TORONTO

Pedestrian Level Wind Study
Template A for Complete Application Evaluation

1. General

A. Name of the Project: 50 Stephanie Street

B. Date: 2025.09.11

C. Address of Application: 50 Stephanie Street, Toronto, ON M5T 1B3

D. Name of Consultant: Kathryn Kim

E. Phone number and email of the Consultant: 647.475.1048 x2031 Kathryn.Kim@rwdi.com

2. Description

A. Short Description of the Project:

The project consists of an 11-storey apartment building that will be connected by a one-storey podium to the 24-storey existing apartment building to the south

B. Programme of the Application: OPA/ZBLA

C. Number of buildings for this Application: 1

3. (When required) Triggers

A. Location (Map 1):
◉ **Area 1** ○ Area 2

B1. Height in Metres: 41.4

B2. Height Triggers Classification (Table 1):
◉ **Low** ○ Moderate ○ High

C. Additional triggers:

D. Final Classification:
◉ **Low** ○ Moderate ○ High

4. Application Process

A. Application type:
○ OPA ○ ZBLA ◉ **Combined OPA/ZBLA** ○ SPA

B. Method of Wind Study for this Application:
○ CFD Phase 1 ◉ **CFD Phase 2** ○ WTS

*CFD: Computational Fluid Dynamics Software.
WTS: Wind Tunnel Study.

C. Was a CFD Phase 1 submitted at Pre-Application consultation? ○ Yes ◉ **No**

D. Were there any previous applications for this project? ○ Yes ◉ **No**

If Yes:

D.1 Date:

D.2 Type of previous application process:
○ Low ○ Moderate ○ High

D.3 Method of Wind Study for the previous Application: ○ CFD Phase 1 ○ CFD Phase 2 ○ WTS

D.4 Important findings in the previous Study:

4. Application Process – Continued

E. If this application is for a SPA, are there any design changes between the previous and current Application? ○ Yes ○ No ◉ Not Applicable

If Yes:

E.1 Describe the design changes between the previous and current application:

E.2 Do those changes qualify as significant: ○ Yes ○ No

If yes, is this a submission for a revised study? ○ Yes ○ No ○ Not Applicable

F. Did the urban designer approve the type of wind study assessment method/ the location of the sensors/vulnerable areas: ◉ Yes ○ No

G. If a CFD is used for the study, did you provide a 3D model: ◉ Yes ○ No

H. Please attach a diagram with heights of the buildings that were used for the context of the scenarios that were tested

5. Required Contents

A. Which scenarios have been tested:

☑ Existing ☑ Proposed ☐ Mitigation ☐ Phases

B. Is this a large project? ○ Yes ◉ No

C. Is this project with different stages? ○ Yes ◉ No

D. Main Areas of Interest:

Key areas of interest include building entrances, public sidewalks/walkways near the project site, as well as the outdoor amenity areas and parkland dedication.

E. Data Station Used:

Billy Bishop Toronto City Airport

6. Technical Information

A. Are you fully compliant with all of the technical specifications in the Terms of Reference and Guide:

◉ Yes ○ No

B. Are you fully compliant with the City criteria for comfort and safety? ◉ Yes ○ No

If not, please explain:

C. Is the consultant acknowledging that this method is appropriate for this study: ◉ Yes ○ No

6. Technical Information Continued

D. Is the consultant recommending a different method of study? ○ Yes ◉ No

If Yes:

D.1 Please explain:

7. General Comments

Declaration of Consultant

I Kathryn Kim

(Print name)

certify that I have examined the contents of the application, certify that the information submitted with it is accurate and concur with the submission of the application.

Date: 2025.09.11

Signature of Consultant:

50 STEPHANIE STREET

TORONTO, ONTARIO

PEDESTRIAN WIND ASSESSMENT

PROJECT #2409519

AUGUST 7, 2025

SUBMITTED TO

Neve Adams, MScPI
Planner
nadams@bousfields.ca
T: 416.947.9744 x230

Bousfields Inc.
3 Church Street
Suite 200
Toronto, Ontario M5E 1M2

SUBMITTED BY

Maryam Al Labbad, M.A.Sc., EIT
Technical Coordinator
Maryam.AlLabbad@rwdi.com

Saba Saneinejad, Ph.D.
Technical Director / Principal
Saba.Saneinejad@rwdi.com

Kathryn Kim, P.Eng.
Senior Project Manager
Kathryn.Kim@rwdi.com

RWDI
625 Queen Street West
Toronto, ON M5V 2B7
T: 647.475.1048 x2031

1. INTRODUCTION

Rowan Williams Davies & Irwin Inc. (RWDI) was retained to conduct a pedestrian wind assessment for the proposed project at 50 Stephanie Street in Toronto, Ontario. The objective of this assessment is to provide an evaluation of the potential wind impact of the proposed project in support of the Official Plan Amendment (OPA) and Zoning By-law Amendment (ZBA) application.

The site is located at the northeast corner of Stephanie Street and Beverley Street, approximately 150 m north of Queen Street West in Downtown Toronto (Image 1). The site is currently occupied by a 24-storey (162.9 m including the mechanical penthouse) rental apartment building situated on the southern portion of the site. The northern portion of the site, abutting Grange Park, is currently open space.

The project will consist of an 11-storey apartment building that will be connected by a one-storey podium to the 24-storey existing apartment building to the south (Image 2). Outdoor amenity areas are proposed to the west of the podium at grade, as well as on the podium rooftop between the proposed and existing buildings. Also, a parkland dedication is planned on the north side of the building (see Image 3).

Key areas of interest for this assessment include building entrances, public sidewalks/walkways near the project site, as well as the outdoor amenity areas and parkland dedication (Images 2 and 3).

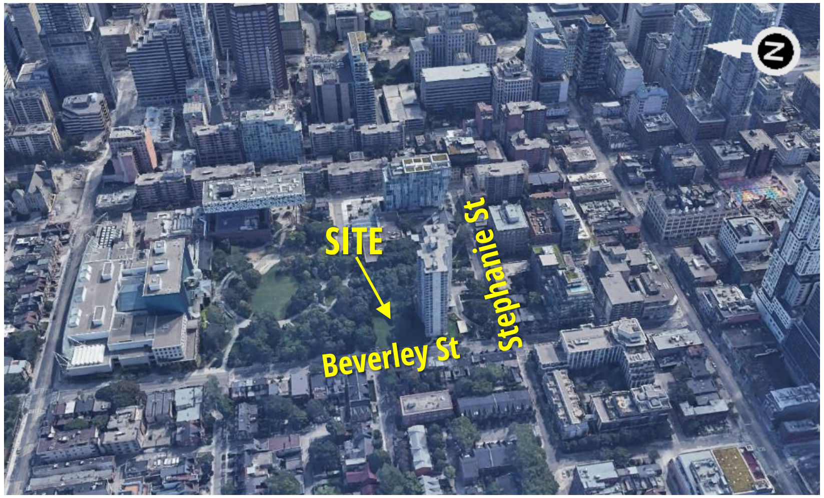


Image 1: Aerial View of the Existing Site and Surroundings
Source: Google Earth

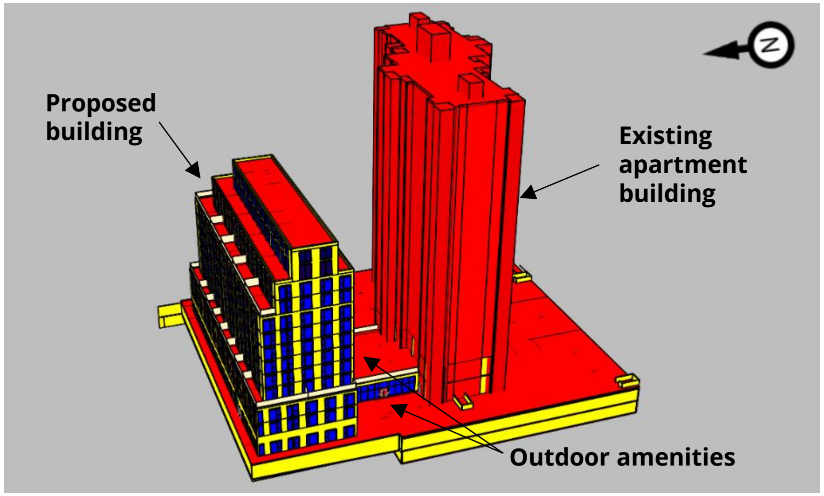
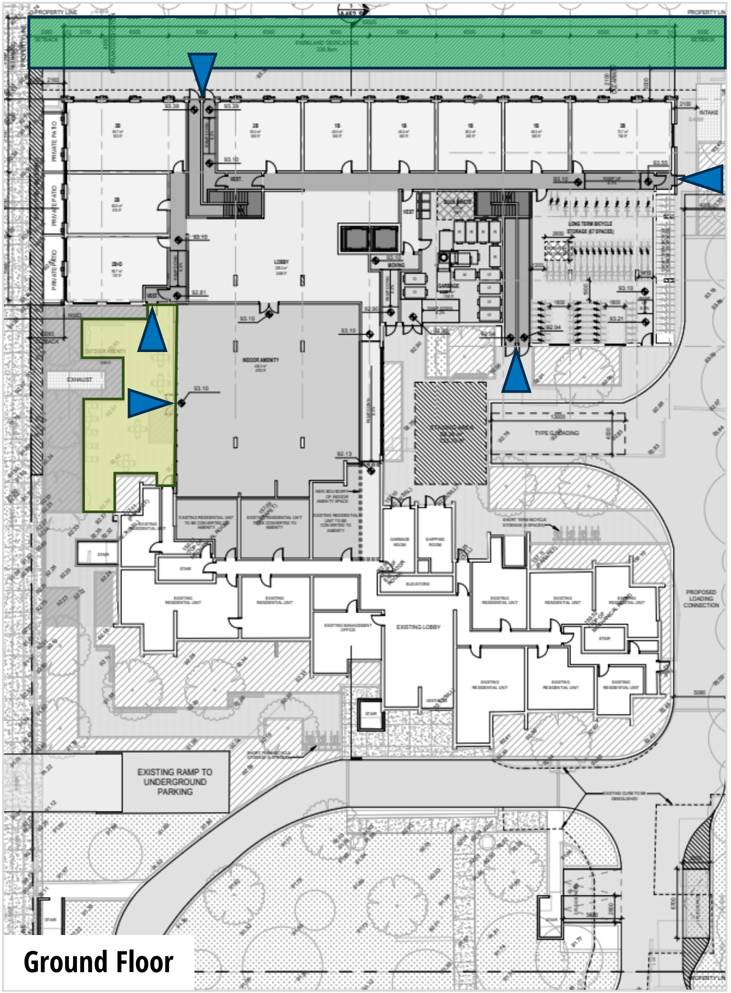
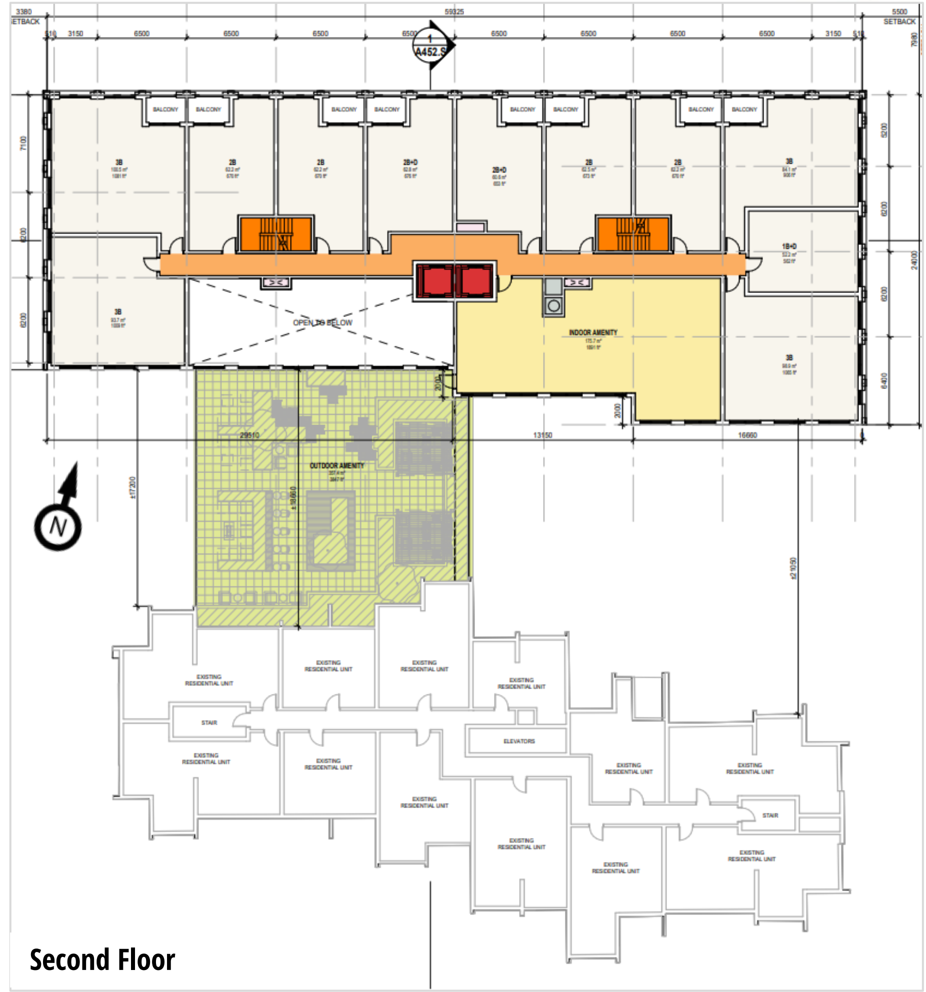


Image 2: 3D Model of the Proposed Project





ENTRANCE

OUTDOOR AMENITY AREA

PARKLAND DEDICATION

Image 3: Ground and Second Floor Plans of the Proposed Project

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 Billy Bishop Toronto City Airport;
- 3D model and updated architectural drawings of the proposed project received between June and July 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 criteria specified in the *Pedestrian Level Wind Study Terms of Reference Guide (June 2022)* prepared by the City of Toronto.

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 Billy Bishop Toronto City Airport to determine the wind speeds and frequencies in the simulated areas.

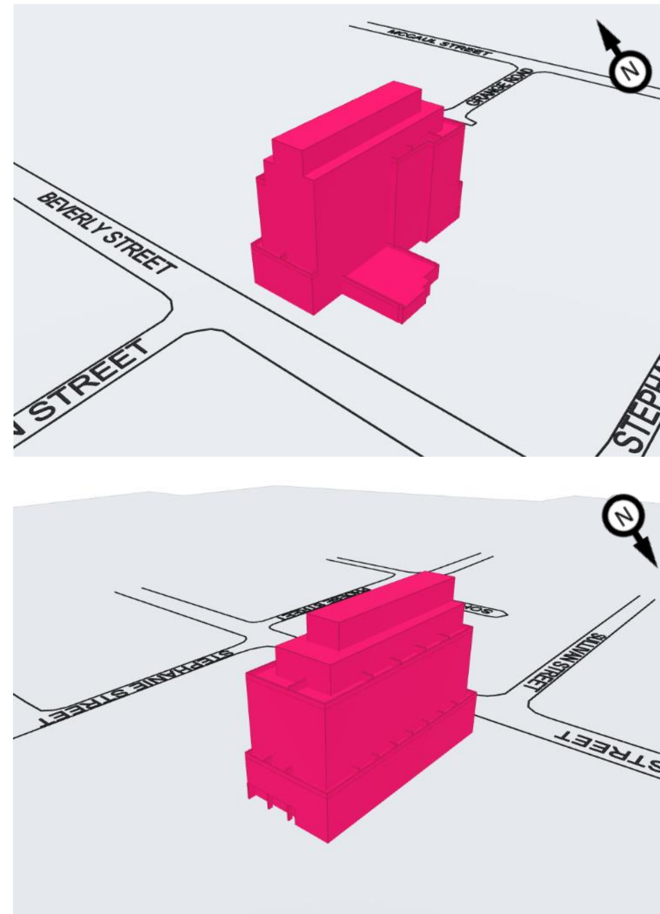


Image 4: Computer Model of the Proposed Project

2. METHODOLOGY

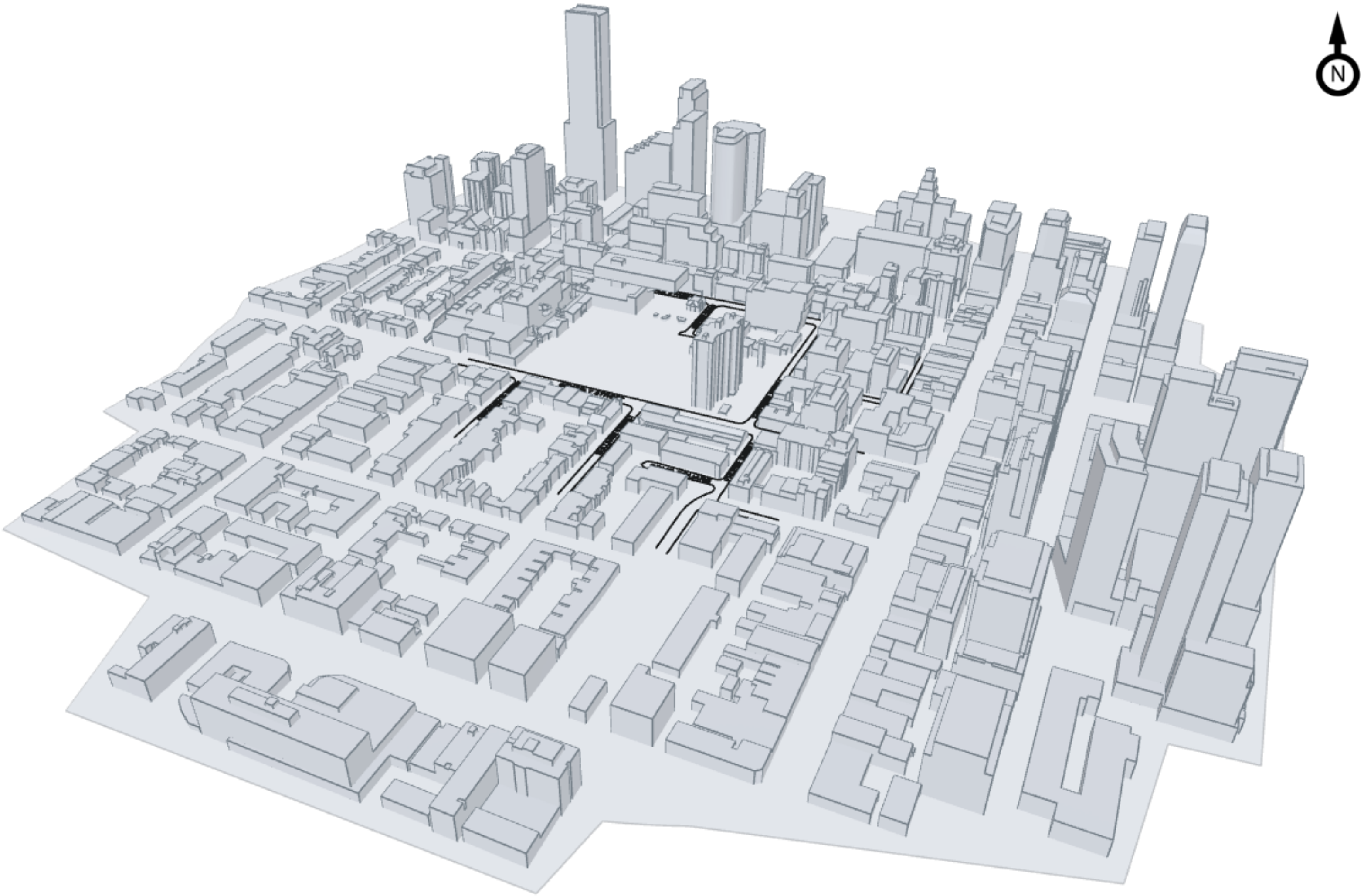


Image 5a: Computer Model of the Existing Site and Extended Surroundings

2. METHODOLOGY

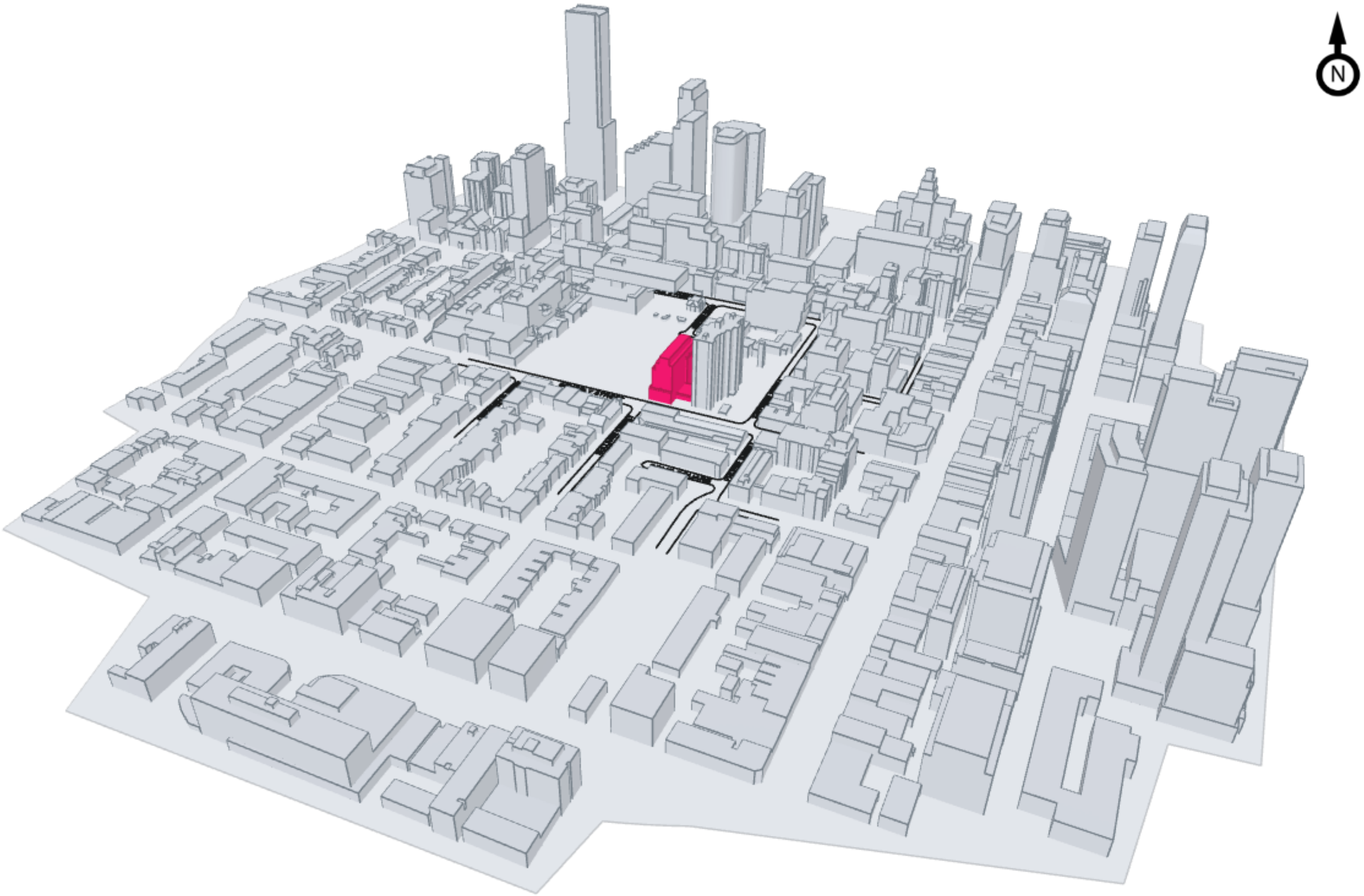


Image 5b: Computer Model of the Proposed Project and Existing Surroundings

3. METEOROLOGICAL DATA

Meteorological data from Billy Bishop Toronto City 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 four seasonal periods (as required by the City of Toronto) are presented in the wind-roses in Image 6.

Winds from the east-northeast are predominant throughout the year. During the spring, summer and fall, winds also occur from the southwest through northwest directions, with wind speeds being lowest in the summer. During the winter, strong winds are frequent from east-northeasterly and southwesterly to northwesterly directions. Strong winds of a speed greater than 30 km/h measured at the airport (red and yellow bands) occur most often in the winter, followed by spring, fall, and summer.

Wind statistics were combined with the simulated wind data to predict the full-scale wind conditions, which were then compared with the wind criteria.

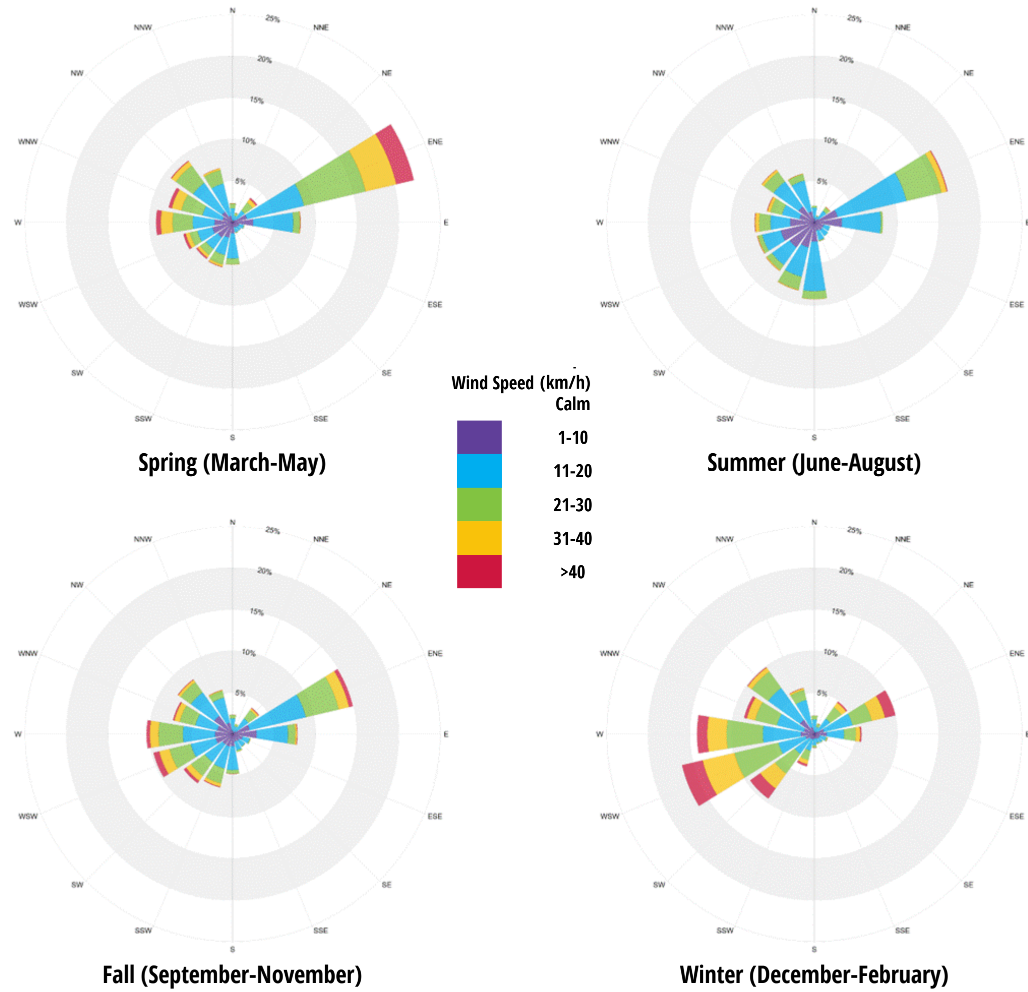


Image 6: Directional Distribution of Winds Approaching Billy Bishop Toronto City Airport (1994-2024)

4. WIND CRITERIA

The criteria specified in the *Pedestrian Level Wind Study Terms of Reference Guide (June 2022)* prepared by the City of Toronto are used in the current study and presented below. The criteria consider pedestrian comfort (pertaining to common wind speeds conducive to different levels of human activity) and safety (pertaining to infrequent but strong gusts that could affect a person's footing).

For the current development, wind speeds comfortable for walking are appropriate for sidewalks and walkways. Lower wind speeds comfortable for standing are required at building entrances and proposed parkland. Calm wind speeds suitable for sitting are desired on amenity areas, but higher wind speeds may be considered appropriate in the winter, when such areas will get little to no use in the severe cold climate in Toronto.

Comfort Category	Speed (km/h)	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

Safety Criterion	Gust (km/h)	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

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. Low roofs/podiums, canopies, and wind screens diffuse downwash and reduce the potential wind impact. These flow patterns are illustrated in Image 7.

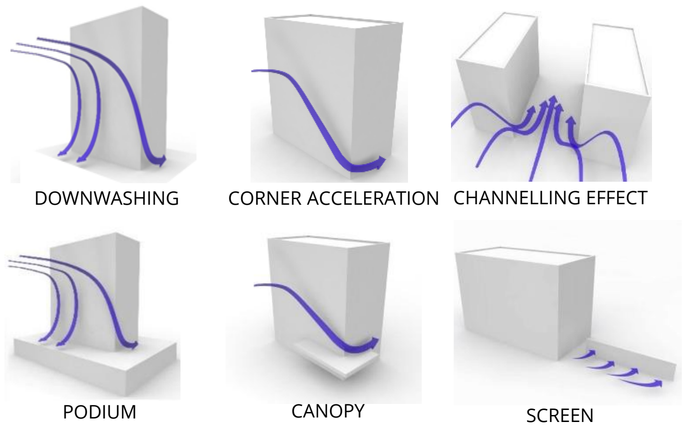


Image 7: General Wind Flow Patterns

5.2 Simulation Results

The predicted seasonal wind comfort conditions at grade level for the Existing and Proposed scenarios are presented in Images 8 and 9, respectively. Results for the second-floor outdoor amenity area are shown in Image 10. 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 in Toronto.

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.

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

https://app.orbitalstack.com/projects/3474/viewer/3411/configuration/9702/Viewer

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

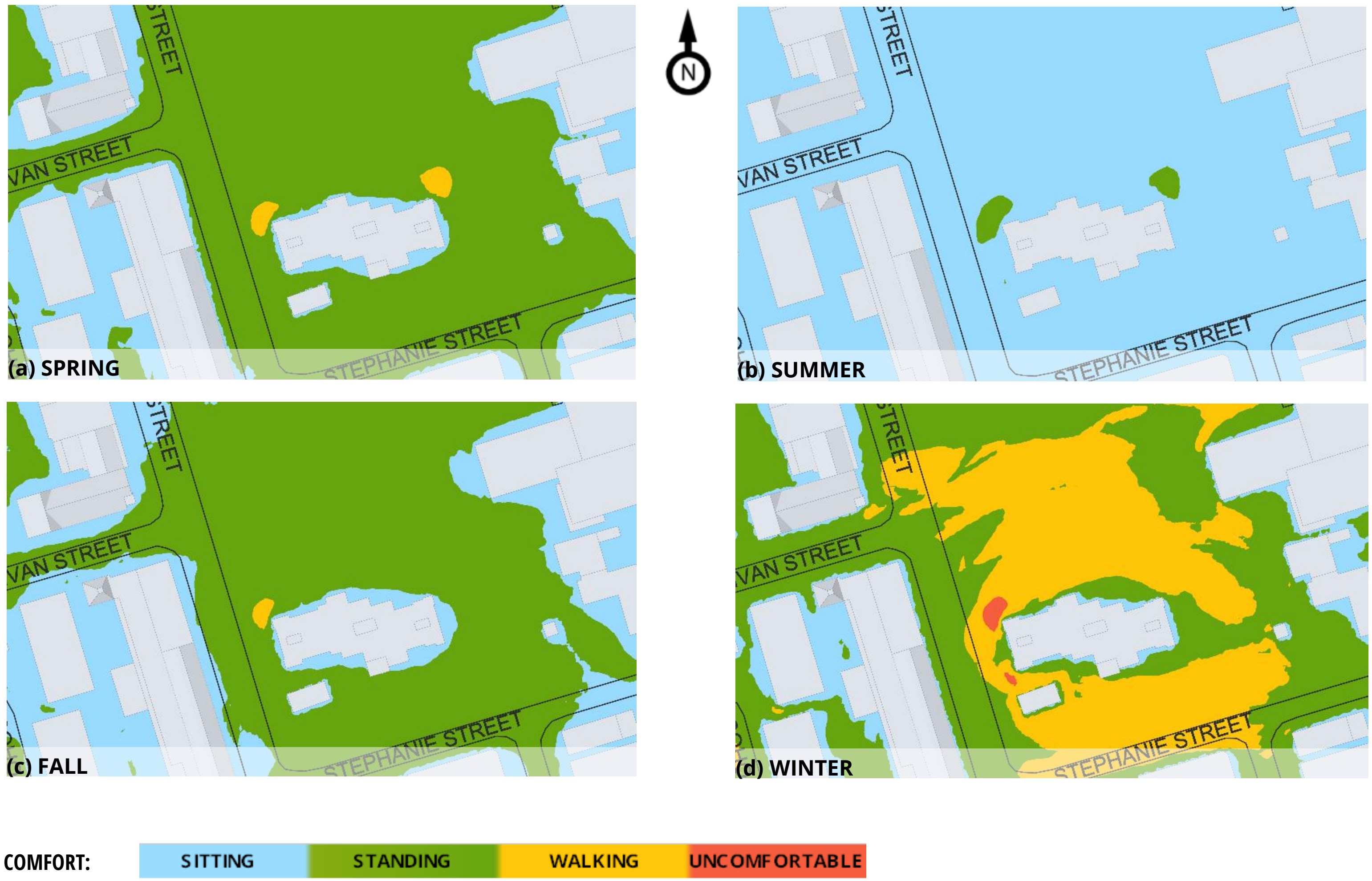


Image 8: Predicted Wind Conditions – GROUND LEVEL – EXISTING SCENARIO

5. RESULTS AND DISCUSSION

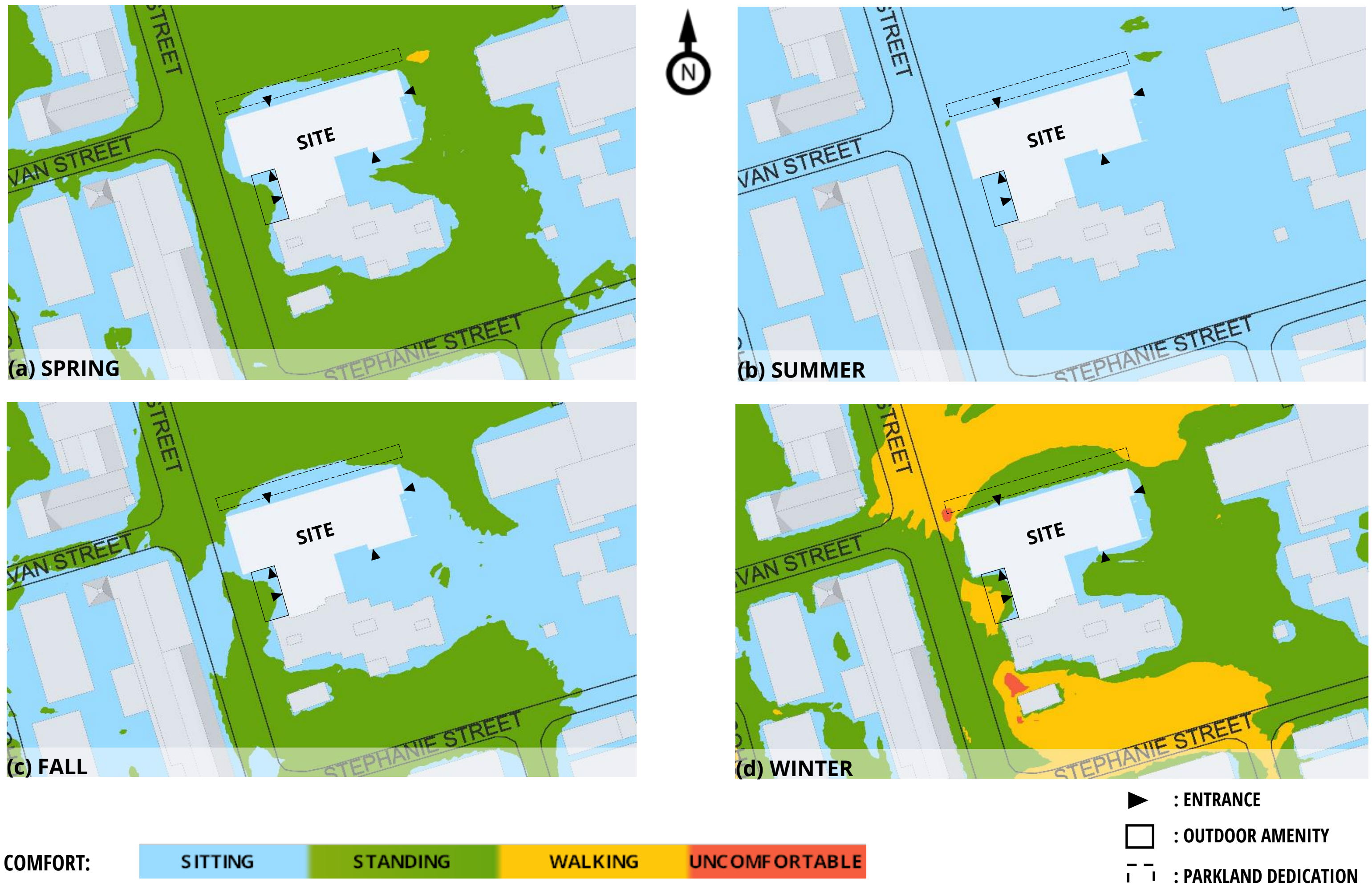


Image 9: Predicted Wind Conditions – GROUND LEVEL – PROPOSED SCENARIO

5. RESULTS AND DISCUSSION

Image 10: Predicted Wind Conditions – LEVEL 2 – PROPOSED SCENARIO

5. RESULTS AND DISCUSSION

5.3 Existing Scenario

The existing site is unoccupied, surrounded by a tall building immediately to the south, dense low- and mid-rise buildings to the north and west, and high rises to the east and south. Results for the Existing scenario are presented in Image 8. Wind conditions in most areas on and around the project site are comfortable for sitting during the summer (Image 8b), for sitting and standing during the spring and fall (Images 8a and 8c), and for standing and walking during the winter (Image 8d). These wind speeds are appropriate for the intended use.

In the winter only, uncomfortable wind conditions are expected around the western corners of the existing 24-storey apartment building to the south of the site. These conditions are due to the prevailing westerly winds downwashing off the west façade of the building and subsequently accelerating at grade around the corners.

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

5.4 Proposed Scenario

The proposed project, at 11-storeys, will be similar in height to, or shorter than, most of the existing buildings in the vicinity. Due to its limited height and nested location, the addition of the proposed building does not have a notable influence on wind conditions around it. The pedestrian wind safety criterion is expected to be met at all areas on and around the proposed project at and above grade.

5.4.1 Sidewalks and Walkways

With the addition of the proposed project, wind conditions around the site, including sidewalks and walkways, remain comfortable for sitting or standing in the spring, summer, and fall (Images 9a, 9b, and 9c), and for standing or walking during the winter (Image 9d). These wind speeds are appropriate for the intended active use of sidewalks and walkways. Positively, the addition of the proposed building is predicted to improve wind conditions around the existing apartment building to the south, including the uncomfortable wind speeds at the northwest corner.

However, during the winter, uncomfortable wind conditions are expected around the northwest corner of the proposed building. Since there is a pedestrian walkway and parkland planned near the northwest corner of the proposed building, we recommend that the design team include wind mitigation measures to reduce wind speeds. Porous wind screens (at least 2 m tall and no more than 20-30% porous), or coniferous landscaping placed at the northwest corner near the windy area can help to reduce the wind speeds to appropriate levels. Examples of the recommended wind control solutions are shown in Image 11 for reference.

5.4.2 Building Entrances

The building entrances are denoted by triangles in Images 3 and 9. The entrances are located away from exposed building corners; as such, appropriate wind speeds comfortable for sitting or standing are predicted near all entrances, year-round.

5.4.3 Parkland Dedication

A parkland dedication is proposed on the north side of the building. Overall wind conditions in the area are expected to be comfortable for sitting in the summer (Image 9b), for sitting or standing in spring and fall (Images 9a and 9c), and for standing in the winter (Image 9b). These conditions are appropriate for the intended use. However, the east and west ends of the parkland are predicted to have higher wind speeds in the winter, where conditions are expected to be comfortable for walking. Given the anticipated seasonal usage of the space, these speeds are considered acceptable.

Image 11: Examples of Wind Mitigation Features around Building Corner

5. RESULTS AND DISCUSSION

5.4.4 Ground Floor Amenity Area

The ground floor amenity area is located on the west side of the podium. In the summer (Image 9b), when the outdoor area will be used most often, wind speeds are comfortable for sitting, which is ideal for the intended use. In the spring and fall (Images 9a and 9c), calm wind speeds suitable for sitting are still predicted closer to the building façade, but slightly higher wind speeds comfortable for standing are anticipated at the central and west parts of the area. These conditions are generally appropriate. In the winter, wind speeds increase, and conditions that are comfortable for standing or walking are expected in the outdoor space, but this might be acceptable due to reduced usage of outdoor spaces during the colder months.

We recommend placing seating areas closer to the building façade, where wind conditions are calmer. Additionally, the design drawings show large trees along the western edge of the space, which, when in full foliage, reduce wind speeds in the amenity area. To maintain these wind-reducing benefits during colder months, we suggest incorporating evergreen landscaping.

5.4.5 Second Floor Amenity Area

The second floor amenity area is located on the rooftop of the connecting podium between the exiting apartment building and the proposed building.

Wind conditions at most areas are comfortable for sitting during the summer (Image 10b), for standing in the spring and fall (Images 10a and 10c), and for walking during the winter (Image 10d).

While the summer wind conditions are favourable for the intended use of the space, the conditions in the shoulder seasons are slightly higher than desired for passive usage, given the planned seating programming.

We recommend that the design team consider a taller parapet at both ends, with a minimum height of 2 m and no more than 30% openness. The design drawings show planters and trellises around the designated seating areas. These are positive features that should be retained in the final design. We recommend incorporating dense landscaping with the planters, and/or wind screens to diffuse the energy of winds channelling between the two buildings. Examples are shown in Image 12 for reference.

5. RESULTS AND DISCUSSION

Image 12: Design Strategies for Wind Control on the Second Floor Amenity Space

6. SUMMARY

RWDI was retained to provide an assessment of the potential pedestrian level wind impact of the proposed project at 50 Stephenie Street in Toronto, 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 wind criteria specified by the City of Toronto. Our findings are summarized as follows:

- The existing wind conditions on and around the project site are comfortable for the intended usage at most areas throughout the year and meet the pedestrian wind safety criterion. In the winter, uncomfortable wind speeds are expected around the western corners of the 24-storey existing apartment building to the south of the site.
- The addition of the proposed project is not expected to alter wind conditions around the site or neighbouring areas substantially. Positively, the project is predicted to improve wind conditions at most areas around the existing apartment building.
- Wind conditions around the project continue to be comfortable for the intended use at grade level, including the building entrances, sidewalks/walkways, and parkland dedication.
- Uncomfortable wind conditions are expected around the northwest corner of the proposed building during the winter only.
- Wind conditions on the ground and second floor outdoor amenity areas are generally appropriate for passive use, especially during the summer, when the areas will be used most often. Slightly higher wind speeds are expected in the shoulder seasons.
- Wind control strategies are included in the report for the design team consideration. RWDI can help guide the placement of wind control features to achieve appropriate levels of wind comfort based on the programming of the various outdoor spaces.

7. DESIGN ASSUMPTIONS

The findings/recommendations in this report are based on the building geometry and architectural drawings communicated to RWDI between June and July 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)
2025-06-26 - 50 Stephanie St - 3D	DWG	06/26/2025
2025-07-15 - 50 Stephanie St - ZBA Draft Drawings	PDF	07/16/2025

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. 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.

8. STATEMENT OF LIMITATIONS

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

9. 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.