DUNPAR HOMES

PEDESTRIAN WIND LEVEL ASSESSMENT

2225 ERIN MILLS PARKWAY, MISSISSAUGA

MARCH 24, 2023

PEDESTRIAN WIND LEVEL ASSESSMENT

2225 ERIN MILLS PARKWAY, MISSISSAUGA

DUNPAR HOMES

PROJECT NO.: 231-01343-00

DATE: MARCH 24, 2023

WSP
582 LANCASTER STREET WEST
KITCHENER, ON
CANADA N2K 1M3

T: +1 519 743-8778
WSP.COM

REVISION HISTORY

FIRST ISSUE

February 14,23	Draft issue for Internal review			
Prepared by	Reviewed by	Approved By		
Atta Sojoudi	Thabet Belamri	Katherine Armstrong		
REVISION 1				
March 24,23	Update Site plan images			
Prepared by	Reviewed by	Approved By		
Atta Sojoudi	Thabet Belamri	Katherine Armstrong		

SIGNATURES

PREPARED BY

March 24, 2023

Atta Sojoudi., Ph.D.
Air Quality Specialist - Environment

Date

REVIEWED BY

March 24, 2023

Thabet Belamri., Ph.D., P.Eng.
Senior Engineer - Environment

Date

APPROVED BY

March 24, 2023

Katherine Armstrong, B. Sc, M. Sc.
Team Lead – Air Quality Modeling and Approvals

Date

WSP Canada Inc. (WSP) prepared this report solely for the use of the intended recipient, DUNPAR HOMES in accordance with the professional services agreement between the parties. In the event a contract has not been executed, the parties agree that the WSP General Terms for Consultant shall govern their business relationship which was provided to you prior to the preparation of this report.

The report is intended to be used in its entirety. No excerpts may be taken to be representative of the findings in the assessment.

The conclusions presented in this report are based on work performed by trained, professional and technical staff, in accordance with their reasonable interpretation of current and accepted engineering and scientific practices at the time the work was performed.

The content and opinions contained in the present report are based on the observations and/or information available to WSP at the time of preparation, using investigation techniques and engineering analysis methods consistent with those ordinarily exercised by WSP and other engineering/scientific practitioners working under similar conditions, and subject to the same time, financial and physical constraints applicable to this project.

WSP makes no other representations whatsoever concerning the legal significance of its findings.

The intended recipient is solely responsible for the disclosure of any information contained in this report. If a third party makes use of, relies on, or makes decisions in accordance with this report, said third party is solely responsible for such use, reliance or decisions. WSP does not accept responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken by said third party based on this report.

WSP has provided services to the intended recipient in accordance with the professional services agreement between the parties and in a manner consistent with that degree of care, skill and diligence normally provided by members of the same profession performing the same or comparable services in respect of projects of a similar nature in similar circumstances. It is understood and agreed by WSP and the recipient of this report that WSP provides no warranty, express or implied, of any kind. Without limiting the generality of the foregoing, it is agreed and understood by WSP and the recipient of this report that WSP makes no representation or warranty whatsoever as to the sufficiency of its scope of work for the purpose sought by the recipient of this report.

In preparing this report, WSP has relied in good faith on information provided by others, as noted in the report. WSP has reasonably assumed that the information provided is correct and WSP is not responsible for the accuracy or completeness of such information.

The original of this digital file will be kept by WSP for a period of not less than 10 years. As the digital file transmitted to the intended recipient is no longer under the control of WSP, its integrity cannot be assured. As such, WSP does not guarantee any modifications made to this digital file subsequent to its transmission to the intended recipient.

This limitations statement is considered an integral part of this report.

CONTRIBUTORS

CLIENT

Project Lead	Mehedi Khan

WSP

Air Quality Specialist, Environment	Atta Sojoudi
Senior Engineer, Environment	Thabet Belamri
Team Lead – Air Quality Modeling and Approvals	Katherine Armstrong

SUBCONSULTANTS

None

EXECUTIVE SUMMARY

WSP Canada Inc (WSP) was retained by Dunpar Homes (the 'Client') to assess the wind comfort conditions of the proposed development at 2225 Erin Mills Parkway, Mississauga, Ontario (the 'Development'). The scope of work is based on the new City of Mississauga Terms of Reference (TOR) dated October 2022 for completing a wind impact study. The objective of this assessment is to provide an evaluation of pedestrian wind comfort and safety conditions surrounding the Development. The assessment considers an analysis of long-term meteorological data from Toronto Pearson Airport weather station maintained by Environment and Climate Change Canada and representative of the years 1950-2023, site plans prepared by Dunpar Homes, dated February 01, 2023, existing and future topology within the vicinity of the Development, and the use of Computational Fluid Dynamics (CFD) modelling.

PROJECTDESCRIPTION

The Development is immediately surrounded by the following land uses:

- North: Lincoln Greenway and a residential area.
- South: Erin Mills Parkway, commercial buildings and a residential area.
- East: Fowler Drive, commercial buildings and a residential area.
- West: Erin Mills Parkway, commercial buildings and a residential area.

The Development consists of the construction of two (2) 15 storey residential buildings: Building A, located on the north-west side of the plaza, and building G located on the north-east side of the plaza. Both buildings are expected to extend to a height of 52.1 m.

Building A has entrances/exits facing south and north sides of the building. The principal entrance to the building is located on the south side of the building facing Erin Mills Parkway, while the secondary entrance is located on the north side facing Lincoln Greenway. The entrance/exit to the underground parking lots is located on the south side of the building. Furthermore, Building A is planned to have outdoor parking lots located on the south side of the building. Finally, Building A will be surrounded by new sidewalks located on the north, east and south sides of the building, in addition to the existing sidewalk along Erin Mills Parkway on the west side of the building.

Building G has entrances/exits facing east and west sides of the building. The principal entrance to the building is located on the east side of the building facing Fowler drive, while the secondary entrance is located on the west side facing Sheridan centre. The entrances/exits to the underground parking lots are located on the west and north/east sides of the building. In addition, Building G will be surrounded by new sidewalks located on the north and west sides of the building, in addition to the existing sidewalk along Fowler drive on the east side of the building.

METHODOLOGY

When assessing wind level impacts, there are several areas of concern where wind speeds can have a negative effect on the public use of the space. In general, all ground effects at 1.5 m above grade should be evaluated to assess how the wind impacts pedestrian movement around the building. Specific locations of concern would be building entrances/exits, garage entrances, sidewalks, parking lots, outdoor patios, public amenity spaces, and private (employee) amenity spaces.

Computational Fluid Dynamics (CFD) modelling was utilized in this assessment. CFD modeling consists of solving Navier-Stokes (N-S) mass-momentum and energy equations within a defined 3D domain called a computational domain, representing the physical domain. To solve these equations, the computational domain is constructed into a three-dimensional model with the volume space being divided into millions of small grid spaces where the N-S equations are solved. Boundary conditions or known values, such as wind speed and direction, within the computational domain are applied to achieve a unique solution of the problem.

To construct an accurate 3D model, CAD drawings were used. Using the physical dimensions of the site and surroundings, the computational domain was constructed. The run is initiated by gradually increasing the simulation

time from zero (0) seconds to reach a steady state solution. In order to accurately capture the dynamic behavior of the wind flow field, a transient simulation with a high-fidelity turbulence modeling (Large Eddy Simulation or LES) was adopted. The model is run until a steady state in time or an averaging time solution is achieved.

METEOROLOGICAL DATA

Meteorological data was used to identify the prevailing wind direction and wind speeds for the four seasons, which when compared with the site plan support the selection of reasonable worst-case conditions for modelling. For this assessment, historical meteorological data from Toronto Pearson Airport weather station was reviewed. Based on the TOR, wind roses for the two seasons (winter and summer) were generated from the collected data from the period 1950 to 2023. Dominant wind directions for each season were identified and used for the modeling. In addition, average monthly wind speeds were calculated. The data indicates that the mean wind speed is typically lower in the summer months than the winter months, with a mean value varying between 3.7 m/s to 4.9 m/s for the summer (defined from May to October) and winter season (defined from November to April), respectively. When comparing the wind rose data to the site plan and with reference to the Development location, wind directions from the north and west are considered most dominant for both winter and summer seasons, as the surrounding buildings will obstruct the wind, therefore, the winds will impact the Development and surrounding sidewalks. To assess the wind impacts on pedestrians during the two seasons, westerly and northerly winds for the winter and the summer seasons winds blowing at average speeds of 3.7 m/s (summer), and 4.9 m/s (winter) were applied.

COMFORT EVALUATION CRITERIA

The criteria for the pedestrian wind level assessment are established based on a classification of proposed pedestrian activities, combined with threshold wind speeds that those activities can occur at while maintaining comfort. Several comfort criteria have been established (e.g. Melbourne, Davenport, Lawson, Williams and Soligo, see the reference section). Most of these criteria consist of a threshold wind speed and a maximum allowed exceedance of this threshold. The threshold wind speed can be a) mean wind speed, b) gust speed and c) Gust Equivalent Mean (GEM) which is defined as the maximum of mean and gust wind speeds. The criteria for wind comfort and safety used in this assessment are based on Lawson wind comfort criteria, in conjunction with the usage of the Maximum Gust Equivalent Mean (GEM) for the speed thresholds. These criteria were selected for this study because they are considered as “complete” criteria, as they address a wide range of activities, including “sitting/standing long”, “sitting short”, “Walking leisurely” and “Walking Fast”. Also, these criteria are similar to those developed at the Boundary Layer Wind Tunnel Lab of the University of Western Ontario, together with building officials in London, England. These wind criteria are based on best engineering practices for wind comfort studies and have been widely accepted by municipalities in Ontario and by the international building design and city planning community. These criteria are also used by Mississauga, as identified in section 3.0 of the TOR for the Preparation of a Wind Comfort Study (see reference 14).

Finally, the existing conditions for the pedestrian footpaths around the site are also analysed as part of this study to assess the potential impact of the Development. If it is found that the existing conditions exceed the comfort criteria, then the target wind speed for that area with the inclusion of the Development is refined to at least match the existing site conditions.

Using the CFD modeling, the 3D wind flow patterns in terms of velocity magnitude and direction distributions were predicted at several locations (planes), particularly at a height of 1.5 m above grade for the pedestrian comfort study. The modeling was done for each season and for the most dominant wind directions for that season. Below is a summary of the wind study findings.

WIND PATTERNS- EXISITING CONDITIONS

Summer Season

For the summer season, the winds approaching the site are predominantly from the north and west. The wind patterns are characterized by slight accelerations due to the channeling and downwash effects originating from the buildings located north of the site. These accelerations move southerly towards the site and beyond it through the channels between buildings. Overall, the wind patterns are characterized by calm conditions at the site in general. This is mainly due to the low northerly and westerly wind speeds blowing towards the site during the summer season.

Winter Season

For the winter season, the winds approaching the site are dominantly from the north and west. During the winter season, the wind patterns are characterised by a similar behavior as for the summer season with wind accelerations being more pronounced as for the summer season due to the higher average wind speed approaching the site during the winter. The westerly and northerly winds accelerate further when moving south and south-east of the development due to the channeling and building edge effects created by the existing buildings. However, this acceleration remains within an acceptable wind threshold, as defined by the TOR, and is assumed to be tolerable for pedestrian comfort.

Wind Comfort

For the existing conditions, the CFD model results indicate that there are no predicted wind issues at the ground level for pedestrians accessing the site during the summer and winter seasons. The CFD model results show that pedestrians are expected to be comfortable when walking on the sidewalks. Finally, the CFD model results indicate that predicted GEM speeds around the development do not exceed the threshold of the wind safety condition of 90 km/hr, year around.

CFD RESULTS- WITH THE DEVELOPMENT

Wind Patterns

Once the Development is added to the model, the accelerations around the site for both summer and winter seasons are mainly around Building A and are due to the building edge or downwash effects occurring at the north-east and north-west corners of this building in conjunction with the orientation of this building (running south-west to north-east). There is also a slight acceleration occurring at the north-west corner of Building G and is due to the building edge and the north-west corner of this building.

Wind Comfort

For the Development and for both seasons, the CFD model results indicate that there are no predicted issues observed at the ground level of the building for pedestrians using the main entrance or other entrances/exits. Overall, at ground level, the study shows that the main entrances to the Development buildings are expected to be comfortable for people to stand or stroll in this area. People standing, strolling, or walking in these areas will primarily experience calm and gentle breezes. Similar wind comfortable conditions are shown for the other entrances/exits when people are walking out.

In addition, and for both seasons, the CFD model results indicate that pedestrians are expected to be comfortable when walking in the vicinity of the Development along the existing sidewalks on Erin Mills Parkway, Lincoln Greenway and Fowler drive, as well as the new sidewalks surrounding the two buildings and from and to the outdoor parking lots located south of Building A.

Finally, the CFD model results indicate that predicted GEM speeds around areas of interests of the development do not exceed the threshold of the wind safety condition of 90 km/hr for both winter and summer season.

GENERAL CONCLUSION

The CFD model results indicate that the Development is not expected to negatively affect the wind patterns and consequently the pedestrian comfort at ground level on the surroundings of the Development, particularly at the entrances/exits to the Development and sidewalks. Overall, at ground level, the study shows that comfortable conditions are predicted when people are entering/exiting Building A and Building G, or walking on the existing and the new sidewalks, as well as from and to the outdoor parking lots located south of Building A.

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

1 MANDATE

WSP Canada Inc (WSP) was retained by Dunpar Homes (the 'Client'). to assess the wind comfort conditions of the proposed development at 2225 Erin Mills Parkway, Mississauga, Ontario (the 'Development'). The scope of work is based on the new City of Mississauga Terms of Reference (TOR) dated October 2022 for completing a wind impact study. The objective of this assessment is to provide an evaluation of pedestrian wind comfort and safety conditions surrounding the Development. The assessment considers an analysis of long-term meteorological data from Toronto Pearson Airport weather station maintained by Environment and Climate Change Canada and representative of the years 1950-2023, site plans prepared by Dunpar Homes, dated February 01, 2023, existing and future topology within the vicinity of the Development, and the use of Computational Fluid Dynamics (CFD) modelling.

1.1 DEVELOPMENT

The Development is located at 2225 Erin Mills Parkway in Mississauga. **Figure 1** displays an aerial view of the Development location and surrounding area. An image of the site plan is shown in **Appendix A**.

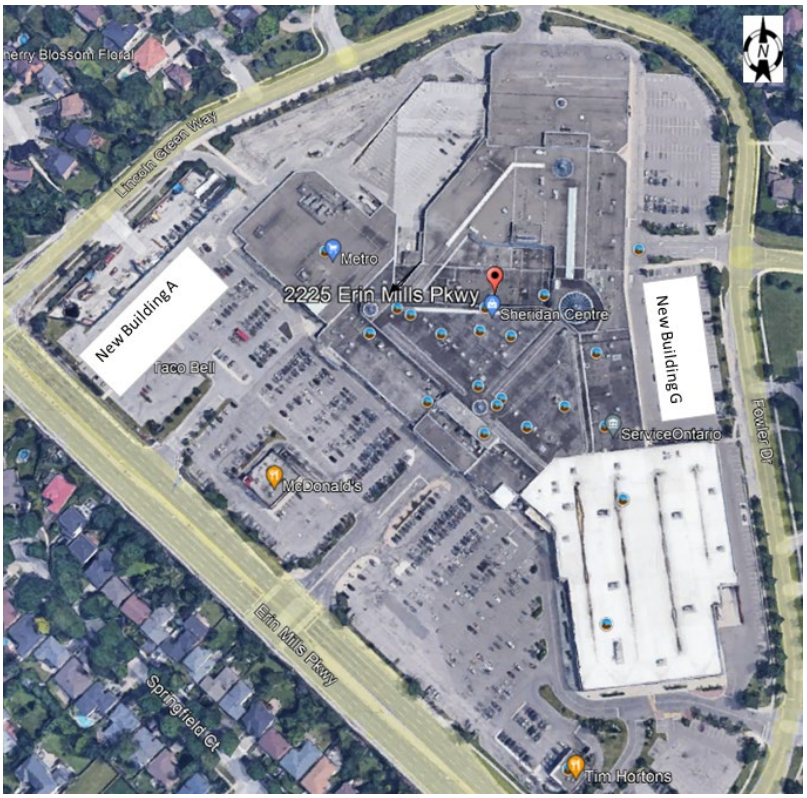


Figure 1: Proposed Development on Erin Mills Parkway (Source: Google Earth dated February 08, 2023)

The Development consists of the construction of two (2) 15 storey residential buildings: Building A, located on the north-west of the plaza, and building G located on the east of the plaza. Both buildings are expected to extend to a height of 52.1 m. The Development location is immediately surrounded by the following land uses:

- North: Lincoln Greenway and a residential area.
- South: Erin Mills Parkway, commercial buildings, and a residential area.
- East: Fowler Drive, commercial buildings, and a residential area.
- West: Erin Mills Parkway, commercial buildings, and a residential area.

1.2 AREAS OF CONCERN

When assessing wind level impacts, there are several areas of concern where wind speeds can have a negative effect on the public use of the space. In general, all ground effects at 1.5 m above grade should be evaluated to assess how the wind impacts pedestrian movement around the building. Specific locations of concern would be building entrances/exits, garage entrances, sidewalks, parking lots, outdoor patios, public amenity spaces, and private (employee) amenity spaces.

Figure 2 shows the locations of the entrances and exits for Building A. these entrances/exits are facing south and north sides of the building. The principal entrance (labelled Main-A1 in **Figure 2**) to the building is located on the south side of the building facing Erin Mills Parkway, while the secondary entrance (labelled Main-A2 in **Figure 2**) is located on the north side facing Lincoln Greenway. The entrance/exit (labelled Door-A1 in **Figure 2**) to the underground parking lots is located on the south side of the building. Furthermore, Building A is planned to have outdoor parking lots located on the south side of the building. Finally, Building A will have new sidewalks located on the north, east and south sides of the building, in addition to the existing sidewalks along Erin Mills Parkway on the west side of the building, and along the Sheridan Centre on the east side.

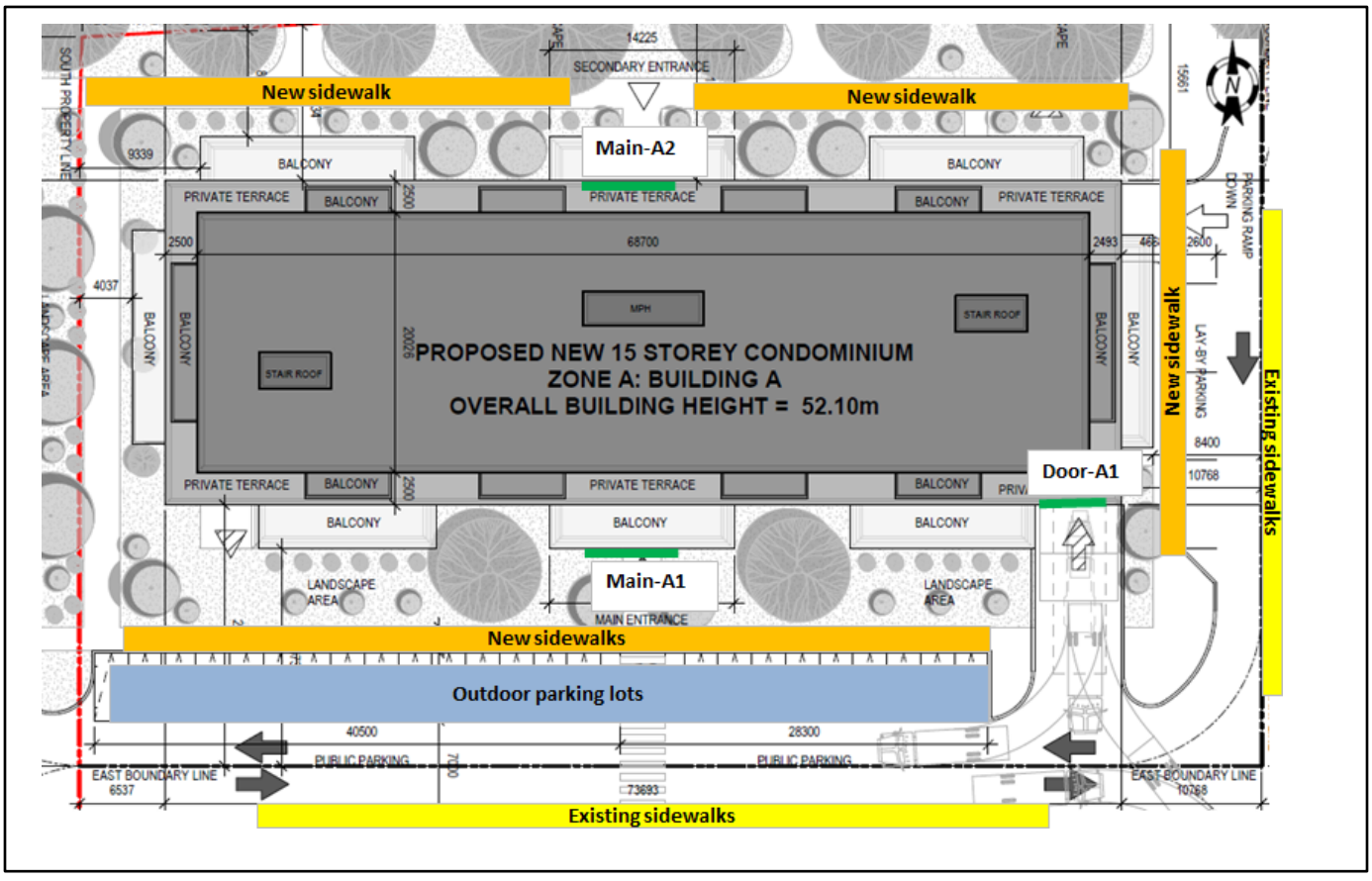


Figure 2: Building A: Areas of Concern – Ground Floor

Figure 3 shows the locations of the entrances and exits for Building G. These entrances/exits are facing east and west sides of the building. The principal entrance (labelled Main-G1 in **Figure 3**) to the building is located on the east side of the building facing Fowler Drive, while the secondary entrance (labelled Main-G2 in **Figure 3**) is located on the west side facing Sheridan Centre. The entrances/exits to the underground parking lots are located on the west (labelled Door-G2 in **Figure 3**) and north/east sides (labelled Door-G1 in **Figure 3**) of the building. In addition, Building G will be surrounded by new sidewalks located on the north and west sides of the building, in addition to existing sidewalks along Fowler Drive on the east side of the building, as well as along the Sheridan centre.

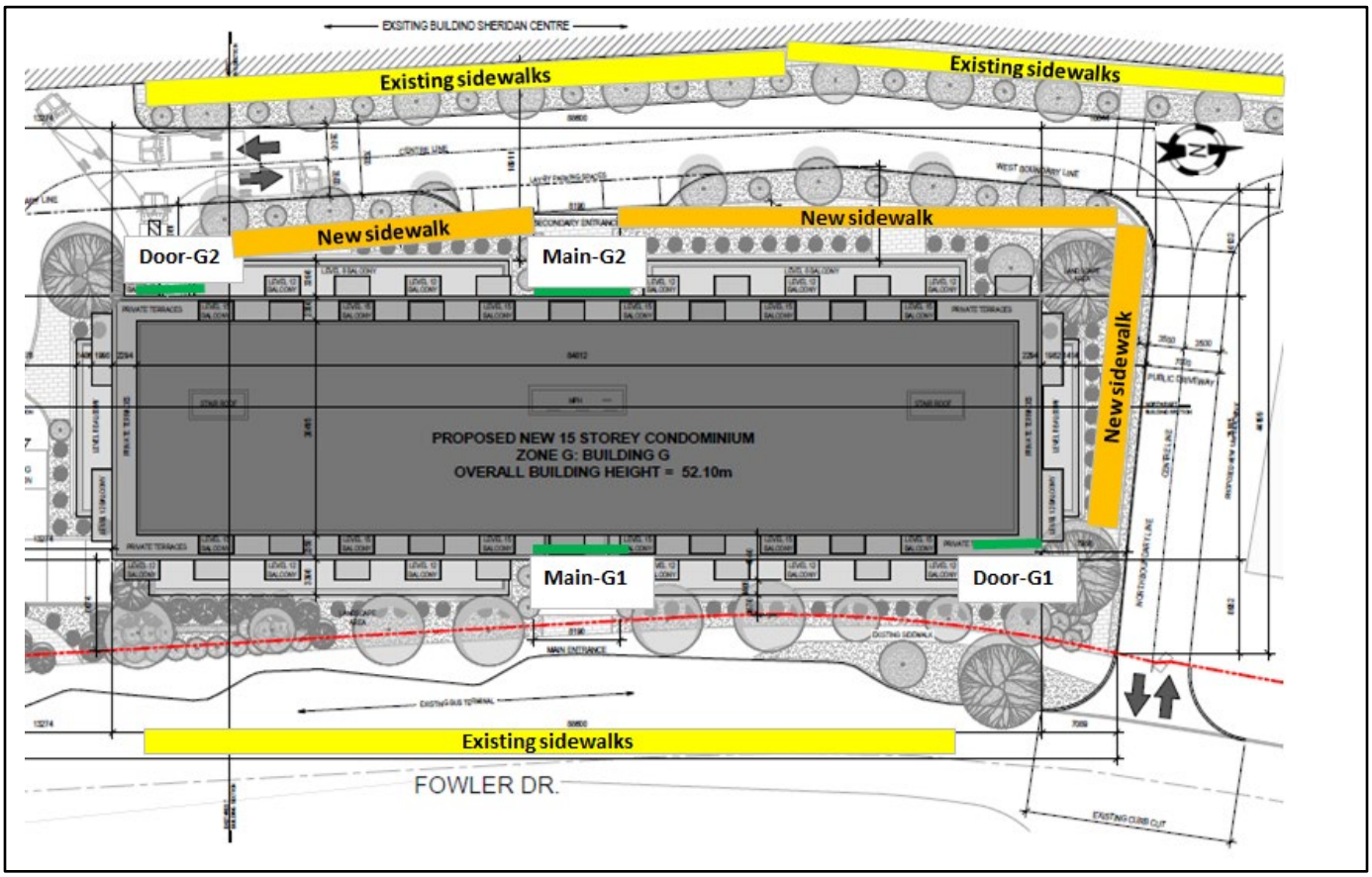


Figure 3: Building G: Areas of Concern – Ground Floor

1.3 ASSESSMENT CRITERIA

The criteria for the pedestrian wind level assessment are based on a classification of proposed activities combined with threshold wind speeds that those activities can occur at while maintaining comfort. Several comfort criteria have been established (Melbourne, Davenport, Lawson, Williams and Soligo, see the reference section). Most of these criteria consist of a threshold wind speed and a maximum allowed exceedance frequency of this threshold. The threshold wind speed can include mean wind speed; gust speed; or Gust Equivalent Mean (GEM) which is defined as the maximum of mean and gust wind speeds. The criteria for wind comfort and safety used in this assessment are based on Davenport and Lawson wind criteria thresholds. These criteria were selected for use in this study because

they are considered as “complete” criteria. They address a wide range of activities, including “sitting/standing long”, “sitting short”, “Strolling or Walking leisurely” and “Walking” and are similar to those developed at the Boundary Layer Wind Tunnel Lab of the University of Western Ontario, together with building officials in London, England. **Table 1** shows the wind criteria thresholds, based on Lawson comfort criteria, in conjunction with the Gust Equivalent Mean (GEM) wind speed (defined below) for the wind speed thresholds. These wind criteria are based on best engineering practices for wind comfort studies and have been widely accepted by municipalities and by the building design and city planning community. The criteria defined in **Table 1** are used by the Mississauga Terms of References (see Reference 14. Section 3).

Table 1: Assessment Criteria

ACTIVITY	THRESHOLD GEM WIND SPEED (km/h)	INTENDED ACTIVITIES	GEM EXCEEDANCE
Sitting	10 (2.8 m/s)	Outdoor areas where sitting and reading would be tolerable	20%
Standing	15 (4.16 m/s)	Main entranceways and bus stops	20%
Walking	20 (5.6 m/s)	Walking, running, cycling without frequent stops (parking lot, sidewalks with no retail)	20%
Uncomfortable	> 20 (> 5.6 m/s)	Nuisance wind	
Safe conditions (all activities)	90 (25 m/s)	Noise at ears, difficulty of walking.	0.1% (9 hour/year)
Existing Conditions	If the existing conditions exceed the relevant GEM criteria, then the target GEM speed for that location is refined to at least match the existing site conditions.		

Notes:

- The Gust Equivalent Mean (GEM) is defined as Max (Mean Speed, Gust Speed/1.85) where Gust speed is defined as Mean speed +3.5*STDEV (Standard Deviation) of wind speed.
- Wind conditions are considered comfortable if predicted GEM should not exceed 20% of the threshold GEM value for each comfort category. In another word, GEM should below the threshold 80% of the time for each comfort category.
- The GEM as defined is a conservative approach to studying pedestrian wind comfort.

2 METHODOLOGY

Computational Fluid Dynamics (CFD) modelling was utilized in this assessment. To construct an accurate model, historical meteorological data from Pearson International Airport weather station was examined. The meteorological data was used to identify the prevailing wind direction and typical wind speeds, which when compared with the site plan are used to identify reasonable worst-case conditions for modelling.

2.1 METEOROLOGICAL DATA

A 'blowing from' wind rose generated from data collected at Pearson International Airport meteorological station is shown in **Figure 4**.

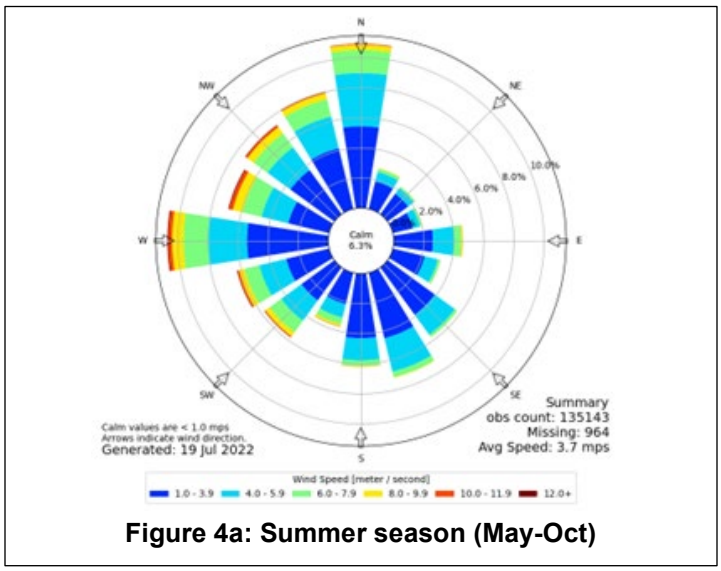


Figure 4a: Summer season (May-Oct)

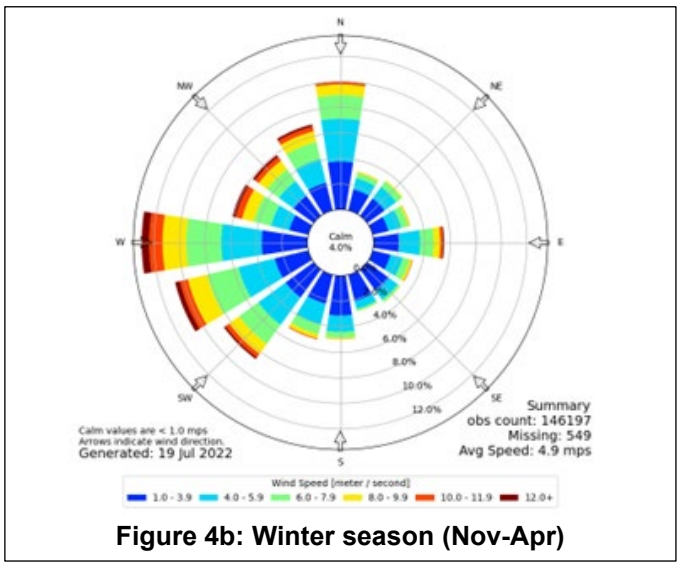


Figure 4b: Winter season (Nov-Apr)

Figure 4: Pearson Airport Meteorological Station Wind Rose (1950 - 2023)

The wind conditions are dominated primarily by winds from the north for the summer and spring seasons and from the west for the winter and autumn seasons. A summary of the average wind speed by month is shown in **Figure 5**.

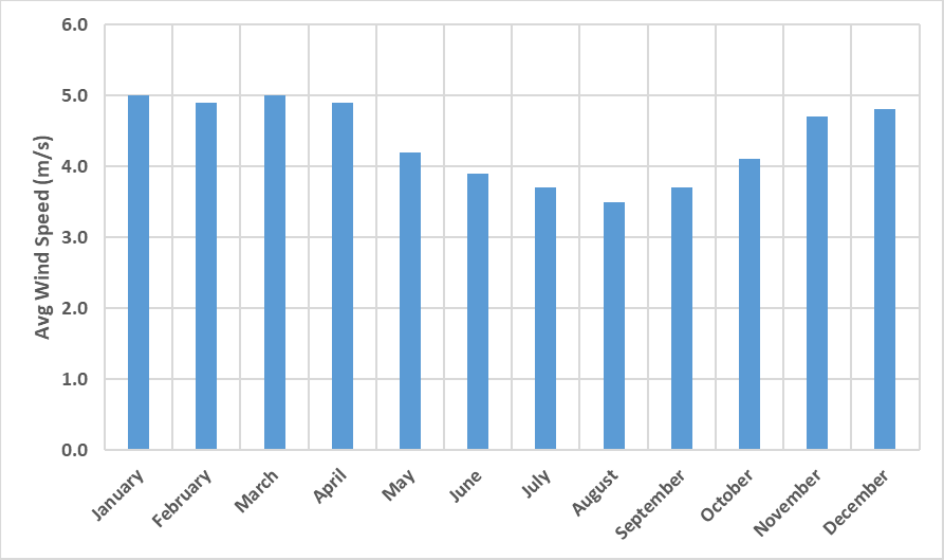


Figure 5: Pearson International Airport Meteorological Station Average Wind Speeds (1950 - 2023)

As illustrated in **Figure 5**, the average wind speeds are lower in the summer months than the winter months, with an average value varying from of 3.7 m/s and 4.9 m/s for the summer and winter season, respectively. When reviewing the wind rose data for the four seasons with reference to the site plan, wind directions from the west (W) and north (N) are most dominant wind directions and considered the most relevant for this study, as the Development buildings will obstruct the winds from these directions and impact the surrounding sidewalks. Therefore, northerly (N) and Westerly (W) winds approaching the development at 3.7 m/s and 4.9 m/s were applied to study the wind comfort for both the summer and winter season respectively.

2.2 MODELLING STRATEGY

Computational Fluid Dynamics (CFD) modelling was utilized in this assessment. CFD modeling consists of solving Navier-Stokes (mass-momentum and energy) equations within a defined 3D domain called computational domain, representing the physical domain. To solve these equations, the computational domain is constructed into a three-dimensional model with the volume space being divided into millions of small grid spaces where the N-S equations are solved. Boundary conditions or known values, such as wind speed and direction, within the computational domain are applied to achieve a unique solution of the problem.

To construct an accurate 3D model, CAD drawings were used. Using the physical dimensions of the site and surroundings, the computational domain was constructed. **Figure 6** through **Figure 10** show isometric views of the CFD model with the proposed Development. The run is initiated by gradually increasing the simulation time from zero (0) seconds to reach a steady state solution. To accurately capture the dynamic behavior of the wind flow field, a transient simulation with a high-fidelity turbulence modeling (Large Eddy Simulation or LES) was adopted. The model is run until a steady state in time, or an averaging time solution is achieved.

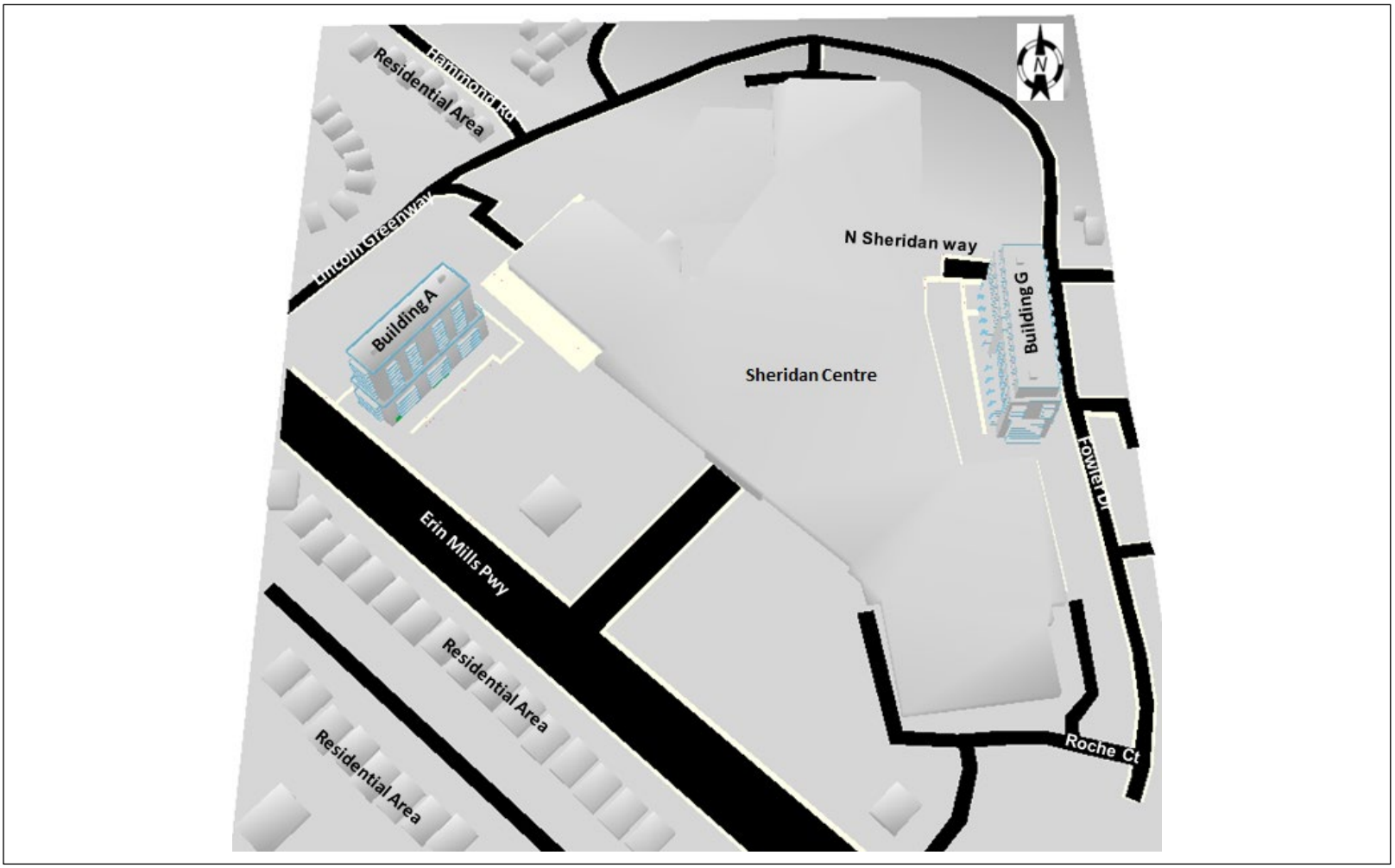


Figure 6: Top View of Model – Proposed Development

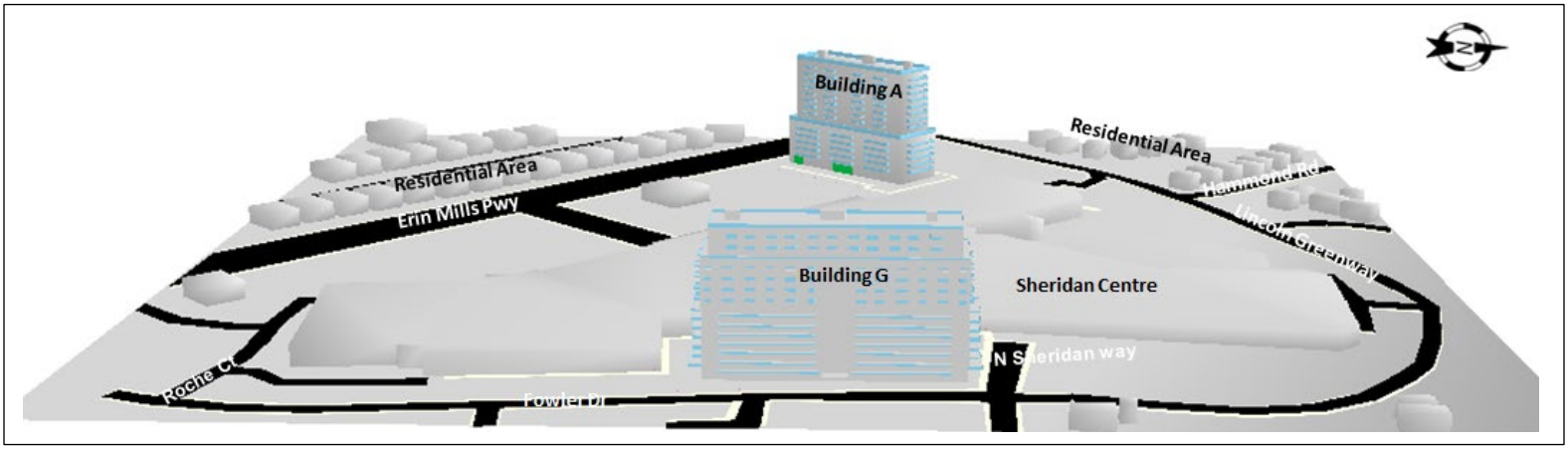


Figure 7: Isometric View of Model Proposed Development (looking from east)

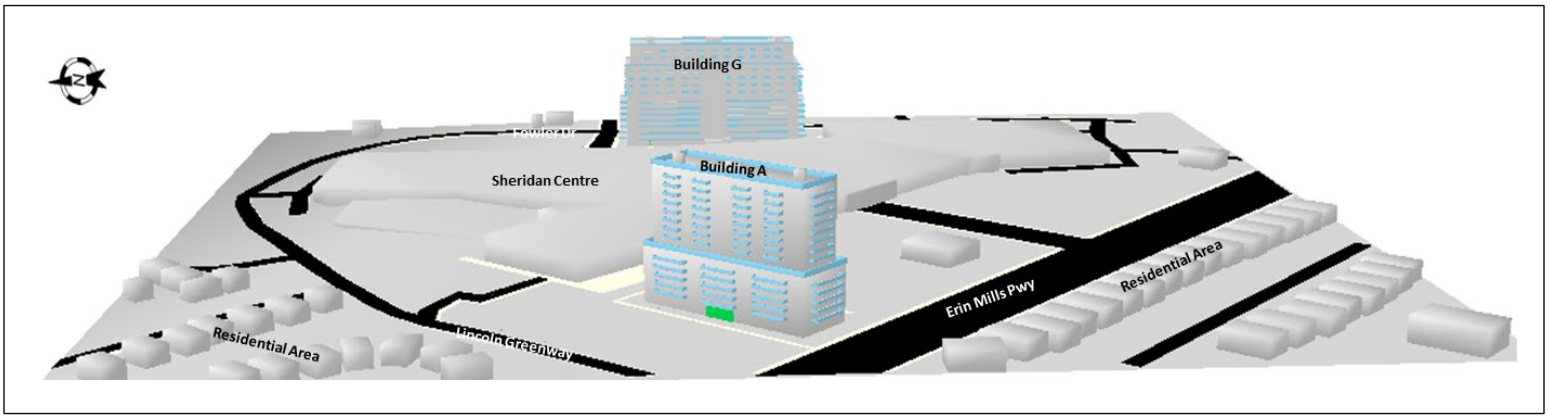


Figure 8: Isometric View of Model Proposed Development (looking from west)

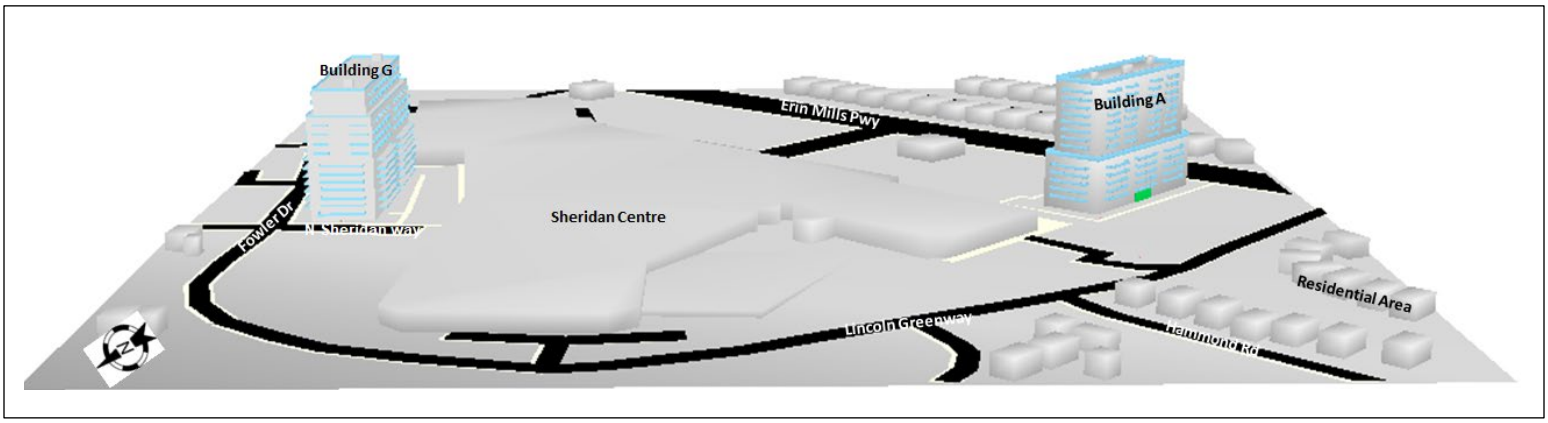


Figure 9: Isometric View of Model Proposed Development (looking from north)

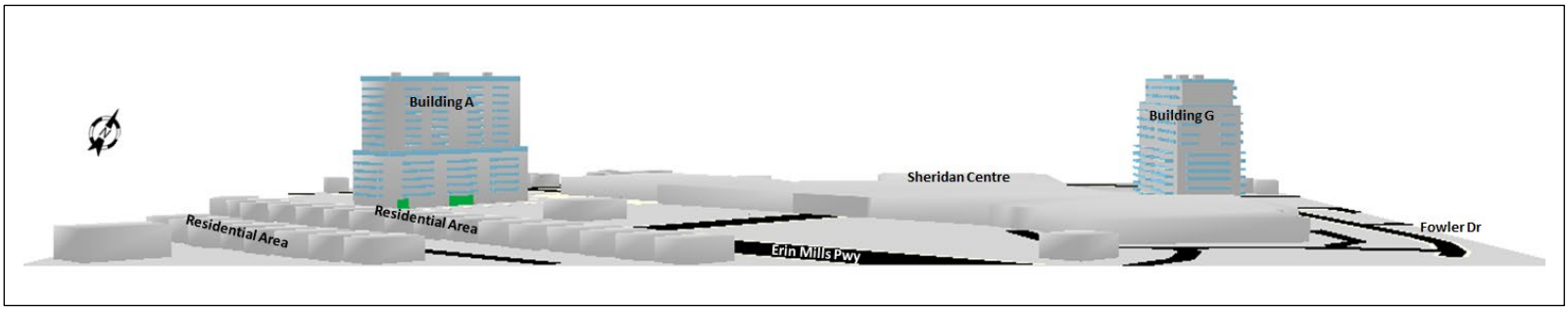


Figure 10: Isometric View of Model Proposed Development (looking from south)

Using the CFD modeling, wind distributions were predicted for both seasons. Average wind speeds and GEM values were calculated based on predicted wind speeds and were compared to the wind comfort criteria to assess wind comfort at all areas of interest. Since most of pedestrian outdoor activities occur during the summer season, the results of the CFD modelling for the summer season are reported in the following section, while **Appendix B** summarises the findings of the study for the winter season.

3 RESULTS-SUMMER SEASON

3.1 WIND PATTERNS – EXISTING CONDITIONS

The model results of pedestrian wind levels at 1.5 m above grade for the west winds is shown in **Figure 11**

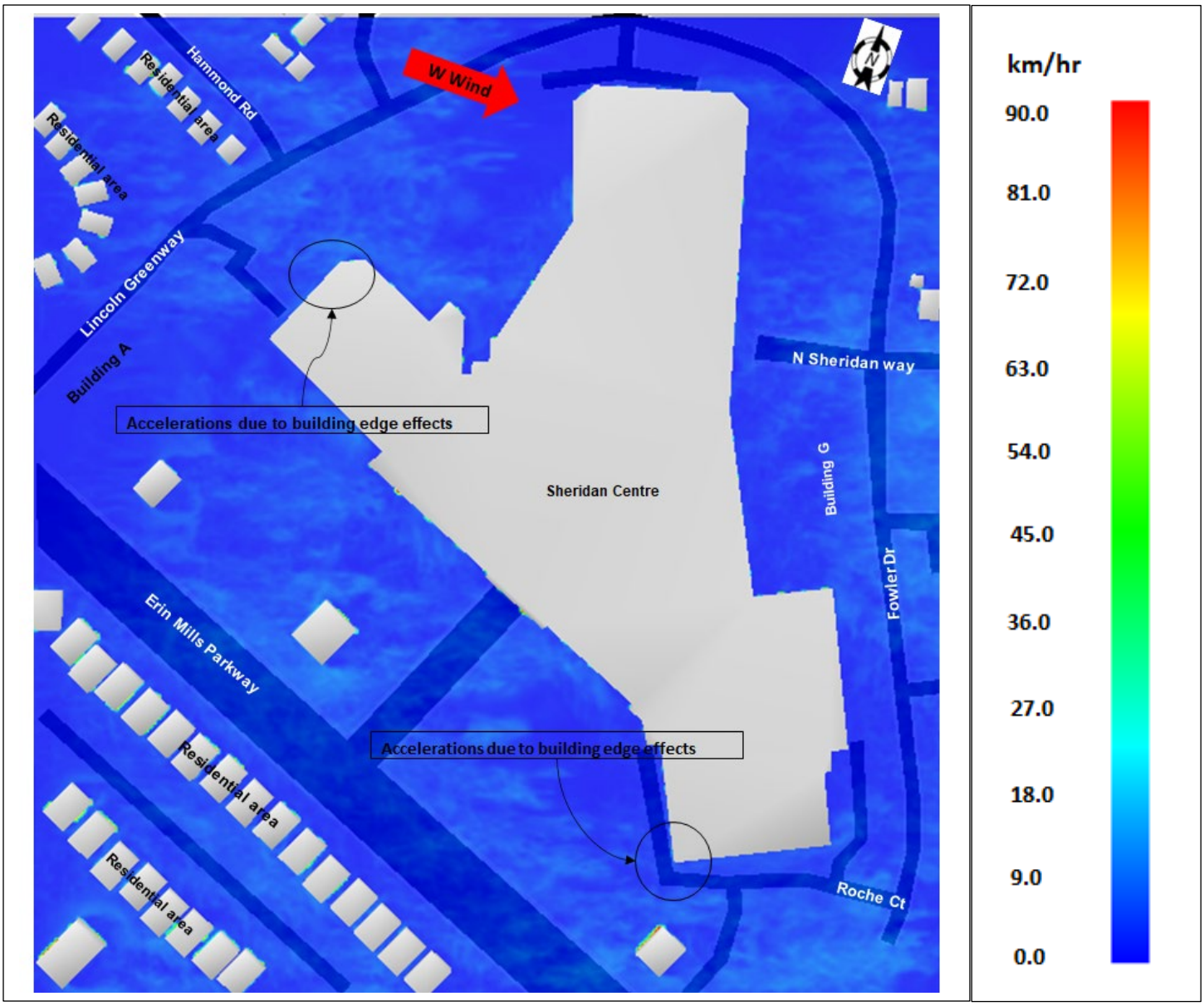


Figure 11: Ground Level Results (1.5 m above grade) – Plan View –Summer Season - Existing Conditions – West Winds

As shown in **Figure 11**, the wind patterns are characterised by calm conditions in general with a slight acceleration originating at the north-west corner of the Sheridan and at the south-west corner of the Sheridan centre due to the vortex shedding and downwash occurring at these corners. Both accelerations are below the wind threshold of 20 km/hr and are tolerable for pedestrian comfort.

The model results of pedestrian wind levels at 1.5 m above grade for the north winds is shown in **Figure 12**.

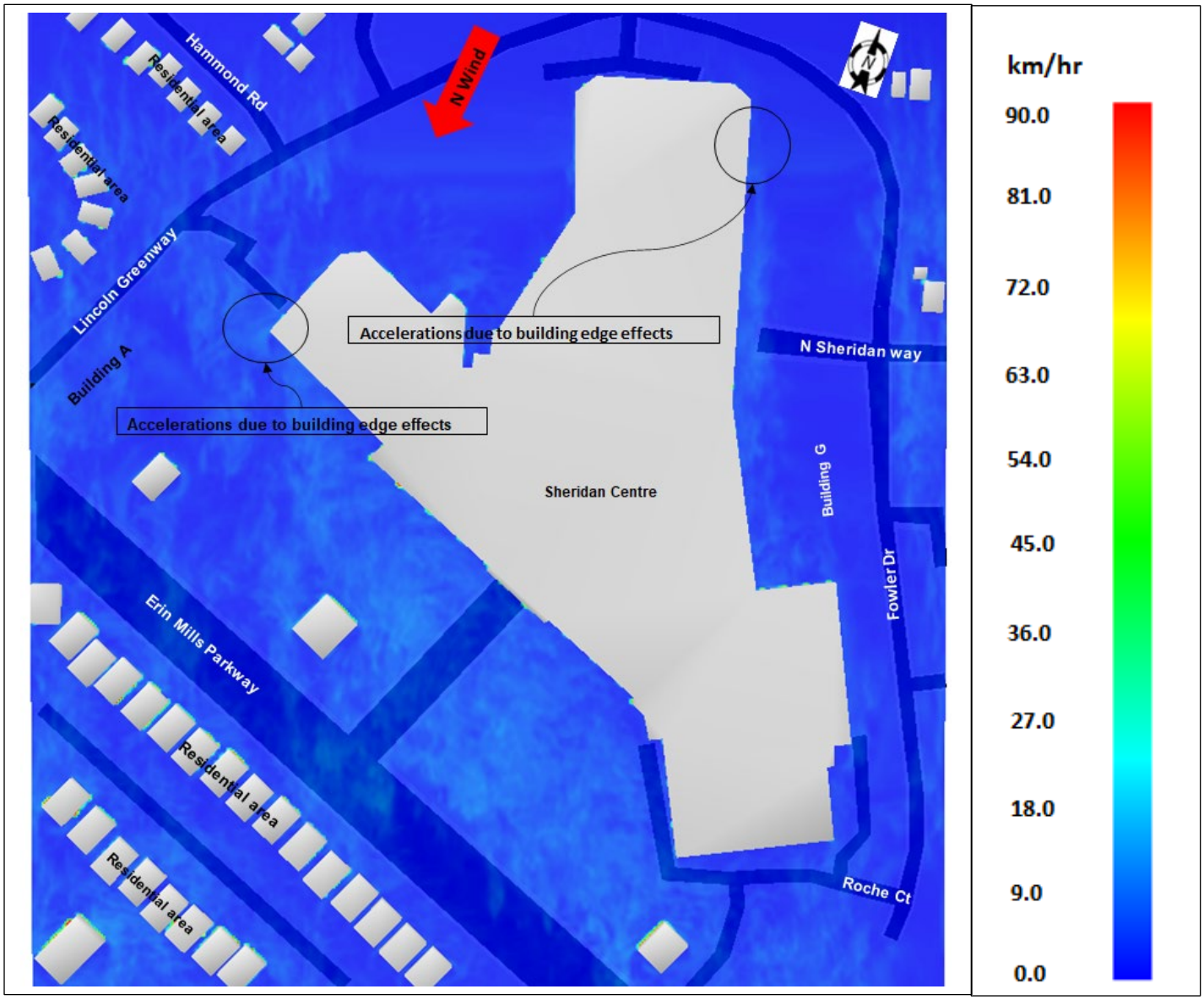


Figure 12: Ground Level Results (1.5 m above grade) – Plan View –Summer Season - Existing Conditions – North Winds

For the northerly winds, the wind patterns are characterised by a similar behavior as for the westerly winds, with slight accelerations at the north-west and the north-east corners of the Sheridan centre when moving south due to the building edge effect occurring at these corners. Both accelerations are below the threshold of the wind comfort of 20 km/hr and remain tolerable for the pedestrian.

Finally, it is shown in **Figure 11** and **Figure 12** that predicted wind speeds around the Development do not exceed the threshold of 90 km/hr for wind safety.

3.2 WIND PATTERNS – WITH THE DEVELOPMENT

The model results of pedestrian wind levels at 1.5 m above grade for the two seasons are shown in **Figure 13** and **Figure 14.**

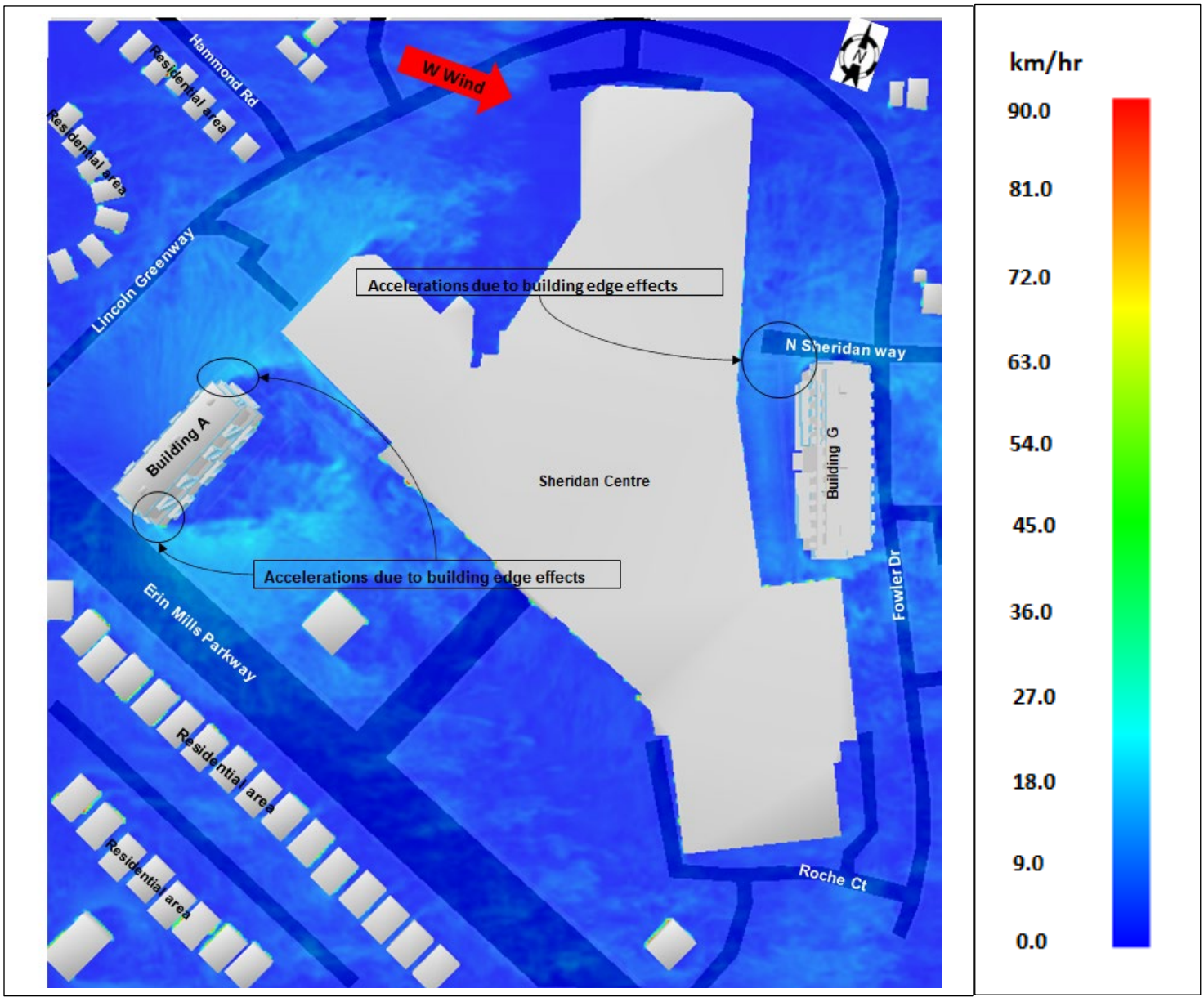


Figure 13: Ground Level Results (1.5 m above grade) – Plan View –Summer Season – Development – West Winds

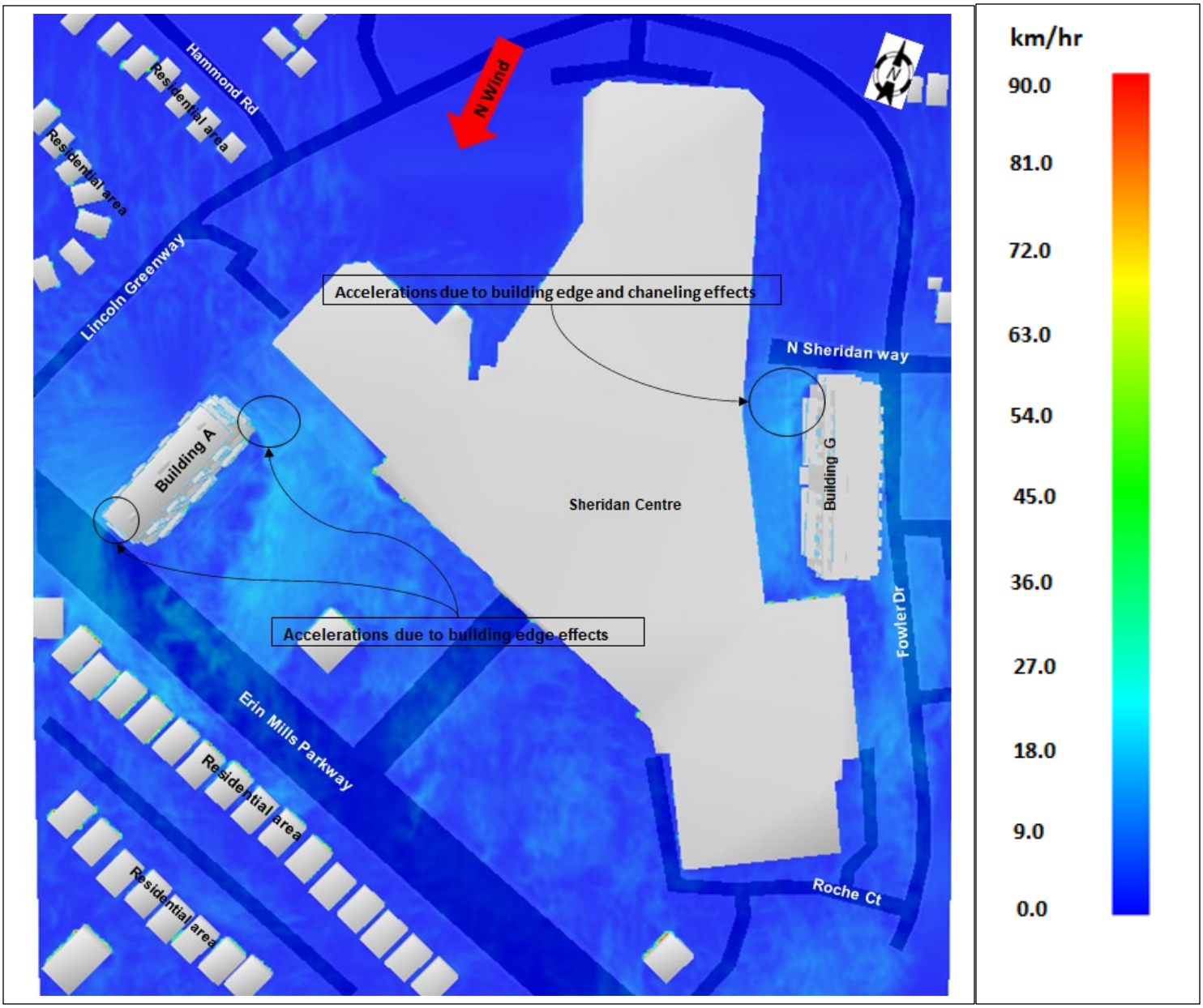


Figure 14: Ground Level Results (1.5 m above grade) – Plan View –Summer Season – Development – North Winds

Once the Development is added to the model, the accelerations around the site for both westerly and northerly winds, mainly around Building A are due to the building edge or downwash effects occurring at the north-east and north-west corners of this building. There is also a slight acceleration due to the building edge and occurring at the north-west corner of Building G.

Finally, it is shown in **Figure 13** and **Figure 14** that predicted wind speeds around the development do not exceed the threshold wind safety condition of 90 km/hr.

For this study, the wind comfort category is comprised of the "Sitting and Standing category" and the "Walking category". The former is related to people standing at the entrances/exits of the buildings, while the latter is related to people strolling or walking along the sidewalks and the from and to the parking lots.

Results of the wind comfort analysis for this category and comfort map are detailed in the next sections.

3.3 WIND COMFORT AT THE ENTRANCES/EXITS

In order to track the wind speeds at the entrances and exits, several numerical sensors were used in the model to record wind speeds. These sensors are located at each entrance/exit, at heights of 1.5m above grade. **Figure 2** and **Figure 3** above show the layout of these sensors. The sensors were also used to record the wind speeds for the existing conditions and allow comparison of the recorded values under existing conditions with the values recorded once the Development is added to the model.

For the ground level, average wind speeds were calculated based on predicted wind speeds at a height of 1.5 m above grade at all entrances/exits. **Figure 15** shows an example of predicted wind s at the Main entrance (Main-A1 in **Figure 2** above).

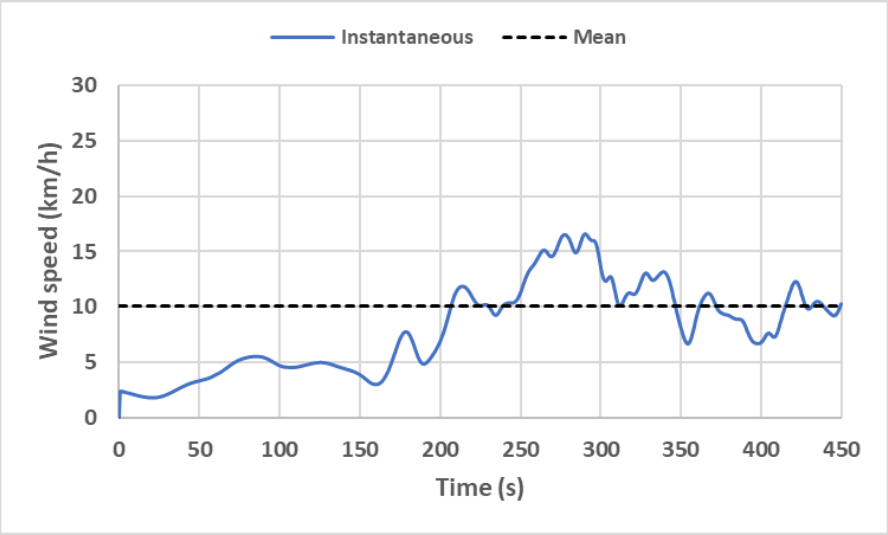


Figure 15: Predicted instantaneous wind speed at the Main entrance (1.5 m above grade) – Building A – North Winds

Using predicted instantaneous wind speeds, mean wind speeds and GEM speeds were calculated. **Figure 16** shows GEM speeds at the building entrances of Development. For these areas, the comfort category varies from "Standing" to "Walking" with a GEM speed varying between 15 km/hr and 22 km/hr.

Based on predicted GEM speeds at the entrances of the Development, **Figure 16** shows that there are no exceedances of the comfort criteria at the entrances to the development (building A and building G). Therefore, pedestrians are expected to be able to access the Development comfortably through these entrances.

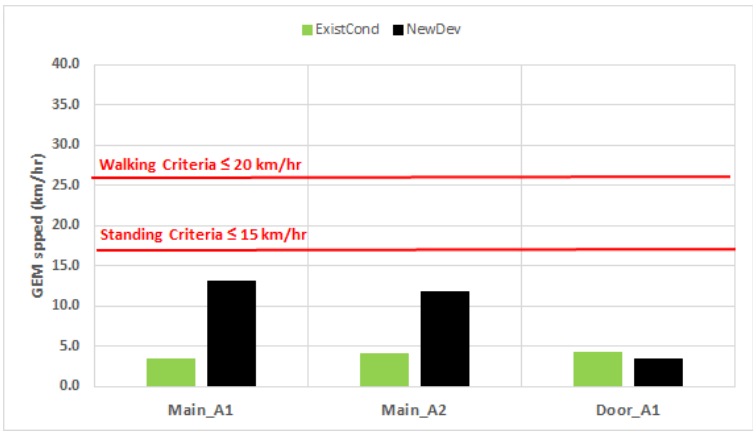


Figure 16a: Building A – West Winds

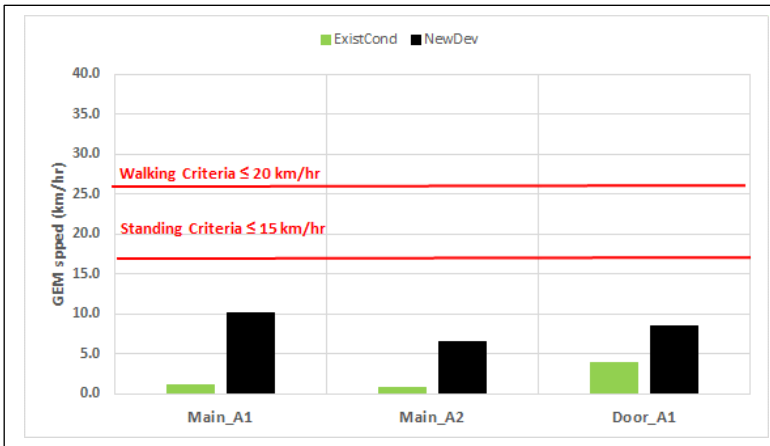


Figure 16b: Building A – North Winds

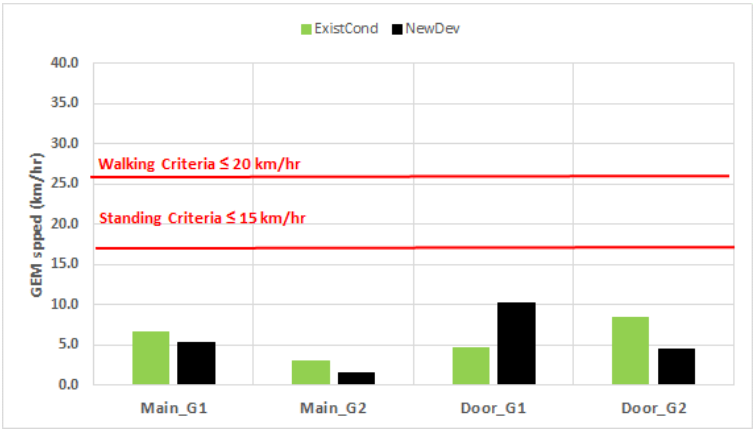


Figure 16c: Building G – West Winds

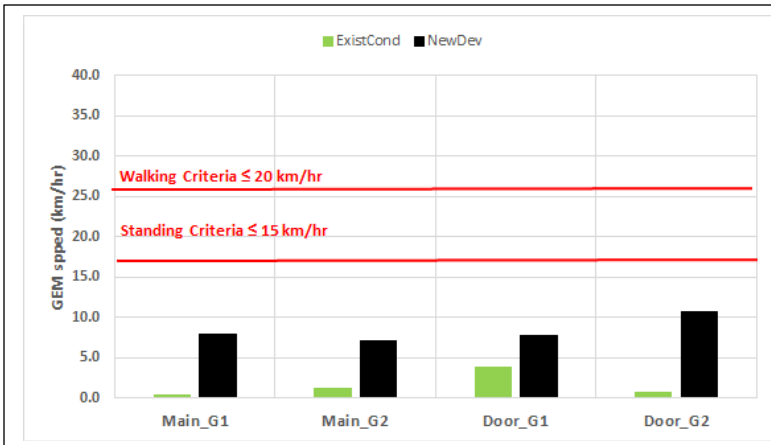


Figure 16d: Building G – North Winds

Figure 16: Predicted GEM Speeds at Building Entrances (1.5 m above grade) – Summer Season.

3.4 WIND COMFORT AT THE OUTDOOR PARKING LOTS

To track the wind speeds at the outdoor parking lots located on the south side of Building A, several numerical sensors were used in the model to record wind speeds. These sensors are located at the centreline of the sidewalks, at heights of 1.5 m above grade. **Figure 17** shows the layout of the sensors. The sensors were also used to record the wind speeds for the existing conditions and allow comparison of the recorded values under existing conditions with the values recorded once the Development is added to the model.

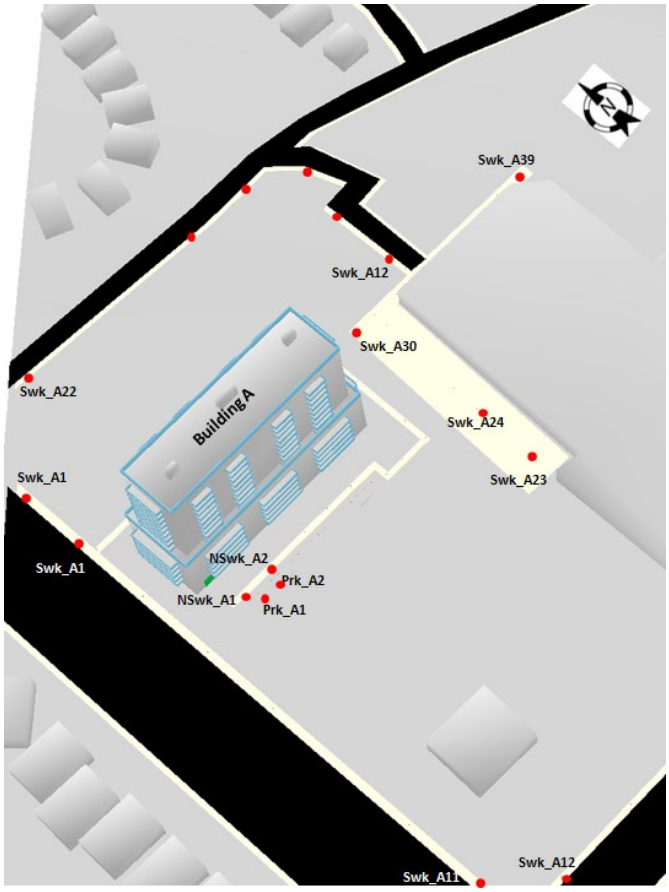


Figure 17-a: Around Building A

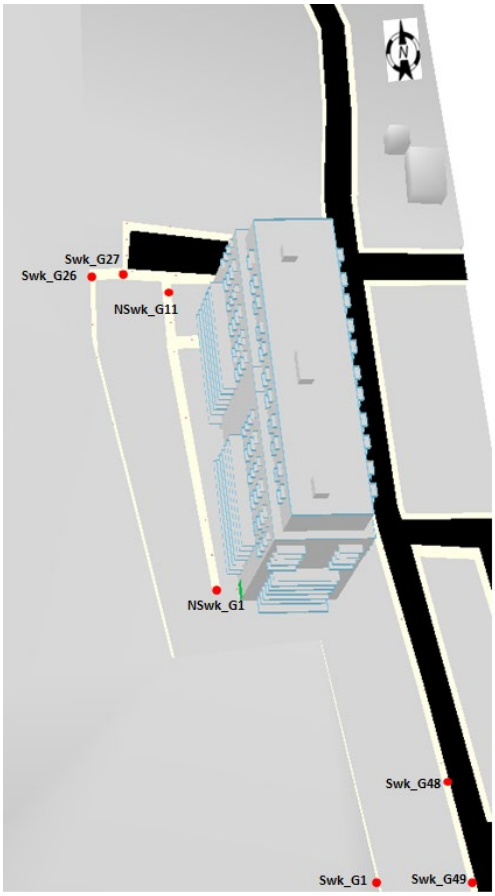


Figure 17-b: Around Building G

Figure 17: Numerical Sensors Locations at the parking lots (1.5 m above grade)

For the parking lots, mean wind speeds and GEM speeds were calculated based on predicted wind speed at a height of 1.5 m above ground at the numerical sensors. **Figure 18** shows an example of predicted wind speed at first parking lot (point Prk_A1 in **Figure 17**).

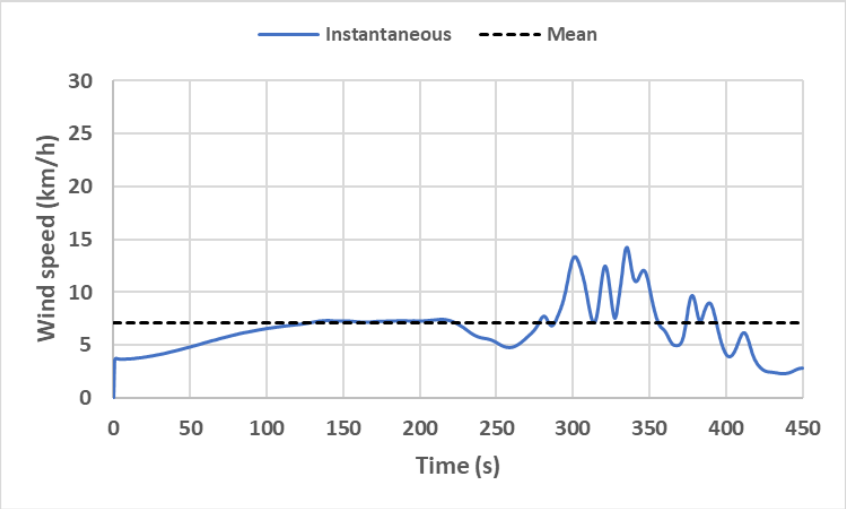


Figure 18: Predicted Instantaneous Wind Speed at a Parking lot Sensor (Prk-A1) (1.5 m above grade) – Building A- West Winds

Using predicted instantaneous wind speeds at all numerical sensors, mean wind speeds and GEM speeds were calculated. **Figure 19** shows GEM speeds on the parking lots around Building A. For all these locations, the comfort category is defined as "Walking" with a GEM speed not exceeding 20 km/hr. As shown in **Figure 19**, there is no predicted exceedance of the GEM speed limit for the "Walking" category from and to the outdoor parking, and therefore pedestrians are expected to be comfortable when walking in these areas.

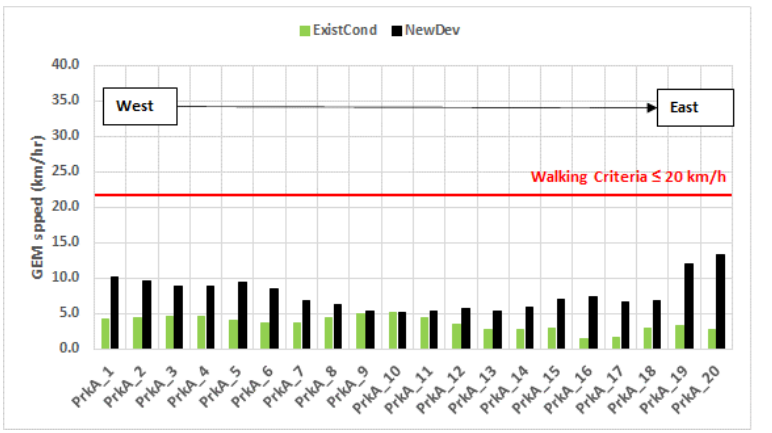


Figure 19a: Building A: West Winds.

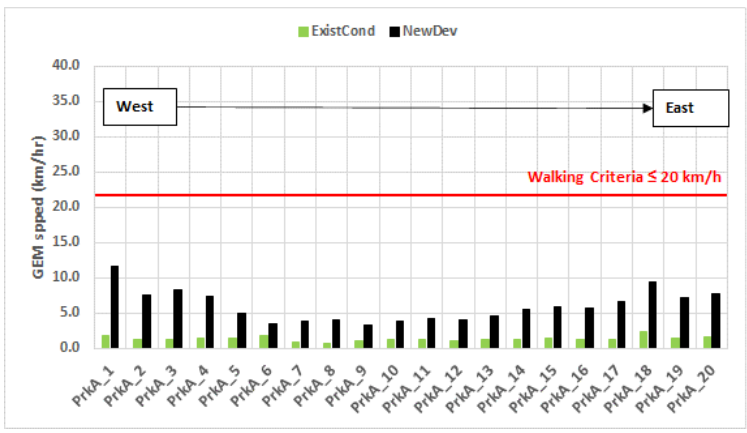


Figure 19b: Building A: North Winds.

Figure 19: Predicted GEM Speeds at the outdoor parking lots (1.5 m above grade) – Building A

3.5 WIND COMFORT AT THE NEW SIDEWALKS

To track the wind speeds at the sidewalks, several numerical sensors were used in the model to record wind speeds. These sensors are located at the centreline of the new sidewalks, at heights of 1.5 m above grade. **Figure 17** above shows the layout of the sensors. The sensors were also used to record the wind speeds for the existing conditions and allow comparison of the recorded values under existing conditions with the values recorded once the Development is added to the model.

For the sidewalks, mean wind speeds and GEM speeds were calculated based on predicted wind speed at a height of 1.5 m above ground at the numerical sensors. **Figure 20** shows an example of predicted wind speed at the new sidewalk on the west side of Building A (point NSwk-A1 in **Figure 17**).

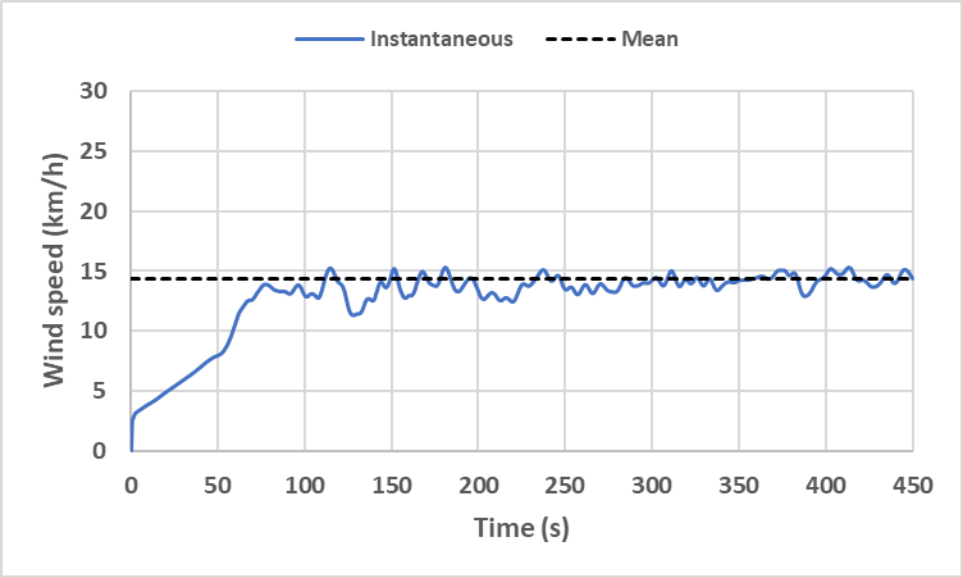


Figure 20: Predicted Instantaneous Wind Speed at the new Sidewalk Sensor (NSwk-A1) (1.5 m above grade) – Building A – North Winds

Using predicted instantaneous wind speeds at all numerical sensors, mean wind speeds and GEM speeds were calculated. **Figure 21** shows GEM speeds along the new sidewalks around Building A and Building G. For all these locations, the comfort category is defined as "Walking" with a GEM speed not exceeding 20 km/hr. As shown in **Figure 21**, there is no exceedance of the GEM speed limit for the "Walking" category along the new sidewalks associated with Building A and Building G, and therefore pedestrians are expected to be comfortable when walking along these new sidewalks.

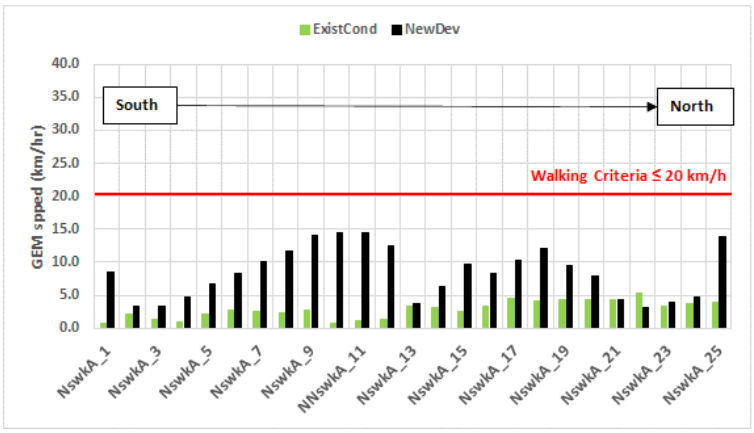


Figure 21a: Building A: West Winds

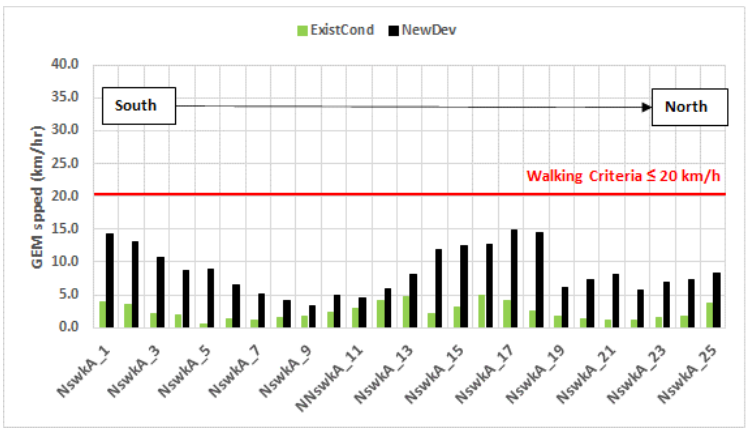


Figure 21b: Building A: North Winds

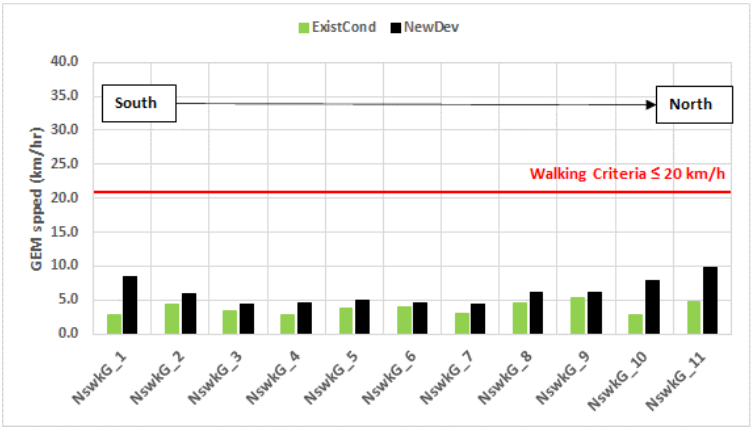


Figure 21c: Building G: West Winds

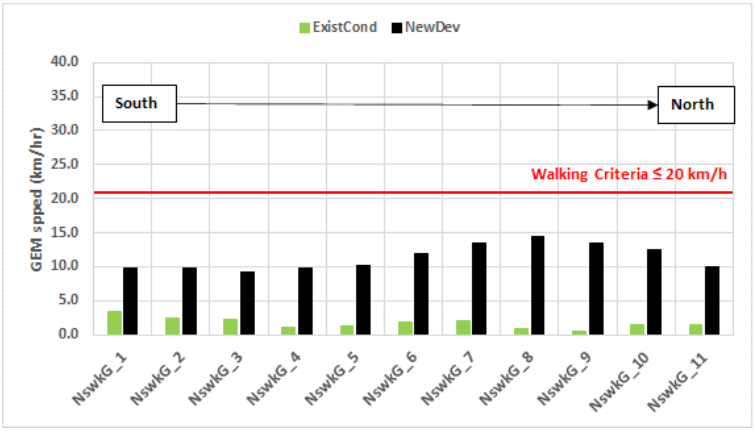


Figure 21d: Building G: North Winds

Figure 21: Predicted GEM Speeds Along the new Sidewalks St (1.5 m above grade) – Summer Season.

3.6 WIND COMFORT AT THE EXISTING SIDEWALKS

To track the wind speeds at the existing sidewalks, several numerical sensors were used in the model to record wind speeds. These sensors are located at the centreline of the sidewalks, at heights of 1.5 m above grade. **Figure 17** above shows the layout of the sensors. The sensors were also used to record the wind speeds for the existing conditions and allow comparison of the recorded values under existing conditions with the values recorded once the Development is added to the model.

For the existing sidewalks, mean wind speeds and GEM speeds were calculated based on predicted wind speed at a height of 1.5 m above ground at the numerical sensors. **Figure 22** shows an example of predicted wind speed along the sidewalk on Erin Mills Parkway (point Swk-A1 in **Figure 17**).

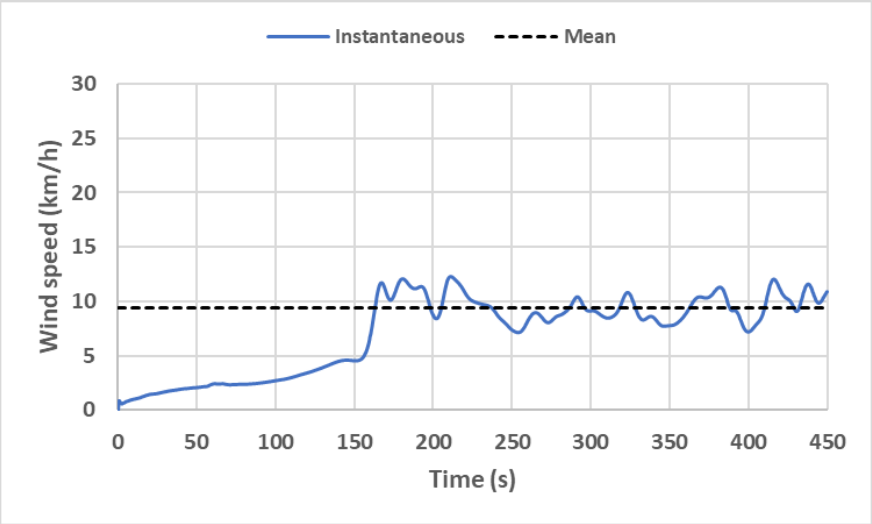


Figure 22: Predicted Instantaneous Wind Speed at the Sidewalk Sensor on Erin Mills Parkway (Swk-A1) (1.5 m above grade) –North Winds

Using predicted instantaneous wind speeds at all numerical sensors, mean wind speeds and GEM speeds were calculated. **Figure 23** and **Figure 24** shows GEM speeds along the sidewalks on Erin Mills parkway and Lincoln Greenway as well as along the Sheridan centre. For all these locations, the comfort category is defined as "Walking" with a GEM speed not exceeding 20 km/hr. As shown in **Figure 23** and **Figure 24**, there is no predicted exceedance of the GEM speed limit for the "Walking" category along the existing sidewalks surrounding Building A and Building G, and therefore pedestrians are expected to be comfortable when walking along these existing sidewalks.

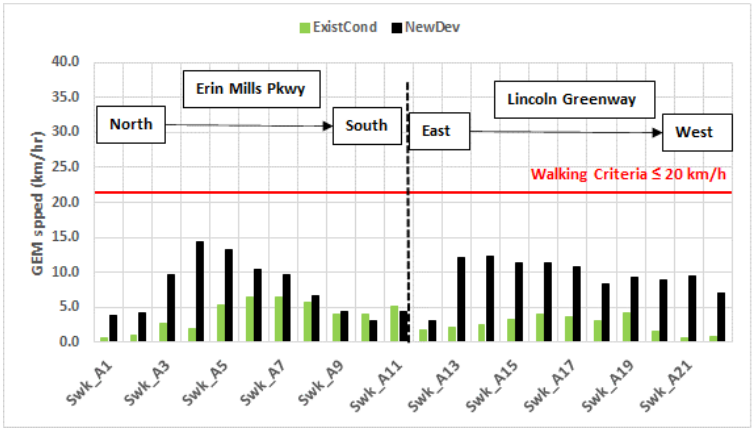


Figure 23a: Building A: West Winds

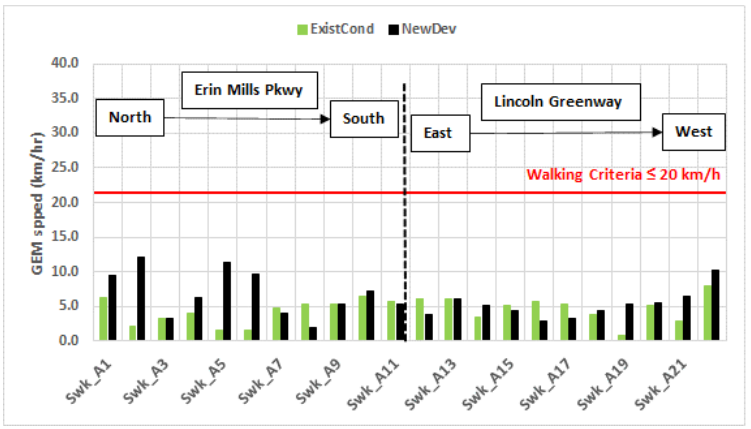


Figure 23b: Building A: North Winds

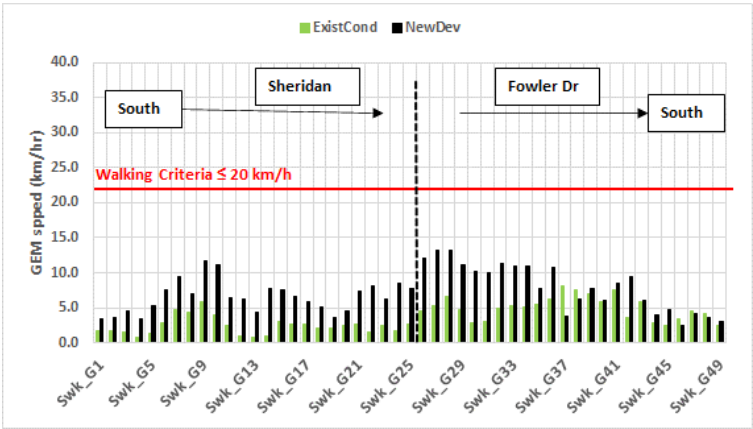


Figure 23c: Building G: West Winds

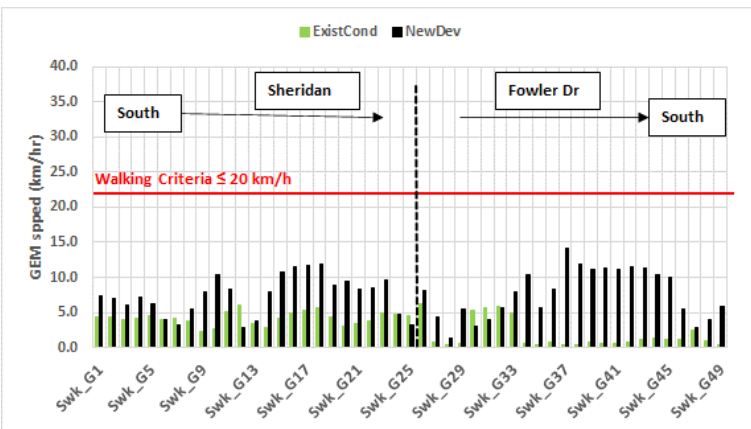


Figure 23d: Building G: North Winds

Figure 23: Predicted GEM Speeds Along the existing Sidewalks (1.5 m above grade) – Summer Season.

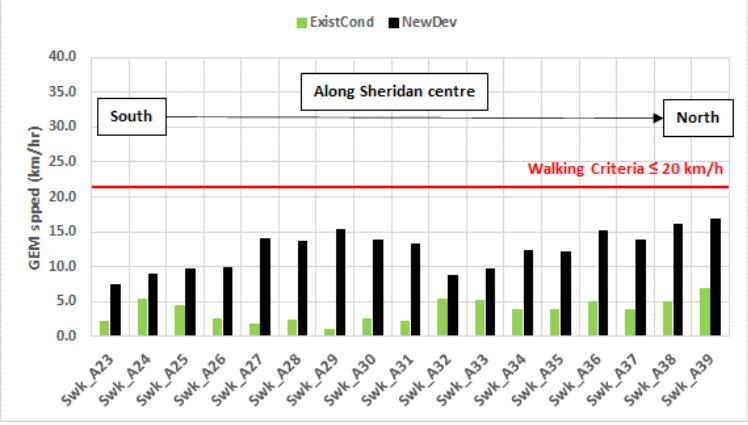


Figure 24a: Building A: West Winds

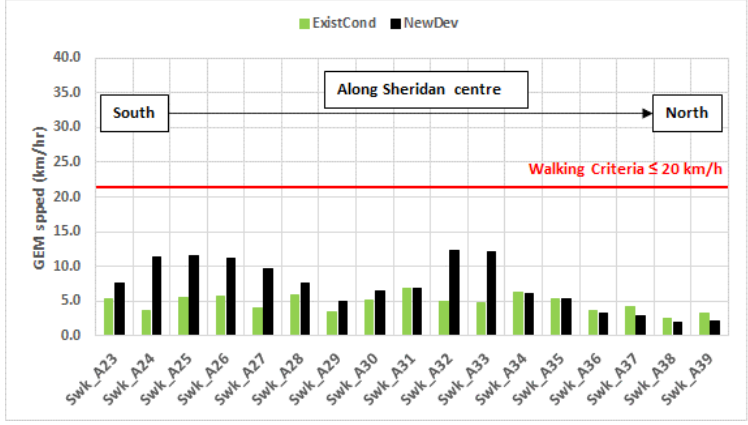


Figure 23b: Building A: North Winds

Figure 24: Predicted GEM Speeds on the Sidewalks along Sheridan centre (1.5 m above grade)

3.7 PEDESTRIAN COMFORT MAP

Predicted GEM wind speeds were compared to the comfort criteria values from **Table 1**. **Figure 25** and **Figure 26** show the pedestrian activities maps based on the corresponding predicted mean and GEM wind speed thresholds at ground level at 1.5 m above grade for the existing conditions and with the Development.

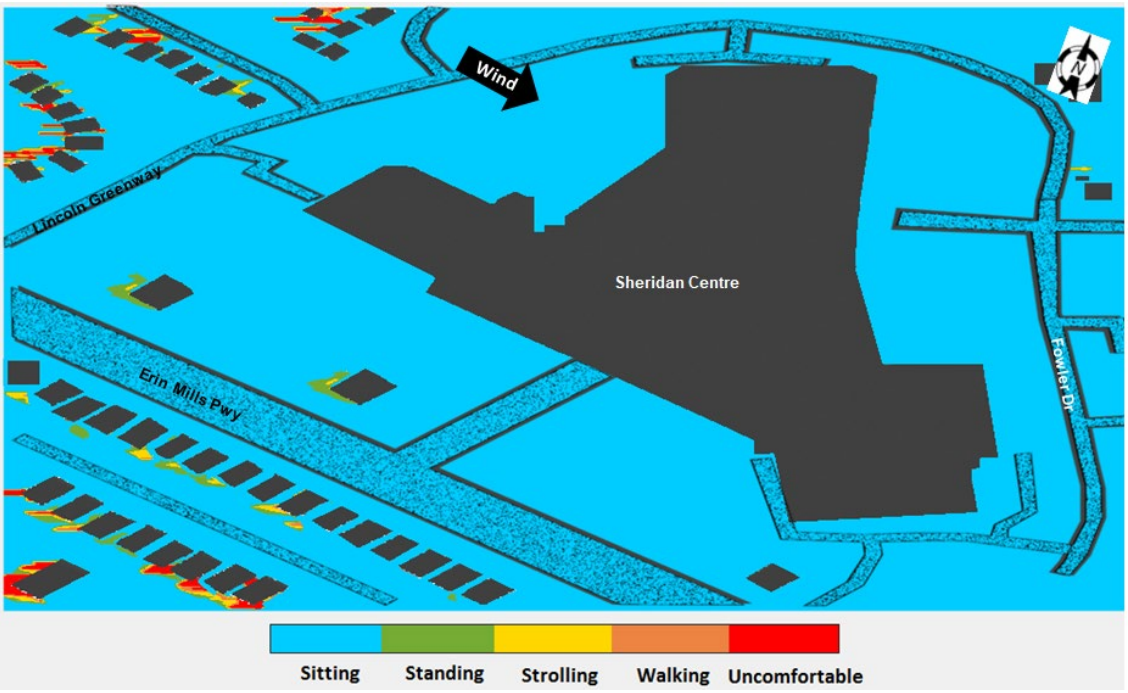


Figure 25a: Existing Conditions

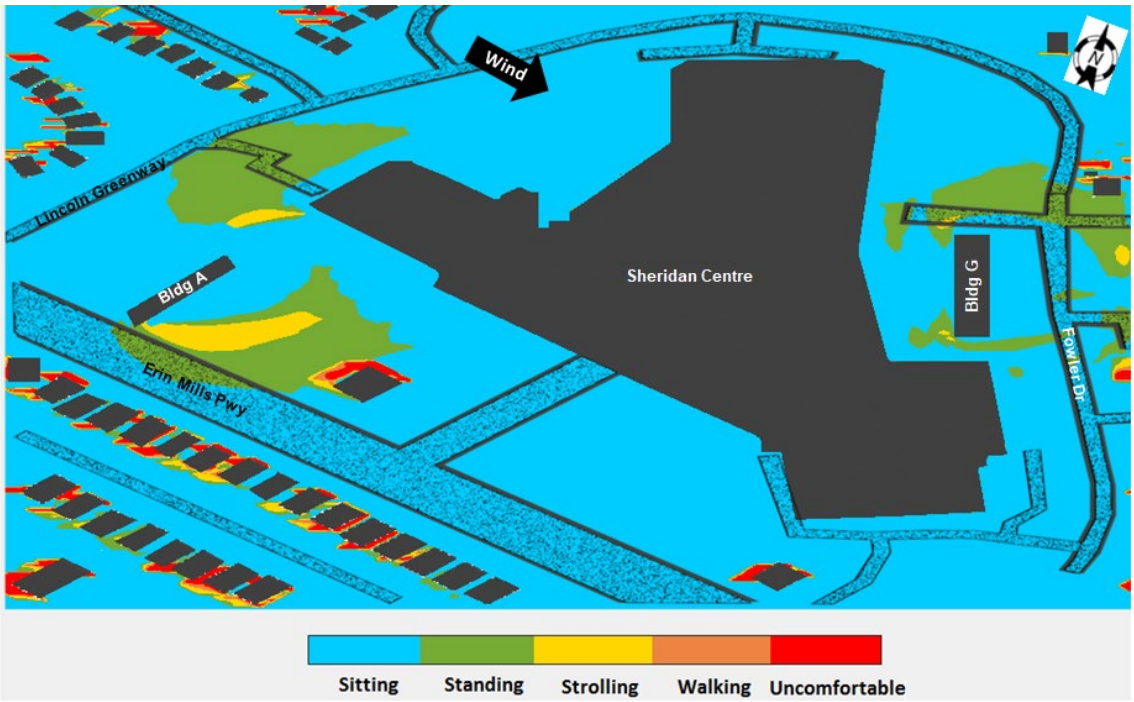


Figure 25b: With the Development

Figure 25: Predicted Pedestrian Comfort Map at Ground Level – (1.5 m above grade) – West Winds

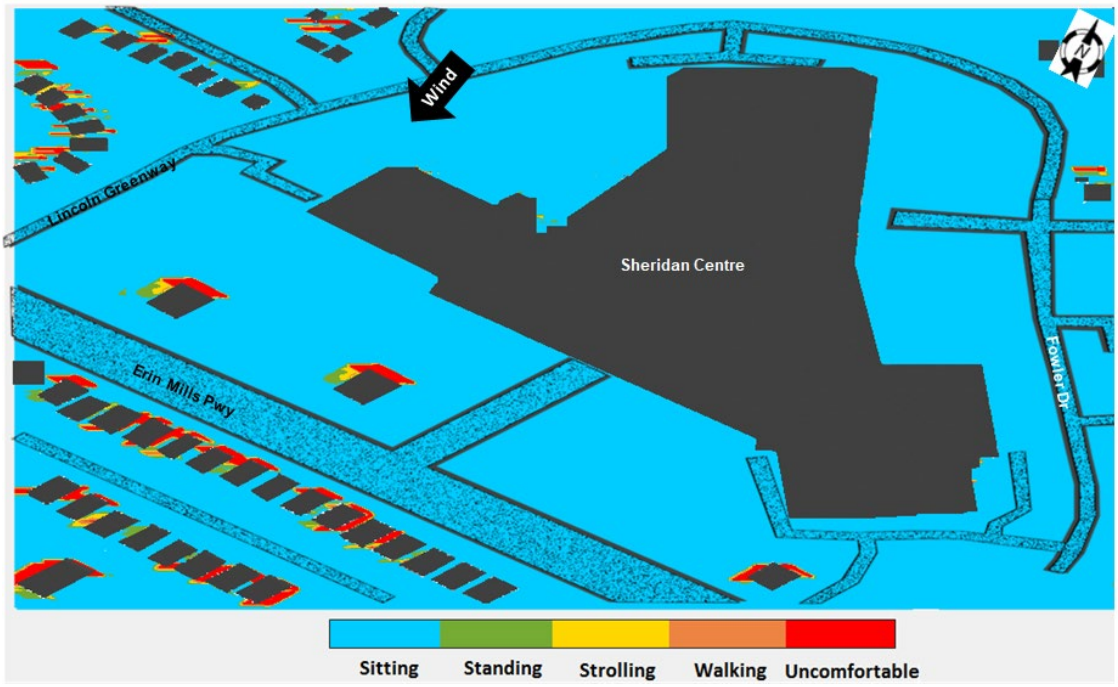


Figure 26a: Existing Conditions

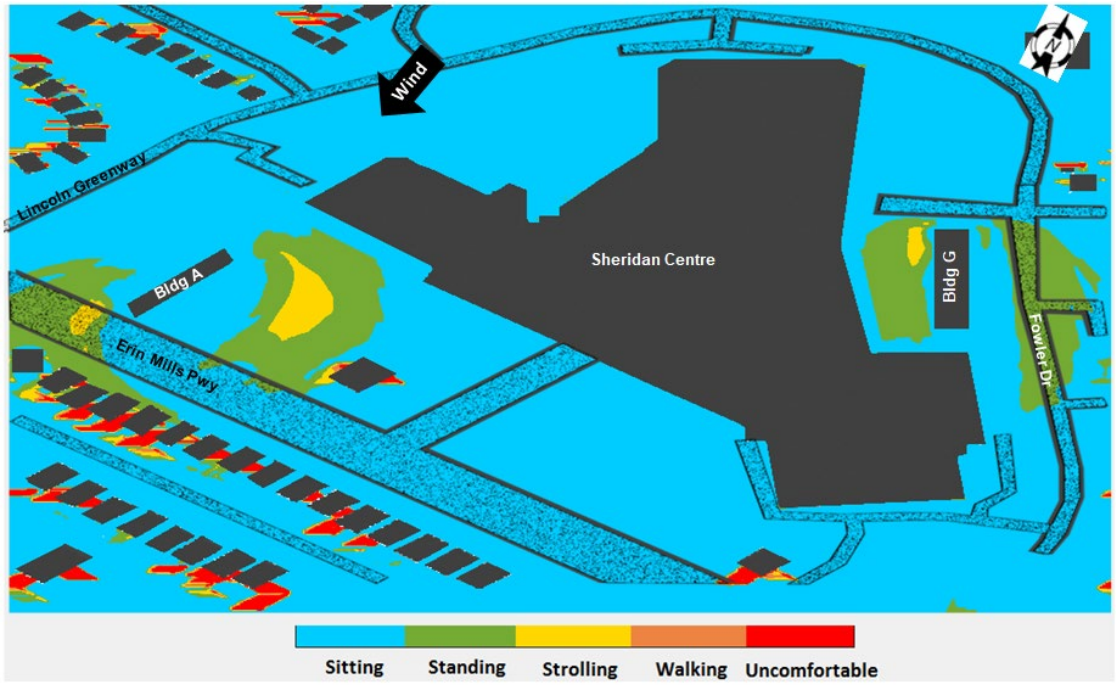


Figure 26b: With the Development

Figure 26: Predicted Pedestrian Comfort Map at Ground Level – (1.5 m above grade) – North Winds

A summary of the CFD model results for all areas of interest are shown in **Table 2** through **Table 13**, with compliance relevant to the TOR criteria indicated.

Table 2 Wind Level Results from CFD Modelling –Entrances/Exits – Building A – West Winds

LEVEL	ENTRANCES/EXITS	GEM SPEED (KM/HR)	COMFORT CATEGORY	LIMIT (KM/HR)	EXCEEDANCE	COMPLIANT
Ground Floor	Main_A1	13.1	Standing	14	0.0%	Yes
	Main_A2	11.8	Standing	14	0.0%	Yes
	Door_A1	3.4	Walking	20	0.0%	Yes

Table 3 Wind Level Results from CFD Modelling –Entrances/Exits – Building G – West Winds

LEVEL	ENTRANCES/EXITS	GEM SPEED (KM/HR)	COMFORT CATEGORY	LIMIT (KM/HR)	EXCEEDANCE	COMPLIANT
Ground Floor	Main_G1	5.3	Standing	14	0.0%	Yes
	Main_G2	1.5	Standing	14	0.0%	Yes
	Door_G1	10.1	Walking	20	0.0%	Yes
	Door_G2	4.4	Walking	20	0.0%	Yes

Table 4 Wind Level Results from CFD Modelling –New Sidewalks - Building G – West Winds

LEVEL	SIDEWALK	GEM SPEED (KM/HR)	COMFORT CATEGORY	LIMIT (KM/HR)	EXCEEDANCE	COMPLIANT
Ground	NswkG_1	8.5	Walking	20	0.0%	Yes
	NswkG_2	5.9	Walking	20	0.0%	Yes
	NswkG_3	4.4	Walking	20	0.0%	Yes
	NswkG_4	4.5	Walking	20	0.0%	Yes
	NswkG_5	5.0	Walking	20	0.0%	Yes
	NswkG_6	4.6	Walking	20	0.0%	Yes
	NswkG_7	4.5	Walking	20	0.0%	Yes
	NswkG_8	6.0	Walking	20	0.0%	Yes
	NswkG_9	6.1	Walking	20	0.0%	Yes
	NswkG_10	7.8	Walking	20	0.0%	Yes
	NswkG_11	9.8	Walking	20	0.0%	Yes

Table 5 Wind Level Results from CFD Modelling –New Sidewalks - Building A – West Winds

LEVEL	SIDEWALK	GEM SPEED (KM/HR)	COMFORT CATEGORY	LIMIT (KM/HR)	EXCEEDANCE	COMPLIANT
Ground	**NswkA_1**	8.5	Walking	20	0.0%	**Yes**
	NswkA_2	3.3	Walking	20	0.0%	**Yes**
	NswkA_3	3.2	Walking	20	0.0%	**Yes**
	NswkA_4	4.6	Walking	20	0.0%	**Yes**
	NswkA_5	6.7	Walking	20	0.0%	**Yes**
	NswkA_6	8.3	Walking	20	0.0%	**Yes**
	NswkA_7	10.1	Walking	20	0.0%	**Yes**
	NswkA_8	11.7	Walking	20	0.0%	**Yes**
	NswkA_9	14.0	Walking	20	0.0%	**Yes**
	NswkA_10	14.5	Walking	20	0.0%	**Yes**
	NNswkA_11	14.5	Walking	20	0.0%	**Yes**
	NswkA_12	12.4	Walking	20	0.0%	**Yes**
	NswkA_13	3.8	Walking	20	0.0%	**Yes**
	NswkA_14	6.3	Walking	20	0.0%	**Yes**
	NswkA_15	9.6	Walking	20	0.0%	**Yes**
	NswkA_16	8.3	Walking	20	0.0%	**Yes**
	NswkA_17	10.2	Walking	20	0.0%	**Yes**
	NswkA_18	12.2	Walking	20	0.0%	**Yes**
	NswkA_19	9.6	Walking	20	0.0%	**Yes**
	NswkA_20	7.9	Walking	20	0.0%	**Yes**
	NswkA_21	4.4	Walking	20	0.0%	**Yes**
	NswkA_22	3.1	Walking	20	0.0%	**Yes**
	NswkA_23	3.9	Walking	20	0.0%	**Yes**
	NswkA_24	4.7	Walking	20	0.0%	**Yes**
	NswkA_25	13.9	Walking	20	0.0%	**Yes**

Table 6 Wind Level Results from CFD Modelling –Existing Sidewalks - Building A – West Winds

LEVEL	SIDEWALK	GEM SPEED (KM/HR)	COMFORT CATEGORY	LIMIT (KM/HR)	EXCEEDANCE	COMPLIANT
Ground	**Swk_A1**	3.8	Walking	20	0.0%	**Yes**
	Swk_A2	4.2	Walking	20	0.0%	**Yes**
	Swk_A3	9.7	Walking	20	0.0%	**Yes**
	Swk_A4	14.3	Walking	20	0.0%	**Yes**
	Swk_A5	13.3	Walking	20	0.0%	**Yes**
	Swk_A6	10.4	Walking	20	0.0%	**Yes**
	Swk_A7	9.7	Walking	20	0.0%	**Yes**
	Swk_A8	6.6	Walking	20	0.0%	**Yes**
	Swk_A9	4.3	Walking	20	0.0%	**Yes**
	Swk_A10	3.0	Walking	20	0.0%	**Yes**

	Swk_A11	4.4	Walking	20	0.0%	**Yes**
	Swk_A12	3.2	Walking	20	0.0%	**Yes**
	Swk_A13	12.2	Walking	20	0.0%	**Yes**
	Swk_A14	12.4	Walking	20	0.0%	**Yes**
	Swk_A15	11.4	Walking	20	0.0%	**Yes**
	Swk_A16	11.4	Walking	20	0.0%	**Yes**
	Swk_A17	10.9	Walking	20	0.0%	**Yes**
	Swk_A18	8.4	Walking	20	0.0%	**Yes**
	Swk_A19	9.3	Walking	20	0.0%	**Yes**
	Swk_A20	8.9	Walking	20	0.0%	**Yes**
	Swk_A21	9.5	Walking	20	0.0%	**Yes**
	Swk_A22	7.1	Walking	20	0.0%	**Yes**
	Swk_A23	7.4	Walking	20	0.0%	**Yes**
	Swk_A24	9.0	Walking	20	0.0%	**Yes**
	Swk_A25	9.6	Walking	20	0.0%	**Yes**
	Swk_A26	9.9	Walking	20	0.0%	**Yes**
	Swk_A27	14.0	Walking	20	0.0%	**Yes**
	Swk_A28	13.7	Walking	20	0.0%	**Yes**
	Swk_A29	15.3	Walking	20	0.0%	**Yes**
	Swk_A30	13.8	Walking	20	0.0%	**Yes**
	Swk_A31	13.3	Walking	20	0.0%	**Yes**
	Swk_A32	8.8	Walking	20	0.0%	**Yes**
	Swk_A33	9.8	Walking	20	0.0%	**Yes**
	Swk_A34	12.4	Walking	20	0.0%	**Yes**
	Swk_A35	12.1	Walking	20	0.0%	**Yes**
	Swk_A36	15.1	Walking	20	0.0%	**Yes**
	Swk_A37	13.7	Walking	20	0.0%	**Yes**
	Swk_A38	16.1	Walking	20	0.0%	**Yes**
	Swk_A39	16.7	Walking	20	0.0%	**Yes**

Table 7 Wind Level Results from CFD Modelling – Existing Sidewalks - Building G – West Winds

LEVEL	SIDEWALK	GEM SPEED (KM/HR)	COMFORT CATEGORY	LIMIT (KM/HR)	EXCEEDANCE	COMPLIANT
Ground	**Swk_G1**	3.4	Walking	20	0.0%	**Yes**
	Swk_G2	3.7	Walking	20	0.0%	**Yes**
	Swk_G3	4.5	Walking	20	0.0%	**Yes**
	Swk_G4	3.4	Walking	20	0.0%	**Yes**
	Swk_G5	5.4	Walking	20	0.0%	**Yes**
	Swk_G6	7.5	Walking	20	0.0%	**Yes**
	Swk_G7	9.5	Walking	20	0.0%	**Yes**
	Swk_G8	6.9	Walking	20	0.0%	**Yes**
	Swk_G9	11.6	Walking	20	0.0%	**Yes**
	Swk_G10	11.1	Walking	20	0.0%	**Yes**

	Swk_G11	6.3	Walking	20	0.0%	**Yes**
	Swk_G12	6.2	Walking	20	0.0%	**Yes**
	Swk_G13	4.3	Walking	20	0.0%	**Yes**
	Swk_G14	7.8	Walking	20	0.0%	**Yes**
	Swk_G15	7.5	Walking	20	0.0%	**Yes**
	Swk_G16	6.6	Walking	20	0.0%	**Yes**
	Swk_G17	5.8	Walking	20	0.0%	**Yes**
	Swk_G18	5.2	Walking	20	0.0%	**Yes**
	Swk_G19	3.6	Walking	20	0.0%	**Yes**
	Swk_G20	4.6	Walking	20	0.0%	**Yes**
	Swk_G21	7.4	Walking	20	0.0%	**Yes**
	Swk_G22	8.2	Walking	20	0.0%	**Yes**
	Swk_G23	6.3	Walking	20	0.0%	**Yes**
	Swk_G24	8.6	Walking	20	0.0%	**Yes**
	Swk_G25	7.8	Walking	20	0.0%	**Yes**
	Swk_G26	12.1	Walking	20	0.0%	**Yes**
	Swk_G27	13.2	Walking	20	0.0%	**Yes**
	Swk_G28	13.1	Walking	20	0.0%	**Yes**
	Swk_G29	11.2	Walking	20	0.0%	**Yes**
	Swk_G30	10.2	Walking	20	0.0%	**Yes**
	Swk_G31	10.0	Walking	20	0.0%	**Yes**
	Swk_G32	11.3	Walking	20	0.0%	**Yes**
	Swk_G33	11.0	Walking	20	0.0%	**Yes**
	Swk_G34	10.9	Walking	20	0.0%	**Yes**
	Swk_G35	7.8	Walking	20	0.0%	**Yes**
	Swk_G36	10.7	Walking	20	0.0%	**Yes**
	Swk_G37	3.8	Walking	20	0.0%	**Yes**
	Swk_G38	6.2	Walking	20	0.0%	**Yes**
	Swk_G39	7.8	Walking	20	0.0%	**Yes**
	Swk_G40	6.0	Walking	20	0.0%	**Yes**
	Swk_G41	8.4	Walking	20	0.0%	**Yes**
	Swk_G42	9.5	Walking	20	0.0%	**Yes**
	Swk_G43	6.0	Walking	20	0.0%	**Yes**
	Swk_G44	4.0	Walking	20	0.0%	**Yes**
	Swk_G45	4.8	Walking	20	0.0%	**Yes**
	Swk_G46	2.5	Walking	20	0.0%	**Yes**
	Swk_G47	4.2	Walking	20	0.0%	**Yes**
	Swk_G48	3.5	Walking	20	0.0%	**Yes**
	Swk_G49	3.0	Walking	20	0.0%	**Yes**

Table 8 Wind Level Results from CFD Modelling –Entrances/Exits – Building A – North Winds

LEVEL	ENTRANCES/EXITS	GEM SPEED (KM/HR)	COMFORT CATEGORY	LIMIT (KM/HR)	EXCEEDANCE	COMPLIANT
Ground	Main_A1	10.1	Standing	14	0.0%	Yes
	Main_A2	6.5	Standing	14	0.0%	Yes
	Door_A1	8.4	Standing	20	0.0%	Yes

Table 9 Wind Level Results from CFD Modelling –Entrances/Exits – Building G – North Winds

LEVEL	ENTRANCES/EXITS	GEM SPEED (KM/HR)	COMFORT CATEGORY	LIMIT (KM/HR)	EXCEEDANCE	COMPLIANT
Ground	Main_G1	7.8	Standing	14	0.0%	Yes
	Main_G2	7.1	Standing	14	0.0%	Yes
	Door_G1	7.8	Standing	20	0.0%	Yes
	Door_G2	10.7	Standing	20	0.0%	Yes

Table 10 Wind Level Results from CFD Modelling –New Sidewalks - Building G – North Winds

LEVEL	SIDEWALK	GEM SPEED (KM/HR)	COMFORT CATEGORY	LIMIT (KM/HR)	EXCEEDANCE	COMPLIANT
Ground	NswkG_1	9.7	Walking	20	0.0%	Yes
	NswkG_2	9.8	Walking	20	0.0%	Yes
	NswkG_3	9.2	Walking	20	0.0%	Yes
	NswkG_4	9.7	Walking	20	0.0%	Yes
	NswkG_5	10.1	Walking	20	0.0%	Yes
	NswkG_6	12.0	Walking	20	0.0%	Yes
	NswkG_7	13.5	Walking	20	0.0%	Yes
	NswkG_8	14.4	Walking	20	0.0%	Yes
	NswkG_9	13.5	Walking	20	0.0%	Yes
	NswkG_10	12.6	Walking	20	0.0%	Yes
	NswkG_11	10.0	Walking	20	0.0%	Yes

Table 11 Wind Level Results from CFD Modelling –New Sidewalks - Building A – North Winds

LEVEL	SIDEWALK	GEM SPEED (KM/HR)	COMFORT CATEGORY	LIMIT (KM/HR)	EXCEEDANCE	COMPLIANT
	NswkA_1	14.3	Walking	20	0.0%	Yes
	NswkA_2	13.1	Walking	20	0.0%	Yes
	NswkA_3	10.8	Walking	20	0.0%	Yes
	NswkA_4	8.6	Walking	20	0.0%	Yes
	NswkA_5	8.8	Walking	20	0.0%	Yes
	NswkA_6	6.6	Walking	20	0.0%	Yes
	NswkA_7	5.0	Walking	20	0.0%	Yes
	NswkA_8	4.2	Walking	20	0.0%	Yes
	NswkA_9	3.3	Walking	20	0.0%	Yes
	NswkA_10	4.9	Walking	20	0.0%	Yes

Ground	**NNswkA_11**	4.4	Walking	20	0.0%	**Yes**
	NswkA_12	6.0	Walking	20	0.0%	**Yes**
	NswkA_13	8.1	Walking	20	0.0%	**Yes**
	NswkA_14	11.8	Walking	20	0.0%	**Yes**
	NswkA_15	12.4	Walking	20	0.0%	**Yes**
	NswkA_16	12.6	Walking	20	0.0%	**Yes**
	NswkA_17	14.9	Walking	20	0.0%	**Yes**
	NswkA_18	14.4	Walking	20	0.0%	**Yes**
	NswkA_19	6.1	Walking	20	0.0%	**Yes**
	NswkA_20	7.2	Walking	20	0.0%	**Yes**
	NswkA_21	8.2	Walking	20	0.0%	**Yes**
	NswkA_22	5.8	Walking	20	0.0%	**Yes**
	NswkA_23	6.9	Walking	20	0.0%	**Yes**
	NswkA_24	7.2	Walking	20	0.0%	**Yes**
	NswkA_25	8.3	Walking	20	0.0%	**Yes**

Table 12 Wind Level Results from CFD Modelling –Existing Sidewalks - Building A – North Winds

LEVEL	SIDEWALK	GEM SPEED (KM/HR)	COMFORT CATEGORY	LIMIT (KM/HR)	EXCEEDANCE	COMPLIANT
Ground	**Swk_A1**	9.4	Walking	20	0.0%	**Yes**
	Swk_A2	12.1	Walking	20	0.0%	**Yes**
	Swk_A3	3.3	Walking	20	0.0%	**Yes**
	Swk_A4	6.3	Walking	20	0.0%	**Yes**
	Swk_A5	11.4	Walking	20	0.0%	**Yes**
	Swk_A6	9.6	Walking	20	0.0%	**Yes**
	Swk_A7	4.0	Walking	20	0.0%	**Yes**
	Swk_A8	2.0	Walking	20	0.0%	**Yes**
	Swk_A9	5.3	Walking	20	0.0%	**Yes**
	Swk_A10	7.2	Walking	20	0.0%	**Yes**
	Swk_A11	5.3	Walking	20	0.0%	**Yes**
	Swk_A12	3.9	Walking	20	0.0%	**Yes**
	Swk_A13	6.2	Walking	20	0.0%	**Yes**
	Swk_A14	5.1	Walking	20	0.0%	**Yes**
	Swk_A15	4.4	Walking	20	0.0%	**Yes**
	Swk_A16	3.0	Walking	20	0.0%	**Yes**
	Swk_A17	3.3	Walking	20	0.0%	**Yes**
	Swk_A18	4.4	Walking	20	0.0%	**Yes**
	Swk_A19	5.3	Walking	20	0.0%	**Yes**
	Swk_A20	5.5	Walking	20	0.0%	**Yes**
	Swk_A21	6.4	Walking	20	0.0%	**Yes**
	Swk_A22	10.2	Walking	20	0.0%	**Yes**
	Swk_A23	7.6	Walking	20	0.0%	**Yes**

	Swk_A24	11.3	Walking	20	0.0%	**Yes**
	Swk_A25	11.6	Walking	20	0.0%	**Yes**
	Swk_A26	11.2	Walking	20	0.0%	**Yes**
	Swk_A27	9.6	Walking	20	0.0%	**Yes**
	Swk_A28	7.7	Walking	20	0.0%	**Yes**
	Swk_A29	5.0	Walking	20	0.0%	**Yes**
	Swk_A30	6.5	Walking	20	0.0%	**Yes**
	Swk_A31	6.8	Walking	20	0.0%	**Yes**
	Swk_A32	12.3	Walking	20	0.0%	**Yes**
	Swk_A33	12.2	Walking	20	0.0%	**Yes**
	Swk_A34	6.1	Walking	20	0.0%	**Yes**
	Swk_A35	5.3	Walking	20	0.0%	**Yes**
	Swk_A36	3.3	Walking	20	0.0%	**Yes**
	Swk_A37	2.8	Walking	20	0.0%	**Yes**
	Swk_A38	2.0	Walking	20	0.0%	**Yes**
	Swk_A39	2.1	Walking	20	0.0%	**Yes**

Table 13 Wind Level Results from CFD Modelling – Existing Sidewalks - Building G – North Winds

LEVEL	SIDEWALK	GEM SPEED (KM/HR)	COMFORT CATEGORY	LIMIT (KM/HR)	EXCEEDANCE	COMPLIANT
Ground	**Swk_G1**	7.4	Walking	20	0.0%	**Yes**
	Swk_G2	7.1	Walking	20	0.0%	**Yes**
	Swk_G3	6.1	Walking	20	0.0%	**Yes**
	Swk_G4	7.1	Walking	20	0.0%	**Yes**
	Swk_G5	6.3	Walking	20	0.0%	**Yes**
	Swk_G6	4.0	Walking	20	0.0%	**Yes**
	Swk_G7	3.2	Walking	20	0.0%	**Yes**
	Swk_G8	5.5	Walking	20	0.0%	**Yes**
	Swk_G9	7.9	Walking	20	0.0%	**Yes**
	Swk_G10	10.4	Walking	20	0.0%	**Yes**
	Swk_G11	8.4	Walking	20	0.0%	**Yes**
	Swk_G12	2.9	Walking	20	0.0%	**Yes**
	Swk_G13	3.8	Walking	20	0.0%	**Yes**
	Swk_G14	7.9	Walking	20	0.0%	**Yes**
	Swk_G15	10.8	Walking	20	0.0%	**Yes**
	Swk_G16	11.5	Walking	20	0.0%	**Yes**
	Swk_G17	11.7	Walking	20	0.0%	**Yes**
	Swk_G18	11.9	Walking	20	0.0%	**Yes**
	Swk_G19	8.9	Walking	20	0.0%	**Yes**
	Swk_G20	9.3	Walking	20	0.0%	**Yes**
	Swk_G21	8.4	Walking	20	0.0%	**Yes**
	Swk_G22	8.5	Walking	20	0.0%	**Yes**

	Swk_G23	9.6	Walking	20	0.0%	**Yes**
	Swk_G24	4.7	Walking	20	0.0%	**Yes**
	Swk_G25	3.3	Walking	20	0.0%	**Yes**
	Swk_G26	8.0	Walking	20	0.0%	**Yes**
	Swk_G27	4.3	Walking	20	0.0%	**Yes**
	Swk_G28	1.4	Walking	20	0.0%	**Yes**
	Swk_G29	5.5	Walking	20	0.0%	**Yes**
	Swk_G30	3.0	Walking	20	0.0%	**Yes**
	Swk_G31	4.0	Walking	20	0.0%	**Yes**
	Swk_G32	5.7	Walking	20	0.0%	**Yes**
	Swk_G33	8.0	Walking	20	0.0%	**Yes**
	Swk_G34	10.4	Walking	20	0.0%	**Yes**
	Swk_G35	5.6	Walking	20	0.0%	**Yes**
	Swk_G36	8.4	Walking	20	0.0%	**Yes**
	Swk_G37	14.1	Walking	20	0.0%	**Yes**
	Swk_G38	12.0	Walking	20	0.0%	**Yes**
	Swk_G39	11.2	Walking	20	0.0%	**Yes**
	Swk_G40	11.3	Walking	20	0.0%	**Yes**
	Swk_G41	11.1	Walking	20	0.0%	**Yes**
	Swk_G42	11.5	Walking	20	0.0%	**Yes**
	Swk_G43	11.3	Walking	20	0.0%	**Yes**
	Swk_G44	10.4	Walking	20	0.0%	**Yes**
	Swk_G45	9.9	Walking	20	0.0%	**Yes**
	Swk_G46	5.5	Walking	20	0.0%	**Yes**
	Swk_G47	2.9	Walking	20	0.0%	**Yes**
	Swk_G48	4.0	Walking	20	0.0%	**Yes**
	Swk_G49	5.9	Walking	20	0.0%	**Yes**

4 CONCLUSION

For the existing conditions, the CFD model results indicate that there are no predicted wind issues at the ground level for pedestrians accessing the site during the summer season.

For the Development, the CFD model results indicate that there are no predicted issues observed at the ground level of the buildings for pedestrians using the main entrances or other entrances/exits. Overall, at ground level, the study shows that the main entrances to Building A and Building G are expected to be comfortable for people to stand or stroll in these areas. People standing, strolling, or walking in these areas are predicted to primarily experience calm and gentle breezes. Similar wind comfortable conditions are shown for the other entrances/exits when people are walking in and out.

In addition, the CFD model results indicate that pedestrians are expected to be comfortable when walking in the vicinity of the Development along the new and existing sidewalks surrounding the development.

Finally, the CFD model results indicate that predicted GEM speeds around areas of interests of the development do not exceed the threshold wind safety condition of 90 km/hr.

5 REFERENCES

1. Davenport, A.G. (1972) "An Approach to Human Comfort Criteria for Environmental Wind Conditions", Colloquium on Building Climatology, Stockholm, September 1972.

2. Lawson, T.V. (1973). "Wind Environment of Buildings: A Logical Approach to the Establishment of Criteria", Report No. TVL 7321, Department of Aeronautic Engineering, University of Bristol, Bristol, England.

3. Lawson TV, Penwarden AD. 1975. "The effects of wind on people in the vicinity of buildings", Proceedings 4th International Conference on Wind Effects on Buildings and Structures, Cambridge University Press, Heathrow, pp. 605–622.

4. Isyumov, N. and Davenport, A.G., (1977) "The Ground Level Wind Environment in Built-up Areas", Proc. of 4th Int. Conf. on Wind Effects on Buildings and Structures, London, England, Sept. 1975, Cambridge University Press, 1977.

5. Isyumov, N., (1978), "Studies of the Pedestrian Level Wind Environment at the Boundary Layer Wind Tunnel Laboratory of the University of Western Ontario", Journal. Industrial Aerodynamics, Vol. 3, 187-200, 1978.

6. Lawson TV. 1978. "The wind content of the built environment". J Ind Aerodyn 3:93-105.

7. Melbourne WH. 1978. "Criteria for environmental wind conditions". J Ind Aerodyn 3:241-249.

8. Kapoor, V., Page, C., Stefanowicz, P., Livesey, F., Isyumov, N., (1990) “Pedestrian Level Wind Studies to Aid in the Planning of a Major Development”, Structures Congress Abstracts, American Society of Civil Engineers, 1990.

9. Williams, C.J., Soligo M.J. and Cote, J. (1992). "A Discussion of the Components for a Comprehensive Pedestrian Level Comfort Criteria," Journal of Wind Engineering and Industrial Aerodynamics, Vol.41-44, pp.2389-2390.

10. Soligo, M.J., Irwin, P.A., Williams, C.J. and Schuyler, G.D. (1998). "A Comprehensive Assessment of Pedestrian Comfort Including Thermal Effects," Journal of Wind Engineering and Industrial Aerodynamics, Vol.77&78, pp.753-766.

11. Alan G. Davenport Wind Engineering Group, "Wind Tunnel Testing: A General Outline", May 2007.

12. Blocken B, Janssen WD, van Hooff T. 2012. "CFD simulation for pedestrian wind comfort and wind safety in urban areas: General decision framework and case study for the Eindhoven University campus". Environ Modell Softw 30:15-34.

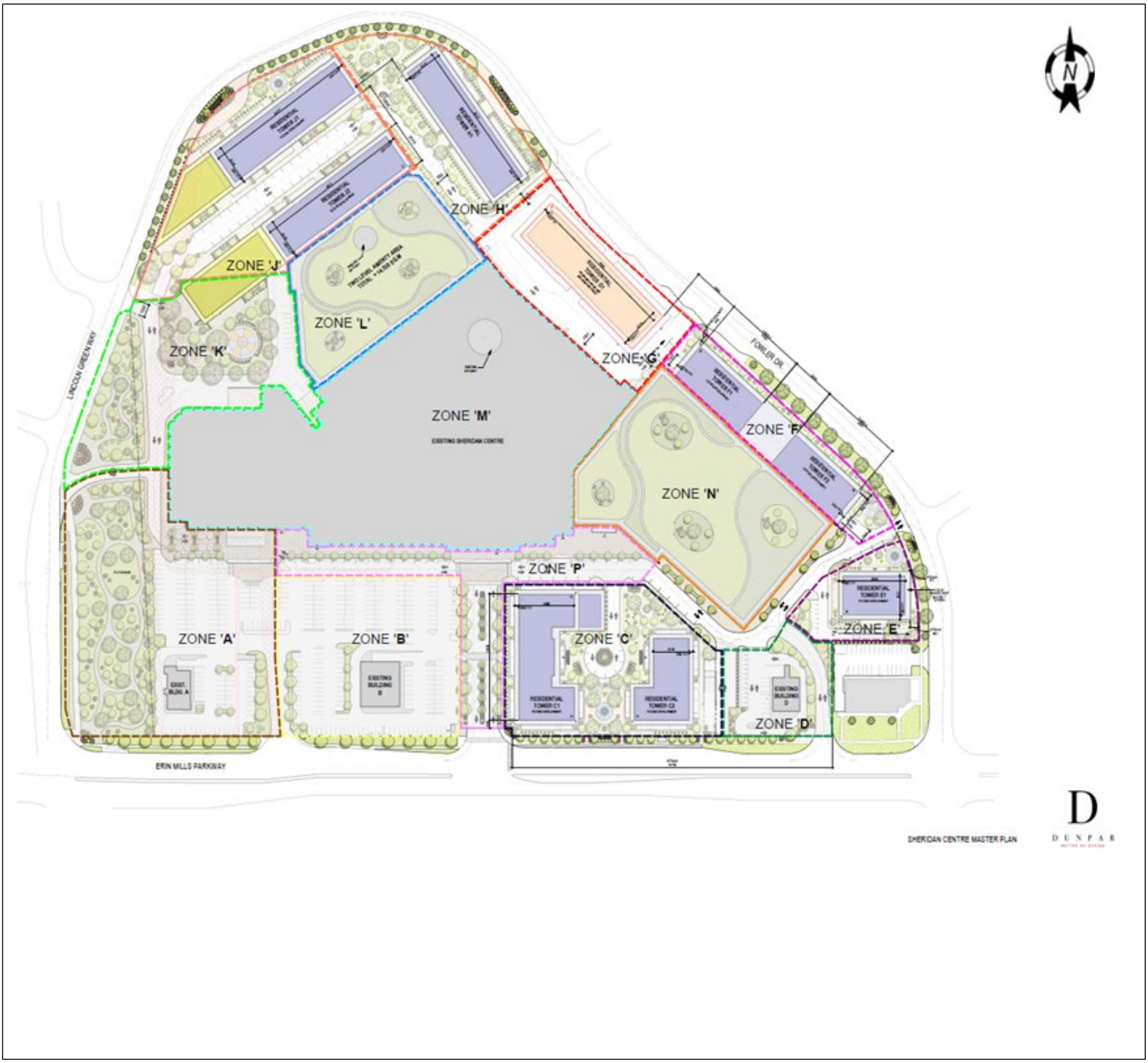
13. Blocken B, Janssen WD, van Hooff T. 2012. "Pedestrian wind comfort around buildings: comparison of wind comfort criteria based on whole-flow field data for a complex case study". Building and Environment, October 25, 2012.

14. Terms of Reference for the Preparation of a Pedestrian Wind Comfort Study document dated October 21, 2022. (https://www.mississauga.ca/publication/pedestrian-wind-comfort-and-safety-studies/)

APPENDIX

A SITE PLAN

APPENDIX


ZONE 'H'
ZONE 'J'
ZONE 'L'
ZONE 'K'
ZONE 'G'
ZONE 'M'
ZONE 'F'
ZONE 'N'
ZONE 'P'
ZONE 'A'
ZONE 'B'
ZONE 'C'
ZONE 'E'
ZONE 'D'
LINCOLN GREEN WAY
FOWLER DR.
ERIN MILLS PARKWAY
SHERIDAN CENTRE MASTER PLAN
DUNPAR

APPENDIX

B CFD RESULTS – WINTER SEASON

APPENDIX

B-1 RESULTS – WINTER SEASON

B.1.1 WIND PATTERNS – EXISTING CONDITIONS

The model results of pedestrian wind levels at 1.5 m above grade for the west wind is shown in **Figure B-1.**

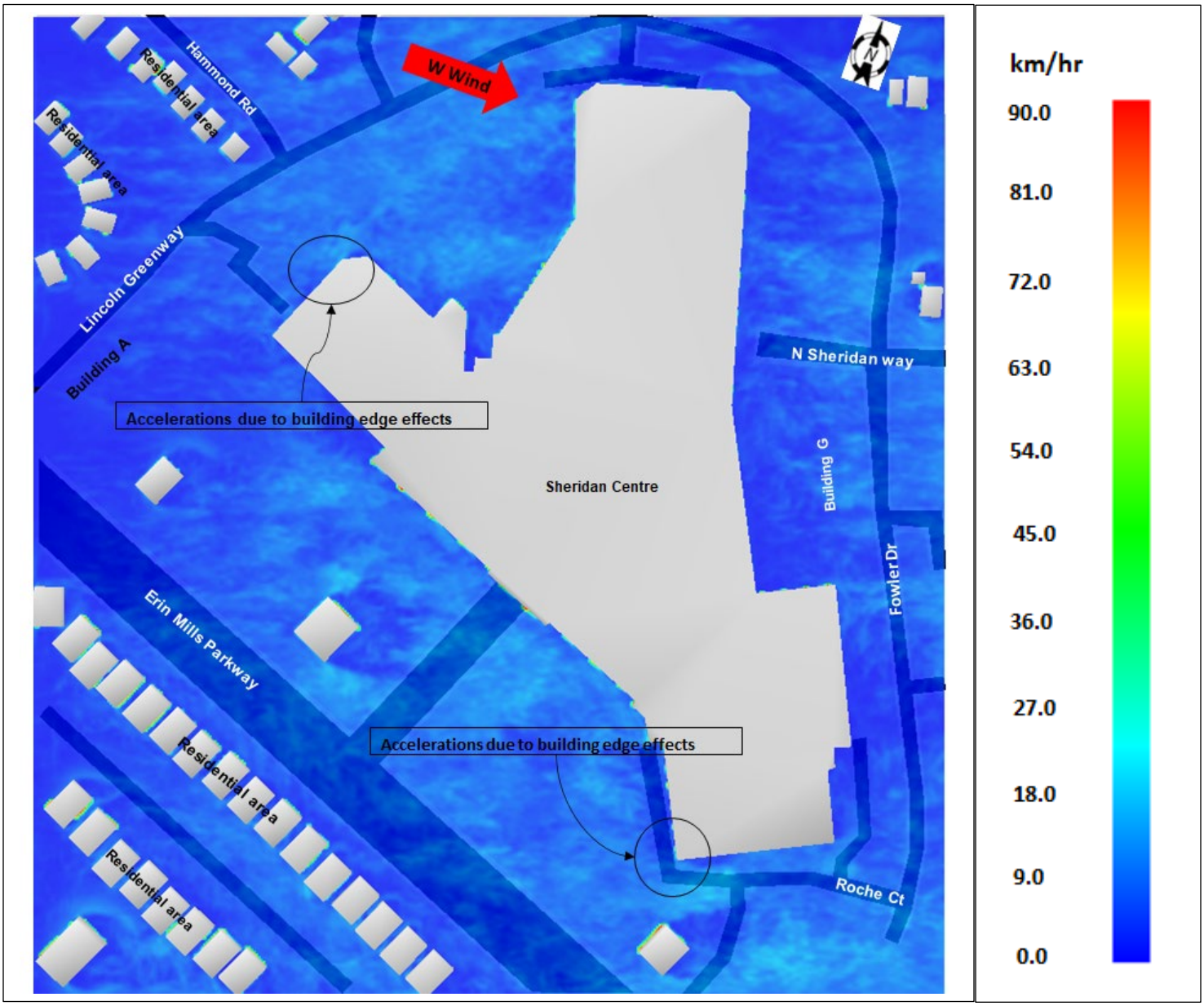


Figure B-1: Ground Level Results (1.5 m above grade) – Plan View –Existing Conditions – West Winds

As shown in **Figure B-1**, the wind patterns are characterised by a slight acceleration originating at the north-west corner of the Sheridan centre due to the vortex shedding and downwash occurring at this corner. Another slight acceleration occurs at the south-west corner of

APPENDIX

the Sheridan Centre. Both accelerations are below the wind threshold of 20 km/hr and are therefore considered tolerable for pedestrian comfort.

The model results of pedestrian wind levels at 1.5 m above grade for the north wind is shown in **Figure B-2**.

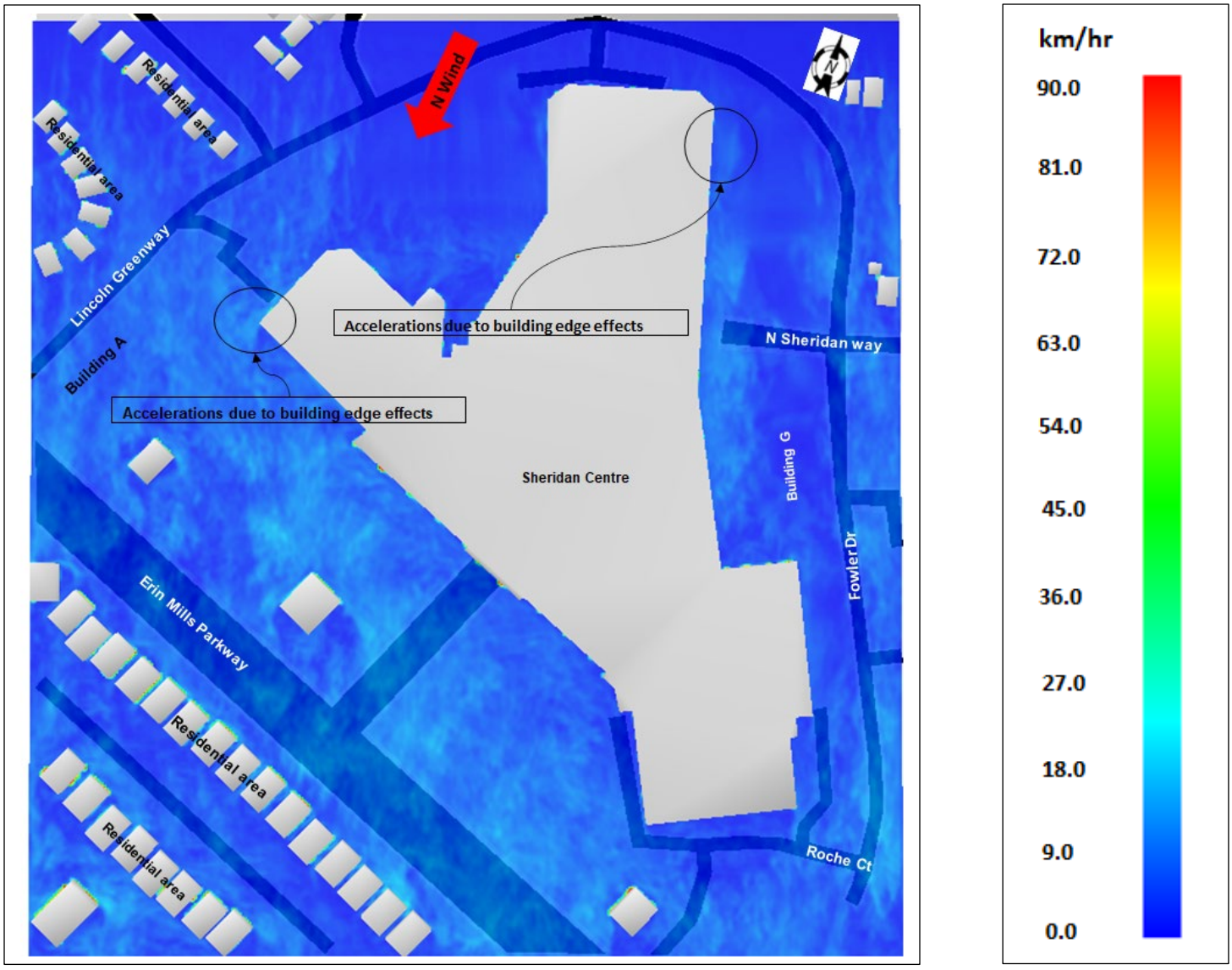


Figure B-2: Ground Level Results (1.5 m above grade) – Plan View -Existing Conditions – North Winds

For the north winds, the wind patterns are characterised by a similar behavior as for the westerly winds. As illustrated in **Figure B-2**, The northerly winds accelerate at the north-west corner of the Sheridan Centre when moving south due to the building edge effect occurring at this corner. There is another slight acceleration occurring at the north-east corner of the Sheridan Centre due to the building edge effect occurring at this corner. Again, both accelerations are below the threshold of the wind comfort of 20 km/hr and remain tolerable for the pedestrian.

Finally, it is shown in **Figure B-1** and **Figure B-2** that predicted wind speeds around the Development do not exceed the threshold of the wind safety condition of 90 km/hr.

APPENDIX

B.1.2 WIND PATTERNS – WITH THE DEVELOPMENT

The model results of pedestrian wind levels at 1.5 m above grade for the two seasons are shown in **Figure B-3** and **Figure B-4.**

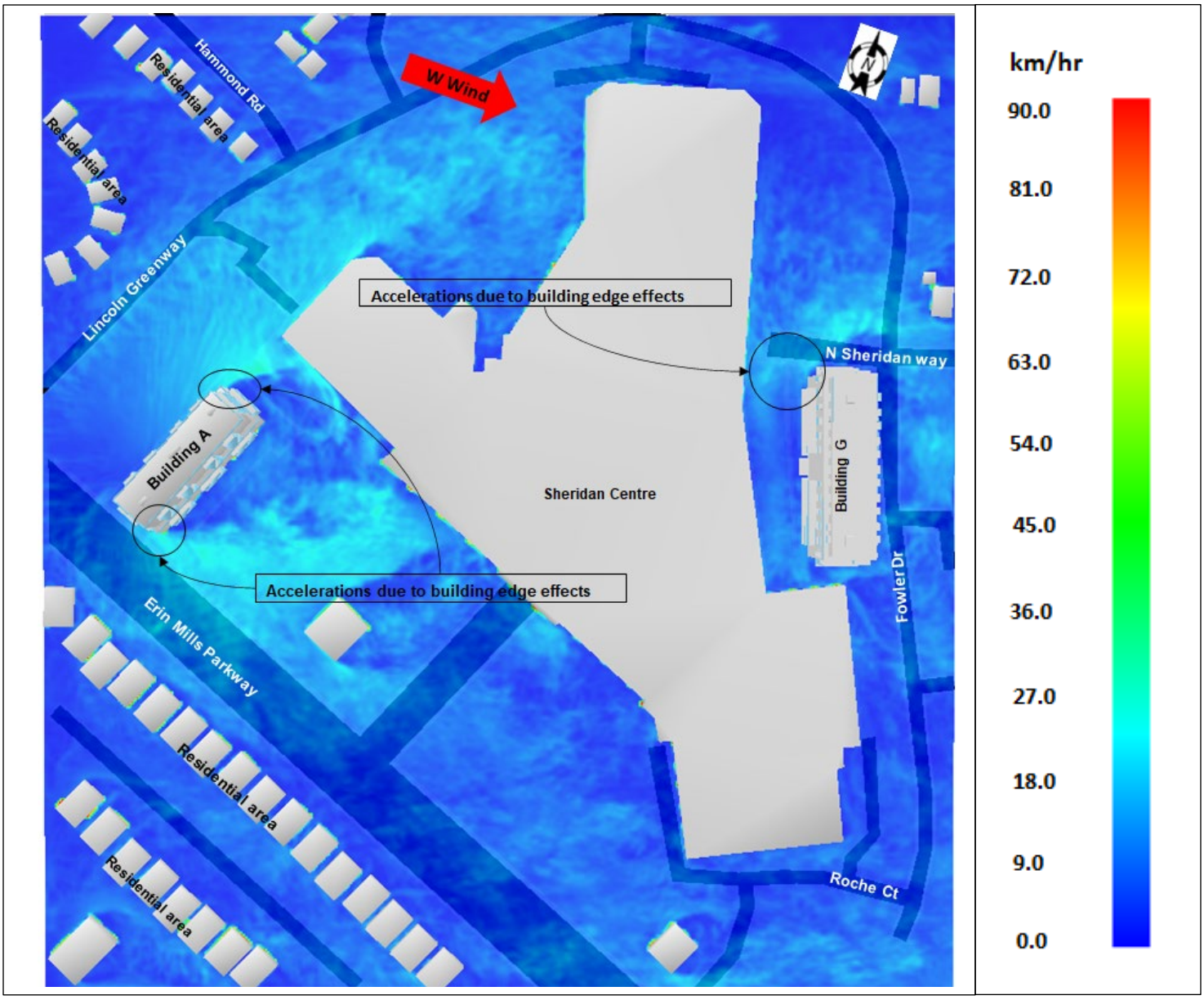


Figure B-3: Ground Level Results (1.5 m above grade) – Plan View –Winter Season – Development – West Winds

APPENDIX

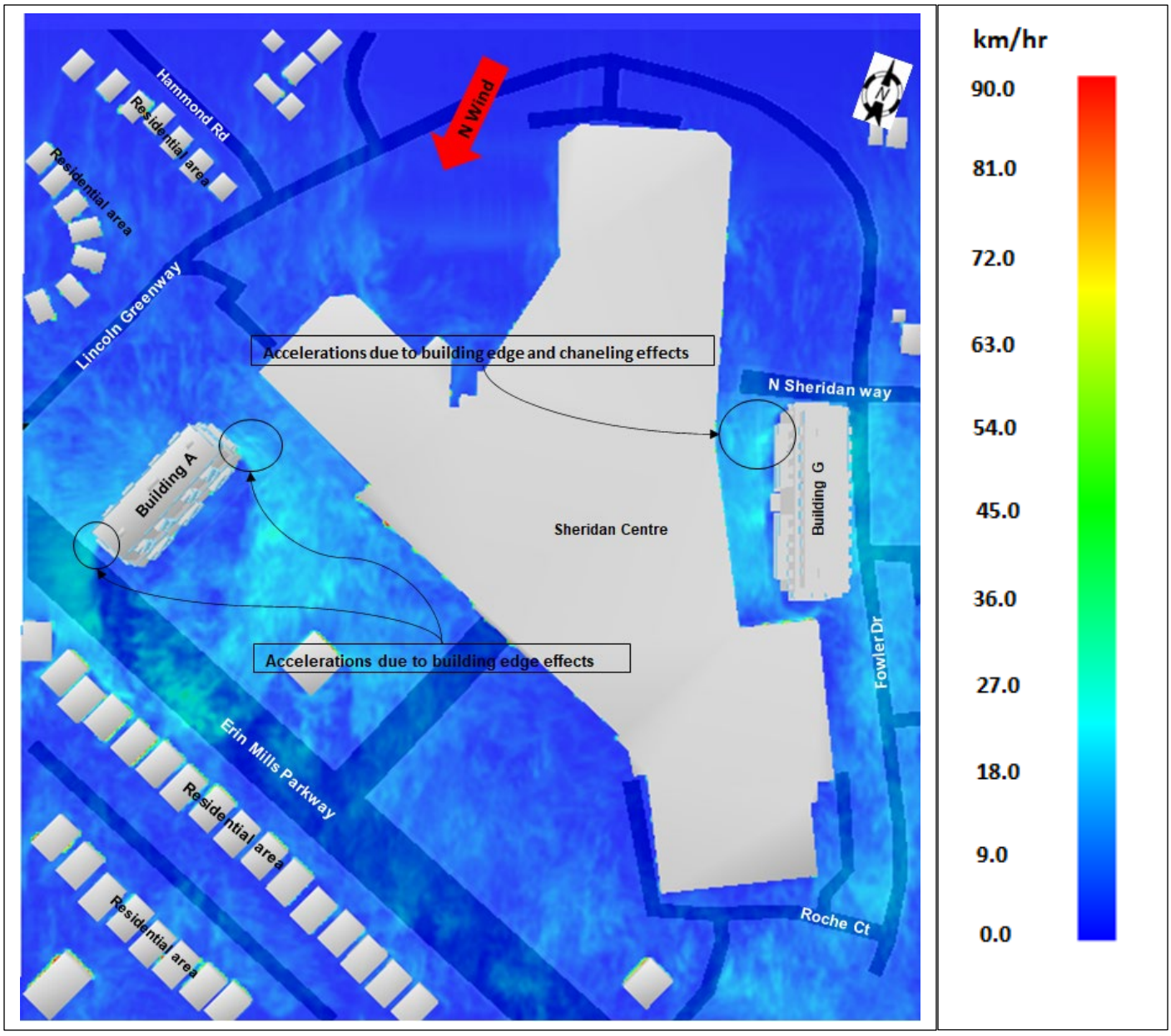


Figure B-4: Ground Level Results (1.5 m above grade) – Plan View –Winter Season – Development – North Winds

Once the Development is added to the model, the wind patterns remain similar to those in the summer season with moderate accelerations. The accelerations, mainly around Building A and for both westerly and northerly winds, are due to the building edge or downwash effects occurring at the north-east and north-west corners of this building. There is also a slight acceleration due to the building edge and occurring at the north-west corner of Building G.

Finally, it is shown in **Figure B-3** and **Figure B-4** that predicted wind speeds around the development do not exceed the threshold of the wind safety condition of 90 km/hr.

For this study, the wind comfort category is comprised of the "Sitting and Standing category" and the "Walking category". The former is related to people standing at the entrances/exits of the buildings, while the latter is related to people strolling or walking along the sidewalks and the from and to the parking lots.

Results of the wind comfort analysis for this category and comfort map are detailed in the next sections.

APPENDIX

B.1.3 WIND COMFORT AT THE ENTRANCES/EXITS

In order to track the wind speeds at the entrances and exits, several numerical sensors were used in the model to record wind speeds. These sensors are located at each entrance/exit, at heights of 1.5m above grade. **Figure 2** and **Figure 3** above show the layout of these sensors. The sensors were also used to record the wind speeds for the existing conditions and allow comparison of the recorded values under existing conditions with the values recorded once the Development is added to the model.

For the ground level, average wind speeds were calculated based on predicted wind speeds at a height of 1.5 m above grade at all entrances/exits. **Figure B-5** shows an example of predicted wind s at the Main entrance (Main-A1 in **Figure 2** above).

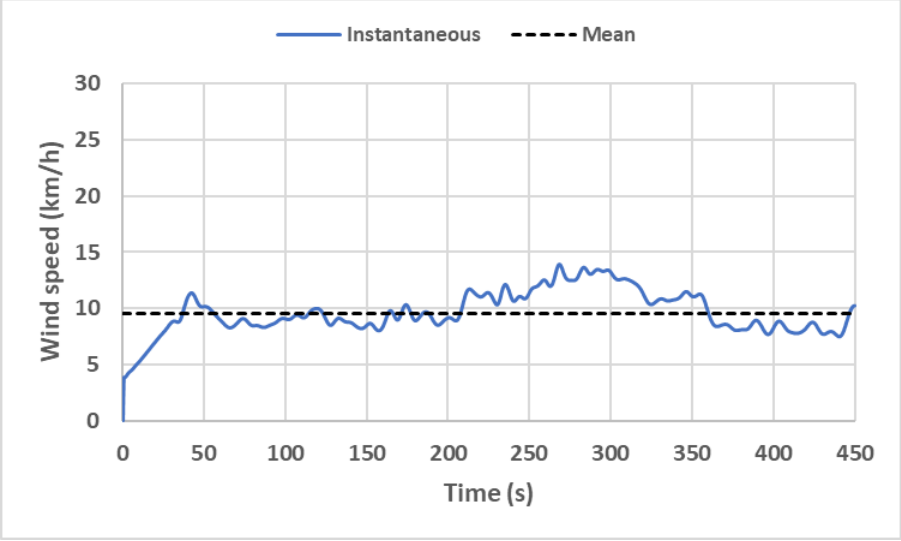


Figure B-5: Predicted instantaneous wind speed at the Main entrance (1.5 m above grade)– Building A – West Winds

Using predicted instantaneous wind speeds, mean wind speeds and GEM speeds were calculated. **Figure B-6** shows GEM speeds at the building entrances of Development. For these areas, the comfort category varies from "Standing" to "Walking" with a GEM speed varying between 15 km/hr and 22 km/hr.

Based on predicted GEM speeds at the entrances of the Development, **Figure B-6** shows that there are no predicted exceedances of the comfort criteria at the entrances to the development. Therefore, pedestrians are expected to be able to access the Development comfortably through these entrances.

APPENDIX

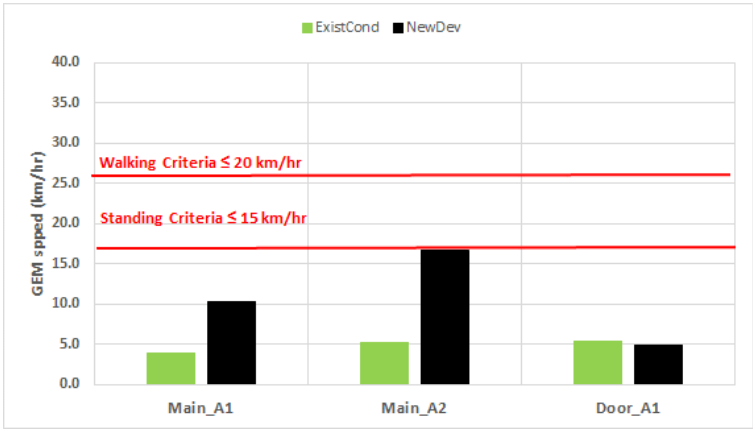


Figure B-6a: Building A – West Winds

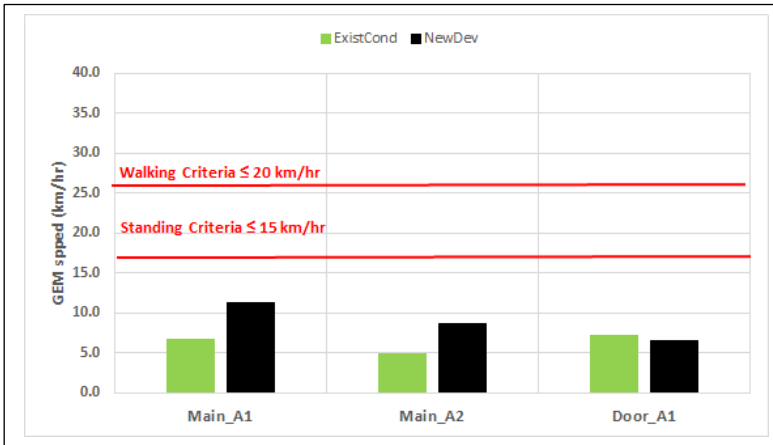


Figure B-6b: Building A – North Winds

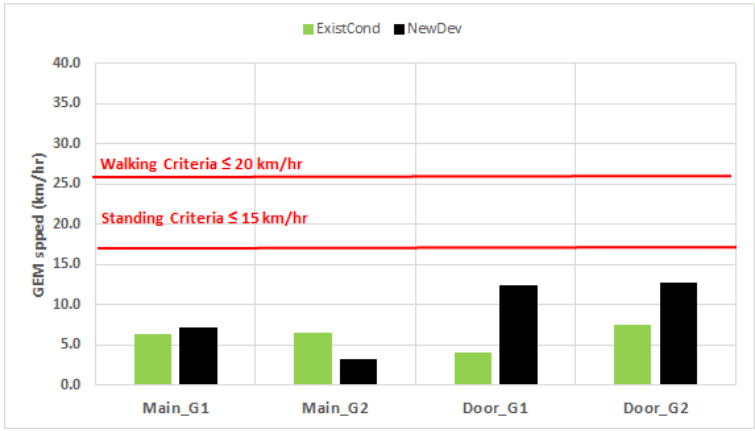


Figure B-6c: Building G – West Winds

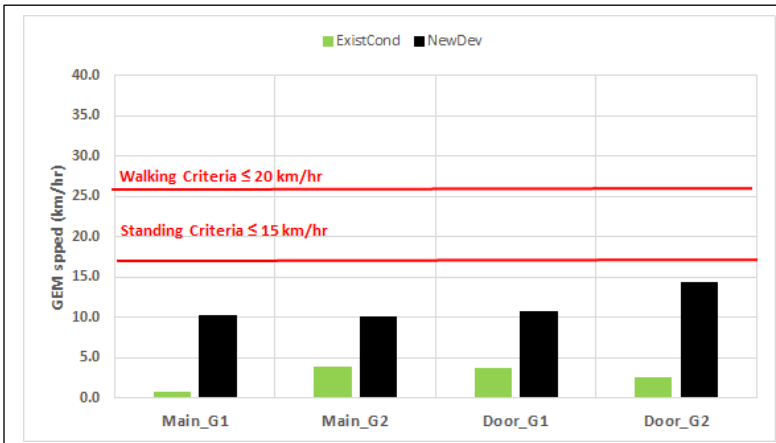


Figure B-6d: Building G – North Winds

Figure B-6: Predicted GEM Speeds at Building Entrances (1.5 m above grade) – Winter season.

B.1.4 WIND COMFORT AT THE OUTDOOR PARKING LOTS

To track the wind speeds at the outdoor parking lots located on the south side of building A, several numerical sensors were used in the model to record wind speeds. These sensors are located at the centreline of the sidewalks, at heights of 1.5 m above grade. **Figure 17** above shows the layout of the sensors. The sensors were also used to record the wind speeds for the existing conditions and allow comparison of the recorded values under existing conditions with the values recorded once the Development is added to the model.

APPENDIX

For the parking lots, mean wind speeds and GEM speeds were calculated based on predicted wind speed at a height of 1.5 m above ground at the numerical sensors. **Figure B-7** shows an example of predicted wind speed at first parking lot (point Prk-A1 in **Figure 18**).

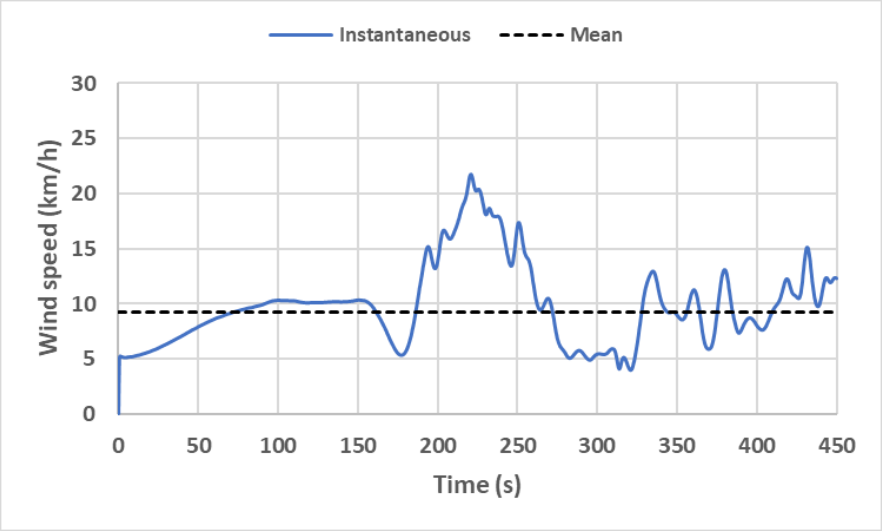


Figure B-7: Predicted Instantaneous Wind Speed at a Parking lot Sensor (Prk-A1) (1.5 m above grade) –West Winds

Using predicted instantaneous wind speeds at all numerical sensors, mean wind speeds and GEM speeds were calculated. **Figure B-8** shows GEM speeds on the outdoor parking lots around Building A. For all these locations, the comfort category is defined as "Walking" with a GEM speed not exceeding 20 km/hr. As shown in **Figure B-8**, there is no exceedance of the GEM speed limit for the "Walking" category from and to the outdoor parking lots, and therefore pedestrians are expected to be comfortable when walking in these areas.

APPENDIX

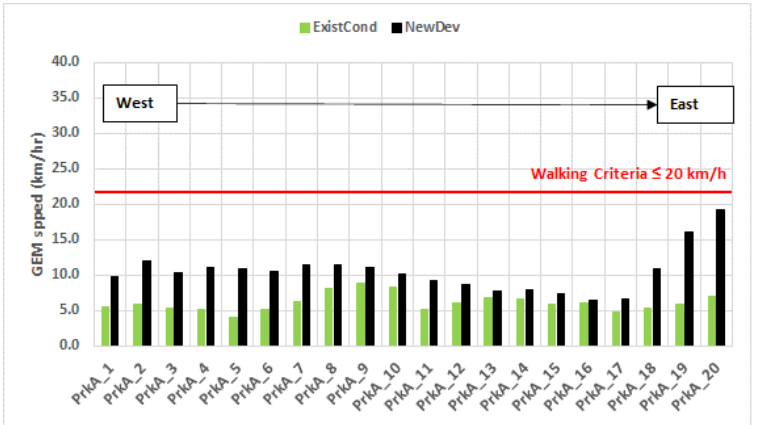


Figure B-8a: Building A: West Winds.

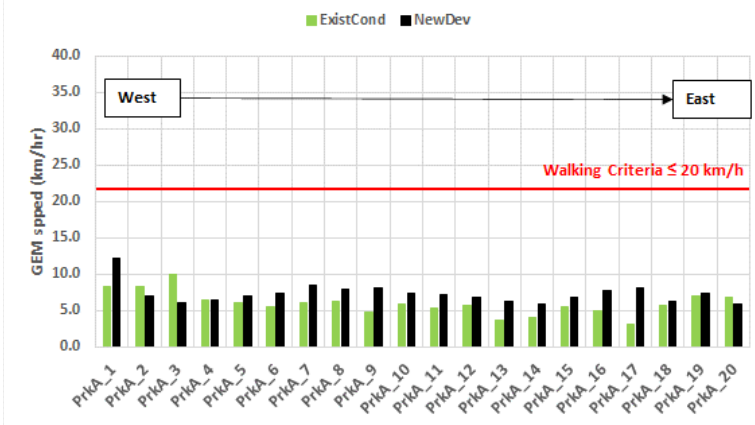


Figure B-8b: Building A: North Winds.

Figure B-8: Predicted GEM Speeds at the outdoor parking lots (1.5 m above grade) – Winter season.

B.1.4 WIND COMFORT AT THE NEW SIDEWALKS

To track the wind speeds at the sidewalks, several numerical sensors were used in the model to record wind speeds. These sensors are located at the centreline of the new sidewalks, at heights of 1.5 m above grade. **Figure 17** above shows the layout of the sensors. The sensors were also used to record the wind speeds for the existing conditions and allow comparison of the recorded values under existing conditions with the values recorded once the Development is added to the model.

For the new sidewalks, mean wind speeds and GEM speeds were calculated based on predicted wind speed at a height of 1.5 m above ground at the numerical sensors. **Figure B-9** shows an example of predicted wind speed at the new sidewalk on the west side of Building A (point Nswk-A1 in **Figure 17**).

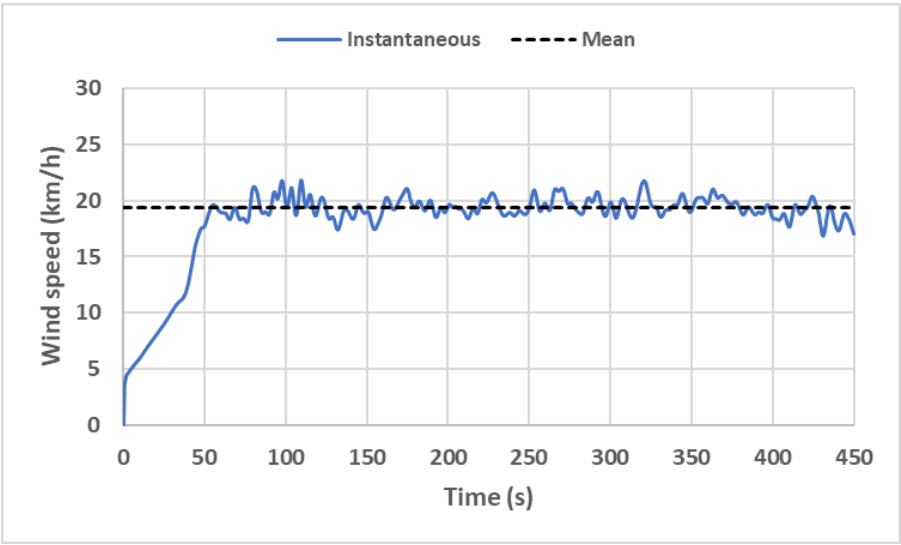


Figure B-9: Predicted Instantaneous Wind Speed at the new Sidewalk Sensor (Nswk-A1) (1.5 m above grade) –North Winds

APPENDIX

Using predicted instantaneous wind speeds at all numerical sensors, mean wind speeds and GEM speeds were calculated. **Figure B-10** shows GEM speeds along the new sidewalks around building A and building G. For all these locations, the comfort category is defined as "Walking" with a GEM speed not exceeding 20 km/hr. As shown in **Figure B-10**, there is no exceedance of the GEM speed limit for the "Walking" category along the new sidewalks associated with Building A and Building G, and therefore pedestrians are expected to be comfortable when walking along these new sidewalks.

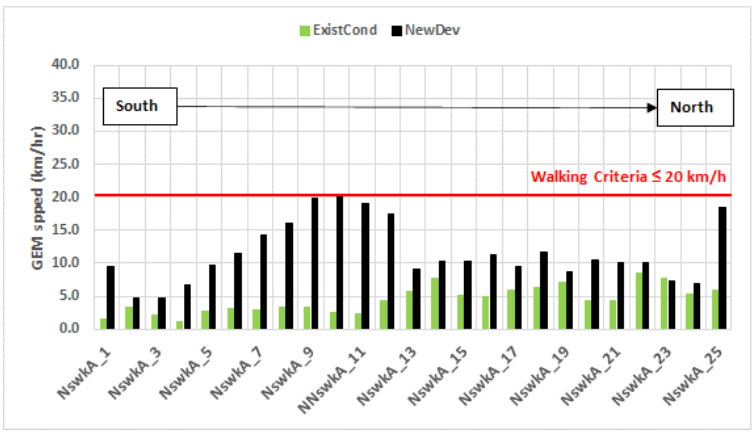


Figure B-10a: Building A: West Winds

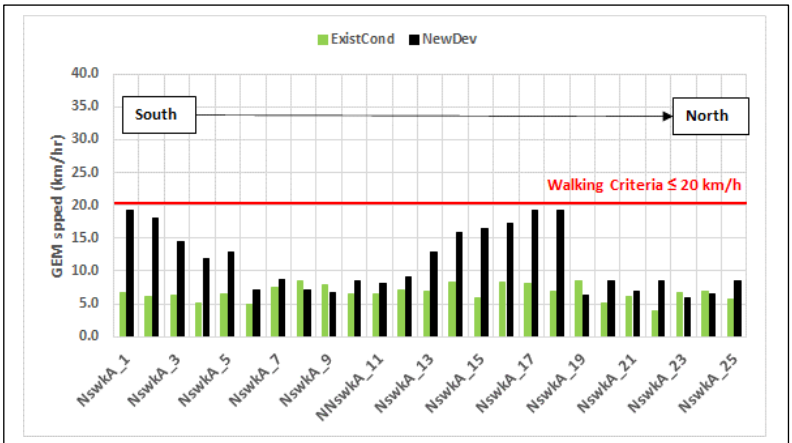


Figure B-10b: Building A: North Winds

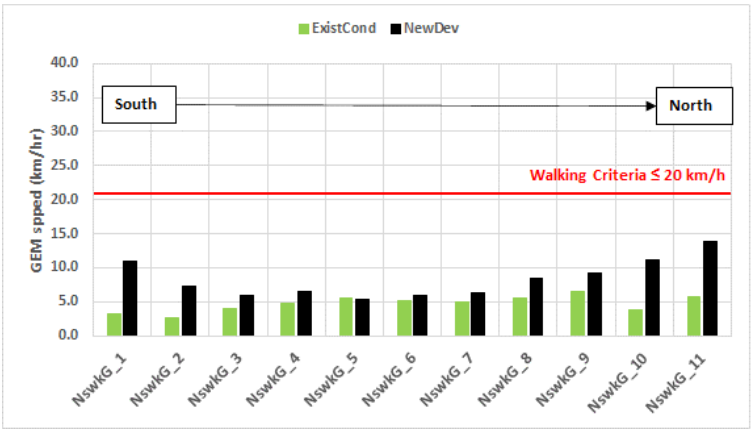


Figure B-10c: Building G: West Winds

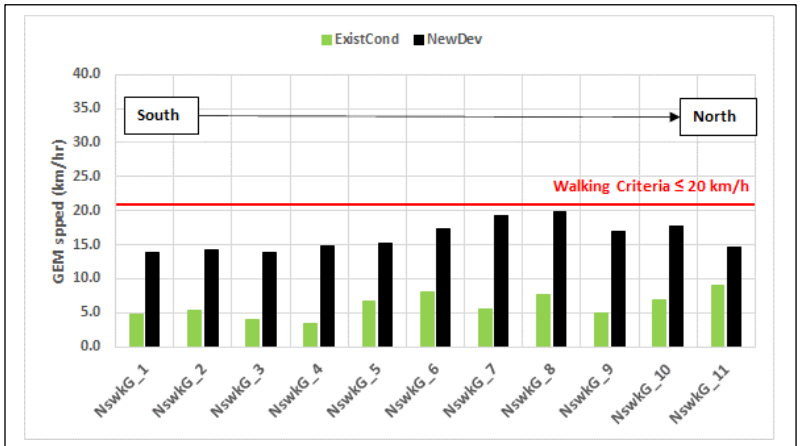


Figure B-10d: Building G: North Winds

Figure B-10: Predicted GEM Speeds Along the new Sidewalks St (1.5 m above grade) –Winter Season.

B.1.5 WIND COMFORT AT THE EXISTING SIDWALKS

To track the wind speeds at the existing sidewalks, several numerical sensors were used in the model to record wind speeds. These sensors are located at the centreline of the sidewalks, at heights of 1.5 m above grade. **Figure 18** above shows the layout of the sensors. The sensors were also used to record the wind speeds for the existing conditions and allow comparison of the recorded values under existing conditions with the values recorded once the Development is added to the model.

APPENDIX

For the existing sidewalks, mean wind speeds and GEM speeds were calculated based on predicted wind speed at a height of 1.5 m above ground at the numerical sensors. **Figure B-11** shows an example of predicted wind speed along the sidewalk on Erin Mills Parkway (point Swk-A1 in **Figure 17**).

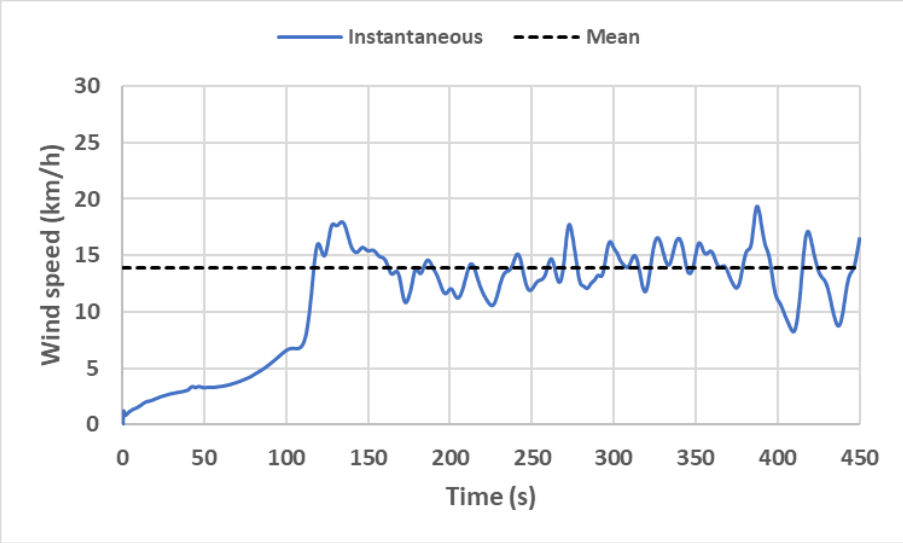


Figure B-11: Predicted Instantaneous Wind Speed at the Sidewalk Sensor on Erin Mills Parkway (Swk-A1) (1.5 m above grade) –North Winds

Using predicted instantaneous wind speeds at all numerical sensors, mean wind speeds and GEM speeds were calculated. **Figure B-12** and **Figure B-13** show GEM speeds on the sidewalks along Erin Mills Parkway and Lincoln greenway, as well as along the Sheridan centre. For all these locations, the comfort category is defined as "Walking" with a GEM speed not exceeding 20 km/hr. As shown in **Figure B-12**, there is no exceedance of the GEM speed limit for the "Walking" category along the existing sidewalks surrounding Building A and Building G, and therefore pedestrians are expected to be comfortable when walking along these existing sidewalks. It is also shown in **Figure B-13**, there is no exceedance of the GEM speed limit for the "Walking" category on the existing sidewalks along the Sheridan Centre near Building A, except at the north-west area of this sidewalk. However, this exceedance remains below the threshold exceedance of 20%. Therefore, pedestrians are expected to be comfortable when walking along these sidewalks.

APPENDIX

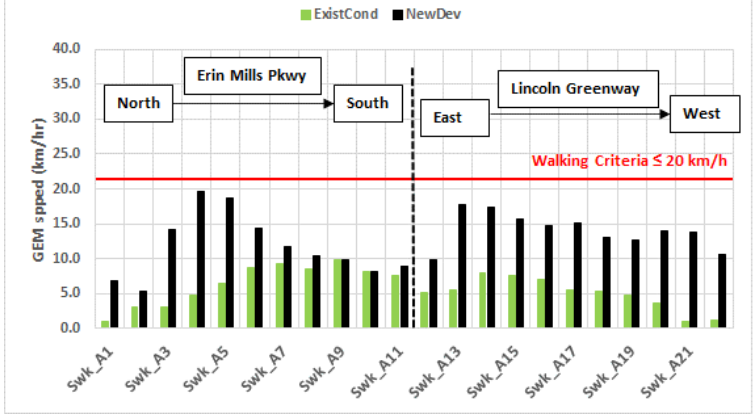


Figure B-12a: Building A: West Winds

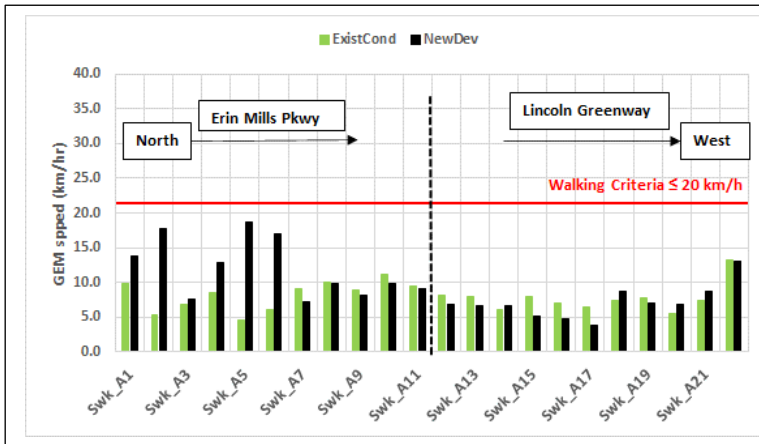


Figure B-12b: Building A: North Winds

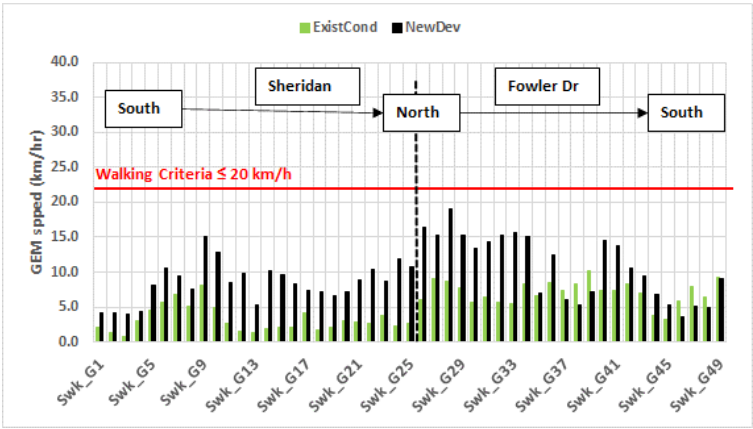


Figure B-12c: Building G: West Winds

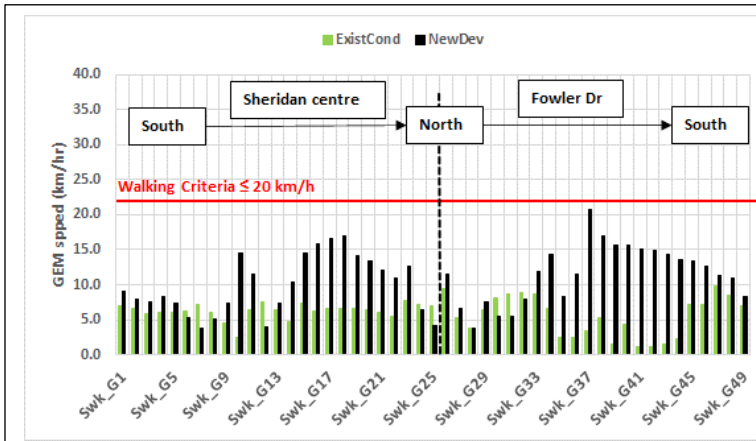


Figure B-12d: Building G: North Winds

Figure B-12: Predicted GEM Speeds Along the existing Sidewalks St (1.5 m above grade) – Winter Season.

APPENDIX

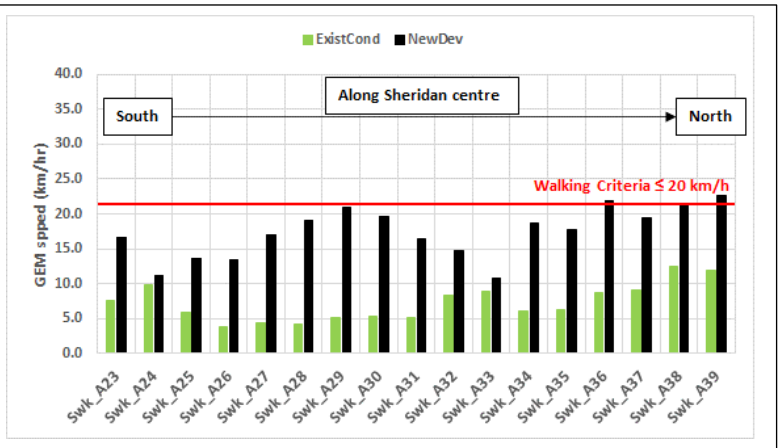


Figure B-13a: Building A: West Winds

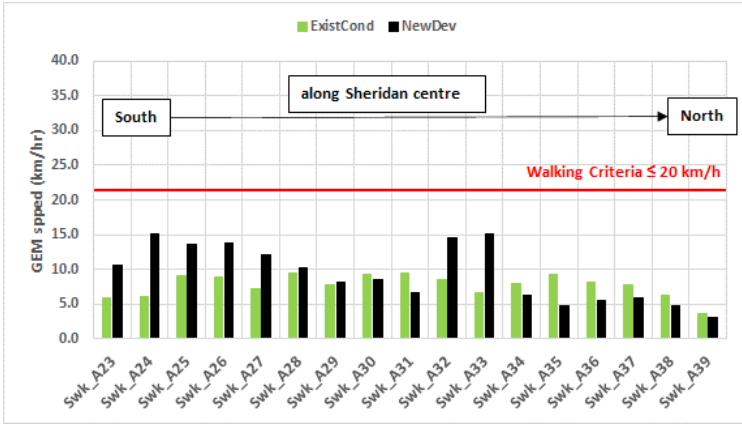


Figure B-13b: Building A: North Winds

Figure B-13: Predicted GEM Speeds Along the Sheridan centre St (1.5 m above grade) – Winter Season

B.1.6 PEDESTRIAN COMFORT MAPS

Predicted GEM wind speeds were compared to the comfort criteria values from **Table 1**. **Figure B-14** and **Figure B-15** show the pedestrian activities maps based on the corresponding predicted mean and GEM wind speed thresholds at ground level at 1.5 m above grade for the existing conditions and with the Development.

APPENDIX

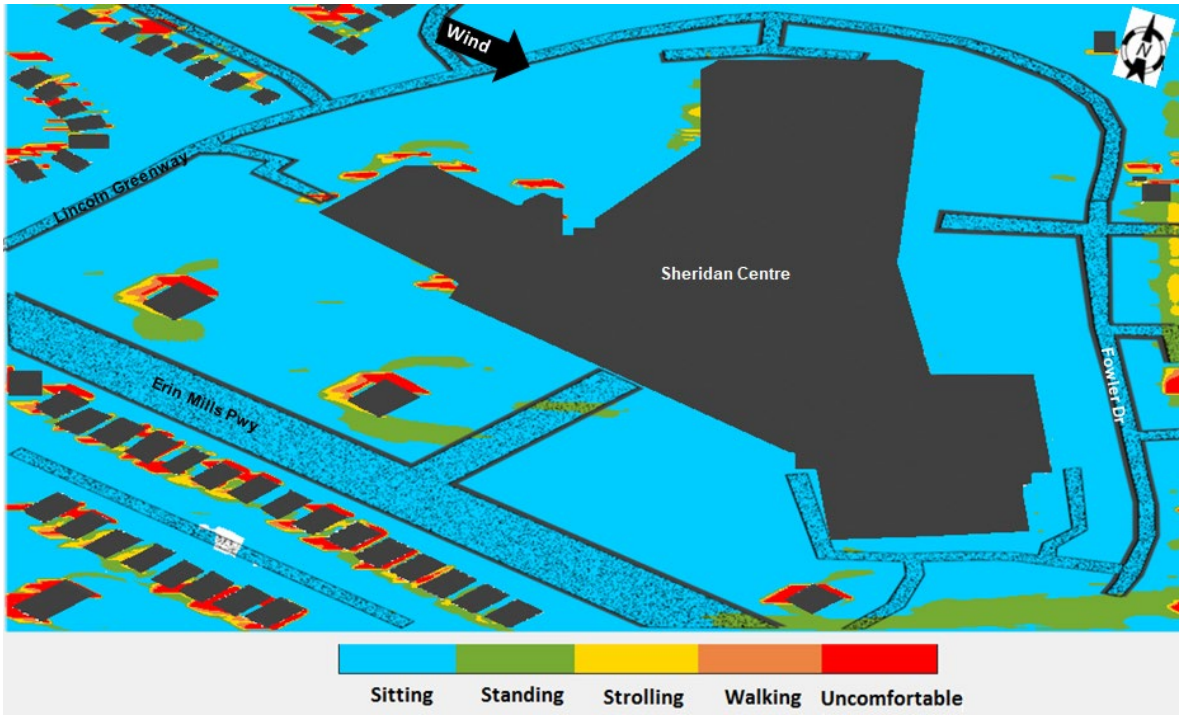


Figure B-14a: Existing Conditions

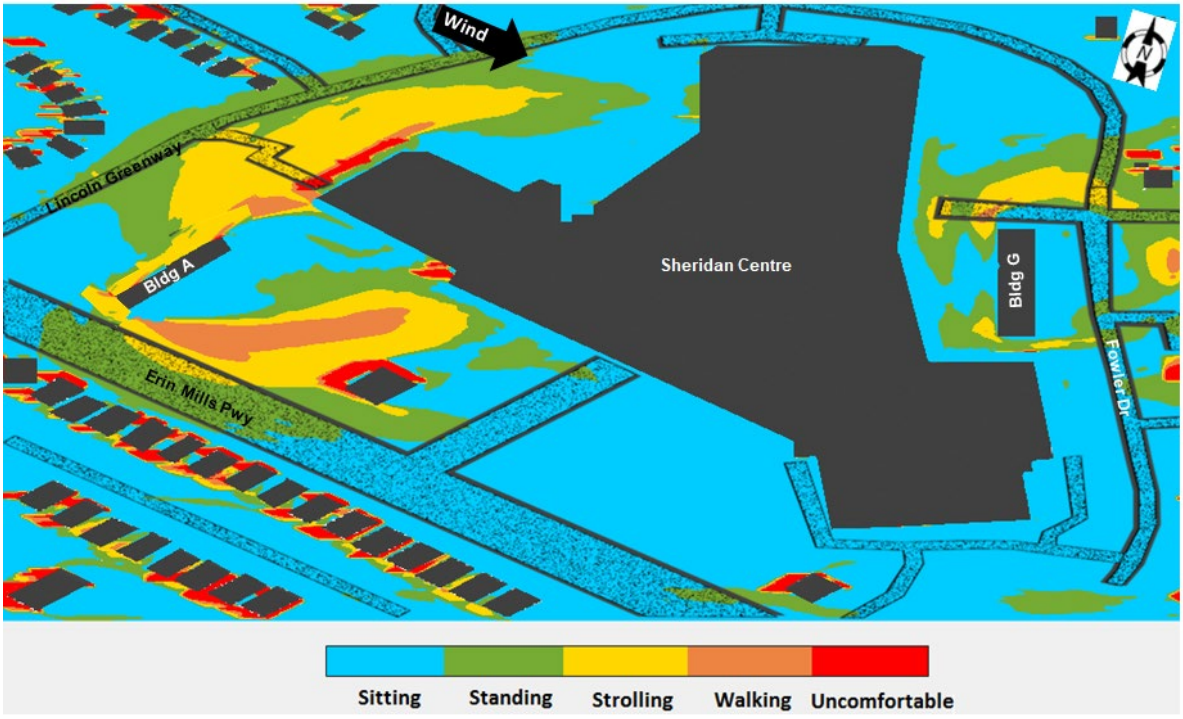


Figure B-14b: With the Development

Figure B-14: Predicted Pedestrian Comfort Map at Ground Level – (1.5 m above grade) – West Winds

APPENDIX

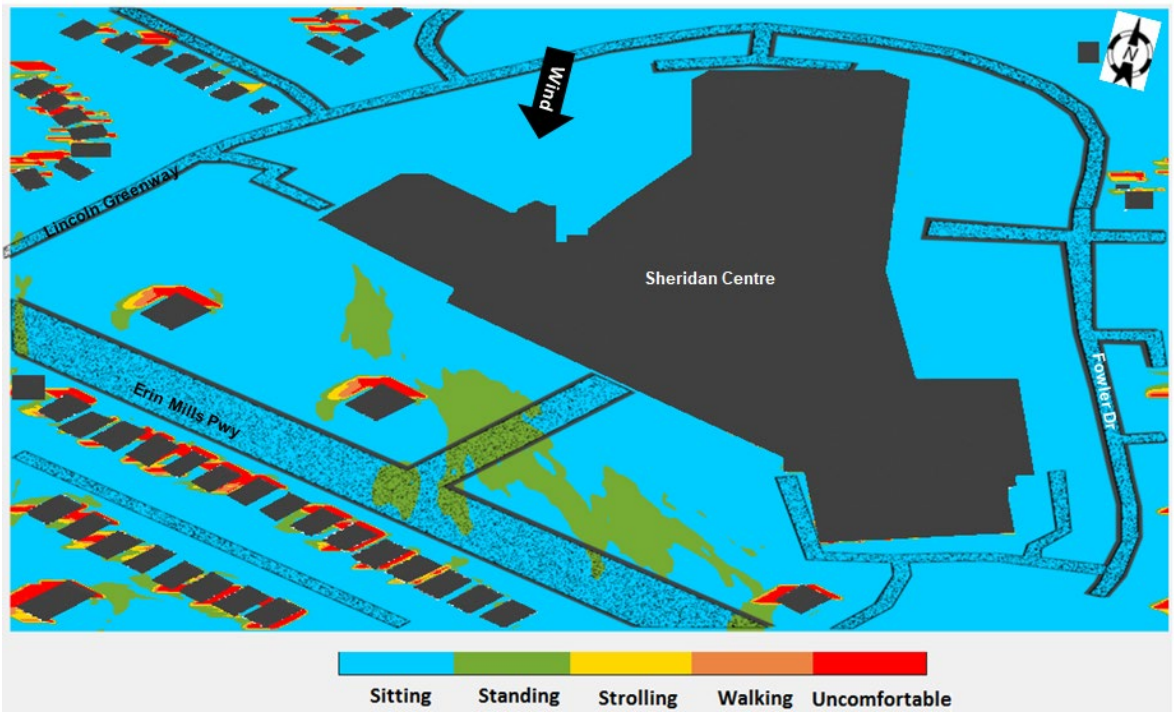


Figure B-15a: Existing Conditions

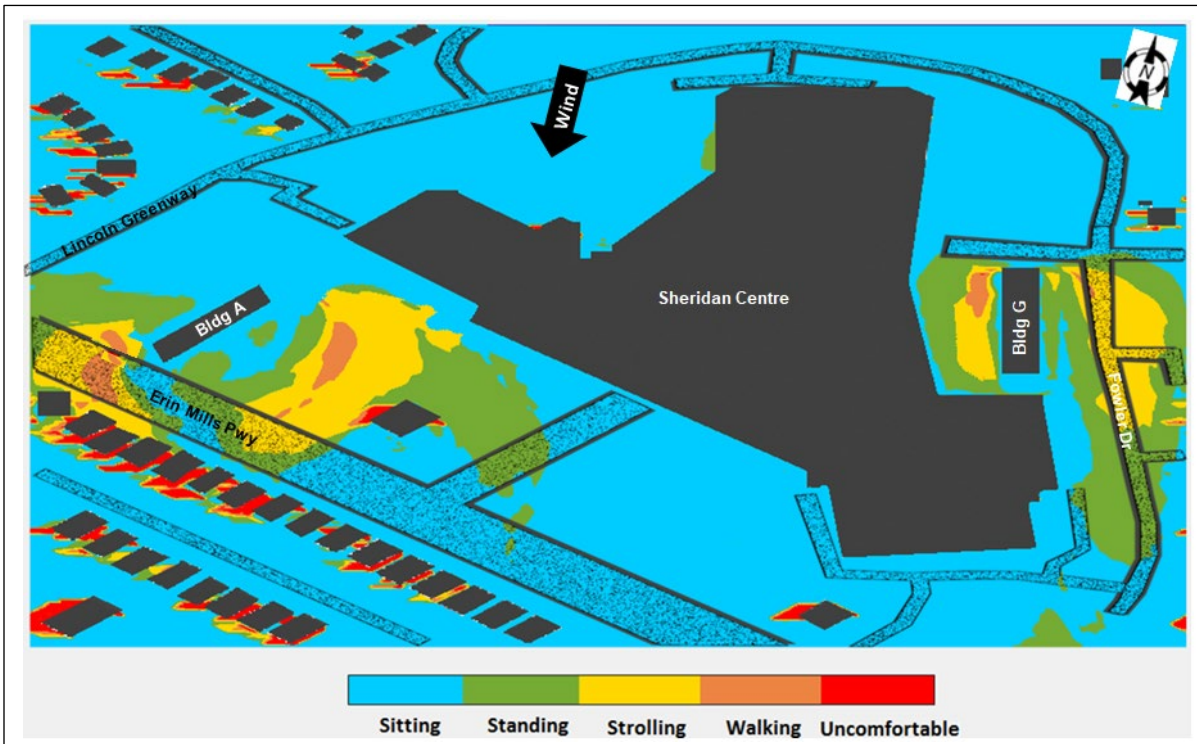


Figure B-15b: With the Development

Figure B-15: Predicted Pedestrian Comfort Map at Ground Level – (1.5 m above grade) – North Winds

APPENDIX

A summary of the CFD model results for all areas of interest are shown in **Table B-1** through **Table B-12**. Compliance is indicated relative to the TOR criteria for comfort.

Table B-1 Wind Level Results from CFD Modelling –Entrances/Exits – Building A – West Winds

LEVEL	ENTRANCES/EXITS	GEM SPEED (KM/HR)	COMFORT CATEGORY	LIMIT (KM/HR)	EXCEEDANCE	COMPLIANT
Ground Floor	Main_A1	10.2	Standing	14	0.0%	Yes
	Main_A2	16.6	Standing	14	18.7%	Yes
	Door_A1	4.8	Walking	20	0.0%	Yes

Table B-2 Wind Level Results from CFD Modelling –Entrances/Exits – Building G – West Winds

LEVEL	ENTRANCES/EXITS	GEM SPEED (KM/HR)	COMFORT CATEGORY	LIMIT (KM/HR)	EXCEEDANCE	COMPLIANT
Ground	Main_G1	7.0	Standing	14	0.0%	Yes
	Main_G2	3.1	Standing	14	0.0%	Yes
	Door_G1	12.3	Walking	20	0.0%	Yes
	Door_G2	12.6	Walking	20	0.0%	Yes

Table B-3 Wind Level Results from CFD Modelling –New Sidewalks - Building G – West Winds

LEVEL	SIDEWALK	GEM SPEED (KM/HR)	COMFORT CATEGORY	LIMIT (KM/HR)	EXCEEDANCE	COMPLIANT
Ground	NswkA_1	11.0	Walking	20	0.0%	Yes
	NswkA_2	7.3	Walking	20	0.0%	Yes
	NswkA_3	5.9	Walking	20	0.0%	Yes
	NswkA_4	6.5	Walking	20	0.0%	Yes
	NswkA_5	5.3	Walking	20	0.0%	Yes
	NswkA_6	5.8	Walking	20	0.0%	Yes
	NswkA_7	6.3	Walking	20	0.0%	Yes
	NswkA_8	8.4	Walking	20	0.0%	Yes
	NswkA_9	9.2	Walking	20	0.0%	Yes
	NswkA_10	11.0	Walking	20	0.0%	Yes
	NswkA_11	13.8	Walking	20	0.0%	Yes

APPENDIX

Table B-4 Wind Level Results from CFD Modelling –New Sidewalks - Building A – West Winds

LEVEL	SIDEWALK	GEM SPEED (KM/HR)	COMFORT CATEGORY	LIMIT (KM/HR)	EXCEEDANCE	COMPLIANT
Ground	**NswkA_1**	9.6	Walking	20	0.0%	**Yes**
	NswkA_2	4.7	Walking	20	0.0%	**Yes**
	NswkA_3	4.8	Walking	20	0.0%	**Yes**
	NswkA_4	6.6	Walking	20	0.0%	**Yes**
	NswkA_5	9.7	Walking	20	0.0%	**Yes**
	NswkA_6	11.5	Walking	20	0.0%	**Yes**
	NswkA_7	14.3	Walking	20	0.0%	**Yes**
	NswkA_8	16.1	Walking	20	0.0%	**Yes**
	NswkA_9	19.9	Walking	20	0.0%	**Yes**
	NswkA_10	20.4	Walking	20	2.1%	**Yes**
	NNswkA_11	19.0	Walking	20	0.0%	**Yes**
	NswkA_12	17.4	Walking	20	0.0%	**Yes**
	NswkA_13	9.0	Walking	20	0.0%	**Yes**
	NswkA_14	10.2	Walking	20	0.0%	**Yes**
	NswkA_15	10.3	Walking	20	0.0%	**Yes**
	NswkA_16	11.3	Walking	20	0.0%	**Yes**
	NswkA_17	9.5	Walking	20	0.0%	**Yes**
	NswkA_18	11.6	Walking	20	0.0%	**Yes**
	NswkA_19	8.8	Walking	20	0.0%	**Yes**
	NswkA_20	10.4	Walking	20	0.0%	**Yes**
	NswkA_21	10.1	Walking	20	0.0%	**Yes**
	NswkA_22	10.1	Walking	20	0.0%	**Yes**
	NswkA_23	7.4	Walking	20	0.0%	**Yes**
	NswkA_24	7.0	Walking	20	0.0%	**Yes**
	NswkA_25	18.4	Walking	20	0.0%	**Yes**

APPENDIX

Table B-5 Wind Level Results from CFD Modelling –Existing Sidewalks - Building A – West Winds

LEVEL	SIDEWALK	GEM SPEED (KM/HR)	COMFORT CATEGORY	LIMIT (KM/HR)	EXCEEDANCE	COMPLIANT
Ground	Swk_A1	6.8	Walking	20	0.0%	Yes
	Swk_A2	5.3	Walking	20	0.0%	Yes
	Swk_A3	14.2	Walking	20	0.0%	Yes
	Swk_A4	19.7	Walking	20	0.0%	Yes
	Swk_A5	18.8	Walking	20	0.0%	Yes
	Swk_A6	14.4	Walking	20	0.0%	Yes
	Swk_A7	11.7	Walking	20	0.0%	Yes
	Swk_A8	10.3	Walking	20	0.0%	Yes
	Swk_A9	9.9	Walking	20	0.0%	Yes
	Swk_A10	8.2	Walking	20	0.0%	Yes
	Swk_A11	8.9	Walking	20	0.0%	Yes
	Swk_A12	9.9	Walking	20	0.0%	Yes
	Swk_A13	17.8	Walking	20	0.0%	Yes
	Swk_A14	17.4	Walking	20	0.0%	Yes
	Swk_A15	15.7	Walking	20	0.0%	Yes
	Swk_A16	14.7	Walking	20	0.0%	Yes
	Swk_A17	15.1	Walking	20	0.0%	Yes
	Swk_A18	13.0	Walking	20	0.0%	Yes
	Swk_A19	12.6	Walking	20	0.0%	Yes
	Swk_A20	14.0	Walking	20	0.0%	Yes
	Swk_A21	13.8	Walking	20	0.0%	Yes
	Swk_A22	10.6	Walking	20	0.0%	Yes
	Swk_A23	16.7	Walking	20	0.0%	Yes
	Swk_A24	11.2	Walking	20	0.0%	Yes
	Swk_A25	13.6	Walking	20	0.0%	Yes
	Swk_A26	13.4	Walking	20	0.0%	Yes
	Swk_A27	17.0	Walking	20	0.0%	Yes
	Swk_A28	19.2	Walking	20	0.0%	Yes
	Swk_A29	21.0	Walking	20	5.0%	Yes
	Swk_A30	19.6	Walking	20	0.0%	Yes
	Swk_A31	16.4	Walking	20	0.0%	Yes
	Swk_A32	14.7	Walking	20	0.0%	Yes
	Swk_A33	10.9	Walking	20	0.0%	Yes
	Swk_A34	18.6	Walking	20	0.0%	Yes
	Swk_A35	17.7	Walking	20	0.0%	Yes
	Swk_A36	21.9	Walking	20	9.5%	Yes
	Swk_A37	19.4	Walking	20	0.0%	Yes
	Swk_A38	21.5	Walking	20	7.7%	Yes
	Swk_A39	22.6	Walking	20	13.2%	Yes

APPENDIX

Table B-6 Wind Level Results from CFD Modelling – Existing Sidewalks - Building G – West Winds

LEVEL	SIDEWALK	GEM SPEED (KM/HR)	COMFORT CATEGORY	LIMIT (KM/HR)	EXCEEDANCE	COMPLIANT
Ground	Swk_G1	4.2	Walking	20	0.0%	Yes
	Swk_G2	4.2	Walking	20	0.0%	Yes
	Swk_G3	4.0	Walking	20	0.0%	Yes
	Swk_G4	4.3	Walking	20	0.0%	Yes
	Swk_G5	8.1	Walking	20	0.0%	Yes
	Swk_G6	10.6	Walking	20	0.0%	Yes
	Swk_G7	9.5	Walking	20	0.0%	Yes
	Swk_G8	7.5	Walking	20	0.0%	Yes
	Swk_G9	15.0	Walking	20	0.0%	Yes
	Swk_G10	12.8	Walking	20	0.0%	Yes
	Swk_G11	8.5	Walking	20	0.0%	Yes
	Swk_G12	9.8	Walking	20	0.0%	Yes
	Swk_G13	5.3	Walking	20	0.0%	Yes
	Swk_G14	10.1	Walking	20	0.0%	Yes
	Swk_G15	9.7	Walking	20	0.0%	Yes
	Swk_G16	8.3	Walking	20	0.0%	Yes
	Swk_G17	7.3	Walking	20	0.0%	Yes
	Swk_G18	7.2	Walking	20	0.0%	Yes
	Swk_G19	6.7	Walking	20	0.0%	Yes
	Swk_G20	7.2	Walking	20	0.0%	Yes
	Swk_G21	8.8	Walking	20	0.0%	Yes
	Swk_G22	10.3	Walking	20	0.0%	Yes
	Swk_G23	8.8	Walking	20	0.0%	Yes
	Swk_G24	11.8	Walking	20	0.0%	Yes
	Swk_G25	10.8	Walking	20	0.0%	Yes
	Swk_G26	16.4	Walking	20	0.0%	Yes
	Swk_G27	15.3	Walking	20	0.0%	Yes
	Swk_G28	19.0	Walking	20	0.0%	Yes
	Swk_G29	15.2	Walking	20	0.0%	Yes
	Swk_G30	13.5	Walking	20	0.0%	Yes
	Swk_G31	14.3	Walking	20	0.0%	Yes
	Swk_G32	15.3	Walking	20	0.0%	Yes
	Swk_G33	15.6	Walking	20	0.0%	Yes
	Swk_G34	15.1	Walking	20	0.0%	Yes
	Swk_G35	6.9	Walking	20	0.0%	Yes
	Swk_G36	12.4	Walking	20	0.0%	Yes
	Swk_G37	6.0	Walking	20	0.0%	Yes
	Swk_G38	5.2	Walking	20	0.0%	Yes
	Swk_G39	7.2	Walking	20	0.0%	Yes
	Swk_G40	14.6	Walking	20	0.0%	Yes

APPENDIX

LEVEL	SIDEWALK	GEM SPEED (KM/HR)	COMFORT CATEGORY	LIMIT (KM/HR)	EXCEEDANCE	COMPLIANT
	Swk_G41	13.7	Walking	20	0.0%	Yes
	Swk_G42	10.6	Walking	20	0.0%	Yes
	Swk_G43	9.4	Walking	20	0.0%	Yes
	Swk_G44	6.7	Walking	20	0.0%	Yes
	Swk_G45	5.3	Walking	20	0.0%	Yes
	Swk_G46	3.5	Walking	20	0.0%	Yes
	Swk_G47	5.1	Walking	20	0.0%	Yes
	Swk_G48	5.0	Walking	20	0.0%	Yes
	Swk_G49	9.0	Walking	20	0.0%	Yes

Table B-7 Wind Level Results from CFD Modelling –Entrances/Exits – Building A – North Winds

LEVEL	ENTRANCES/EXITS	GEM SPEED (KM/HR)	COMFORT CATEGORY	LIMIT (KM/HR)	EXCEEDANCE	COMPLIANT
Ground Floor	Main_A1	11.3	Standing	14	0.0%	Yes
	Main_A2	8.6	Standing	14	0.0%	Yes
	Door_A1	6.5	Walking	20	0.0%	Yes

Table B-8 Wind Level Results from CFD Modelling –Entrances/Exits – Building G – North Winds

LEVEL	ENTRANCES/EXITS	GEM SPEED (KM/HR)	COMFORT CATEGORY	LIMIT (KM/HR)	EXCEEDANCE	COMPLIANT
Ground	Main_G1	10.1	Standing	14	0.0%	Yes
	Main_G2	10.1	Standing	14	0.0%	Yes
	Door_G1	10.7	Walking	20	0.0%	Yes
	Door_G2	14.3	Walking	20	0.0%	Yes

Table B-9 Wind Level Results from CFD Modelling –New Sidewalks - Building G – North Winds

LEVEL	SIDEWALK	GEM SPEED (KM/HR)	COMFORT CATEGORY	LIMIT (KM/HR)	EXCEEDANCE	COMPLIANT
Ground	NswkG_1	13.8	Walking	20	0.0%	Yes
	NswkG_2	14.3	Walking	20	0.0%	Yes
	NswkG_3	13.8	Walking	20	0.0%	Yes
	NswkG_4	14.9	Walking	20	0.0%	Yes
	NswkG_5	15.3	Walking	20	0.0%	Yes
	NswkG_6	17.2	Walking	20	0.0%	Yes
	NswkG_7	19.2	Walking	20	0.0%	Yes
	NswkG_8	19.8	Walking	20	0.0%	Yes
	NswkG_9	16.9	Walking	20	0.0%	Yes
	NswkG_10	17.6	Walking	20	0.0%	Yes
	NswkG_11	14.7	Walking	20	0.0%	Yes

APPENDIX

Table B-10 Wind Level Results from CFD Modelling –New Sidewalks - Building A – North Winds

LEVEL	SIDEWALK	GEM SPEED (KM/HR)	COMFORT CATEGORY	LIMIT (KM/HR)	EXCEEDANCE	COMPLIANT
Ground	**NswkA_1**	19.3	Walking	20	0.0%	**Yes**
	NswkA_2	18.0	Walking	20	0.0%	**Yes**
	NswkA_3	14.4	Walking	20	0.0%	**Yes**
	NswkA_4	11.9	Walking	20	0.0%	**Yes**
	NswkA_5	12.8	Walking	20	0.0%	**Yes**
	NswkA_6	7.2	Walking	20	0.0%	**Yes**
	NswkA_7	8.7	Walking	20	0.0%	**Yes**
	NswkA_8	7.1	Walking	20	0.0%	**Yes**
	NswkA_9	6.7	Walking	20	0.0%	**Yes**
	NswkA_10	8.6	Walking	20	0.0%	**Yes**
	NNswkA_11	8.0	Walking	20	0.0%	**Yes**
	NswkA_12	9.1	Walking	20	0.0%	**Yes**
	NswkA_13	12.9	Walking	20	0.0%	**Yes**
	NswkA_14	15.9	Walking	20	0.0%	**Yes**
	NswkA_15	16.5	Walking	20	0.0%	**Yes**
	NswkA_16	17.2	Walking	20	0.0%	**Yes**
	NswkA_17	19.1	Walking	20	0.0%	**Yes**
	NswkA_18	19.1	Walking	20	0.0%	**Yes**
	NswkA_19	6.4	Walking	20	0.0%	**Yes**
	NswkA_20	8.5	Walking	20	0.0%	**Yes**
	NswkA_21	6.9	Walking	20	0.0%	**Yes**
	NswkA_22	8.4	Walking	20	0.0%	**Yes**
	NswkA_23	6.0	Walking	20	0.0%	**Yes**
	NswkA_24	6.4	Walking	20	0.0%	**Yes**
	NswkA_25	8.4	Walking	20	0.0%	**Yes**

APPENDIX

Table B-11 Wind Level Results from CFD Modelling –Existing Sidewalks - Building A – North Winds

LEVEL	SIDEWALK	GEM SPEED (KM/HR)	COMFORT CATEGORY	LIMIT (KM/HR)	EXCEEDANCE	COMPLIANT
Ground	Swk_A1	13.9	Walking	20	0.0%	Yes
	Swk_A2	17.7	Walking	20	0.0%	Yes
	Swk_A3	7.7	Walking	20	0.0%	Yes
	Swk_A4	12.9	Walking	20	0.0%	Yes
	Swk_A5	18.6	Walking	20	0.0%	Yes
	Swk_A6	16.9	Walking	20	0.0%	Yes
	Swk_A7	7.3	Walking	20	0.0%	Yes
	Swk_A8	9.9	Walking	20	0.0%	Yes
	Swk_A9	8.1	Walking	20	0.0%	Yes
	Swk_A10	9.8	Walking	20	0.0%	Yes
	Swk_A11	9.1	Walking	20	0.0%	Yes
	Swk_A12	6.9	Walking	20	0.0%	Yes
	Swk_A13	6.6	Walking	20	0.0%	Yes
	Swk_A14	6.7	Walking	20	0.0%	Yes
	Swk_A15	5.1	Walking	20	0.0%	Yes
	Swk_A16	4.7	Walking	20	0.0%	Yes
	Swk_A17	3.7	Walking	20	0.0%	Yes
	Swk_A18	8.6	Walking	20	0.0%	Yes
	Swk_A19	7.0	Walking	20	0.0%	Yes
	Swk_A20	6.9	Walking	20	0.0%	Yes
	Swk_A21	8.7	Walking	20	0.0%	Yes
	Swk_A22	13.1	Walking	20	0.0%	Yes
	Swk_A23	10.6	Walking	20	0.0%	Yes
	Swk_A24	15.1	Walking	20	0.0%	Yes
	Swk_A25	13.6	Walking	20	0.0%	Yes
	Swk_A26	13.8	Walking	20	0.0%	Yes
	Swk_A27	12.1	Walking	20	0.0%	Yes
	Swk_A28	10.2	Walking	20	0.0%	Yes
	Swk_A29	8.1	Walking	20	0.0%	Yes
	Swk_A30	8.5	Walking	20	0.0%	Yes
	Swk_A31	6.7	Walking	20	0.0%	Yes
	Swk_A32	14.5	Walking	20	0.0%	Yes
	Swk_A33	15.2	Walking	20	0.0%	Yes
	Swk_A34	6.3	Walking	20	0.0%	Yes
	Swk_A35	4.7	Walking	20	0.0%	Yes
	Swk_A36	5.6	Walking	20	0.0%	Yes
	Swk_A37	5.8	Walking	20	0.0%	Yes
	Swk_A38	4.8	Walking	20	0.0%	Yes
	Swk_A39	3.0	Walking	20	0.0%	Yes

APPENDIX

Table B-12 Wind Level Results from CFD Modelling – Existing Sidewalks - Building G – North Winds

LEVEL	SIDEWALK	GEM SPEED (KM/HR)	COMFORT CATEGORY	LIMIT (KM/HR)	EXCEEDANCE	COMPLIANT
Ground	Swk_G1	9.1	Walking	20	0.0%	Yes
	Swk_G2	7.9	Walking	20	0.0%	Yes
	Swk_G3	7.6	Walking	20	0.0%	Yes
	Swk_G4	8.4	Walking	20	0.0%	Yes
	Swk_G5	7.3	Walking	20	0.0%	Yes
	Swk_G6	5.3	Walking	20	0.0%	Yes
	Swk_G7	3.8	Walking	20	0.0%	Yes
	Swk_G8	5.1	Walking	20	0.0%	Yes
	Swk_G9	7.4	Walking	20	0.0%	Yes
	Swk_G10	14.5	Walking	20	0.0%	Yes
	Swk_G11	11.6	Walking	20	0.0%	Yes
	Swk_G12	3.9	Walking	20	0.0%	Yes
	Swk_G13	7.3	Walking	20	0.0%	Yes
	Swk_G14	10.4	Walking	20	0.0%	Yes
	Swk_G15	14.5	Walking	20	0.0%	Yes
	Swk_G16	15.9	Walking	20	0.0%	Yes
	Swk_G17	16.6	Walking	20	0.0%	Yes
	Swk_G18	16.9	Walking	20	0.0%	Yes
	Swk_G19	14.1	Walking	20	0.0%	Yes
	Swk_G20	13.4	Walking	20	0.0%	Yes
	Swk_G21	12.0	Walking	20	0.0%	Yes
	Swk_G22	10.9	Walking	20	0.0%	Yes
	Swk_G23	12.7	Walking	20	0.0%	Yes
	Swk_G24	6.4	Walking	20	0.0%	Yes
	Swk_G25	4.2	Walking	20	0.0%	Yes
	Swk_G26	11.5	Walking	20	0.0%	Yes
	Swk_G27	6.5	Walking	20	0.0%	Yes
	Swk_G28	3.8	Walking	20	0.0%	Yes
	Swk_G29	7.6	Walking	20	0.0%	Yes
	Swk_G30	5.5	Walking	20	0.0%	Yes
	Swk_G31	5.5	Walking	20	0.0%	Yes
	Swk_G32	7.8	Walking	20	0.0%	Yes
	Swk_G33	11.8	Walking	20	0.0%	Yes
	Swk_G34	14.4	Walking	20	0.0%	Yes
	Swk_G35	8.4	Walking	20	0.0%	Yes
	Swk_G36	11.5	Walking	20	0.0%	Yes
	Swk_G37	20.7	Walking	20	3.6%	Yes
	Swk_G38	17.0	Walking	20	0.0%	Yes
	Swk_G39	15.7	Walking	20	0.0%	Yes

APPENDIX

LEVEL	SIDEWALK	GEM SPEED (KM/HR)	COMFORT CATEGORY	LIMIT (KM/HR)	EXCEEDANCE	COMPLIANT
	Swk_G40	15.7	Walking	20	0.0%	**Yes**
	Swk_G41	15.0	Walking	20	0.0%	**Yes**
	Swk_G42	14.9	Walking	20	0.0%	**Yes**
	Swk_G43	14.4	Walking	20	0.0%	**Yes**
	Swk_G44	13.6	Walking	20	0.0%	**Yes**
	Swk_G45	13.3	Walking	20	0.0%	**Yes**
	Swk_G46	12.6	Walking	20	0.0%	**Yes**
	Swk_G47	11.4	Walking	20	0.0%	**Yes**
	Swk_G48	10.9	Walking	20	0.0%	**Yes**
	Swk_G49	8.4	Walking	20	0.0%	**Yes**

B.2 CONCLUSION

For the existing conditions, the CFD model results indicate that there are no predicted wind issues at the ground level for pedestrians accessing the site during the summer and winter seasons.

For the Development, the CFD model results indicate that there are no predicted issues observed at the ground level of the building for pedestrians using the main entrances or other entrances/exits. Overall, at ground level, the study shows that the main entrances to Building A and Building G are expected to be comfortable for people to stand or stroll in these areas. People standing, strolling, or walking in these areas will primarily experience calm and gentle breezes. Similar wind comfortable conditions are shown for the other entrances/exits when people are walking in and out.

In addition, the CFD model results indicate that pedestrians are expected to be comfortable when walking in the vicinity of the Development along the new and existing sidewalks for both westerly and northerly wind directions.

Finally, the CFD model results indicate that predicted GEM speeds around areas of interests of the Development do not exceed the threshold wind safety condition of 90 km/hr.