



36 WESTHILL DRIVE

WATERLOO, ONTARIO

PEDESTRIAN WIND ASSESSMENT

PROJECT #2511196

AUGUST 21, 2025

SUBMITTED TO

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1. INTRODUCTION



Rowan Williams Davies & Irwin Inc. (RWDI) was retained to conduct a qualitative assessment of the potential wind impact on pedestrian areas on and around the proposed project at 36 Westhill Drive in Waterloo, Ontario. This effort is intended to inform good design and has been conducted in support of Zoning By-Law Amendment application for the project.

The project site is located on the east side of Westhill Drive, near Ira Needles Boulevard and Erb Street West as shown in **Image 1**. The site is currently occupied by a house and surrounded by low buildings, open

lands and roadways in all directions (**Image 1**). Two 5 and 11-storey buildings exist to the northwest and future buildings are proposed to the north of the project site, as shown in **Images 1 and 2**.

The proposed project consists of two residential buildings with similar rectangular floor plans with Building A at six storeys and Building B at eight storeys (**Images 2 and 3**). Areas of interest to the current wind assessment include main building entrances, adjacent sidewalks and parking spaces, as well as amenity spaces at grade and on building roofs (**Image 3**).



Image 1: Aerial view of the existing site and surroundings (Credit: Google Earth)

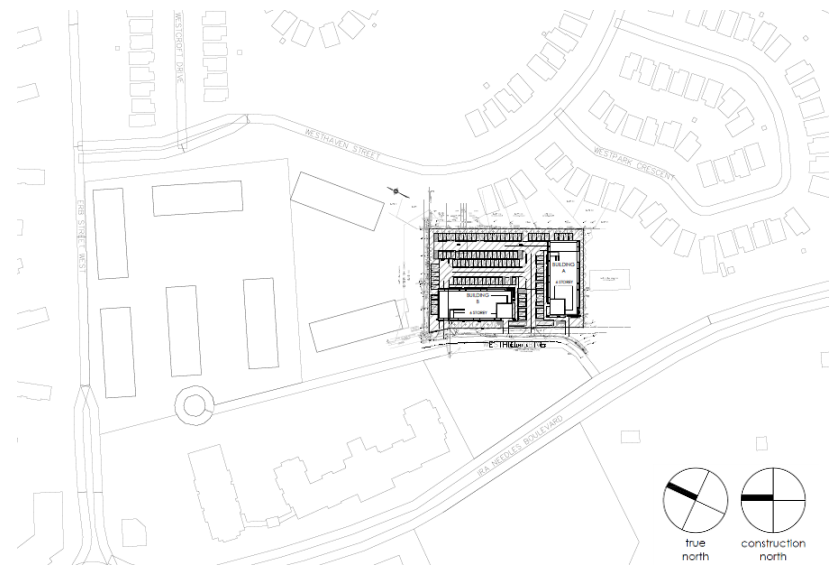


Image 2: Context plan

1. INTRODUCTION

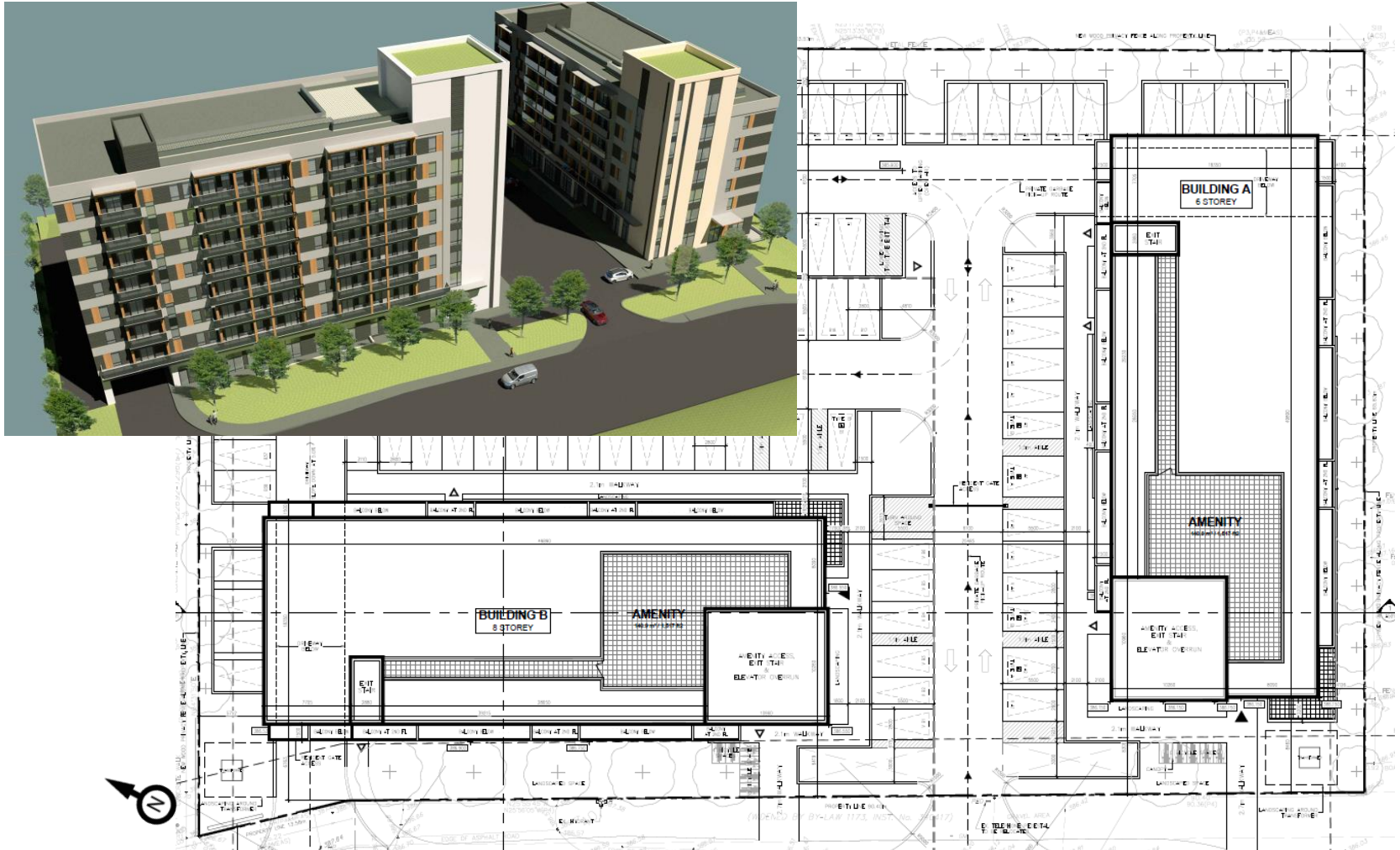


Image 3: Site plan and birds eye view of the proposed project

2. METHODOLOGY



Predicting wind speeds and occurrence frequencies is complex. It involves a combined assessment of building geometry, orientation, position and height of surrounding buildings, upstream terrain and the local wind climate.

Over the years, RWDI has conducted thousands of wind-tunnel model studies on pedestrian wind conditions around buildings, yielding a broad knowledge base. In some situations, this knowledge and experience, together with literature, allow for a reliable, consistent and efficient desktop estimation of pedestrian wind conditions without wind-tunnel testing. This approach provides a screening-level estimation of potential wind conditions and offers conceptual wind control measures for improved wind comfort, where necessary.

In order to quantify and confirm the predicted conditions or refine any of the suggested conceptual wind control measures, physical scale model tests in a boundary-layer wind tunnel would be required.

RWDI's assessment is based on the following:

- Design drawings received on August 7, 2025;
- A review of the regional long-term meteorological data from Region of Waterloo International Airport;
- Use of RWDI's proprietary software (*WindEstimator*¹) for providing a screening-level numerical estimation of potential wind conditions around generalized building forms;
- Wind-tunnel studies and desktop assessments undertaken by RWDI for projects in the Kitchener area and around the world;
- RWDI's engineering judgement and knowledge of wind flows around buildings^{2,3}; and,
- The City of Waterloo Wind Comfort Criteria.

Note that other microclimate issues such as those relating to cladding and structural wind loads, door operability, building air quality, noise, vibration, etc. are not part of the scope of this assessment.

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1. H. Wu, C.J. Williams, H.A. Baker and W.F. Waechter (2004), "Knowledge-based Desk-Top Analysis of Pedestrian Wind Conditions", *ASCE Structure Congress 2004*, Nashville, Tennessee.
 2. H. Wu and F. Kriksic (2012). "Designing for Pedestrian Comfort in Response to Local Climate", *Journal of Wind Engineering and Industrial Aerodynamics*, vol.104-106, pp.397-407.
 3. C.J. Williams, H. Wu, W.F. Waechter and H.A. Baker (1999), "Experience with Remedial Solutions to Control Pedestrian Wind Problems", *10th International Conference on Wind Engineering*, Copenhagen, Denmark.

3. METEOROLOGICAL DATA



Meteorological data from Region of Waterloo International Airport for the period from 1994 to 2024 were used as a reference for wind conditions in the area as this is the nearest station to the site with long-term, hourly wind data. The distributions of wind frequency and directionality for the summer (May through October) and winter (November through April) seasons are shown by two wind roses in **Image 4**.

Image 4.

When all winds are considered, winds from the southwest through northwest directions are predominant throughout the year, with secondary winds from the east.

Strong winds of a speed greater than 30 km/h measured at the airport (red and yellow bands) occur more often in the winter than in the summer season. Winds from the southwest through northwest and east directions potentially could be the source of uncomfortable or severe wind conditions, depending upon the site exposure and development design.

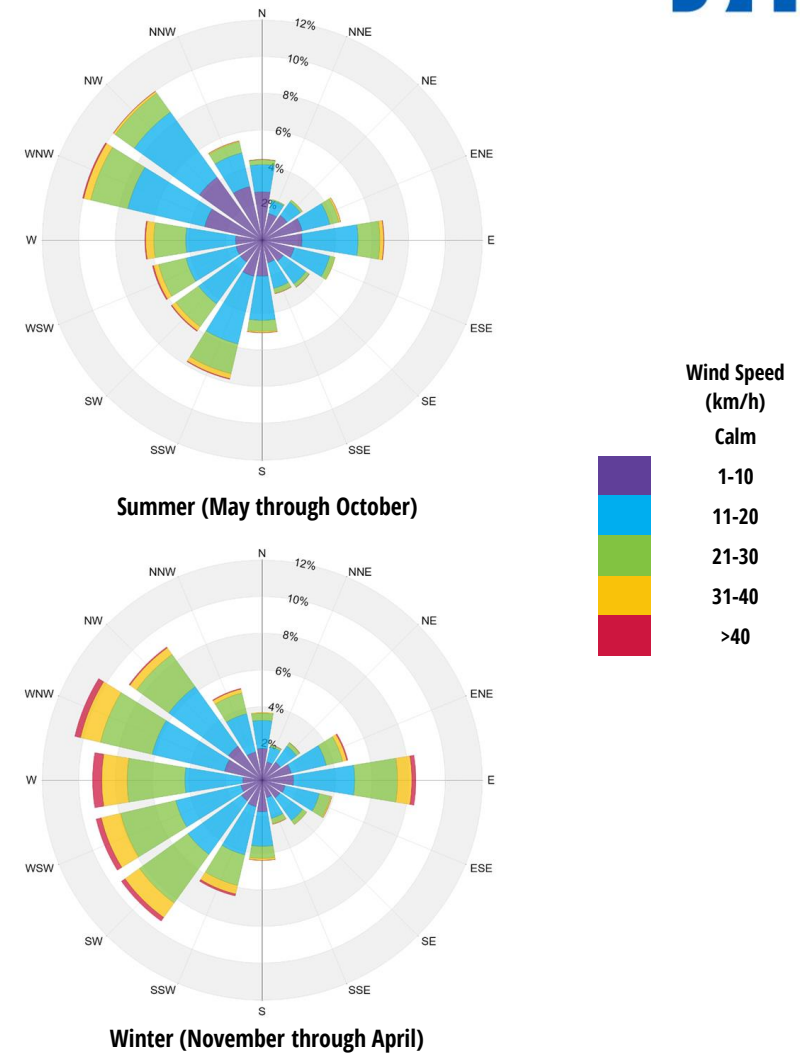


Image 4: Directional distribution of winds approaching Region of Waterloo International Airport (1994 to 2024)

4. WIND CRITERIA



Based on pedestrian level wind study terms of reference guide for the City of Waterloo (dated June 2023), the public realm, streetscapes and public/private outdoor open spaces related to the existing and proposed buildings are to be comfortable for their intended use. The table below describes the minimum criteria for specific locations. Comfort criteria are for commonly experienced wind speeds and have been categorized into ranges based on the activity level of a person that the winds would be

conducive to. Lower wind speeds are desirable for passive activities and active pedestrians would be tolerant of higher wind speeds. It is also important to assess wind conditions in the pedestrian realm from a safety perspective as strong wind gusts can deter safe pedestrian use of outdoor spaces. Wind speeds associated with wind gusts are infrequent but deserve special attention due to their potential impact on pedestrian safety.

Comfort Category	GEM Speed (km/h) ^{1,2}	Description	Area of Application
Sitting	≤ 10 at least 80% of the time	Light breezes desired for outdoor seating areas where one can read a paper without having it blown away.	Park benches, restaurant and café seating, balconies, amenity terraces, children's areas, etc. intended for relaxed, and usually seated activities.
Standing	≤ 15 at least 80% of the time	Gentle breezes suitable for passive pedestrian activities where a breeze may be tolerated.	Areas where seated activities are not expected but would be used for passive activities such as bus-stops, dog areas and main entrances.
Walking	≤ 20 at least 80% of the time	Relatively high speeds that can be tolerated during intentional walking, running and other active movements.	Sidewalks, parking lots, alleyways and areas where pedestrian activity is primarily for walking.
Uncomfortable	> 20 more than 20% of the time	Strong winds, considered a nuisance for most activities.	Not acceptable in areas with pedestrian access.

(1) GEM speeds are equal to the gust speed divided by 1.85, or the mean speed (whichever is larger) and gust speed can be simulated or measured directly or estimated by mean speed + 3 * rms speed.

(2) GEM speeds listed above are based on a seasonal exceedance of 20% of the time between 6:00 and 0:00. Nightly hours between 0:00 and 6:00 are excluded from the wind analysis for comfort since limited usage of outdoor spaces is anticipated.

Safety Criterion	Gust Speed (km/h) ³	Description	Area of Application
Exceeded	> 90 At least 0.1 % of the time (9 hours) in a year)	Excessive gusts that can adversely affect one's balance and footing. Wind mitigation is typically required.	Not acceptable in any area of interest.

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

5. RESULTS AND DISCUSSION



5.1 Wind Flow Around Buildings

Short buildings do not redirect winds significantly to cause adverse wind conditions at pedestrian areas. Buildings that are taller than their surroundings tend to intercept the stronger winds at higher elevations and redirect them to the ground level (Downwashing). These winds subsequently move around exposed building corners and through the gap between buildings, causing a localized increase in wind activity (**Image 5**). If these building / wind combinations occur for prevailing winds, there is a greater potential for increased wind activity and uncomfortable conditions.

Design details such as deep canopies close to ground level, wind screens / tall trees with dense underplanting, etc. can help reduce wind speeds. The choice and effectiveness of these measures would depend on the exposure and orientation of the site with respect to the prevailing wind directions and the size and massing of the proposed buildings.

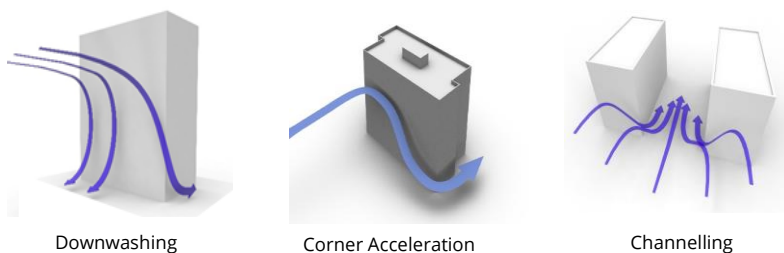


Image 5: Generalized wind flows

5.2 Existing Scenario

The project site is currently occupied by a low house and sheltered by existing surroundings for winds from the west, northwest and other directions. There are no significant buildings or structures on site that would deflect ambient winds to ground to cause adverse wind impacts. Currently, wind conditions on sidewalks around the site are considered comfortable for standing in the summer and for standing or walking in the winter. Wind conditions exceeding the safety criterion are not expected.

5.3 Proposed Scenario

The proposed buildings, at six and eight storeys, are considered low or moderate for wind impact. However, they are still higher than many surrounding buildings and, therefore, are expected to be exposed to winds from the southwest, west, east and other directions.

Downwashing, corner accelerating and channelling flows are predicted to result in increased wind activity around and between the proposed buildings, resulting in increased wind activity.

Given the limited building heights and local wind climate, wind speeds are expected to meet the safety criterion on and around the project. The following sub-sections provide a discussion of the potential wind comfort conditions around the project. The expected wind conditions at grade are shown in **Images 6 and 7** for the summer and winter seasons, respectively, while the potential summer wind conditions on the building roofs are presented in **Image 9**.

5. RESULTS AND DISCUSSION

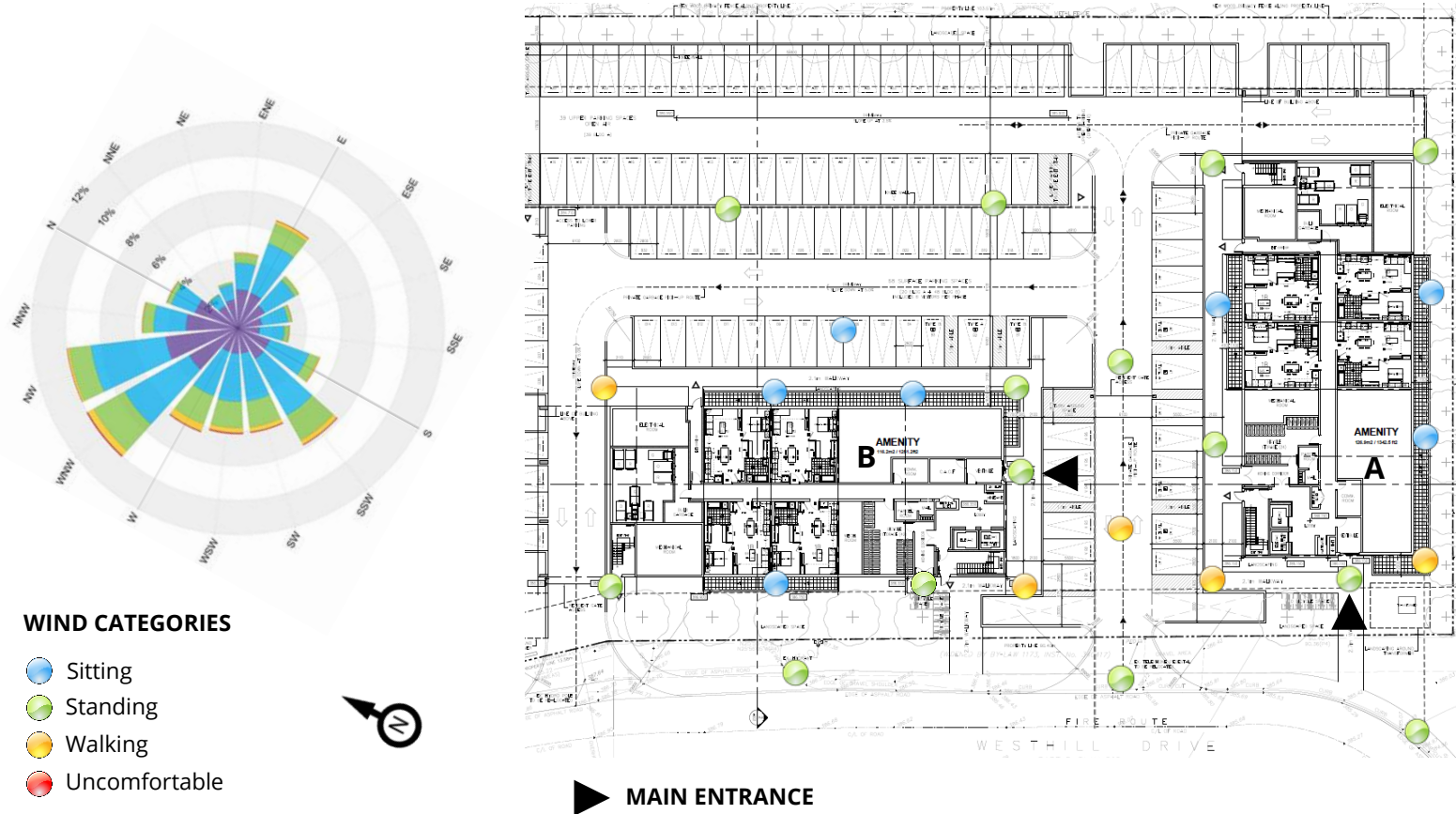


Image 6: Predicted wind comfort conditions at grade - Summer

5. RESULTS AND DISCUSSION

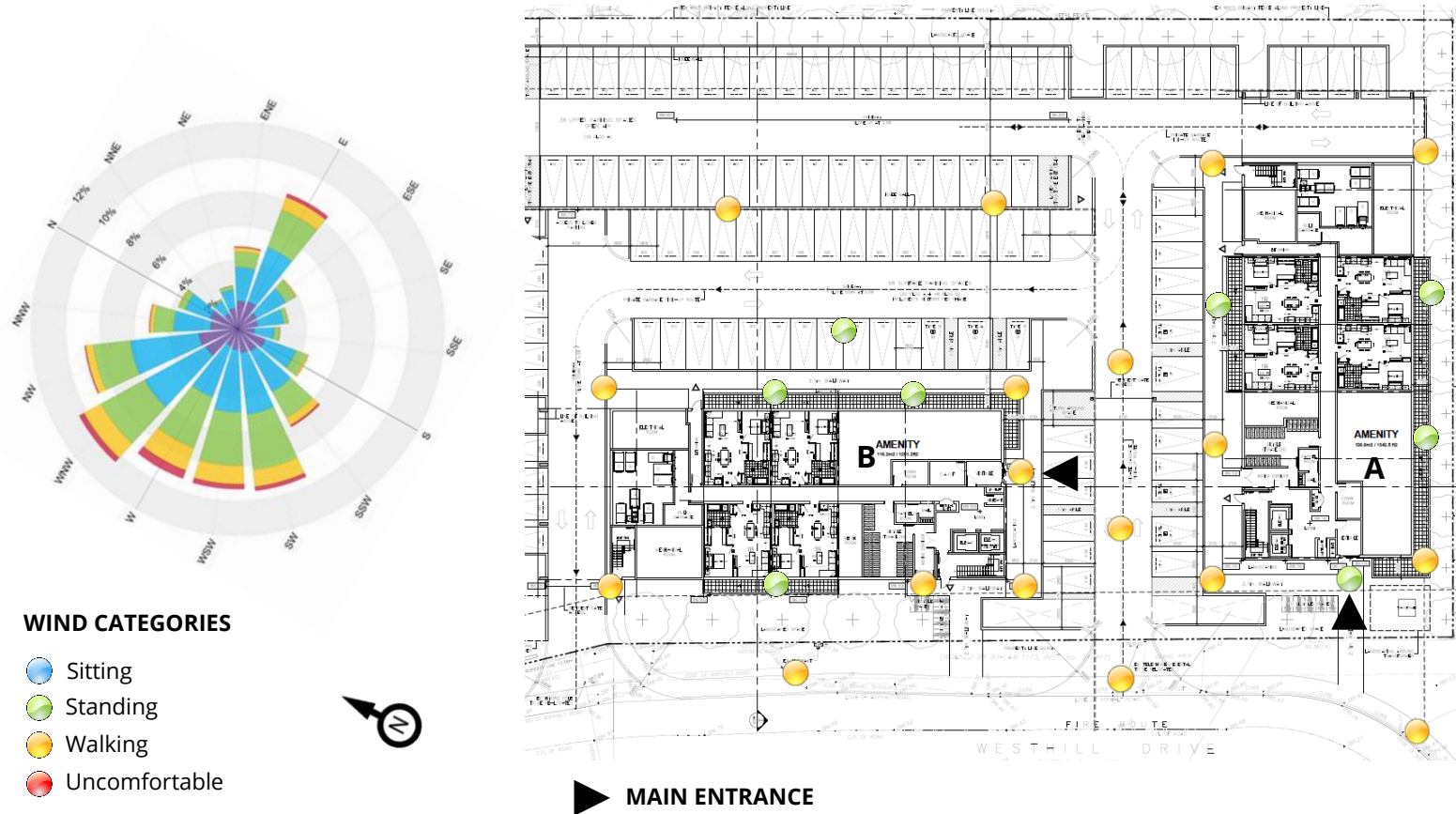


Image 7: Predicted wind comfort conditions at grade - Winter

5. RESULTS AND DISCUSSION



5.3 Proposed Scenario (cont'd)

5.3.1 Building Entrances

The main entrance to Building A is located on the west façade, while the main entrance to Building B is on the south façade within the gap between the proposed buildings (**Images 3, 6 and 7**). Each entrance is designed with a vestibule and a canopy, which are positive features for user comfort and door operability and should be retained in the final design.

Relatively speaking, slightly higher wind speeds are expected in front of the Building B entrance due to the winds being channelled between the proposed buildings (blue arrows in **Image 8**). The resultant wind conditions are suitable for a main entrance in the summer (**Image 6**), but not in the winter (**Image 7**).

If desired, lower wind speeds can be achieved around the main entrance to Building B by recessing the entrance into the building façade and/or adding wind screens or tall planters on both sides of the entrance way – see Image 10 for examples.

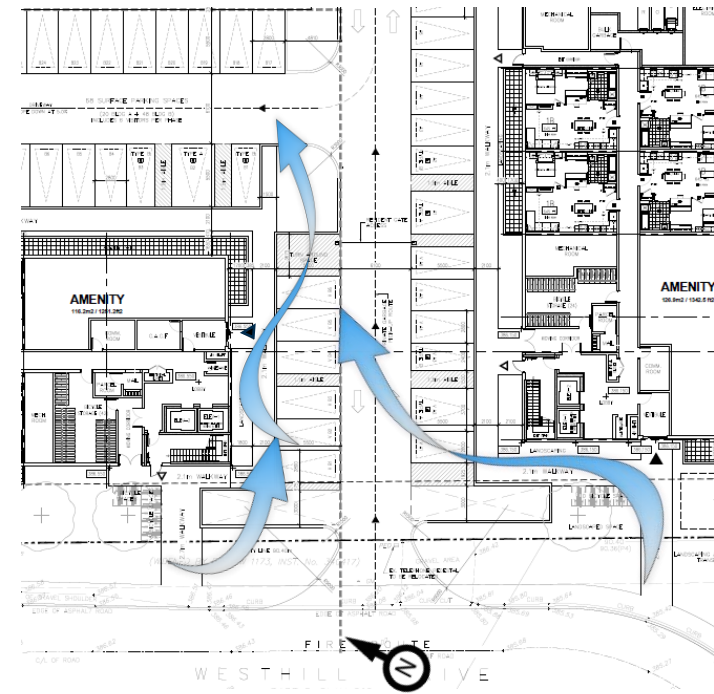


Image 8: Wind flow around the main entrance to Building B

5. RESULTS AND DISCUSSION



5.3 Proposed Scenario (cont'd)

5.3.2 Sidewalks and Parking Spaces

Although elevated wind conditions may occur from time to time in the winter around the western and northern corners of the proposed buildings and along the gap between the buildings, wind conditions at all pedestrian areas at grade on and around the project, including sidewalks and parking spaces, are predicted to be comfortable for walking or better throughout the year (**Images 6 and 7**). These wind conditions are considered appropriate for the intended use of these areas.

5.3.3 Amenity at Grade

Public amenity areas at grade are located around the southwest corner of Building A and the southeast corner of Building B (**Image 3**). While suitable wind conditions are generally expected for the amenity space around Building B in the summer (**Image 6**), wind speeds on the amenity space of Building A are predicted to be higher than those that are desired for passive activities.

It is recommended that amenity spaces being located away from building corners. Alternatively, landscaping elements (e.g., screens and coniferous trees) can be added to the building corners to reduce the wind speeds and to keep users away from windy corners, if feasible.

Image 10 provides a few examples of wind mitigation for reference.

5.3.4 Roof Amenity

Wind speed increases with elevation. Without any wind control measures, high wind speeds are typically expected on the roofs. **Image 9** shows the predicted wind conditions on the roof terraces in the summer when these areas are typically in use. Wind conditions are generally expected to be comfortable for standing in the summer, with higher wind speeds comfortable for walking on the north and south sides of the elevator overruns and lower wind speeds on the east side (**Image 9**).

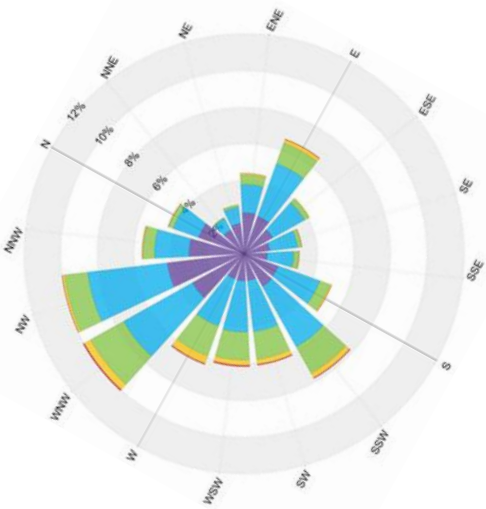
Higher wind speeds are expected in the winter, but they are considered acceptable due to limited use of these outdoor areas in the colder months.

It is positive to have the roof amenity areas setback from the roof edges. Lower wind speeds can be achieved by installing tall wind screens along the west perimeter adjacent to the elevator overruns. If desired, local wind control measures can also be considered around planned seating/gathering areas, and they may include wind screens, planters, trellises and so on – see **Image 10** for reference.

5. RESULTS AND DISCUSSION



5.3 Proposed Scenario (cont'd)



WIND CATEGORIES

-  Sitting
-  Standing
-  Walking
-  Uncomfortable

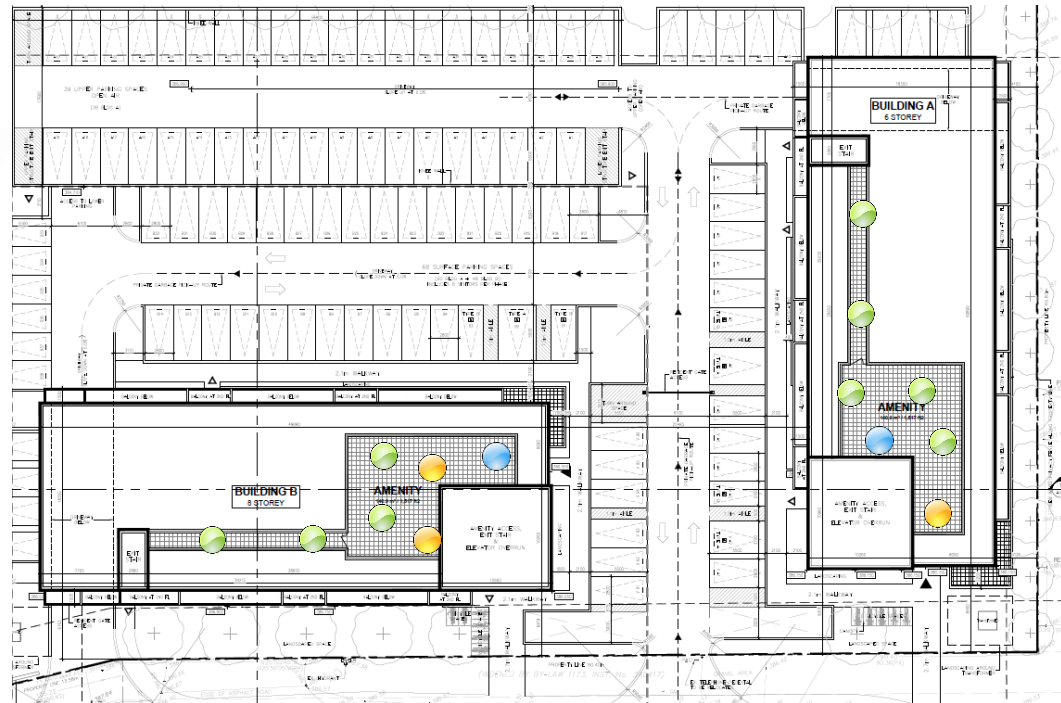


Image 9: Predicted wind comfort conditions on building roofs - Summer

5. RESULTS AND DISCUSSION



5.3 Proposed Scenario (cont'd)

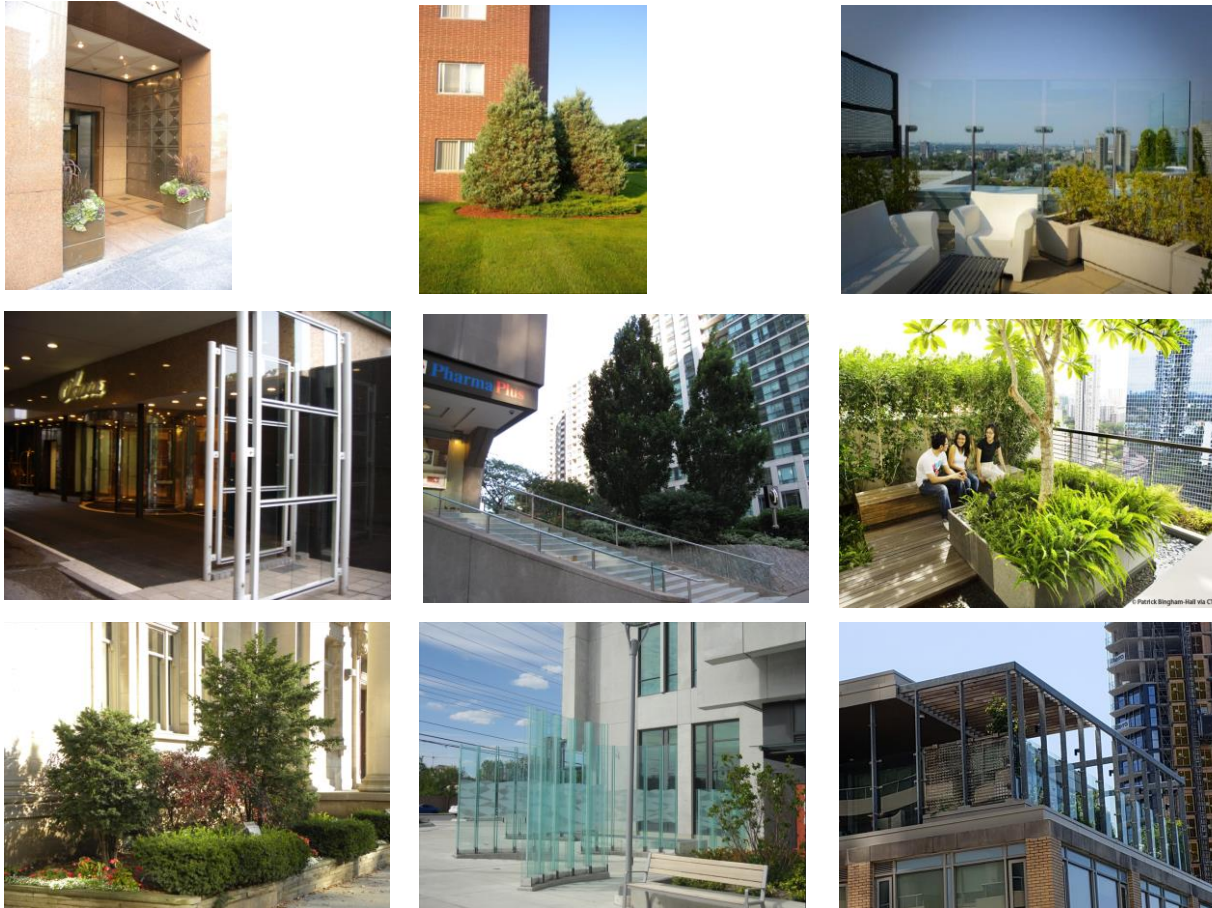


Image 10: Wind control measures for main entrance, and amenity spaces at grade and on roof

6. SUMMARY



RWDI was retained to provide an assessment of the potential pedestrian level wind impact of the proposed project at 36 Westhill Drive in Waterloo, Ontario. Our assessment was based on the local wind climate, the current design of the proposed development, the existing surrounding buildings, our experience with wind-tunnel testing of similar buildings, and screening-level modelling of wind flow around buildings.

Our findings are summarized as follows:

- The existing wind conditions on and around the project site meet the wind comfort and safety criteria throughout the year.
- The proposed buildings, at six and eight storeys, are considered low or moderate in height for wind impact. As a result, the wind safety criterion is expected to be met on and around the proposed site, and no significant wind impact is predicted to the surrounding areas.
- Suitable wind conditions are expected for most pedestrian areas throughout the year, including the main entrance to Building A, sidewalks and parking lots.
- Higher-than-desired wind speeds are predicted around the main entrance to Building B, at the amenity around the southwest corner of Building A and on the roof-top amenity areas. Potential wind control measures are discussed in the report with photo examples to improve these conditions to appropriate levels.

7. STATEMENT OF LIMITATIONS



Design Assumptions

The findings/recommendations in this report are based on the architectural drawings communicated to RWDI on August 7, 2025, listed below. Should the details of the proposed design and/or geometry of the building change significantly, results may vary.

36 Westhill Drive - ISSUED FOR ZBA - 08.07.2025	File Type	Date Received (mm/dd/yyyy)
36 Westhill Drive - ISSUED FOR ZBA - 08.07.2025	pdf	08/07/2025

Changes to the Design or Environment

It should be noted that wind comfort is subjective and can be sensitive to changes in building design and operation that are possible during the life of a building. In the event of changes to the design, construction, or operation of the building in the future, RWDI could provide an assessment of their impact on the discussions included in this report. It is the responsibility of Others to contact RWDI to initiate this process.

Limitations

This report was prepared by RWDI for Blackdoor (Westhill) Inc. ("Client"). The findings and conclusions presented in this report have been prepared for the Client and are specific to the project described herein and authorized scope. The conclusions and recommendations contained in this report are based on the information available to RWDI when this

report was prepared. Because the contents of this report may not reflect the final design of the Project or subsequent changes made after the date of this report, RWDI recommends that it be retained by Client to verify that the results and recommendations provided in this report have been correctly interpreted in the final design of the Project.

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

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