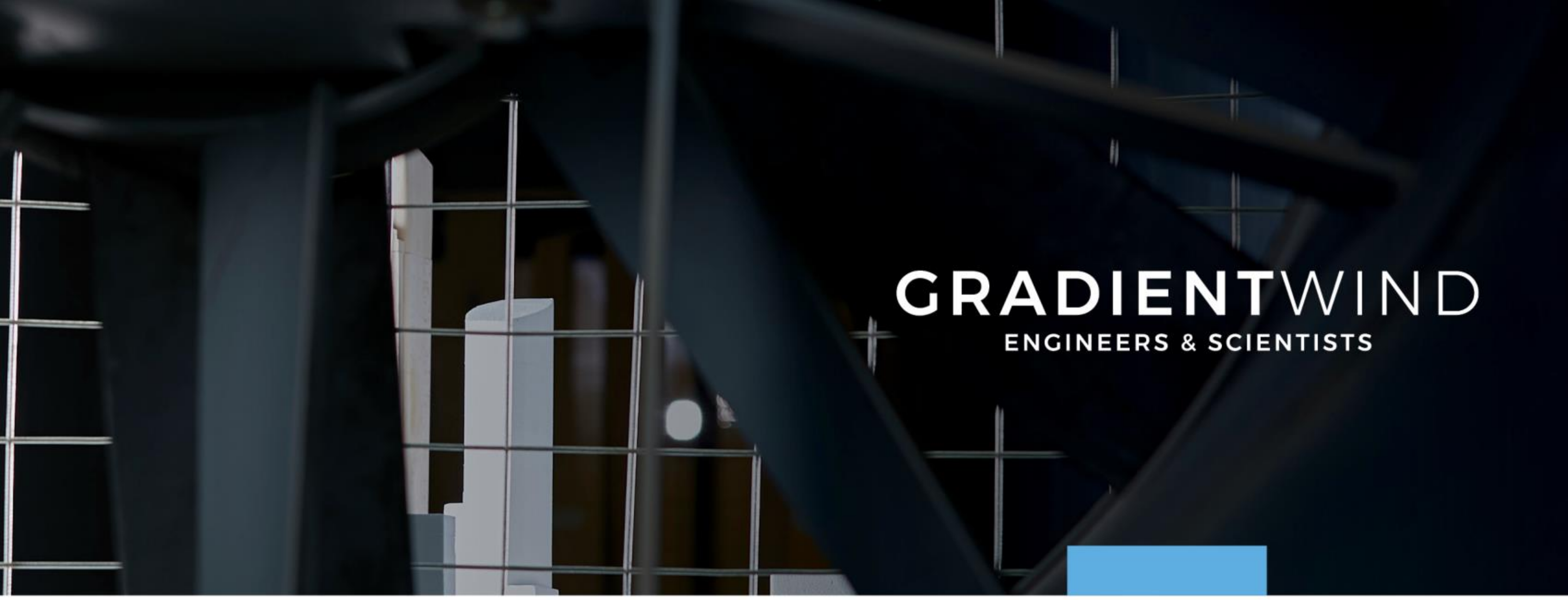
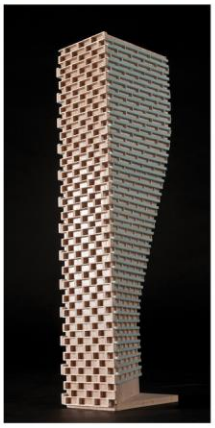
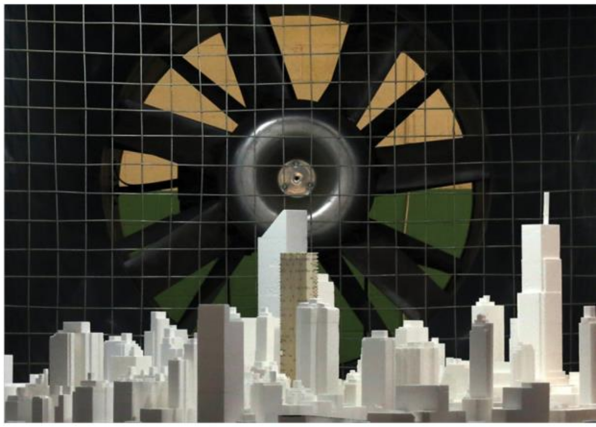


PEDESTRIAN LEVEL WIND STUDY

2935 & 2955 Mississauga Road
Mississauga, Ontario

REPORT: GW25-166-WTPLW





December 4, 2025

PREPARED FOR
590816 Ontario Inc.
2616 Cynara Road
Mississauga, Ontario
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PREPARED BY
Cristiano Kondo, MESc., P.Eng., Wind Engineer
Angelina Gomes, P.Eng., Wind Engineer

EXECUTIVE SUMMARY

This report describes a wind tunnel pedestrian level wind study undertaken to assess wind conditions for a proposed residential development located at 2935 & 2955 Mississauga Road in Mississauga, Ontario. Two configurations were studied: (i) *existing scenario*, including all under construction, surrounding developments and without the proposed development, and (ii) *proposed scenario* with the proposed development in place. The study involves wind tunnel measurements of pedestrian wind speeds using a physical scale model, combined with meteorological data integration, to assess pedestrian comfort at key areas within and surrounding the study site. Grade-level areas investigated include sidewalks, walkways, laneways, landscaped areas, outdoor amenities, and building access points. Wind comfort is also evaluated over the Levels 7 and 8 outdoor amenity terraces. The results and recommendations derived from these considerations are summarized in the following paragraphs and detailed in the subsequent report.

Our work is based on industry standard wind tunnel testing and data analysis procedures, architectural drawings prepared by CariCari Lee Architects in October 2025, surrounding street layouts, as well as existing and approved future building massing information obtained from the City of Mississauga, and recent site imagery.

A complete summary of the predicted wind conditions is provided in Section 5 of this report and is also illustrated in Figures 2A through 4B, as well as Tables A1-A2 and B1-B3 in the appendices. Based on wind tunnel test results, meteorological data analysis, and experience with similar developments in Mississauga, we conclude that the future wind conditions over all grade-level pedestrian wind-sensitive areas within and surrounding the study site will be acceptable for the intended uses on a seasonal basis. Additionally, the Levels 7 and 8 outdoor amenity terraces will be comfortable for sitting or more sedentary activities throughout the warmer months without the need for mitigation.

Within the context of typical weather patterns, which exclude anomalous localized storm events such as tornadoes and downbursts, no areas over the study site were found to experience wind conditions that are considered unsafe.

TABLE OF CONTENTS

1. INTRODUCTION

This report describes a wind tunnel pedestrian level wind (PLW) study undertaken to assess wind conditions for a proposed residential development located at 2935 & 2955 Mississauga Road in Mississauga, Ontario. Two configurations were studied: (i) *existing scenario*, including all under construction, surrounding developments and without the proposed development, and (ii) *proposed scenario* with the proposed development in place. The study was performed in accordance with industry standard wind tunnel testing techniques, architectural drawings provided by CariCari Lee Architects in October 2025, surrounding street layouts and existing and approved future building massing information, as well as recent site imagery.

2. TERMS OF REFERENCE

The focus of this wind tunnel pedestrian wind study is the proposed residential development located at 2935 & 2955 Mississauga Road in Mississauga, Ontario. The study site is situated approximately 90 metres southeast of the intersection of Mississauga Road and Dundas Street West.

The study site comprises a residential 12-storey building with a six-storey podium to the west longitudinally aligned with Mississauga Road, and a three-storey stacked townhouse block to the east, containing private amenities for ground-floor units along its north elevation. A proposed private driveway connecting to Mississauga Road to the south provides access to a central roundabout, which leads to the drop-off areas, loading areas, and the ramp to three levels of underground parking. The ground floor includes a primary entrance fronting the roundabout to the east, an indoor amenity with an adjacent outdoor amenity at the northeast corner, residential space units along the north and west elevations, and building support services in the remaining spaces. The floorplate sets back from the east side at Levels 7 and 8 to accommodate outdoor and indoor amenities, with residential units elsewhere. The floorplate rises uniformly to full height, where a mechanical penthouse and green roof complete the tower.

Regarding wind exposures, the near-field surroundings of the development (defined as an area falling within a 200-metre radius of the site) are characterized by open green spaces in all directions, with low-rise suburban buildings along the boundary of the southwest and southeast quadrants. The far-field surroundings (defined as the area beyond the near field and within a two-kilometer radius) are characterized by primarily suburban exposure in all directions, with isolated open green spaces in Erindale Park in the northwest quadrant and Credit Valley Golf and Country Club in the northeast quadrant. The Queen Elizabeth Way is approximately 830 metres to the southeast.

Grade-level areas investigated include sidewalks, walkways, laneways, landscaped areas, outdoor amenities, and building access points. Wind comfort is also evaluated over the Levels 7 and 8 outdoor amenity terraces. Figures 1A and 1B illustrate the *existing* and *proposed* study sites and surrounding context, respectively, and Photographs 1 through 6 depict the wind tunnel model used to conduct the study.

3. OBJECTIVES

The principal objectives of this study are to (i) determine pedestrian level wind comfort and safety conditions at key areas within and surrounding the development site; (ii) identify areas where wind conditions may interfere with the intended uses of outdoor spaces; (iii) recommend suitable mitigation measures, where required; and (iv) evaluate the influence of the proposed development on the existing wind conditions.

4. METHODOLOGY

The approach followed to quantify pedestrian wind conditions over the site is based on wind tunnel measurements of wind speeds at selected locations on a reduced-scale physical model, meteorological analysis of the Mississauga area wind climate, and synthesis of wind tunnel data with industry-accepted guidelines[1]. The following sections describe the analysis procedures, including a discussion of the pedestrian comfort and safety guidelines.

4.1 Wind Tunnel Context Modelling

A detailed PLW study is performed to determine the influence of local winds at the pedestrian level for a proposed development. The physical model of the proposed development and relevant surroundings, illustrated in Photographs 1 through 6 following the main text, was constructed at a scale of 1:400. The wind tunnel model includes all existing buildings and approved future developments within a full-scale

[1] City of Mississauga Urban Design Terms of Reference, Wind Comfort and Safety Studies, July 2024

diameter of approximately 840 metres. The general concept and approach to wind tunnel modelling is to provide building and topographic detail in the immediate vicinity of the study site on the surrounding model, and to rely on a length of wind tunnel upwind of the model to develop wind properties consistent with known turbulent intensity profiles that represent the surrounding terrain.

An industry standard practice is to omit trees, vegetation, and other existing and planned landscape elements from the wind tunnel model due to the difficulty of providing an accurate seasonal representation of vegetation. The omission of trees and other landscaping elements produces slightly more conservative wind speed values.

4.2 Wind Speed Measurements

The PLW study was performed by testing a total of 78 sensor locations on the scale model in Gradient Wind's wind tunnel, with 71 sensors located at grade and the remaining seven sensors over the Levels 7 and 8 outdoor amenity terraces. Wind speed measurements were performed for each of the 78 sensors for 36 wind directions at 10° intervals. Figures 1A and 1B illustrate the *existing* and *proposed* study sites and surrounding context, respectively, while sensor locations used to investigate wind conditions are illustrated in Figures 2A through 4B.

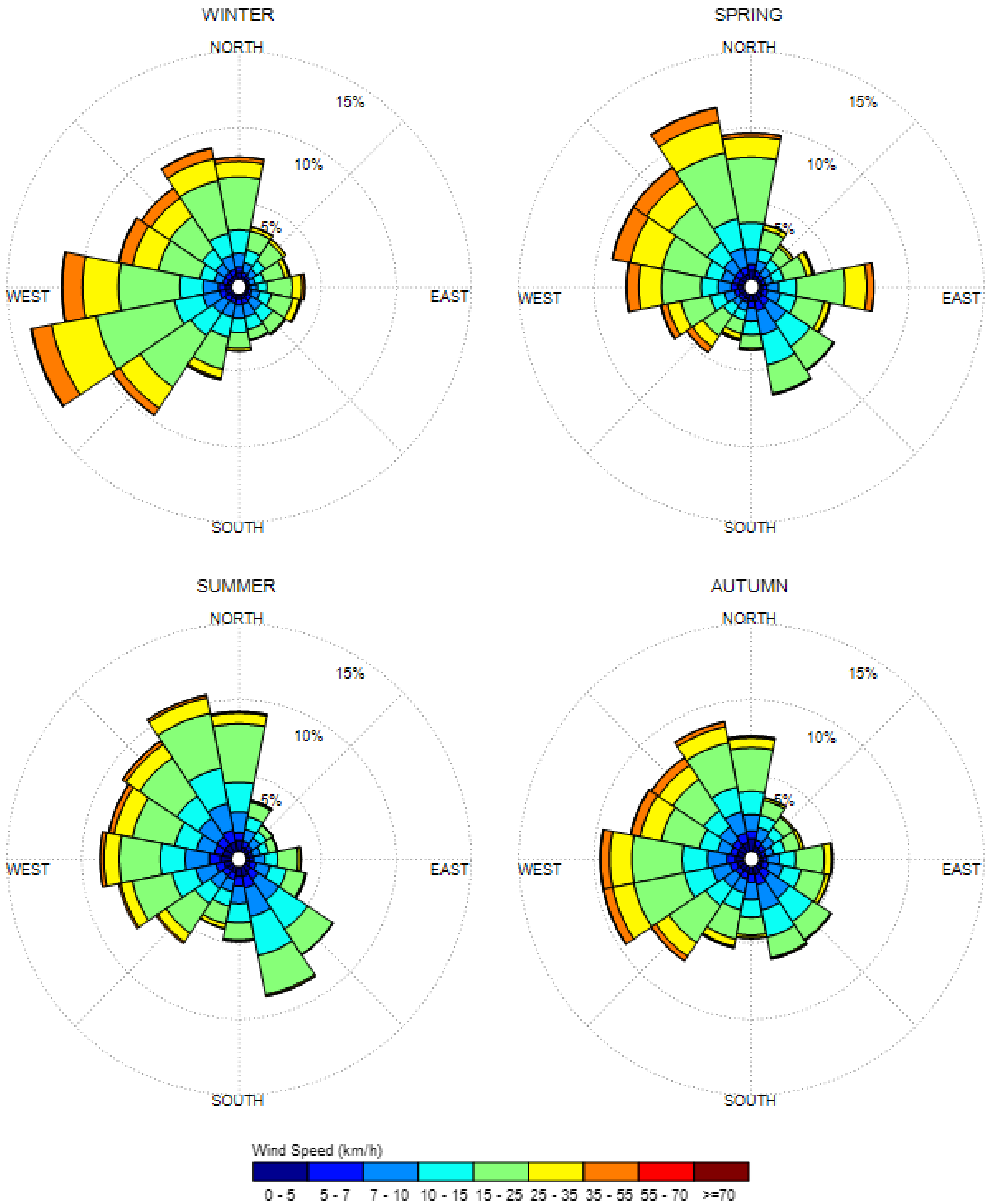
Mean and peak wind speed values for each location and wind direction were calculated from real-time pressure measurements, recorded at a sample rate of 500 samples per second, and taken over a 60-second time period. This period at model-scale corresponds approximately to one hour in full-scale, which matches the time frame of full-scale meteorological observations. Measured mean and gust wind speeds at grade were referenced to the wind speed measured near the ceiling of the wind tunnel to generate mean and peak wind speed ratios. Ceiling height in the wind tunnel represents the depth of the boundary layer of wind flowing over the earth's surface, referred to as the gradient height. Within this boundary layer, mean wind speed increases up to the gradient height and remains constant thereafter. Appendices C and D provide greater detail of the theory behind wind speed measurements. Wind tunnel measurements for this project, conducted in Gradient Wind's wind tunnel facility, meet or exceed guidelines found in the National Building Code of Canada 2015 and of 'Wind Tunnel Studies of Buildings and Structures', ASCE Manual 7 Reports on Engineering Practice No 67.

4.3 Meteorological Data Analysis - Pearson International Airport

A statistical model for winds in Mississauga was developed from over 50 years of hourly meteorological wind data recorded at Pearson International Airport. Wind speed and direction data were analyzed for each month of the year in order to determine the statistically prominent wind directions and corresponding speeds, and to characterize similarities between monthly weather patterns. Based on this portion of the analysis, the four seasons are represented by grouping data from consecutive months based on similarity of weather patterns, and not according to the traditional calendar method.

The statistical model of the Mississauga area wind climate, which indicates the directional character of local winds on a seasonal basis, is illustrated on the following page. The plots illustrate seasonal distribution of measured wind speeds and directions in km/h. Probabilities of occurrence of different wind speeds are represented as stacked polar bars in sixteen azimuth divisions. The radial direction represents the percentage of time for various wind speed ranges per wind direction during the measurement period. The preferred wind speeds and directions can be identified by the longer length of the bars. For Pearson International Airport, the most common winds concerning pedestrian comfort occur from the southwest clockwise to the north, as well as those from the east. The directional preference and relative magnitude of the wind speed varies somewhat from season to season, with the summer months displaying the calmest winds relative to the remaining seasonal periods.

SEASONAL DISTRIBUTION OF WINDS FOR VARIOUS PROBABILITIES
PEARSON INTERNATIONAL AIRPORT, TORONTO, ONTARIO



Notes:

1. Radial distances indicate percentage of time of wind events.
2. Wind speeds are mean hourly in km/h, measured at 10 m above the ground.

4.4 Pedestrian Comfort and Safety Guidelines

Pedestrian comfort and safety guidelines are based on the mechanical effects of wind without consideration of other meteorological conditions (i.e. temperature, relative humidity). The comfort guidelines assume that pedestrians are appropriately dressed for a specified outdoor activity during any given season. Four pedestrian comfort classes are based on 80% non-exceedance Guest Equivalent Mean (GEM) wind speed ranges, which include (i) Sitting; (ii) Standing; (iii) Walking; and (iv) Uncomfortable. More specifically, the comfort classes and associated GEM wind speed ranges are summarized as follows:

(i) **Sitting** – A wind speed below 10 km/h (i.e. 0 – 10 km/h) would be considered acceptable for sedentary activities, including sitting.

(ii) **Standing** – A wind speed below 15 km/h (i.e. 10 km/h – 15 km/h) is acceptable for activities such as standing or leisurely strolling.

(iii) **Walking** – A wind speed below 20 km/h (i.e. 15 km/h – 20 km/h) is acceptable for walking or more vigorous activities.

(iv) **Uncomfortable** – A wind speed over 20 km/h is classified as uncomfortable from a pedestrian comfort standpoint. Brisk walking and exercise, such as jogging, would be acceptable for moderate excesses of this criterion.

The pedestrian safety wind speed guideline is based on the approximate threshold that would cause a vulnerable member of the population to fall. A 0.1% exceedance gust wind speed of greater than 90 km/h is classified as dangerous.

Experience and research on people's perception of mechanical wind effects has shown that if the wind speed levels are exceeded for more than 20% of the time, the activity level would be judged to be uncomfortable by most people. For instance, if wind speeds of 10 km/h were exceeded for more than 20% of the time most pedestrians would judge that location to be too windy for sitting or more sedentary activities. Similarly, if 20 km/h at a location were exceeded for more than 20% of the time, walking or less vigorous activities would be considered uncomfortable. As most of these criteria are based on subjective reactions of a population to wind forces, their application is partly based on experience and judgment.

Once the pedestrian wind speed predictions have been established at tested locations, the assessment of pedestrian comfort involves determining the suitability of the predicted wind conditions for their associated spaces. This step involves comparing the predicted comfort class to the desired comfort class, which is dictated by the location type represented by the sensor (i.e. a sidewalk, building entrance, amenity space, or other). An overview of common pedestrian location types and their desired comfort classes are summarized below.

DESIRED PEDESTRIAN COMFORT CLASSES FOR VARIOUS LOCATION TYPES

Location Types	Desired Comfort Classes
Primary Building Entrance	Standing
Secondary Building Access Point	Walking
Public Sidewalks / Pedestrian Walkways	Walking
Outdoor Amenity Spaces	Sitting / Standing
Cafés / Patios / Benches / Gardens	Sitting / Standing
Plazas	Standing / Walking
Transit Stops	Standing
Public Parks	Sitting / Walking
Garage / Service Entrances	Walking
Vehicular Drop-Off Zones	Walking
Laneways / Loading Zones	Walking

5. RESULTS AND DISCUSSION

Tables A1 and A2 in Appendix A provide a summary of seasonal comfort predictions for each sensor location under the *existing* massing scenario. Similarly, Tables B1 and B2 in Appendix B provide the seasonal comfort predictions for under the *proposed* massing scenario. The tables indicate the 80% non-exceedance GEM wind speeds and corresponding comfort classifications as defined in Section 4.4. In other words, a wind speed threshold of 19.1 for the summer season indicates that 80% of the measured data falls at or below 19.1 km/h during the summer months and conditions are therefore suitable for walking, as the 80% threshold value falls within the exceedance range of 15-20 km/h for walking. The tables include the predicted threshold values for each sensor location during each season, accompanied by the corresponding predicted comfort class (i.e., sitting, standing, walking, etc.).

The most significant findings of the PLW study are summarized in Sections 5.1 and 5.2. To assist with understanding and interpretation, predicted conditions for the proposed development are also illustrated in colour-coded format in Figures 2A through 4B. Conditions suitable for sitting are represented by the colour blue, while standing is represented by green, and walking by yellow. Conditions considered uncomfortable for walking are represented by the colour orange. For locations where the wind safety criterion is exceeded, the sensor is highlighted in red.

5.1 Pedestrian Comfort Suitability – *Existing Scenario*

Based on the analysis of the measured data, consideration of local climate data, and the suitability descriptors provided in Tables A1 and A2 in Appendix A and illustrated in Figures 2A and 2B, this section summarizes the significant findings of the PLW study with respect to the *existing scenario*, as follows:

1. All public sidewalks and landscaped spaces within and surrounding the proposed development currently experience wind conditions suitable for walking or better throughout the year.
2. Within the context of typical weather patterns, which exclude anomalous localized storm events such as tornadoes and downbursts, no areas over the study site were found to experience wind conditions that are considered unsafe.

5.2 Pedestrian Comfort Suitability – *Proposed Scenario*

Based on the analysis of the measured data, consideration of local climate data, and the suitability descriptors provided in Tables B1-B3 in Appendix B and illustrated in Figures 3A through 4B, this section summarizes the significant findings of the PLW study with respect to the *proposed scenario*, as follows:

1. All public sidewalks, walkways, laneways, and landscaped spaces within and surrounding the proposed development will experience wind conditions suitable for walking or better during each seasonal period, which is acceptable for the intended uses of spaces.
2. The main residential entrance (Sensors 56/57) will experience sitting conditions throughout the year, which is acceptable for the intended use.

The entrances to the proposed stacked townhouses (Sensors 67-70) will generally experience standing or sitting conditions year-round, which is acceptable. One exception is the southwest townhouse entrance (Sensor 70), which will experience marginal walking conditions during the winter. However, it is notable that all townhouse entrances are currently recessed within the building façade, therefore mitigation is not necessary.

All secondary building access points (including stairwell exits, loading areas, and vehicle entrances) throughout the proposed development will be comfortable for walking or better, with mostly standing or better, throughout the year, which is acceptable for the intended uses of spaces.

3. The proposed grade-level outdoor amenity (Sensors 53-56) will experience a mix of sitting and standing conditions during the warmer months. Designated seating areas in the northwest of the amenity (Sensors 54 & 55) are recommended to be equipped with overhead canopy or pergola structures, or targeted wind barriers directly north. Such barriers should measure at least 1.8-metres-tall and may comprise high-solidity wind screens, raised planters with dense coniferous plantings, or a combination thereof. The exact configuration of such mitigation can be coordinated with the design team as the landscape plans develop.

4. The private amenities along the north side of the proposed stacked townhomes (Sensors 60, 62, & 64) will experience largely sitting conditions during the summer months, with marginal standing conditions (0.8 km/h exceedance of the sitting threshold; see Appendix B) near the northeast corner (Sensor 64). The noted conditions are acceptable for the intended use.

5. The Level 7 outdoor amenity terrace (Sensors 72-76) will generally be suitable for sitting or more sedentary activities during the summer months, with the area in the northeast corner (Sensor 73) marginally experiencing standing conditions (0.3km/h exceedance of the sitting threshold; see Appendix B), which is considered acceptable for intended uses.

6. The Level 8 outdoor amenity terrace (Sensors 77 & 78) will be suitable for sitting or more sedentary activities year-round without the need for mitigation.

7. Within the context of typical weather patterns, which exclude anomalous localized storm events such as tornadoes and downbursts, no areas over the study site were found to experience wind conditions that are considered unsafe.

6. CONCLUSIONS AND RECOMMENDATIONS

This report summarizes the methodology, results, and recommendations related to a pedestrian level wind study for a proposed residential development located at 2935 & 2955 Mississauga Road in Mississauga, Ontario. The study was performed in accordance with industry standard wind tunnel testing and data analysis procedures.

A complete summary of the predicted wind conditions is provided in Section 5 of this report and is also illustrated in Figures 2A through 4B, as well as Tables A1-A2 and B1-B3 in the appendices. Based on wind tunnel test results, meteorological data analysis, and experience with similar developments in Mississauga, we conclude that the future wind conditions over all grade-level pedestrian wind-sensitive areas within and surrounding the study site will be acceptable for the intended uses on a seasonal basis. Additionally, the Levels 7 and 8 outdoor amenity terraces will be comfortable for sitting or more sedentary activities throughout the warmer months without the need for mitigation.

Within the context of typical weather patterns, which exclude anomalous localized storm events such as tornadoes and downbursts, no areas over the study site were found to experience wind conditions that are considered unsafe.

This concludes our pedestrian level wind study and report. Please advise the undersigned of any questions or comments.

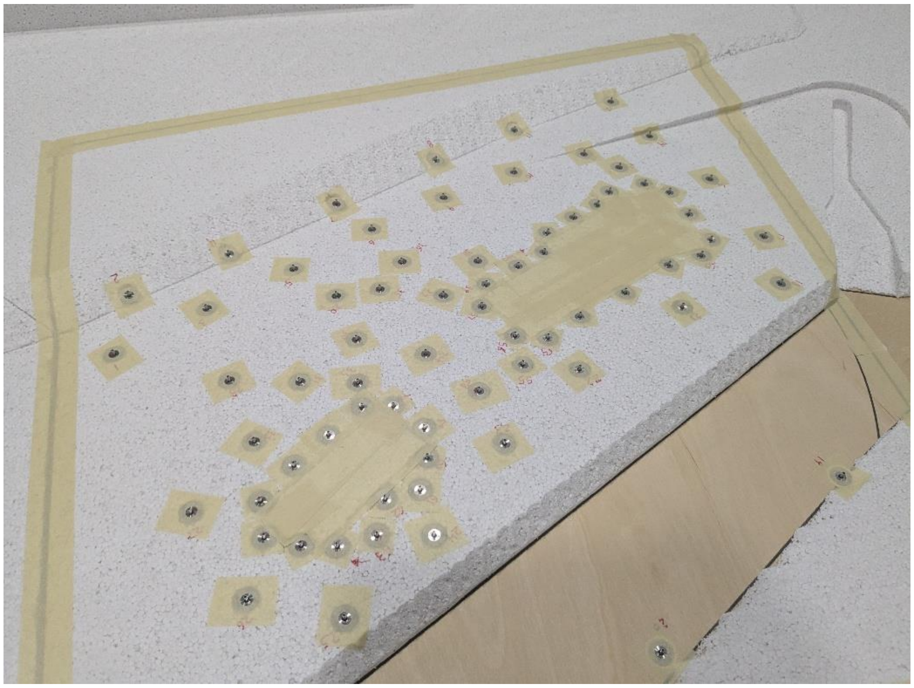
Sincerely,

Gradient Wind Engineering Inc.

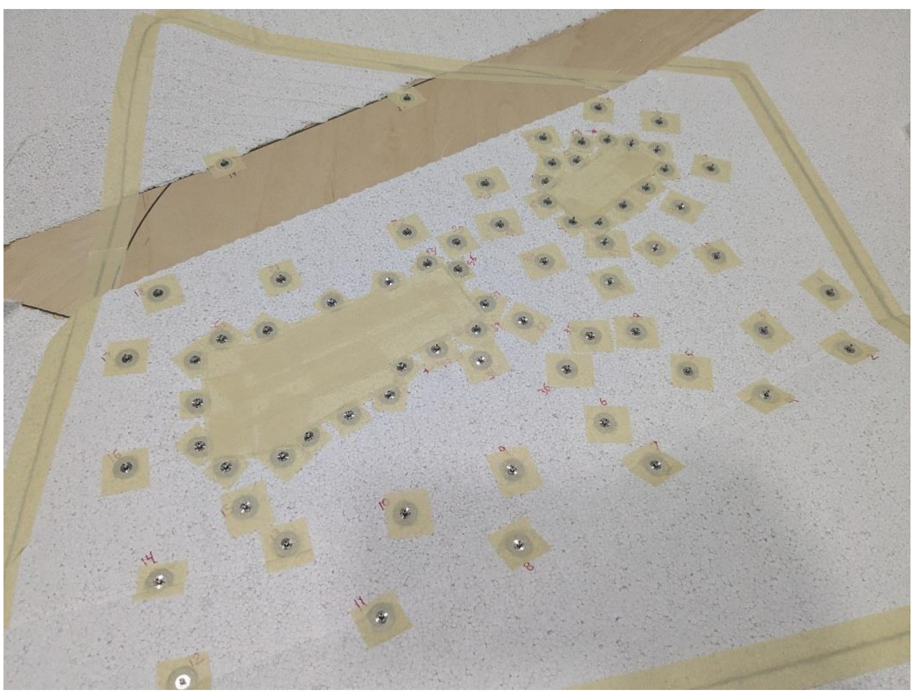
Cristiano Kondo, MESc., P.Eng.,
Wind Engineer

Angelina Gomes, P.Eng.,
Wind Engineer

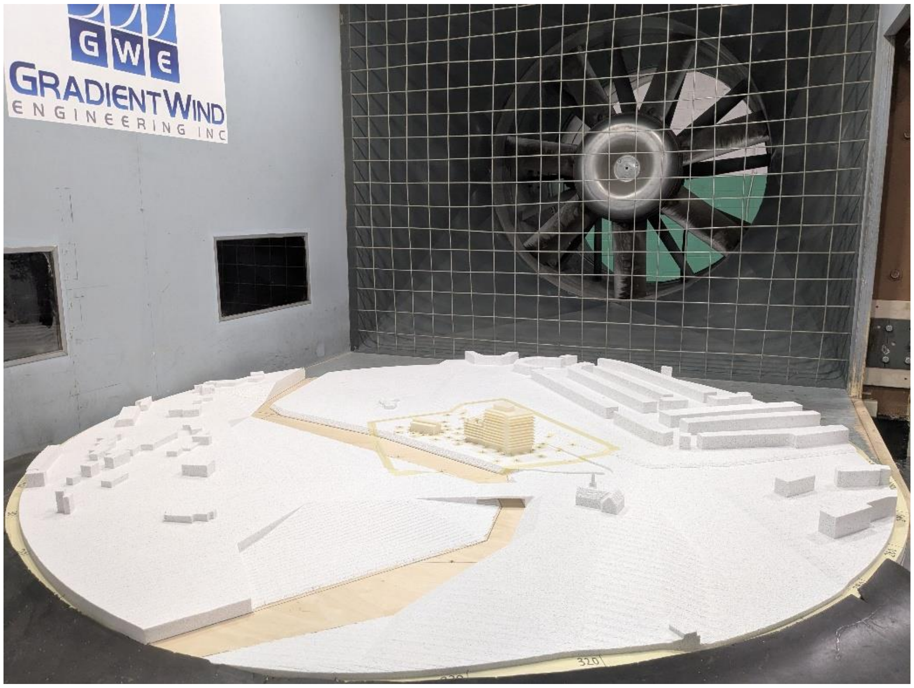
GW25-166-WTPLW



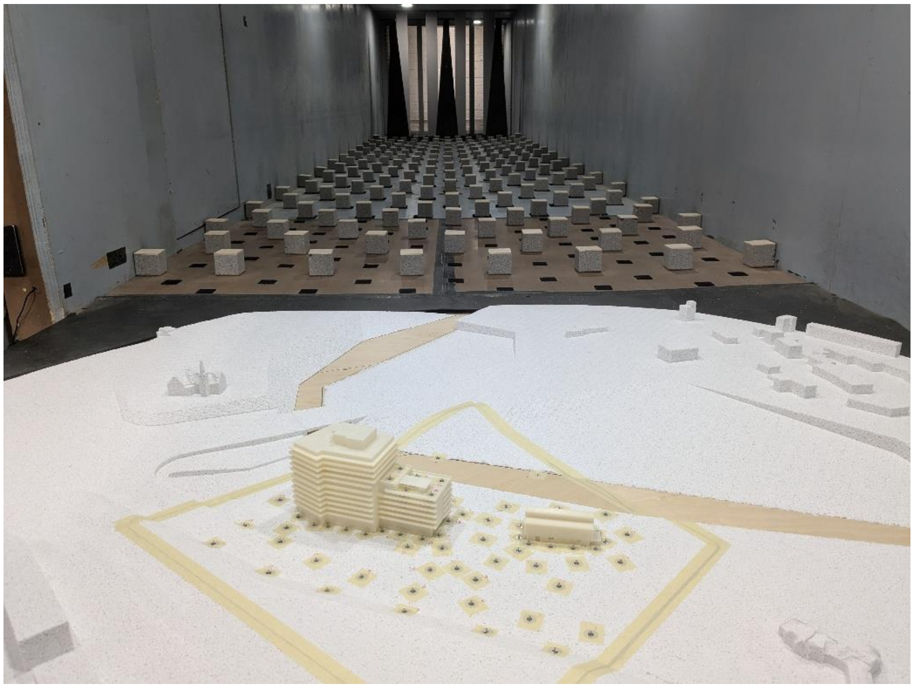
PHOTOGRAPH 1: CLOSE-UP VIEW OF EXISTING CONTEXT MODEL LOOKING SOUTHWEST



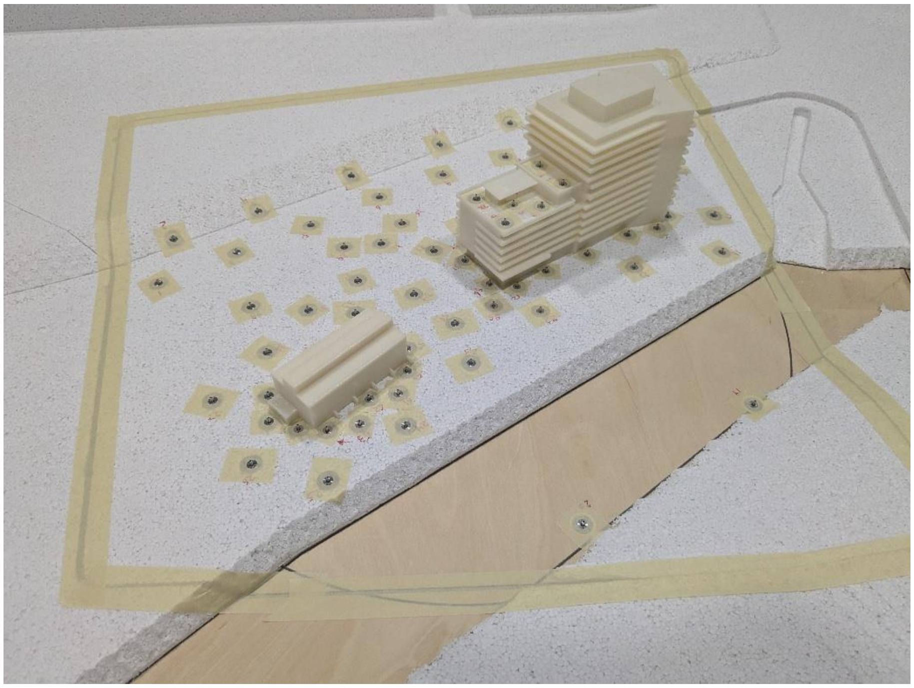
PHOTOGRAPH 2: CLOSE-UP VIEW OF EXISTING CONTEXT MODEL LOOKING NORTHEAST



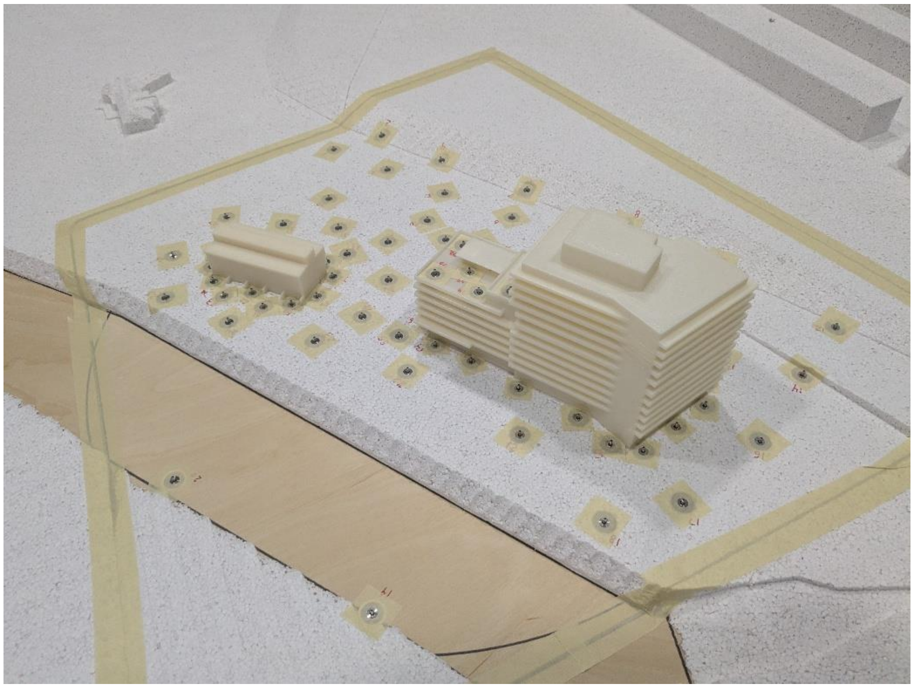
PHOTOGRAPH 3: <u>PROPOSED</u> STUDY MODEL INSIDE THE GWE WIND TUNNEL LOOKING DOWNWIND



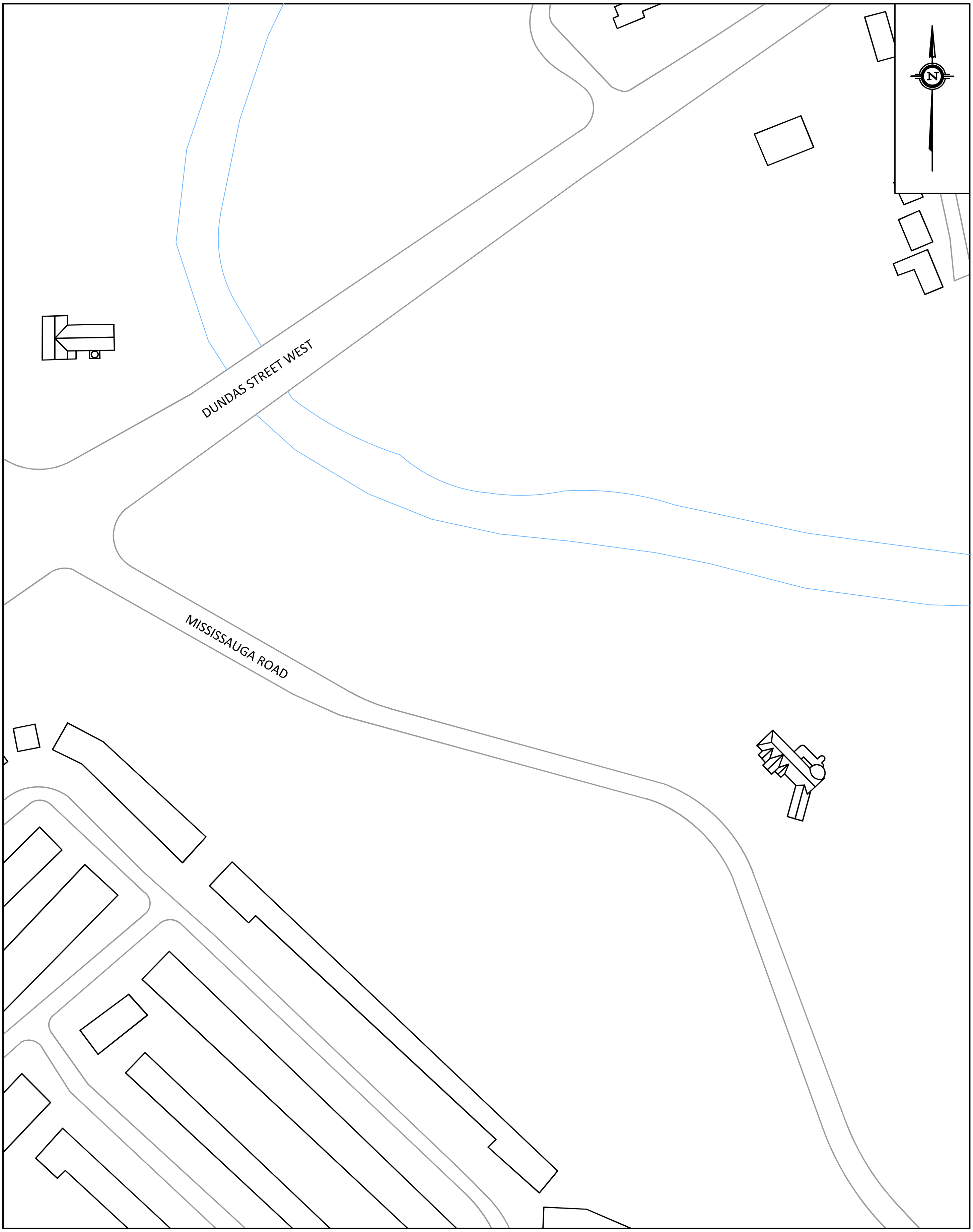
PHOTOGRAPH 4: <u>PROPOSED</u> STUDY MODEL INSIDE THE GWE WIND TUNNEL LOOKING UPWIND



PHOTOGRAPH 5: CLOSE-UP VIEW OF PROPOSED STUDY MODEL LOOKING SOUTHWEST



PHOTOGRAPH 6: CLOSE-UP VIEW OF PROPOSED STUDY MODEL LOOKING SOUTHEAST



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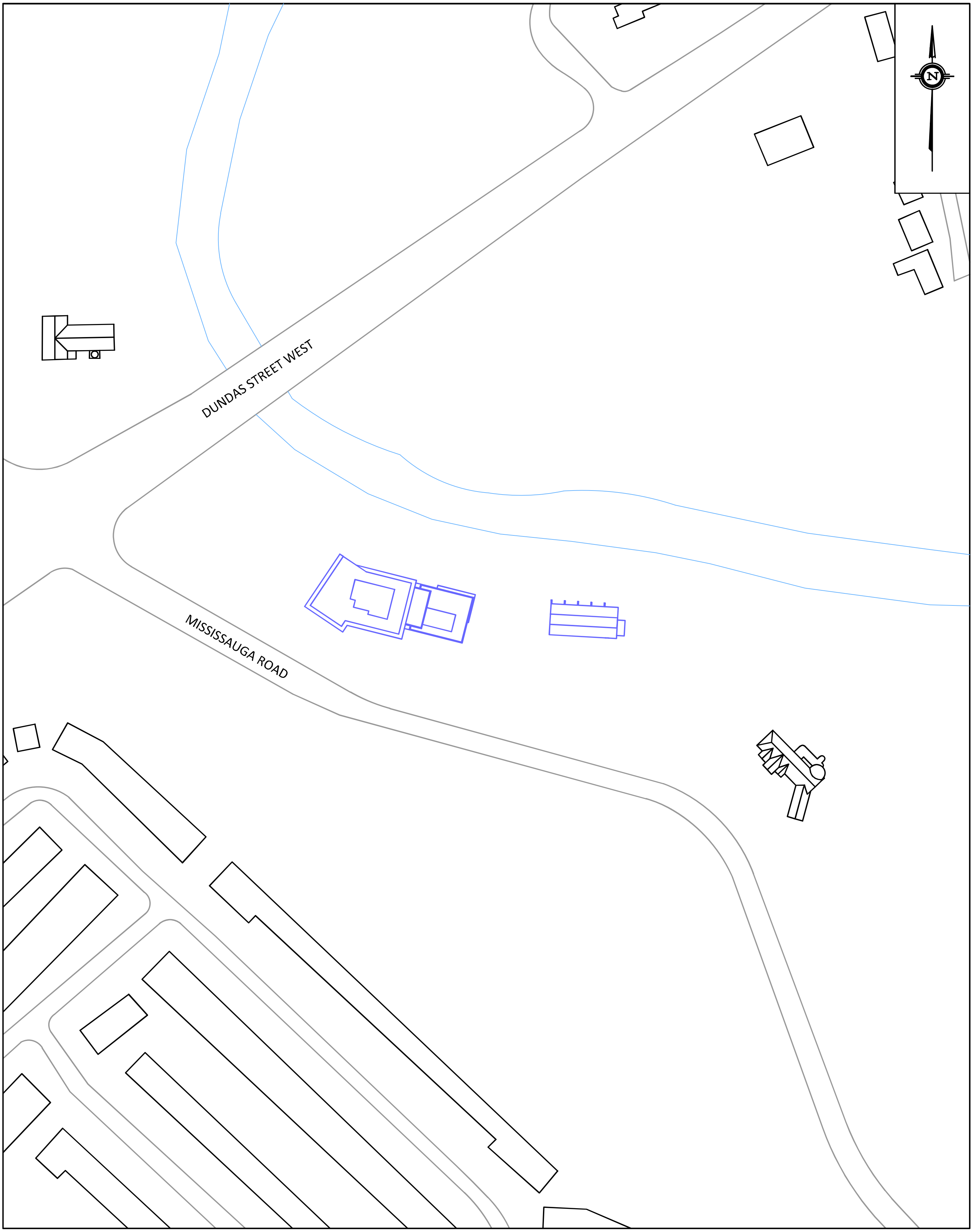
PROJECT: 2935 MISSISSAUGA RD, MISSISSAUGA PEDESTRIAN LEVEL WIND STUDY		DESCRIPTION: FIGURE 1A: EXISTING SITE PLAN AND SURROUNDING CONTEXT
SCALE: 1:2500 (APPROX.)	DRAWING NO.: GW25-166-PLW-1A	
DATE: NOVEMBER 28, 2025	DRAWN BY: C.E.	



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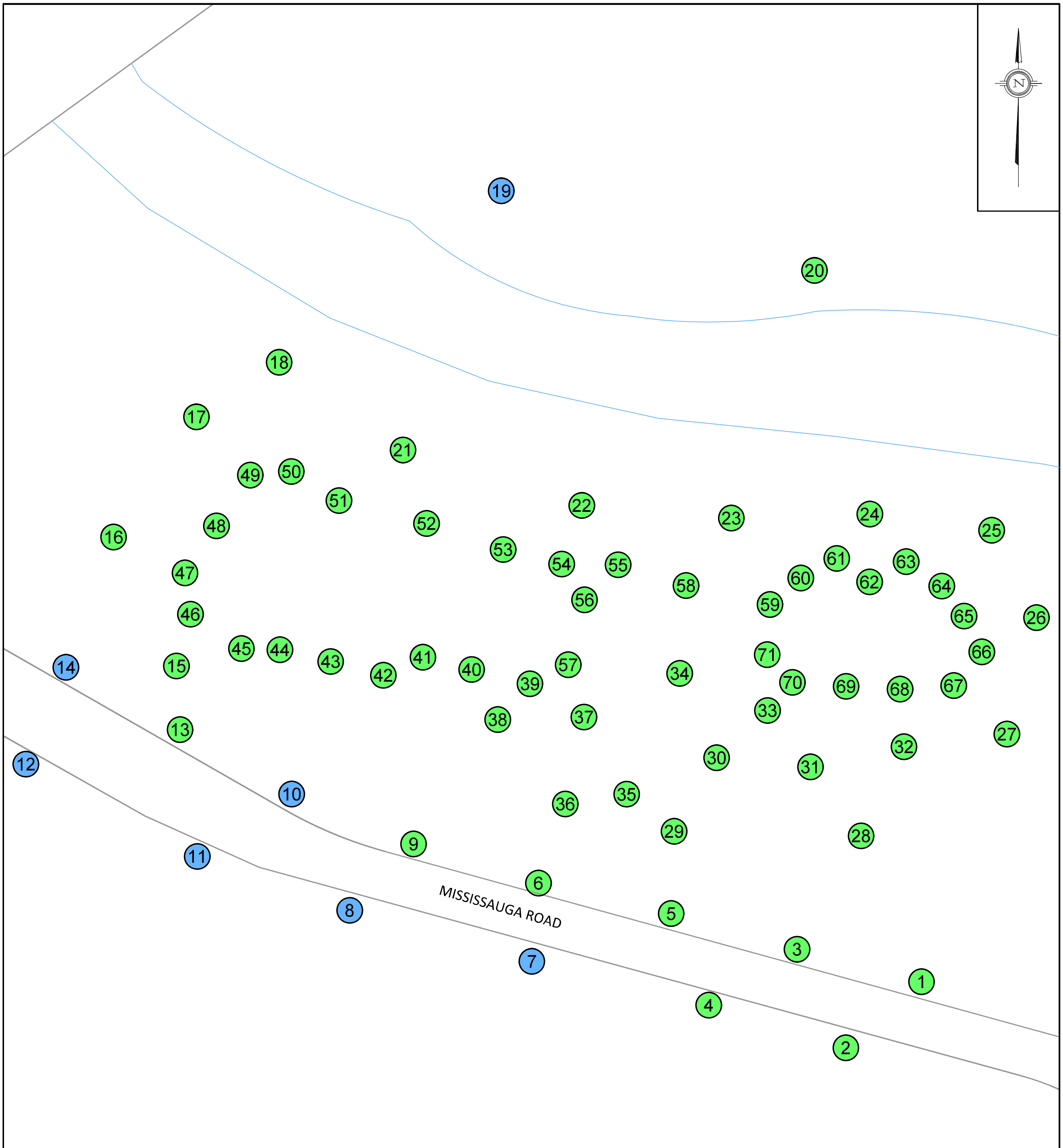
PROJECT: 2935 MISSISSAUGA RD, MISSISSAUGA PEDESTRIAN LEVEL WIND STUDY		DESCRIPTION: FIGURE 1B: PROPOSED SITE PLAN AND SURROUNDING CONTEXT
SCALE: 1:2500 (APPROX.)	DRAWING NO.: GW25-166-PLW-1B	
DATE: NOVEMBER 28, 2025	DRAWN BY: C.E.	



PREDICTED COMFORT CLASSES
- # SITTING
- # STANDING
- # WALKING
- # UNCOMFORTABLE

WIND SAFETY CRITERION
- # ACCEPTABLE
- # EXCEEDED

NOTES:

1. SCALE IS APPROXIMATE.
2. # PEDESTRIAN LEVEL WIND SENSOR LOCATION.

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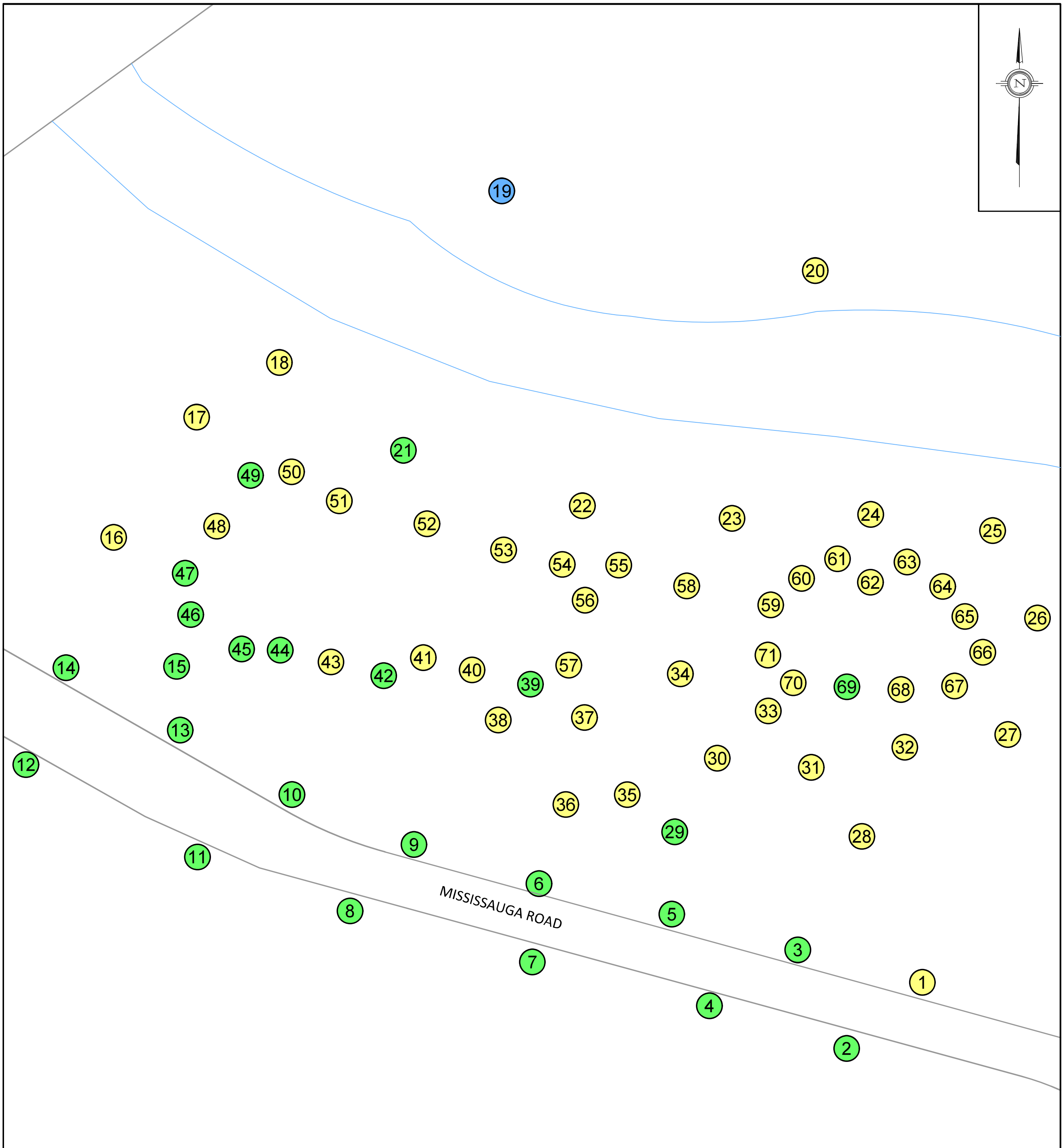
PROJECT	2935 MISSISSAUGA RD, MISSISSAUGA PEDESTRIAN LEVEL WIND STUDY
SCALE	1:1100 (APPROX.)
DRAWING NO.	GW25-166-PLW-2A
DATE	NOVEMBER 28, 2025
DRAWN BY	C.E.
DESCRIPTION	FIGURE 2A: SUMMER EXPOSED GROUND FLOOR PLAN PEDESTRIAN COMFORT PREDICTIONS



PREDICTED COMFORT CLASSES

- # SITTING
- # STANDING
- # WALKING
- # UNCOMFORTABLE

WIND SAFETY CRITERION

- # ACCEPTABLE
- # EXCEEDED

NOTES:

1. SCALE IS APPROXIMATE.
2. # PEDESTRIAN LEVEL WIND SENSOR LOCATION.

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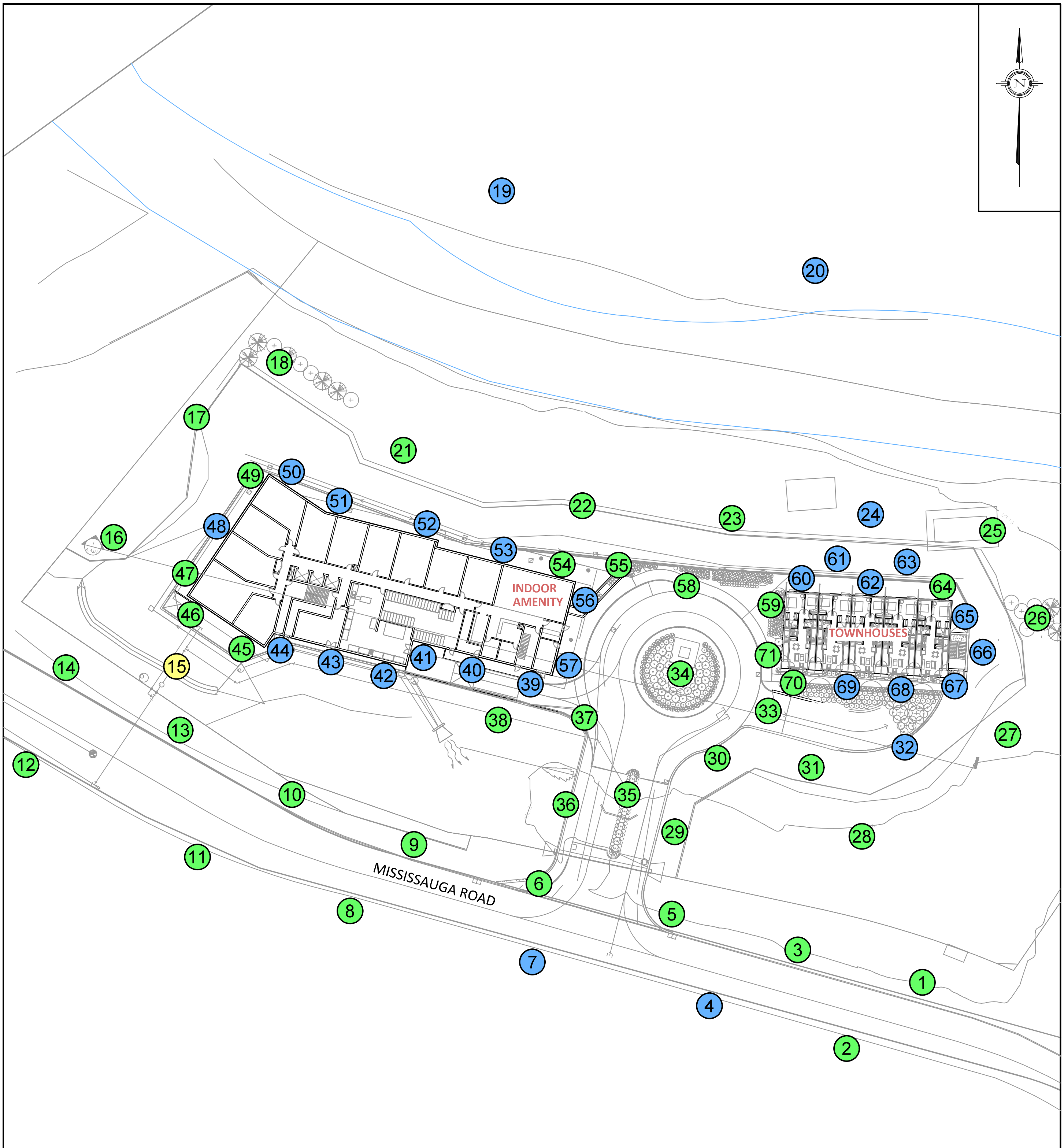
PROJECT: 2935 MISSISSAUGA RD, MISSISSAUGA PEDESTRIAN LEVEL WIND STUDY		DESCRIPTION: FIGURE 2B: WINTER EXPOSED GROUND FLOOR PLAN PEDESTRIAN COMFORT PREDICTIONS
SCALE: 1:1100 (APPROX.)	DRAWING NO.: GW25-166-PLW-2B	
DATE: NOVEMBER 28, 2025	DRAWN BY: C.E.	



PREDICTED COMFORT CLASSES
- # SITTING
- # STANDING
- # WALKING
- # UNCOMFORTABLE

WIND SAFETY CRITERION
- # ACCEPTABLE
- # EXCEEDED

NOTES:

1. SCALE IS APPROXIMATE.
2. # PEDESTRIAN LEVEL WIND SENSOR LOCATION.

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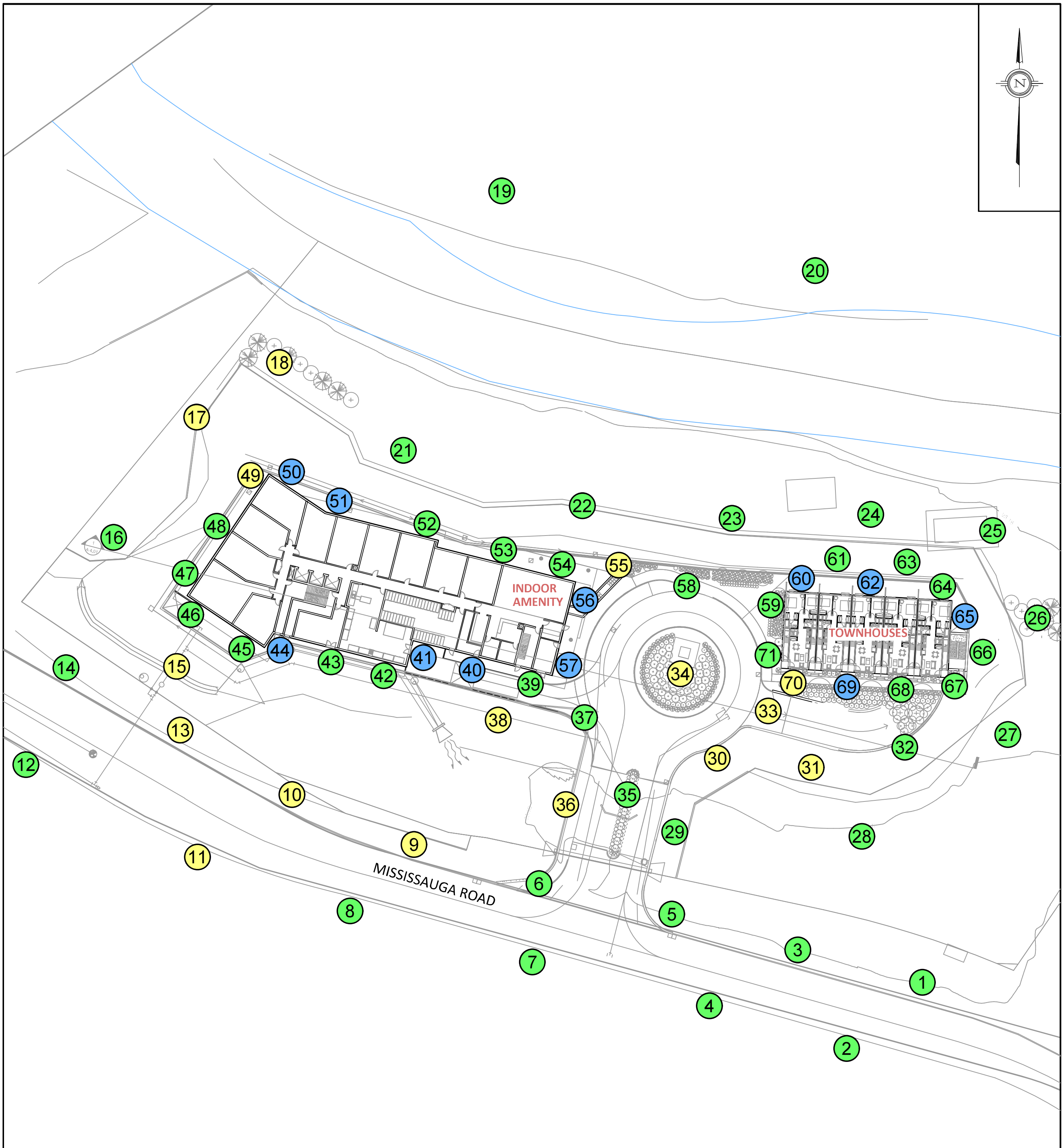
PROJECT	2935 MISSISSAUGA RD, MISSISSAUGA PEDESTRIAN LEVEL WIND STUDY
SCALE	1:1100 (APPROX.)
DRAWING NO.	GW25-166-PLW-3A
DATE	NOVEMBER 28, 2025
DRAWN BY	C.E.
DESCRIPTION	FIGURE 3A: SUMMER PROPOSED GROUND FLOOR PLAN PEDESTRIAN COMFORT PREDICTIONS



PREDICTED COMFORT CLASSES	
#	SITTING
#	STANDING
#	WALKING
#	UNCOMFORTABLE

WIND SAFETY CRITERION	
#	ACCEPTABLE
#	EXCEEDED

NOTES:

1. SCALE IS APPROXIMATE.
2. # PEDESTRIAN LEVEL WIND SENSOR LOCATION.

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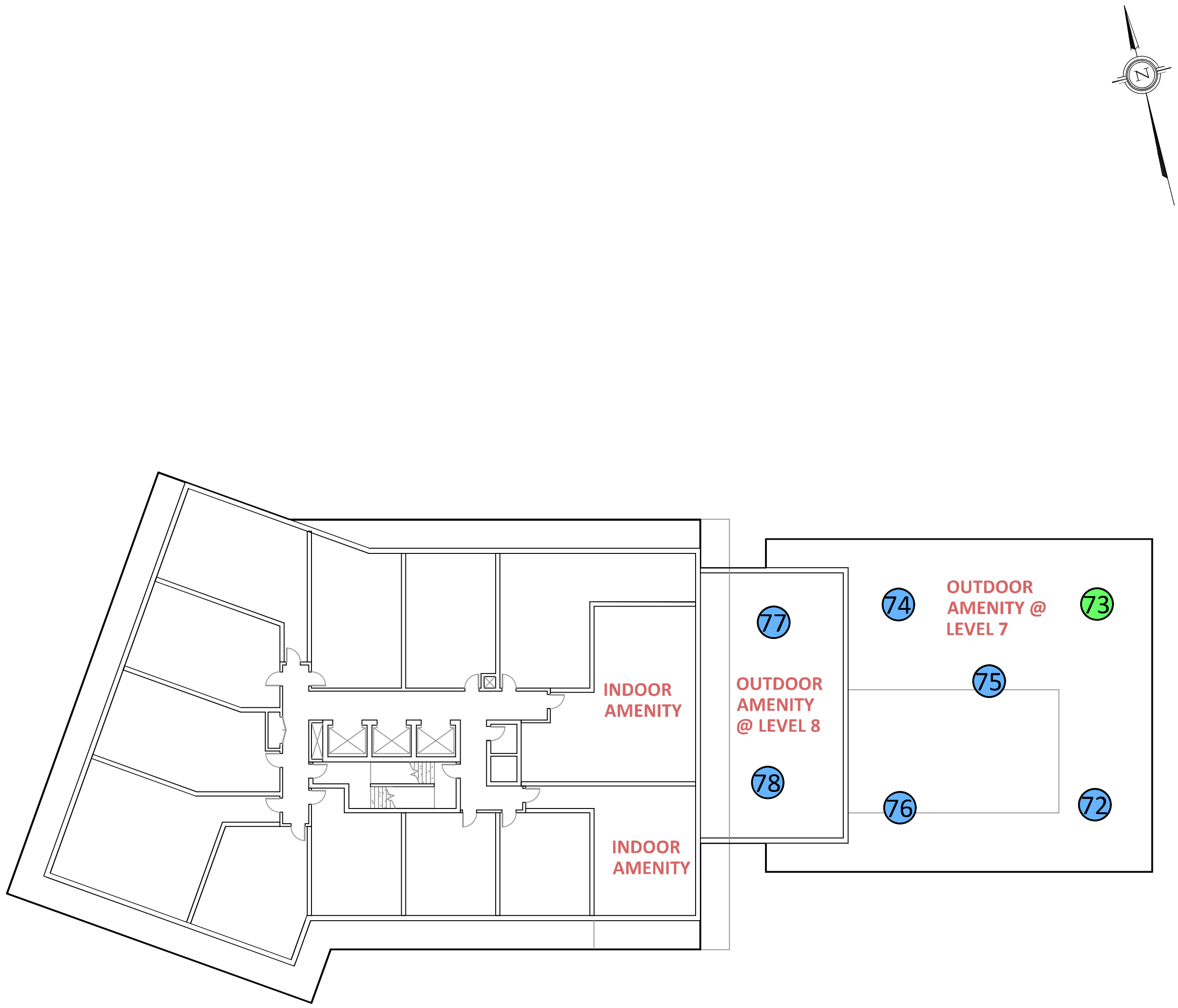
PROJECT		DESCRIPTION
2935 MISSISSAUGA RD, MISSISSAUGA PEDESTRIAN LEVEL WIND STUDY		FIGURE 3B: WINTER PROPOSED GROUND FLOOR PLAN PEDESTRIAN COMFORT PREDICTIONS
SCALE: 1:1100 (APPROX.)	DRAWING NO. GW25-166-PLW-3B	
DATE: NOVEMBER 28, 2025	DRAWN BY: C.E.	



PREDICTED COMFORT CLASSES
- # SITTING
- # STANDING
- # WALKING
- # UNCOMFORTABLE

WIND SAFETY CRITERION
- # ACCEPTABLE
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NOTES:

1. SCALE IS APPROXIMATE.
2. # PEDESTRIAN LEVEL WIND SENSOR LOCATION.

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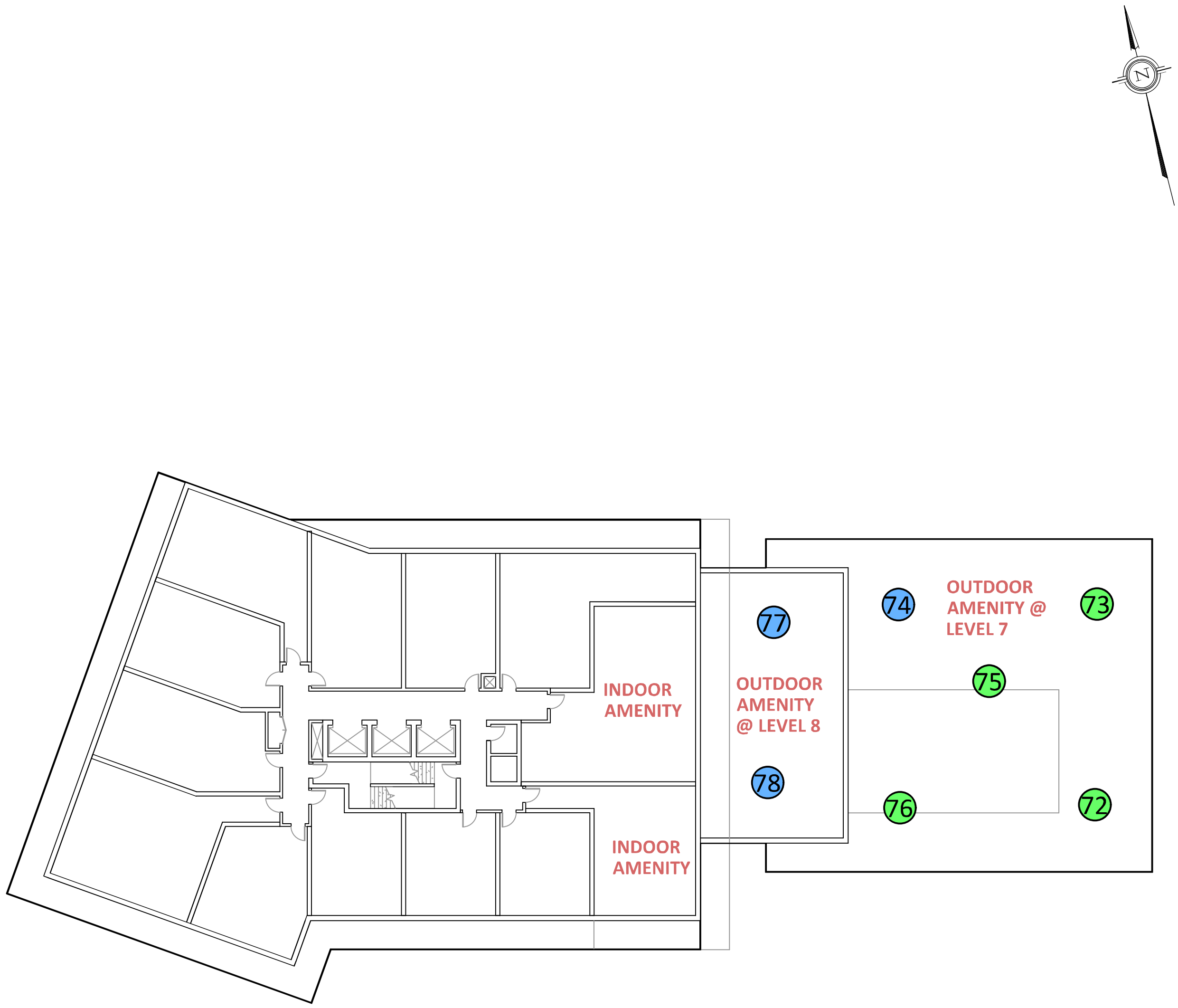
PROJECT	2935 MISSISSAUGA RD, MISSISSAUGA PEDESTRIAN LEVEL WIND STUDY
SCALE	1:500 (APPROX.)
DRAWING NO.	GW25-166-PLW-4A
DATE	NOVEMBER 28, 2025
DRAWN BY	C.E.
DESCRIPTION	FIGURE 4A: SUMMER OUTDOOR AMENITY FLOOR PLAN PEDESTRIAN COMFORT PREDICTIONS



PREDICTED COMFORT CLASSES

- # SITTING
- # STANDING
- # WALKING
- # UNCOMFORTABLE

WIND SAFETY CRITERION

- # ACCEPTABLE
- # EXCEEDED

NOTES:

1. SCALE IS APPROXIMATE.
2. # PEDESTRIAN LEVEL WIND SENSOR LOCATION.

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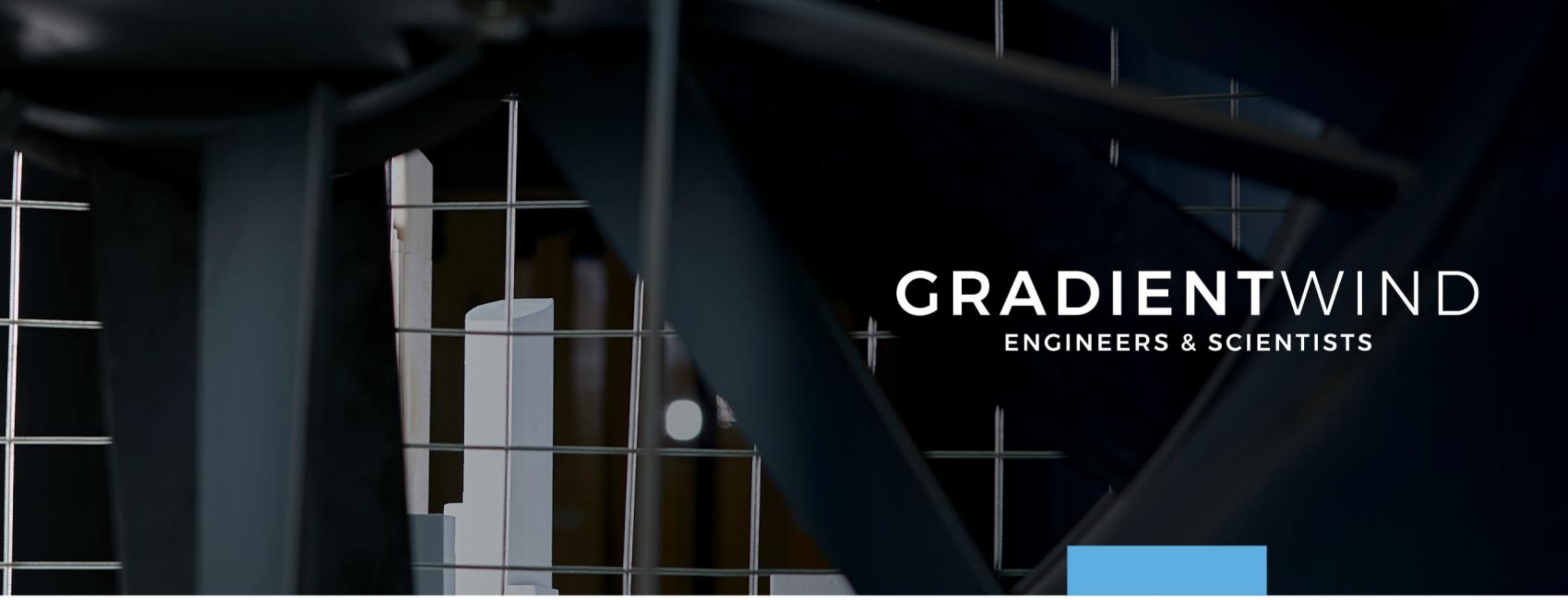
PROJECT	2935 MISSISSAUGA RD, MISSISSAUGA PEDESTRIAN LEVEL WIND STUDY
SCALE	1:500 (APPROX.)
DRAWING NO.	GW25-166-PLW-4B
DATE	NOVEMBER 28, 2025
DRAWN BY	C.E.
DESCRIPTION	FIGURE 4B: WINTER OUTDOOR AMENITY FLOOR PLAN PEDESTRIAN COMFORT PREDICTIONS



APPENDIX A

PEDESTRIAN COMFORT SUITABILITY, TABLES A1-A2
(EXISTING SCENARIO)

Guidelines	
Pedestrian Comfort	**20% exceedance wind speed** 0-10 km/h = Sitting, 10-15 km/h = Standing, 15-20 km/h = Walking, >20 km/h = Uncomfortable
Pedestrian Safety	**0.1% exceedance wind speed** 0-90 km/h = Safe

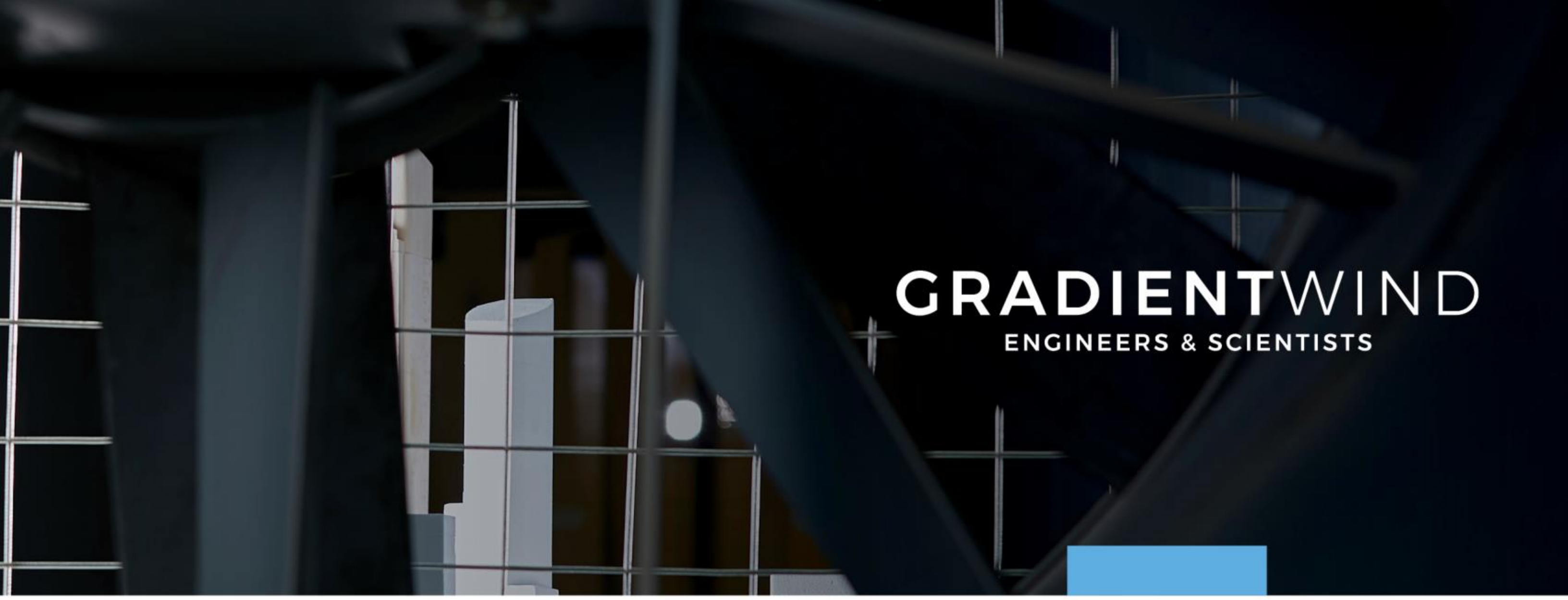
TABLE A1: SUMMARY OF PEDESTRIAN COMFORT (EXISTING SCENARIO)

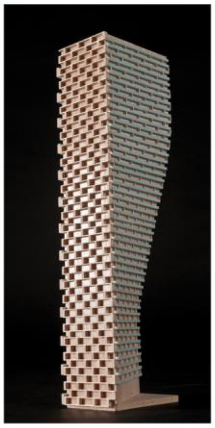
Sensor	Pedestrian Comfort				Pedestrian Safety	
	Summer		Winter		Annual	
	Wind Speed	Comfort Class	Wind Speed	Comfort Class	Wind Speed	Safety Class
1	11.9	Standing	15.4	Walking	52.9	Safe
2	10.8	Standing	14.1	Standing	49.0	Safe
3	11.4	Standing	14.8	Standing	51.4	Safe
4	10.2	Standing	13.2	Standing	47.2	Safe
5	11.2	Standing	14.2	Standing	48.0	Safe
6	10.2	Standing	13.1	Standing	47.6	Safe
7	9.6	Sitting	12.4	Standing	43.9	Safe
8	9.5	Sitting	12.3	Standing	44.5	Safe
9	10.4	Standing	13.4	Standing	46.8	Safe
10	10.0	Sitting	12.8	Standing	44.7	Safe
11	8.7	Sitting	11.4	Standing	40.4	Safe
12	9.6	Sitting	12.5	Standing	46.6	Safe
13	10.4	Standing	13.1	Standing	45.6	Safe
14	8.6	Sitting	10.7	Standing	38.9	Safe
15	10.8	Standing	13.5	Standing	46.6	Safe
16	11.8	Standing	15.1	Walking	51.9	Safe
17	12.2	Standing	15.3	Walking	52.2	Safe
18	12.6	Standing	16.1	Walking	55.7	Safe
19	7.3	Sitting	9.5	Sitting	37.7	Safe
20	13.2	Standing	18.1	Walking	71.7	Safe
21	11.9	Standing	15.0	Standing	50.2	Safe
22	12.0	Standing	15.3	Walking	52.4	Safe
23	13.8	Standing	17.7	Walking	58.9	Safe
24	13.3	Standing	16.9	Walking	59.4	Safe
25	12.7	Standing	15.9	Walking	56.1	Safe
26	12.6	Standing	15.8	Walking	54.5	Safe
27	12.7	Standing	16.1	Walking	54.4	Safe
28	12.6	Standing	16.0	Walking	53.1	Safe
29	11.9	Standing	14.9	Standing	50.0	Safe
30	12.8	Standing	15.8	Walking	52.2	Safe
31	12.9	Standing	16.2	Walking	53.2	Safe
32	12.8	Standing	16.1	Walking	54.2	Safe
33	12.8	Standing	16.4	Walking	54.6	Safe
34	12.6	Standing	15.6	Walking	51.6	Safe
35	12.1	Standing	15.3	Walking	51.7	Safe

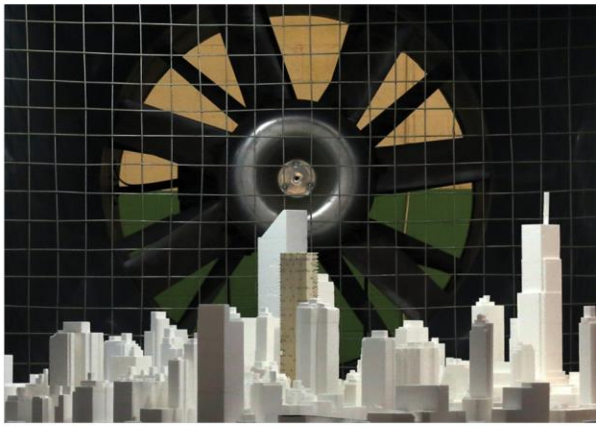
Guidelines	
Pedestrian Comfort	**20% exceedance wind speed** 0-10 km/h = Sitting, 10-15 km/h = Standing, 15-20 km/h = Walking, >20 km/h = Uncomfortable
Pedestrian Safety	**0.1% exceedance wind speed:** 0-90 km/h = Safe

TABLE A2: SUMMARY OF PEDESTRIAN COMFORT (EXISTING SCENARIO)

Sensor	Pedestrian Comfort				Pedestrian Safety	
	Summer		Winter		Annual	
	Wind Speed	Comfort Class	Wind Speed	Comfort Class	Wind Speed	Safety Class
36	11.9	Standing	15.2	Walking	51.1	Safe
37	12.8	Standing	16.3	Walking	55.6	Safe
38	12.4	Standing	15.5	Walking	51.6	Safe
39	11.9	Standing	15.0	Standing	50.8	Safe
40	12.1	Standing	15.2	Walking	51.5	Safe
41	11.8	Standing	15.2	Walking	55.7	Safe
42	11.4	Standing	14.4	Standing	49.3	Safe
43	12.5	Standing	15.8	Walking	52.7	Safe
44	10.9	Standing	13.6	Standing	45.6	Safe
45	11.5	Standing	14.5	Standing	49.4	Safe
46	11.3	Standing	14.4	Standing	48.9	Safe
47	11.8	Standing	15.0	Standing	50.7	Safe
48	12.3	Standing	15.1	Walking	49.6	Safe
49	12.3	Standing	14.9	Standing	49.1	Safe
50	12.3	Standing	15.3	Walking	49.7	Safe
51	12.5	Standing	15.7	Walking	53.1	Safe
52	12.7	Standing	16.2	Walking	53.9	Safe
53	12.3	Standing	15.7	Walking	53.7	Safe
54	12.0	Standing	15.3	Walking	54.0	Safe
55	12.6	Standing	15.4	Walking	50.6	Safe
56	12.7	Standing	16.2	Walking	55.0	Safe
57	12.4	Standing	16.1	Walking	54.7	Safe
58	12.7	Standing	16.0	Walking	54.2	Safe
59	13.2	Standing	16.4	Walking	53.6	Safe
60	12.7	Standing	15.8	Walking	56.4	Safe
61	13.2	Standing	16.7	Walking	56.5	Safe
62	13.1	Standing	16.5	Walking	57.4	Safe
63	12.7	Standing	15.8	Walking	53.9	Safe
64	12.8	Standing	16.2	Walking	56.6	Safe
65	12.2	Standing	15.3	Walking	51.2	Safe
66	12.9	Standing	16.1	Walking	53.3	Safe
67	12.5	Standing	15.5	Walking	56.5	Safe
68	12.8	Standing	15.9	Walking	54.2	Safe
69	11.7	Standing	14.4	Standing	49.5	Safe
70	13.0	Standing	16.2	Walking	52.8	Safe
71	12.0	Standing	15.6	Walking	52.6	Safe







APPENDIX B

PEDESTRIAN COMFORT SUITABILITY, TABLES B1-B3
(PROPOSED SCENARIO)

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Guidelines	
Pedestrian Comfort	**20% exceedance wind speed** 0-10 km/h = Sitting, 10-15 km/h = Standing, 15-20 km/h = Walking, >20 km/h = Uncomfortable
Pedestrian Safety	**0.1% exceedance wind speed** 0-90 km/h = Safe

TABLE B1: SUMMARY OF PEDESTRIAN COMFORT (PROPOSED SCENARIO)

Sensor	Pedestrian Comfort				Pedestrian Safety	
	Summer		Winter		Annual	
	Wind Speed	Comfort Class	Wind Speed	Comfort Class	Wind Speed	Safety Class
1	10.6	Standing	13.9	Standing	49.4	Safe
2	10.1	Standing	13.1	Standing	48.5	Safe
3	10.4	Standing	13.6	Standing	50.8	Safe
4	9.8	Sitting	13.0	Standing	49.2	Safe
5	10.5	Standing	13.7	Standing	50.3	Safe
6	10.6	Standing	14.0	Standing	52.3	Safe
7	9.8	Sitting	12.6	Standing	44.7	Safe
8	11.3	Standing	14.7	Standing	51.4	Safe
9	11.7	Standing	15.5	Walking	53.0	Safe
10	11.7	Standing	15.1	Walking	54.8	Safe
11	12.2	Standing	15.6	Walking	59.0	Safe
12	11.1	Standing	14.0	Standing	48.4	Safe
13	14.7	Standing	18.3	Walking	71.1	Safe
14	11.7	Standing	13.2	Standing	44.4	Safe
15	15.8	Walking	19.0	Walking	72.6	Safe
16	11.9	Standing	13.2	Standing	49.6	Safe
17	12.1	Standing	15.8	Walking	54.4	Safe
18	12.1	Standing	16.6	Walking	65.4	Safe
19	8.7	Sitting	11.2	Standing	45.0	Safe
20	8.8	Sitting	11.5	Standing	48.1	Safe
21	10.4	Standing	12.9	Standing	58.6	Safe
22	12.8	Standing	14.6	Standing	57.7	Safe
23	11.3	Standing	13.3	Standing	50.9	Safe
24	9.1	Sitting	11.6	Standing	46.4	Safe
25	11.0	Standing	12.8	Standing	48.1	Safe
26	11.9	Standing	13.5	Standing	55.3	Safe
27	11.3	Standing	13.9	Standing	51.1	Safe
28	10.9	Standing	14.3	Standing	53.2	Safe
29	10.6	Standing	13.9	Standing	51.8	Safe
30	11.8	Standing	15.2	Walking	58.2	Safe
31	11.7	Standing	15.4	Walking	61.5	Safe
32	9.6	Sitting	12.8	Standing	49.7	Safe
33	13.4	Standing	16.9	Walking	69.5	Safe
34	12.8	Standing	15.2	Walking	61.4	Safe
35	10.9	Standing	14.6	Standing	57.5	Safe

Guidelines	
Pedestrian Comfort	**20% exceedance wind speed** 0-10 km/h = Sitting, 10-15 km/h = Standing, 15-20 km/h = Walking, >20 km/h = Uncomfortable
Pedestrian Safety	**0.1% exceedance wind speed** 0-90 km/h = Safe

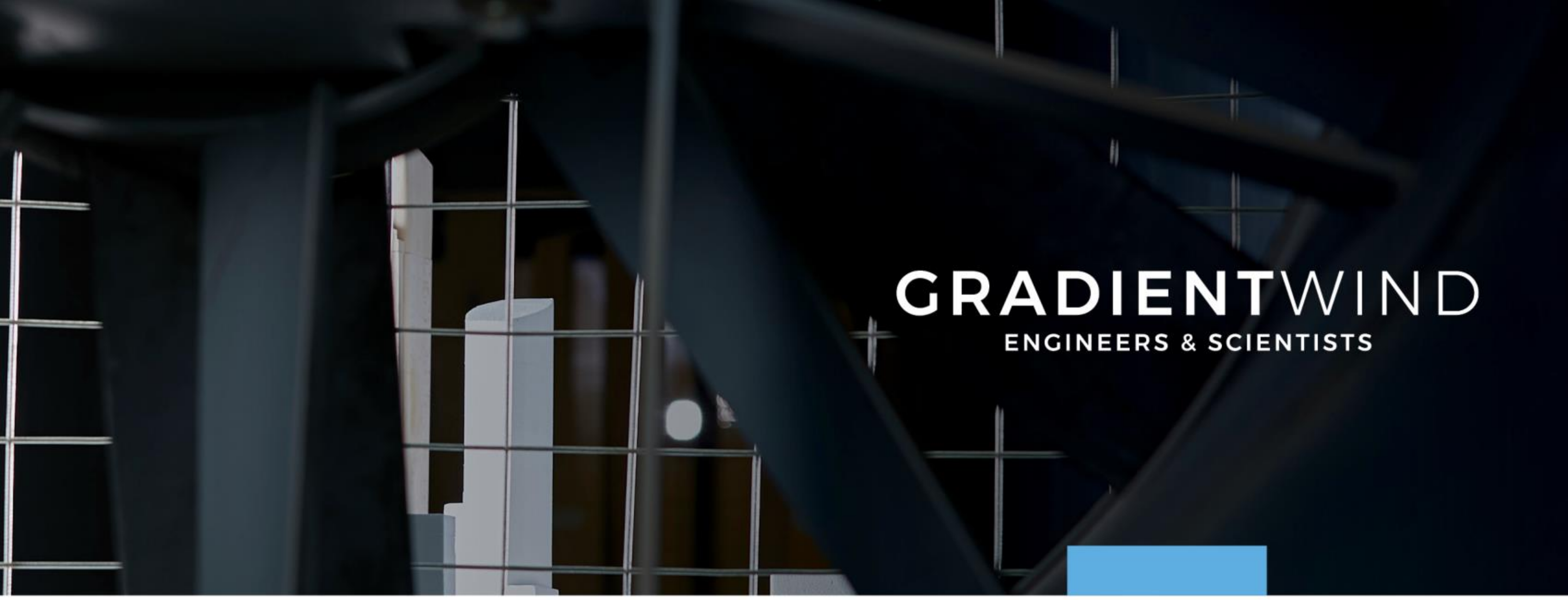
TABLE B2: SUMMARY OF PEDESTRIAN COMFORT (PROPOSED SCENARIO)

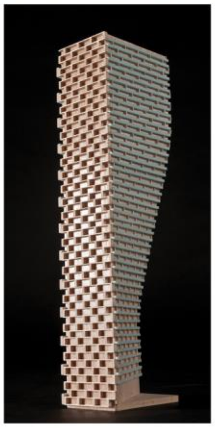
Sensor	Pedestrian Comfort				Pedestrian Safety	
	Summer		Winter		Annual	
	Wind Speed	Comfort Class	Wind Speed	Comfort Class	Wind Speed	Safety Class
36	11.6	Standing	15.5	Walking	57.8	Safe
37	11.0	Standing	14.7	Standing	61.2	Safe
38	10.7	Standing	15.2	Walking	63.4	Safe
39	7.9	Sitting	10.5	Standing	50.1	Safe
40	6.2	Sitting	8.0	Sitting	30.8	Safe
41	5.8	Sitting	7.3	Sitting	26.0	Safe
42	9.4	Sitting	12.5	Standing	52.8	Safe
43	8.8	Sitting	11.9	Standing	55.8	Safe
44	7.5	Sitting	9.4	Sitting	44.6	Safe
45	11.9	Standing	14.3	Standing	62.2	Safe
46	10.4	Standing	11.9	Standing	67.9	Safe
47	10.3	Standing	12.6	Standing	60.6	Safe
48	8.4	Sitting	10.6	Standing	44.3	Safe
49	11.6	Standing	15.9	Walking	65.4	Safe
50	7.0	Sitting	9.0	Sitting	39.1	Safe
51	6.3	Sitting	7.9	Sitting	32.3	Safe
52	9.0	Sitting	11.5	Standing	49.6	Safe
53	9.0	Sitting	11.3	Standing	54.5	Safe
54	10.9	Standing	13.4	Standing	67.9	Safe
55	13.8	Standing	15.6	Walking	66.6	Safe
56	8.0	Sitting	8.8	Sitting	43.2	Safe
57	7.3	Sitting	8.2	Sitting	40.1	Safe
58	12.7	Standing	14.3	Standing	60.8	Safe
59	10.3	Standing	12.8	Standing	53.3	Safe
60	6.7	Sitting	8.3	Sitting	33.0	Safe
61	8.5	Sitting	10.6	Standing	43.3	Safe
62	7.1	Sitting	8.9	Sitting	37.6	Safe
63	9.2	Sitting	11.7	Standing	46.1	Safe
64	10.8	Standing	13.5	Standing	53.1	Safe
65	7.1	Sitting	8.4	Sitting	34.4	Safe
66	9.7	Sitting	10.9	Standing	39.1	Safe
67	8.8	Sitting	11.2	Standing	44.0	Safe
68	8.1	Sitting	10.9	Standing	45.9	Safe
69	7.7	Sitting	9.9	Sitting	42.5	Safe
70	12.7	Standing	15.7	Walking	66.1	Safe

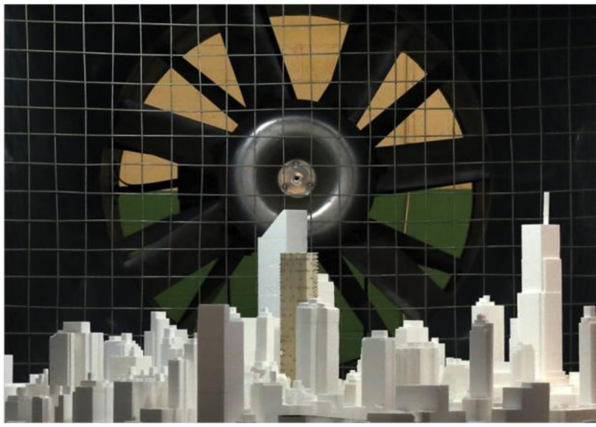
Guidelines	
Pedestrian Comfort	**20% exceedance wind speed** 0-10 km/h = Sitting, 10-15 km/h = Standing, 15-20 km/h = Walking, >20 km/h = Uncomfortable
Pedestrian Safety	**0.1% exceedance wind speed** 0-90 km/h = Safe

TABLE B3: SUMMARY OF PEDESTRIAN COMFORT (PROPOSED SCENARIO)

Sensor	Pedestrian Comfort				Pedestrian Safety	
	Summer		Winter		Annual	
	Wind Speed	Comfort Class	Wind Speed	Comfort Class	Wind Speed	Safety Class
71	12.7	Standing	14.3	Standing	58.0	Safe
72	9.9	Sitting	12.8	Standing	57.5	Safe
73	10.3	Standing	11.7	Standing	44.3	Safe
74	7.6	Sitting	9.2	Sitting	34.7	Safe
75	9.5	Sitting	12.4	Standing	61.0	Safe
76	9.0	Sitting	10.6	Standing	47.8	Safe
77	7.7	Sitting	8.9	Sitting	39.8	Safe
78	6.6	Sitting	8.1	Sitting	35.7	Safe
71	12.7	Standing	14.3	Standing	58.0	Safe
72	9.9	Sitting	12.8	Standing	57.5	Safe
73	10.3	Standing	11.7	Standing	44.3	Safe
74	7.6	Sitting	9.2	Sitting	34.7	Safe
75	9.5	Sitting	12.4	Standing	61.0	Safe
76	9.0	Sitting	10.6	Standing	47.8	Safe
77	7.7	Sitting	8.9	Sitting	39.8	Safe
78	6.6	Sitting	8.1	Sitting	35.7	Safe







APPENDIX C

WIND TUNNEL SIMULATION OF THE NATURAL WIND

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WIND TUNNEL SIMULATION OF THE NATURAL WIND

Wind flowing over the surface of the earth develops a boundary layer due to the drag produced by surface features such as vegetation and man-made structures. Within this boundary layer, the mean wind speed varies from zero at the surface to the gradient wind speed at the top of the layer. The height of the top of the boundary layer is referred to as the gradient height, above which the velocity remains more-or-less constant for a given synoptic weather system. The mean wind speed is taken to be the average value over one hour. Superimposed on the mean wind speed are fluctuating (or turbulent) components in the longitudinal (i.e. along wind), vertical and lateral directions. Although turbulence varies according to the roughness of the surface, the turbulence level generally increases from nearly zero (smooth flow) at gradient height to maximum values near the ground. While for a calm ocean the maximum could be 20%, the maximum for a very rough surface such as the center of a city could be 100%, or equal to the local mean wind speed. The height of the boundary layer varies in time and over different terrain roughness within the range of 400 metres (m) to 600 m.

Simulating real wind behaviour in a wind tunnel requires simulating the variation of mean wind speed with height, simulating the turbulence intensity, and matching the typical length scales of turbulence. It is the ratio between wind tunnel turbulence length scales and turbulence scales in the atmosphere that determines the geometric scales that models can assume in a wind tunnel. Hence, when a 1:200 scale model is quoted, this implies that the turbulence scales in the wind tunnel and the atmosphere have the same ratios. Some flexibility in this requirement has been shown to produce reasonable wind tunnel predictions compared to full scale. In model scale the mean and turbulence characteristics of the wind are obtained with the use of spires at one end of the tunnel and roughness elements along the floor of the tunnel. The fan is located at the model end and wind is pulled over the spires, roughness elements and model. It has been found that, to a good approximation, the mean wind profile can be represented by a power law relation, shown below, giving height above ground versus wind speed.

$$U = U_g \left(\frac{Z}{Z_g} \right)^{\alpha}$$

Where; ***U*** = mean wind speed, $\boldsymbol{U_g}$ = gradient wind speed, ***Z*** = height above ground, $\boldsymbol{Z_g}$ = depth of the boundary layer (gradient height) and α is the power law exponent.

Figure C1 on the following page plots three velocity profiles for open country, and suburban and urban exposures.

The exponent α varies according to the type of upwind terrain; α ranges from 0.14 for open country to 0.33 for an urban exposure. Figure C2 illustrates the theoretical variation of turbulence for open country, suburban and urban exposures.

The integral length scale of turbulence can be thought of as an average size of gust in the atmosphere. Although it varies with height and ground roughness, it has been found to generally be in the range of 100 m to 200 m in the upper half of the boundary layer. Thus, for a 1:300 scale, the model value should be between 1/3 and 2/3 of a metre. Integral length scales are derived from power spectra, which describe the energy content of wind as a function of frequency. There are several ways of determining integral length scales of turbulence. One way is by comparison of a measured power spectrum in model scale to a non-dimensional theoretical spectrum such as the Davenport spectrum of longitudinal turbulence. Using the Davenport spectrum, which agrees well with full-scale spectra, one can estimate the integral scale by plotting the theoretical spectrum with varying L until it matches as closely as possible the measured spectrum:

$$f \times S(f) = \frac{\dfrac{4(Lf)^2}{U_{10}^{\,2}}}{\left[1 + \dfrac{4(Lf)^2}{U_{10}^{\,2}}\right]^{\frac{4}{3}}}$$

Where, f is frequency, S(f) is the spectrum value at frequency f, U10 is the wind speed 10 m above ground level, and L is the characteristic length of turbulence.

Once the wind simulation is correct, the model, constructed to a suitable scale, is installed at the center of the working section of the wind tunnel. Different wind directions are represented by rotating the model to align with the wind tunnel center-line axis.

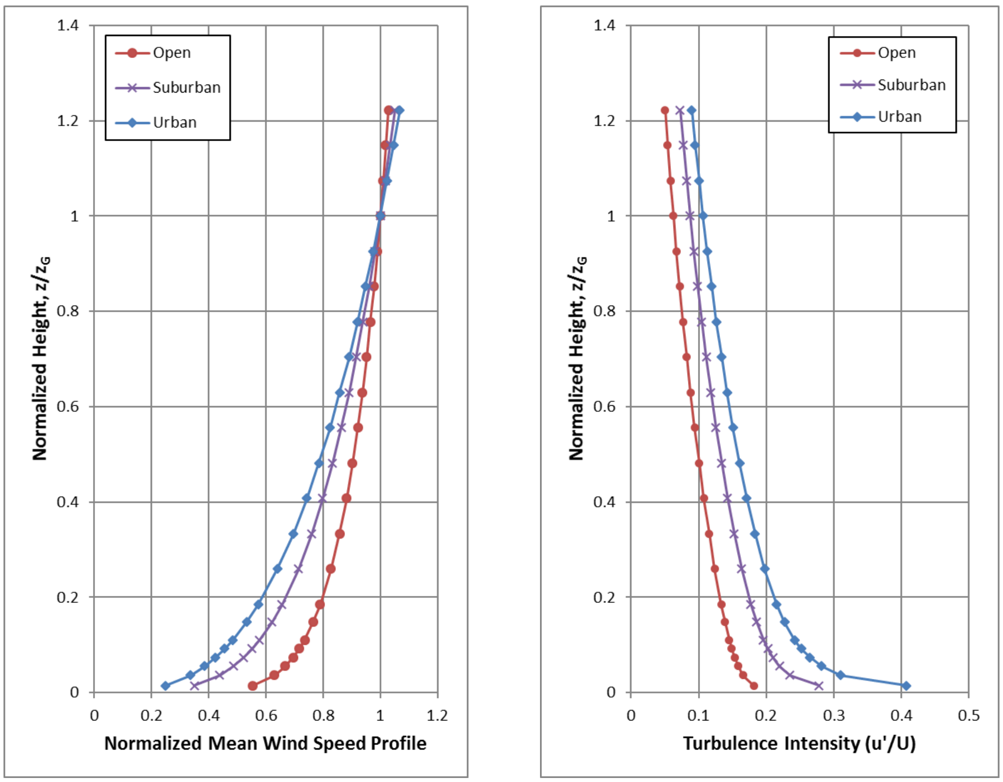

FIGURE C1 (LEFT): MEAN WIND SPEED PROFILES;
FIGURE C2 (RIGHT): TURBULENCE INTENSITY PROFILES

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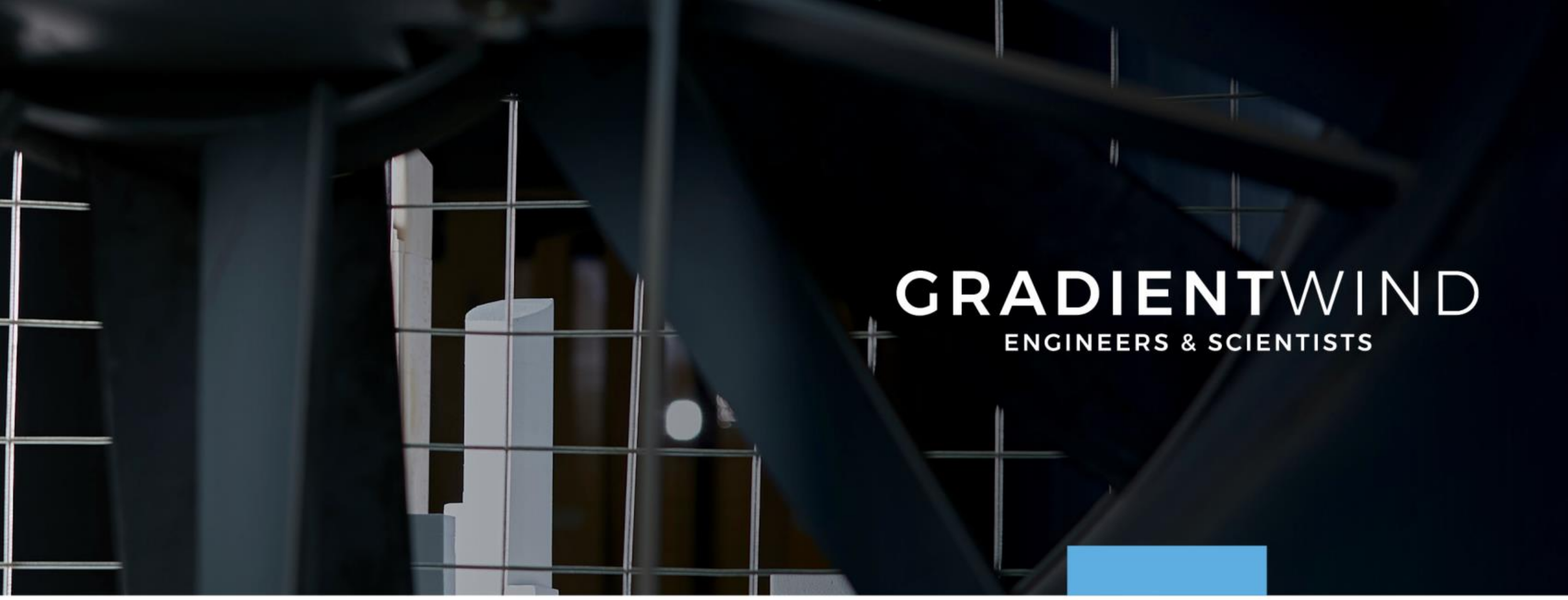

APPENDIX D

PEDESTRIAN LEVEL WIND MEASUREMENT METHODOLOGY

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PEDESTRIAN LEVEL WIND MEASUREMENT METHODOLOGY

Pedestrian level wind studies are performed in a wind tunnel on a physical model of the study buildings at a suitable scale. Instantaneous wind speed measurements are recorded at a model height corresponding to 1.5 m full scale using either a hot wire anemometer or a pressure-based transducer. Measurements are performed at any number of locations on the model and usually for 36 wind directions. For each wind direction, the roughness of the upwind terrain is matched in the wind tunnel to generate the correct mean and turbulent wind profiles approaching the model.

The hot wire anemometer is an instrument consisting of a thin metallic wire conducting an electric current. It is an omni-directional device equally sensitive to wind approaching from any direction in the horizontal plane. By compensating for the cooling effect of wind flowing over the wire, the associated electronics produce an analog voltage signal that can be calibrated against velocity of the air stream. For all measurements, the wire is oriented vertically so as to be sensitive to wind approaching from all directions in a horizontal plane.

The pressure sensor is a small cylindrical device that measures instantaneous pressure differences over a small area. The sensor is connected via tubing to a transducer that translates the pressure to a voltage signal that is recorded by computer. With appropriately designed tubing, the sensor is sensitive to a suitable range of fluctuating velocities.

For a given wind direction and location on the model, a time history of the wind speed is recorded for a period of time equal to one hour in full-scale. The analog signal produced by the hot wire or pressure sensor is digitized at a rate of 400 samples per second. A sample recording for several seconds is illustrated in Figure D1. This data is analyzed to extract the mean, root-mean-square (rms) and the peak of the signal. The peak value, or gust wind speed, is formed by averaging a number of peaks obtained from sub-intervals of the sampling period. The mean and gust speeds are then normalized by the wind tunnel gradient wind speed, which is the speed at the top of the model boundary layer, to obtain mean and gust ratios. At each location, the measurements are repeated for 36 wind directions to produce normalized polar plots, which will be provided upon request.

In order to determine the duration of various wind speeds at full scale for a given measurement location the gust ratios are combined with a statistical (mathematical) model of the wind climate for the project site. This mathematical model is based on hourly wind data obtained from one or more meteorological stations (usually airports) close to the project location. The probability model used to represent the data is the Weibull distribution expressed as:

$$P\left(>U_g\right) = A_\theta \bullet \exp\left[\left(-\frac{U_g}{C_\theta}\right)^{K_\theta}\right]$$

Where,

P (> U_g) is the probability, fraction of time, that the gradient wind speed ***U_g*** is exceeded; ***θ*** is the wind direction measured clockwise from true north, ***A***, ***C***, ***K*** are the Weibull coefficients, (Units: A - dimensionless, C - wind speed units [km/h] for instance, K - dimensionless). ***A_θ*** is the fraction of time wind blows from a 10° sector centered on ***θ***.

Analysis of the hourly wind data recorded for a length of time, on the order of 10 to 30 years, yields the ***A_θ, C_θ*** and ***K_θ*** values. The probability of exceeding a chosen wind speed level, say 20 km/h, at sensor *N* is given by the following expression:

$$P_N(>20) = \Sigma_\theta P\left[\frac{(>20)}{\left(\frac{U_N}{U_g}\right)}\right]$$

$$P_N(>20) = \Sigma_\theta P\{>20/(U_N/Ug)\}$$

Where, ***U_N/U_g*** is the gust velocity ratios, where the summation is taken over all 36 wind directions at 10° intervals.

If there are significant seasonal variations in the weather data, as determined by inspection of the C_θ and K_θ values, then the analysis is performed separately for two or more times corresponding to the groupings of seasonal wind data. Wind speed levels of interest for predicting pedestrian comfort are based on the comfort guidelines chosen to represent various pedestrian activity levels as discussed in the main text.

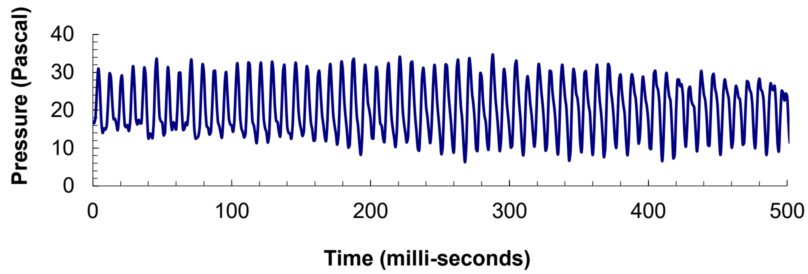

FIGURE D1: TIME VERSUS VELOCITY TRACE FOR A TYPICAL WIND SENSOR

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