REPORT

51- 55 DUNDAS STREET WEST AND 60-78 AGNES STREET

MISSISSAUGA, ONTARIO

PEDESTRIAN WIND COMFORT ASSESSMENT

PROJECT #2509046
July 8, 2025

SUBMITTED TO

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1. INTRODUCTION

Rowan Williams Davies & Irwin Inc. (RWDI) was retained to conduct a pedestrian wind assessment for the proposed project at 51-55 Dundas Street West and 60-78 Agnes Street in Mississauga, Ontario. The objective of this assessment is to provide an evaluation of the potential wind impact of the proposed development in support of the Zoning Bylaw Application (ZBA).

The project site is located at the south corner of the intersection of Agnes Street and Cook Street, surrounded by a mix of low- to mid-rise buildings and open lots in all directions **(Image 1)**.

The project consists of a 34-storey, mixed-use condominium building, with an outdoor play area on the ground floor, and outdoor amenity areas on Levels 2, 8 and 33 **(Image 2)**.

Key areas of interest for this assessment include the main entrances to the buildings, sidewalks and walkways, as well as the outdoor play area and amenity spaces at and above grade **(Image 3)**.

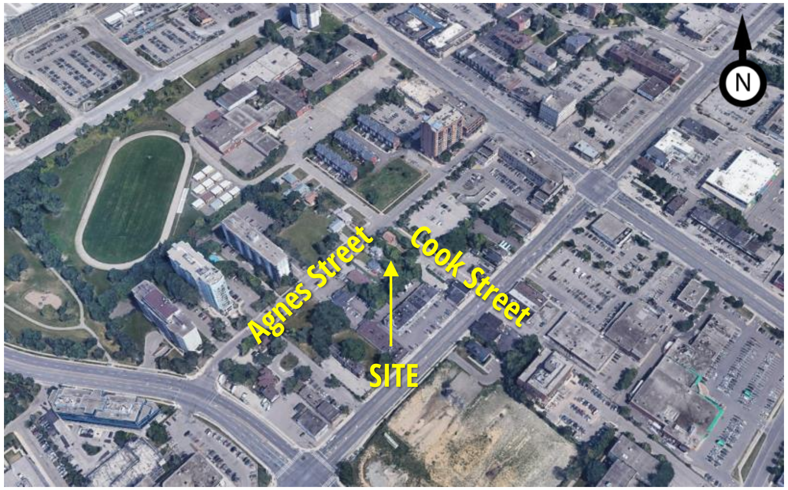


Image 1: Aerial View of the Existing Site and Surroundings
Source: Google Earth

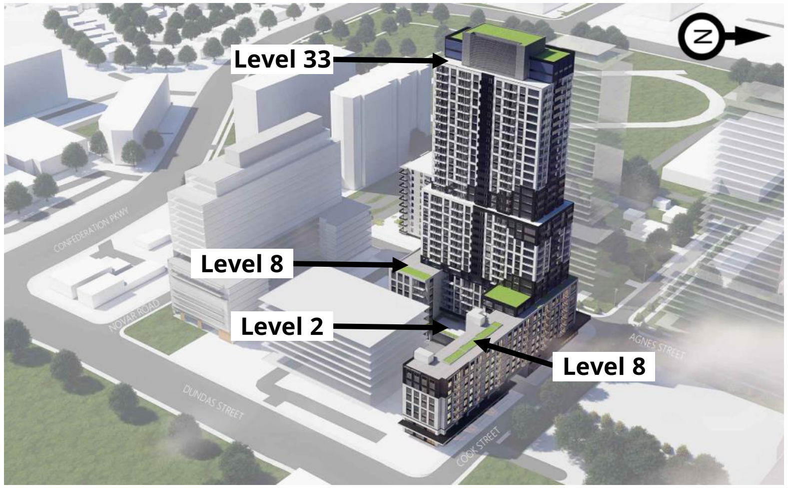


Image 2: Rendering of the Proposed Project

1. INTRODUCTION

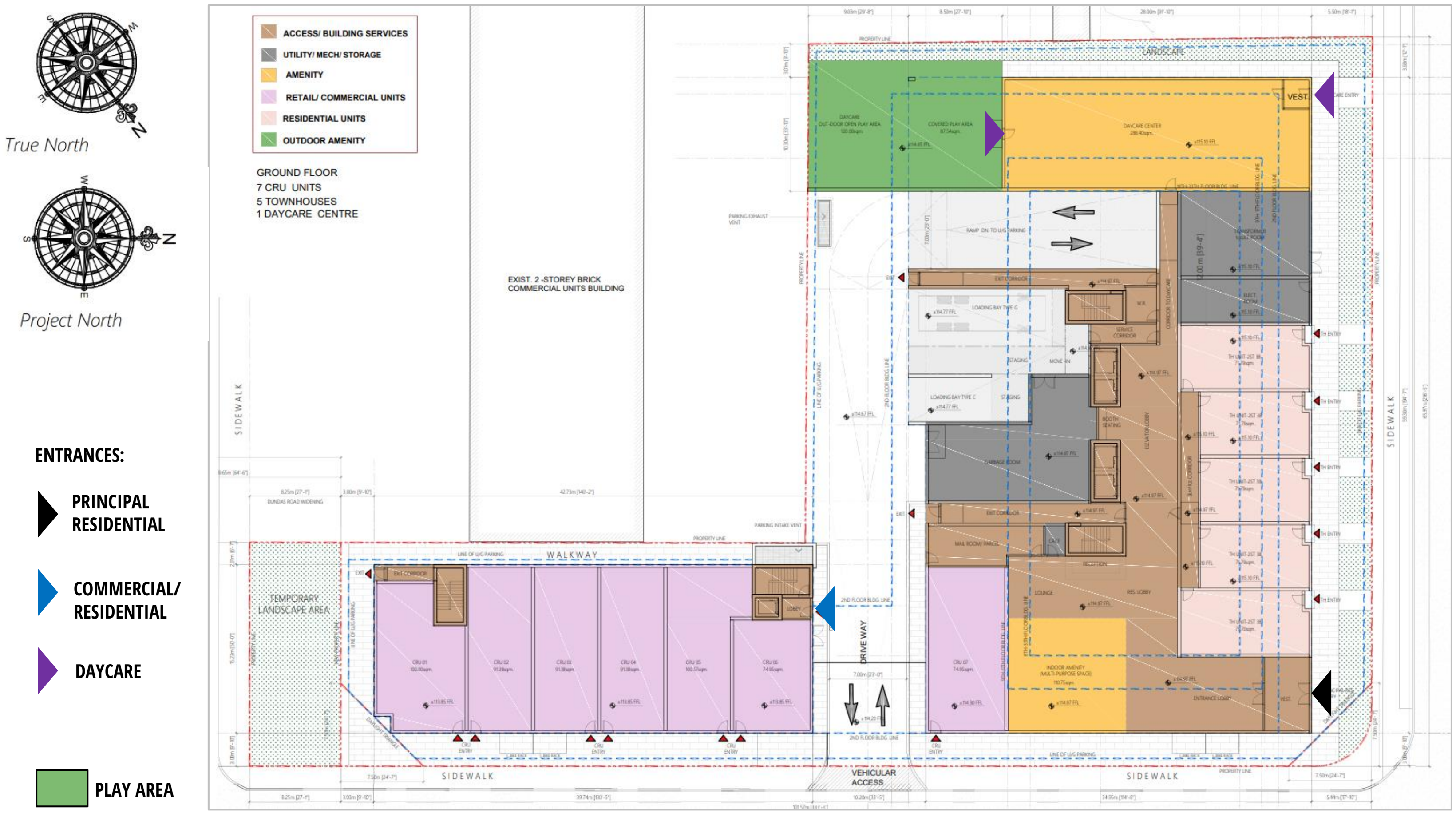


Image 3: Ground Floor Plan of the Proposed Project (Courtesy of Sajecki Planning Inc.)

2. METHODOLOGY

2.1 Objective

The objective of this assessment is to provide an evaluation of the potential impact of the proposed development on wind conditions in pedestrian areas on and around it based on Computational Fluid Dynamics (CFD) modelling. The assessment is based on the following:

- A review of the regional long-term meteorological data from Toronto Pearson International Airport;
- Architectural drawings and 3D model of the proposed project received in March 2025;
- The use of *Orbital Stack*, an in-house CFD tool;
- RWDI's engineering judgment, experience, and expert knowledge of wind flows around buildings[1-3]; and,
- The City of Mississauga wind comfort and safety criteria.

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

2.2 CFD for Wind Simulation

CFD is a numerical technique that can be used for simulating wind flows in complex environments. For this analysis, CFD techniques were used to generate a virtual wind tunnel where flows around the site and its surroundings were simulated in full scale. The computational domain that covered the site and its surroundings was divided into millions of small cells where calculations were performed, yielding a prediction of wind conditions across the entire study domain. CFD excels as a tool for wind modelling, presenting early design advice, comparing different design and site scenarios, resolving complex flow physics, and helping diagnose problematic wind conditions.

While the computational modelling method used in the current assessment does not explicitly simulate the transient behaviour of turbulent wind, its effects were estimated based on other calculated quantities. RWDI has found this approach to be appropriate for the assessment of typical wind comfort conditions. Wind safety issues, which relate to transient, higher-speed gusts, are discussed qualitatively, based on the CFD predictions and our extensive wind-tunnel experience for similar projects.

In order to quantify the transient behaviour of wind and refine any conceptual mitigation measures, a more detailed assessment would be required using either boundary-layer wind tunnel or transient computational modelling.

2. METHODOLOGY

2.3 Simulation Model

CFD simulations were completed for two scenarios:

- Existing: Existing site and surroundings, and,
- Proposed: Proposed development with the existing surroundings.

The computer model of the proposed project is shown in **Image 4**, and the Existing and Proposed configurations with the proximity model are shown in Images 5a and 5b, respectively. The 3D models were simplified to include only the necessary building and terrain details that would affect the local wind flows in the area and around the site. Landscaping and other smaller architectural and accessory features were not included in the computer model in order to provide more conservative wind conditions (as is the norm for this level of assessment).

The wind approaching the modelled area were simulated for 16 directions (starting at 0°, at 22.5° increments around the compass), accounting for the effects of the atmospheric boundary layer and terrain impacts. Wind data were obtained in the form of ratios of wind speeds at approximately 1.5 m above concerned levels, to the mean wind speed at a reference height. The data was then combined with meteorological records obtained from Toronto Pearson International Airport to determine the wind speeds and frequencies in the simulated areas.

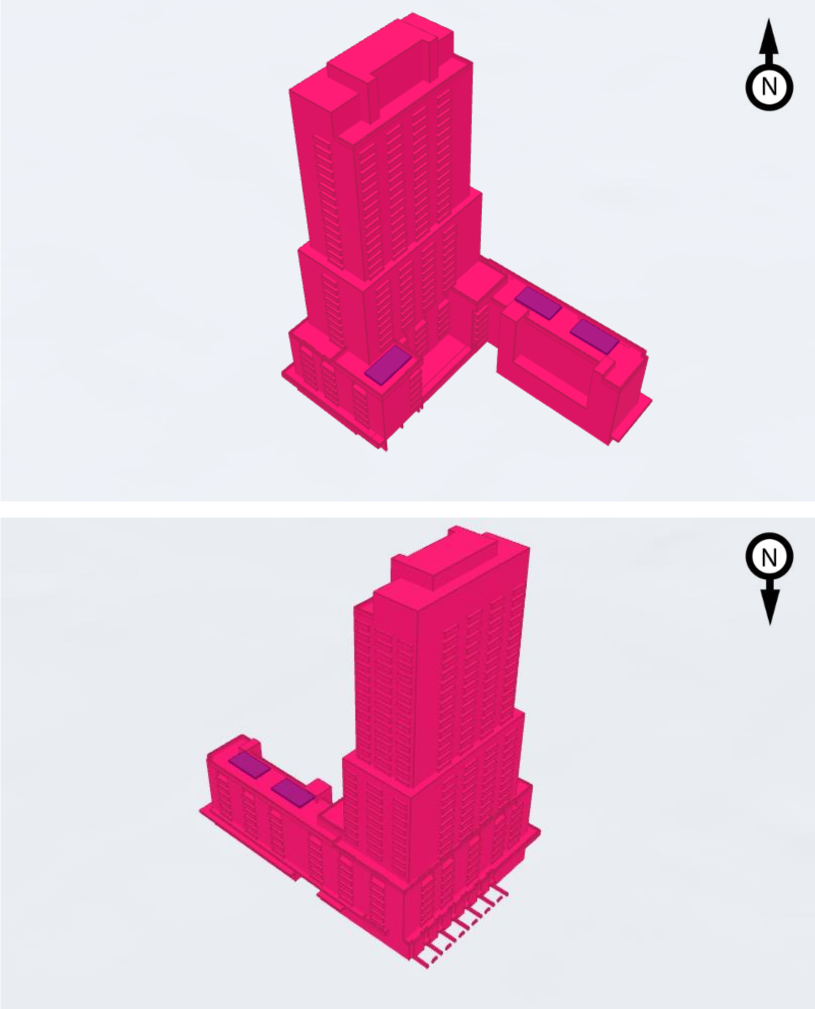


Image 4: Computer Model of the Proposed Project

2. METHODOLOGY

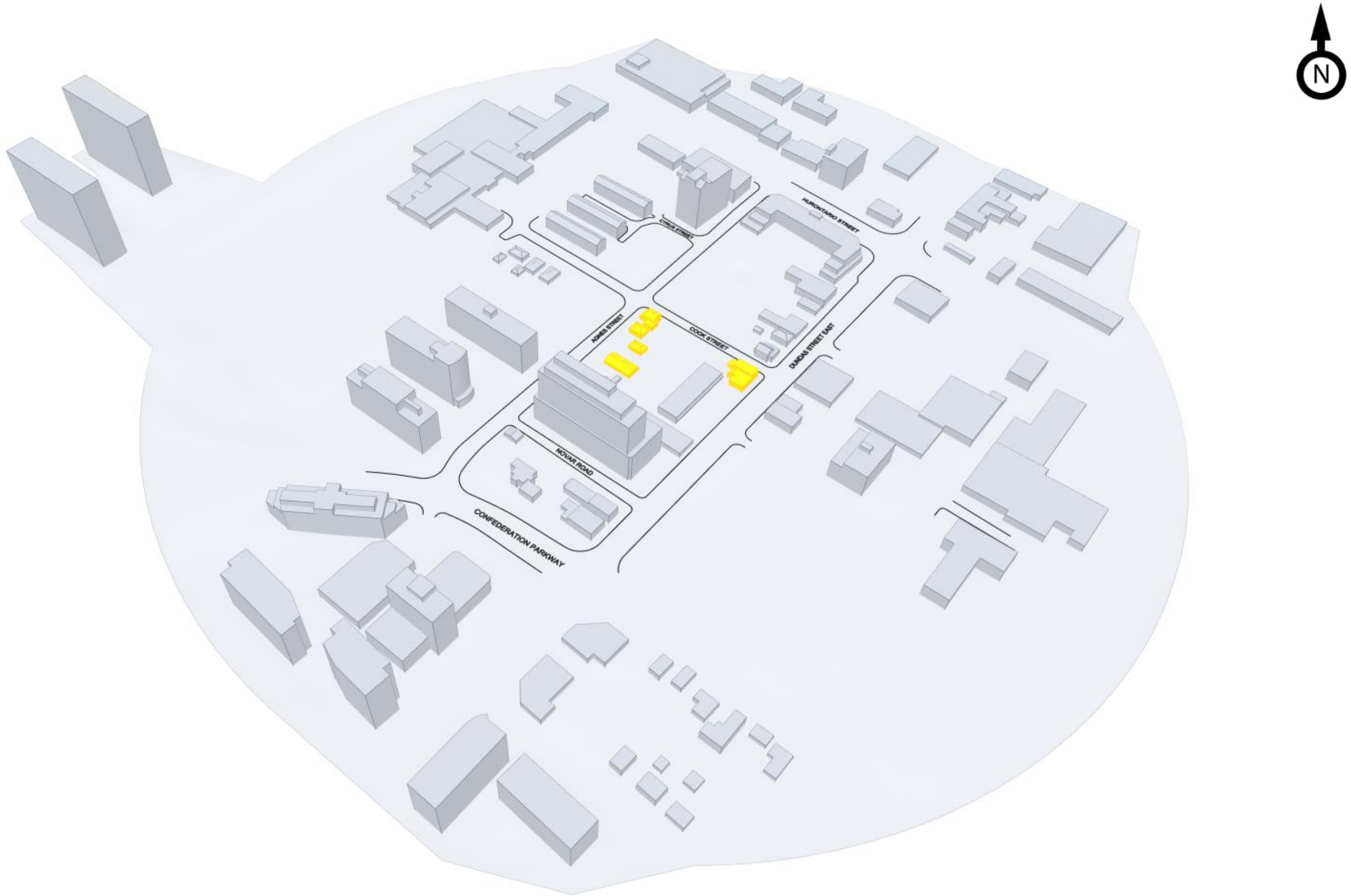


Image 5a: Computer Model of the Existing Site and Extended Surroundings

2. METHODOLOGY

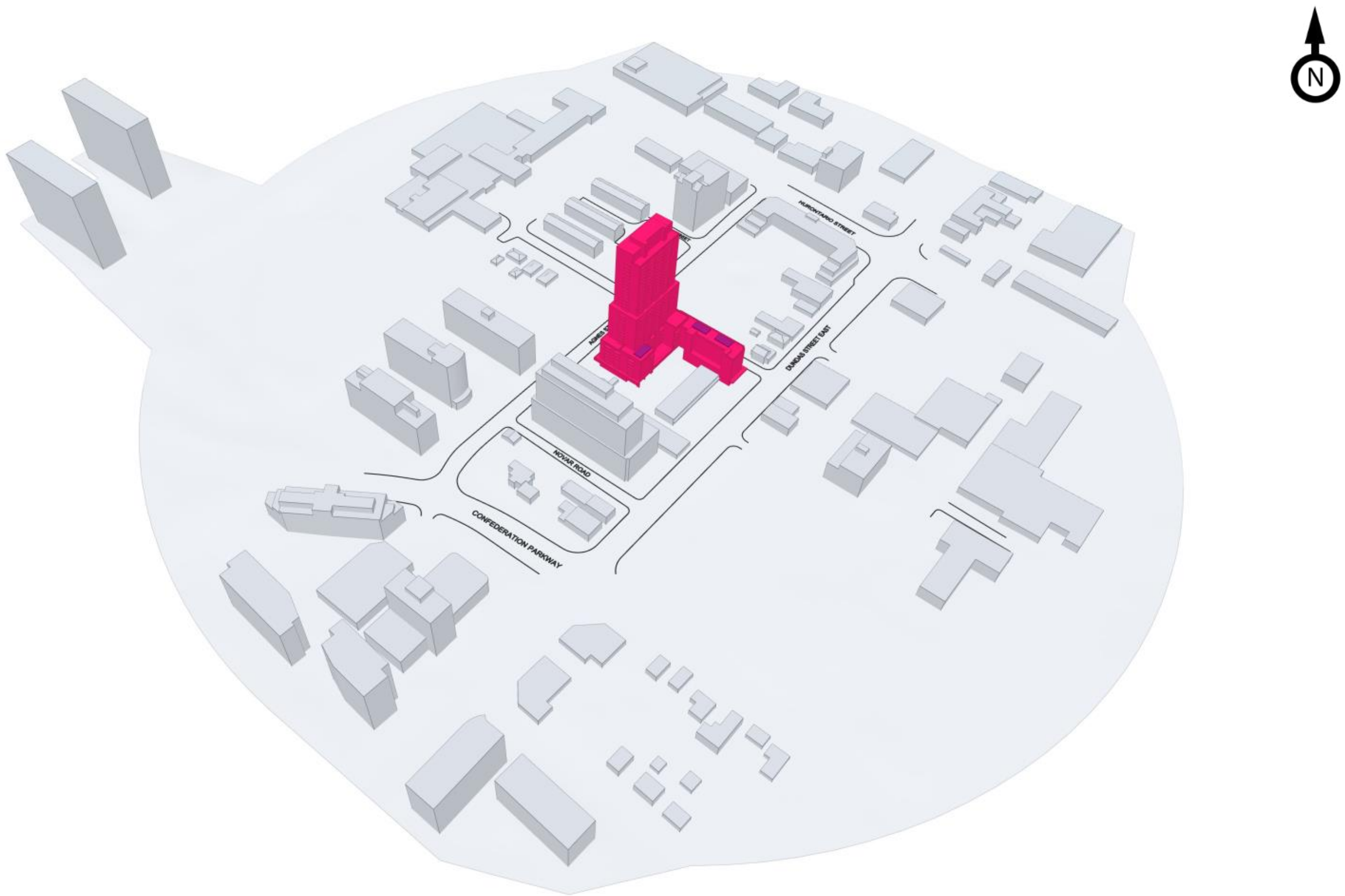


Image 5b: Computer Model of the Proposed Project and Existing Surroundings

3. METEOROLOGICAL DATA

Long-term wind data recorded at Toronto Pearson International Airport between 1994 and 2024, inclusive, were analyzed for the summer (May to October) and winter (November to April) months. **Image 6** graphically depicts the directional distributions of wind frequencies and speeds for these periods.

When all winds are considered, winds from the southwest through north directions are predominant throughout the year, with secondary winds from the south-southeast direction in the summer, and from the east in the winter.

Strong winds of a mean speed greater than 30 km/h measured at the airport (at an anemometer height of 10 m) are more frequent in the winter (red and yellow bands in Image 6). These winds potentially could be the source of uncomfortable or severe wind conditions, depending on the site exposure and development design.

Wind statistics were combined with the simulated data to predict the wind conditions at the project site and assessed against the wind criteria for pedestrian comfort.

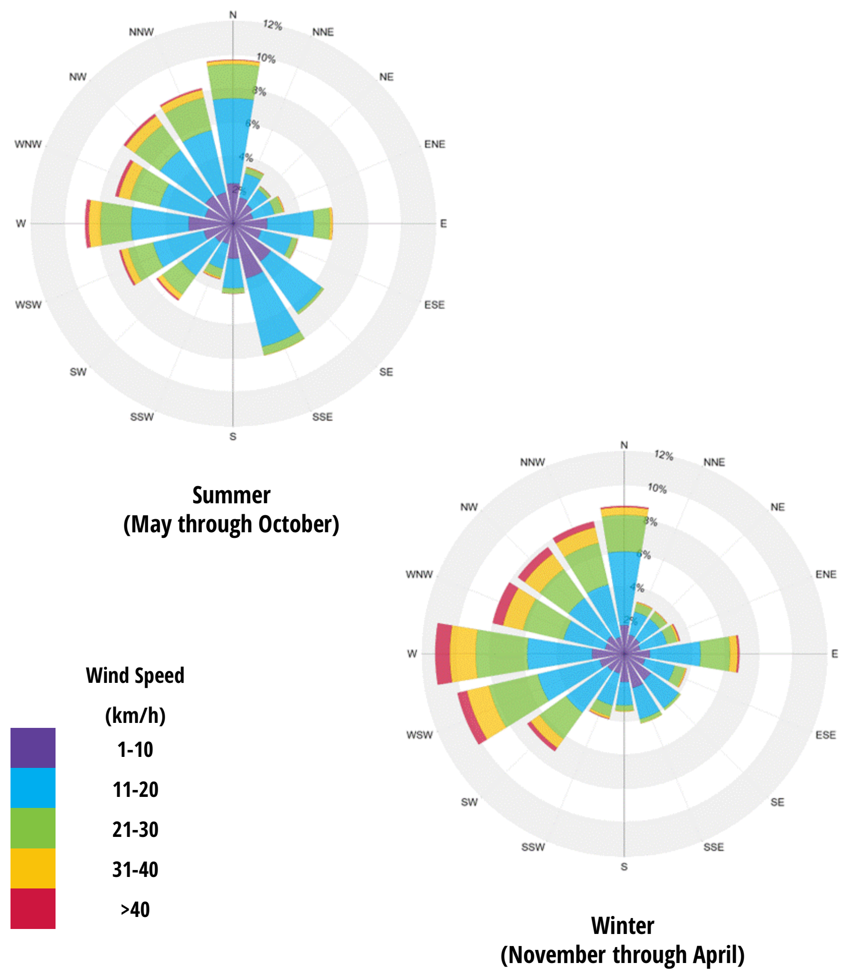


Image 6: Directional Distribution of Wind Approaching Toronto Pearson International Airport (1994 to 2024)

4. WIND CRITERIA

The Mississauga pedestrian wind criteria, developed in June 2014, are specified in the Urban Design Terms of Reference, “Pedestrian Wind Comfort and Safety Studies”. The criteria are as follows:

4.1 Pedestrian Safety Criterion

Pedestrian safety is associated with excessive gust that can adversely affect a pedestrian’s balance and footing. If strong winds that can affect a person’s balance (**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 (≤ 15 km/h): Gentle breezes suitable for main building entrances and bus stops.

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

Uncomfortable: None of the above criteria are met.

Wind conditions are considered suitable for sitting, standing 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 people's perception of the wind climate.

For the current development, wind speeds comfortable for walking are appropriate for sidewalks and walkways; lower wind speeds comfortable for standing are required at main building entrances. For amenity spaces, calm wind conditions comfortable for sitting are desired in the summer when these areas are typically in use.

5. RESULTS AND DISCUSSION

5.1 Wind Flow Around the Project

Wind generally tends to flow over buildings of uniform height, without disruption. Buildings that are taller than their surroundings tend to intercept and redirect winds around them. The mechanism in which winds are directed down the height of a building is called *Downwashing*. These flows subsequently move around exposed building corners, causing a localized increase in wind activity due to *Corner Acceleration*. When two buildings are situated side by side, wind flow tends to accelerate through the space between the buildings due to *Channelling Effect* caused by the narrow gap. *Stepped* facades, low roofs/podiums and canopies diffuse downwash and reduce the potential wind impact on the ground level. These flow patterns are illustrated in **Image 7**.

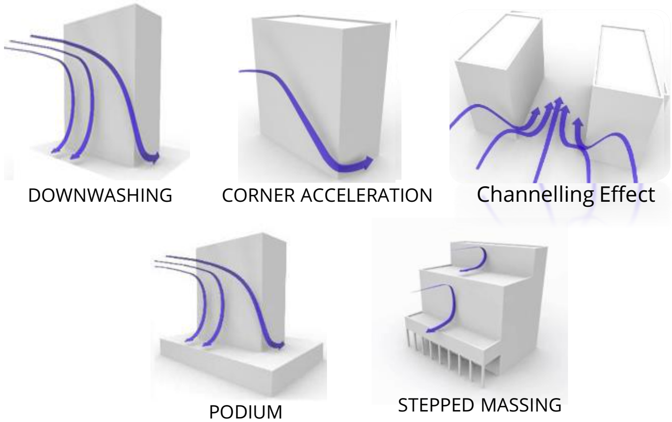


Image 7: General Wind Flow Patterns

5.2 Simulation Results

The predicted seasonal wind comfort conditions are presented in **Images 8 and 9** for the grade level, and in **Image 10** for the above-grade levels. The results are presented as colour contours of wind speeds calculated based on the wind criteria (Section 4). The contours represent wind speeds at a horizontal plane approximately 1.5 m above the concerned levels.

The assessment against the safety criterion (Section 4) was conducted qualitatively based on the predicted wind conditions and our extensive experience with wind tunnel assessments.

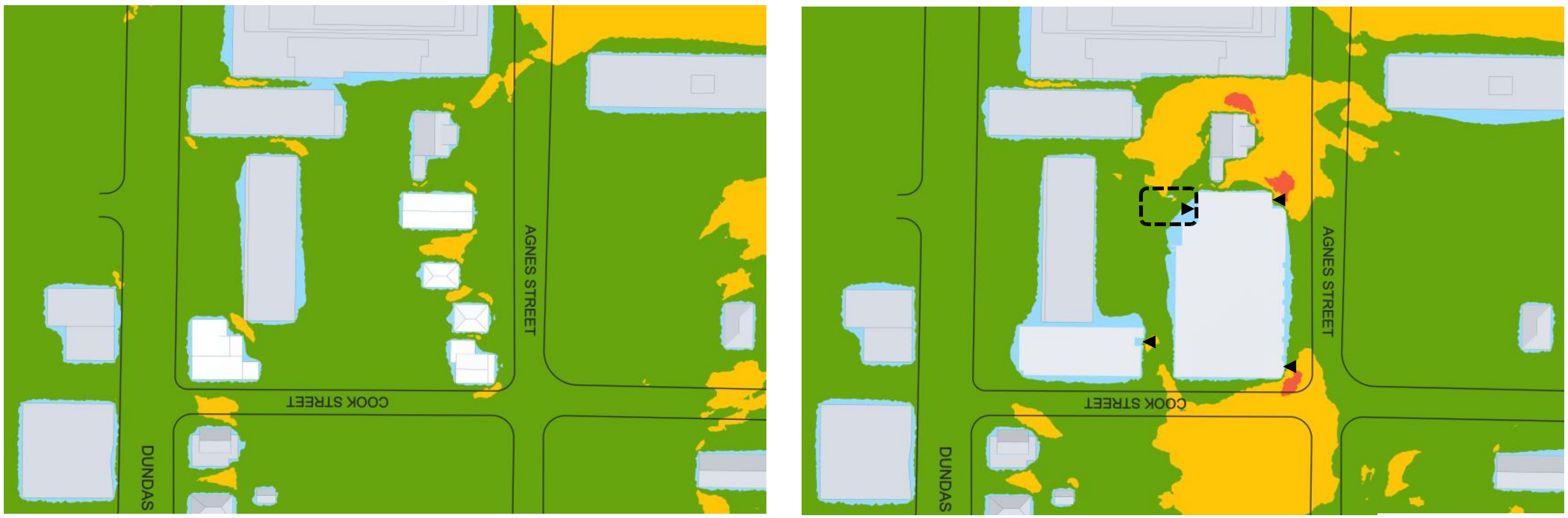
A detailed discussion of the expected wind conditions with respect to the applicability of the results follows in Sections 5.3. and 5.4. The discussion also includes recommendations for wind control to reduce the potential of high wind speeds for the design team's consideration (Section 6).

The full set of results can be accessed via the OrbitalStack online platform at:

https://app.orbitalstack.com/projects/3310/viewer/3247/configuration/9200/Viewer

Please contact support@orbitalstack.com if you require assistance with access to the results.

5. RESULTS AND DISCUSSION



(a) EXISTING

(b) PROPOSED

COMFORT: SITTING STANDING WALKING UNCOMFORTABLE

ENTRANCE LOCATION OUTDOOR PLAY AREA

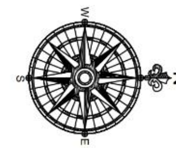
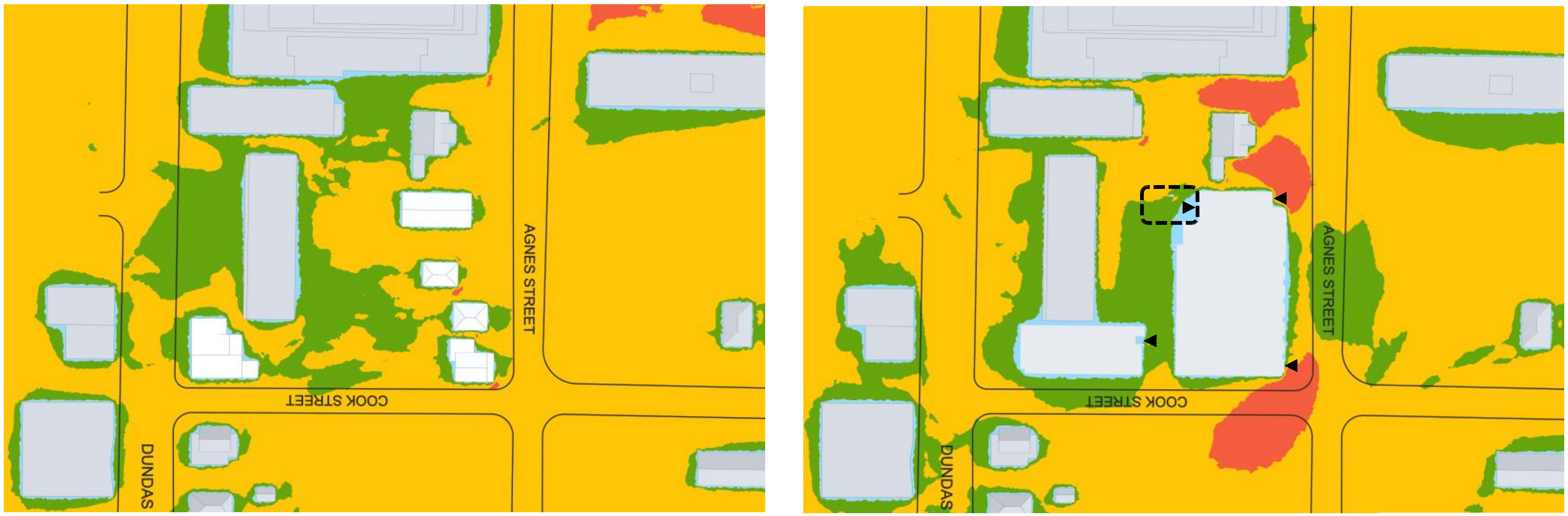
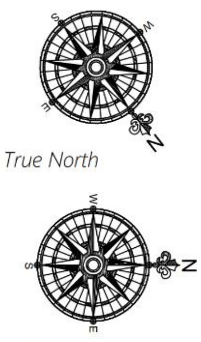


Image 8: Predicted Wind Conditions – Grade Level – Summer (May through October)

5. RESULTS AND DISCUSSION



(a) EXISTING (b) PROPOSED

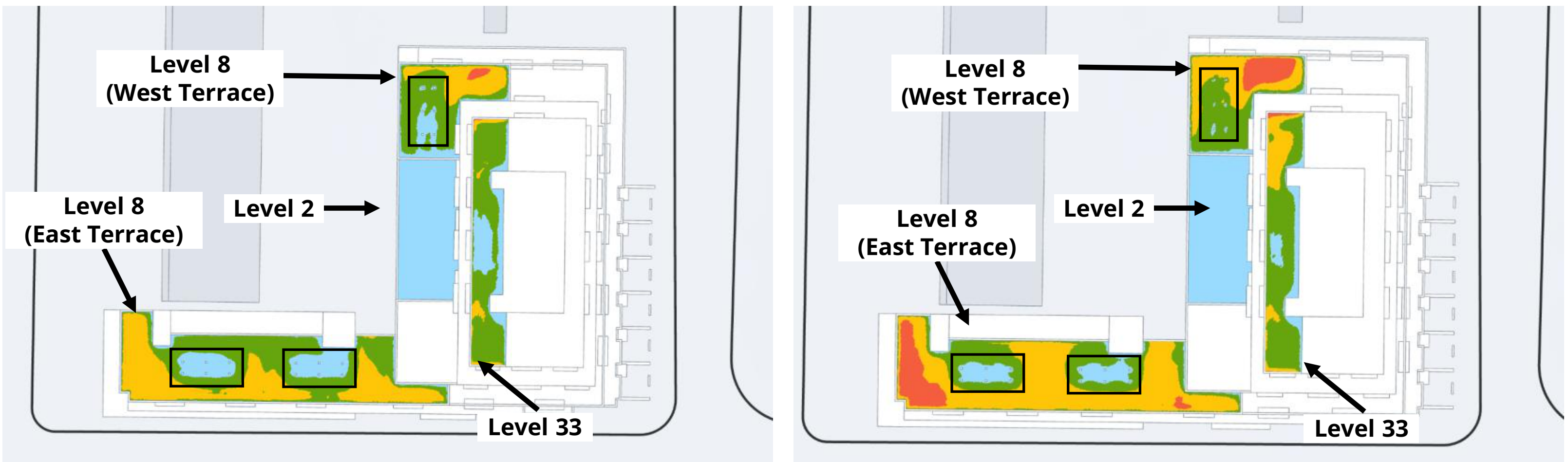


COMFORT: SITTING | STANDING | WALKING | UNCOMFORTABLE

▶ ENTRANCE LOCATION ⌜- - -⌟ OUTDOOR PLAY AREA

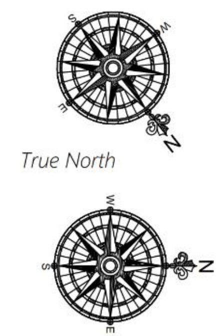
Image 9: Predicted Wind Conditions – Grade Level – Winter (November through April)

5. RESULTS AND DISCUSSION



(a) SUMMER

(b) WINTER



TRELLIS OUTLINE

COMFORT: SITTING STANDING WALKING UNCOMFORTABLE

Image 10: Predicted Wind Conditions – Above-grade Levels

5.3 Existing Scenario

The existing buildings on the site are low-rise and therefore do not redirect winds to create any notable impact. Wind conditions at most areas in the existing scenario are considered comfortable for standing in the summer **(Image 8a)** and walking in the winter **(Image 9a)**. Due to the seasonally stronger winds in the winter, uncomfortable wind speeds occur in small areas around the northeastern corners of the existing buildings on-site, and between the tall buildings to the northwest of the site.

Wind conditions at all areas near the project site meet the safety criterion.

5.4 Proposed Scenario

It is important to note that the orientation referenced in this section is based on project North rather than true North, which is along Cook Street.

The addition of the proposed project to the site is generally expected to cause higher wind speeds, compared to the Existing scenario, which is primarily due to the height of the proposed building and the relatively low surroundings / open spaces in the predominant wind directions. Downwashing of the prevailing winds off the tall building façades will redirect them to the ground level; these redirected winds can be relatively strong and turbulent, especially around exposed building corners.

The proposed building has a stepped façades, re-entrant corner design on the northwest side, as well as canopies along the east façade of the podium, wrapping around the southeast corner, and extending to the south façade. These are positive design features for reducing wind speeds and should be retained in the final design. Also, the proposed building is expected to provide shelter to the existing tall buildings located northwest of the site, resulting in improved wind conditions between those buildings compared to the Existing scenario.

5.4.1 Sidewalks, Walkways and Neighbouring Properties

The resulting wind speeds at most sidewalks, walkways and areas outside the property are expected to be comfortable for standing or walking in the summer and walking in the winter (Images 8b and 9b). Walking conditions are considered appropriate for the intended use of walkways and sidewalks. Uncomfortable wind conditions are predicted to occur around the northern corners of the proposed building and the sidewalks close to these building corners, as well as around the northwest corner of the low-rise building to the west of the site, primarily during the winter (Image 9b). The annual pedestrian wind safety criterion may also be exceeded at these areas. Wind tunnel testing is recommended to quantify potential wind conditions. We also recommend that the design team include wind mitigation measures to reduce wind speeds at walkways and sidewalks where uncomfortable and potentially unsafe wind speeds are predicted (Section 6).

5.4.2 Main Entrances

The principal residential and main daycare entrances are located near the northern corners of the building, where walking and uncomfortable conditions are predicted **(Images 8b and 9b)**. These wind speeds are higher than desired for an entrance area. Wind control strategies are provided in Section 6.

The secondary daycare and residential/commercial entrances are located under massing overhang, to the south of the tower, away from exposed corners. Calm wind speeds conducive to sitting or standing are predicted near the entrances year-round, which is considered appropriate.

5.4.3 Ground Floor Play Area

The outdoor play area is located to the southwest of the building, partially covered by a massing overhang. The wind conditions predicted in this area are generally comfortable for sitting or standing throughout the year **(Images 8b and 9b)**. These conditions are appropriate for an area intended for semi-active use. The west end of the play area may experience higher wind speeds comfortable for walking. Section 6 outlines some wind control measures to improve the wind conditions in the space.

Level 2 Outdoor Amenity Area

The Level 2 outdoor amenity area is located on the south side of the building, recessed from the main facade. Calm wind conditions, comfortable for sitting, are predicted in this area year-round, which is ideal for the intended use.

Level 8 Outdoor Amenity Areas

The Level 8 outdoor amenity areas are located on the rooftop of the podia, east and west of the tower. Based on the information received from the design team, the current computer simulation included 30% porous trellises in both amenity areas, with a 1.5 m tall parapet in the east terrace (outdoor lounges), and 2 m tall parapet in the west terrace (outdoor fitness). Wind conditions at most areas on the terraces are predicted to be comfortable for standing or walking, year-round, with lower wind speeds comfortable for sitting under the trellises (Image 10). Uncomfortable wind speeds are expected in a small area at the west end of the west terrace during the summer (Image 10a), with a larger area experiencing uncomfortable conditions in the winter (Image 10b). Additionally, the south end of the south terrace is anticipated to have uncomfortable conditions during the winter months (Image 10b). The safety criterion might be exceeded in these uncomfortable regions.

The windy conditions in the winter season might not be a concern due to reduced usage during the colder months. However, wind control strategies are needed to lower wind speeds to appropriate levels in the summer and to mitigate potential safety issues (section 6).

5.4.4 Above-grade Areas (Cont'd)

Level 33 Outdoor Amenity Area

The Level 33 outdoor amenity area is located on the rooftop of the building, protected by the mechanical penthouse massing from north.

In the summer, generally calm wind speeds comfortable for sitting or standing are predicted at most areas, with slightly higher wind speeds comfortable for walking mainly near the edges (Image 10a). Increased wind activity is expected during the winter months, with more areas experiencing wind speeds conducive to walking (Image 10b). However, since these areas are likely to see little to no use during the colder months, the conditions may not pose a significant concern.

Section 6 outlines wind control measures aimed at reducing wind speeds to levels suitable for passive uses.

6. RECOMMENDATIONS

6.1 Sidewalks and Walkways

We understand that the north and west sides of the development are planned to be landscaped **(Image 3)**. The addition of landscaping would reduce the wind activity when trees are in full foliage. To extend the landscaping benefit to the winter months, when the wind conditions are more severe, we encourage the design team to consider coniferous/evergreen landscaping where feasible, especially near the northern corners of the building. Additionally, wind screens may be considered near the northern corners and along the sidewalks to diffuse the energy of accelerated winds. Note that for vertical wind control elements to be effective, a minimum height of 2 m and a maximum porosity of 20-30% is required.

Other features for wind control around the northern corners of the building include installing deep canopies/trellises along the north facade of the building, preferably wrapping around the northeast corner.

Examples of the recommended wind control solutions are shown in **Image 11** for reference.

Image 11: Examples of Wind Control Measures near Building Corners

6. RECOMMENDATIONS

6.2 Entrances

To improve the windy conditions near the principal residential entrance, we recommend relocating the entrance to the middle of the east facade, where standing conditions are expected, if feasible. Alternatively, the design team may consider recessing the entrance from the main façade, similar to individual unit entrances along Agnes Street, to create a sheltered area. Wind screens and/or tall planters on the west side of the entrance are also potential alternatives.

For the main daycare entrance, we suggest re-locating it to the middle of the west façade, or installing a screens or planters on the west end of the entrance. Examples are shown in **Image 12** for reference.

Image 12: Examples of Wind Control Measures near Entrances

6.3 Play Area

We understand that landscaping is proposed along the west end of the play area (Image 3), which is a positive design consideration to reduce wind speeds, especially in the summer, when the area would be typically in use. We recommend considering tall and dense vegetation to diffuse the energy of accelerating winds. Alternatively, partitions and/ or screens can be considered in these areas **(see Image 13)**. Enclosing the west end of the play area will result in overall lower wind speeds in the entire space.

Image 13: Examples of Wind Control Measures Applicable to the West End of the Play Area

6. RECOMMENDATIONS

6.4 Upper-Level Areas

Level 8 Outdoor Amenity Area

We recommend the design team to locate seating areas under the trellises, where wind speeds would be lower. Additionally, it is recommended to consider vertical features (wind screens, partitions or landscaping) throughout the amenity spaces, especially on the west end of the west terrace and on the east and south ends of the east terrace. **Image 14** presents examples of the wind control features recommended.

Level 33 Outdoor Amenity Area

The design team may consider installing tall guardrail/parapet along the perimeter of Level 33 amenity area (minimum 2 m tall and no more than 30% open). Additionally, it is recommended to consider overhead features (canopies or arbors) and vertical features (wind screens, partitions or landscaping) throughout the amenity space, especially around any designated seating areas, to reduce wind exposure **(Image 14)**. If feasible, it is recommended to distribute the vertical features such that the roof level is divided into smaller zones. RWDI can work with the design team to develop specific wind control features as the programming evolves.

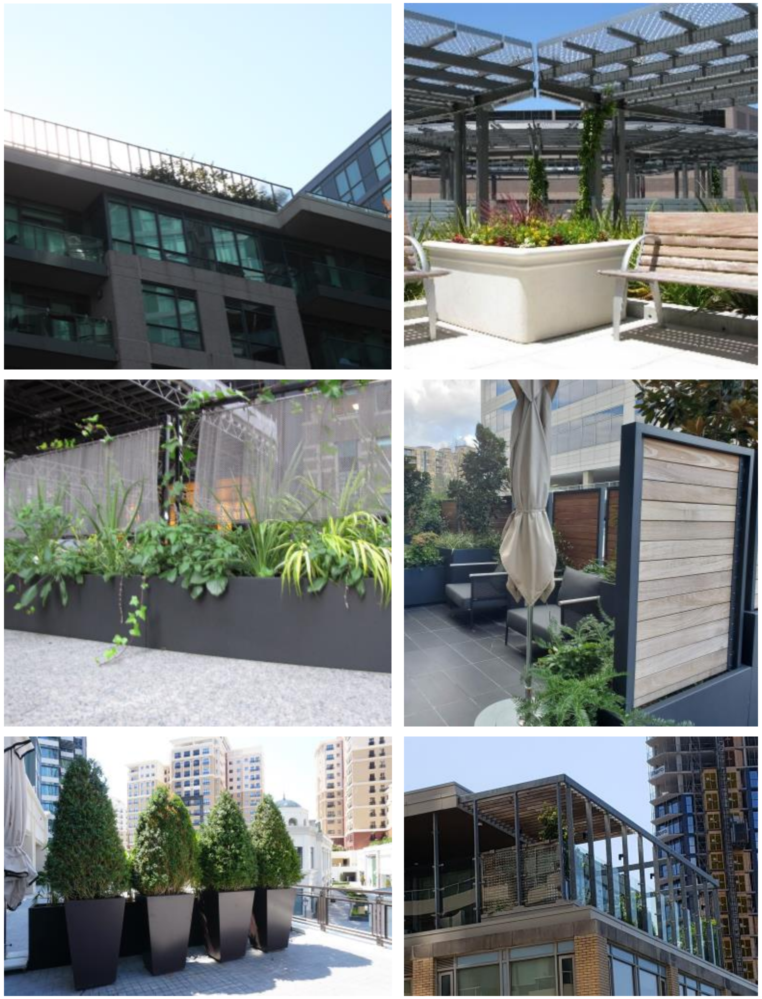


Image 14: Examples of Wind Control Measures Applicable to Upper-level Areas

7. IMPACT OF HERITAGE BUILDING

After the completion of the CFD simulations, RWDI received updated architectural drawings for the proposed project **(Image 15)**. The drawings show that the existing two-storey heritage building at the corner of Dundas Street and Cook Street will be retained and integrated into the southeast side of the seven-storey podium of the proposed building.

The retention of the existing heritage building is not expected to significantly impact the predicted wind conditions in Images 8 through 10. While the roof of the heritage building (which is not accessible by pedestrian) may experience slightly higher wind speeds, the building is expected to improve wind conditions at grade level as it would act like an additional podium to the proposed project.

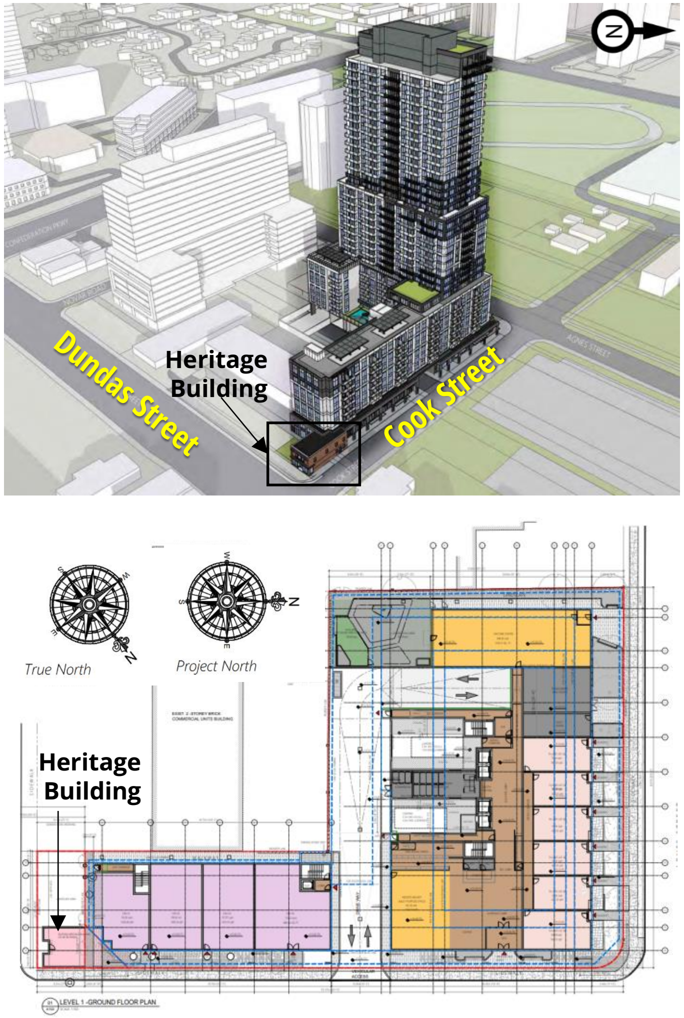


Image 15: Updated Rendering (Top) and Ground Floor Plan (Bottom) Received on June 13, 2025

8. SUMMARY

RWDI was retained to provide an assessment of the potential pedestrian level wind impact of the proposed project at 51-55 Dundas Street West and 60-78 Agnes Street in Mississauga, Ontario. Our assessment was based on computational modelling, simulation and analysis of wind conditions for the proposed development design, in conjunction with the local wind climate data and the City of Mississauga wind criteria for pedestrian comfort and safety. Our findings are summarized as follows:

- The existing wind conditions at most areas on and around the project site are comfortable for the intended usage and meet the pedestrian wind safety criterion. In the winter, localized uncomfortable wind speeds are expected near the northeast corners of the existing on-site buildings, and between the tall buildings northwest of the site.
- The addition of the proposed project is expected to increase wind speeds on the site, but wind conditions at most areas at ground level, such as most sidewalks, secondary entrances, and play area, are expected to be appropriate for the intended usage.
- Uncomfortable wind speeds and conditions that could potentially exceed the safety criterion are expected around the northern corners of the proposed building, where walkways and main entrances are proposed. Similar windy conditions are predicted around the northern corners of the adjacent existing building to the west.
- Wind speeds on the Level 2 outdoor amenity area are predicted to be appropriate for the intended use, year-round.
- Wind speeds on the Levels 8 and 33 outdoor amenity areas are expected to be higher than desired for passive usage at some locations. On Level 8 amenity areas, the pedestrian wind safety criterion might be exceeded on the west end of the west terrace and the south end of the east terrace.
- Wind control strategies are included in the report for the predicted windy areas for the design team consideration. We recommend confirming the wind conditions through wind tunnel testing so that the wind control solutions may be developed appropriately.
- The retention of the existing two-storey heritage building at the corner of Dundas Street and Cook Street is not expected to significantly alter the predicted wind conditions presented in the report.

9. DESIGN ASSUMPTIONS

The findings/recommendations in this report are based on the building geometry and architectural drawings communicated to RWDI in March and June 2025, 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)
Coordination Set_55 Dundas_2025-03-05	PDF	03/06/2025
55 Dundas St. 3D Model_ for Reference only_2025-03-18	Sketchup	03/18/2025
55 Dundas, 34 Storey Arch. Set_2025-06-12	PDF	06/13/2025

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.

10. STATEMENT OF LIMITATIONS

This report was prepared by Rowan Williams Davies & Irwin Inc. for Sajecki Planning 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.

11. REFERENCES

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.