



March 11, 2016

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Dear Ms. Lauzon:

Re: Qualitative Pedestrian Level Wind Assessment  
275 King Edward Avenue, Ottawa  
GWE File: 15-099-DTPLW

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## 1. INTRODUCTION

Gradient Wind Engineering Inc. (GWE) was retained by Claude Lauzon Group Ltd. to undertake a qualitative pedestrian level wind assessment for Site Plan submission for the proposed mixed-use development located at 275 King Edward Avenue in Ottawa. The current study is based on architectural drawings provided by KWC Architects Inc. in March of 2016, a review of existing surrounding context, statistical knowledge of the Ottawa wind climate, and experience with similar past projects in Ottawa.

In the early stages of design development, a qualitative assessment of wind comfort is useful to identify any significant massing features or design elements which may adversely impact pedestrian activities within the study area, and to provide initial recommendations for mitigation strategies, if required.

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## 2. TERMS OF REFERENCE

The focus of this qualitative pedestrian level wind assessment is a proposed 6-storey mixed-use commercial/apartment development located at 275 King Edward Avenue in Ottawa. The proposed development is located on a parcel of land bounded by King Edward Avenue to the west, Murray Street to the north, Nelson Street to the east, and Clarence Street to the south. For the purpose of this wind assessment, project north is taken to be parallel to King Edward Avenue, which is oriented 33° counterclockwise from true north.

The development rises to a height of 19.5 meters (m) above local grade to the top of the roof slab with a staggered rectangular plan form that extends from grade to level 5, and a reduced rectangular plan form at level 6; the long axes of the floor plates are parallel with King Edward Avenue. The ground floor includes a vestibule serving the apartment lobby accessed from King Edward Street, as well as a large commercial space, which is accessed from Clarence Street.

The ground floor also includes stairwell access on the north side of the site, which is adjacent to an existing 2-storey residential building located at 257 King Edward Avenue that is offset from the proposed development by approximately 2.4 m towards the north. The north side of the site also includes direct access to the lowest below-grade parking area (i.e., level P2). The east elevation of the proposed building is offset from the property line by 1.9 m at the north end (closest to Murray Street), while the south end of the site, closest to Clarence Street and adjacent to the existing residential building located at 257 Clarence Street, is offset from the property line by 3 m. The east side of the site at grade includes a laneway, multiple access points to building services, and a dedicated area for bicycle parking. Access to below-grade parking level P1 is provided from Clarence Street, which is located immediately east of the entrance serving the commercial area at grade. Apartment suites begin on level 2 and continue for all remaining floors.

Regarding wind exposures, the development is surrounded for all directions by low- and medium-rise residential and commercial developments. Taller buildings are also located within a distance of approximately 400 m to the southeast clockwise through south-southwest. The Rideau River is situated 500 m to the north of the subject site, while the Ottawa River is situated 1,000 m to the west. Additionally, the downtown core (i.e., southwest of the Rideau Canal) is situated approximately 950 m

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to the south-southwest of the subject site. As such, the existing massing creates hybrid suburban-open wind exposures for wind directions from the southwest clockwise to north, hybrid suburban-urban wind exposures from the south-southwest clockwise to southwest, and suburban wind exposures for the remaining azimuth directions.

With respect to pedestrian winds, key areas under investigation include perimeter sidewalks along King Edward Avenue, Murray Street, and Clarence Street, pedestrian walkways along the east side of the development, and building ingress and egress for the full development. The architectural ground floor plan is provided in Figure 1 for purposes of illustrating and discussing the various pedestrian sensitive locations.

### **3. METHODOLOGY**

The following section describes the analysis process, including a background discussion of pedestrian comfort. The essential aspects of a qualitative pedestrian wind assessment include (i) consideration of the statistical properties of the local wind climate; (ii) consideration of the massing of the site (i.e., the shape, height, and orientation of the buildings); and (iii) evaluation of anticipated pedestrian comfort based on in-house experience and measured against the City of Ottawa criteria<sup>1</sup>.

#### **3.1 Ottawa Wind Climate**

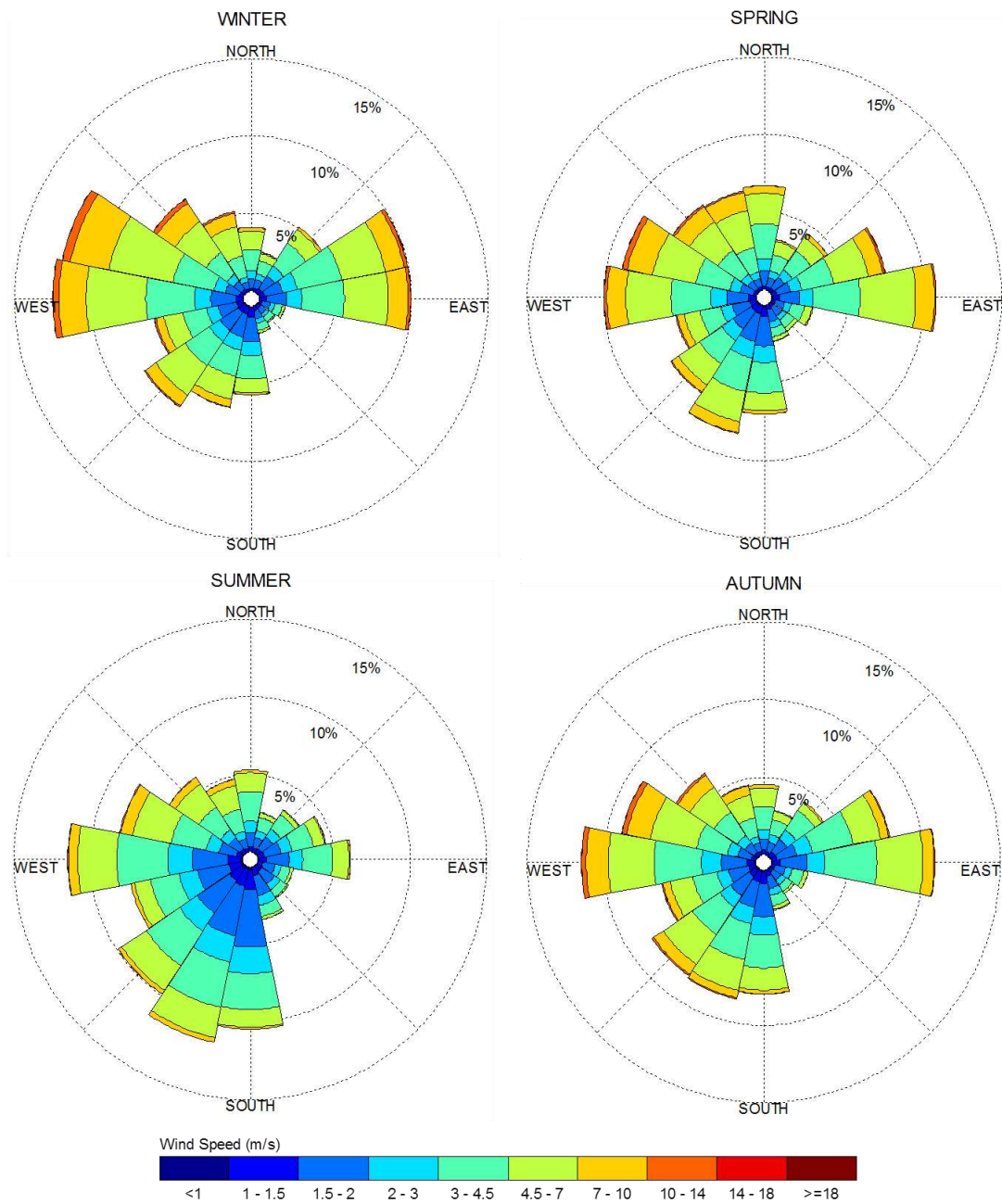
The statistical model of the Ottawa wind climate, which indicates the directional character of local winds on a seasonal basis in meters per second (m/s), is illustrated on the following page. Probabilities of occurrence of different wind speeds are represented as stacked polar bars in sixteen azimuth divisions. The radial direction represents the percentage of time for various wind speed ranges per wind direction during a 40-year measurement period. The preferred wind speeds and directions can be identified by the longer length of the bars.

For Ottawa, the most common winds occur for westerly wind directions, followed by those from the east, while the most common wind speeds are below 10 m/s. The directional preference and relative magnitude of wind speed changes somewhat from season to season. Also, by convention in wind engineering, wind direction refers to the wind origin (e.g., a north wind blows from north to south).

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<sup>1</sup> City of Ottawa, Terms of Reference – Wind Analysis (2016, p. 4)

## SEASONAL DISTRIBUTION OF WINDS FOR VARIOUS PROBABILITIES OTTAWA INTERNATIONAL AIRPORT (CYOW)



**NOTES:**

1. Radial distances indicate percentage of time of wind events.
2. Wind speeds represent mean hourly wind speeds measured at 10 m above the ground.

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## 3.2 Pedestrian Wind Comfort Guidelines

The pedestrian comfort guidelines used by GWE, which parallel the City of Ottawa criteria, are based on the correlation between a variety of pedestrian activity types, and acceptable wind speed ranges for those activities. More specifically:

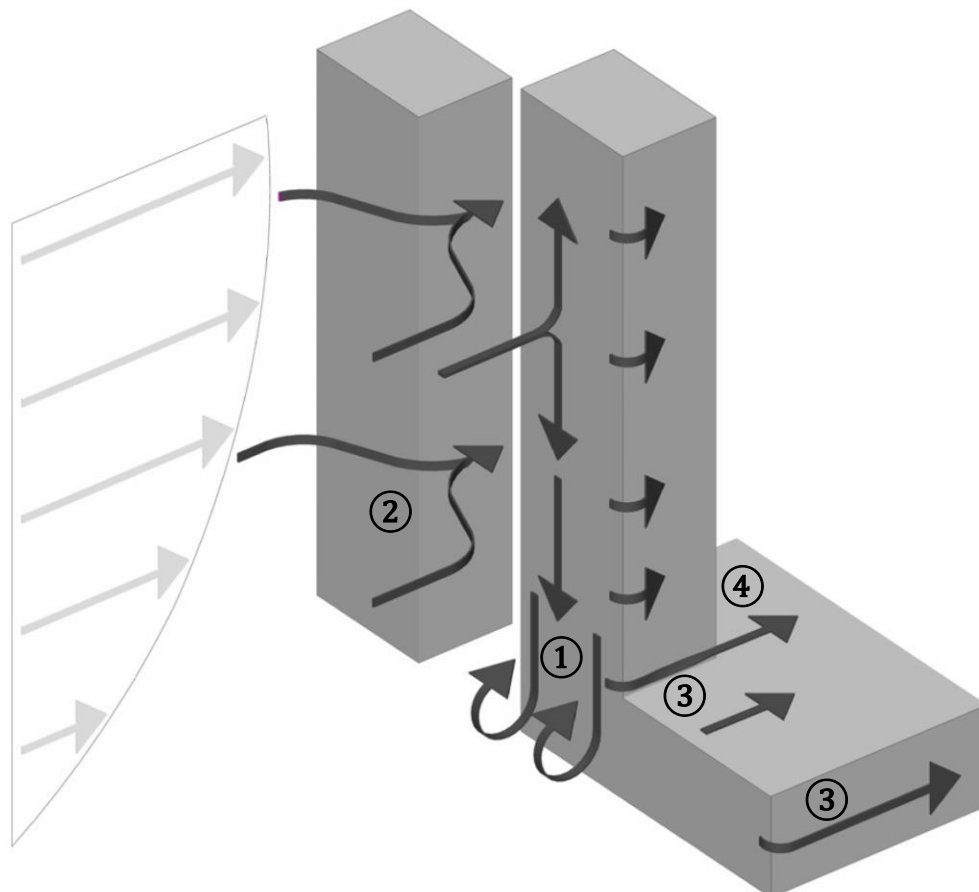
- (i) Wind conditions are considered to be comfortable for **sitting** when gust wind speeds less than or equal to 14 kilometers per hour (km/h) occur at least 80% of the time. The corresponding mean wind speed is approximately 10 km/h.
- (ii) Wind conditions are considered to be comfortable for **standing** when gust wind speeds less than or equal to 20 km/h occur at least 80% of the time. The corresponding mean wind speed is approximately 14 km/h.
- (iii) Wind conditions are considered to be comfortable for **strolling** when gust wind speeds less than or equal to 25 km/h occur at least 80% of the time. The corresponding mean wind speed is approximately 17 km/h, respectively.
- (iv) Wind conditions are considered to be comfortable for **walking** when gust wind speeds less than or equal to 30 km/h occur at least 80% of the time. The corresponding mean wind speed is approximately 20 km/h.
- (v) Dangerous wind conditions which affects pedestrian's ability to be stand or walk in a stable manner are defined to exist when a gust wind speed greater than or equal to 90 km/h exists for more than 0.1% of the time (i.e., approximately 9 hours per year).

The wind comfort guidelines are applied according to the intended use of the outdoor area. For example, a building entrance not served by a revolving door should be suitable for standing but need not be suitable for sitting, while a public sidewalk need only be suitable for walking in most circumstances.

### 3.3 Consideration of Massing and Climate

The physical features of a development site that are most influential to the local wind conditions include the massing and relative spacing of surrounding buildings, the geometry and orientation of the study building, and the alignment of the study building relative to prominent wind directions.

Wind flow characteristics which combine to determine how conditions will develop include phenomena known as downwash, channelling coupled with acceleration, and shielding, as illustrated in the image below. Downwash ① relates to the effect of winds against a tall building, whereby much of the impinging flow on the windward side of the building, nominally below two-thirds of the total height, is directed to lower levels. Taller buildings with smooth façades and no podiums produce the strongest downwash effects at grade, while the presence of protruding balconies and a tower setback from the podium edge mitigates downwash effects at the ground level. Channelling ② refers to acceleration of wind through gaps, while acceleration of wind ③ occurs around building corners. Shielding ④ relates to calm zones on the leeward side of buildings, protected from prevailing winds.



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#### 4. ANTICIPATED PEDESTRIAN COMFORT

Based on the massing of the study site, surrounding building massing, and the orientation of the subject site to the local wind climate, the following statements summarize our experience of how these conditions affect pedestrian comfort in key areas around the site.

**Kind Edward Sidewalk, Building Access along West Elevation, West Elevation of 257 King Edward Avenue, and Pedestrian Walkway / Stairwell Access along North Elevation of Proposed Development (Figure 1, Tags A and B):** The sidewalk area along King Edward Avenue, the main building entrance to the elevator lobby, and the grade-level area in the immediate vicinity of the noted existing building are identified by Tag 'A' in Figure 1. Although the areas are exposed to strong and frequent horizontal west winds, pedestrian comfort will only be somewhat reduced owing to the relatively short height of the study building, which will encourage winds to flow over and around the site. As such, the sidewalk area along Kind Edward Avenue is expected to be suitable for standing during the summer season and suitable for strolling during the early autumn season, becoming suitable for walking during the remaining months of the year. The noted conditions are considered acceptable for public sidewalks.

Wind conditions close to the west elevations of the study building and the noted existing residential building to the north will be somewhat calmer than those expected for the King Edward Avenue sidewalk area. More specifically, winds affecting pedestrians entering or leaving the buildings, as well as operation of the vestibule doors for the subject site, will be moderated by the noted buildings. As such, conditions are expected to be suitable for standing from late spring through the autumn season, becoming suitable for walking during the remaining colder months. Since a vestibule serves the elevator lobby entrance, the noted conditions are considered acceptable. Additionally, conditions along the north pedestrian walkway and in the vicinity of the stairwell access serving the north façade of the proposed development, identified as Tag 'B', are expected to be calm and suitable for sitting during the summer season, becoming acceptable for standing during the remaining colder months.

Note: Based on our extensive experience in Ottawa, existing conditions around the site are presently believed to be suitable for walking, or better, during the colder months. As such, introduction of the proposed development results in a net neutral impact to both the noted sidewalk area and existing residence at 257 King Edward Avenue.

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**North and East Sides of Existing Residence at 257 King Edward Avenue, Murray Street Sidewalk, West Side of Existing Residence at 262 Murray Street, and Pedestrian Walkway along East Side of Proposed Development (Figure 1, Tags C, D, and E):** Conditions at the intersection of King Edward Avenue and Murray Street, identified by Tag 'C' in Figure 1, are expected to be windier than the sidewalk area along King Edward Avenue due to greater exposure to westerly winds. However, conditions will remain acceptable and suitable for walking, or better, throughout the year.

Wind conditions between the existing residence at 262 Murray Street and the 5-storey massing connected to the proposed development, identified by Tag 'D', are expected to vary between the north and south ends. More specifically, wind conditions within the north end closest to Murray Street are expected to be suitable for standing, or better, from late spring to early autumn, becoming suitable for strolling, or better, during the remaining colder months. Pedestrian comfort is expected to improve towards the south, and in the vicinity of the building services entrance, owing to the added protection from the proposed development; conditions along the laneway, between the noted two developments, are expected to be suitable for sitting from late spring to late autumn, and suitable for standing during the remaining colder months, which are considered acceptable for the intended uses of the areas.

Pedestrian wind comfort between the 257 King Edward Avenue building and the noted proposed 5-storey massing, identified as Tag 'E', is expected to be suitable for sitting during the summer season, becoming suitable and acceptable for standing during the remaining colder months of the year. Similar conditions are expected within the patio serving the noted existing building.

**Pedestrian Walkway along East Side of Proposed Development (Figure 1, Tags F and G):** Conditions along the walkway, beginning from the noted building services entrance toward the area flanked by the ramp to below-grade parking and the existing residence at 257 Clarence Street, identified as Tag 'F' in Figure 1, are expected to remain calm throughout the year. The area immediately south of the southeast corner of the proposed development, identified as Tag 'G', is expected to be suitable for sitting during the summer season, becoming suitable and acceptable for standing during the remaining colder months of the year.



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**Clarence Street Sidewalk, Intersection of King Edward Avenue and Clarence Street, and Retail Entrance**

**(Figure 1, Tags H, I, and J):** The sidewalk area along Clarence Street, identified by Tag ‘H’ in Figure 1, will be exposed to prominent horizontal southwest and east winds. However, given the relatively low height of the proposed building, and its setback from the existing residence at 262 Clarence Street, wind conditions are expected to be similar to those along Kind Edward Avenue. More specifically, the sidewalk area along Clarence Street is expected to be suitable for standing during the summer season and suitable for strolling during the early autumn season, becoming suitable for walking during the remaining months of the year. The noted conditions are considered acceptable for public sidewalks.

Wind conditions at the intersection of King Edward Avenue and Clarence Street, identified as Tag ‘I’, are expected to be somewhat stronger than those reported along the noted sidewalk areas. More specifically, the strolling condition will likely define the wind environment from late spring to late autumn, while conditions suitable for walking are expected during the remaining colder months. The noted conditions are considered acceptable for public sidewalks.

Pedestrian winds within the vicinity of the retail entrance, identified as Tag ‘J’, are expected to be calmer than those anticipated for the Clarence Street sidewalk area. Conditions at the entrance are expected to be suitable for sitting during the summer season, becoming suitable for standing during the remaining colder months. Of particular importance, although comfort conditions at the entrance may experience short durations of stronger wind activity during the winter season, the walking criterion will not be exceeded at any time. As such, wind comfort at the retail entrance is considered to be acceptable.

**Existing vs Future Wind Conditions:** The introduction of the proposed development is not expected to adversely influence existing neighbouring buildings. Although modest changes to wind speeds may occur beyond the site property, pedestrian comfort over areas outside the immediate influence of the study site is expected to remain similar to existing conditions. Additionally, within the context of typical weather patterns, excluding anomalous local storm events, such as thunderstorms, tornadoes and downbursts, no dangerous or consistently strong wind conditions are expected anywhere over the subject site on a seasonal and annual basis. Of particular interest, no areas over the study site are likely to experience conditions that would be considered unsafe, or troublesome for elderly persons.

## 5. SUMMARY AND RECOMMENDATIONS

Based on the qualitative analysis of site plans, the proposed building form, and the wind statistics for Ottawa, grade-level wind conditions over the proposed development site at 275 King Edward Avenue, including public sidewalk areas and building access points, are expected to be suitable for the intended uses throughout the year without mitigation.

Of particular importance, the introduction of the proposed development is not expected to adversely influence existing neighbouring buildings. Although modest changes to wind speeds may occur beyond the site property, pedestrian comfort over areas outside the immediate influence of the study site is expected to remain similar to existing conditions. Additionally, within the context of typical weather patterns, excluding anomalous local storm events, such as thunderstorms, tornadoes and downbursts, no dangerous or consistently strong wind conditions are expected anywhere over the subject site on a seasonal and annual basis. Of particular interest, no areas over the study site are likely to experience conditions that would be considered unsafe, or troublesome for elderly persons.

The foregoing analysis and statements are based on experience and knowledge of wind flow patterns in suburban settings. Hence, this assessment is intended to assure adequate pedestrian safety relating to wind while providing general guidance relating to pedestrian comfort around the subject site.

This concludes our pedestrian level wind assessment and report. We thank you for the opportunity to be of service.

Sincerely,

**Gradient Wind Engineering Inc.**



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Project Manager

GWE15-099-DTPLW



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Managing Principal

