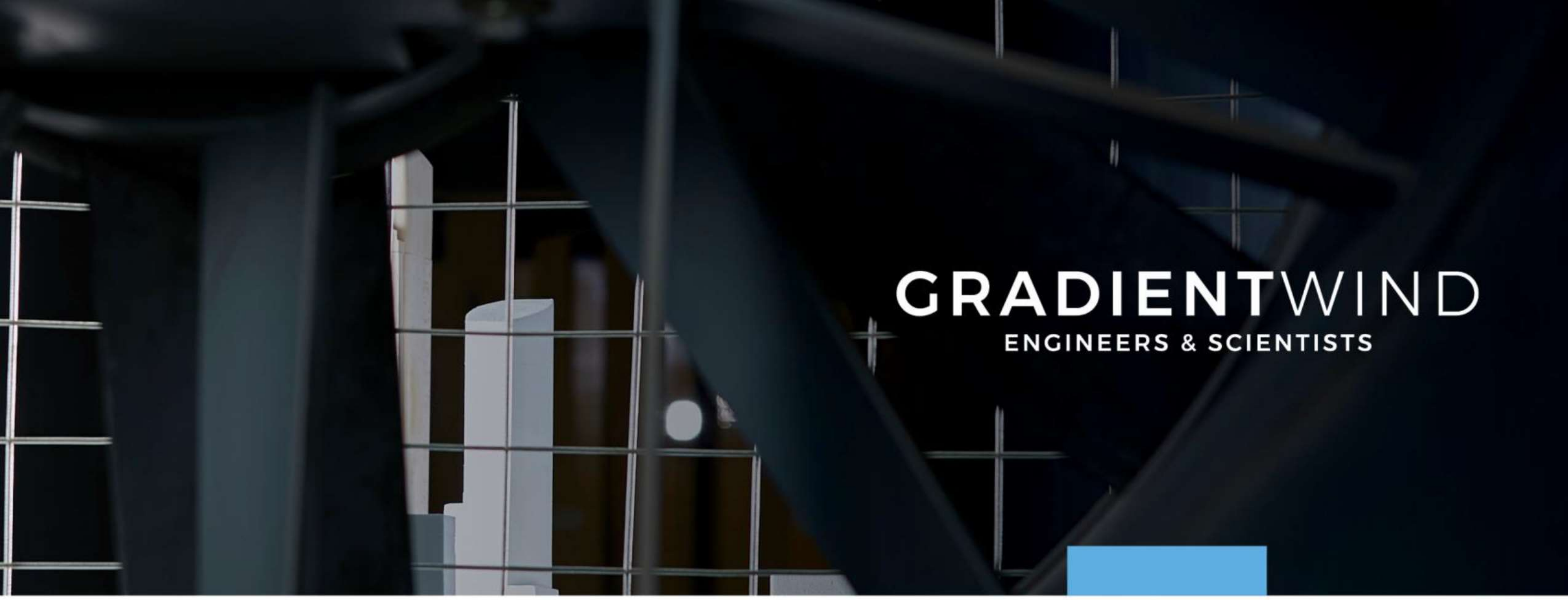
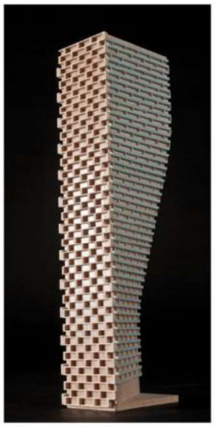


GRADIENTWIND
ENGINEERS & SCIENTISTS

PEDESTRIAN LEVEL WIND STUDY

2000 City Park Drive
Ottawa, Ontario

Report: 23-075-PLW-2025



August 11, 2025

PREPARED FOR
Colonnade BridgePort ITF City Park LP
16 Concourse Gate, Suite 200
Ottawa, ON K2E 7S8

PREPARED BY
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David Huitema, M.Eng., P.Eng., CFD Lead Engineer

EXECUTIVE SUMMARY

This report describes a pedestrian level wind (PLW) study undertaken to satisfy Zoning By-Law Amendment (ZBLA) application resubmission requirements for the proposed multi-building development located at 2000 City Park Drive in Ottawa, Ontario (hereinafter referred to as "subject site" or "proposed development"). Our mandate within this study is to investigate pedestrian wind conditions within and surrounding the subject site, and to identify areas where wind conditions may interfere with certain pedestrian activities so that mitigation measures may be considered, where required.

The study involves simulation of wind speeds for selected wind directions in a three-dimensional (3D) computer model using the computational fluid dynamics (CFD) technique, combined with meteorological data integration, to assess pedestrian wind comfort and safety within and surrounding the subject site according to City of Ottawa wind comfort and safety criteria. The results and recommendations derived from these considerations are detailed in the main body of the report (Section 5), illustrated in Figures 3A-9, and summarized as follows:

1) Most grade-level areas within and surrounding the subject site are predicted to experience conditions that are considered acceptable for the intended pedestrian uses throughout the year. Conditions over surrounding sidewalks, transit stops, neighbouring surface parking lots, the proposed drive aisle and corresponding sidewalks, drop-off areas, and most walkways, are considered acceptable.

    a. Following the introduction of the proposed development, isolated areas of conditions that may be considered occasionally uncomfortable for walking are predicted between Blocks B and C and Blocks C and D during the spring and winter months, affecting isolated areas of the proposed walkways between these blocks.

    b. Wraparound canopies may be considered along the northwest and northeast elevations of Blocks C and D to diffuse downwashing winds. Additional mitigation measures may include wind screens, dense arrangements of tall coniferous plantings, high-back bench seating, and other common landscape elements.

c. During the typical use period, conditions over the parkland dedication are predicted to be suitable for mostly sitting with an isolated region of standing conditions predicted to the south. If required by programming, sitting conditions may be extended to the south through targeted mitigation such as wind screens, gazebos, dense arrangements of coniferous plantings, high-back bench seating, and other common landscape elements.

d. It is recommended that primary and secondary building access points be placed where wind conditions are predicted to be suitable for standing, or better, and walking, or better, throughout the year, respectively, or otherwise be recessed into building façades or include flanking wind barriers/overhead protection.

2) During the typical use period, wind conditions were assessed atop all podia and towers to consider potentially suitable locations for common amenity terraces. While several terraces are predicted to receive windier conditions, particularly those atop the towers, many regions over the podia are predicted to experience conditions that are mostly suitable for sitting, including the northeast and southeast elevations of Block A, the northeast elevation of Block B, and most of Block E.

   a. Depending on programming, and as the amenity terrace areas are defined at future application stages, conditions within the windier terrace areas may be improved by implementing tall perimeter wind screens and canopies that extend from select façades in combination with inboard mitigation, such as free-standing canopies, wind screens, dense coniferous plantings in tall planters, and other common mitigation elements.

3) The foregoing statements and conclusions apply to common weather systems, during which no dangerous wind conditions, as defined in Section 4.4, are expected anywhere over the subject site. During extreme weather events, (for example, thunderstorms, tornadoes, and downbursts), pedestrian safety is the main concern. However, these events are generally short-lived and infrequent and there is often sufficient warning for pedestrians to take appropriate cover.

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TABLE OF CONTENTS

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by Colonnade BridgePort ITF City Park LP to undertake a pedestrian level wind (PLW) study to satisfy Zoning By-Law Amendment (ZBLA) application resubmission requirements for the proposed multi-building development located at 2000 City Park Drive in Ottawa, Ontario (hereinafter referred to as "subject site" or "proposed development"). Our mandate within the current study is to investigate pedestrian wind conditions within and surrounding the subject site, and to identify areas where wind conditions may interfere with certain pedestrian activities so that mitigation measures may be considered, where required.

Our work is based on industry standard computer simulations using the computational fluid dynamics (CFD) technique and data analysis procedures, City of Ottawa wind comfort and safety criteria, architectural drawings prepared by NEUF architect(e)s in July 2025, surrounding street layouts and existing and approved future building massing information obtained from the City of Ottawa, as well as recent satellite imagery.

2. TERMS OF REFERENCE

The subject site is located at 2000 City Park Drive in Ottawa, situated on a parcel of land bordered by City Park Drive to the northwest, two high-rise buildings to the east-northeast, the Light Rail Transit (LRT) Line 1 railway to the southeast, and an existing mid-rise building to the southwest at 1900 City Park Drive.

Situated clockwise from the north direction, the proposed development comprises Block A (16-storey tower), Block B (30-storey tower), Block C (30-storey tower), Block D (30-storey tower), a dedicated parkland, and Block E (12-storey tower). The subject site is divided by a proposed southwest-northeast oriented drive aisle, segregating the dedicated parkland, Block E, and Block A to the northwest, and Blocks B-D to the southeast. The proposed drive aisle connects to City Park Drive between Blocks A and E, and to the existing drive aisle serving 1900 City Park Drive to the southwest. Drop-off areas and underground parking ramps serving the proposed development are accessible via the proposed drive aisle. Internal sidewalks and walkways are located along the proposed drive aisle and between Blocks B and C and Blocks C and D.

The near-field surroundings (defined as an area within 200 metres (m) of the subject site) comprise a mid-rise building at 1900 City Park Drive followed by City Centre Park to the southwest, low-rise residential dwellings from the west clockwise to the north, a movie theatre to the north-northeast, two high-rise towers to the east-northeast, and the LRT Line 1 railway (southwest-northeast oriented) followed by Highway 147 (southwest-northeast oriented) and low-rise residential dwellings to the southeast.

The far-field surroundings (defined as an area beyond the near-field but within a 2-kilometre (km) radius of the subject site) are characterized by a low-rise suburban massing in all compass directions with isolated mid- and high-rise buildings, and the Pine View Golf Course located approximately 900 m to the east-southeast.

3. OBJECTIVES

The principal objectives of this study are to (i) determine pedestrian level wind 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; and (iii) recommend suitable mitigation measures, where required.

4. METHODOLOGY

The approach followed to quantify pedestrian wind conditions over the site is based on CFD simulations of wind speeds across the subject site within a virtual environment, meteorological analysis of the Ottawa area wind climate, and synthesis of computational data with City of Ottawa wind comfort and safety criteria[1]. The following sections describe the analysis procedures, including a discussion of the noted pedestrian wind criteria.

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[1] City of Ottawa Terms of References: Wind Analysis
https://documents.ottawa.ca/sites/documents/files/wind_analysis_tor_en.pdf

4.1 Computer-Based Context Modelling

A computer based PLW study was performed to determine the influence of the wind environment on pedestrian comfort over the proposed development site. Pedestrian comfort predictions, based on the mechanical effects of wind, were determined by combining measured wind speed data from CFD simulations with statistical weather data obtained from Ottawa Macdonald-Cartier International Airport. The general concept and approach to CFD modelling is to represent building and topographic details in the immediate vicinity of the subject site on the surrounding model, and to create suitable atmospheric wind profiles at the model boundary. The wind profiles are designed to have similar mean and turbulent wind properties consistent with actual site exposures.

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

4.2 Wind Speed Measurements

The PLW analysis was performed by simulating wind flows and gathering velocity data over a CFD model of the site for 16 wind directions. The CFD simulation model was centered on the proposed development, complete with surrounding massing within a radius of 530 m. The process was performed for two context massing scenarios, as noted in Section 2.

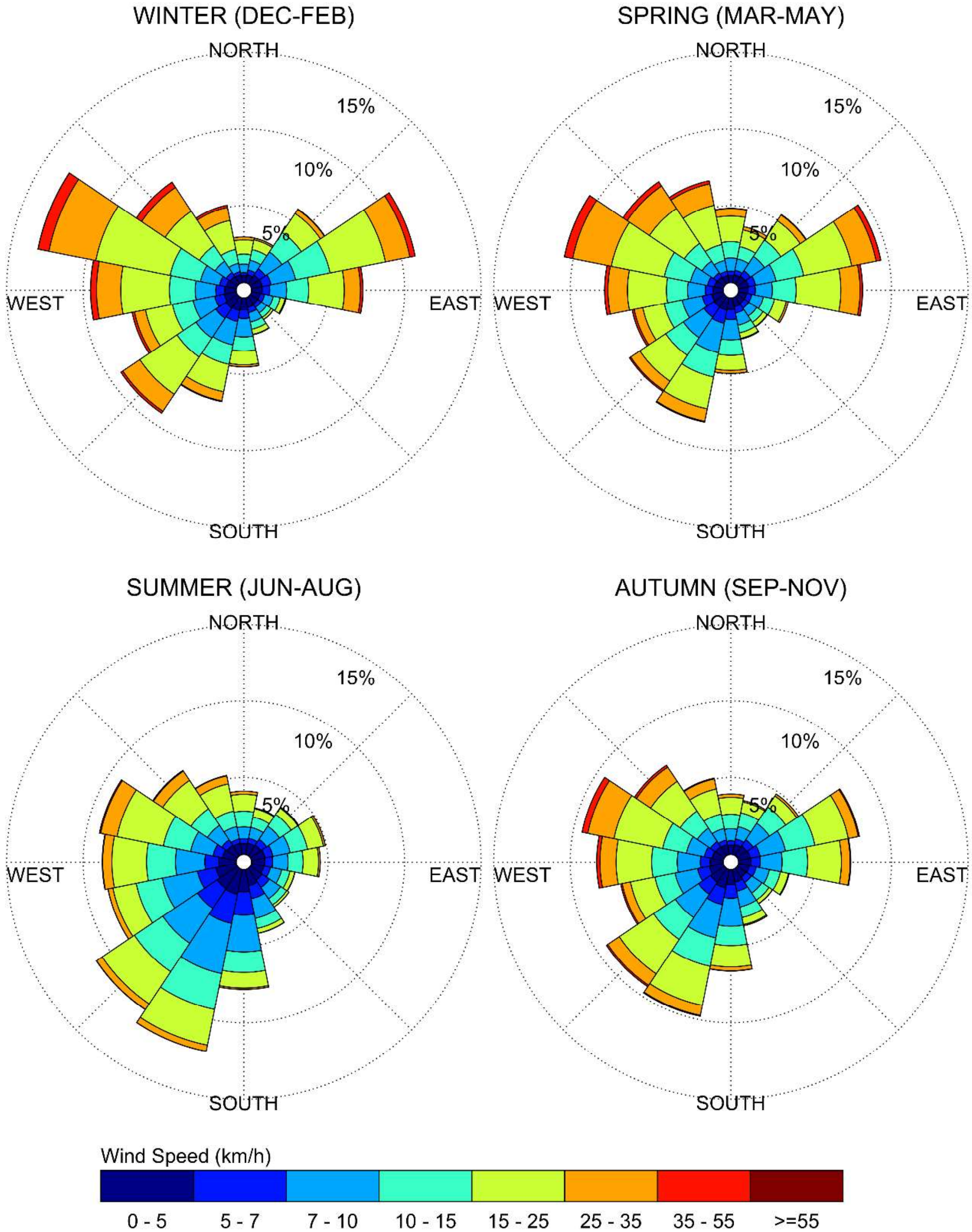
Mean and peak wind speed data obtained over the subject site for each wind direction were interpolated to 36 wind directions at 10° intervals, representing the full compass azimuth. Measured wind speeds approximately 1.5 m above local grade and the potential common amenity terraces serving the proposed development were referenced to the wind speed at gradient height to generate mean and peak velocity ratios, which were used to calculate full-scale values. Gradient height represents the theoretical depth of the boundary layer of the earth’s atmosphere, above which the mean wind speed remains constant. Further details of the wind flow simulation technique are presented in Appendix A.

4.3 Historical Wind Speed and Direction Data

A statistical model for winds in Ottawa was developed from approximately 40 years of hourly meteorological wind data recorded at Ottawa Macdonald-Cartier International Airport and obtained from Environment and Climate Change Canada. Wind speed and direction data were analyzed during the appropriate hours of pedestrian usage (that is, between 06:00 and 23:00) and divided into four distinct seasons, as stipulated in the wind criteria. Specifically, the spring season is defined as March through May, the summer season is defined as June through August, the autumn season is defined as September through November, and the winter season is defined as December through February, inclusive.

The statistical model of the Ottawa 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 kilometers per hour (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 prominent wind speeds and directions can be identified by the longer length of the bars. For Ottawa, the most common winds occur for westerly wind directions, followed by those from the east, while the most common wind speeds are below 36 km/h. The directional prominence and relative magnitude of wind speed changes somewhat from season to season.

SEASONAL DISTRIBUTION OF WIND
OTTAWA MACDONALD-CARTIER INTERNATIONAL AIRPORT



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 Wind Comfort and Safety Criteria – City of Ottawa

Pedestrian wind comfort and safety criteria are based on the mechanical effects of wind without consideration of other meteorological conditions (that is, temperature and relative humidity). The comfort criteria assume that pedestrians are appropriately dressed for a specified outdoor activity during any given season. Five pedestrian comfort classes based on 20% non-exceedance mean wind speed ranges are used to assess pedestrian comfort: (1) Sitting; (2) Standing; (3) Strolling; (4) Walking; and (5) Uncomfortable. The gust speeds, and equivalent mean speeds, are selected based on the Beaufort scale, which describes the effects of forces produced by varying wind speed levels on objects. Wind conditions suitable for sitting are represented by the colour blue, standing by green, strolling by yellow, and walking by orange; uncomfortable conditions are represented by the colour magenta. Specifically, the comfort classes, associated wind speed ranges, and limiting criteria are summarized as follows:

PEDESTRIAN WIND COMFORT CLASS DEFINITIONS

Wind Comfort Class	Mean Speed (km/h)	Description
SITTING	≤ 10	Mean wind speeds no greater than 10 km/h occurring at least 80% of the time. The equivalent gust wind speed is approximately 16 km/h.
STANDING	≤ 14	Mean wind speeds no greater than 14 km/h occurring at least 80% of the time. The equivalent gust wind speed is approximately 22 km/h.
STROLLING	≤ 17	Mean wind speeds no greater than 17 km/h occurring at least 80% of the time. The equivalent gust wind speed is approximately 27 km/h.
WALKING	≤ 20	Mean wind speeds no greater than 20 km/h occurring at least 80% of the time. The equivalent gust wind speed is approximately 32 km/h.
UNCOMFORTABLE	> 20	Uncomfortable conditions are characterized by predicted values that fall below the 80% target for walking. Brisk walking and exercise, such as jogging, would be acceptable for moderate excesses of this criterion.

Regarding wind safety, the pedestrian safety wind speed criterion 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 90 km/h is classified as dangerous. From calculations of stability, it can be shown that gust wind speeds of 90 km/h would be the approximate threshold wind speed that would cause an average elderly person in good health to fall. Notably, pedestrians tend to be more sensitive to wind gusts than to steady winds for lower wind speed ranges. For strong winds approaching dangerous levels, this effect is less important because the mean wind can also create problems for pedestrians.

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 a mean wind speed of 10 km/h (equivalent gust wind speed of approximately 16 km/h) were exceeded for more than 20% of the time most pedestrians would judge that location to be too windy for sitting. Similarly, if mean wind speed of 20 km/h (equivalent gust wind speed of approximately 32 km/h) at a location were exceeded for more than 20% of the time, walking or less vigorous activities would be considered uncomfortable. As 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 throughout the subject site, the assessment of pedestrian comfort involves determining the suitability of the predicted wind conditions for discrete regions within and surrounding the subject site. This step involves comparing the predicted comfort classes to the target comfort classes, which are dictated by the location type for each region (that is, a sidewalk, building entrance, amenity space, or other). An overview of common pedestrian location types and their typical windiest target comfort classes are summarized on the following page. Depending on the programming of a space, the desired comfort class may differ from this table.

TARGET PEDESTRIAN WIND COMFORT CLASSES FOR VARIOUS LOCATION TYPES

Location Types	Target Comfort Classes
Primary Building Entrance	Standing
Secondary Building Access Point	Walking
Public Sidewalk / Bicycle Path	Walking
Outdoor Amenity Space	Sitting / Standing
Café / Patio / Bench / Garden	Sitting / Standing
Transit Stop (Without Shelter)	Standing
Transit Stop (With Shelter)	Walking
Public Park / Plaza	Sitting / Standing
Garage / Service Entrance	Walking
Parking Lot	Walking
Vehicular Drop-Off Zone	Walking

5. RESULTS AND DISCUSSION

The following discussion of the predicted pedestrian wind conditions for the subject site is accompanied by Figures 3A-6B, which illustrate wind conditions at grade level for the proposed and existing massing scenarios and by Figures 8A-D, which illustrate wind conditions over the potential common amenity terraces serving the proposed development. Conditions are presented as continuous contours of wind comfort throughout the subject site and correspond to the comfort classes presented in Section 4.4.

Wind comfort conditions are also reported for the typical use period, which is defined as May to October, inclusive. Figures 7 and 9 illustrate wind comfort conditions during this period at grade level and within the potential amenity terraces serving the proposed development, respectively, consistent with the comfort classes illustrated in Section 4.4.

The details of these conditions are summarized in the following pages for each area of interest.

5.1 Wind Comfort Conditions – Grade Level

The limited built-up massing in the area and the suburban environs exposes the subject site to prevailing winds from multiple directions, particularly those from the east clockwise to the west. Notably, Highway 174 and the LRT Line 1 railway situated to the immediate southeast exposes the subject site to prevailing unmitigated winds and low-rise massing within the near field from the northwest clockwise to the northeast offer limited shielding from prominent winds from the northern compass quadrants. Under the existing massing scenario, wind comfort conditions over the subject site are predicted to be suitable for mostly standing throughout the year with strolling conditions predicted to the southeast during the spring and winter seasons.

Following the introduction of the proposed development, prevailing unmitigated winds are predicted to downwash over the proposed towers to grade, accelerating around building corners and channelling between the podia along the southeast elevation. Specifically, prevailing westerly winds are predicted to downwash over the north-facing facades of Blocks C and D to grade, accelerating around each block's north corner and channeling between adjacent blocks. As a result, isolated areas of conditions that may be considered occasionally uncomfortable for walking are predicted between Blocks B and C and Blocks C and D during the spring and winter seasons. The noted windier areas are also predicted to be suitable for walking at least 75% of the time during the spring and winter seasons, representing a 5% exceedance of the walking threshold. To diffuse downwashing winds, wraparound canopies may be considered along the northwest and northeast elevations of Blocks C and D. Additional mitigation measures that may be considered by the design team include wind screens, dense arrangements of tall coniferous plantings, high-back bench seating, and other common landscape elements that may diffuse accelerating and channeling winds.

Sidewalks and Transit Stops along City Park Drive: Under the existing massing scenario, wind comfort conditions over public sidewalks and in the vicinity of nearby transit stops along City Park Drive are predicted to be suitable for standing, or better, throughout the year. Following the introduction of the proposed development, conditions are predicted to remain mostly suitable for standing, or better, throughout the year, with conditions suitable for strolling predicted to the north of Block A. The noted conditions are nonetheless considered acceptable for public sidewalks and transit stops.

Neighbouring Surface Parking Lots: Wind comfort conditions over the existing surface parking lots to the immediate southwest and east of the subject site are predicted to be suitable for strolling, or better, throughout the year under the existing massing scenario, becoming suitable for walking, or better, following the introduction of the proposed development. The noted conditions are considered acceptable for surface parking lots.

Proposed Drive Aisle, Drop-off Area, Sidewalks, and Walkways: Wind comfort conditions over the proposed drive aisle and corresponding sidewalks and drop-off areas are predicted to be suitable for walking, or better, throughout the year and are considered acceptable.

With the exception of the above-noted uncomfortable conditions between Blocks B and C and Blocks C and D, wind comfort conditions over the proposed walkways serving the proposed development are predicted to be suitable for walking, or better, throughout the year.

Parkland Dedication: During the typical use period, wind comfort conditions over the proposed parkland dedication are predicted to be suitable for mostly sitting with an isolated region of standing conditions predicted to the south. If the noted region suitable for standing will not accommodate sedentary activities, the noted conditions may be considered acceptable. If required by programming, sitting conditions may be extended through targeted mitigation, such as wind screens, gazebos, dense arrangements of coniferous plantings, high-back bench seating, and other common landscape elements implemented in this area.

Building Access Points: Although the locations of building access points are not currently defined at this stage, it is recommended that primary and secondary access points be programmed where wind comfort conditions are predicted to be suitable for standing, or better, and walking, or better, throughout the year, respectively. If primary and secondary access points are to be programmed in the vicinity of wind conditions that exceed their respective comfort thresholds, it is recommended that these entrances be recessed into the building façade by at least 2 m or include flanking vertical wind barriers/overhead canopies. Of note, the implementation of measures to mitigate conditions between the southeastern blocks, as noted above, including overhead canopies, dense arrangements of coniferous plantings in tall planters, coniferous trees, and other common landscape elements would be expected to also provide relief for access points in these areas.

5.2 Wind Comfort Conditions – Potential Common Amenity Terraces

The podia and tower rooftops were modelled using standard 1.1-m-tall parapets to assess potentially suitable locations for common amenity terraces. The following wind conditions are predicted over the noted areas serving each block during the typical use period (that is, May to October, inclusive):

Block A: Wind comfort conditions atop the podium serving Block A are predicted to be suitable for sitting along the northeast and southeast elevations, and a mix of sitting and standing over the remainder of the space. Conditions atop the tower are predicted to be suitable for mostly standing with strolling conditions predicted central to the space.

Block B: Wind conditions atop the podium serving Block B are predicted to be suitable for sitting along the northeast elevation and mostly standing throughout the remainder of the space. Atop the tower, conditions are predicted to be suitable for mostly strolling.

Block C: Atop the podium serving Block C, wind comfort conditions are predicted to be suitable for a mix of mostly sitting and standing along the northeast and northwest elevations with strolling conditions predicted around the north corner and along the southwest elevation. Conditions atop the tower are predicted to be suitable for mostly strolling with walking conditions predicted central to the space.

Block D: Wind conditions atop the Block D podium are predicted to be suitable for a mix of mostly sitting and standing with conditions suitable for strolling around the west and north corners. Conditions atop the tower are predicted to be suitable for mostly strolling, with standing conditions predicted along the northwest and southwest perimeter and walking conditions predicted central to the space.

Block E: Wind comfort conditions atop the Block E podium and the tower are predicted to be suitable for mostly sitting and mostly standing, respectively.

A mitigation strategy may be developed in coordination with the building and landscape architects as the design of the proposed development progresses, and the location and programming of potential common amenity terraces is defined. Preliminary mitigation measures may include tall perimeter wind screens and canopies that extend from select façades in combination with inboard mitigation, such as free-standing canopies, wind screens, dense coniferous plantings in tall planters, and other common mitigation elements.

5.3 Wind Safety

Within the context of typical weather patterns, which exclude anomalous localized storm events such as tornadoes and downbursts, no pedestrian areas within or surrounding the subject site at grade are expected to experience conditions that could be considered dangerous, as defined in Section 4.4.

5.4 Applicability of Results

Pedestrian wind comfort and safety have been quantified for the specific configuration of existing and foreseeable construction around the subject site. Future changes (that is, construction or demolition) of these surroundings may cause changes to the wind effects in two ways, namely: (i) changes beyond the immediate vicinity of the subject site would alter the wind profile approaching the subject site; and (ii) development in proximity to the subject site would cause changes to local flow patterns.

6. CONCLUSIONS AND RECOMMENDATIONS

A complete summary of the predicted wind conditions is provided in Section 5 and illustrated in Figures 3A-9. Based on computer simulations using the CFD technique, meteorological data analysis of the Ottawa wind climate, City of Ottawa wind comfort and safety criteria, and experience with numerous similar developments, the study concludes the following:

1) Most grade-level areas within and surrounding the subject site are predicted to experience conditions that are considered acceptable for the intended pedestrian uses throughout the year. Conditions over surrounding sidewalks, transit stops, neighbouring surface parking lots, the proposed drive aisle and corresponding sidewalks, drop-off areas, and most walkways, are considered acceptable.

    a. Following the introduction of the proposed development, isolated areas of conditions that may be considered occasionally uncomfortable for walking are predicted between Blocks B and C and Blocks C and D during the spring and winter months, affecting isolated areas of the proposed walkways between these blocks.

    b. Wraparound canopies may be considered along the northwest and northeast elevations of Blocks C and D to diffuse downwashing winds. Additional mitigation measures may include wind screens, dense arrangements of tall coniferous plantings, high-back bench seating, and other common landscape elements.

    c. During the typical use period, conditions over the parkland dedication are predicted to be suitable for mostly sitting with an isolated region of standing conditions predicted to the south. If required by programming, sitting conditions may be extended to the south through targeted mitigation such as wind screens, gazebos, dense arrangements of coniferous plantings, high-back bench seating, and other common landscape elements.

    d. It is recommended that primary and secondary building access points be placed where wind conditions are predicted to be suitable for standing, or better, and walking, or better, throughout the year, respectively, or otherwise be recessed into building façades or include flanking wind barriers/overhead protection.

2) During the typical use period, wind conditions were assessed atop all podia and towers to consider potentially suitable locations for common amenity terraces. While several terraces are predicted to receive windier conditions, particularly those atop the towers, many regions over the podia are predicted to experience conditions that are mostly suitable for sitting, including the northeast and southeast elevations of Block A, the northeast elevation of Block B, and most of Block E.

    a. Depending on programming, and as the amenity terrace areas are defined at future application stages, conditions within the windier terrace areas may be improved by implementing tall perimeter wind screens and canopies that extend from select façades in combination with inboard mitigation, such as free-standing canopies, wind screens, dense coniferous plantings in tall planters, and other common mitigation elements.

3) The foregoing statements and conclusions apply to common weather systems, during which no dangerous wind conditions, as defined in Section 4.4, are expected anywhere over the subject site. During extreme weather events, (for example, thunderstorms, tornadoes, and downbursts), pedestrian safety is the main concern. However, these events are generally short-lived and infrequent and there is often sufficient warning for pedestrians to take appropriate cover.

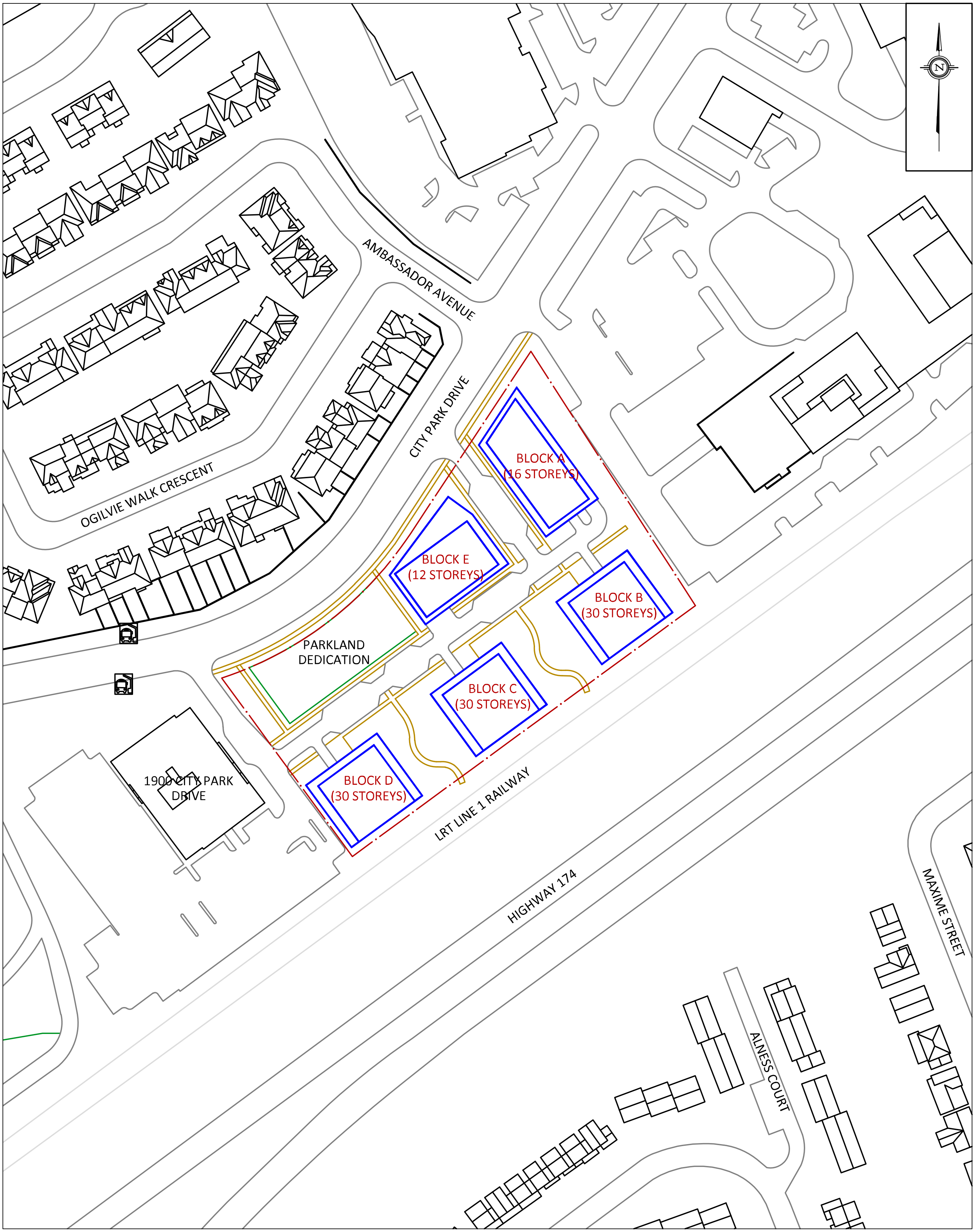
Sincerely,

Gradient Wind Engineering Inc.

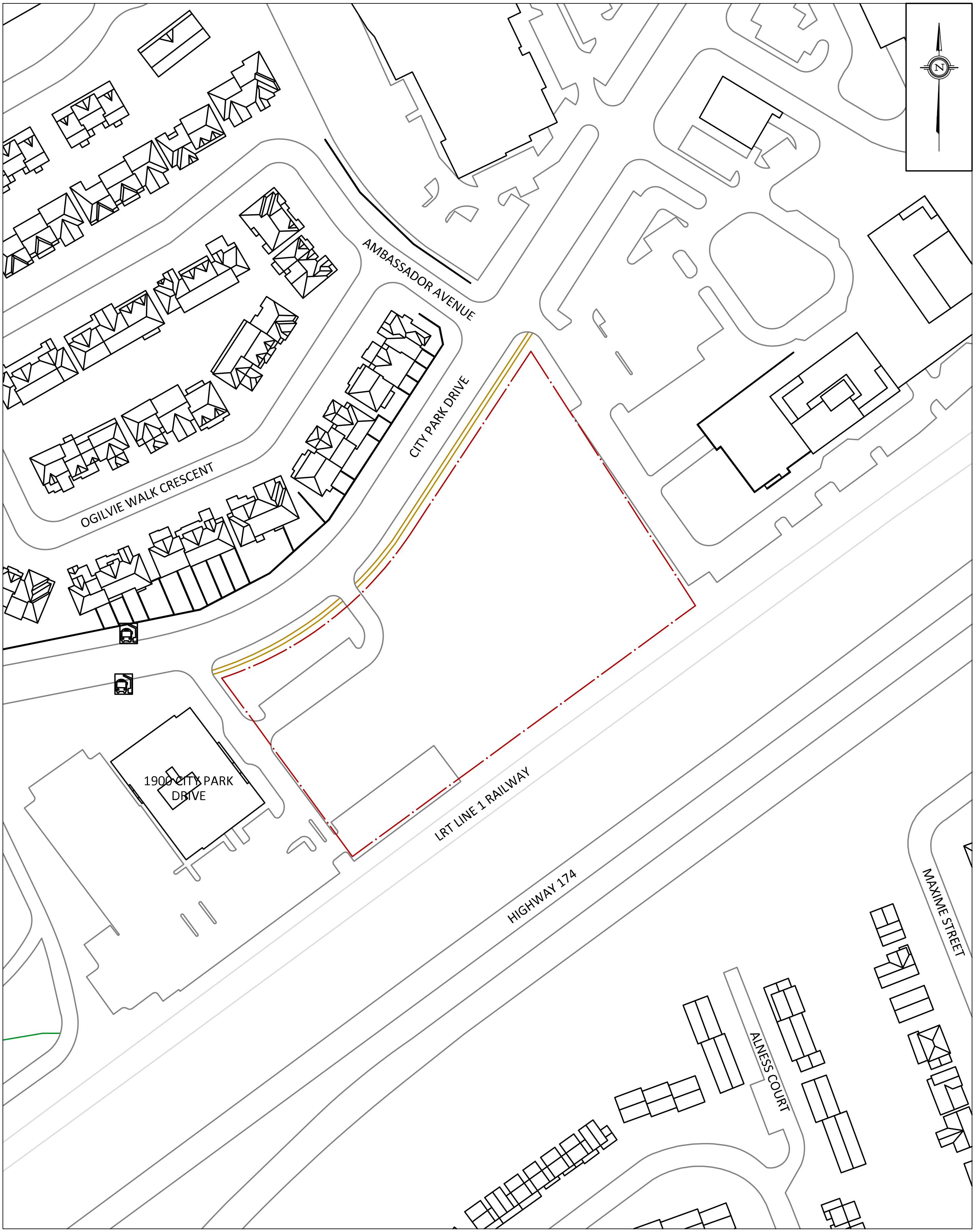
Justin Denne, M.A.Sc.
Junior Wind Scientist

LICENSED PROFESSIONAL ENGINEER
D. T. HUITEMA
100561777
August 11, 2025
PROVINCE OF ONTARIO

David Huitema, M.Eng., P.Eng.
CFD Lead Engineer



GRADIENTWIND ENGINEERS & SCIENTISTS 127 WALGREEN ROAD, OTTAWA, ON 613 836 0934 • GRADIENTWIND.COM	PROJECT 2000 CITY PARK DRIVE, OTTAWA PEDESTRIAN LEVEL WIND STUDY		DESCRIPTION FIGURE 1A: PROPOSED SITE PLAN AND SURROUNDING CONTEXT
	SCALE 1:2000	DRAWING NO. 23-075-PLW-2025-1A	
	DATE AUGUST 7, 2025	DRAWN BY S.K.	



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PROJECT	2000 CITY PARK DRIVE, OTTAWA PEDESTRIAN LEVEL WIND STUDY
SCALE	1:2000
DRAWING NO.	23-075-PLW-2025-1B
DATE	AUGUST 7, 2025
DRAWN BY	S.K.
DESCRIPTION	FIGURE 1B: EXISTING SITE PLAN AND SURROUNDING CONTEXT

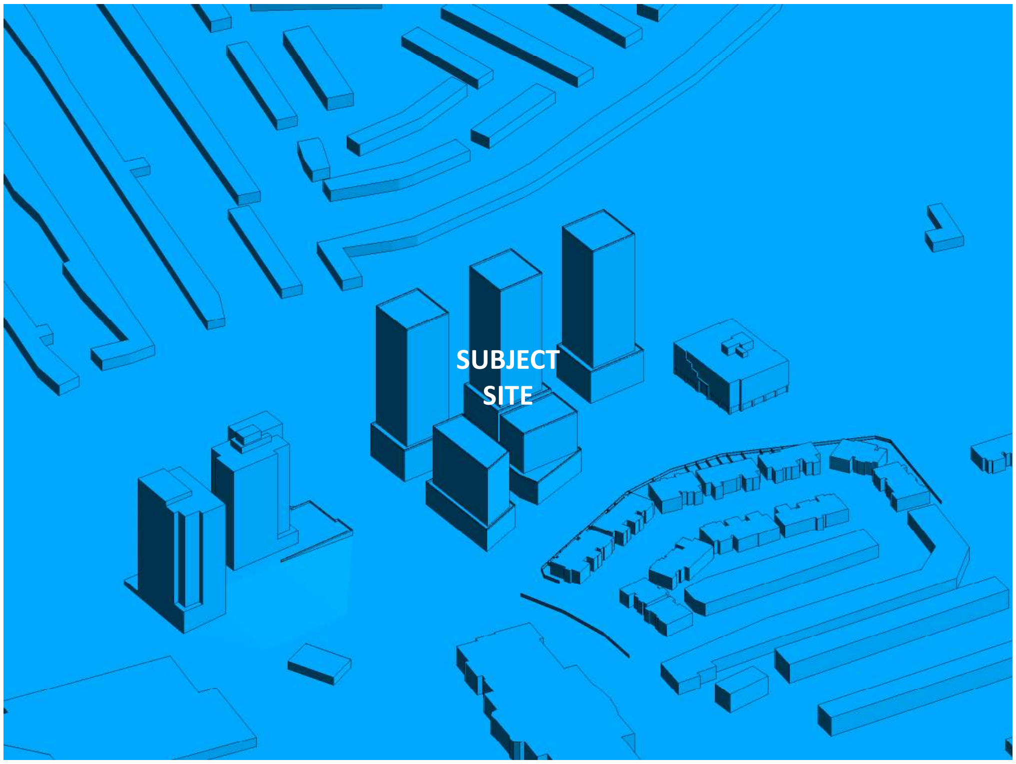

FIGURE 2A: COMPUTATIONAL MODEL, PROPOSED MASSING, NORTH PERSPECTIVE

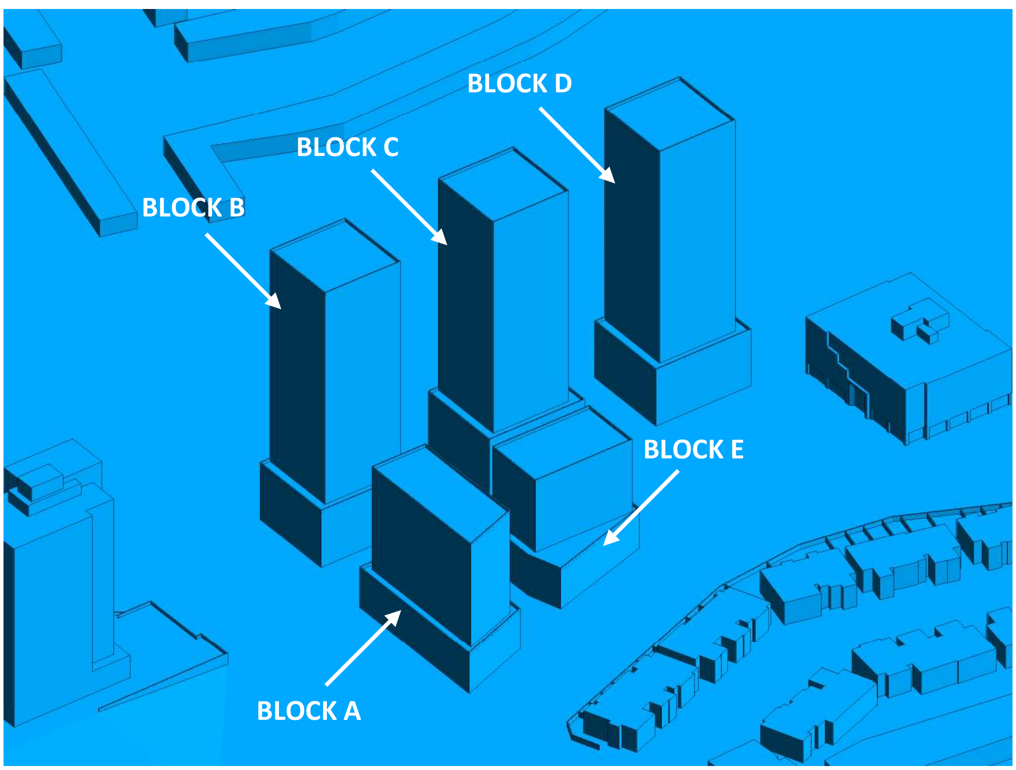

FIGURE 2B: CLOSE UP OF FIGURE 2A

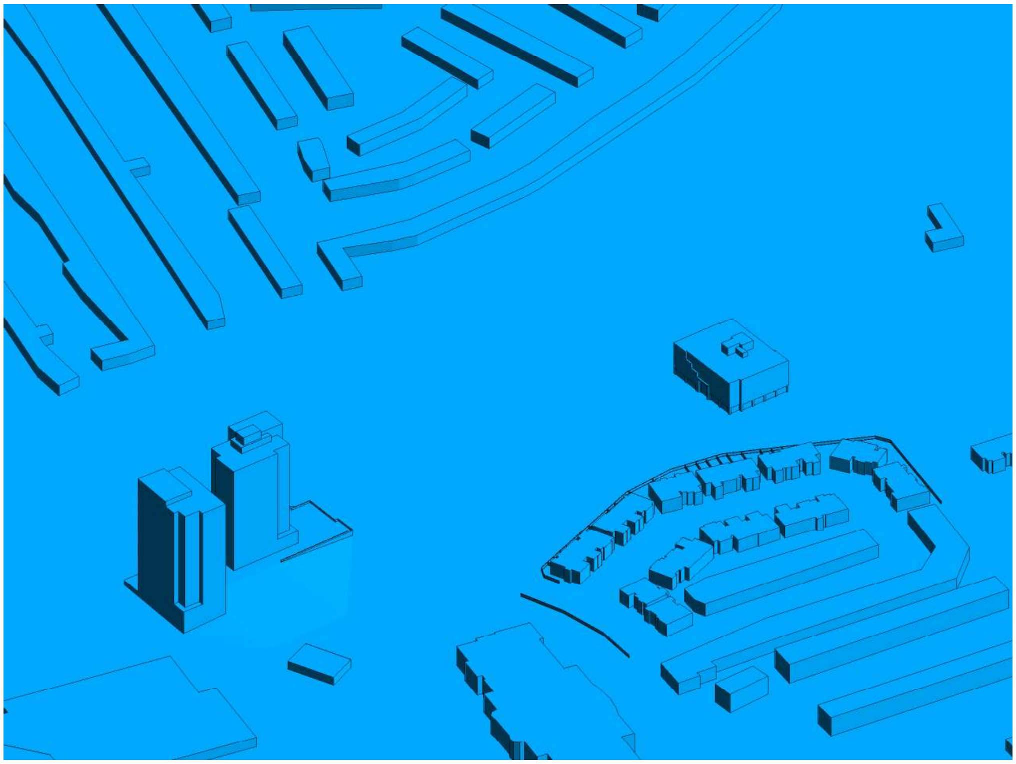

FIGURE 2C: COMPUTATIONAL MODEL, EXISTING MASSING, NORTH PERSPECTIVE

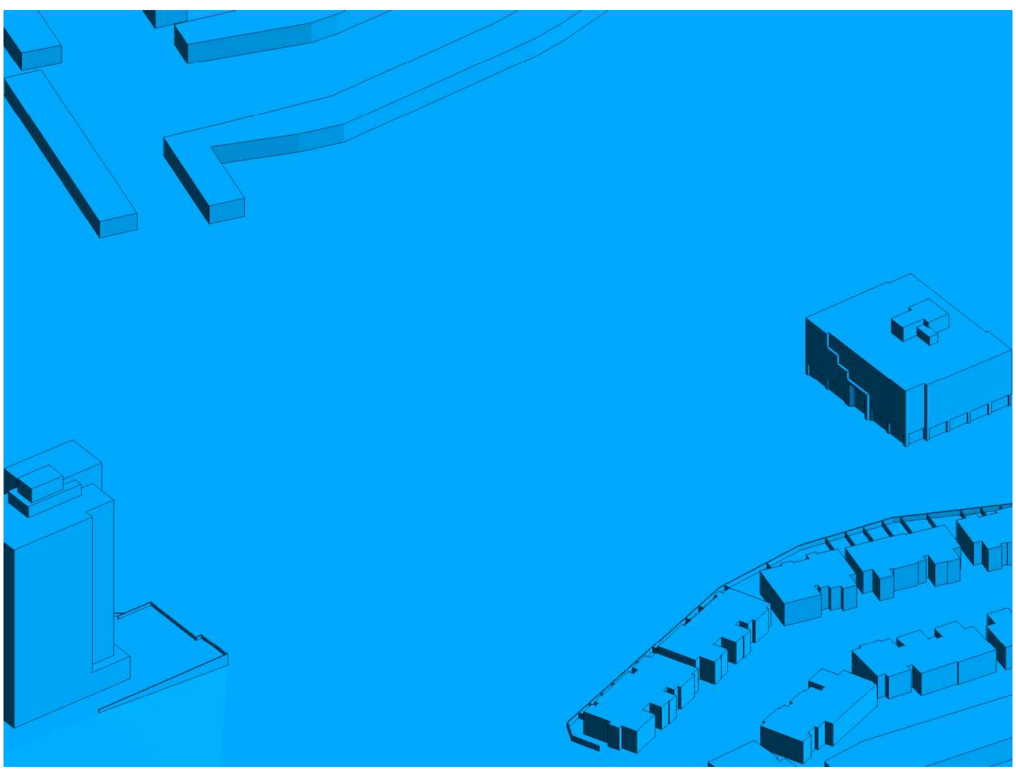

FIGURE 2D: CLOSE UP OF FIGURE 2C

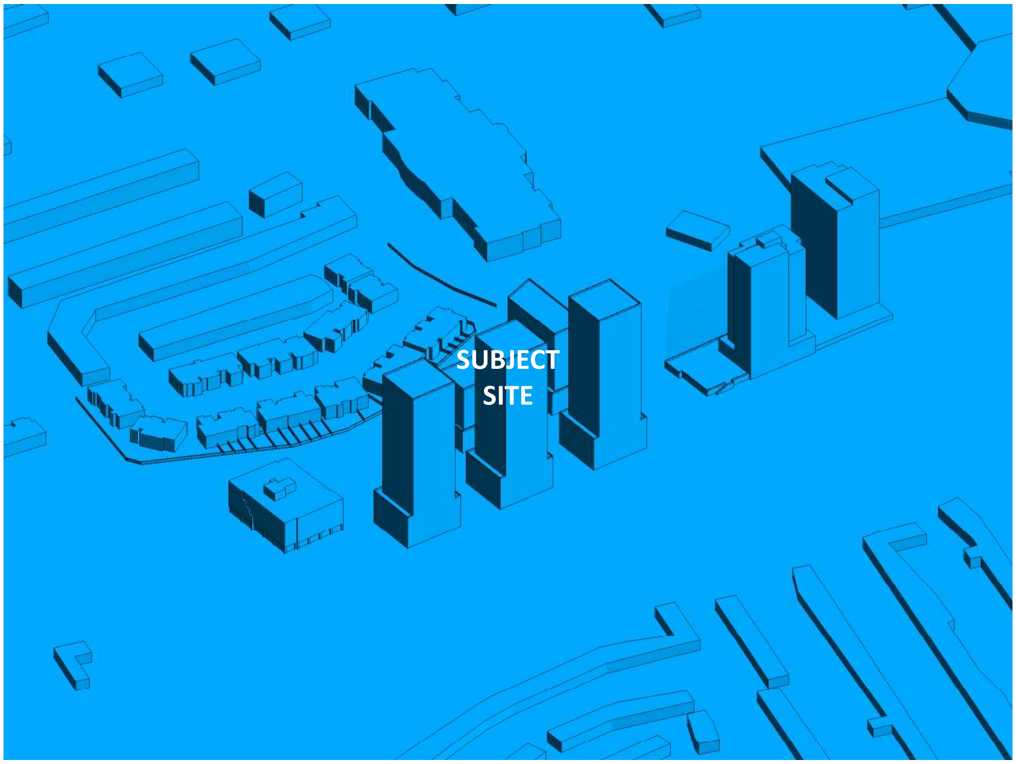

FIGURE 2E: COMPUTATIONAL MODEL, PROPOSED MASSING, SOUTH PERSPECTIVE

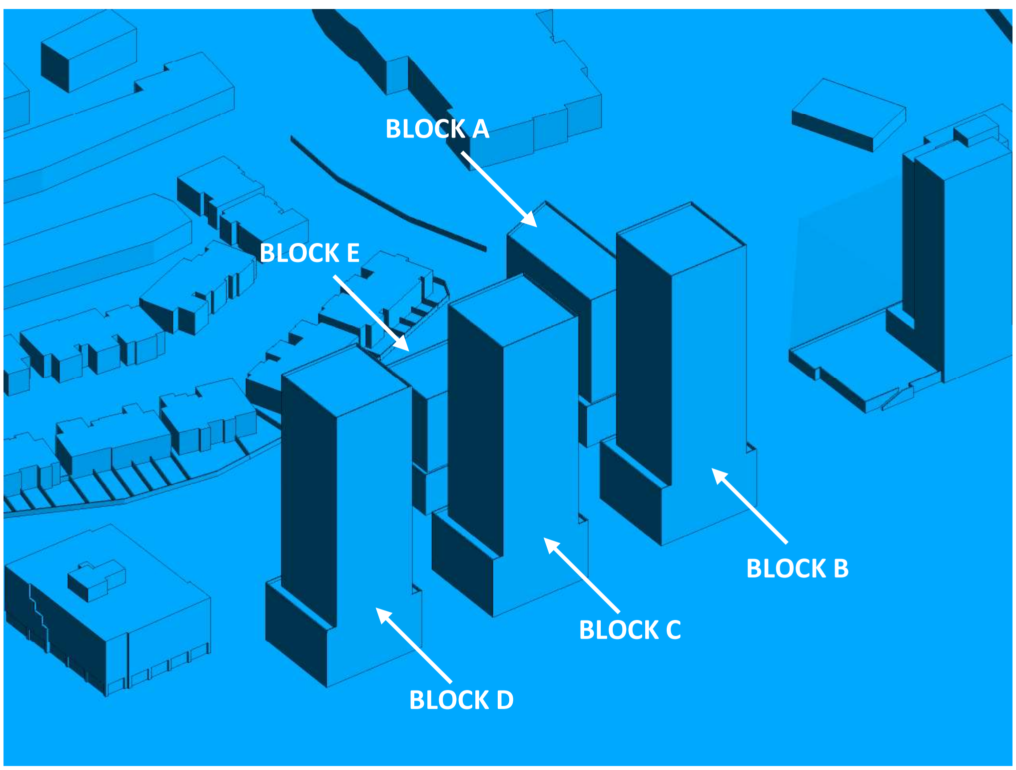

FIGURE 2F: CLOSE UP OF FIGURE 2E

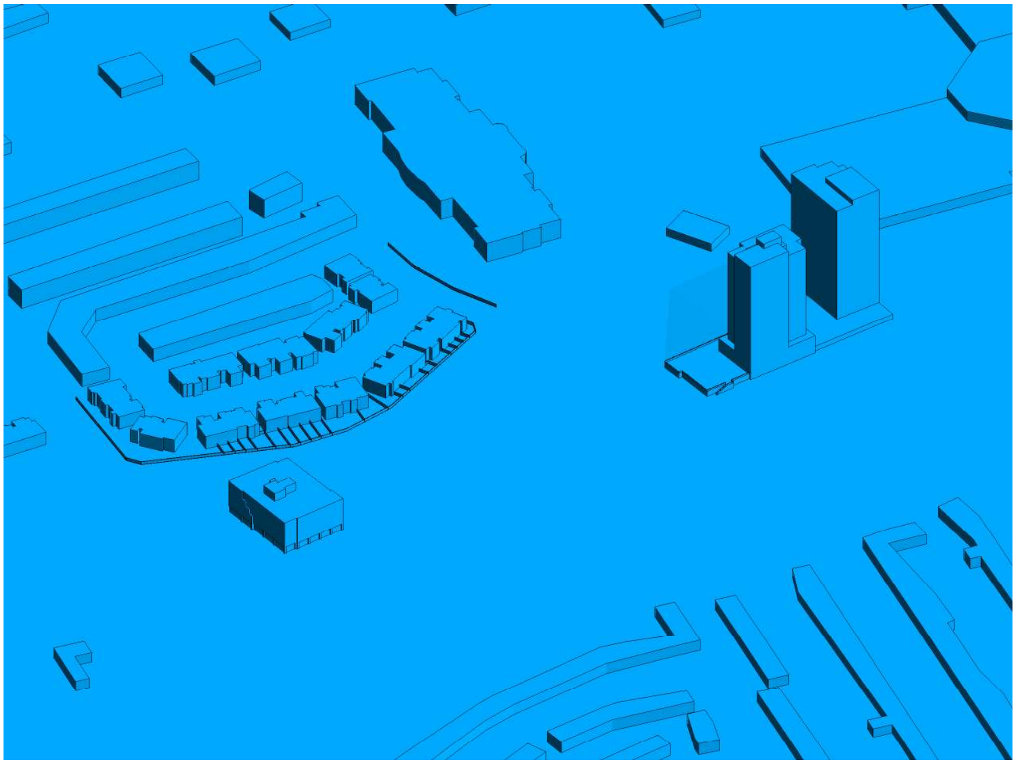

FIGURE 2G: COMPUTATIONAL MODEL, EXISTING MASSING, SOUTH PERSPECTIVE

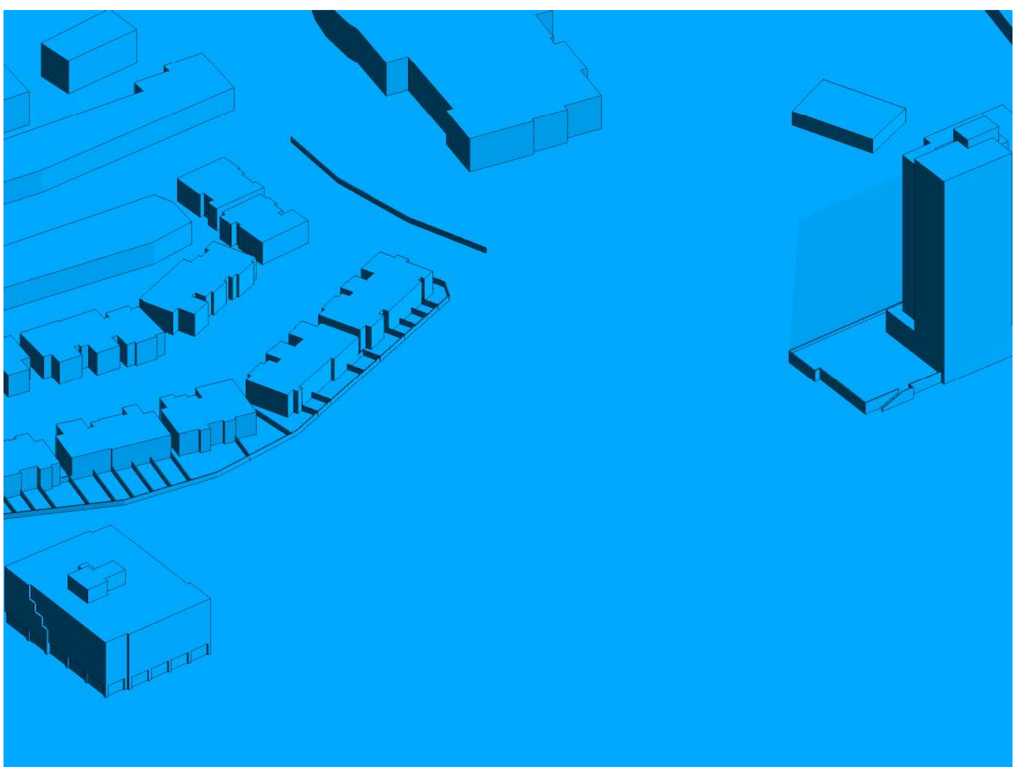

FIGURE 2H: CLOSE UP OF FIGURE 2G

FIGURE 3A: SPRING – WIND COMFORT, GRADE LEVEL – PROPOSED MASSING

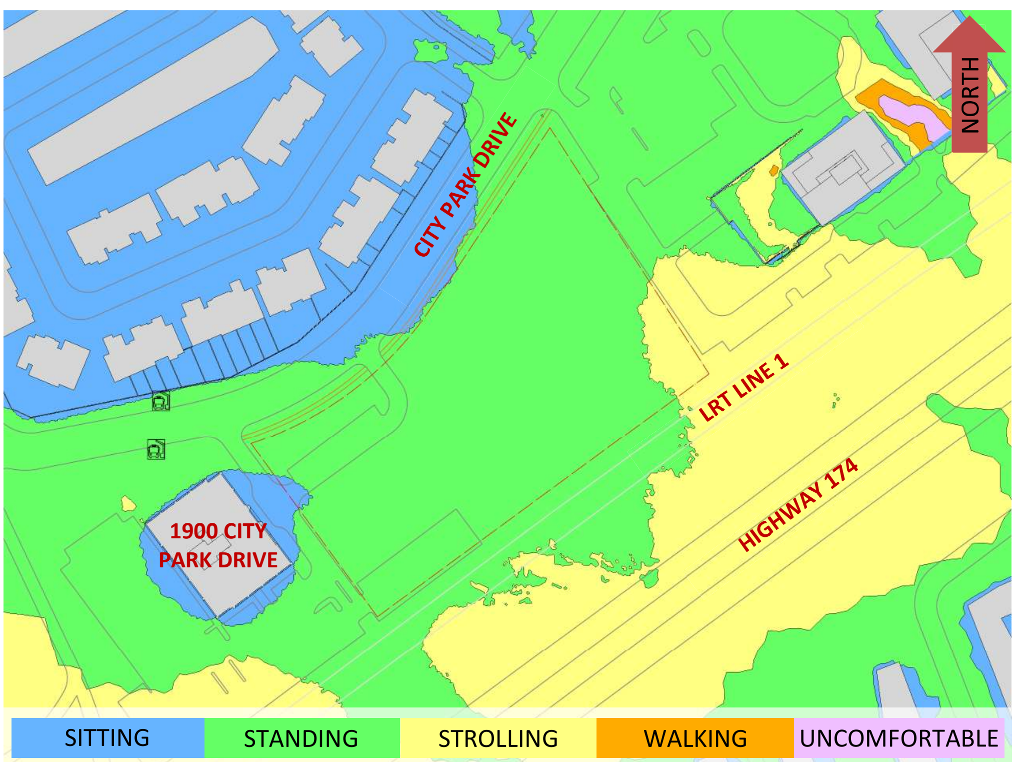

FIGURE 3B: SPRING – WIND COMFORT, GRADE LEVEL – EXISTING MASSING

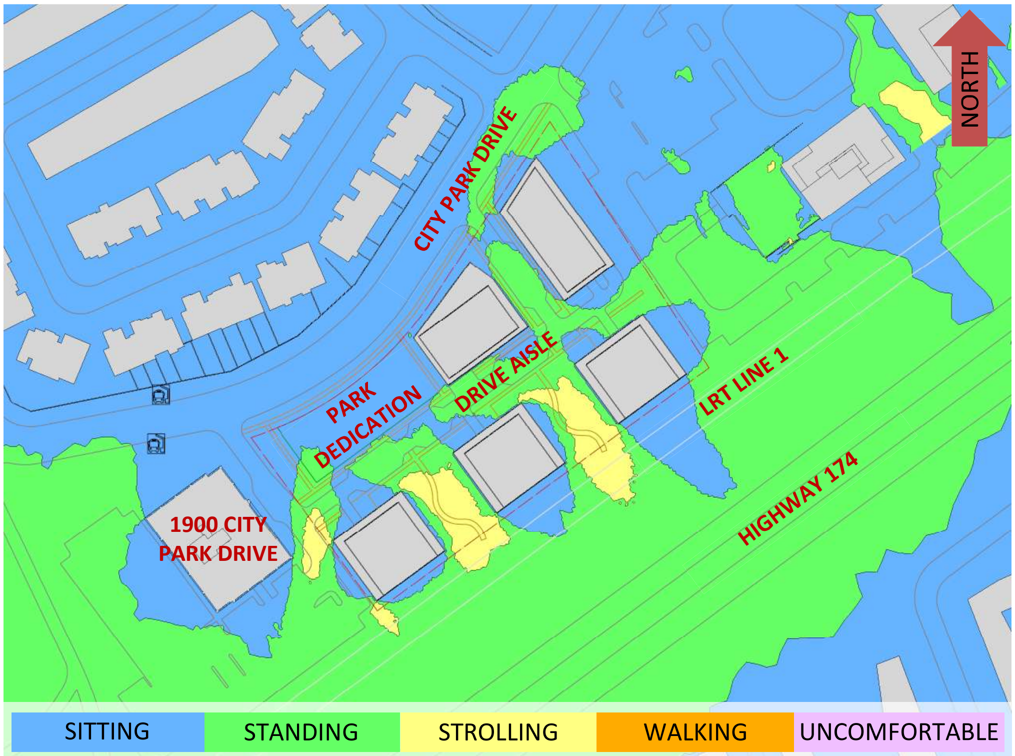

FIGURE 4A: SUMMER – WIND COMFORT, GRADE LEVEL – PROPOSED MASSING

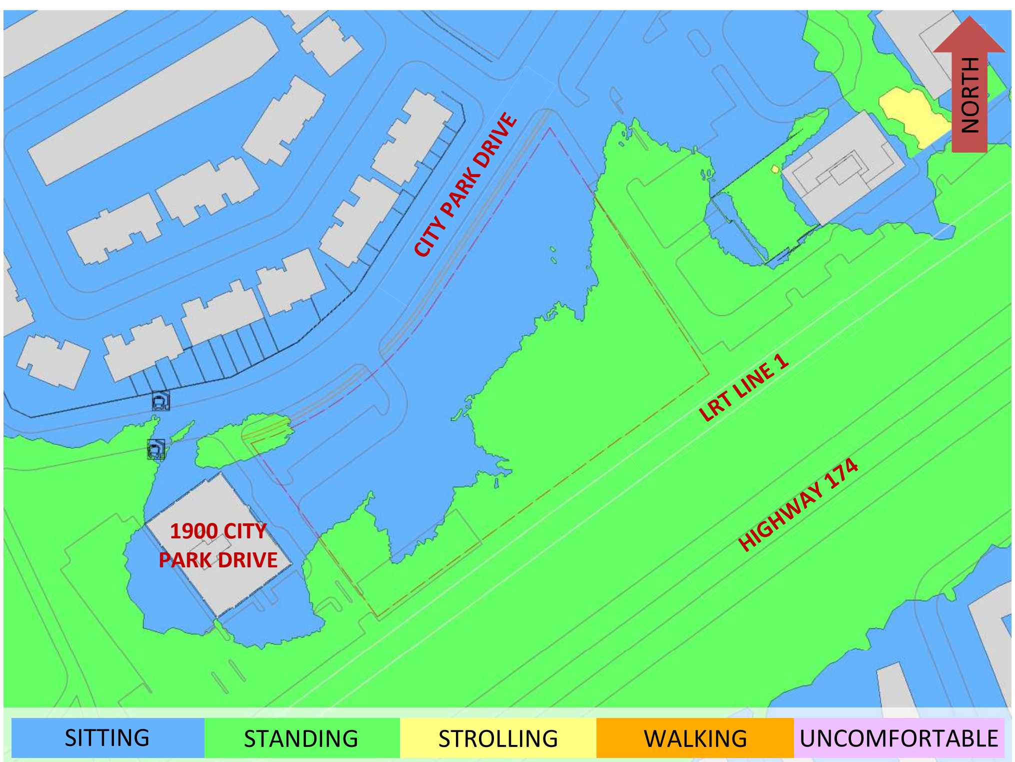

FIGURE 4B: SUMMER – WIND COMFORT, GRADE LEVEL – EXISTING MASSING

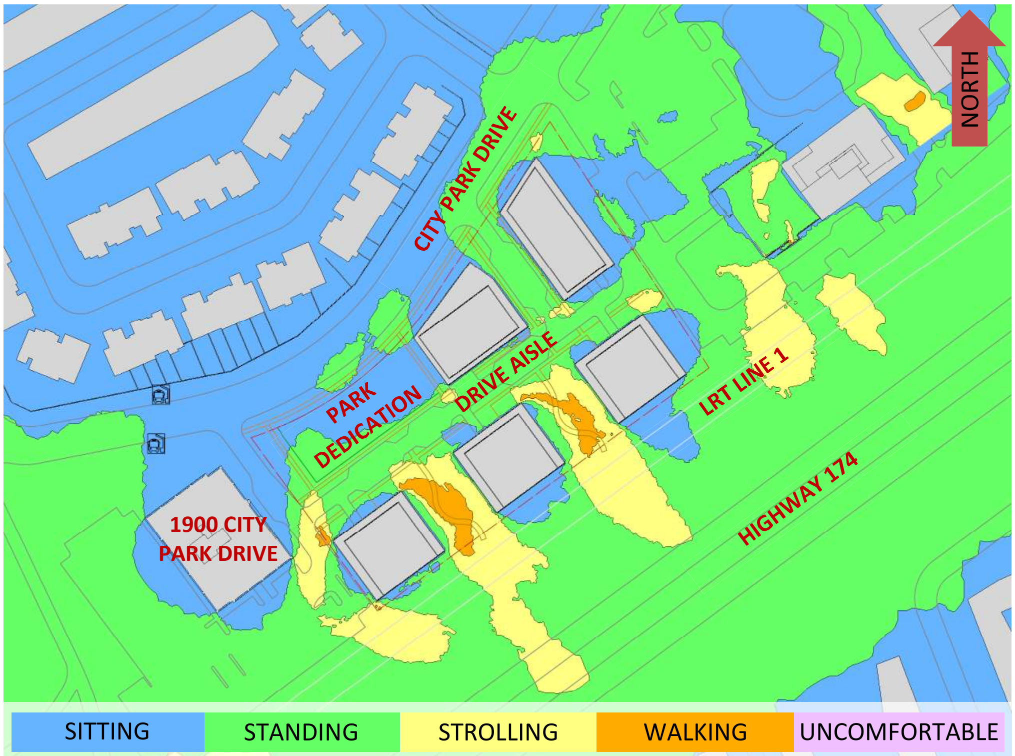

FIGURE 5A: AUTUMN – WIND COMFORT, GRADE LEVEL – PROPOSED MASSING

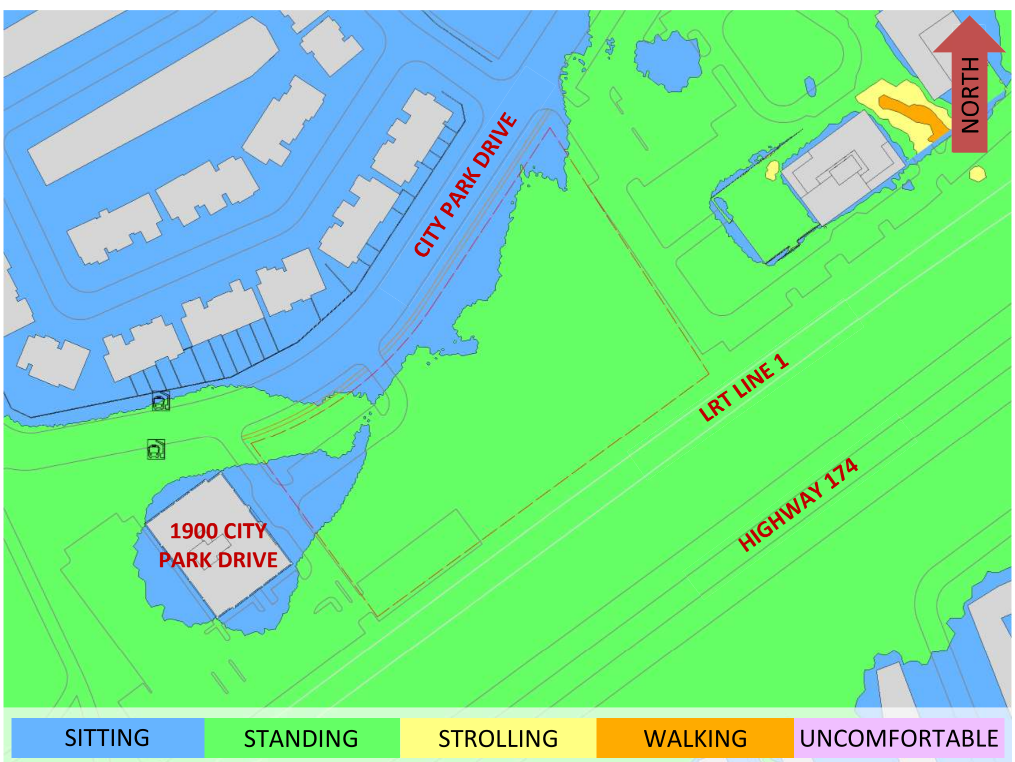

FIGURE 5B: AUTUMN – WIND COMFORT, GRADE LEVEL – EXISTING MASSING

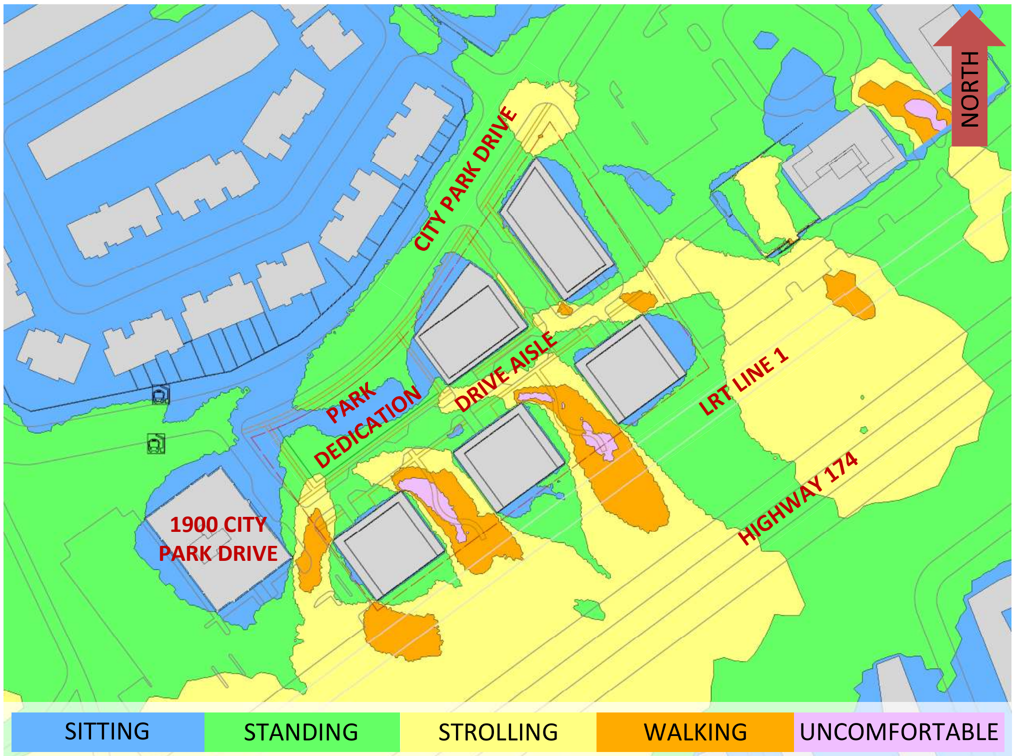

FIGURE 6A: WINTER – WIND COMFORT, GRADE LEVEL – PROPOSED MASSING

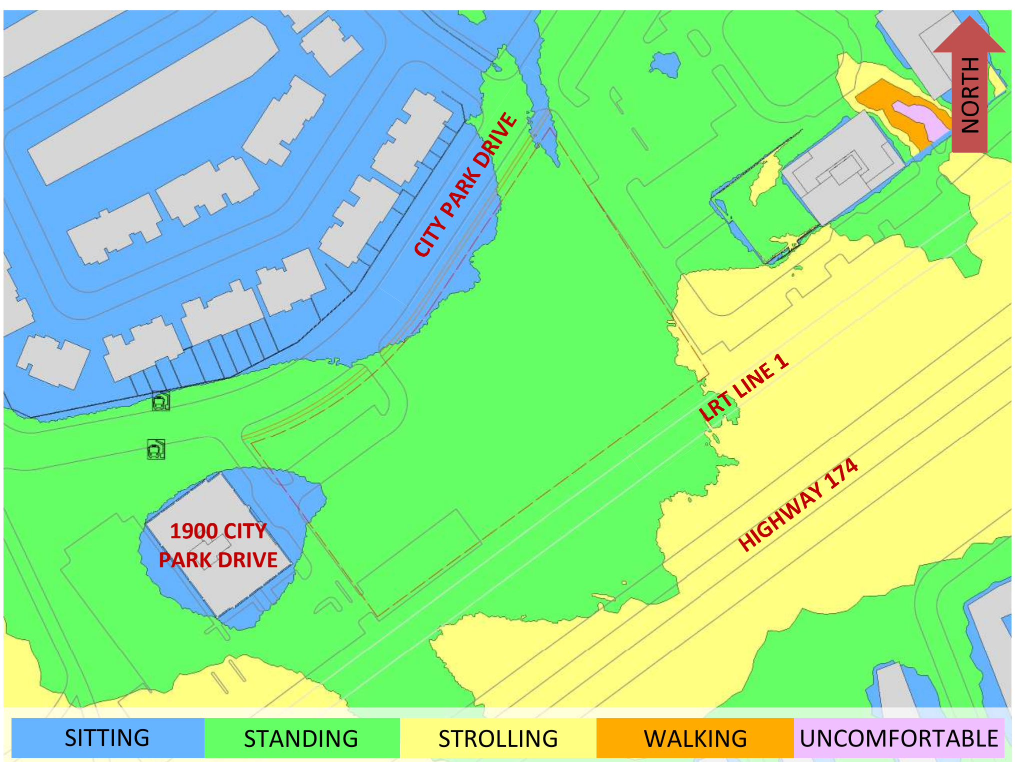

FIGURE 6B: WINTER – WIND COMFORT, GRADE LEVEL – EXISTING MASSING

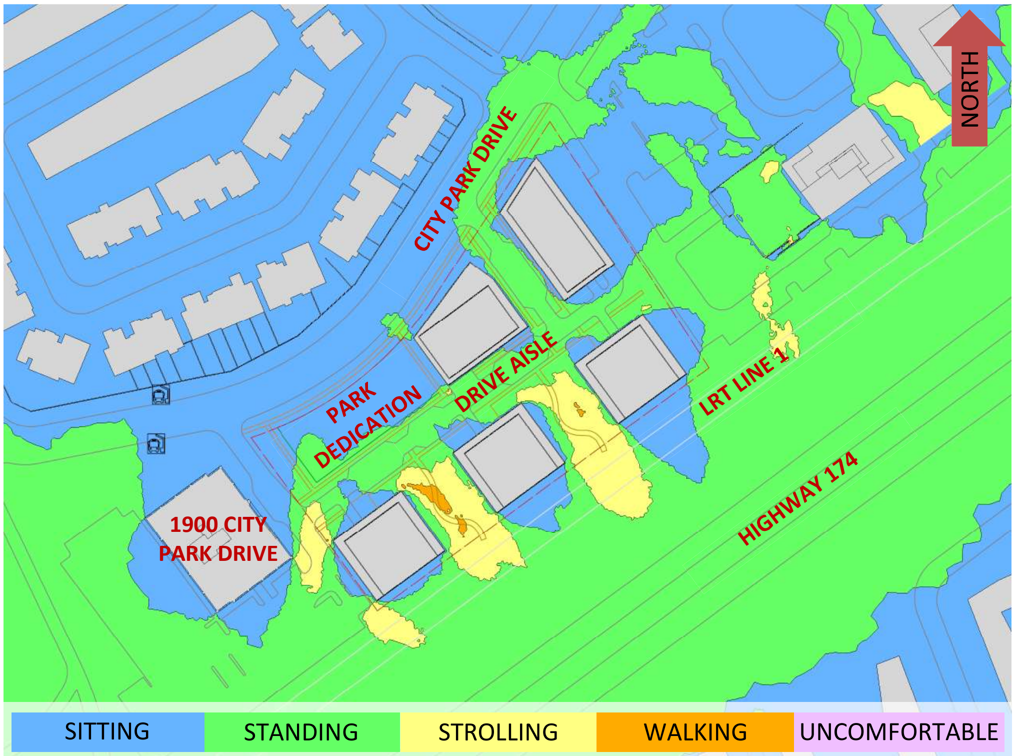

FIGURE 7: TYPICAL USE PERIOD – WIND COMFORT, GRADE LEVEL – PROPOSED MASSING

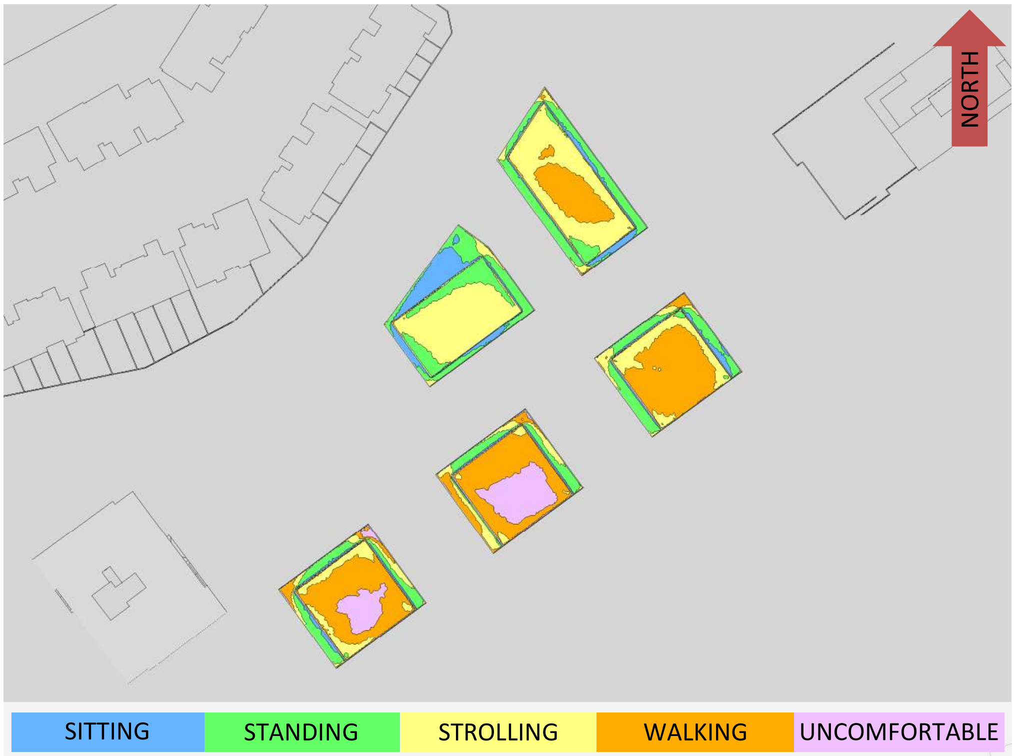

FIGURE 8A: SPRING – WIND COMFORT, COMMON AMENITY TERRACES

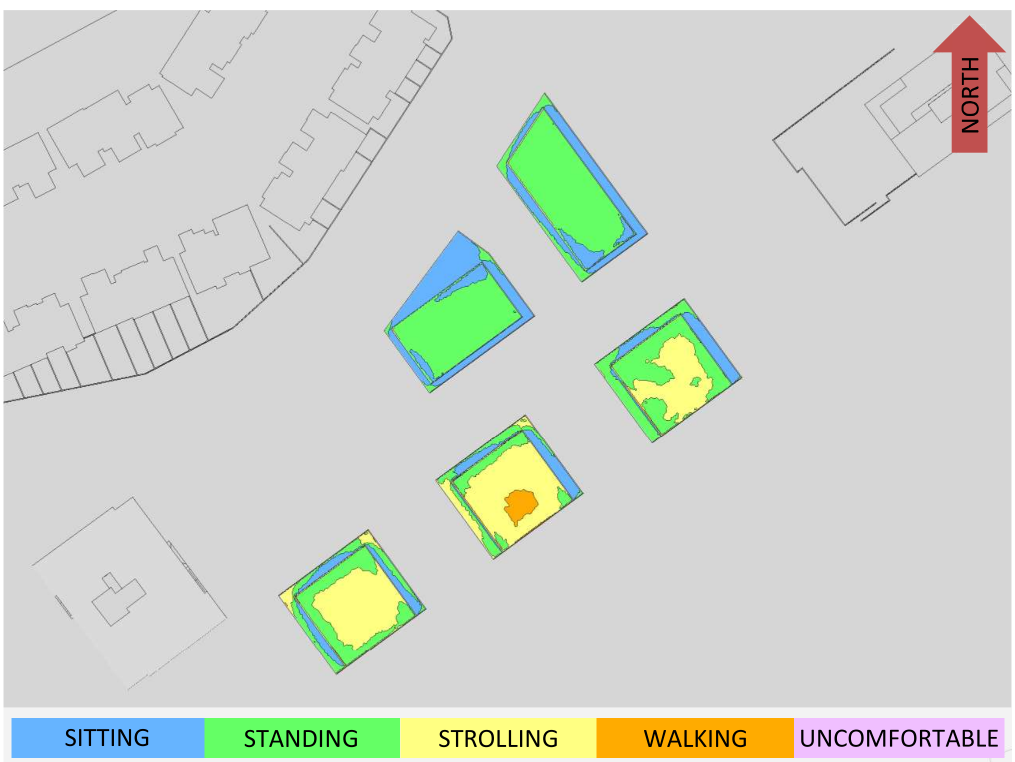

FIGURE 8B: SUMMER – WIND COMFORT, COMMON AMENITY TERRACES

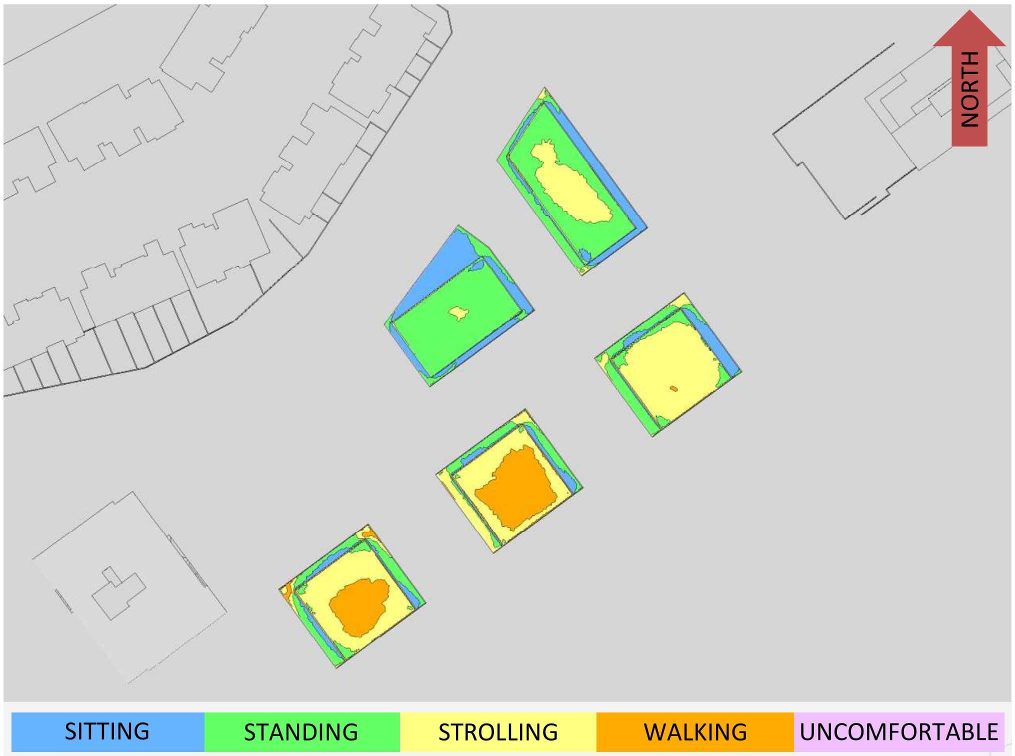

FIGURE 8C: AUTUMN – WIND COMFORT, COMMON AMENITY TERRACES

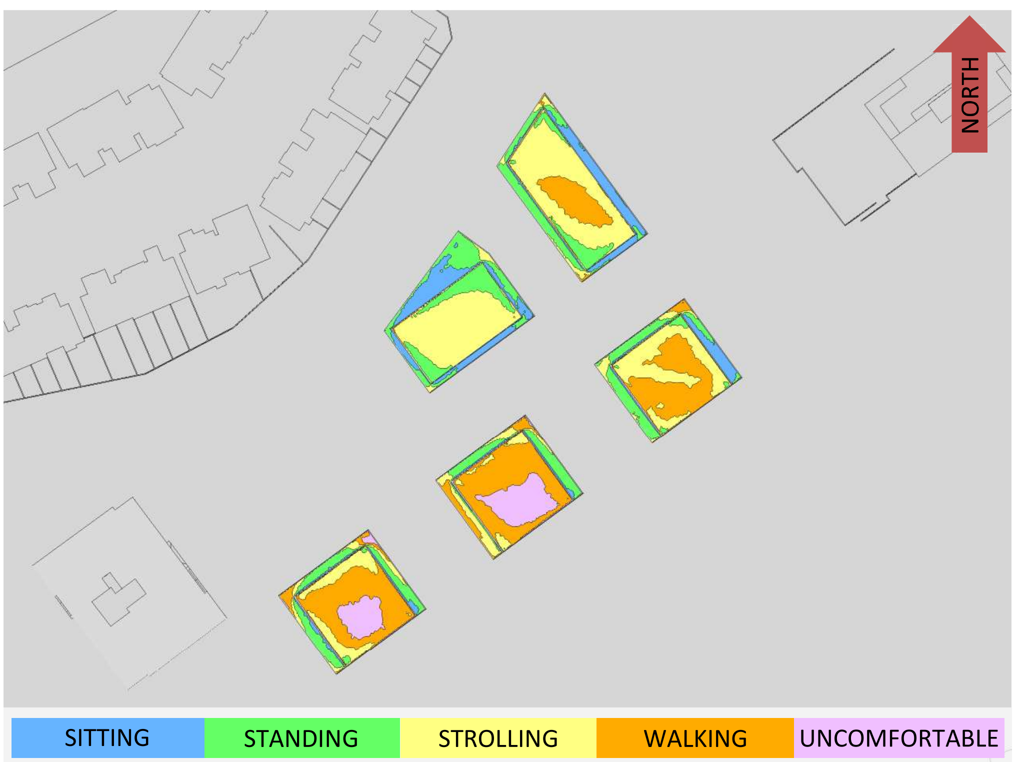

FIGURE 8D: WINTER – WIND COMFORT, COMMON AMENITY TERRACES

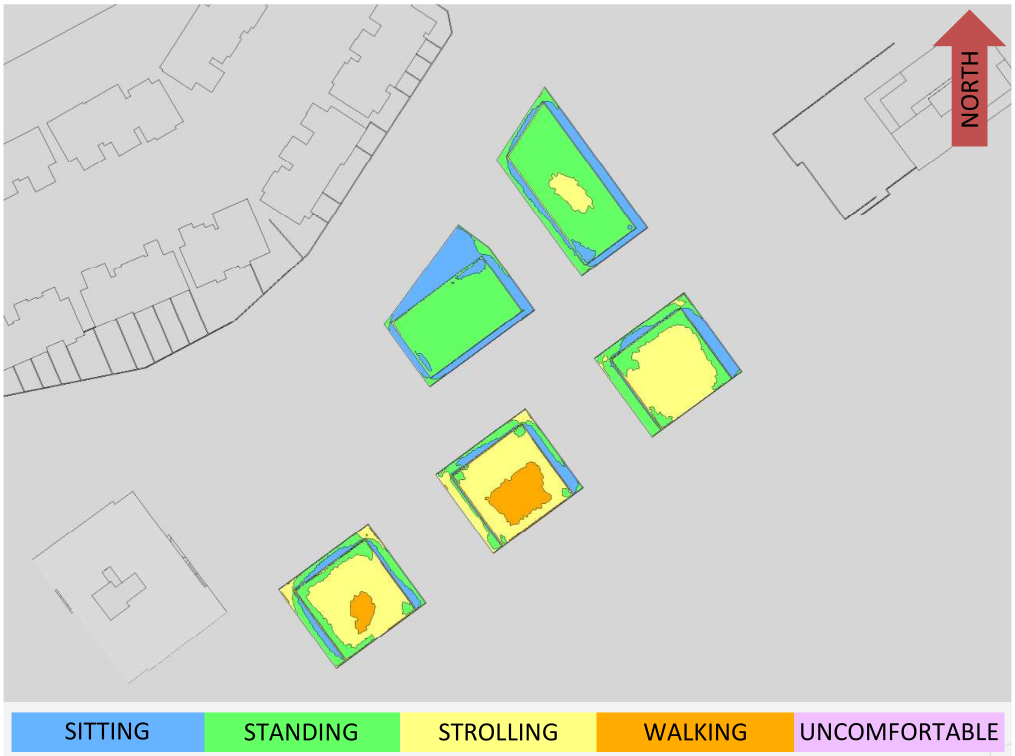

FIGURE 9: TYPICAL USE PERIOD – WIND COMFORT, COMMON AMENITY TERRACES

APPENDIX A

SIMULATION OF THE ATMOSPHERIC BOUNDARY LAYER

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SIMULATION OF THE ATMOSPHERIC BOUNDARY LAYER

The atmospheric boundary layer (ABL) is defined by the velocity and turbulence profiles according to industry standard practices. The mean wind profile can be represented, to a good approximation, by a power law relation, Equation (1), giving height above ground versus wind speed (1), (2).

$$U = U_g \left(\frac{Z}{Z_g} \right)^{\alpha} \qquad \text{Equation (1)}$$

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

For the model, U_g is set to 6.5 metres per second (m/s), which approximately corresponds to the 60% mean wind speed for Ottawa based on historical climate data and statistical analyses. When the results are normalized by this velocity, they are relatively insensitive to the selection of gradient wind speed.

Z_g is set to 540 m. The selection of gradient height is relatively unimportant, so long as it exceeds the building heights surrounding the subject site. The value has been selected to correspond to our physical wind tunnel reference value.

α is determined based on the upstream exposure of the far-field surroundings (that is, the area that is not captured within the simulation model).

Table 1 presents the values of α used in this study, while Table 2 presents several reference values of α. When the upstream exposure of the far-field surroundings is a mixture of multiple types of terrain, the α values are a weighted average with terrain that is closer to the subject site given greater weight.

TABLE 1: UPSTREAM EXPOSURE (ALPHA VALUE) VS TRUE WIND DIRECTION

Wind Direction (Degrees True)	Alpha Value (α)
0	0.23
22.5	0.23
45	0.23
67.5	0.21
90	0.21
112.5	0.23
135	0.23
157.5	0.23
180	0.23
202.5	0.23
225	0.23
247.5	0.23
270	0.25
292.5	0.25
315	0.24
337.5	0.25

TABLE 2: DEFINITION OF UPSTREAM EXPOSURE (ALPHA VALUE)

Upstream Exposure Type	Alpha Value (α)
Open Water	0.14-0.15
Open Field	0.16-0.19
Light Suburban	0.21-0.24
Heavy Suburban	0.24-0.27
Light Urban	0.28-0.30
Heavy Urban	0.31-0.33

The turbulence model in the computational fluid dynamics (CFD) simulations is a two-equation shear-stress transport (SST) model, and thus the ABL turbulence profile requires that two parameters be defined at the inlet of the domain. The turbulence profile is defined following the recommendations of the Architectural Institute of Japan for flat terrain (3).

$$I(Z) = \begin{cases} 0.1\left(\frac{Z}{Z_g}\right)^{-\alpha-0.05}, & Z > 10\text{ m} \\ 0.1\left(\frac{10}{Z_g}\right)^{-\alpha-0.05}, & Z \leq 10\text{ m} \end{cases}$$ Equation (2)

$$L_t(Z) = \begin{cases} 100\text{ m}\sqrt{\frac{Z}{30}}, & Z > 30\text{ m} \\ 100\text{ m}, & Z \leq 30\text{ m} \end{cases}$$ Equation (3)

where ***I*** = turbulence intensity, $\boldsymbol{L_t}$ = turbulence length scale, ***Z*** = height above ground, and **α** is the power law exponent used for the velocity profile in Equation (1).

Boundary conditions on all other domain boundaries are defined as follows: the ground is a no-slip surface; the side walls of the domain have a symmetry boundary condition; the top of the domain has a specified shear, which maintains a constant wind speed at gradient height; and the outlet has a static pressure boundary condition.

REFERENCES

[1] P. Arya, "Chapter 10: Near-neutral Boundary Layers," in *Introduction to Micrometeorology*, San Diego, California, Academic Press, 2001.

[2] S. A. Hsu, E. A. Meindl and D. B. Gilhousen, "Determining the Power-Law Wind Profile Exponent under Near-neutral Stability Conditions at Sea," vol. 33, no. 6, 1994.

[3] Y. Tamura, H. Kawai, Y. Uematsu, K. Kondo, and T. Okhuma, "Revision of AIJ Recommendations for Wind Loads on Buildings," in *The International Wind Engineering Symposium, IWES 2003*, Taiwan, 2003.