REPORT

NEYAGAWA BLVD & 407

OAKVILLE, ONTARIO

PEDESTRIAN WIND COMFORT ASSESSMENT

PROJECT #2401167
June 19, 2025

SUBMITTED TO

Marc J. Pourvahidi
VP Business Development
marc@skypminc.com

Sky Property Group Inc.
1 Steeles Ave. E
Toronto, ON M2M 3Y2
T: 416.228.0000 x102

SUBMITTED BY

Eric L. Li, M.A.Sc., P.Eng.
Senior Engineer
Eric.Li@rwdi.com

Hanqing Wu, Ph.D.
Senior Technical Director / Principal
Hanqing.Wu@rwdi.com

Scott Bell, GSC
Project Manager
Scott.Bell@rwdi.com

RWDI
600 Southgate Drive
Guelph, ON N1G 4P6
T: 519.823.1311 x2426

1. INTRODUCTION

Rowan Williams Davies & Irwin Inc. (RWDI) was retained to conduct a pedestrian wind assessment for the proposed project located on the east side of Neyagawa Blvd between Hwy 407 and Burnhamthorpe Rd. **(Image 1)** in Oakville, Ontario. The objective of this assessment is to provide an evaluation of the potential wind impact of the proposed development in support of the OPA/DPoC/ZBA application to the Town of Oakville.

The project site is a 6.5-acre vacant plot surrounded by mostly farmland and roadways, with a low-rise neighborhood to the south, at the southwest corner of the Neyagawa/Burnhamthorpe intersection.

We understand that the proposed project is a mixed-use development comprising 5 residential towers ("A" to "E") of 18-storeys in height **(Images 2 and 3)**. Block 1 of the development includes a podium along with Towers "A" to "C", and Block 2 comprises a second podium joining Towers "D" and "E" (Images 2 and 4).

The assessment has been completed based on a full build-out of the proposed development with the existing surroundings, but without any future developments. Key areas of interest for this assessment include main residential and retail entrances, sidewalks, walkways, and parking areas within and around the development **(Image 4)**, along with outdoor amenity areas at grade and atop both podiums **(Images 4 and 5)**.

Image 1: Aerial view of the existing site and surroundings
Source: Google Maps

1. INTRODUCTION

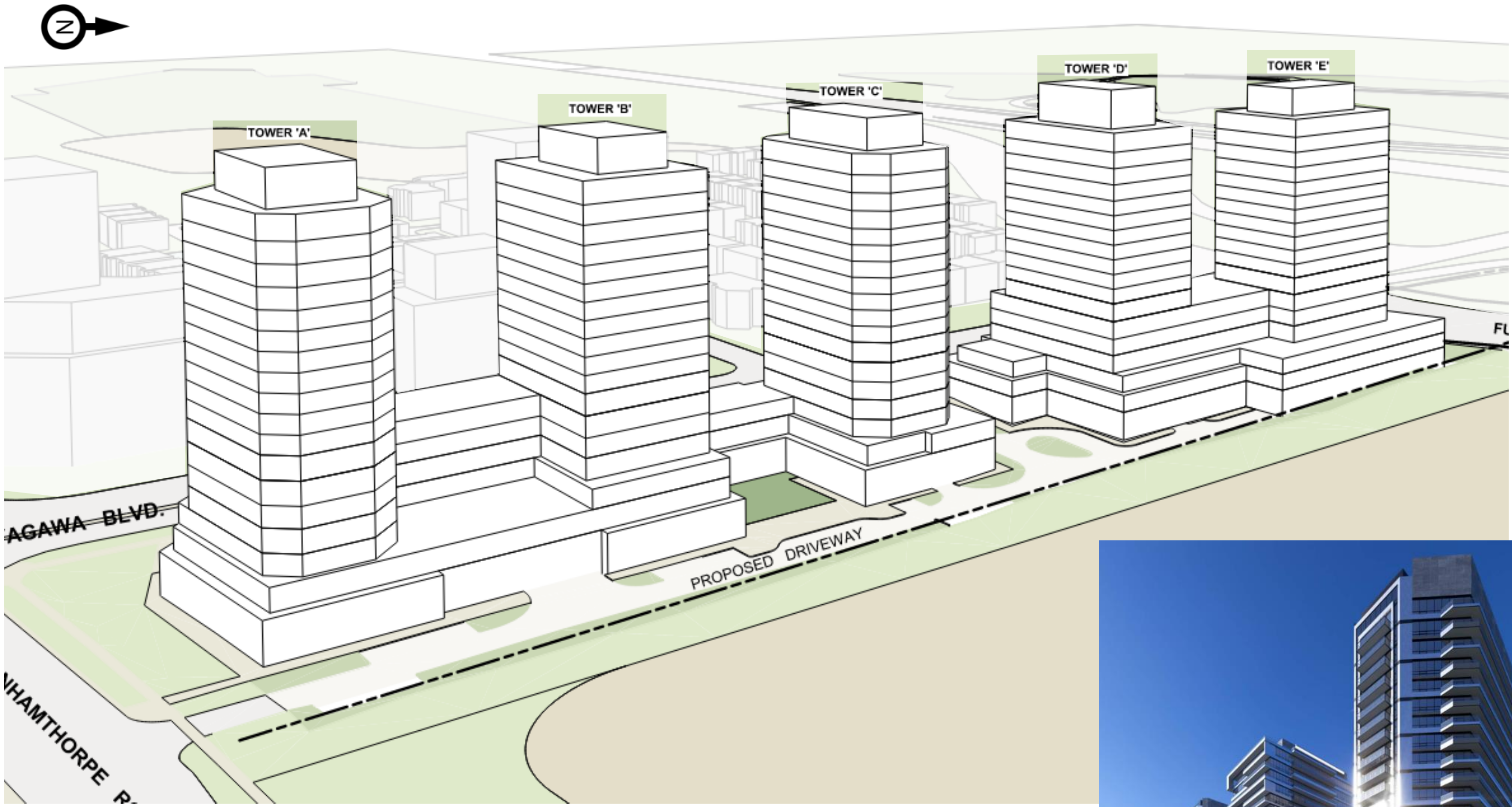


Image 2: Proposed massing of the project

Image 3: Rendering of the proposed development

1. INTRODUCTION

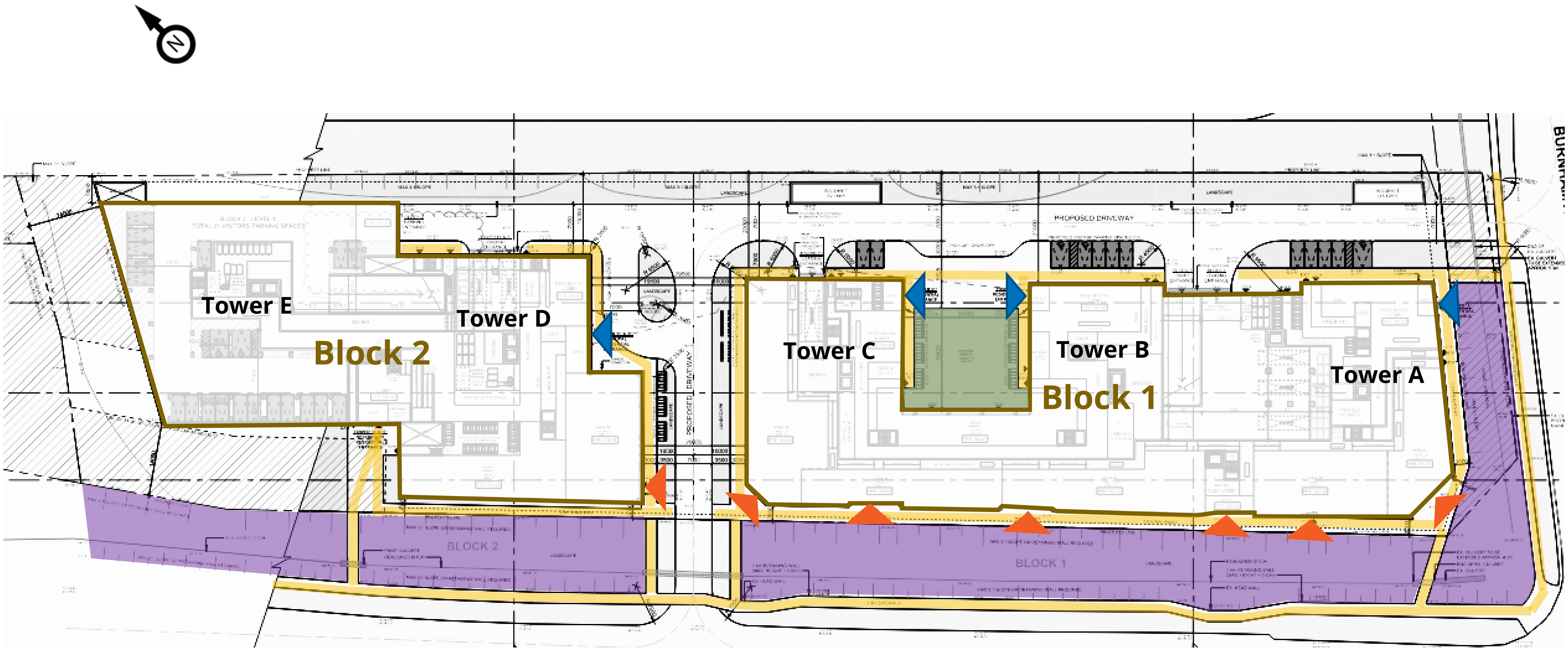


Image 4: L1 plan of the proposed project showing walkways, entrances, parking, and amenity areas

1. INTRODUCTION

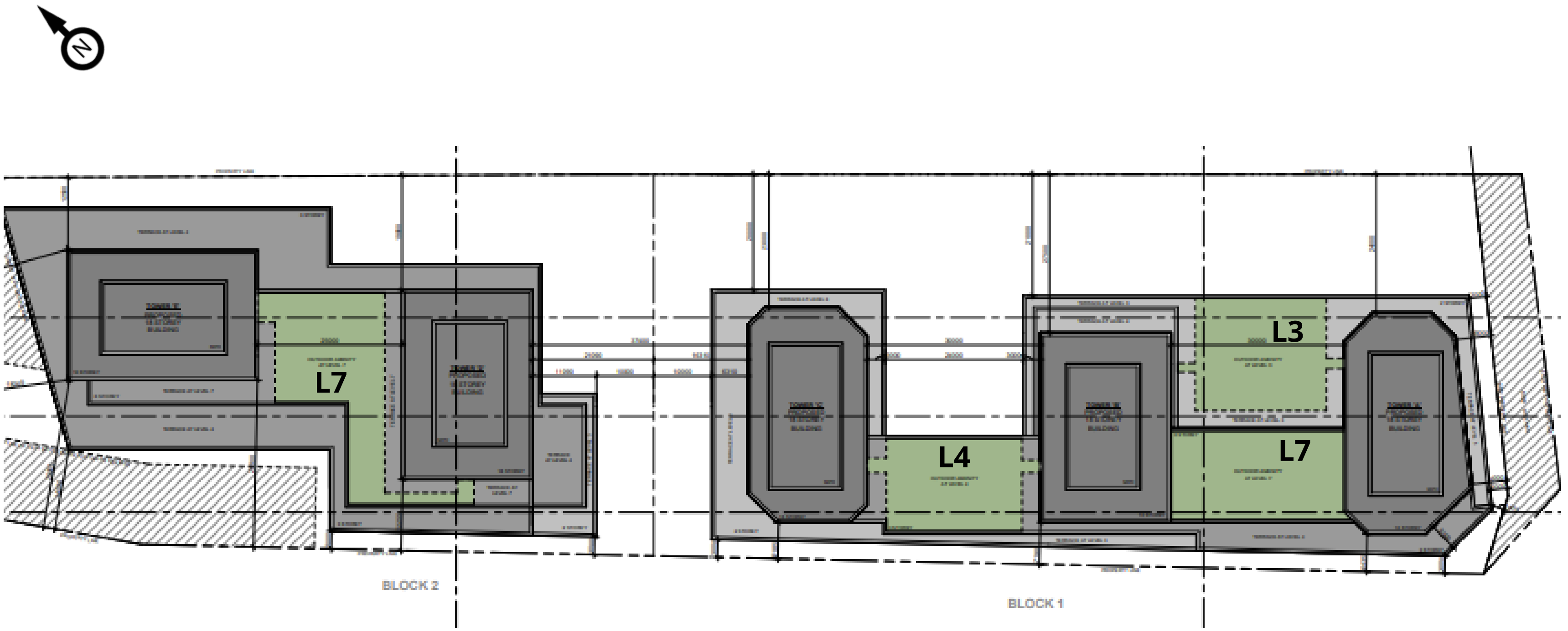


Image 5: Roof plan of the proposed project showing amenity areas atop the podiums

2. METHODOLOGY

2.1 Objective

The objective of this assessment is to provide an evaluation of the potential wind 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 of the proposed project received on June 3, 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 RWDI 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 existing site and the proposed development are shown in **Image 6**, and the proposed development with the surroundings is shown in **Image 7**. 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 1.5m 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.

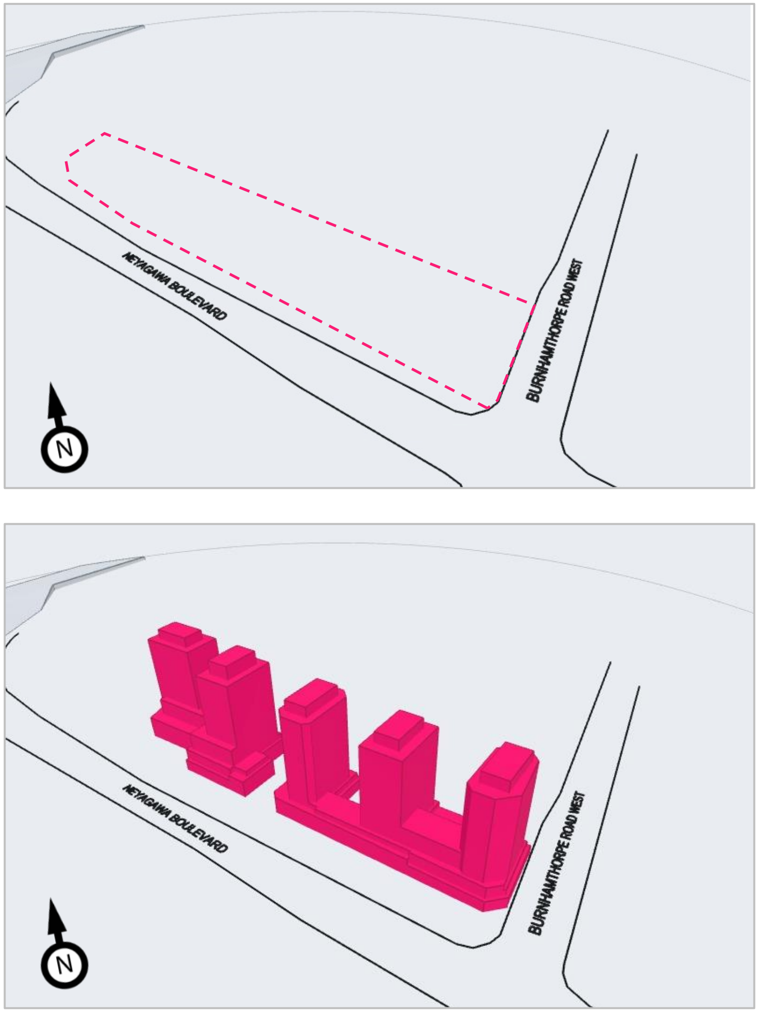


Image 6: Computer model of the existing site (top) and proposed project (bottom)

2. METHODOLOGY

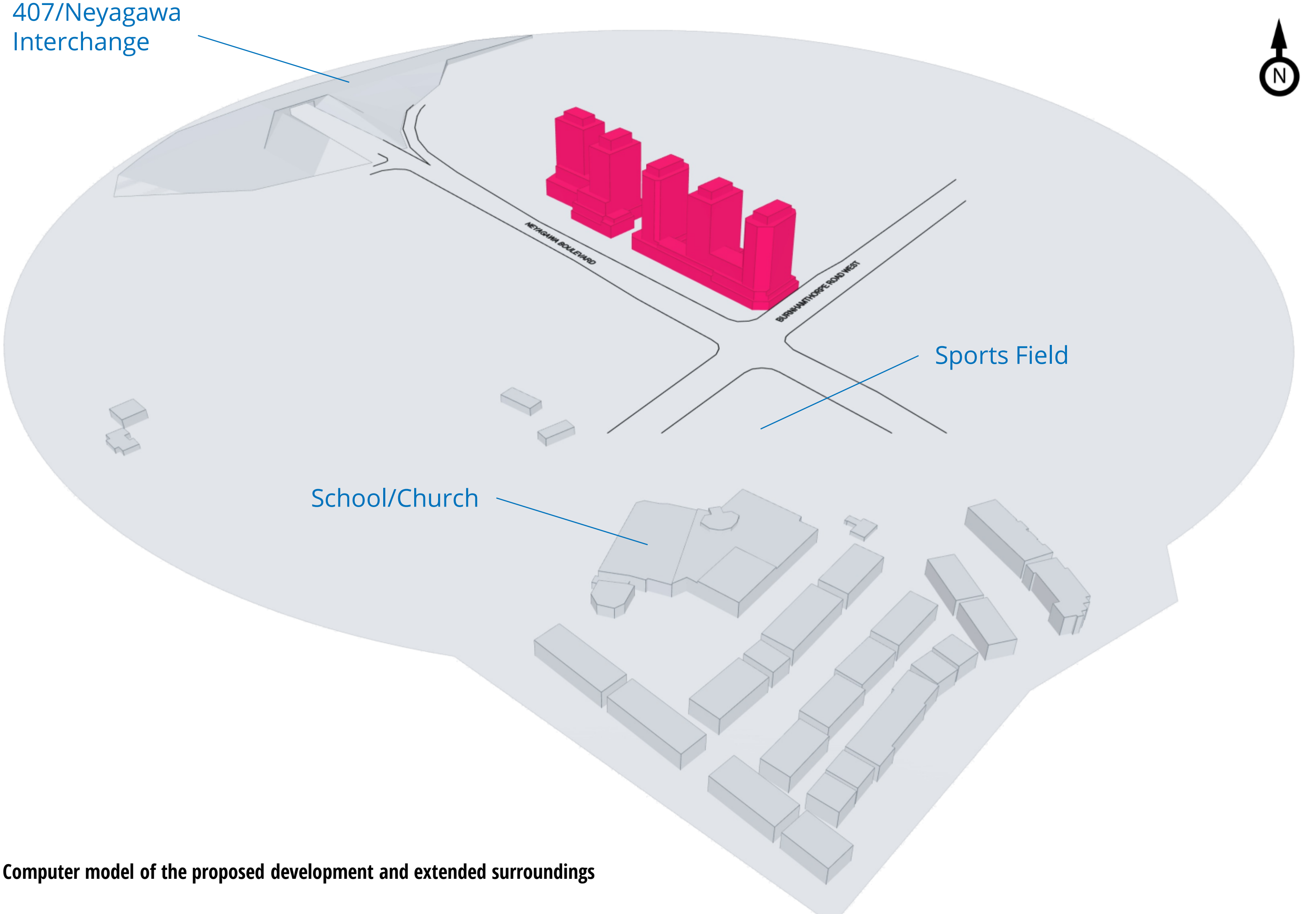


Image 7: Computer model of the proposed development and extended surroundings

2. METHODOLOGY

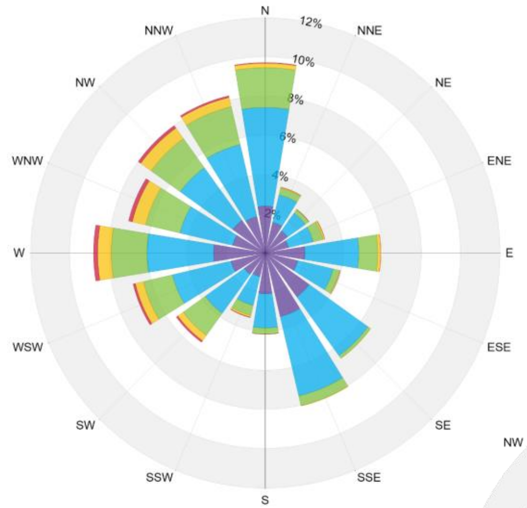
2.4 Meteorological Data

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 8** graphically depicts the directional distributions of wind frequencies and speeds for these periods.

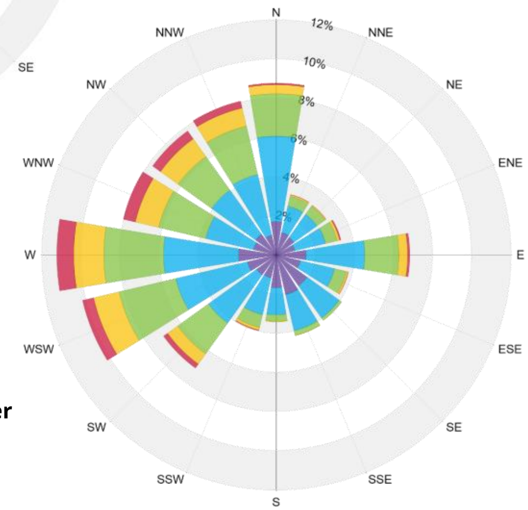
In the summer, winds from the southwest through north are predominant, with winds also approaching from the south-southeast, southeast, and east directions. In the winter, winds from the southwest through north and northwest are more frequent in addition to winds from the easterly directions.

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 8). 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.



Summer
(May through October)



Winter
(November through April)

Wind Speed (km/h)	Probability (%) Summer	Winter
Calm	4.1	2.8
1-10	31.3	22.9
11-20	43.4	39.9
21-30	16.3	22.7
31-40	4.0	8.3
>40	0.9	3.4

Image 8: Directional distribution of wind approaching Toronto Pearson International Airport (1994 to 2024)

3. WIND CRITERIA

The RWDI pedestrian wind criteria are used in the current study; the criteria presented in the table below, addresses pedestrian safety and comfort. 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.

3.1 Pedestrian Comfort

Pedestrian comfort is associated with common wind speeds conducive to different levels of human activity. Wind conditions are considered suitable for sitting, standing, strolling or walking if the associated mean wind speeds (see table) are expected for at least four out of five days (80% of the time). The assessment considers winds occurring between 6 AM and midnight. Limited usage of outdoor spaces is anticipated in the excluded period. Speeds that exceed the criterion for Walking are categorized Uncomfortable. 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.

Comfort Category	GEM Speed (km/h)	Description (Based on seasonal compliance of 80%)
Sitting	≤ 10	Calm or light breezes desired for outdoor seating areas where one can read a paper without having it blown away
Standing	≤ 14	Gentle breezes suitable for main building entrances, bus stops, and other places where pedestrians may linger
Strolling	≤ 17	Moderate winds appropriate for window shopping and strolling along a downtown street, plaza or park
Walking	≤ 20	Relatively high speeds that can be tolerated if one's objective is to walk, run or cycle without lingering
Uncomfortable	> 20	Strong winds considered a nuisance for all pedestrian activities. Wind mitigation is typically recommended

3.2 Pedestrian Safety

Pedestrian safety is associated with excessive Gust Speeds that can adversely affect a person's balance and footing. These are usually infrequent events but deserve special attention due to the potential impact on pedestrian safety.

Safety Criterion	Gust Speed (km/h)	Description (Based on annual exceedance of 9 hrs or 0.1% of time)
Exceeded	> 90	Excessive gusts that can adversely affect one's balance and footing. Wind mitigation is typically required

4. RESULTS AND DISCUSSION

4.1 Wind Flow around Buildings

Wind generally tends to flow over buildings of uniform height, without disruption and accelerate in large open areas. Buildings that are taller than the surroundings intercept and redirect winds around them. Wind is directed down the height of the building (*Downwashing)*, and the flow subsequently moves around windward building corners, causing a localized increase in wind activity (*Corner Acceleration)*. Wind also accelerates through the relatively narrow space between tall buildings (*Channelling Effect)*. Large horizontal platforms like podium roofs and low roofs of adjacent buildings disrupt downwash and reduce the potential wind impact on the ground level. These flow patterns are illustrated in **Image 9**.

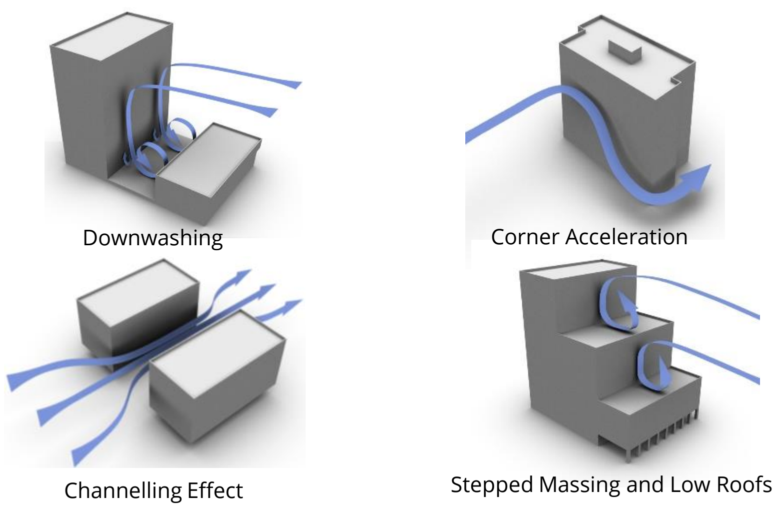


Image 9: General wind flow mechanisms

4.2 Presentation of Results

The results of the assessment are presented and discussed in detail in Sections 4.3 and 4.4. **Images 10 and 11** show the predicted seasonal wind conditions at grade for the Existing and Proposed configurations. **Images 12 and 13** are enlarged views of the Proposed configuration in Images 10 and 11, respectively, to highlight additional details. **Image 14** shows the predicted seasonal wind conditions at the proposed outdoor amenity areas. The graphical presentation is in the form of colour contours of wind speeds calculated based on the wind comfort criteria (Section 3.1), approximately 1.5 m above the concerned levels. The assessment against the safety criterion (Section 3.2) was conducted qualitatively based on the predicted wind conditions and our extensive experience with wind tunnel assessments. The discussion also includes recommendations for wind control, where necessary, to reduce the potential for high wind speeds for the design team's consideration.

Target Conditions

For the current development, wind speeds comfortable for walking or strolling are appropriate for sidewalks, walkways and parking areas where pedestrians are likely to be active and moving intentionally. Lower wind speeds comfortable for standing are required for entrances and areas where people are expected to be engaged in passive activities. Calm wind speeds suitable for sitting are desired in areas where prolonged periods of passive activities are anticipated, such as outdoor amenity areas, seating areas etc., especially during the summer when these areas are typically in use.

4. RESULTS AND DISCUSSION

4.3 Existing Scenario

The existing site is an open field. The only nearfield buildings are low-rise residentials with a single-storey school/church building and sports field, located in the diagonally opposite corner of the Neyagawa/Burnhamthorpe intersection, and the Hwy-407/Neyagawa interchange to the northwest. Beyond these developments are significant stretches of open fields and forested land. As such, the site is exposed to the predominant winds. Wind conditions in all areas of the existing site are considered comfortable for walking in the summer (yellow regions in Image 10a) and uncomfortable in the winter (orange regions in Image 11a). Since there are no high-rise buildings or structures to cause wind accelerations or gusts, wind conditions at all areas near the project site are expected to meet the safety criterion.

4.4 Proposed Scenario

The proposed project includes towers that would be substantially taller than the existing built context. These towers would be exposed to the predominant winds and create the flows described in Section 4.1. Overall, the conditions on the site would be largely governed by the ambient existing wind microclimate as well as the height and exposure of the proposed buildings. Potential wind impacts are expected to be moderated to some extent by positive built form design elements such as the proposed stepped podiums. The addition of the development will also positively disrupt the preexisting open and uninterrupted wind flow through the site and reduce wind speeds in areas immediately around the site. Overall, wind conditions around the site are expected to be comfortable for strolling (green in **Image 10b**) in the summer and walking in the winter (yellow in **Image 11b**).

4.4.1. Entrances (STANDING)

All main residential entrances are predicted to be comfortable for standing or strolling in the summer (light blue and green in **Image 12**). In the winter, these entrances are predicted to be comfortable for strolling or walking (green and yellow in **Image 13**). These conditions are worse than desired for entrance areas, necessitating interventions to improve comfort levels.

Retail entrances at or near the podium corners are predicted to be comfortable for strolling or walking in the summer (green and yellow in **Image 12**), and uncomfortable in the winter (orange in **Image 13**). These conditions are worse than desired for patron comfort and require interventions for improvement.

The remainder of the commercial entrances are predicted to be comfortable for sitting or standing in the summer, and standing in the winter, which are acceptable conditions for their use.

4.4.2. Sidewalks, Walkways, and Parking Areas

Along the sidewalks and walkways, and in the parking areas, conditions are generally predicted to be comfortable for standing, strolling or walking in the summer, comfortable for walking or uncomfortable in the winter.

Higher wind activity is expected around some corners of and along the access road between both podium buildings – conditions in these areas are expected to be uncomfortable in the summer and winter. They may exceed the safety criterion.

4.4.3. Amenity Area (Grade Level)

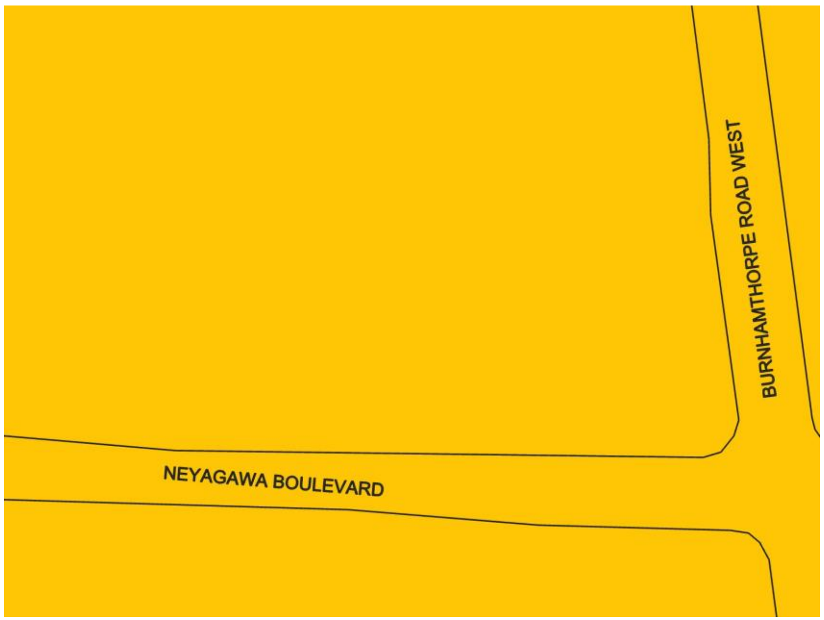
The amenity area located between Towers B and C at grade are predicted to be suitable for standing, strolling or walking in the summer (light blue, green, and yellow in **Image 12**). Winds are likely too fast and will need to be slowed to produce conditions suitable for passive activities typical of these spaces.

In the winter, most of the area is predicted to be comfortable for strolling or walking (green and yellow in **Image 13**), with the remaining areas uncomfortable (orange in **Image 13**). Regardless of the wind conditions, this space is likely too cold to use in the winter season.

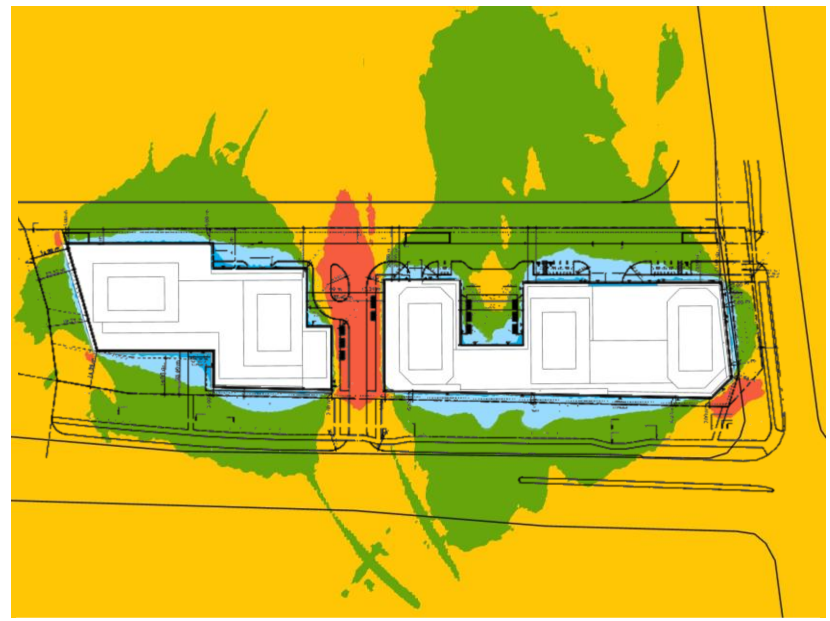
4.4.4. Amenity Area (L3, L4, L7)

The amenity area atop the podium on L3 is predicted to be comfortable for strolling in the summer and for walking in the winter (green in **Image 14a**, yellow in **Image 14b**). The amenity areas on L4 and L7 are predicted to be uncomfortable in the summer and winter (orange in Image 14).

4. RESULTS AND DISCUSSION



(a) Existing scenario – summer

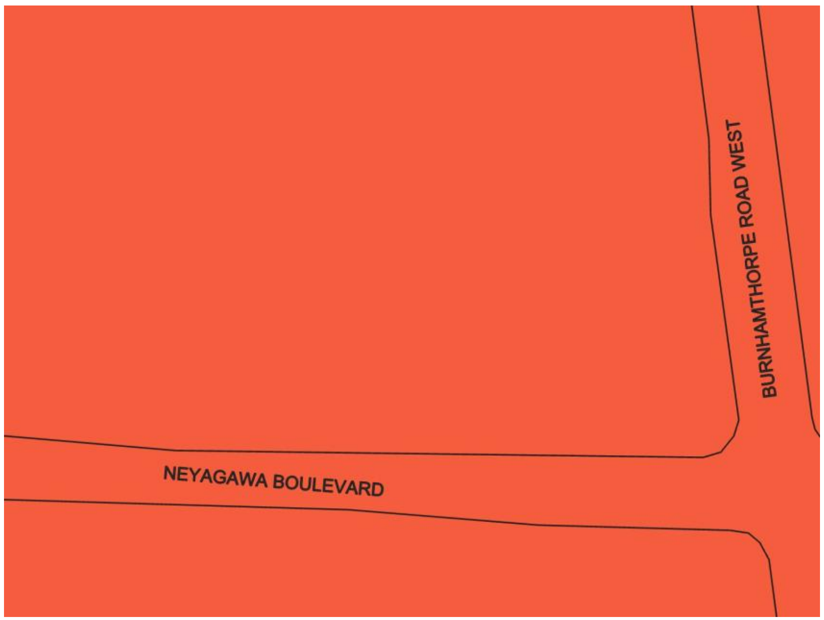


(b) Proposed scenario – summer

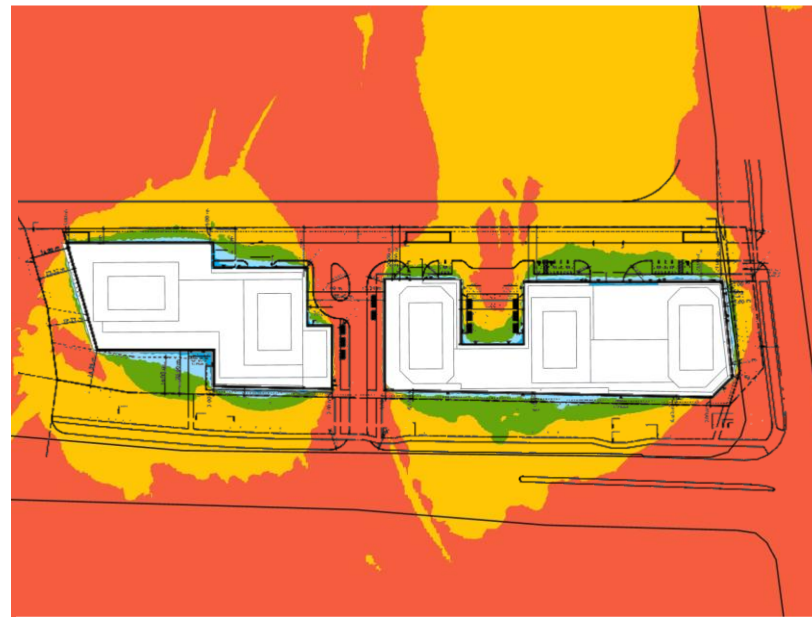
COMFORT: SITTING | STANDING | STROLLING | WALKING | UNCOMFORTABLE

Image 10: Predicted wind conditions – ground level – summer

4. RESULTS AND DISCUSSION



(a) Existing scenario – winter



(b) Proposed scenario – winter

COMFORT: SITTING | STANDING | STROLLING | WALKING | UNCOMFORTABLE

Image 11: Predicted wind conditions – ground level – winter

4. RESULTS AND DISCUSSION

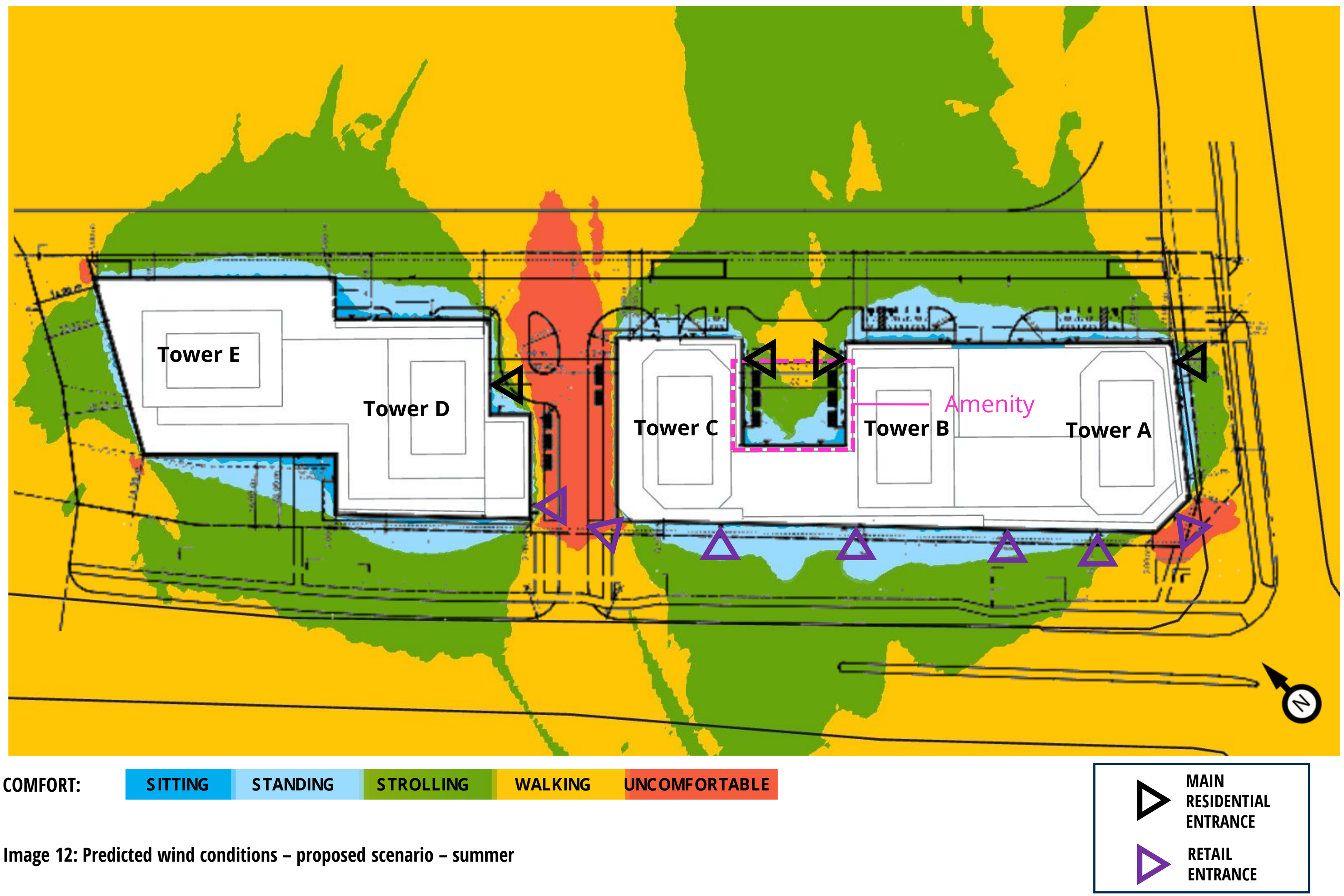


Image 12: Predicted wind conditions – proposed scenario – summer

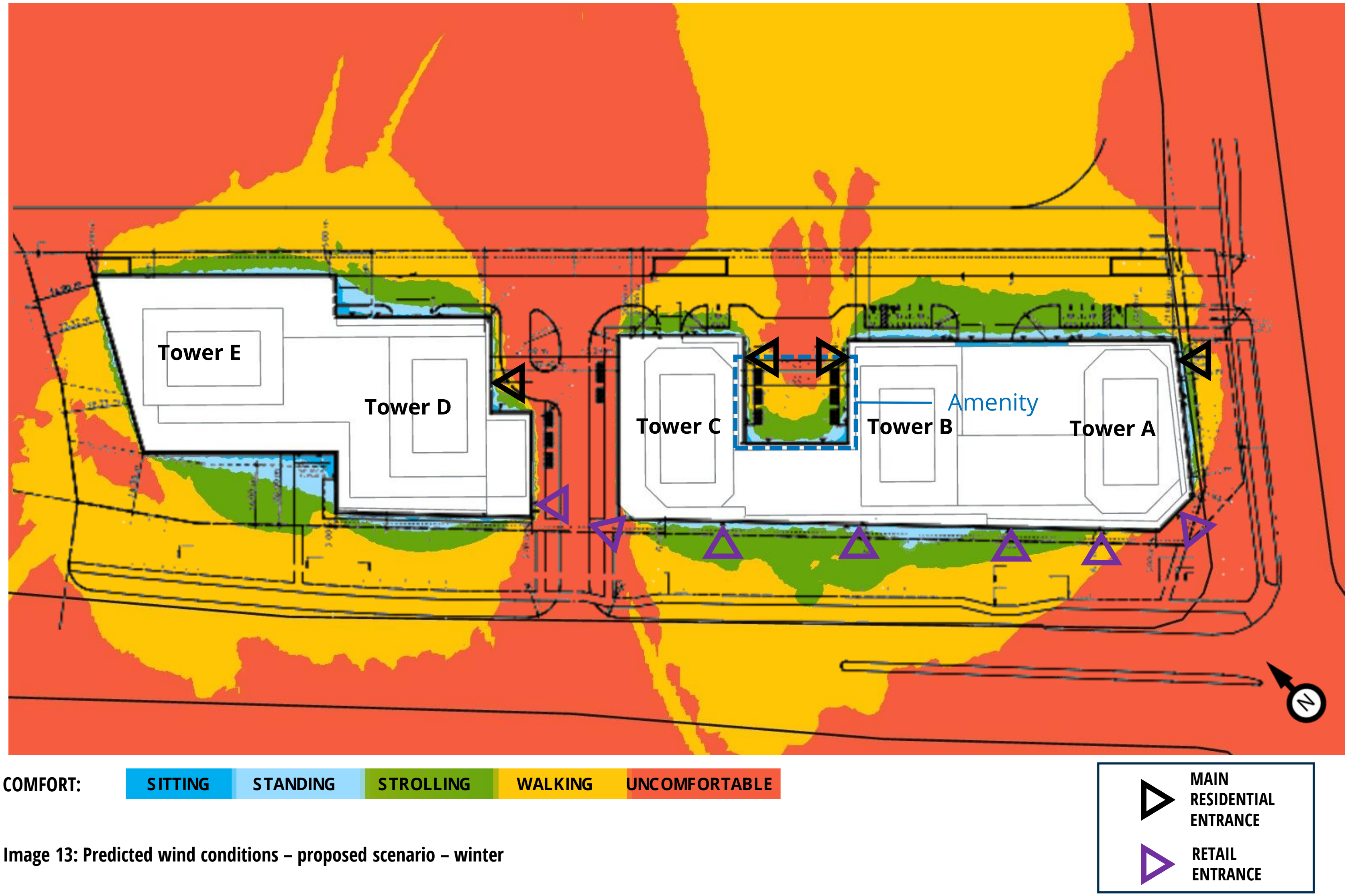
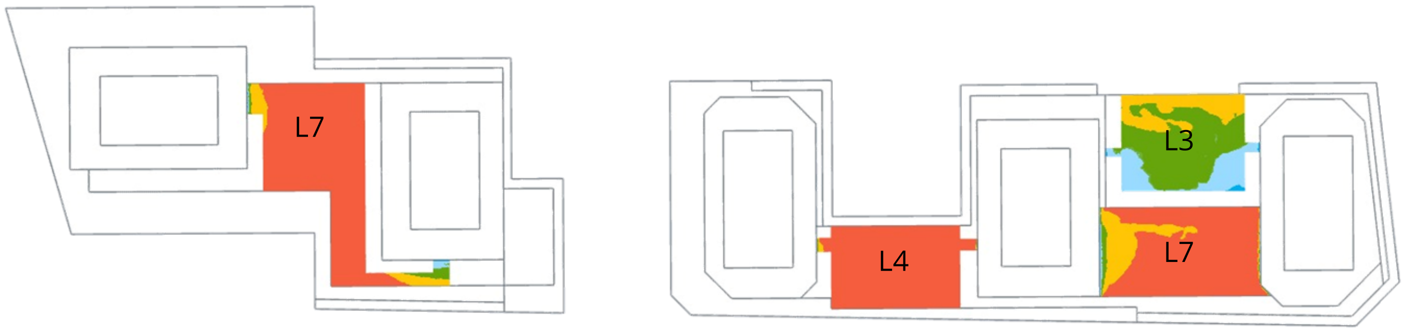
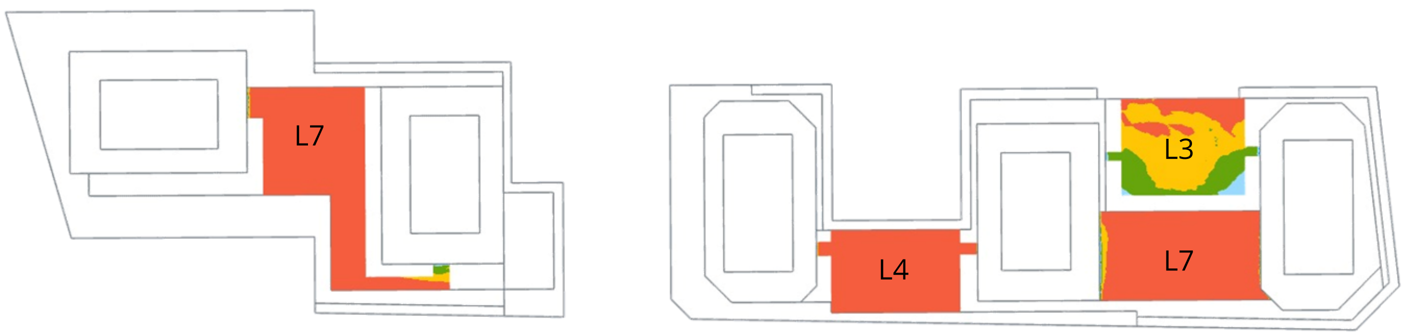


Image 13: Predicted wind conditions – proposed scenario – winter

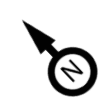
4. RESULTS AND DISCUSSION



(a) Proposed Outdoor Amenity Areas – Summer



(b) Proposed Outdoor Amenity Areas – Winter



COMFORT: SITTING | STANDING | STROLLING | WALKING | UNCOMFORTABLE

Image 14: Predicted wind conditions – proposed outdoor amenity areas

5. CONCLUSIONS AND RECOMMENDATIONS

The current assessment concludes that the wind conditions in the existing scenario may be too windy for pedestrian use. In comparison, the addition of the proposed development is expected to reduce wind activity in a large area around it (including the public areas on the adjacent streets and sidewalks) and create localized areas of higher wind activity near the new buildings. At a later design stage, we recommend quantifying and confirming the potential wind conditions through wind tunnel testing to refine this information and develop appropriate wind control measures.

Architectural and massing articulations have the most impact on wind impacts. Some massing features that are positive for wind control at grade are already part of the design that was assessed include corner articulations (reentrant corners), multiple steps in the podium massing, and large offsets of the tower from the edges of the podium.

To further improve wind comfort conditions, we recommend the following:

- Include deep, wrap-around canopies on the podium around the corners (especially if an entrance is present, **Image 15**). Alternatively, include dense vegetations in planters near podium corners (**Image 16**).
- Place coniferous landscaping or wind screens on both sides of main entrances to create a localized protected zone for patrons using the entrances. Alternatively consider recessing the entrances 2 m into the façade for a similar effect (**Image 17**). If neither are feasible, consider relocating entrances to areas of low wind activity (comfortable for sitting or standing).
- Along sidewalks, walkways, and near parking areas, introduce wind fences, screens or evergreen trees (**Image 18**) for wind protection in the winter months and for added comfort in the shoulder seasons when deciduous trees offer little wind control benefit.
- For the amenity areas at and above grade, assuming that these areas are mostly used in the summer for passive activities, comfort conditions can be improved with the addition of trees and shrubs (ideally at human height or taller, **Image 18**). The landscape design could also be enhanced for wind control with the addition of more solid features like trellises, wide and tall sculptures and wind screens. The design team may also consider adding overhead features like large shade structure or wide-canopied trees to control wind that approaches from the east and downwashes over the podium massing towards the L3 amenity area.
- For amenity areas above grade, introduce parapets (2 m or taller) on both the east and west sides to interrupt winds that channel between towers down near the amenity roofs (**Image 19**).

5. CONCLUSIONS AND RECOMMENDATIONS

Landscaping features were not included in the computer model for this assessment in order to provide a conservative evaluation of the effect of the project massing (as is the norm for this level of assessment). We recommend that the effect of surrounding and on-site landscaping features be evaluated through detailed quantitative assessments using wind tunnel testing.

Some examples of features discussed herein to be considered for wind control are presented in Images 15-19. RWDI can advise the design team to aid in this effort as the design progresses.

5. CONCLUSIONS AND RECOMMENDATIONS

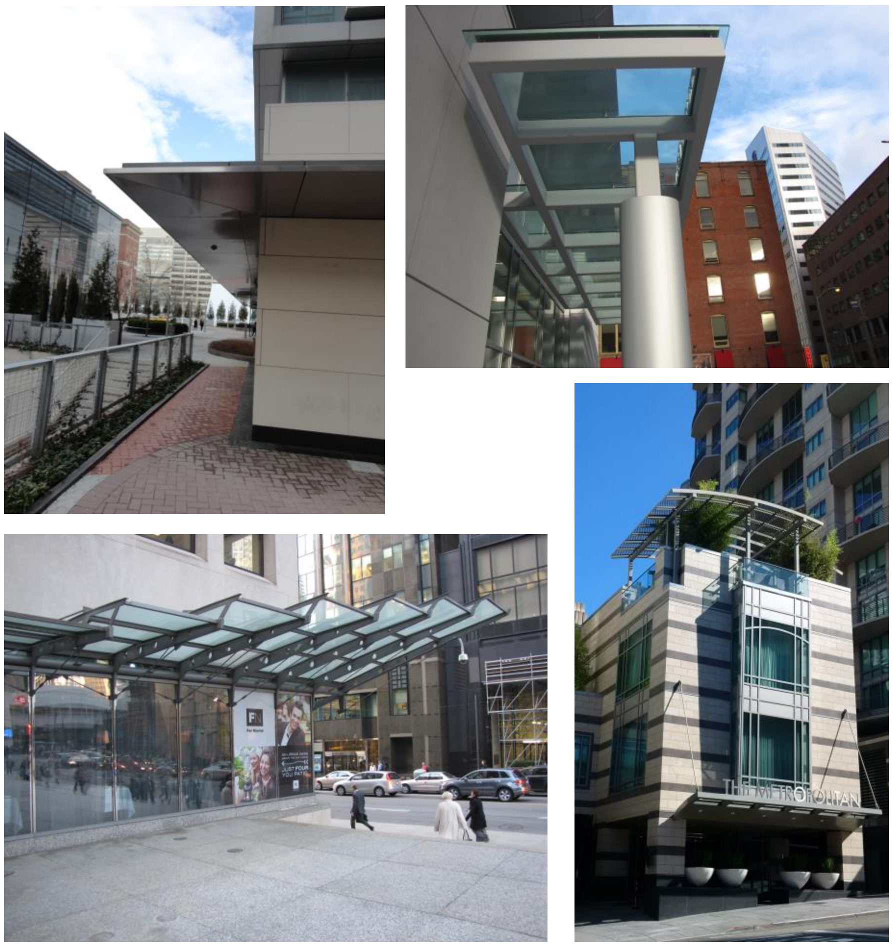


Image 15: Example wind control strategies – canopies around building corners or over entrances

5. CONCLUSIONS AND RECOMMENDATIONS

Image 16: Example wind control strategies – dense trees around building corners

Image 17: Example wind control strategies – recessed entry areas

5. CONCLUSIONS AND RECOMMENDATIONS

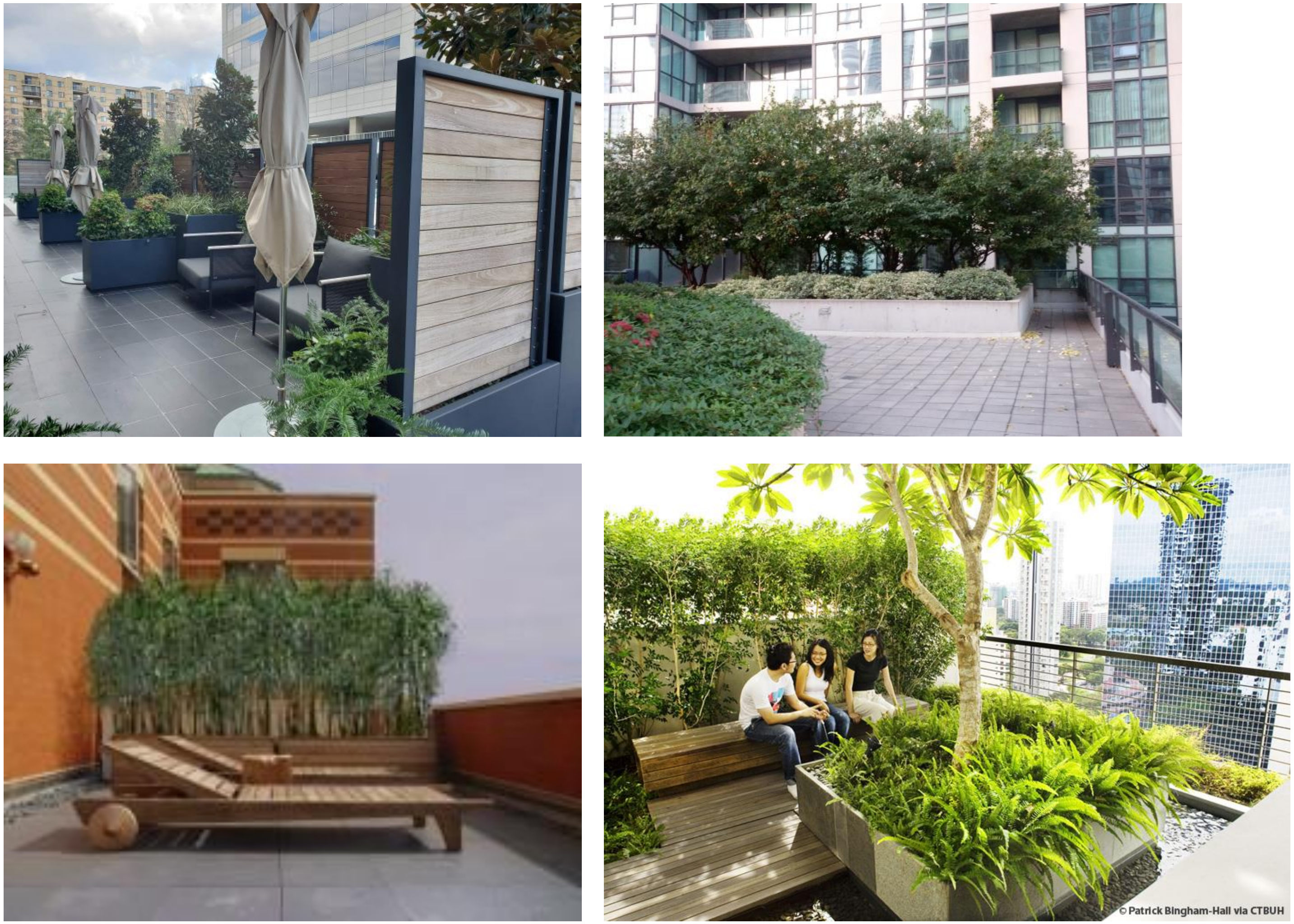


Image 18: Example wind control strategies – wind screens and tall plants/planters

5. CONCLUSIONS AND RECOMMENDATIONS



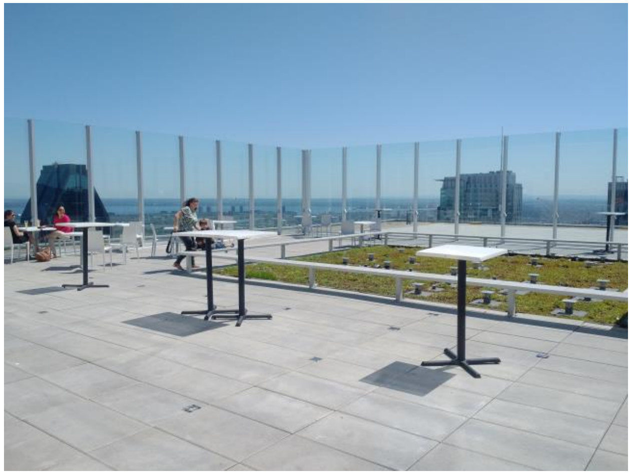


Image 19: Example wind control strategies – parapets on amenity roofs

6. SUMMARY

RWDI was retained to provide an assessment of the potential pedestrian level wind impact of the proposed project at the northeast corner of Burnhamthorpe Road / Neyagawa Boulevard in Oakville, 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 RWDI wind criteria for pedestrian comfort and safety. Our findings are summarized as follows:

- The proposed development is taller than its surroundings and therefore will redirect wind to ground level to create notable wind impacts.
- Positively, the addition of the proposed development is expected to disrupt the preexisting uninterrupted wind flow through the site and reduce wind speeds such that improved comfort is predicted in large areas to the east and west of the site.
- In most areas, wind speeds at ground level on-site are expected to be appropriate for pedestrian uses in the summer and may be higher than desired for use in many areas in the winter. Exceptions to this are the areas around the podium corners, and between the podium where an access road and sidewalks are proposed.
- Potentially uncomfortable and unsafe wind speeds are expected around the corners and areas between the proposed buildings in the winter, including amenity areas atop the podiums.
- Strategies for wind control have been discussed.

RWDI recommends that wind tunnel testing be conducted at the detailed design stages in order to refine and validate the predicted wind speeds and mitigation strategies presented herein. RWDI can help guide the placement of wind control features, including landscaping, 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 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)
23144 - Architectural Coordinatio Package (2025-05-28).zip	ZIP	06/03/2025

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 Sky Property Group ("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.