359 WELLINGTON ROAD

LONDON, ONTARIO

PEDESTRIAN WIND ASSESSMENT

PROJECT #2305549
FEBRUARY 15, 2024

SUBMITTED TO

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1. INTRODUCTION

Rowan Williams Davies & Irwin Inc. (RWDI) was retained to conduct a qualitative assessment of the pedestrian wind conditions expected around the proposed 359 Wellington Road development in London, Ontario. This effort is intended to inform good design and has been conducted in support of ZBA/OPA submissions.

The proposed site is located at the southwest corner of Wellington Road and Base Line Road East (Image 1). The site is currently unoccupied and is surrounded primarily by low-rise commercial and residential developments. Larger surrounding buildings, including London Health Sciences Centre, and a 9-storey development exist immediately to the east-southeast and west, respectively.

The proposed project will consist of a 23-storey mixed-use development (Image 2). Residential entrances are located at the northeast corner, and on the southwest façade within building undercuts. Other areas of interest include the surrounding sidewalks, and the outdoor amenity area on the Level 7 podium. The study focused on these key pedestrian areas, shown in Image 3.

Image 1: Aerial View of the Existing Site and Surroundings (Credit: Google Maps)

Image 2: Proposed Project Massing, View from the Northeast

1. INTRODUCTION

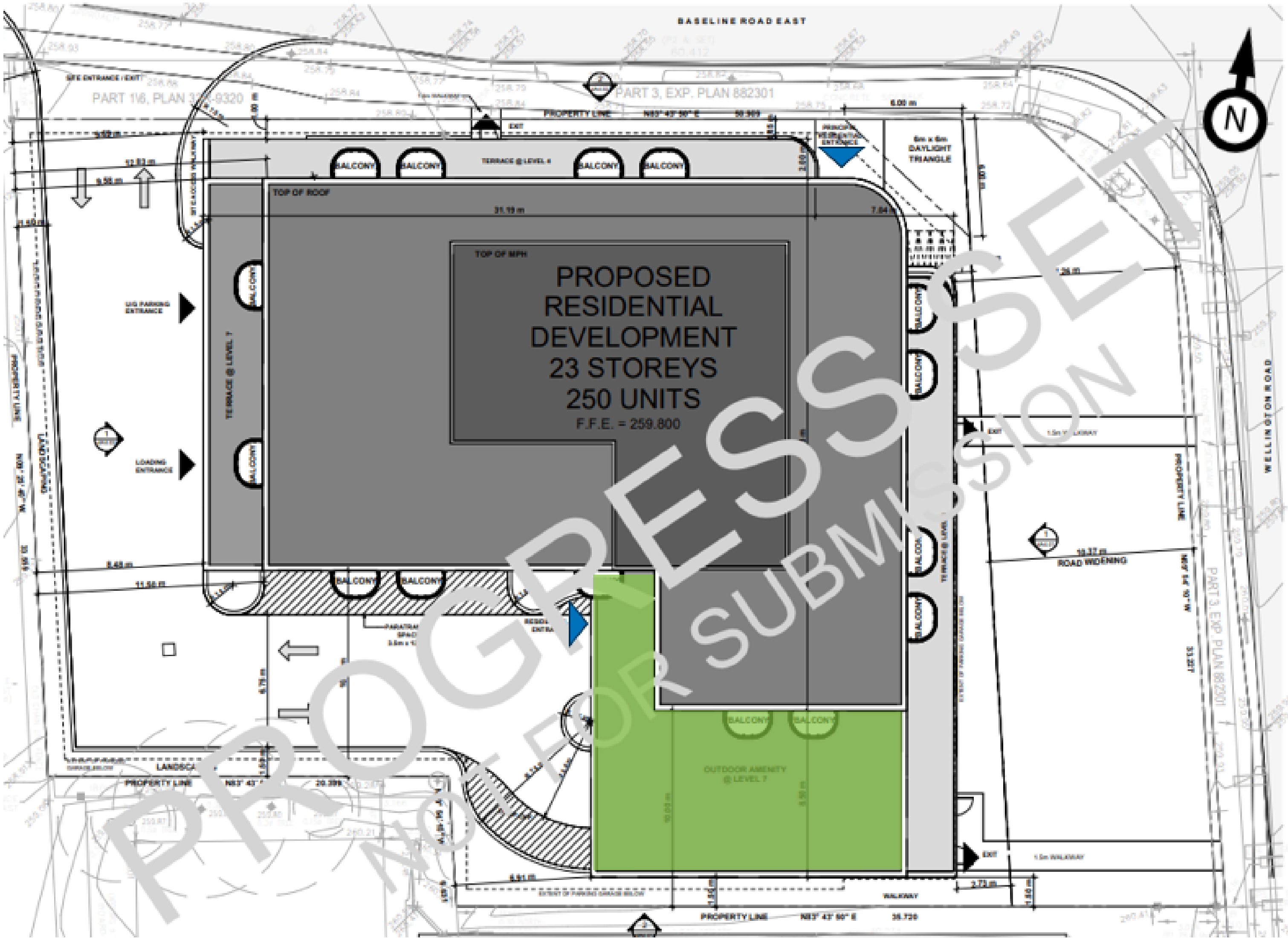


Image 3: Site Plan Displaying Key Areas of Interest | Residential Entrance | Outdoor Amenity

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 from Kirkor Architects and Planners on January 17th and 19th, 2024;
- A review of the regional long-term meteorological data from London 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 region and around the world;
- RWDI's engineering judgement and knowledge of wind flows around buildings[2, 3]; and,
- RWDI Criteria for pedestrian wind comfort and safety.

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.

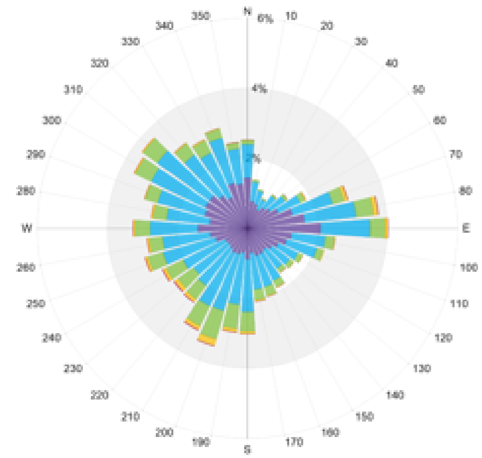
1. H. Wu, C.J. Williams, H.A. Baker and W.F. Waechter (2004), "Knowledge-based Desk-Top Analysis of Pedestrian Wind Conditions", *ASCE Structure Congress 2004,* Nashville, Tennessee.
2. H. Wu and F. Kriksic (2012). "Designing for Pedestrian Comfort in Response to Local Climate", *Journal of Wind Engineering 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

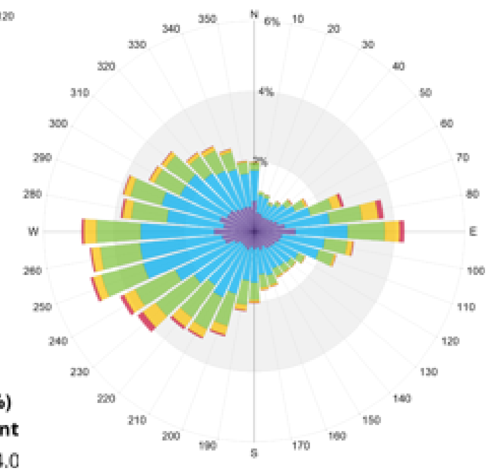
Meteorological data from London International Airport for the period from 1992 to 2022 were used as a reference for wind conditions in the area as this is the nearest station to the site with long-term wind data. The distributions of wind frequency and directionality for the summer (May through October) and winter (November through April) seasons are shown in the wind roses in Image 4.

When all winds are considered (regardless of speed), winds from the south through northwest are predominant throughout the year, with additional contributions 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 (6.9%) than in the summer season (2.0%) and are most frequent from the east and southwest. These winds could potentially be the source of uncomfortable or severe wind conditions, depending upon the site exposure and development design.



Summer (May through October)



Winter (November through April)

Wind Speed (km/h)	Probability (%)	
	Summer	Wint
Calm	8.5	4.0
1-10	37.1	24.8
11-20	40.4	41.9
21-30	11.9	22.5
31-40	1.7	5.6
>40	0.3	1.3

Image 4: Directional Distribution of Winds Approaching London International Airport (1992 to 2022)

4. WIND CRITERIA

The RWDI pedestrian wind criteria are used in the current study. These criteria have been developed by RWDI through research and consulting practice since 1974. They have also been widely accepted by municipal authorities, building designers and the city planning community. The criteria are as follows:

4.1 Safety Criterion

Pedestrian safety is associate with excessive gust that can adversely affect the balance and footing of a pedestrian. If strong winds that can affect the balance of a person (90 km/h) occur more than 0.1% of the time or 9 hours per year, the wind conditions are considered severe.

4.2 Pedestrian Comfort Criteria

Wind comfort can be categorized by typical pedestrian activities:

Sitting (≤ 10 km/h): Calm or light breezes desired for outdoor seating areas where one can read a paper without having it blown away.

Standing (≤ 14 km/h): Gentle breezes suitable for main building entrances and bus stops.

Strolling (≤ 17 km/h): Moderate winds that would be appropriate for window shopping and strolling along a downtown street, plaza or park.

Walking (≤ 20 km/h): Relatively high speeds that can be tolerated if the objective of a pedestrian is to walk, run, or cycle without lingering.

Uncomfortable: The comfort category for walking is not met.

Wind conditions are considered suitable for sitting, standing, strolling, or walking if the associated mean wind speeds are expected for at least four out of five days (80% of the time). Wind control measures are typically required at locations where winds are rated as uncomfortable, or they exceed the wind safety criterion.

Note that these wind speeds are assessed at the pedestrian height (i.e., 1.5 m above grade or the concerned floor level), typically lower than those recorded in the airport (10 m height and open terrain).

These criteria for wind forces represent average wind tolerance. They are sometimes subjective and regional differences in wind climate and thermal conditions as well as variations in age, health, clothing, etc., can also affect the perception of the wind climate.

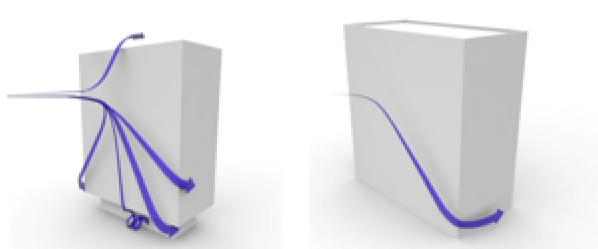
For the current development, wind speeds comfortable for walking or strolling are appropriate for sidewalks; lower wind speeds comfortable for standing are required for building entrances where pedestrians may linger; and calm wind speeds suitable for sitting are desired in areas where passive activities are anticipated, such as the above-grade outdoor amenity on Level 7.

5. RESULTS AND DISCUSSION

5.1 Wind Flow Around Buildings

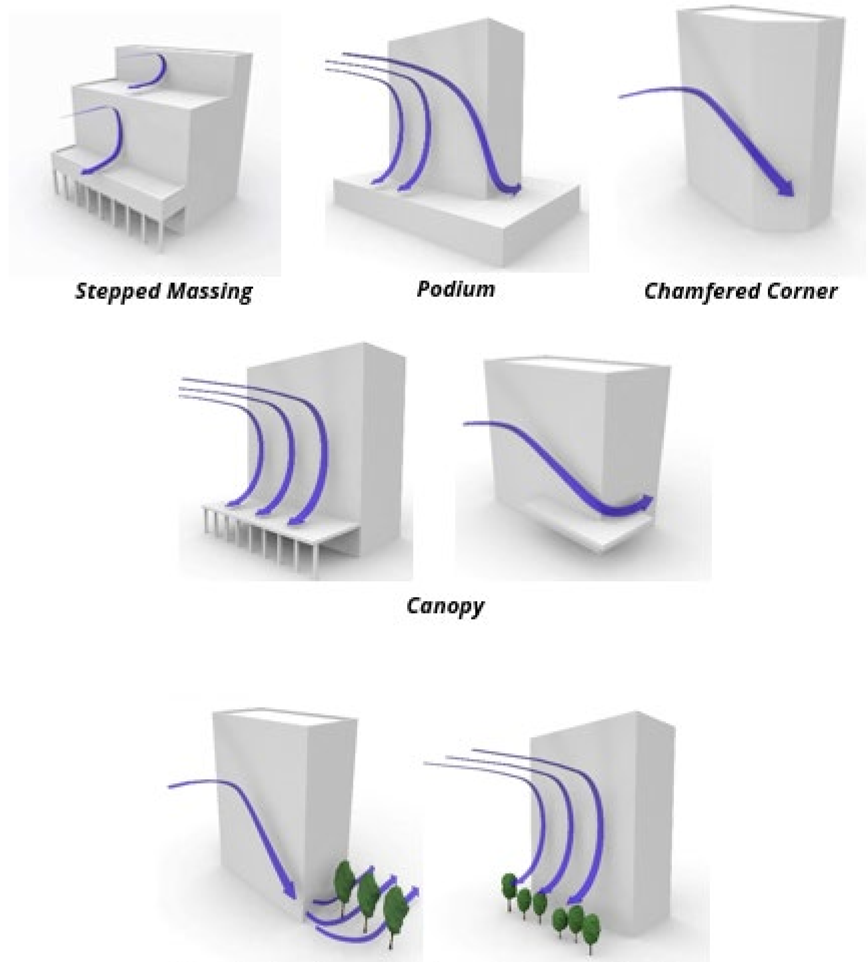
Buildings that are taller than their surroundings tend to intercept the stronger winds at higher elevations and redirect them to the ground level (Downwashing, Image 5a). These winds subsequently move around exposed building corners, causing a localized increase in wind activity due to Corner Acceleration (Image 5b). 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 stepped massing, tower step-back from a podium edge, chamfered corners, deep canopies close to ground level, and wind screens/tall trees with dense underplanting, etc. (Image 6) 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.



a) Downwashing   b) Corner Acceleration

Image 5: Generalized Wind Flows



Trees help reduce wind impact at ground level

Image 6: Examples of Common Wind Control Measures

5.2 Existing Scenario

The existing site is unoccupied and is primarily surrounded by low-rise suburban and commercial developments, comprising buildings that are one to three storeys tall. Larger surrounding buildings, including London Health Sciences Centre, and a 9-storey development exist immediately to the east-southeast and west, respectively, and would be expected to provide shelter to the existing site from winds from those directions. On the existing site itself, there are no significant structures 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 strolling or walking in the winter. Wind conditions exceeding the safety criterion are not expected.

5.3 Proposed Scenario: Wind Flow

The proposed tower, at 23 stories, is taller than buildings in the surrounding area and, therefore, will be exposed to the prevailing winds. Building-induced wind flows (i.e., downwashing and corner acceleration) are predicted to result in increased wind activity around the tower and nearby walkways, with the highest speeds expected around building corners.

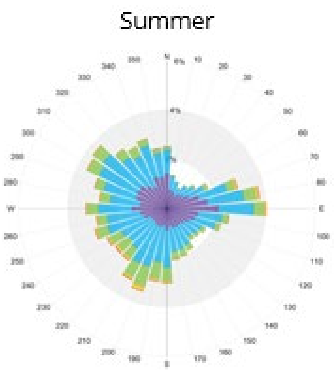
Although the project will increase wind speeds in the immediate surroundings, several features of the building massing are favourable towards reducing the potential for severe wind impacts.

These features are:

- The podium massing and tower setbacks disrupt wind flow at high elevations, and effectively reduces the strength of downwashing.
- The curved nature of the tower massing at the northeast corner will keep incoming wind flows attached to the tower horizontally, rather than redirect and/or accelerate winds down towards the outdoor amenities and ground level.
- The building massing above the residential entrances and the drop-off area of the proposed development will reduce the impact of downwashing flows.
- Each residential entrance includes a vestibule, which will reduce the infiltration of undesirable wind flows into the buildings and will allow patrons to wait in a comfortable transition area before exiting the building.

The following sections provide a discussion of the potential wind conditions around the project, taking these features into account. The expected wind flow pattern and conditions are shown in Images 7 and 8 for the summer and winter seasons, respectively.

5.4 Proposed Scenario: Predicted Wind Conditions



WIND CATEGORIES

- Sitting / Standing
- Strolling / Walking
- Uncomfortable
- Residential Entrance
- Line of Podium Above

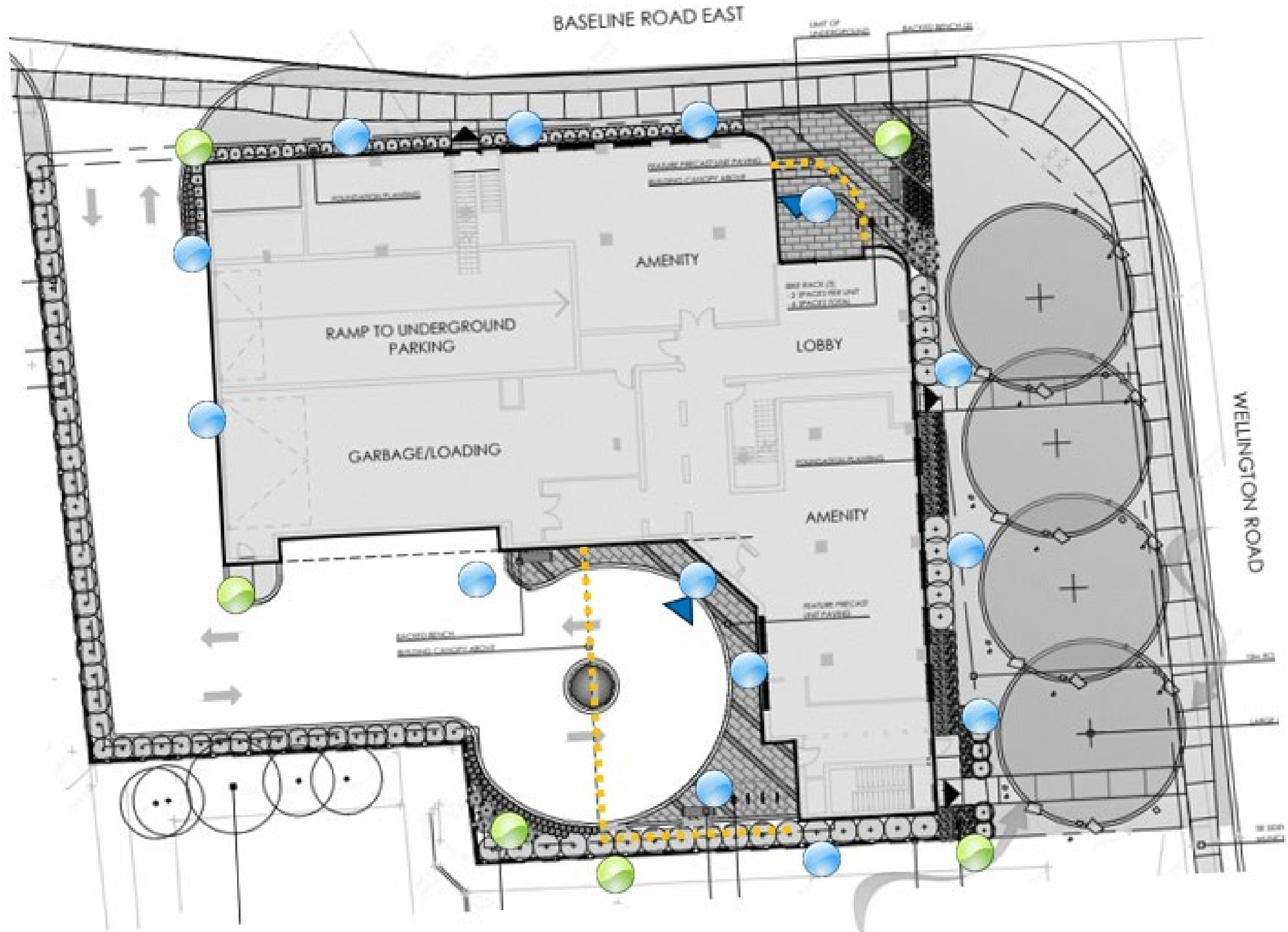


Image 7: Predicted Wind Conditions at Ground Level - Summer

5.4 Proposed Scenario: Predicted Wind Conditions

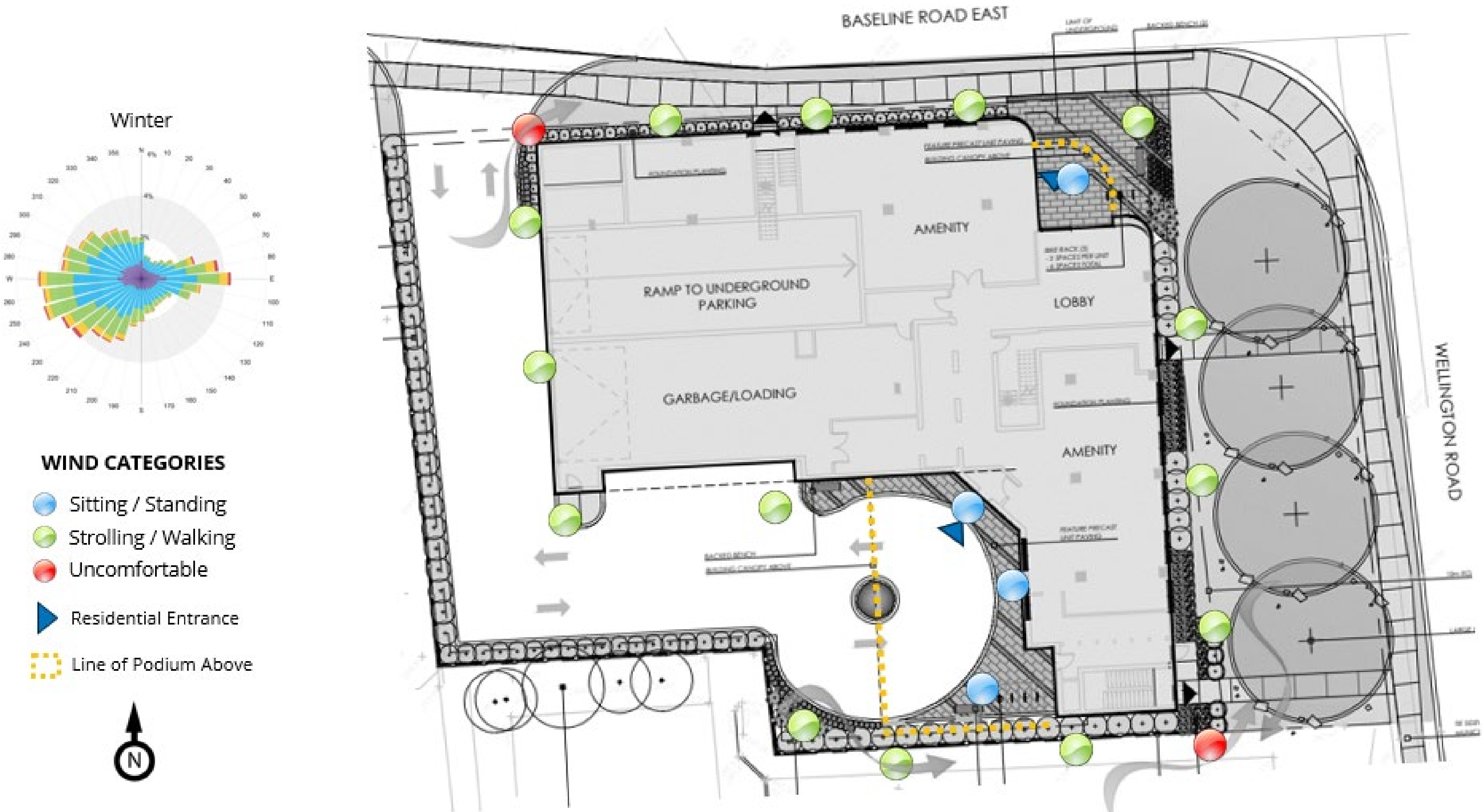


Image 8: Predicted Wind Conditions at Ground Level - Winter

5. RESULTS AND DISCUSSION

5.5 Proposed Scenario: Wind Safety

At 23 storeys, the proposed tower is taller than the existing buildings in the surrounding area. This height is considered moderate to high from a wind impact perspective. The curved northeast corner façade and podium massing reduce the overall potential for severe wind gusts. However, wind conditions around the project may exceed the wind safety criterion near building corners. These strong wind events are expected to occur primarily during the winter season.

5.6 Proposed Scenario: Wind Comfort

5.6.1 Surrounding Sidewalks/Walkways

Wind conditions at most areas at ground level around the project, including sidewalks and walkways, are predicted to be comfortable for standing or strolling in the summer, and for strolling or walking in the winter (Images 7 and 8).

The highest wind speeds are expected at the southeast and northwest corners of the development, where conditions will likely be comfortable for walking in the summer, and uncomfortable and potentially unsafe on windy days in the winter, resulting from downwash and corner-accelerated wind flows (Images 7 and 8).

The podium massing on the south side of the development, and the shelter afforded by the podium at ground level are positive from a wind moderation perspective (Section 5.3) and should be retained in the final design. Additionally, the inclusion of deciduous landscape plantings is expected to have a positive impact on wind conditions during the summer, primarily around the southeast corner of the project.

If feasible, dense coniferous landscaping, wind screens, and/or corner-wrapped canopies are typical measures to be considered at building corners to diffuse accelerating winds. Coniferous species are preferred as their foliage is retained throughout the year, providing shelter from wind during all seasons. Examples of wind control features are provided in Image 9.

It is recommended that the wind impact of the project be quantified through a wind tunnel study at a later design stage to confirm the frequency of high wind activity and thereby the need and level of wind mitigation efforts.

5.6.2 Entrances

Residential entrances are proposed at the northeast corner, and on the southwest façade of the of the development, with both positioned under the massing of the podium above, together with the drop-off area (Image 3). The curved northeast façade corners, in addition to the overhead podium massing, are positive design features expected to benefit wind conditions in the entrance areas. Wind conditions at both entrances and the drop-off area are predicted to be comfortable for sitting or standing during the summer and winter, which is suitable for their intended operation (Images 7 and 8).

5. RESULTS AND DISCUSSION

Image 9: Examples of Wind Control Measures at Building Corners

5.6.3 Outdoor Amenity

We understand that an outdoor amenity area is proposed on the Level 7 podium (Image 3). The Level 7 amenity is expected to be exposed to prevailing winds from the east, and from the south through west. Additionally, downwashing and corner-accelerated wind flows are anticipated to impact the amenity as prevailing winds are intercepted by the tower of the development.

Low wind speeds (i.e., comfortable for sitting) are desirable for prolonged passive use of above-grade outdoor spaces. However, without mitigation, wind conditions on the Level 7 outdoor amenity are expected to be comfortable for strolling or walking in the summer because of the exposure to prevailing winds, and to building-induced downwashing and corner-accelerated flows.

To provide shelter and create areas where the target wind comfort conditions are met during the summer, the design team may consider using a tall parapet (at a height of at least 2 m) along the perimeter of the amenity area in order to redirect prevailing wind flows (examples shown in Image 10). We understand the design team is considering deciduous landscape elements and a trellis feature on the outdoor amenity, focused primarily around proposed seating areas (Image 11). These elements would be expected to lessen the impact of undesirable wind flows; however, additional vertical mitigation features may be required if calmer conditions suitable for sitting are desired. Note that the minimum recommended height for landscape elements is 1.5 m around seating areas, and 2 m if people are expected to be standing most of the time. Porous materials (around 20 to 30% open porosity) may be incorporated into the parapet and/or trellis, which would assist in diffusing rather than redirecting undesirable wind flows.

In the winter, conditions are predicted to be uncomfortable for outdoor use. These conditions may be acceptable, as these areas are typically not expected to be used for activities in the cold months.

Image 10: Examples of Wind Control Features on Outdoor Amenities

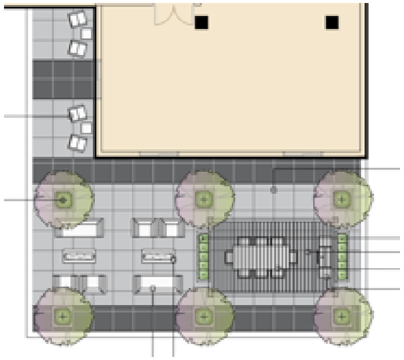


Image 11: Level 7 Outdoor Amenity Landscape Plan (Courtesy of Adesso Design Inc.)

6. SUMMARY

RWDI was retained to provide an assessment of the potential pedestrian level wind impact of the proposed project at 359 Wellington Road in London, 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 flows around buildings.

Our findings are summarized as follows:

- Existing wind conditions are expected to be suitable for pedestrian use throughout the year.
- The proposed development will be taller than buildings in the existing surroundings, and therefore will cause an increase in wind speeds around and between them.
- The building design incorporated several wind-responsive features which will moderate the potential wind impacts on the surroundings.
- In general, conditions on sidewalks and walkways on and around the proposed building are expected to be suitable for pedestrian use throughout the year. Elevated wind speeds, and unsuitable and potentially unsafe conditions are expected around the northwest and southeast corners as a result of building-induced wind flows.
- Suitable wind conditions are expected at the residential entrances and the drop-off area throughout the year, owing to their location and level of overhead shelter.
- The outdoor amenity at Level 7 is predicted to be windier than desired for passive use during the year; however, based on the proposed landscaping for this area, summertime wind conditions are anticipated to improve.
- Wind control features are recommended to be localized at building corners, and on the above-grade outdoor amenity to provide shelter to patrons from undesirable wind flows.
- A wind tunnel test is recommended during a later design stage to quantify the level and frequency of high wind activity, confirm the need for wind control features, and to optimize mitigation efforts.

7. STATEMENT OF LIMITATIONS

Design Assumptions

The findings/recommendations in this report are based on the architectural drawings communicated to RWDI in August 2023, listed below. Should the details of the proposed design and/or geometry of the building change significantly, results may vary.

File Name	File Type	Date Received (mm/dd/yyyy)
22001 - Progress Set - Jan.16, 2024	PDF	01/17/2024
23-131_359 Wellington Road_Landscape Concept_Issued for Client Review_2024-01-19	PDF	01/19/2024

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. These could be, for example: outdoor programming, operation of doors, elevators, and shafts pressurizing the tower, changes in furniture layout, etc. 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 Rowan Williams Davies & Irwin Inc. for LJM Developments ("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.