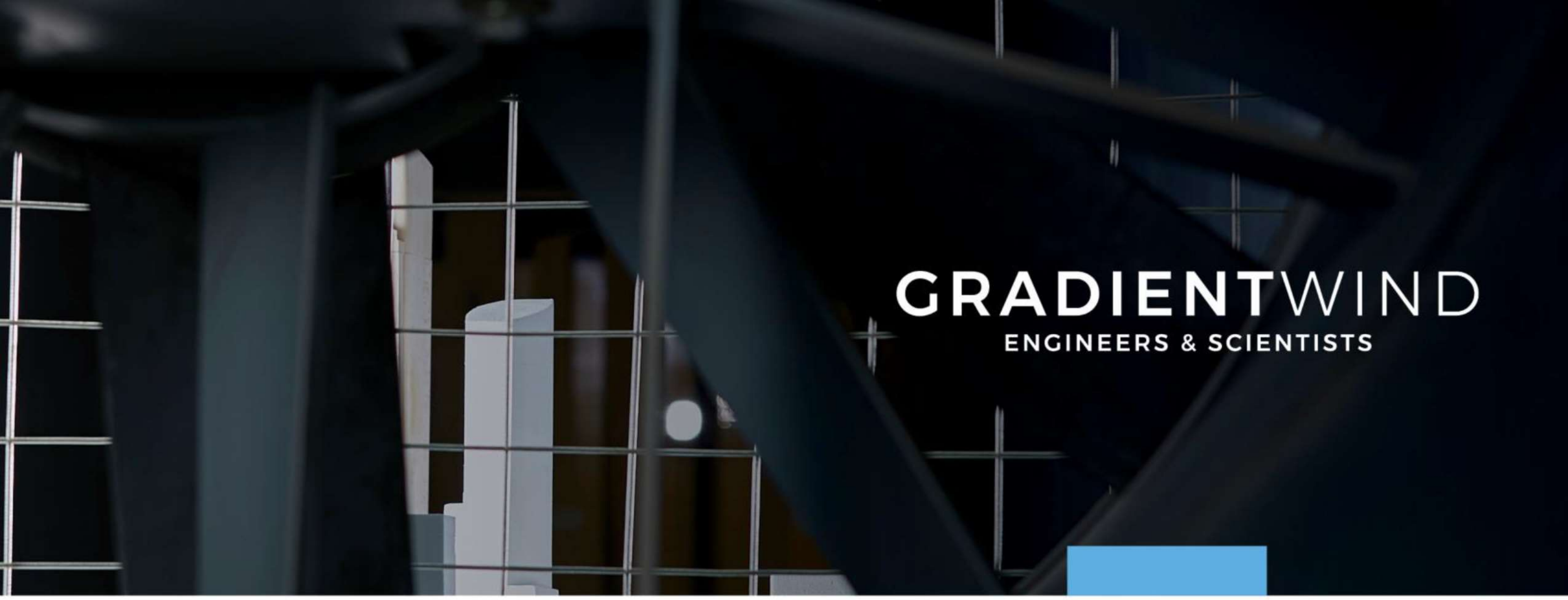
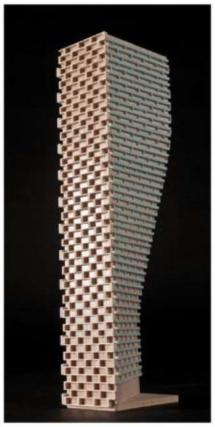



# PEDESTRIAN LEVEL WIND STUDY

145 Loretta Avenue North
951 Gladstone Avenue
Ottawa, Ontario

Report: 18-075-PLW-2025



July 30, 2025

PREPARED FOR
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# EXECUTIVE SUMMARY

This report describes a pedestrian level wind (PLW) study undertaken to satisfy Zoning By-Law Amendment application resubmission requirements for the proposed development located at 145 Loretta Avenue North and 951 Gladstone Avenue 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 their intended pedestrian uses throughout the year. Specifically, conditions over the nearby public sidewalks, most nearby transit stops, the Corso Italia O-Train station plaza and platforms, the multi-use pathways to the east, the nearby existing surface parking lots, the proposed drop-off areas and surface parking, and in the vicinity of the building access points are considered acceptable.

    a. If the nearby westbound transit stop along Gladstone Avenue will remain following the introduction of Towers B and C, it is recommended to implement a typical three-sided transit shelter for the stop to provide pedestrians with a means of relief from the elements, including during periods of strong wind activity.

    b. Owing to salient winds from the southwest clockwise to the northwest that are predicted to downwash over the western elevations of the towers, accelerate around the northwest and southwest corner of Tower B, and accelerate within the accessible volume beneath the shared podium serving Towers B and C, isolated regions between Towers B and C and at the northwest corner of Tower B are predicted to experience conditions that may be considered occasionally uncomfortable for walking. These regions are predicted to impact sections of the drive aisle between Towers B and C and the walkway to the west of Tower B. Recommendations regarding mitigation for these areas are provided in Section 5.1, including a combination of wraparound canopies, chamfering or streamlining of the podium corner, and changes to the podium underpass to either further restrict wind entry and subsequent acceleration or to increase the accessible volume beneath the podium to decrease channelling effects.

c. During the typical use period, conditions over the POPS situated to the east of the Standard Bread Building are predicted to be suitable for a mix of sitting and standing, while conditions over the POPS to the southwest of Tower A and between Towers A and B are predicted to be suitable for standing, strolling, and walking during the same period.

    i. If required by programming, comfort levels within the POPS may be improved by implementing strategically placed wind screens, dense arrangements of coniferous plantings and trees, high-back bench seating, and other common landscaping elements targeted around sensitive areas such as overhead pergolas and trellises above seating areas. The extent of mitigation measures is dependent on the programming of the POPS.

2) Wind conditions during the typical use period within the common amenity terraces serving Tower A at Level 5 and Towers B and C at Level 6 are predicted to be suitable for mostly a mix of siting and standing and standing and strolling, respectively. Notably, 1.8-m-tall wind screens were modelled along the full perimeter of the podia roofs, which is recommended to provide shielding from direct winds.

    a. To improve comfort levels, mitigation inboard of the terrace perimeters and targeted around sensitive areas is recommended, in combination with taller perimeter wind screens along select terrace perimeters (that is, greater than 1.8 m, measured from the walking surface). Inboard mitigation could take the form of wind screens or other common landscape elements. Canopies may also be required above sensitive areas.

b. The extent of mitigation measures is dependent on the programming of the terraces. An appropriate mitigation strategy will be developed in collaboration with the building and landscape architects as the design of the proposed development progresses and the programming of the terraces is defined. This work is expected to support the future Site Plan Control applications.

3) 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. The foregoing statements and conclusions apply to common weather systems, during which one area within the vicinity of the subject site may experience conditions that approach the wind safety criterion, as defined in Section 4.4. Specifically, an isolated area beneath the podium serving Towers B and C over the drive aisle and roadway surface may experience wind conditions that approach the wind safety threshold, isolated in extent to over the roadway surface where pedestrian use and access is limited. The mitigation measures as described in Section 5.1 regarding wind mitigation for Towers B and C at grade to improve wind conditions over the drive aisle are expected to reduce or eliminate this potential exceedance.

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## 1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by TIP Gladstone by its general partner TIP Gladstone GP Inc. c/o CLV Group Developments Inc, to undertake a pedestrian level wind (PLW) study to satisfy Zoning By-Law Amendment (ZBLA) application resubmission requirements for the proposed development located at 145 Loretta Avenue North and 951 Gladstone Avenue in Ottawa, Ontario (hereinafter referred to as “subject site” or “proposed development”). A PLW study for the Site Plan Control application submission for Tower A (Phase 1) was completed in 2024[1]. Our mandate within the current study is to investigate pedestrian wind conditions within and surrounding the subject site for the current architectural design of the full site buildout, comprising primarily the consideration of the revised tower heights, 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 Linebox Studio 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 145 Loretta Avenue North and 951 Gladstone Avenue, situated to the northeast at the intersection of Loretta Avenue North and Gladstone Avenue on a triangular parcel of land bounded by Loretta Avenue North to the west, the O-Train Line 2 to the northeast, and Gladstone Avenue to the south. The existing 3-storey building, referred to as “Standard Bread Building”, situated at the southeast corner of the subject site is to be retained.

The proposed development comprises three towers: Tower A (34 storeys), Tower B (38 storeys), and Tower C (40 storeys) situated to the north, central, and to the south of the subject site, respectively. Towers B and C share a common ‘T’-shaped 5-storey podium with an underpass between the towers at grade. Each tower is topped with a mechanical penthouse. Grade-level privately owned publicly accessible

[1] Gradient Wind Engineering Inc., ‘*Pedestrian Level Wind Study, 145 Loretta Avenue & 951 Gladstone Avenue,*’ [Dec 4, 2024]

spaces (POPS) are proposed to the east of the Standard Bread Building and to the south of Tower A. Drive aisles extending from Loretta Avenue North provide access to the parking ramps located to the north of Tower C and to the northwest of Tower A, the loading spaces between Towers B and C and to the northwest of Tower A, the drop-off area and surface parking to the west of Tower B, and the drop-off area to the southwest of Tower A.

The ground floor of Tower A comprises a lounge, indoor amenity, and main entrances to the southwest and south, a business centre and lounge to the east, and central shared building services. Level 2 includes an indoor amenity to the south and residential units throughout the remainder of the level, while Level 3 comprises residential units and Level 4 includes residential units to the east and amenities to the west. The building steps back from all elevations at Level 5, which is reserved for indoor amenities, accommodating outdoor amenity areas atop the podium around the perimeter of the level, partially covered by a canopy extending from the south elevation of Level 6. Levels 6-34 are reserved for residential occupancy, with an indoor amenity located to the east at Level 34.

The ground floor of the shared podium of Towers B and C includes retail spaces and indoor amenities, and the remaining podium levels are reserved for office use. Setbacks are located from all elevations at Level 6, accommodating a potential common amenity terrace. Towers B and C rise with typical floor plans from Levels 6-38 and 6-40, respectively, which are reserved for residential occupancy.

The near-field surroundings (defined as an area within 200 metres (m) of the subject site) are characterized by mostly low-rise buildings in all directions. The O-Train Line 2 corridor runs from the north-northwest to the northeast of the proposed development, with the Corso Italia station to the east, over Gladstone Avenue. Notably, the Gladstone Village development comprising seven buildings ranging from 8 to 30 storeys is approved at 933 Gladstone, immediately across the O-Train corridor. 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 mix of mostly low-rise massing, with isolated clusters of mid- and high-rise massing from the west-southwest clockwise to the west-northwest and to the southeast, and the edge of the Ottawa downtown core approximately 1.1 km to the northeast. LeBreton Flats is located to the north, followed by the Ottawa River, approximately 950 m from the subject site. Approximately 1 km from the subject site are Dow’s Lake and the Central Experimental Farm, to the southeast and to the south, respectively.

Site plans for the proposed and existing massing scenarios are illustrated in Figures 1A and 1B, while Figures 2A-2H illustrate the computational models used to conduct the study. The existing massing scenario also includes any developments which have been approved by the City of Ottawa.

# 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[2]. The following sections describe the analysis procedures, including a discussion of the noted pedestrian wind criteria.

## 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.

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

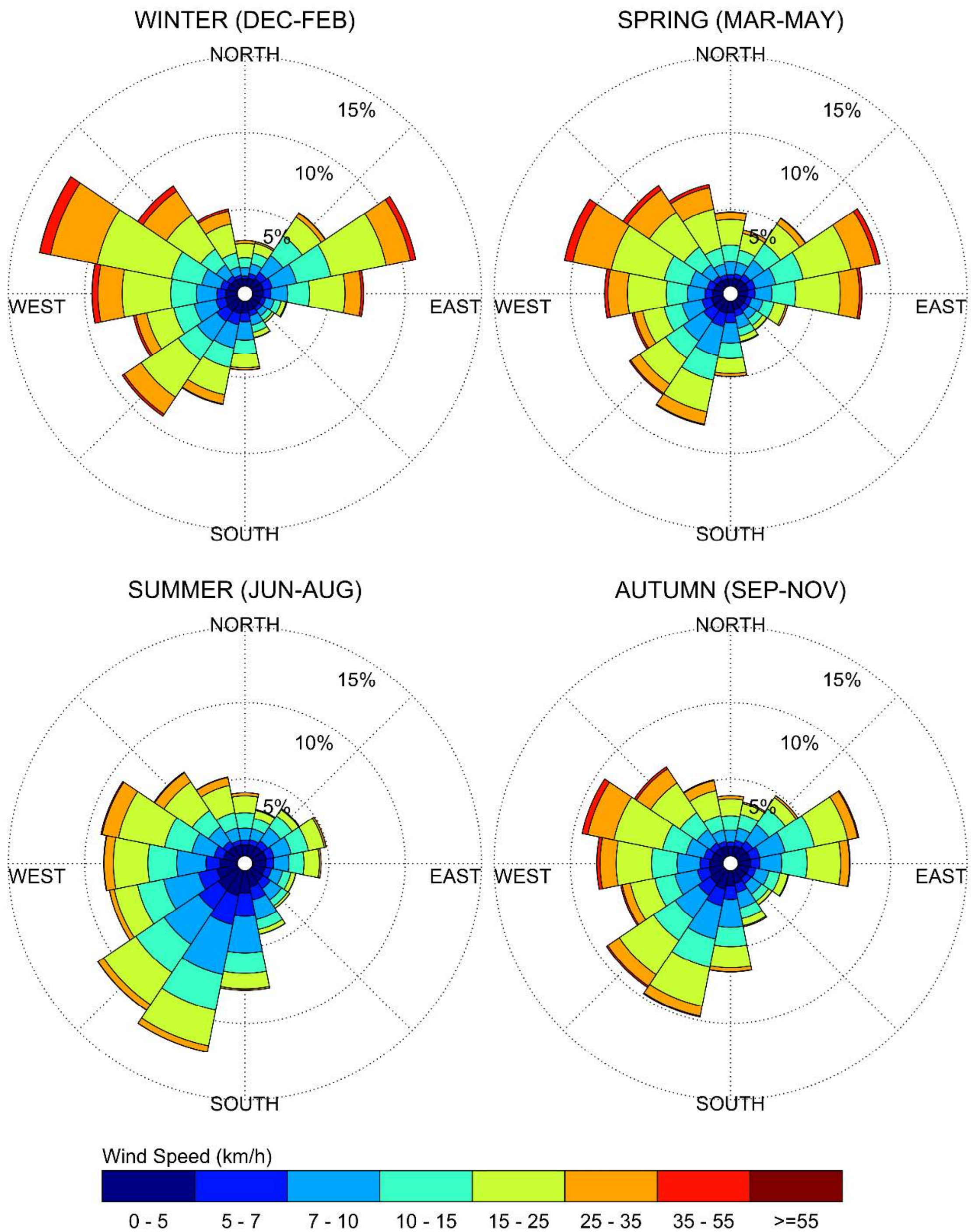
## 4.2 Wind Speed Measurements

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 515 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 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 conditions within the common amenity terraces serving Towers B and C at Level 6 and Tower A at Level 5. 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 at grade level and over the noted common amenity terrace serving the proposed development during this period, respectively, consistent with the comfort classes illustrated in Section 4.4.

The details of these conditions are summarized in the following page for the areas of interest.

## 5.1 Wind Comfort Conditions – Grade Level

**Sidewalks and Transit Stops along Gladstone Avenue: and Loretta Avenue North** Following the introduction of the proposed development, wind comfort conditions over the public sidewalks along Gladstone Avenue and Loretta Avenue North are predicted to be suitable for standing, or better, during the summer and autumn, with isolated areas suitable for strolling, becoming suitable for strolling, or better, during the winter and spring. Conditions in the vicinity of the nearby westbound transit stop to the north of Gladstone Avenue are predicted to be suitable for standing during the summer, becoming suitable for strolling throughout the remainder of the year. Conditions in the vicinity of the nearby eastbound transit stop to the south of Gladstone Avenue are predicted to be suitable for sitting during the summer and autumn, becoming suitable for a mix of sitting and standing during the winter and spring. The noted conditions are considered acceptable for public sidewalks. If the noted westbound transit stop is to remain following the introduction of the proposed development, it is recommended to implement a typical three-sided transit shelter for the stop to provide pedestrians with a means of relief from the elements, including during periods of strong wind activity.

Under the existing massing, conditions over the sidewalks along Gladstone Avenue and Loretta Avenue North are predicted to be suitable for standing, or better, throughout the year, with an area suitable for strolling during the winter and spring, while conditions in the vicinity of the noted nearby transit stops are predicted to be suitable for sitting throughout the year.

**Multi-Use Pathways:** Wind conditions over the multi-use pathways along the O-Train corridor to the east of the subject site under the existing massing are predicted to be suitable for mostly sitting during the summer, becoming suitable for standing, or better, throughout the remainder of the year, with areas suitable for strolling during the winter and spring. Following the introduction of the proposed development, conditions over the noted pathways are predicted to be suitable for standing, or better, throughout the year, with isolated areas suitable for strolling during the winter and spring. While the introduction of the proposed development produces slightly windier conditions over the noted pathways, wind comfort conditions with the proposed development are nevertheless considered acceptable for the multi-use pathways.

**O-Train Station Plaza and Platforms to the East:** Prior to and following the introduction of the proposed development, wind comfort conditions over the nearby O-Train Station (Corso Italia Station) plaza to the southeast of the subject site are predicted to be suitable for sitting during the summer, becoming suitable for standing, or better, throughout the year. The noted conditions are considered acceptable.

Wind conditions in the vicinity of the station platforms to the east of the subject site under the existing massing are predicted to be suitable for sitting during the summer and autumn, becoming suitable for standing, or better, during the winter and spring. Following the introduction of the proposed development, conditions over the noted platforms are predicted to be suitable for standing, or better, during the summer, becoming suitable for strolling, or better, throughout the remainder of the year. While the introduction of the proposed development produces windier conditions over these areas, wind comfort conditions with the proposed development over the O-Train Station public areas are nevertheless considered acceptable.

**Neighboring Surface Parking Lots:** Following the introduction of the proposed development, wind comfort conditions over the neighbouring surface parking lots in the vicinity of the subject site are predicted to be suitable for mostly sitting during the summer, becoming suitable for mostly standing, or better, throughout the remainder of the year. The noted conditions are considered acceptable.

Under the existing massing, conditions over the noted parking lots are predicted to be suitable for sitting during the summer and autumn, becoming suitable for standing, or better, during the winter and spring. While the introduction of the proposed development produces slightly windier conditions in comparison to existing conditions over these areas, wind comfort conditions with the proposed development are nevertheless considered acceptable for parking lots.

**Proposed POPS**: During the typical use period, conditions over the POPS situated to the east of the Standard Bread Building are predicted to be suitable for sitting to the west and suitable for standing to the east and south of the area. Conditions over the POPS to the southwest of Tower A are predicted to be suitable for standing during the same period, while conditions over the POPS between Towers A and B are predicted to be suitable for standing, strolling, and walking during this period.

Comfort levels within the POPS may be improved by implementing strategically placed wind screens, dense arrangements of coniferous plantings and trees, high-back bench seating, and other common landscaping elements targeted around sensitive areas such as overhead pergolas and trellises above seating areas. The extent of mitigation measures is dependent on the programming of the POPS. An appropriate mitigation strategy may be developed in collaboration with the building and landscape architects as the design of the proposed development progresses to the future Site Plan Control applications.

**Drive Aisles, Drop-Off Areas, Surface Parking, and Walkways within Subject Site**: Wind conditions over the drop-off areas and surface parking serving the subject site are predicted to be suitable for walking, or better, throughout the year, which is considered acceptable.

Owing to salient winds from the southwest clockwise to the northwest that are predicted to downwash over the western elevations of the towers, accelerate around the northwest and southwest corner of Tower B, and accelerate within the accessible volume beneath the shared podium serving Towers B and C, isolated regions of conditions that may be considered occasionally uncomfortable for walking are predicted between Towers B and C during the autumn, winter, and spring, and at the northwest corner of Tower B during the winter and spring. Where conditions may be considered uncomfortable between the noted towers, they are predicted to be suitable for walking for approximately 77%, 70%, and 72% of the time during the autumn, winter, and spring seasons, respectively, representing 3%, 10%, and 8% exceedances of the walking threshold. Where conditions may be considered uncomfortable to the northwest of Tower B, they are predicted to be suitable for walking for approximately 77% of the time during the winter and spring seasons, representing a 3% exceedance of the walking threshold.

The introduction of canopies along the west elevations of Towers B and C that wraparound the northwest podia corners may deflect and diffuse the downwashing winds. In combination with the noted canopies, the design team may also consider introducing a chamfer to the southwest and northwest corners of Tower B to reduce wind corner accelerations. Of note, the windiest conditions are beneath the podium serving Towers B and C, located over the drive aisle where pedestrian access and is expected to be limited and restricted. The design team may also consider revisions to the clear height beneath the podium through hanging screens, an increase in the clear height to the base of the overhang, or a closure of the space via rolling doors.

**Building Access Points:** Owing to the protection of the building façade, wind conditions in the vicinity of the building access points serving the proposed development are predicted to be suitable for standing, or better, throughout the year. The noted conditions are considered acceptable for building access points.

## 5.2 Wind Comfort Conditions – Common Amenity Terraces

Tower A is served by a common amenity terrace at Level 5, which includes 1.8-m-tall wind screens along its perimeter, in accordance with the architectural drawings. Potential amenity terraces were considered atop the shared podium serving Towers B and C, which were similarly modelled with 1.8-m-tall wind screens along the full perimeter of the potential terrace, which is recommended to provide shielding from direct winds.

**Tower A, Level 5 Amenity Terrace**: As illustrated in Figure 9, wind conditions over the common amenity terrace serving Tower A at Level 5 are predicted to be suitable for a mix of sitting and standing during the typical use period. Specifically, standing conditions are predicted along the north side of the terrace and near the southeast corner of the tower and sitting conditions are predicted elsewhere throughout the remainder of the terrace.

**Towers B and C, Level 6 Potential Amenity Terrace**: As illustrated in Figure 9, wind conditions over the potential common amenity terrace serving Towers B and C at Level 6 are predicted to be suitable for mostly a mix of mostly sitting, standing, and strolling during the typical use period with isolated walking areas.

If these areas will be used as exterior common amenities, to improve comfort levels, mitigation inboard of the terrace perimeters and targeted around sensitive areas is recommended, in combination with taller perimeter wind screens (that is, greater than 1.8 m, measured from the walking surface) along select terrace perimeters. Inboard mitigation could take the form of a combination of wind screens, raised plantings, and other common landscape elements. Canopies may also be required above sensitive areas.

The extent of mitigation measures is dependent on the programming of the terraces. An appropriate mitigation strategy may be developed in collaboration with the building and landscape architects as the design of the proposed development progresses and the programming of the podium roof is defined towards the future Site Plan Control application stage.

## 5.3 Wind Safety

Within the context of typical weather patterns, which exclude anomalous localized storm events such as tornadoes and downbursts, an isolated area beneath the podium serving Towers B and C over the drive aisle and roadway surface may experience wind conditions that approach the wind safety threshold, as defined in Section 4.4. While this area is expected to be isolated to over the roadway surface where pedestrian use and access is limited, the mitigation measures as described in Section 5.1 regarding wind mitigation for Towers B and C at grade to improve wind conditions over the drive aisle are expected to reduce or eliminate this windier area.

## 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 their intended pedestrian uses throughout the year. Specifically, conditions over the nearby public sidewalks, most nearby transit stops, the Corso Italia O-Train station plaza and platforms, the multi-use pathways to the east, the nearby existing surface parking lots, the proposed drop-off areas and surface parking, and in the vicinity of the building access points are considered acceptable.

    a. If the nearby westbound transit stop along Gladstone Avenue will remain following the introduction of Towers B and C, it is recommended to implement a typical three-sided transit shelter for the stop to provide pedestrians with a means of relief from the elements, including during periods of strong wind activity.

    b. Owing to salient winds from the southwest clockwise to the northwest that are predicted to downwash over the western elevations of the towers, accelerate around the northwest and southwest corner of Tower B, and accelerate within the accessible volume beneath the shared podium serving Towers B and C, isolated regions between Towers B and C and at the northwest corner of Tower B are predicted to experience conditions that may be considered occasionally uncomfortable for walking. These regions are predicted to impact sections of the drive aisle between Towers B and C and the walkway to the west of Tower B. Recommendations regarding mitigation for these areas are provided in Section 5.1, including a combination of wraparound canopies, chamfering or streamlining of the podium corner, and changes to the podium underpass to either further restrict wind entry and subsequent acceleration or to increase the accessible volume beneath the podium to decrease channelling effects.

c. During the typical use period, conditions over the POPS situated to the east of the Standard Bread Building are predicted to be suitable for a mix of sitting and standing, while conditions over the POPS to the southwest of Tower A and between Towers A and B are predicted to be suitable for standing, strolling, and walking during the same period.

    i. If required by programming, comfort levels within the POPS may be improved by implementing strategically placed wind screens, dense arrangements of coniferous plantings and trees, high-back bench seating, and other common landscaping elements targeted around sensitive areas such as overhead pergolas and trellises above seating areas. The extent of mitigation measures is dependent on the programming of the POPS.

2) Wind conditions during the typical use period within the common amenity terraces serving Tower A at Level 5 and Towers B and C at Level 6 are predicted to be suitable for mostly a mix of siting and standing and standing and strolling, respectively. Notably, 1.8-m-tall wind screens were modelled along the full perimeter of the podia roofs, which is recommended to provide shielding from direct winds.

    a. To improve comfort levels, mitigation inboard of the terrace perimeters and targeted around sensitive areas is recommended, in combination with taller perimeter wind screens along select terrace perimeters (that is, greater than 1.8 m, measured from the walking surface). Inboard mitigation could take the form of wind screens or other common landscape elements. Canopies may also be required above sensitive areas.

    b. The extent of mitigation measures is dependent on the programming of the terraces. An appropriate mitigation strategy will be developed in collaboration with the building and landscape architects as the design of the proposed development progresses and the programming of the terraces is defined. This work is expected to support the future Site Plan Control applications.

3) 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. The foregoing statements and conclusions apply to common weather systems, during which one area within the vicinity of the subject site may experience conditions that approach the wind safety criterion, as defined in Section 4.4. Specifically, an isolated area beneath the podium serving Towers B and C over the drive aisle and roadway surface may experience wind conditions that approach the wind safety threshold, isolated in extent to over the roadway surface where pedestrian use and access is limited. The mitigation measures as described in Section 5.1 regarding wind mitigation for Towers B and C at grade to improve wind conditions over the drive aisle are expected to reduce or eliminate this potential exceedance.

Sincerely,

***Gradient Wind Engineering Inc.***

LICENSED PROFESSIONAL ENGINEER
D. T. HUITEMA
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July 30, 2025
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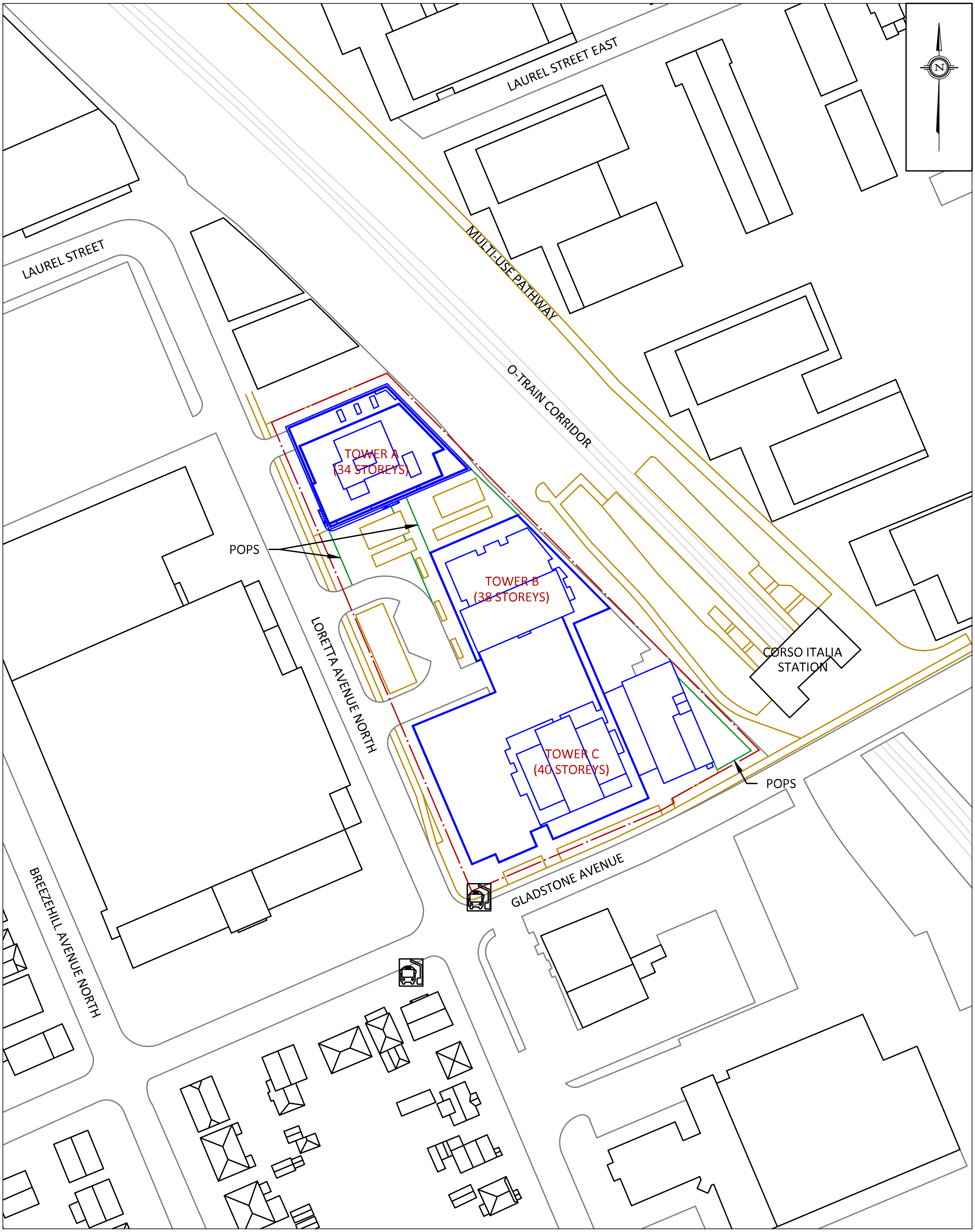


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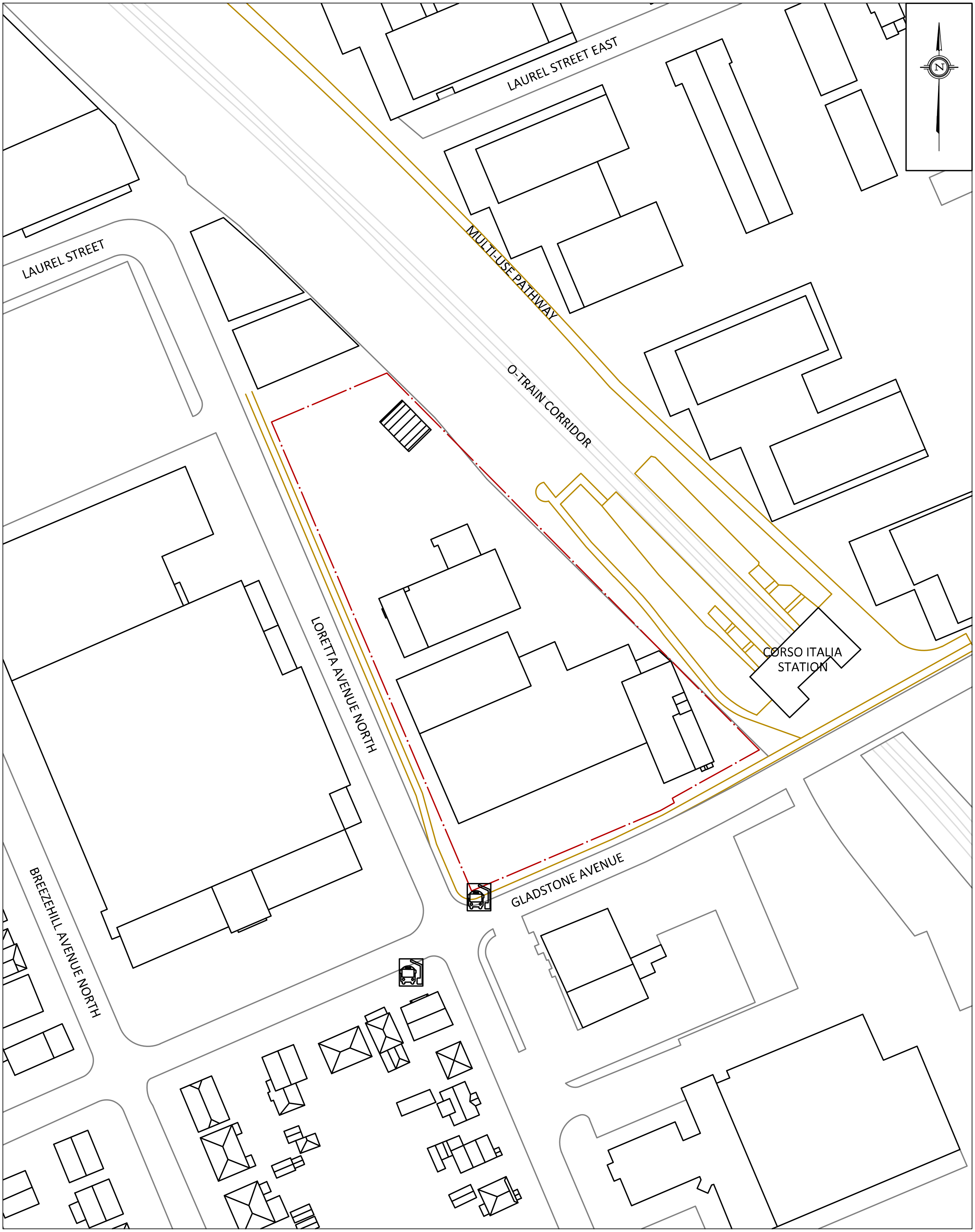
| | | |
|---|---|---|
| PROJECT: 145 LORETTA AVENUE NORTH AND 951 GLADSTONE AVENUE, OTTAWA PEDESTRIAN LEVEL WIND STUDY | | DESCRIPTION: FIGURE 1A: PROPOSED SITE PLAN AND SURROUNDING CONTEXT |
| SCALE: 1:1500 | DRAWING NO.: 18-075-PLW-2025-1A | |
| DATE: JULY 29, 2025 | DRAWN BY: S.K. | |

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| PROJECT 145 LORETTA AVENUE NORTH AND 951 GLADSTONE AVENUE, OTTAWA PEDESTRIAN LEVEL WIND STUDY | | DESCRIPTION |
|---|---|---|
| SCALE 1:1500 | DRAWING NO. 18-075-PLW-2025-1B | FIGURE 1B: PROPOSED SITE PLAN AND SURROUNDING CONTEXT |
| DATE JULY 29, 2025 | DRAWN BY S.K. | |

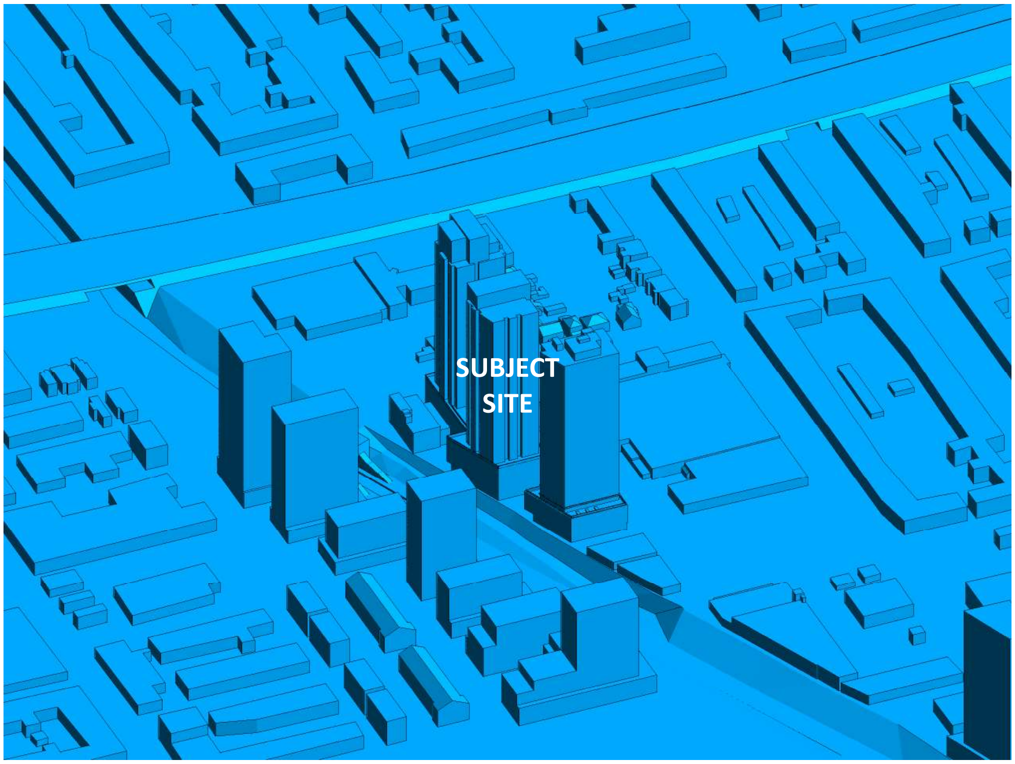



**FIGURE 2A: COMPUTATIONAL MODEL, PROPOSED MASSING, NORTH PERSPECTIVE**

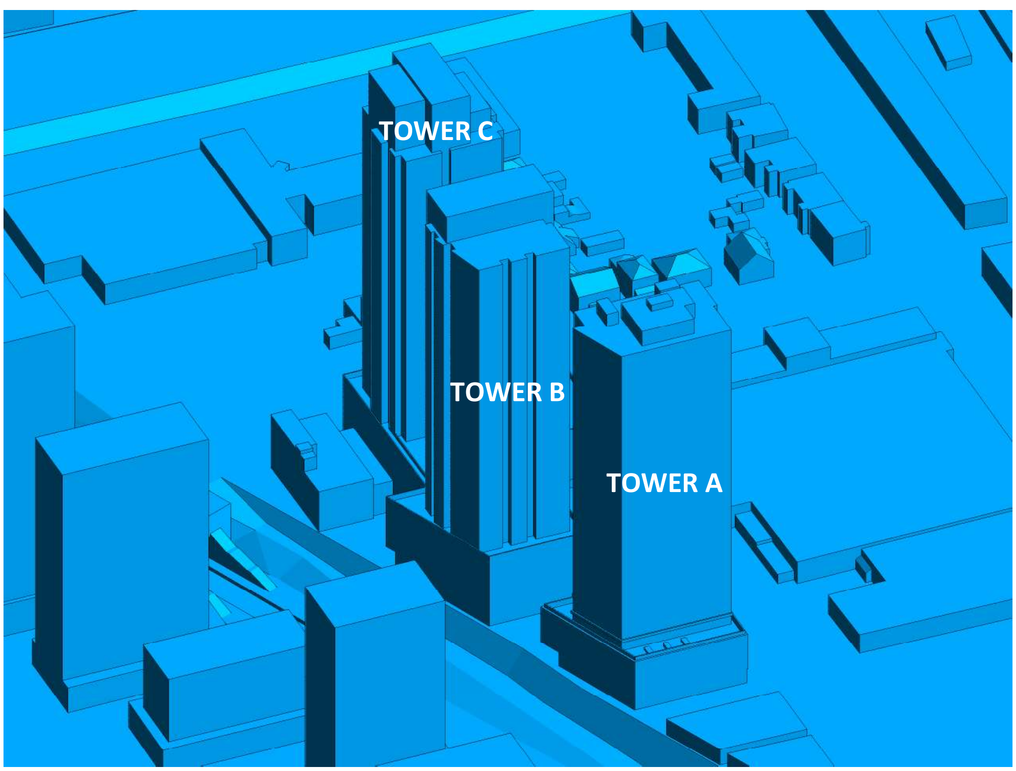



**FIGURE 2B: CLOSE UP OF FIGURE 2A**

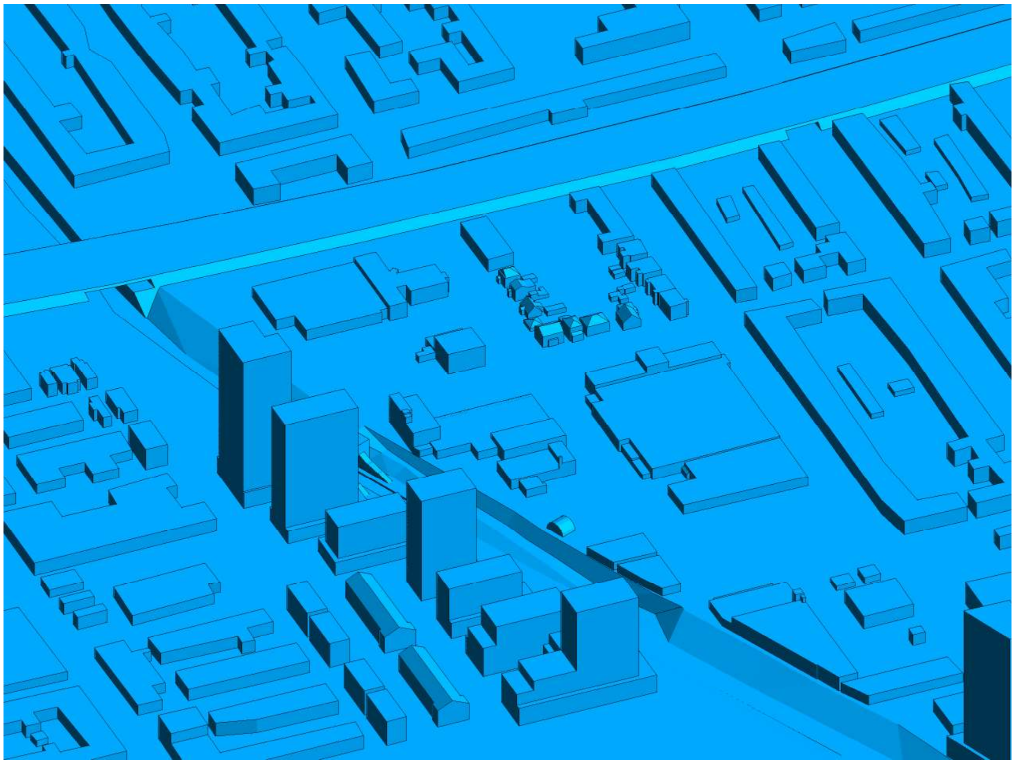


FIGURE 2C: COMPUTATIONAL MODEL, EXISTING MASSING, NORTH PERSPECTIVE

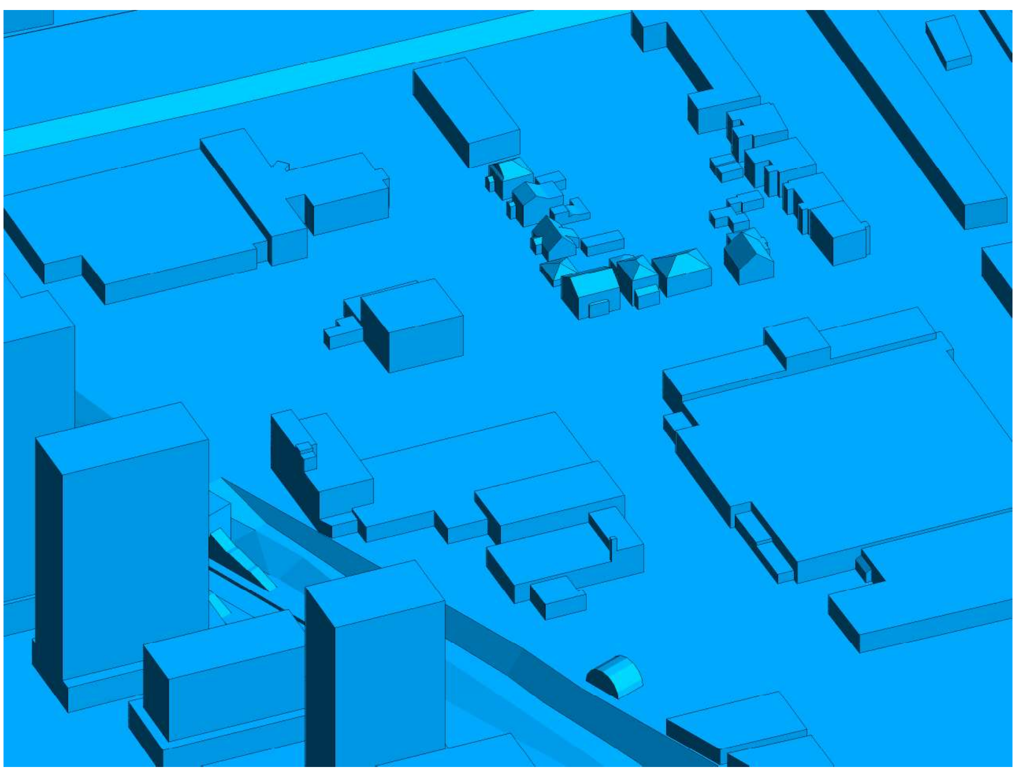


FIGURE 2D: CLOSE UP OF FIGURE 2C

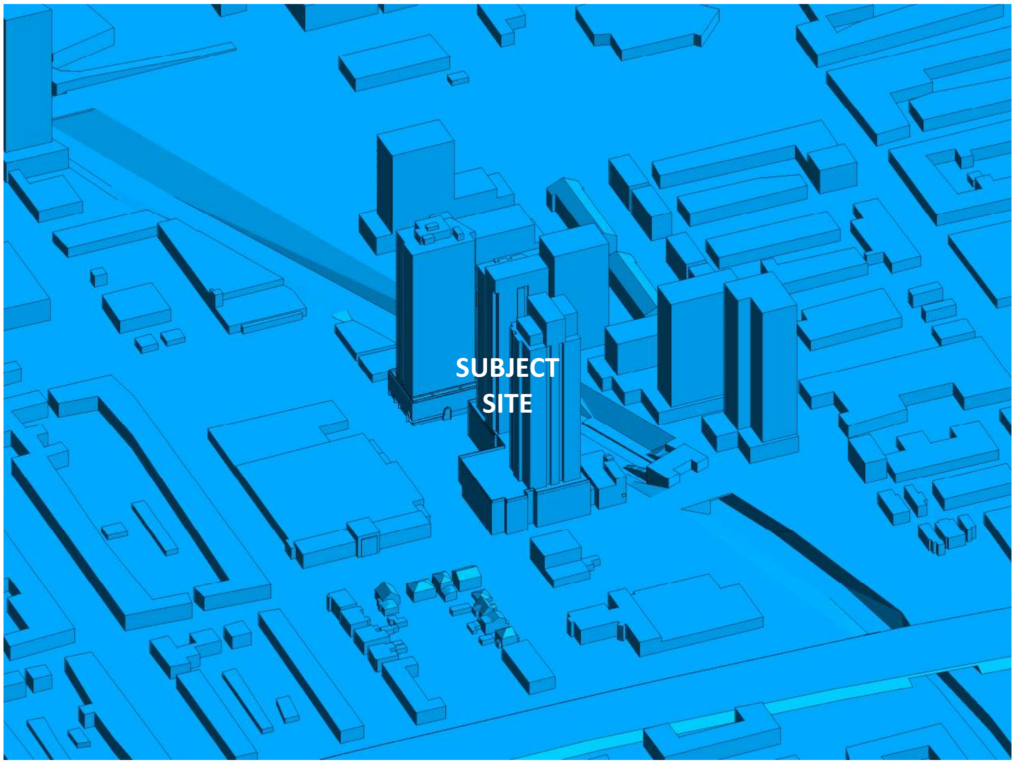



**FIGURE 2E: COMPUTATIONAL MODEL, PROPOSED MASSING, SOUTH PERSPECTIVE**

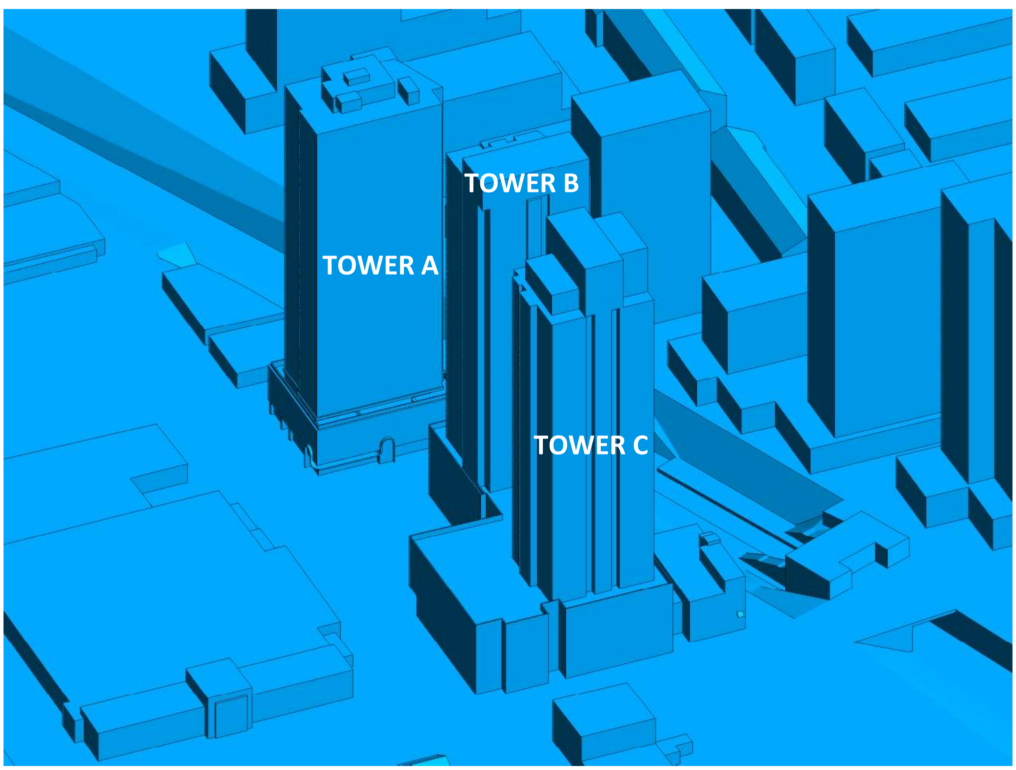



**FIGURE 2F: CLOSE UP OF FIGURE 2E**

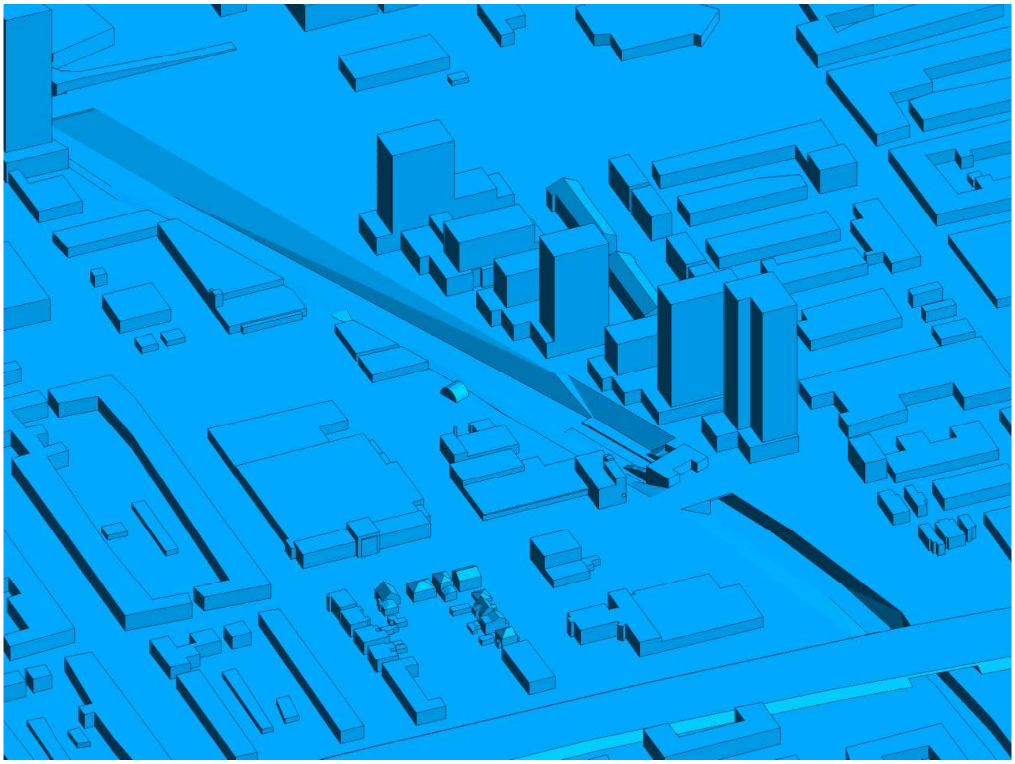


**FIGURE 2G: COMPUTATIONAL MODEL, EXISTING MASSING, SOUTH PERSPECTIVE**

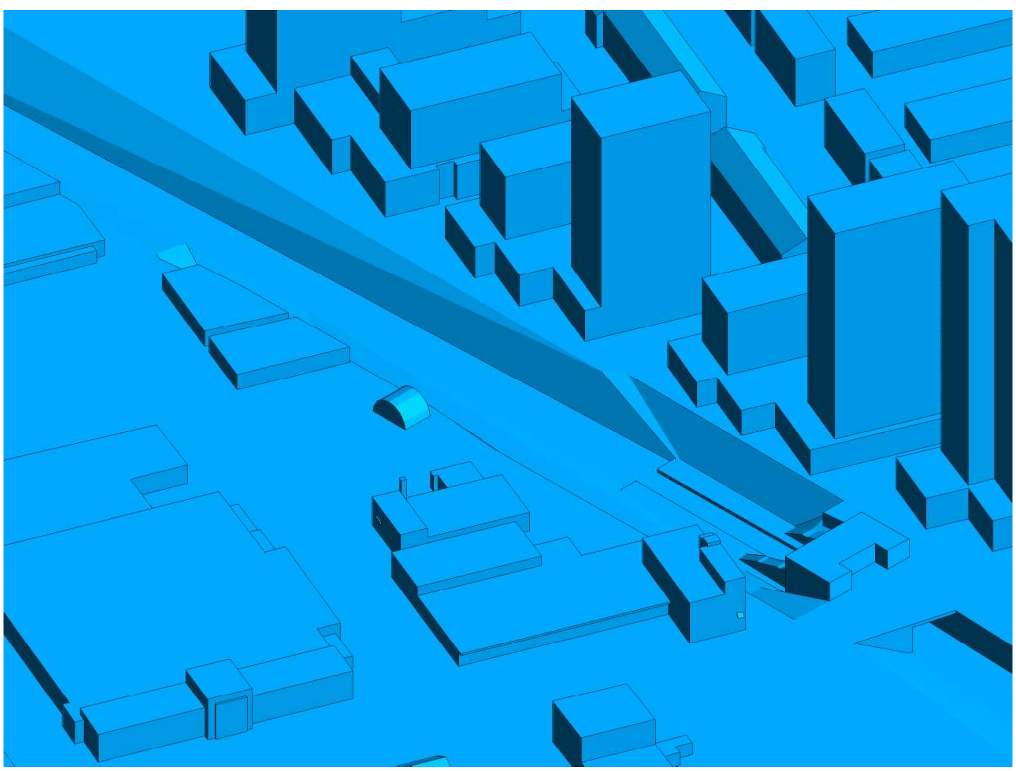


**FIGURE 2H: CLOSE UP OF FIGURE 2G**

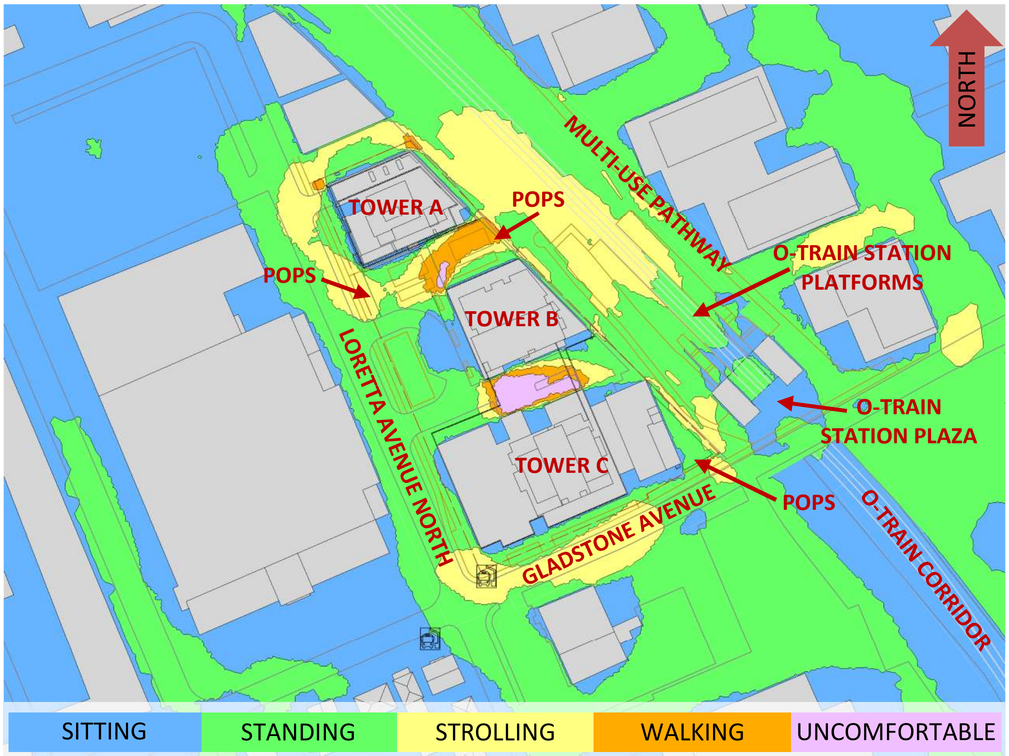



**FIGURE 3A: SPRING – WIND COMFORT, GRADE LEVEL – PROPOSED MASSING**

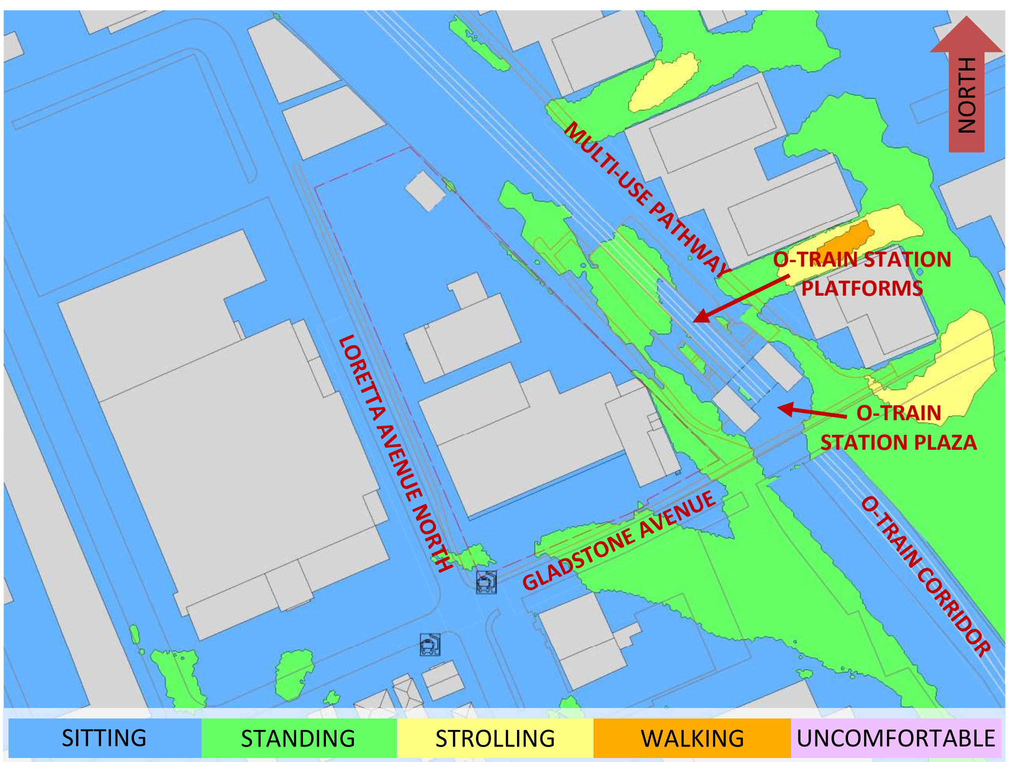



**FIGURE 3B: SPRING – WIND COMFORT, GRADE LEVEL– EXISTING MASSING**

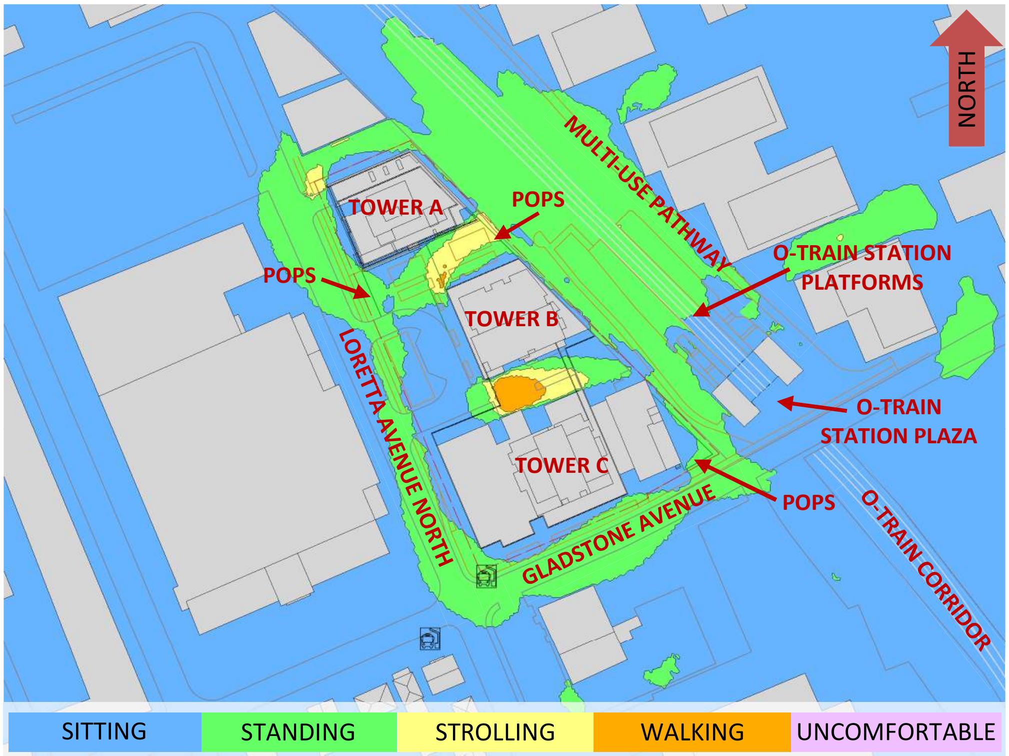



**FIGURE 4A: SUMMER – WIND COMFORT, GRADE LEVEL – PROPOSED MASSING**

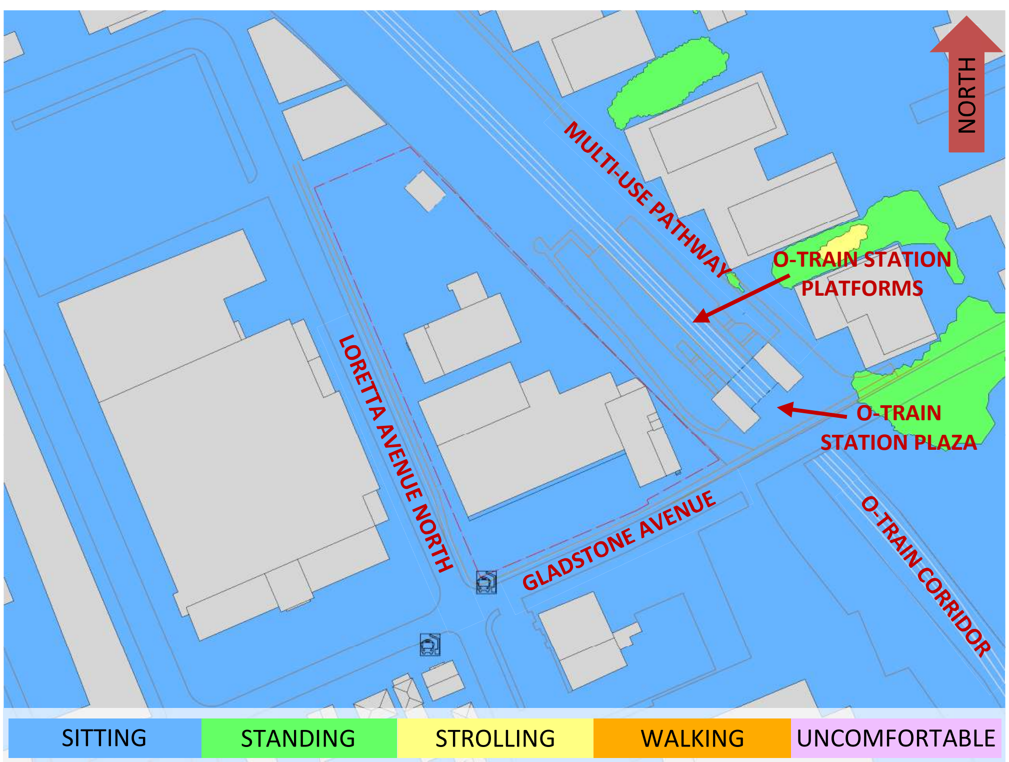



**FIGURE 4B: SUMMER – WIND COMFORT, GRADE LEVEL– EXISTING MASSING**

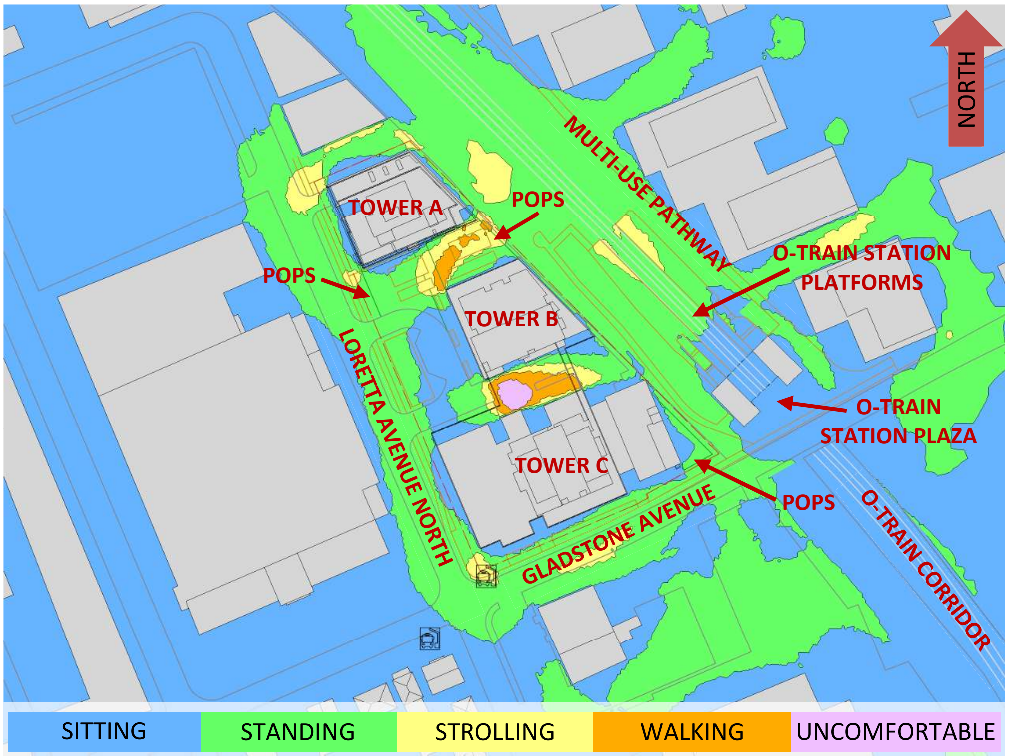



**FIGURE 5A: AUTUMN – WIND COMFORT, GRADE LEVEL – PROPOSED MASSING**

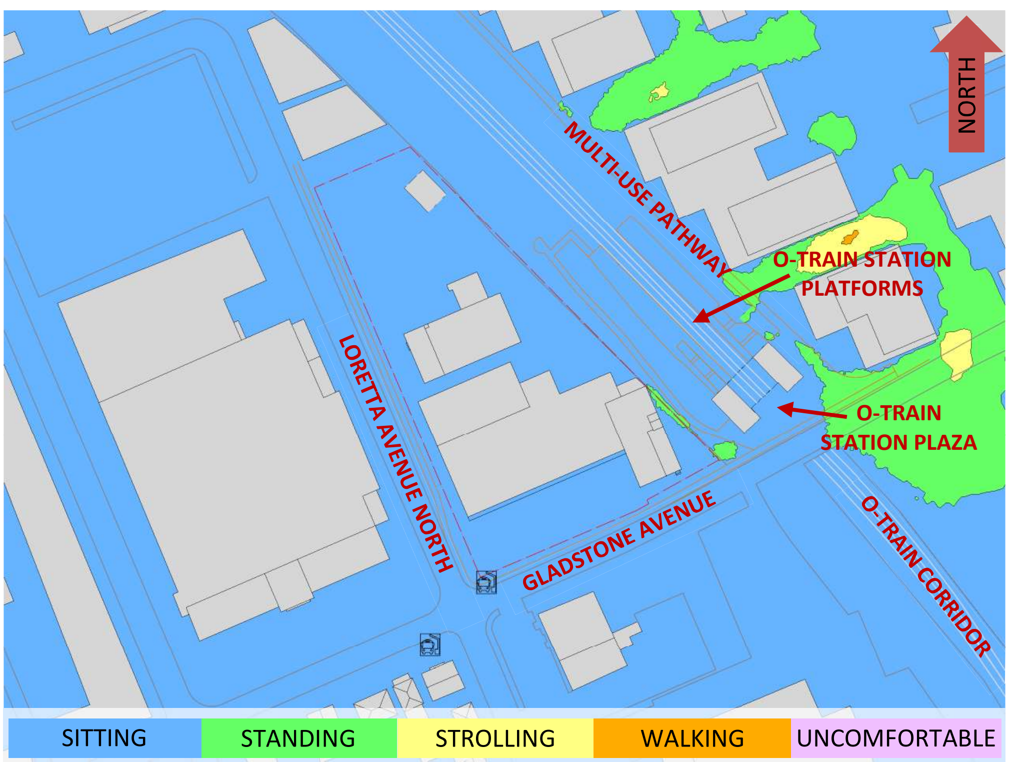



**FIGURE 5B: AUTUMN – WIND COMFORT, GRADE LEVEL– EXISTING MASSING**

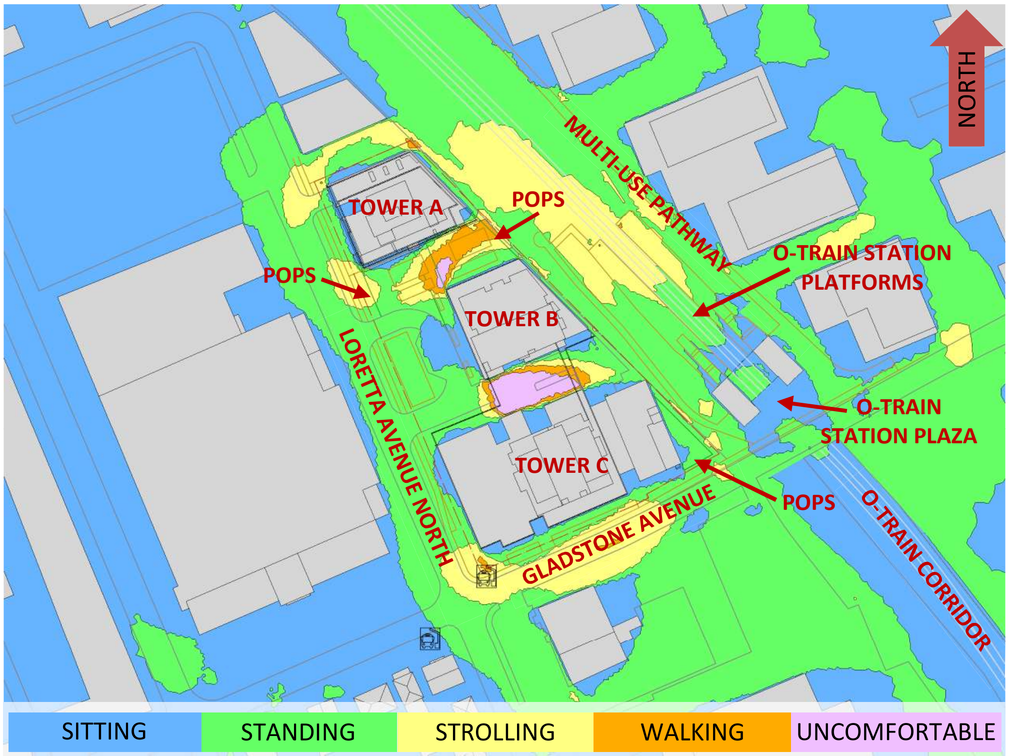



**FIGURE 6A: WINTER – WIND COMFORT, GRADE LEVEL – PROPOSED MASSING**

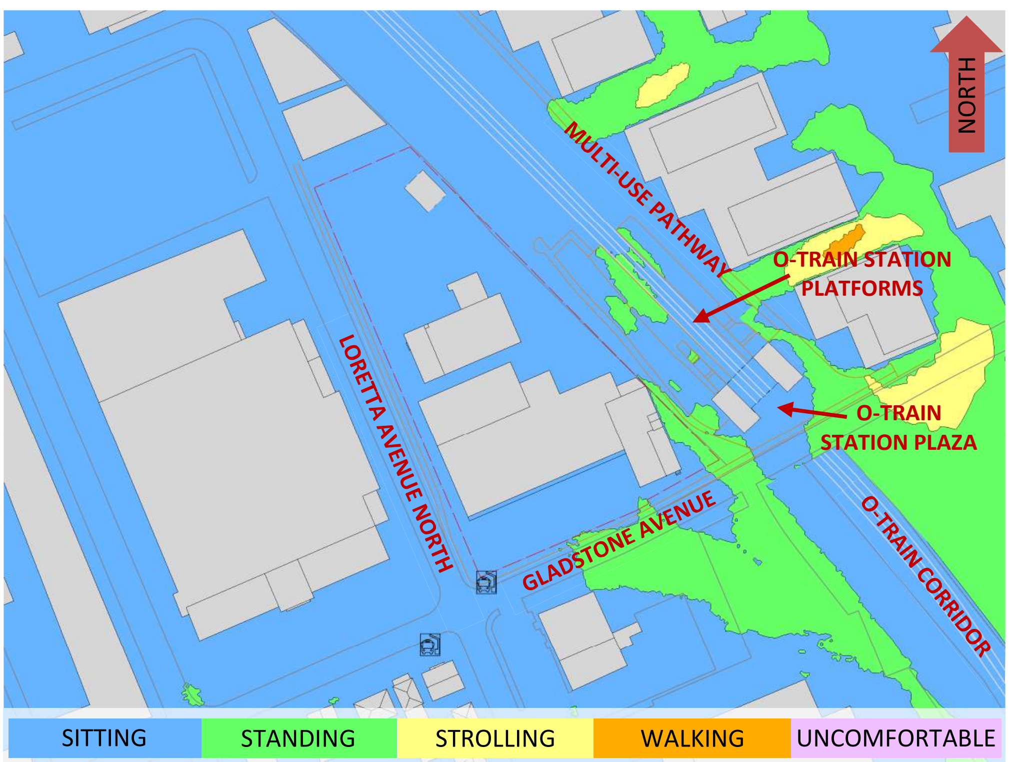



**FIGURE 6B: WINTER – WIND COMFORT, GRADE LEVEL– EXISTING MASSING**

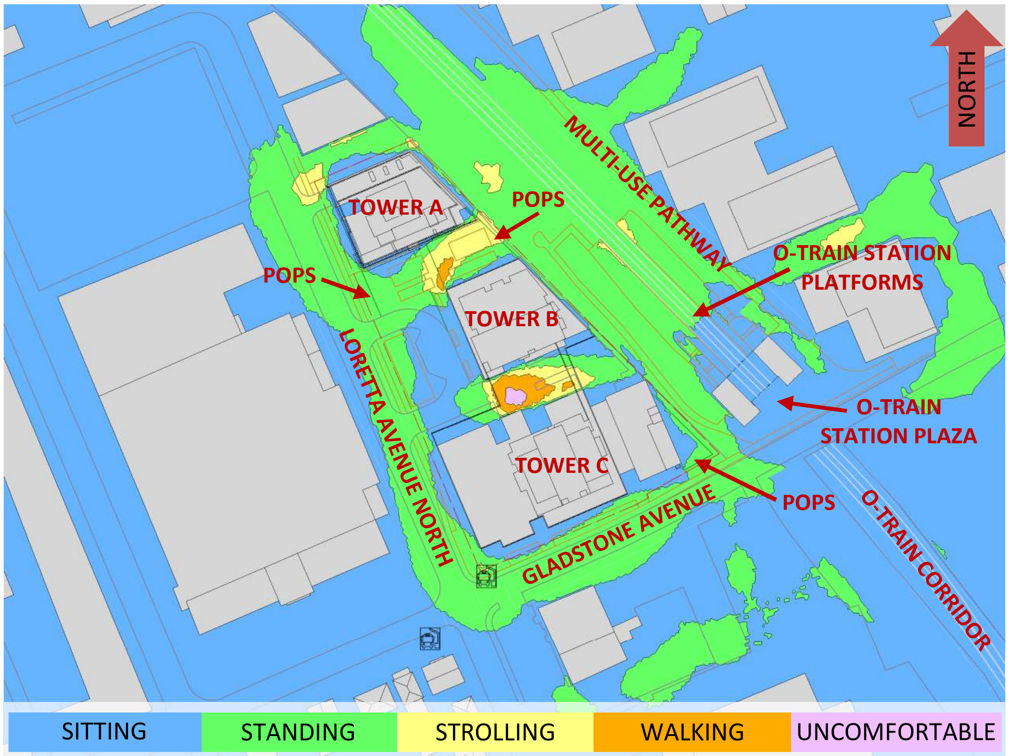



**FIGURE 7: TYPICAL USE PERIOD – WIND COMFORT, GRADE LEVEL – PROPOSED MASSING**

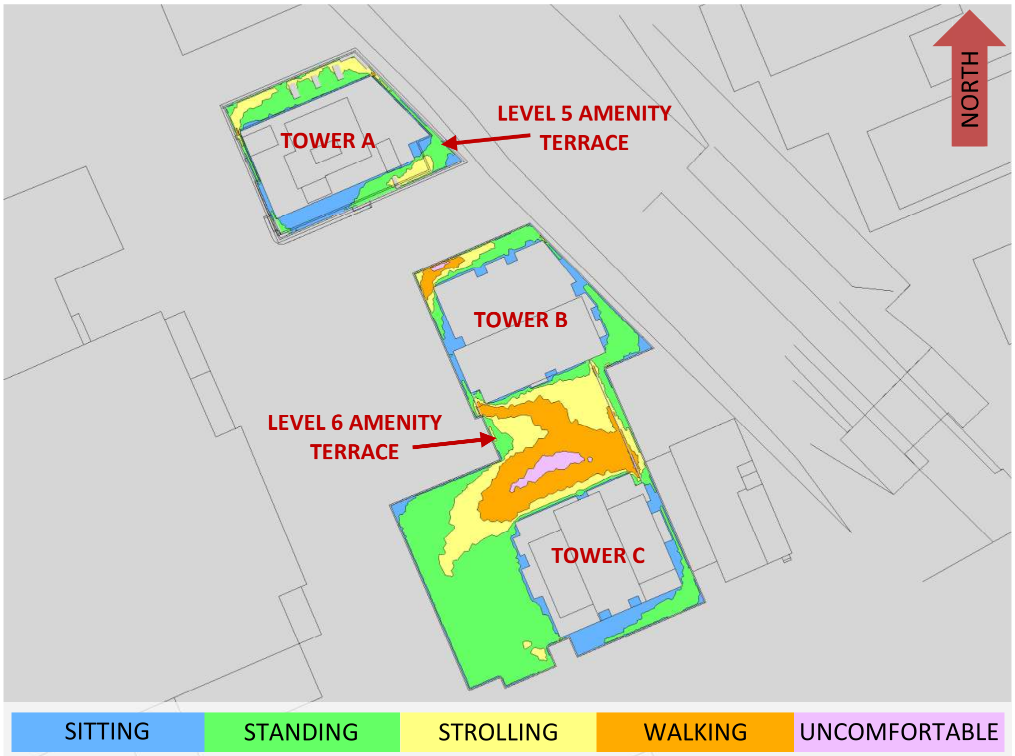



**FIGURE 8A: SPRING – WIND COMFORT, COMMON AMENITY TERRACES**

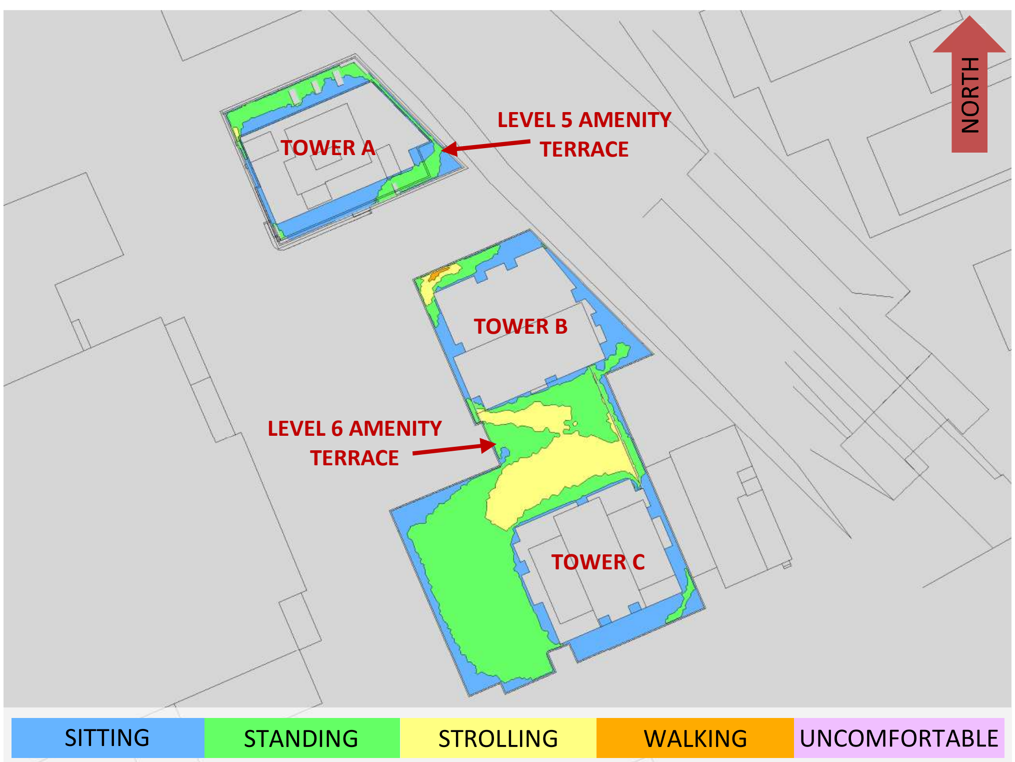



**FIGURE 8B: SUMMER – WIND COMFORT, COMMON AMENITY TERRACES**

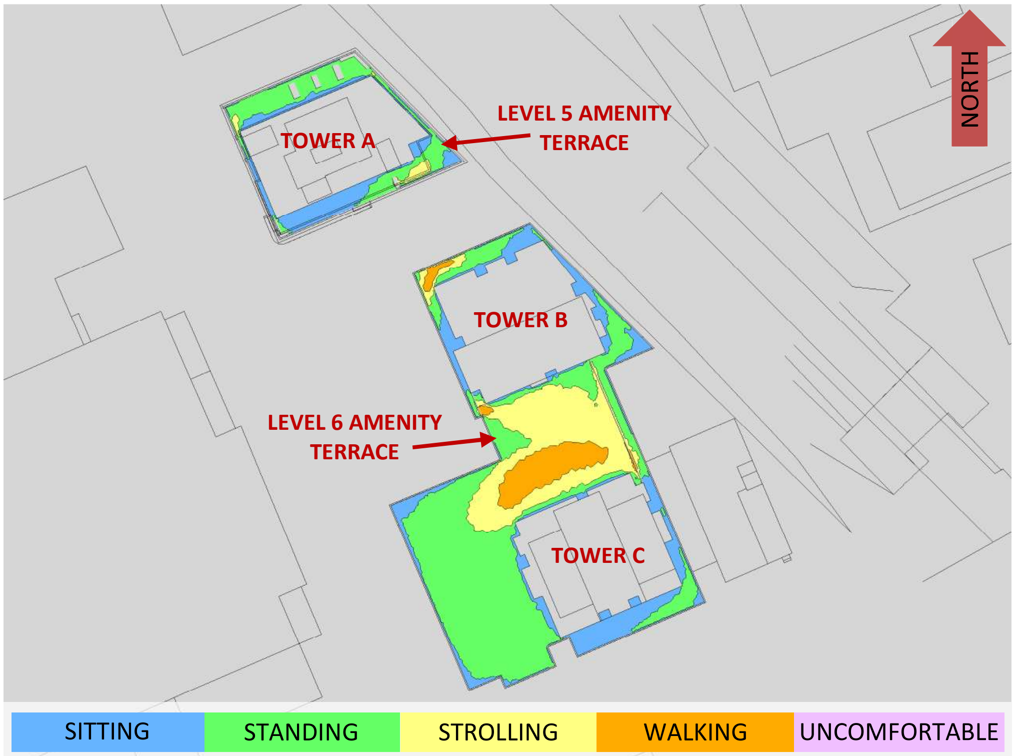



**FIGURE 8C: AUTUMN – WIND COMFORT, COMMON AMENITY TERRACES**

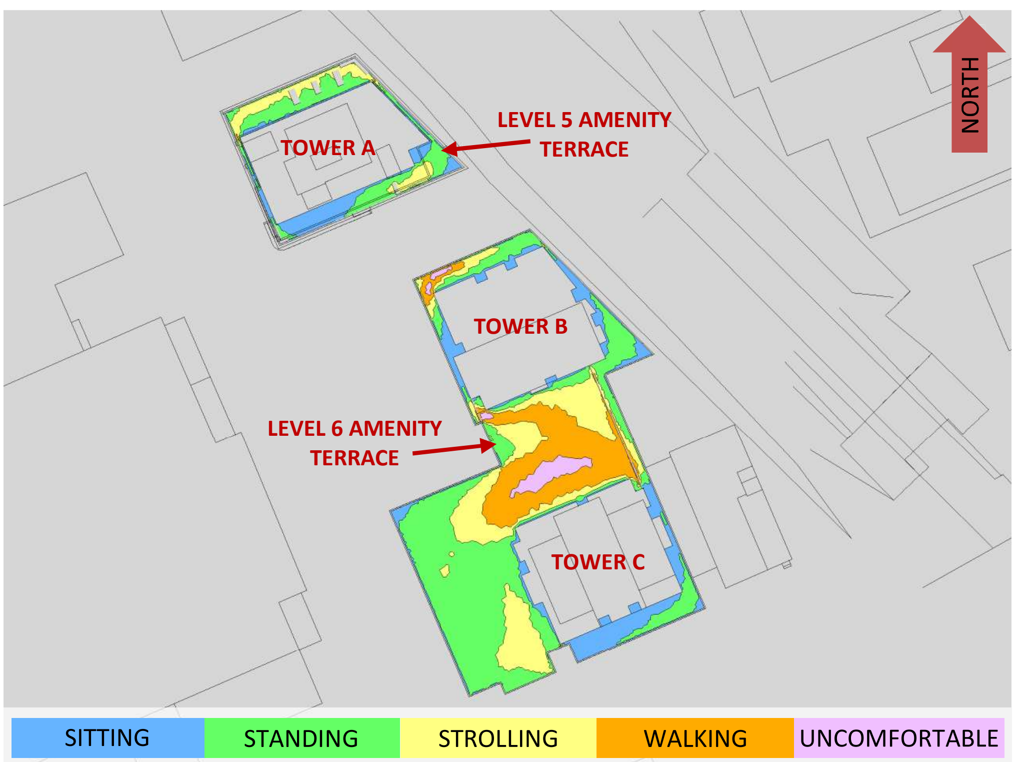



**FIGURE 8D: WINTER – WIND COMFORT, COMMON AMENITY TERRACES**

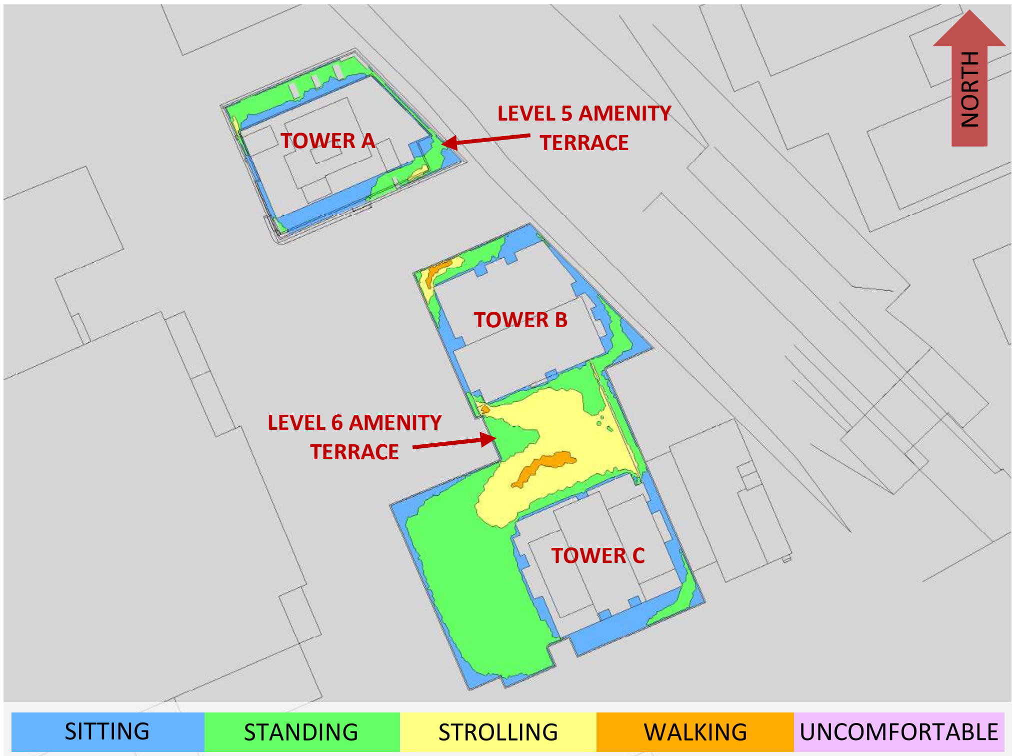
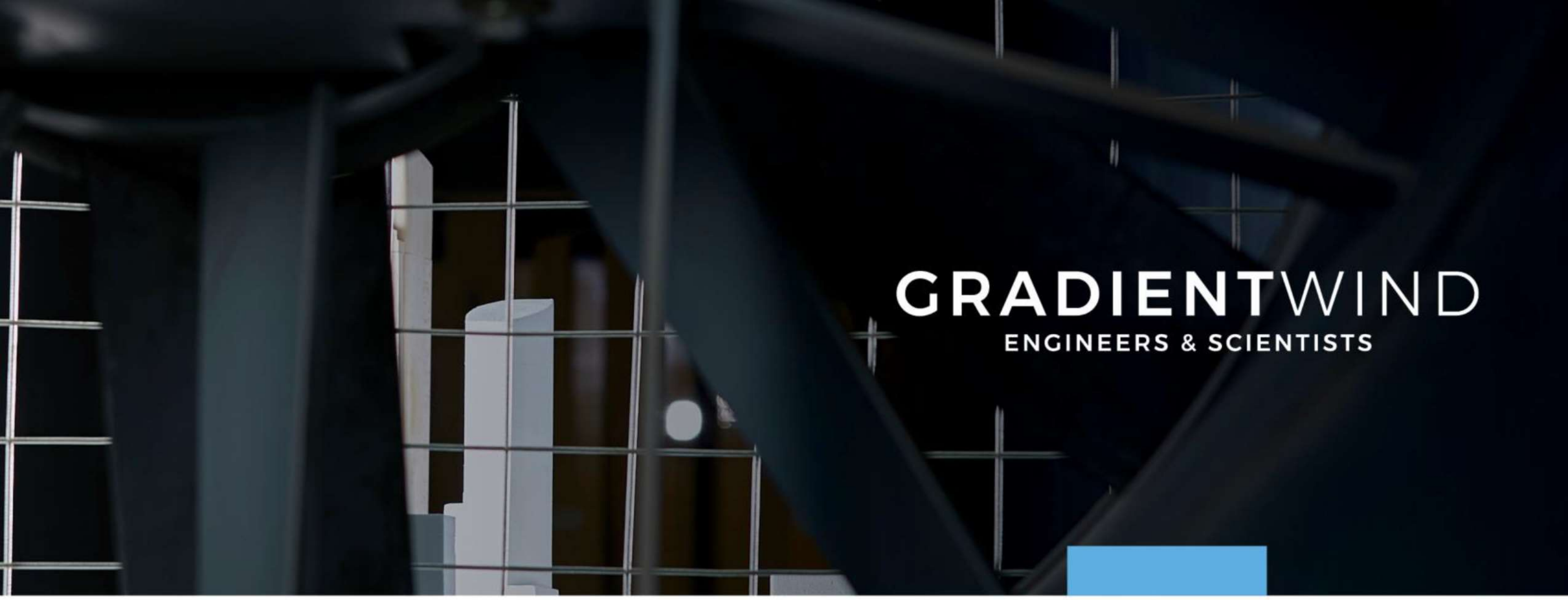
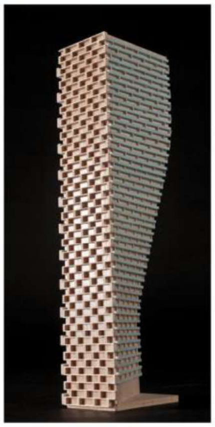



**FIGURE 9: TYPICAL USE PERIOD – WIND COMFORT, COMMON AMENITY TERRACES**



# 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).

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

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 $\alpha$ 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.

$\alpha$ 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 | 0.25 |
| 45 | 0.26 |
| 67.5 | 0.25 |
| 90 | 0.25 |
| 112.5 | 0.26 |
| 135 | 0.25 |
| 157.5 | 0.24 |
| 180 | 0.23 |
| 202.5 | 0.24 |
| 225 | 0.25 |
| 247.5 | 0.25 |
| 270 | 0.25 |
| 292.5 | 0.24 |
| 315 | 0.22 |
| 337.5 | 0.22 |

**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, $L_t$ = 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.