

PARKING GARAGE - HURONTARIO AND BRONTE HOSPITAL

MISSISSAUGA, ON

PEDESTRIAN WIND ASSESSMENT

PROJECT #2105462

AUGUST 5, 2021



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 new Phase 1 parking garage to the southeast of the Trillium Health Partners – Mississauga Hospital in Mississauga, Ontario. This effort is intended to inform good design and has been conducted in support of the project’s application with the City of Mississauga.

The proposed project is located at the northwest side of Bronte College Court, to the southwest of Hurontario Street and southeast of the existing Trillium Health Partners – Mississauga Hospital (Image 1).

The site is currently an open parking lot, and the proposed project is an 8-storey parking structure that is 105.7 m in length and 55.5 m in width (Images 2 and 3). Existing surroundings around the project site include a hospital to the immediate northwest, mid-rise developments across Queensway West and Hurontario Street and low-rise residential in all other directions. Lake Ontario is located approximately 3.2 km to the southeast.



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



Image 2: Rendering of the Proposed Phase 1 Parking Garage

1. INTRODUCTION

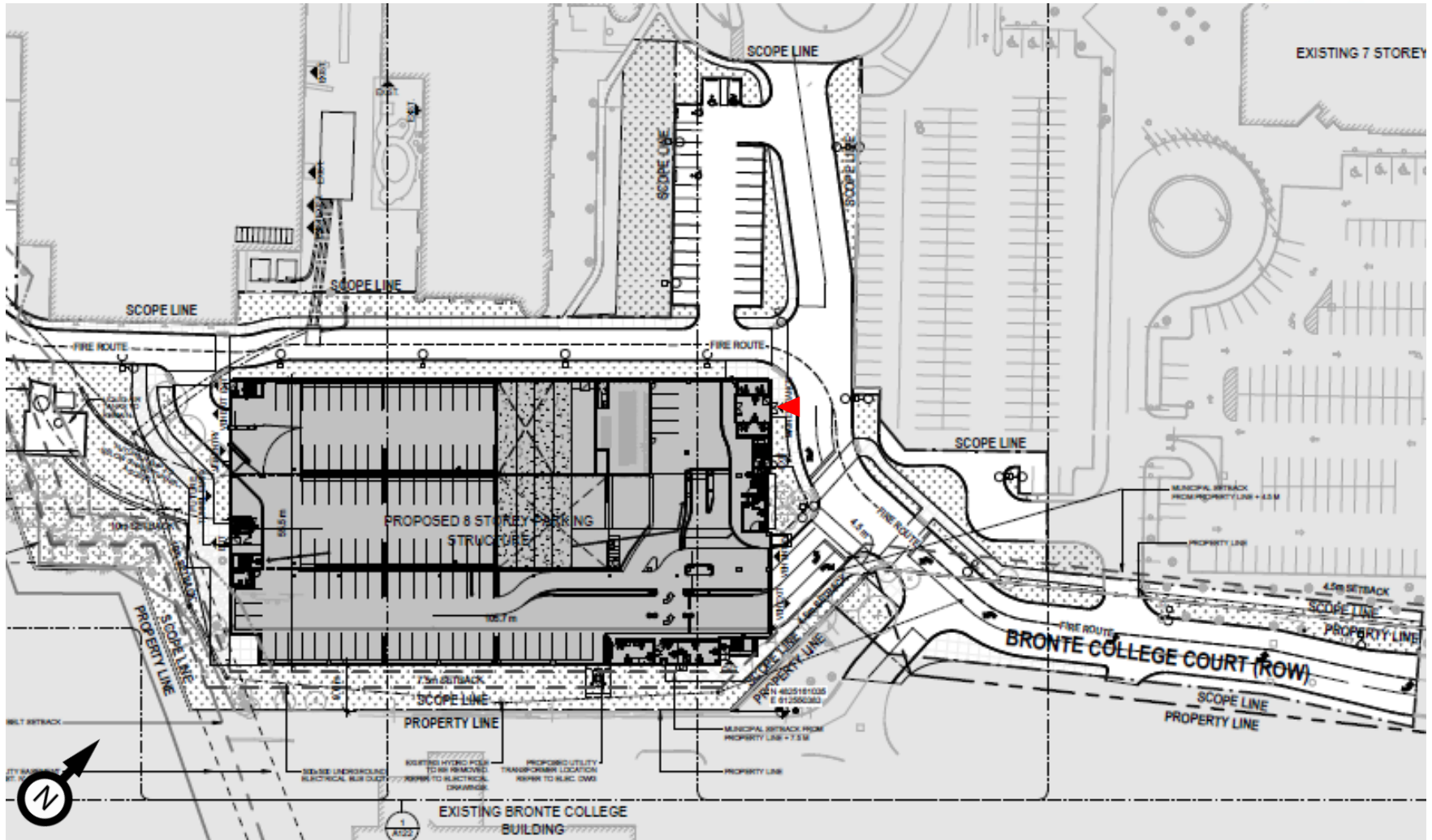


Image 3: Site Plan of Proposed Development

 MIAN ENTRANCE

2. METHODOLOGY



Predicting wind speeds and occurrence frequencies is complex. It involves the 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 July 16 and 27, 2021;
- A review of the regional long-term meteorological data from Toronto Pearson 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 Mississauga Area;
- RWDI's engineering judgement and knowledge of wind flows around buildings^{2, 3}; and,
- Mississauga 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.

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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 Toronto Pearson International Airport for the period from 1989 to 2019 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 in the wind roses in Image 4.

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

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 west-southwest through north-northwest and east directions potentially could be the source of uncomfortable or severe wind conditions, depending upon the site exposure and development design.

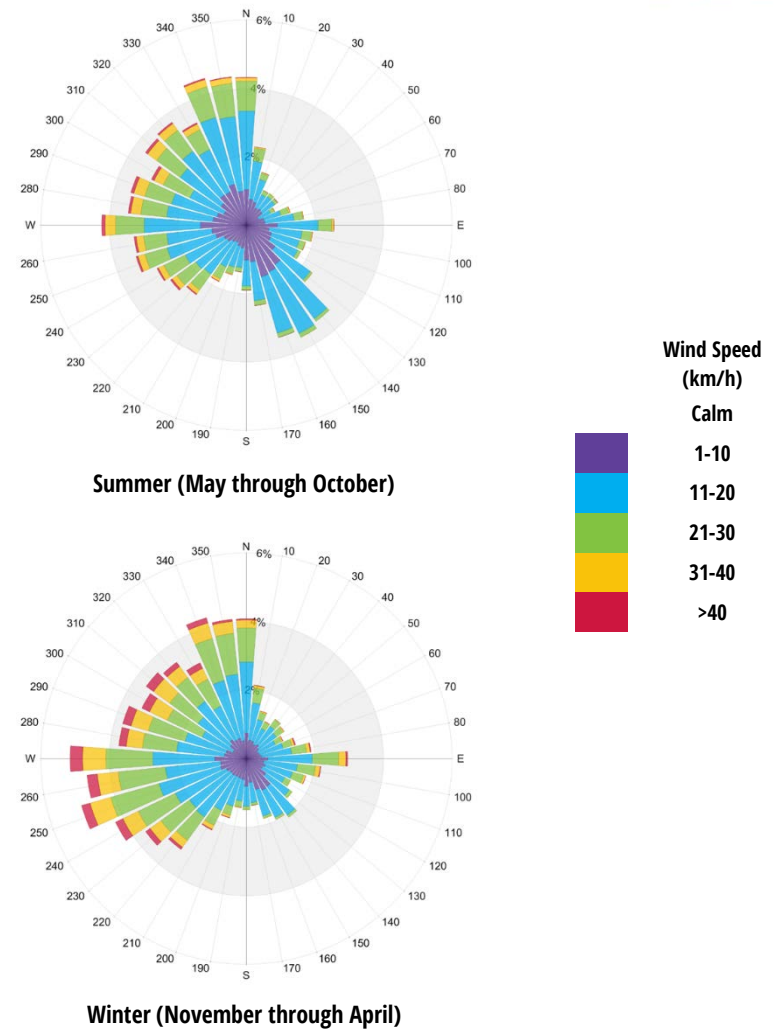


Image 4: Directional Distribution of Winds Approaching Toronto Pearson International Airport (1989 to 2019)

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 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 parking lots.

6. RESULTS AND DISCUSSION



6.1 Existing Scenario

The existing site and immediate surroundings are comprised of low to mid-rise buildings, open parking lots and the existing hospital to the northwest. On site, there are no significant structures that would deflect ambient winds to ground to cause adverse wind impacts. Currently, wind conditions on and around the existing open parking lot are considered comfortable for sitting or standing in the summer and for standing or walking in the winter.

Wind conditions exceeding the safety criterion are not expected.

6.2 Proposed Scenario

The proposed Phase 1 parking garage, at eight storeys, is comparable in height to the neighbourhood buildings to the northwest and southeast. In addition, the hospital to the northwest and buildings to the north will provide sheltering from the prevailing winds. As a result, the proposed project is not expected to significantly increase wind speeds in the extended surroundings.

It is possible that the southwesterly winds could channel between the proposed parking garage and the hospital to the northwest at grade level, resulting in accelerated wind speeds in this area.

The predicted wind comfort conditions are presented in Images 5a and 5b for the summer and winter seasons, respectively, together with the corresponding wind roses. The following sections provide a discussion of the potential wind conditions around the project.

6.2.1 Project Perimeter and Sidewalks

The impact of the proposed Phase 1 parking garage will be limited to the site and immediate surroundings due to its moderate height. Wind conditions around the garage perimeter and surrounding walkways will be suitable for the intended pedestrian use throughout the year, including sidewalks along Bronte College Court. Wind speeds are not predicted to exceed the safety criterion.

Wind conditions on and around the proposed development are generally expected to be comfortable for sitting or standing during the summer (Image 5a). In the winter, due to seasonally stronger winds, wind conditions are expected to be comfortable for standing or walking (Image 5b). These conditions are considered appropriate for the intended use of walkways and parking spaces.

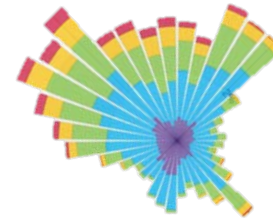
5. RESULTS AND DISCUSSION



Summer (May through October)

COMFORT CATEGORIES

- Sitting / Standing
 - Walking
 - Uncomfortable
 - Exceeds Safety Criterion
- ▶ MIAN ENTRANCE



Winter (November through April)

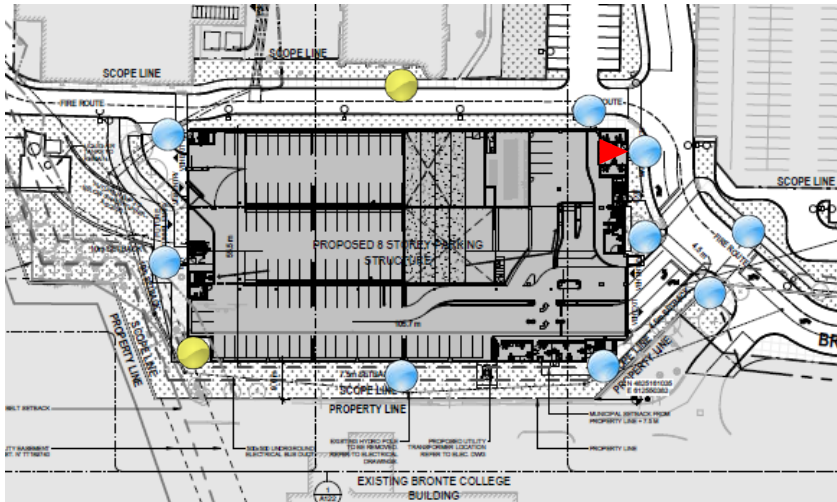


Image 5a: Predicted Wind Conditions - Summer

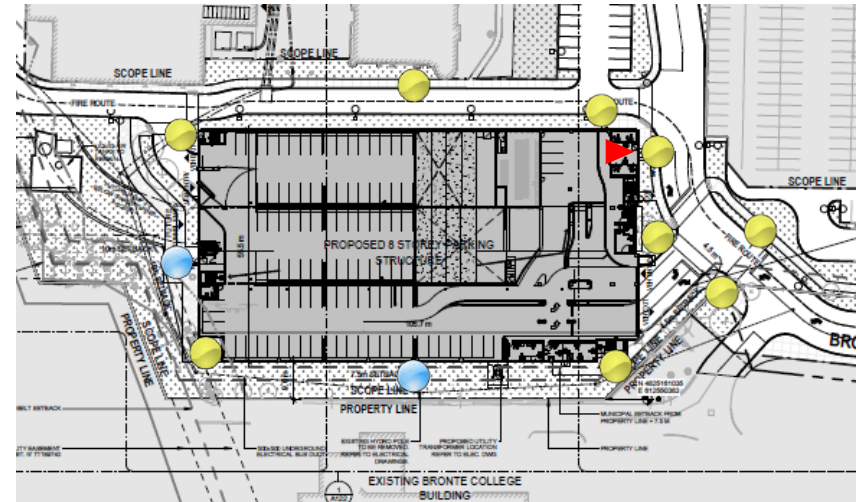


Image 5b: Predicted Wind Conditions - Winter

6. RESULTS AND DISCUSSION



6.2.2 Main Entrance

The main entrance is located near the north corner of the proposed parking garage, along the northeast façade (Images 2 and 5). Based on the information provided by the design team, there will be a canopy above the main entrance, which is a positive design feature that is expected to reduce the downwashing wind effect. In addition, the vestibule at the entrance will provide an area for pedestrian to take shelter on windy days.

Wind conditions at the entrance are expected to be comfortable for sitting or standing in the summer (Image 5a), and for walking during the winter as it's closer to the building corner (image 5b). Since this entrance is used as a transition point and pedestrians are not expected to linger for a long period of time like they would at an entrance to a building with a lobby, wind conditions at the main entrance are considered appropriate for the intended use throughout the year.

6.3 Future Scenario

It is our understanding that a future hospital expansion will be incorporated into the site of the existing hospital at a later date. Future conditions associated with that development, including impacts to the parking garage, that is the subject of this study, should be investigated throughout the design of that hospital.

7. SUMMARY



RWDI was retained to provide an assessment of the potential pedestrian level wind impact of the proposed Phase 1 parking garage to the southeast of the Trillium Health Partners – Mississauga Hospital in Mississauga in Mississauga, 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:

- The proposed Phase 1 parking garage is not expected to significantly impact wind speeds in the extended surroundings.
- In general, wind conditions on sidewalks and other public areas on and around the proposed project are expected to be comfortable for the intended pedestrian use throughout the year.
- The design incorporates a vestibule and a canopy above the main entrance, these are positive wind-responsive features that should be retained in the design.

8. APPLICABILITY OF RESULTS



The assessment presented in this report are for the proposed Phase 1 parking garage to the southeast of the Trillium Health Partners – Mississauga Hospital is based on the information listed in the table below. In the event of any significant changes to the design, construction or operation of the building or addition of surroundings in the future, RWDI could provide an assessment of their impact on the pedestrian wind conditions discussed in this report. It is the responsibility of others to contact RWDI to initiate this process.

File Name	File Type	Date Received (mm/dd/yyyy)
20210716 - Progress Set	PDF	07/16/2021
A120 - SITE PLAN OVERALL NEW CONSTRUCTION - INTERIM	PDF	07/27/2021