REPORT

WEST RITCHIE DEVELOPMENT

EDMONTON, ALBERTA

WIND IMPACT STATEMENT

PROJECT #: 2202903

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SUBMITTED TO

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1. INTRODUCTION

Rowan Williams Davies & Irwin Inc. (RWDI) was retained to prepare a Wind Impact Statement for the proposed Ritchie Development located in the westerly portion of the Ritchie neighbourhood at the southwest corner of the intersection of 80 Avenue NW and 99 Street NW in Edmonton, Alberta. This effort is intended to satisfy requirements of the City of Edmonton as per Zoning Bylaw 16733, Section 14.2. The site location and surroundings are shown in **Image 1**. This assessment is based on the following:

- a review of regional long-term wind data;
- previous wind studies undertaken by RWDI in the Edmonton area;
- design drawings received by RWDI up to January 19, 2022; and,
- our engineering judgement and knowledge of wind flows around buildings[1-3].

The current wind assessment is qualitative in nature. Conceptual wind mitigation measures are recommended, where necessary.

Should a detailed Wind Impact Study be required later in the design, wind tunnel tests could be conducted to quantify the pedestrian wind conditions presented herein, and to develop any required wind mitigation.

Issues associated with ice / snow, wind-induced cladding and structural loads, door operability, air quality and noise / vibration are outside of the current scope.

Image 1: Aerial view of the site and surroundings *(Credit: CASIA Developments)*

1. H. Wu and F. Kriksic (2012). "Designing for Pedestrian Comfort in Response to Local Climate", Journal of Wind Engineering and Industrial Aerodynamics, vol.104-106, pp.397-407.
2. H. Wu, C.J. Williams, H.A. Baker and W.F. Waechter (2004), "Knowledge-based Desk-Top Analysis of Pedestrian Wind Conditions", ASCE Structure Congress 2004, Nashville, Tennessee.
3. C.J. Williams, H. Wu, W.F. Waechter and H.A. Baker (1999), "Experience with Remedial Solutions to Control Pedestrian Wind Problems", 10th International Conference on Wind Engineering, Copenhagen, Denmark.

2. SITE & BUILDING INFORMATION

Currently, the site is mostly open space occupied by a couple of single-family homes (**Image 1**). The immediate surroundings consist of low-rise residential, commercial and light industrial buildings in all directions. The North Saskatchewan River is located about 1.4 km to the north and Downtown Edmonton is approximately three kilometers to the north.

The proposed project is a multi-unit mixed-use across two buildings with amenity spaces including a linear landscaped courtyard at ground level, retail bays and underground parking. Building B is 14-storeys (254 ft tall) on the east portion of the site and Building A is 6-storeys (173 ft tall) on the west. The project will provide a total of 218 residential units and ground floor commercial space as reflected in **Image 2**.

Pedestrian areas of interest include adjacent sidewalks, the main residential entrances, commercial entrances and the courtyard.

Image 2: Perspective view at 80 Avenue and 99 Street looking southwest ***(Credit: CASIA Developments)***

3. WIND DATA

Wind data from the now closed Edmonton City Centre Airport, for the period from 1986 to 2015, was used as a reference for wind conditions in the area. This site is approximately six kilometers to the north-northwest. The distributions of wind frequency and directionality for the summer (May through October) and winter (November through April) seasons are shown in **Image 3**. When all data are considered, winds from the northwesterly and southerly directions are predominant in both the summer and the winter.

Strong winds of a mean speed greater than 30 km/h measured at the airport (red and yellow bands) occur more frequently in the summer, compared to the winter season. Such strong winds occur primarily from the northwest; winds from this direction potentially could be the source of *uncomfortable* or even *unsafe* wind conditions, depending upon the site exposure and/or project design.

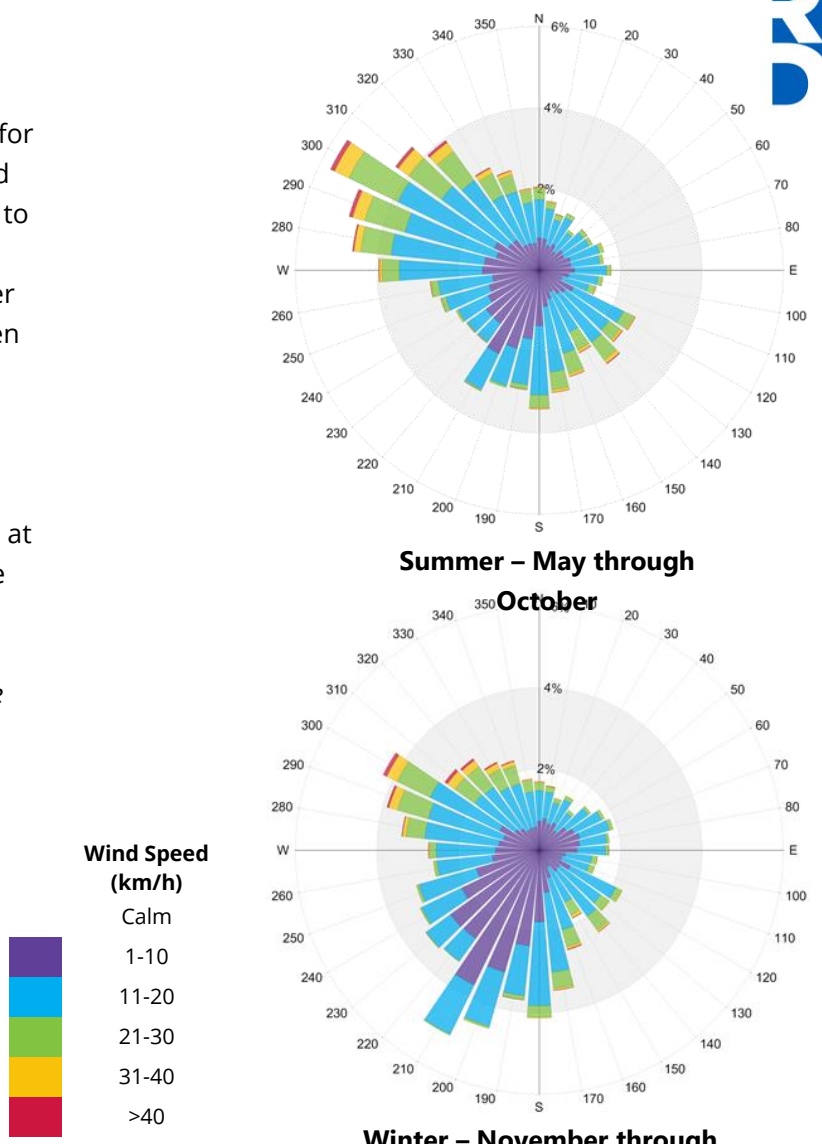


Image 3: Directional distribution of winds approaching Edmonton City Centre Airport (1986 – 2015)

4. CRITERIA

The RWDI pedestrian wind criteria are used in the current study. These criteria have been developed by RWDI through research and consulting practice since 1974. They have also been widely accepted by municipal authorities as well as by the building design and city planning community. The criteria are as follows:

Pedestrian Safety

Pedestrian safety is associated with excessive gust wind speeds that can adversely affect a pedestrian's balance and footing. If strong winds that can affect a person's balance (**90 km/h**) occur more than 0.1% of the time or 9 hours per year, the wind conditions are considered severe.

Pedestrian Comfort

Wind comfort can be categorized by typical pedestrian activities:
Sitting (≤ 10 km/h): Calm or light breezes desired for outdoor seating areas where one can read a paper without having it blown away.
Standing (≤ 14 km/h): Gentle breezes suitable for main building entrances and bus stops.
Strolling (≤ 17 km/h): Moderate winds that would be appropriate for window shopping and strolling along a downtown street, plaza or park.
Walking (≤ 20 km/h): Relatively high speeds that can be tolerated if one's objective is to walk, run or cycle without lingering.
Uncomfortable: None of the comfort categories are met.

Wind conditions are considered suitable for *sitting, standing, strolling* or *walking* if the associate mean wind speeds are expected for at least four out of five days (80% of the time). Wind control measures are typically required at locations where winds are rated as *uncomfortable* or *unsafe* or are considered inappropriate for the intended pedestrian use.

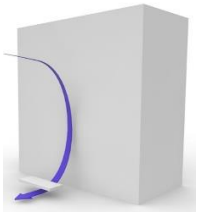
Note that these wind speeds are assessed at the pedestrian height (i.e., 1.5 m above grade or the concerned floor level), typically lower than those recorded in the airport (10 m height and open terrain).

These criteria for wind forces represent average wind tolerance. They are sometimes subjective and regional differences in wind climate and thermal conditions as well as variations in age, health, clothing, etc. can also affect perception of the wind climate.

For the current development, wind speeds comfortable for *walking* or *strolling* are appropriate for sidewalks; lower wind speeds comfortable for *standing* are required for building entrances, where pedestrians may linger; and low wind speeds comfortable for *sitting* are desired for any outdoor passive use areas (e.g., dining).

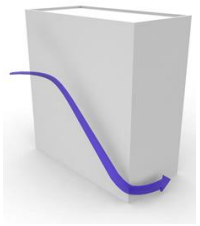
5.1 Wind Flow Around Buildings

In our discussion of wind conditions on and around the proposed Project, reference may be made to the following generalized wind flows (see **Image 4a**). If these building / wind combinations occur for prevailing winds, there is a greater potential for increased wind activity and *uncomfortable* conditions.



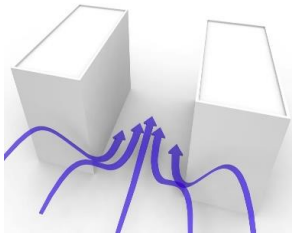
Downwashing

Tall buildings tend to intercept the stronger winds at higher elevations and redirect them to the ground level. This is often the main cause for wind accelerations around large buildings at the pedestrian level.



Corner Acceleration

Winds approach at an oblique angle to a tall façade and are deflected down causing a localized increase in the wind activity or corner acceleration around the exposed building corner(s) at pedestrian level.



Channeling

When two buildings are situated side by side, wind flow tends to accelerate through the space between the buildings due to channeling effect caused by the narrow gap.

Image 4a: Generalized Wind Flows

Design details such as; setting back a tall building from the edges of a podium, deep canopies close to ground level, wind screens / tall trees with dense landscaping, etc. (**Image 4b**) can help reduce wind speeds. The choice and effectiveness of these measures would depend on the exposure and orientation of the site with respect to the prevailing wind directions and the size and massing of the proposed buildings.

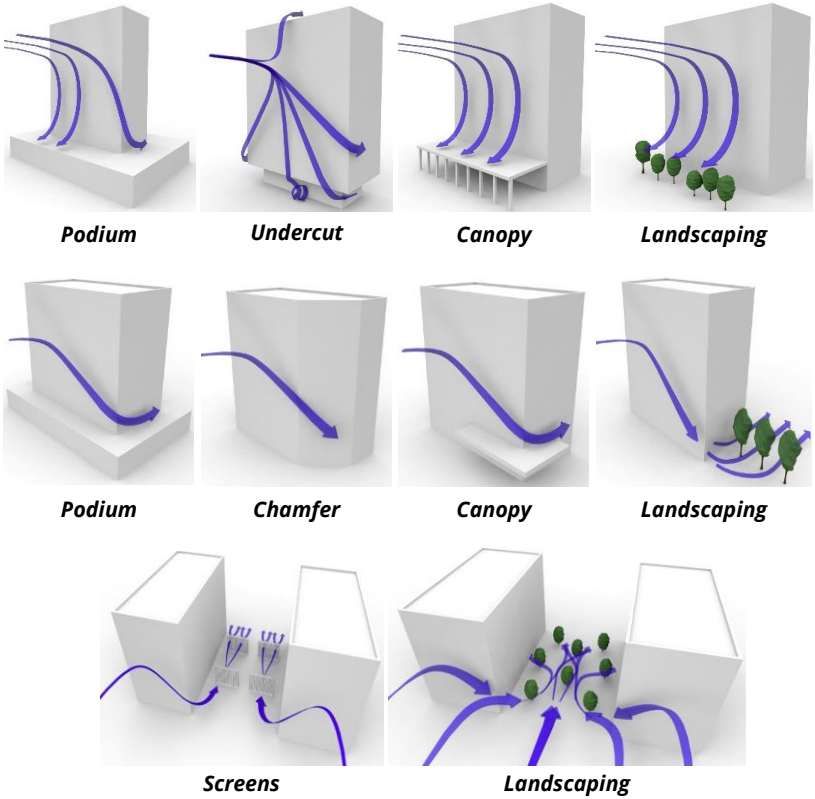


Image 4b: Examples of Common Wind Control Measures

5.2 Existing Site

Wind conditions around the existing site are likely appropriate for pedestrian activities (i.e., comfortable for *sitting* or *standing*) in most areas on and around the current project site throughout the year. Wind conditions are also currently expected to meet the criterion used to assess pedestrian safety. The favourable wind conditions result from the low height of adjacent buildings.

5.3 Proposed Site

The predicted wind comfort conditions for pedestrian areas of interest are shown in **Image 5**. Even though increases in local wind activity relative to existing conditions are predicted, the wind safety criterion will not be exceeded, nor do we expect any *uncomfortable* wind conditions at grade level.

5.3.1 Sidewalks

As shown in **Image 5**, all sidewalks adjacent to the proposed development are expected to have appropriate wind comfort conditions (i.e., suitable for *walking* or better).

5.3.2 Residential Entrances

This primary entrance to Building A is located off the linear courtyard on the east side of the building. This entrance is expected to have appropriate conditions (i.e., comfortable for *standing*) because the entrance is recessed into the façade. One of the two entrances to Building B is located on the opposite side of the courtyard and on the west side of Building B. This entrance will be exposed to northwesterly winds downwashing from the west building façade above (see **Image 4a**). This entrance would benefit from an overhead canopy. The other entrance to Building B is off 80 Avenue (on the north façade) and includes an overhead canopy making the expected conditions to be appropriate.

5.3.3 Commercial Entrance

The main commercial entrance is on the east side of Building B along 99 Street where conditions are expected to be appropriately comfortable for *standing* or better on an annual basis.

5. PEDESTRIAN WIND CONDITIONS

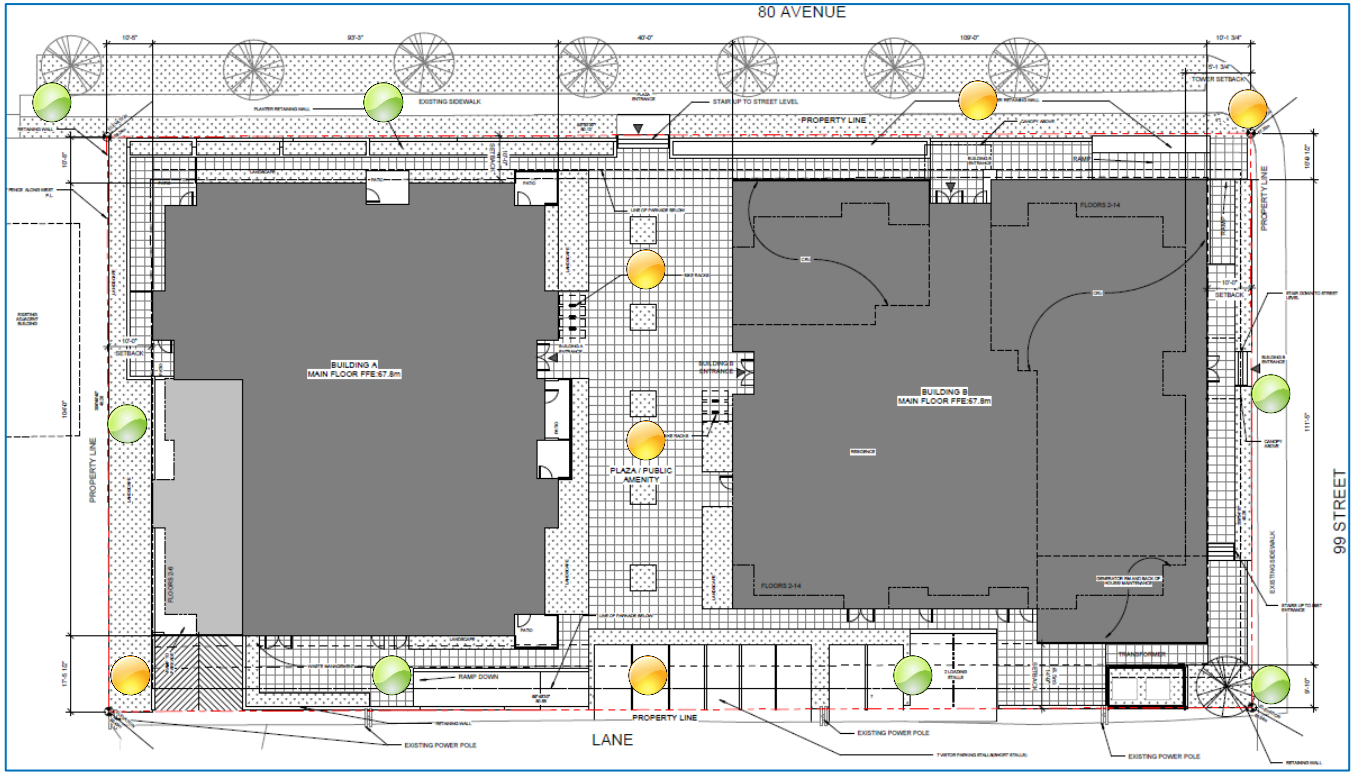


Image 5: Predicted *Annual* Wind Comfort Conditions

5.3.4 Courtyard

The linear courtyard is situated at grade level between Buildings A and B. The orientation of the courtyard is such that prevailing northwesterly winds are expected to downwash from the west façade of Building B (as per the example in **Image 4a**), into the courtyard and then flow toward the south. In general, wind conditions in the courtyard are predicted to be comfortable for *strolling* which is less than desirable for passive activities (e.g., outdoor seating, dining, etc.). Any locations within the courtyard where passive activities are planned would benefit from localized wind protection in the form of overhead trellises / canopies on the west side (closer to the Building B façade) and vertical windscreens / landscaping to protect from the southerly flow expected throughout the courtyard (see **Image 6**). From these guidelines it should be noted that solid wind screens provide better protection for a shorter distance downwind while porous wind screens provide slightly less protection (but still likely acceptable) for a greater distance. Also note that porous wind screens will provide a similar benefit to that of landscaping. **Image 7** provides photos of some example installations.

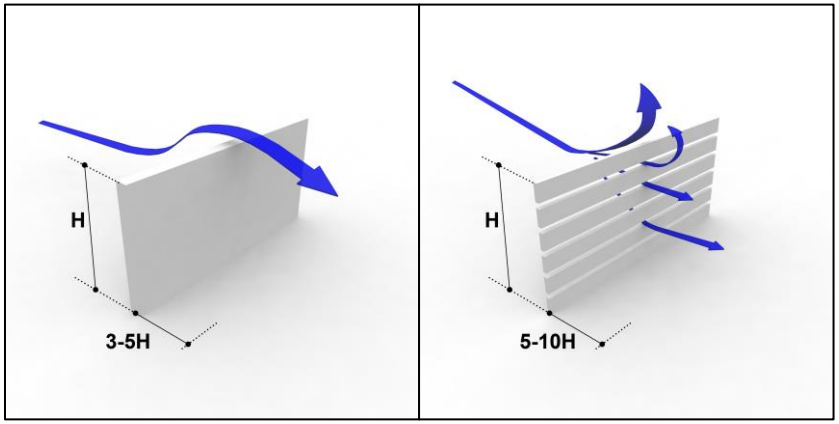


Image 6: Design guidelines for vertical wind screens (solid on left and porous right)

6. EXAMPLES OF WIND CONTROL MEASURES

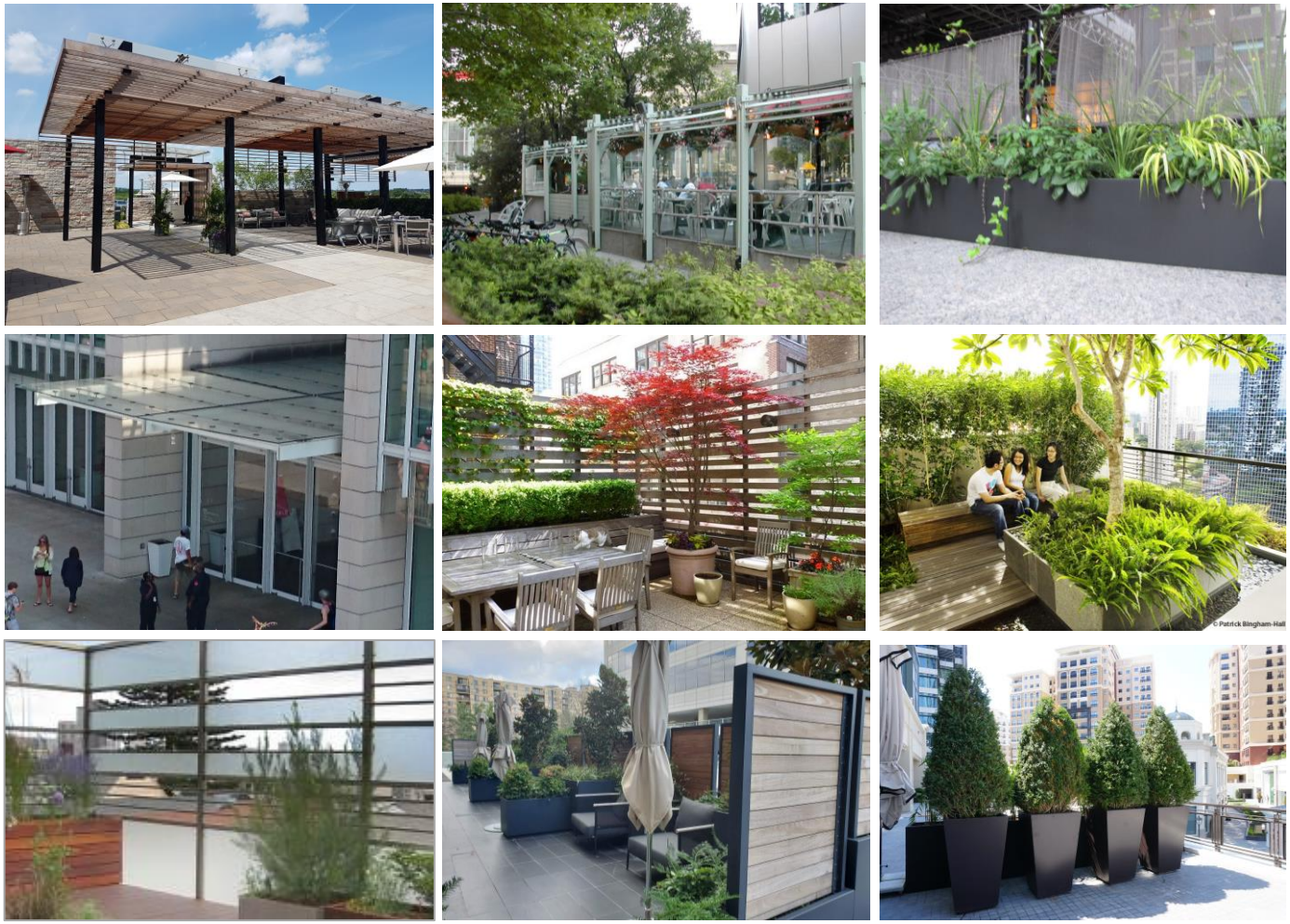


Image 7: Examples of landscaping, wind screens, trellises and canopies for wind control

7. SUMMARY

Given the local wind climate, wind conditions at most entrance locations and on all sidewalks are expected to be suitable for the intended use. Wind conditions on and around the development are expected to meet the wind safety criterion and no *uncomfortable* winds are expected.

The west residential entrance to Building B would benefit from the inclusion of an overhead canopy to protect from downwashing winds.

Any outdoor passive use areas within the linear courtyard would benefit from overhead protection at the base of Building B and vertical wind screens / landscaping to protect from the southerly flows expected in this area.

RWDI can be available to assist the design team while developing any wind control strategies. To quantify these conditions and/or refine any conceptual mitigation measures, physical scale model tests in a wind tunnel is the preferred approach.

8. APPLICABILITY OF RESULTS

The assessment discussed in this report is based on the drawings of the proposed development received up to January 19, 2022. In the event of any significant changes to the design, construction or operation of the building or addition of surroundings in the future, RWDI could provide an assessment of their impact on the pedestrian wind conditions discussed in this report. It is the responsibility of others to contact RWDI to initiate this process.