REPORT

THE BARON

EDMONTON, AB

WIND IMPACT STATEMENT

PROJECT #2002910
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SUBMITTED TO

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1. INTRODUCTION

RWDI was retained by Dialog Design to prepare a Wind Impact Statement for the Baron development in Edmonton, AB, as required by the City of Edmonton as per Zoning Bylaw 12800, Section 14.2. The site is located at the northeast corner of the intersection of Whyte (82) Avenue and 105 Street (see Image 1).

This assessment was based on the following:

- a review of regional long-term meteorological data from Edmonton City Centre Airport;
- design drawings received by RWDI on July 13, 2020;
- wind-tunnel studies undertaken by RWDI for similar projects in the Edmonton Area;
- our engineering judgement and knowledge of wind flows around buildings[1-3]; and,
- use of screening-level software developed by RWDI (Windestimator[2]) for estimating the potential wind conditions around generalized building forms.

The current wind assessment is screening-level in nature. Conceptual wind mitigation measures are recommended, where necessary. If desired, wind tunnel tests could be conducted to quantify the pedestrian wind conditions presented herein, and determine the need and extent for wind mitigation.

Note that other wind issues, such as those related to cladding and structural wind loads, air quality, roof snow loading, snowdrifting, door operability, etc., were not considered in the scope of this pedestrian wind assessment.

Image 1: Aerial view of existing site and surrounding (Photograph courtesy of Google Earth)

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. BUILDING AND SITE INFORMATION

The development site is currently occupied by one-storey buildings and the immediate surroundings are generally low, except two mid-rise buildings to the east and south (Image 1). Relatively tall and dense buildings exist to the distant west (University of Alberta) and to the distant north across Saskatchewan River Valley (downtown Edmonton).

The proposed development is eight storeys plus a mechanical penthouse for a total height of 32.8 m (Images 2 and 3). The tower sets back at Level 3 from the south and west sides of the main podium. Pedestrian areas of interest include residential and commercial entrances, public sidewalks, a commercial patio along the south façade and an amenity space on the roof.

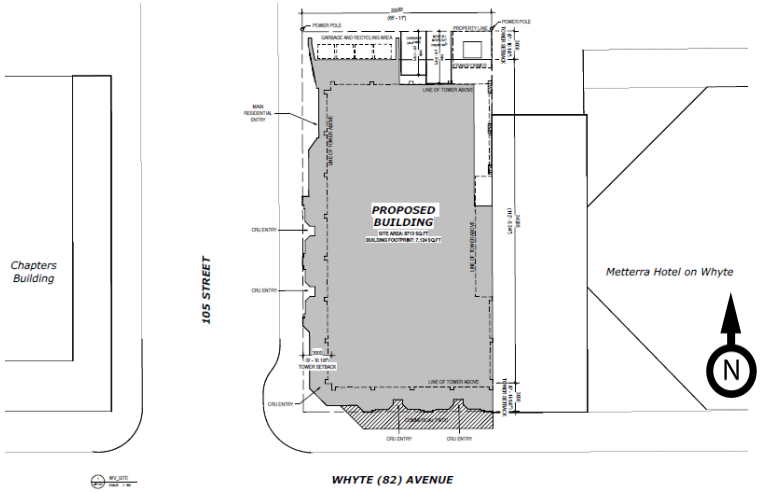


Image 2: Site plan

Image 3: West (left) and south elevations

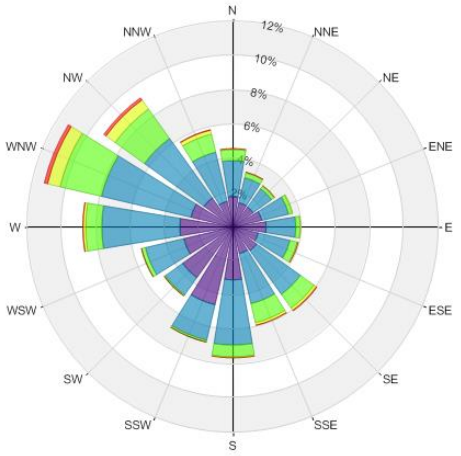
3. METEOROLOGICAL DATA

Meteorological data from Edmonton City Centre Airport, for the period from 1985 to 2015, were used as reference for wind conditions in the area. This is the nearest station with long-term reliable wind data.

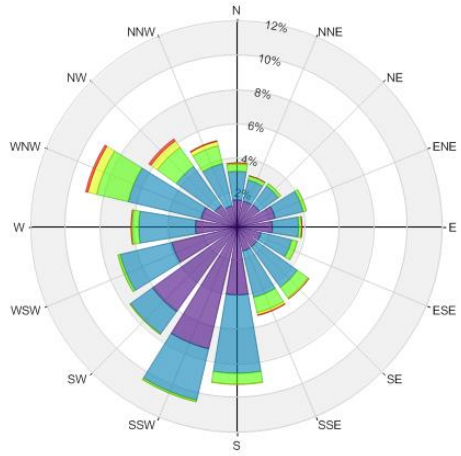
The distributions of wind frequency and directionality for the summer (May through October) and winter (November through April) seasons are shown in Image 4.

When all winds are considered, winds from southeast through south-southwest and west through north-northwest directions are predominant in both the summer and winter seasons.

Strong winds of a mean speed greater than 30 km/h measured at the airport (red and yellow bands in Image 4) occur slightly more frequently during the summer than the winter season, and they are typically from the west-northwest and northwest directions.



Summer - May to October



Winter - November to April

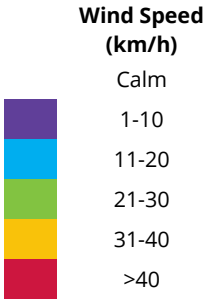


Image 4: Directional distribution of winds recorded at Edmonton City Centre Airport (1985–2015)

4. PEDESTRIAN WIND 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 and city planners including the City of Edmonton.

4.1 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.

4.2 Pedestrian Comfort

Wind comfort levels are 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 associated mean wind speeds are expected for at least four out of five days (80% of the time). Wind control measures are typically required at locations where winds are rated as uncomfortable or they exceed the wind safety criterion.

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

For the current development, wind speeds comfortable for walking or strolling are appropriate for sidewalks, and lower wind speeds comfortable for standing are required for building entrances where pedestrians may linger. Wind speeds comfortable for sitting are appropriate for outdoor amenity areas during the summer, when these areas will typically be in use.

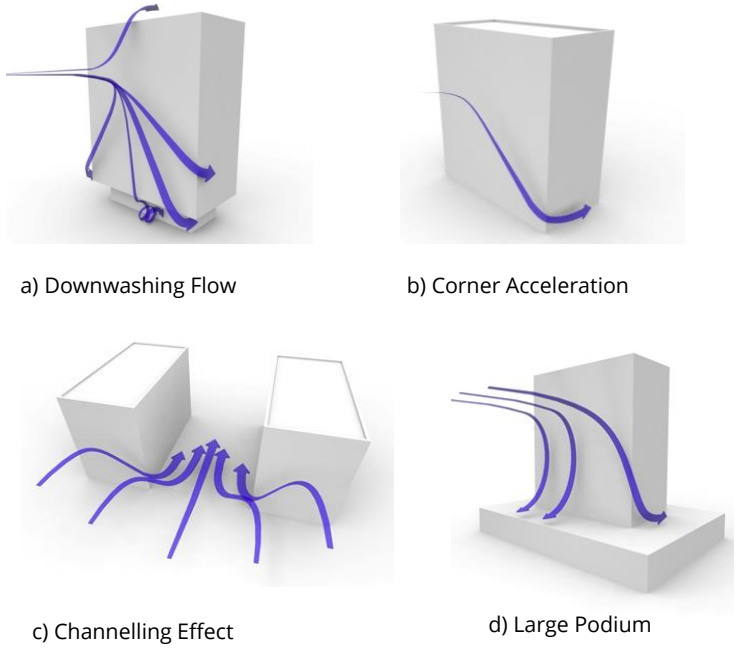
5. PEDESTRIAN WIND CONDITIONS

5.1 Background

Predicting wind speeds and occurrence frequencies is complicated. It involves the assessment of geometry, orientation, position and height of buildings in the master plan, surrounding buildings, upstream terrain and the local wind climate. Over the years, RWDI has conducted thousands of wind-tunnel model studies on pedestrian wind conditions around buildings, yielding a broad knowledge base. This knowledge has been incorporated into RWDI's proprietary software that allows, in many situations, for a qualitative, screening-level numerical estimation of pedestrian wind conditions without wind tunnel testing.

Buildings taller than their immediate surroundings tend to intercept stronger winds at higher elevations and redirect them to the ground level. Such a Downwashing Flow (see Image 5a) is the main cause for increased wind activity around buildings at the pedestrian level. Subsequently, the downwashing winds may accelerate around exposed building corners and along the gap between buildings (see Images 5b and 5c). If these building/wind combinations occur for prevailing winds, there is a greater potential for increased wind activity and uncomfortable conditions.

A large podium structure under a tower is beneficial for wind control as it reduces the direct impact of any downwashing winds from the tower (see Image 5d). However, increased wind activity will be created on the podium terrace, where calm wind conditions are typically desired for any amenity spaces.



a) Downwashing Flow

b) Corner Acceleration

c) Channelling Effect

d) Large Podium

Image 5: General wind flow patterns around buildings

5.2 Existing Wind Conditions

The development site is occupied by one-storey buildings and surrounded by similar or taller buildings in all directions (see Image 1). As a result, the existing wind conditions along Whyte Avenue and 105 Street are expected to be comfortable for standing or strolling throughout the year.

5.3 Future Wind Conditions

With the proposed building in place, pedestrian areas of interest at the grade level include the main residential entrance (Location A in Image 6), commercial entrances (B), public sidewalks (C and C1) and a patio along the south façade (D). Above the grade, there is an outdoor amenity space proposed on the roof (E in Image 8).

As shown in Image 3, the proposed building is on a podium along the south, west and north facades, which will keep the winds downwashing off the tower above the grade. The abutting 2-storey building on the east side will also serve as a podium and any wind flow acceleration between the proposed building and the existing tower to the east will stay above ground, away from pedestrian areas at grade.

As a result, suitable wind conditions are expected throughout the year at all pedestrian areas at grade.

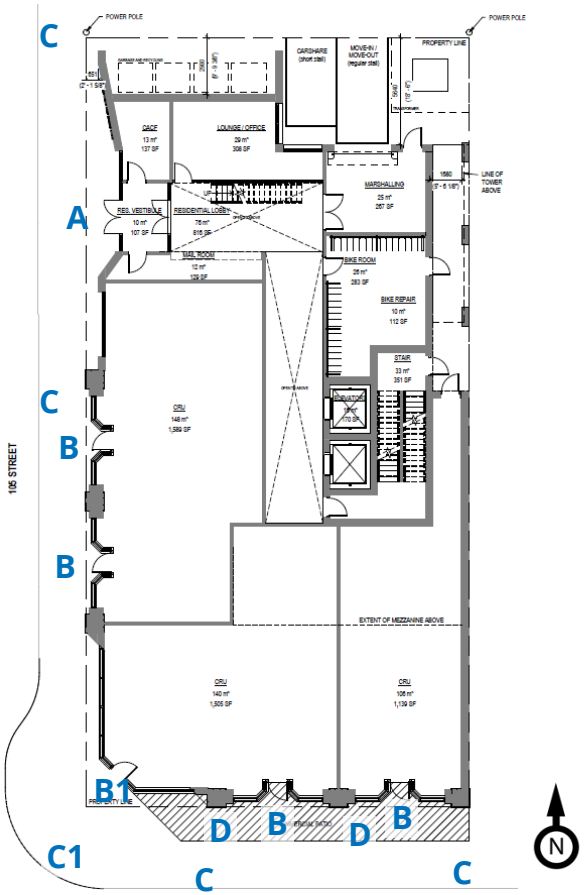


Image 6: Key pedestrian areas at grade

Main Residential Entrance (A)

The main residential entrance is located in a recessed area and designed with a vestibule (Location A in Image 6). It is sheltered by the proposed building from most wind directions, but the west and northwest winds may affect this area. The low podium above the entrance will provide protection for winds downwashing off the tower. Overall, suitable wind conditions are predicted around the main entrance for both the summer and winter seasons. If lower wind speeds are desired, a planter or screen may be considered on the north side of the entrance.

Commercial Entrances (B) and Public Sidewalks (C)

Pedestrians on sidewalks are active and can tolerate high wind speeds that are comfortable for strolling or walking. This criterion is expected to be met in all sidewalks (C in Image 6) around the development throughout the year, including the southwest corner of the building (C1), where wind speed accelerations are expected (Image 5b).

Strong winds in Edmonton are typically from the northwest and southeast directions and they may accelerate along 105 Street and Whyte Avenue (Image 7). However, suitable wind speeds comfortable for standing are expected at all commercial entrances (B and B1 in Image 6), because of the sheltering provided by the proposed building from one or more wind directions and the column/frame structures around entrances. In addition, all outswing doors (B) are recessed from building façade and the entrance door at the southwest corner (B1), where higher wind speeds are expected, would swing inward.

Outdoor Patio (D)

The patio is located on the south side of the proposed building and sheltered from the prevailing northwest winds. Therefore, wind conditions are expected to be suitable during the summer. Additional landscaping, screens and trellises will further reduce the wind speeds.

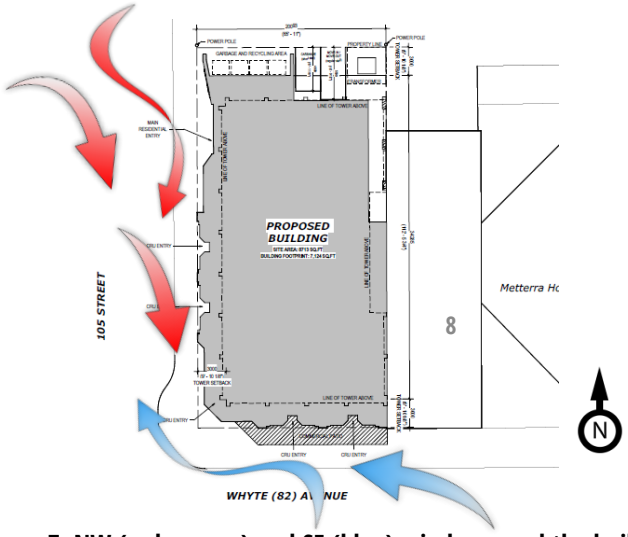


Image 7: NW (red arrows) and SE (blue) winds around the building

Roof Amenity (E)

There is an outdoor amenity space proposed on the roof around the mechanical penthouse (E in Image 8). Relatively high wind activity is expected on the roof, especially along edges and around penthouse corners, considering the increased elevation and exposure.

If seating is planned for this area, wind control measures should be included in the design and they may take the form of tall guardrails or landscaping rows along the roof edges, plus local wind screens and trellises. Image 9 provides wind control examples for reference.

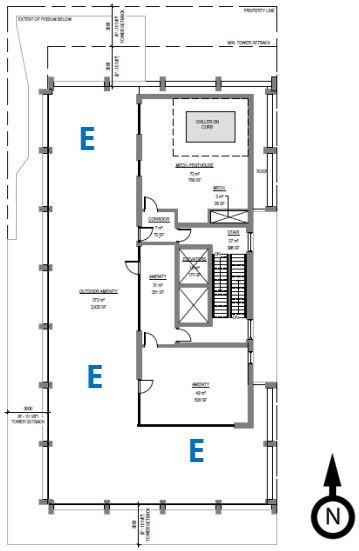


Image 8: Roof Amenity

Image 9: Wind control measures for roof amenity

6. SUMMARY

RWDI was retained to complete a Wind Impact Statement for the proposed Baron development at Whyte Avenue and 105 Street in Edmonton. This statement includes a screening-level assessment of pedestrian wind conditions based on the local wind climate, current design drawings, existing surroundings and our knowledge and experience with wind flows around similar buildings.

The proposed development includes several positive wind control features such as a low podium and an abutting low building around the tower, canopies, a recessed main entrance and vestibule and recessed commercial entrances. Suitable wind conditions are predicted at all building entrances, sidewalks and the outdoor patio on the south side of the proposed building.

Higher than desired wind speeds may occur on the rooftop amenity area. Wind control measures are discussed and photograph examples are provided for reference.

7. APPLICABILITY OF RESULTS

The assessment presented in this report is for the proposed Baron development at Whyte Avenue and 105 Street in Edmonton, based on the design drawings and documents dated on July 13, 2020.

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.