September 14, 2018

David Sanche
Westrich Pacific Corporation
200, 1356 Windermere Way
Edmonton, AB
T6W 2J3

Dear Mr. Sanche:

Re: Qualitative Pedestrian Level Wind Assessment
Westrich Towers - 106 Street, Edmonton, AB
GWE File No.: 18-123-DTPLW (106 St) – R1

1. INTRODUCTION

Gradient Wind Engineering Inc. (GWE) was retained by Westrich Pacific Corporation to undertake a qualitative pedestrian level wind assessment in support of Zoning By-law Amendment (ZBA) for the proposed development referred to as Westrich Towers - 106 Street in Edmonton, Alberta. Our work is based on architectural drawings provided by Westrich Pacific Corporation in July 2018 and updated in September 2018, consideration of existing and approved future surrounding buildings, statistical knowledge of the Edmonton wind climate, and experience with similar projects in Edmonton.

In the early stages of design development, a qualitative wind assessment 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, as may be required.

2. TERMS OF REFERENCE

The focus of this qualitative wind analysis is the proposed development located along the east side of 106 Street NW, approximately mid-block between 102 Avenue to the north and Jasper Avenue to the south in Edmonton, Alberta. The site is approximately 500 metres west of the downtown core and 800 metres northwest of the North Saskatchewan River valley.

The proposed development is a 44-storey tower with a single-storey, double-height podium, rising approximately 139 metres above grade to the base of the mechanical penthouse. The podium planform is nearly rectangular with the long axis oriented along 106 Street NW. The east side of the building contains parking and a ramp to five levels of underground parking, accessed from a laneway along the east side of the building. A loading area and ramp to mezzanine-level parking are accessed from a laneway along the south side of the building. The remainder of ground floor comprises two retail units and a central lobby fronting 106 Street NW, with retail patios and seating located along the west exterior of the building.

Above the podium, the floorplate sets back from the west, north and east elevations to the irregular shaped base the tower. Above Level 16, the floorplate sets back from the south elevation to create a tower planform formed by two offset rectangular parts, the west part of which features a west wall diagonally set back from 106 Street NW, tapered at the south. The tower comprises residential units and features protruding balconies along the east, west, and south sides. At Level 44, the floorplate sets back from the west side to the mechanical penthouse. A canopy-like structure extends from the mechanical penthouse to partially cover the tower rooftop.

Regarding wind exposures, the near-field surroundings of the development (defined as an area falling within a 200-metre radius from the subject site) are primarily characterized by low-rise buildings and surface parking in the southwest quadrant, low and medium-rise buildings with surface parking to the north, and a mixture of low, medium and high-rise buildings for the remaining directions. The far-field surroundings (defined as the area beyond the near-field and within a 2-kilometre radius), are characterized by a moderately dense urban mixture of low, medium and high-rise buildings from the northeast clockwise to the southwest, transitioning to low-rise buildings, green space and the North Saskatchewan River. The remaining far-field is characterized by low-rise buildings to the north, and a mixture of low, medium and occasional high-rise buildings to the west.

The ground floor plan, including letter tags identifying wind sensitive pedestrian locations considered in this assessment, is illustrated in Figure 1.

3. METHODOLOGY

The main aspects of a qualitative pedestrian level wind assessment include (i) consideration of the statistical properties of the local wind climate; (ii) knowledge of wind flow behaviour in typical urban, suburban, and open environments; and (iii) an understanding of how common wind conditions relate to typical pedestrian activity types.

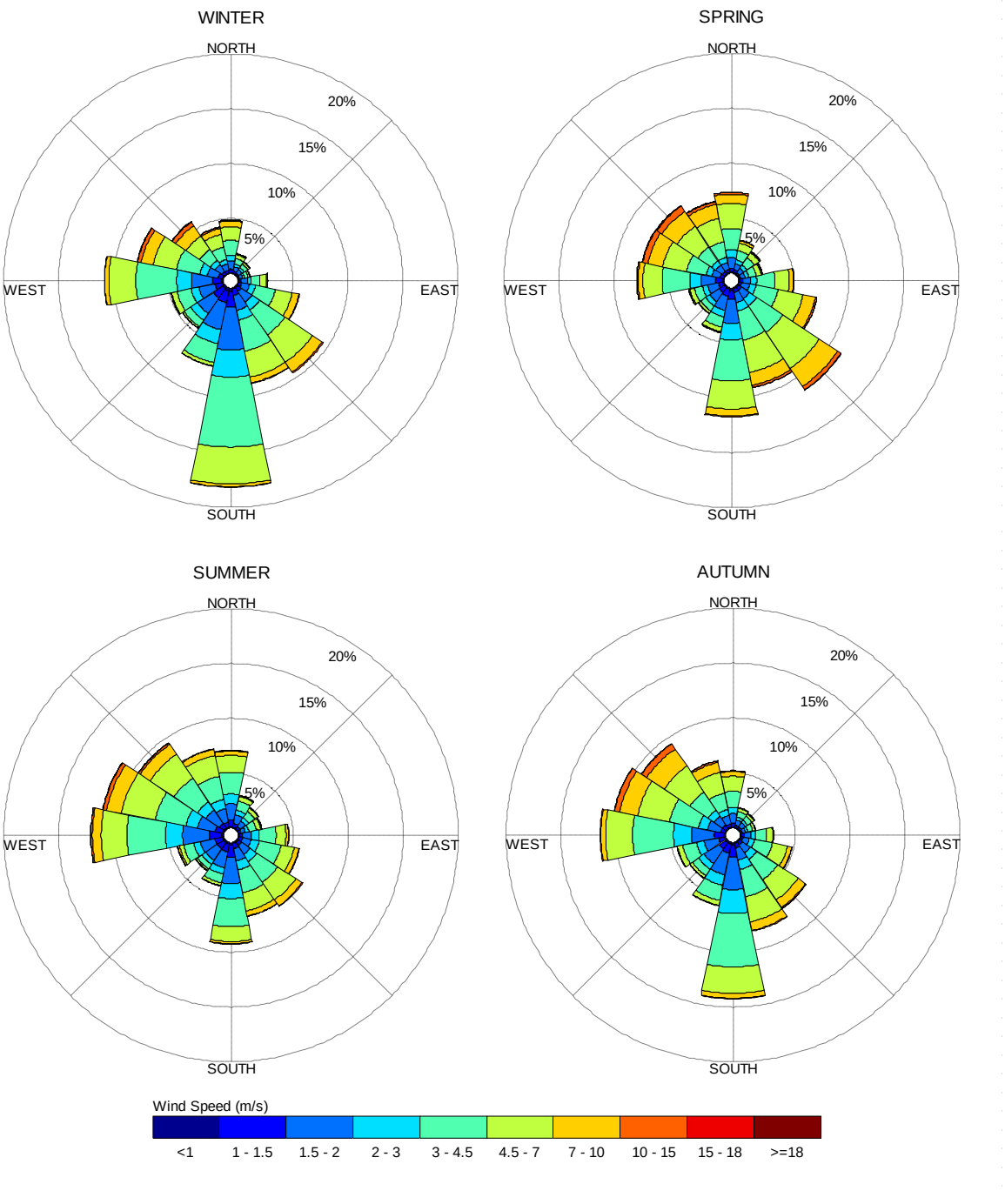
3.1. Edmonton Wind Climate

A statistical model for winds in Edmonton was developed from approximately 40-years of hourly meteorological wind data recorded at Edmonton International Airport. Wind speed and direction data were analyzed for each month of the year in order to determine the statistically prominent wind directions and corresponding wind speeds, and characterize similarities between monthly weather patterns. Based on this portion of the analysis, the four seasons are represented by grouping data from consecutive months based on similarity of weather patterns, not according to the traditional calendar method.

The statistical model of the Edmonton wind climate, which indicates the directional character of local winds on a seasonal basis, is illustrated on the following page. The plots illustrate seasonal distribution of measured wind speeds and directions in meters per second. Probabilities of occurrence of different wind speed ranges are represented as stacked polar bars in sixteen (16) Azimuth divisions. The radial direction represents the percentage of time for various wind speed ranges per wind direction during the measurement period. The preferred wind speeds and directions can be identified by the longer length of the bars. For Edmonton, the most common winds influencing pedestrian comfort occur from the northwest and southeast sectors during each seasonal period. Winter and autumn months display large prominence of south winds. The directional preference and relative magnitude of the wind speed varies somewhat from season to season, with the summer months displaying the calmest winds relative to the remaining seasonal periods.

SEASONAL DISTRIBUTION OF WINDS FOR VARIOUS PROBABILITIES

EDMONTON INTERNATIONAL AIRPORT, EDMONTON



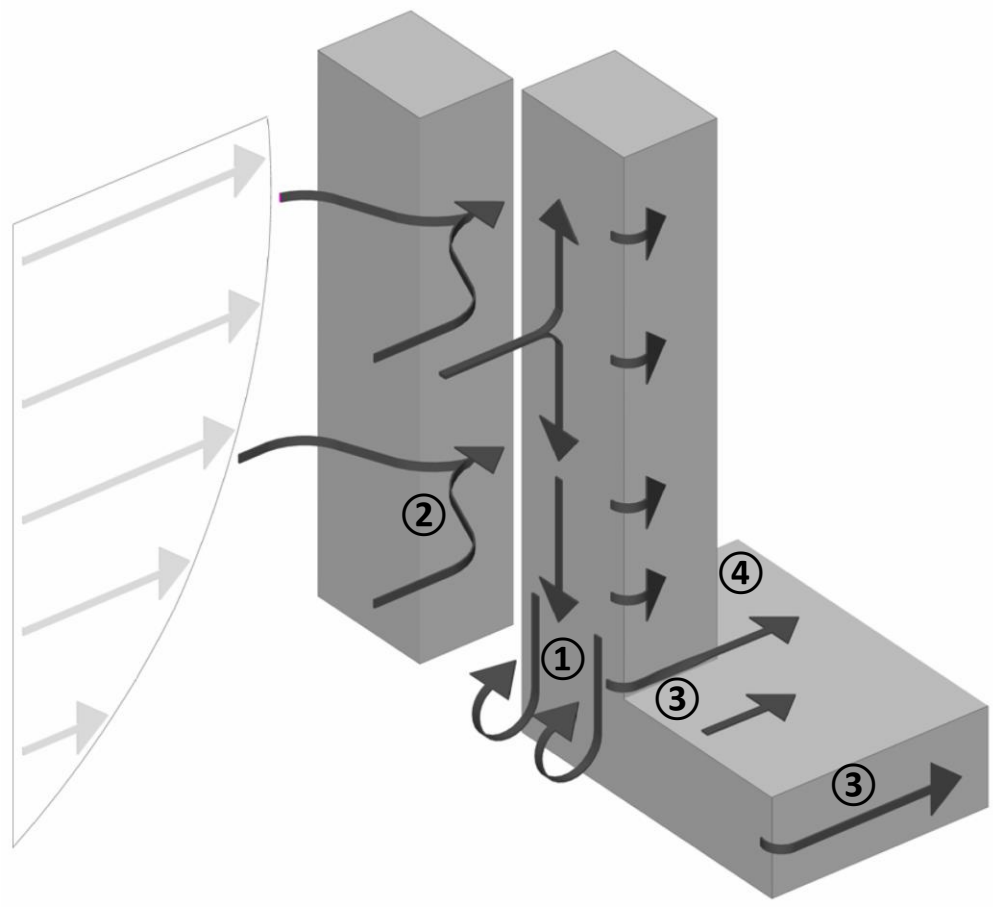
Notes:

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.

3.2. Massing vs. Climate – Geometric Effects

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 with respect to statistically 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 between buildings, 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.



3.3. Pedestrian Wind Comfort Guidelines

The pedestrian wind comfort guidelines used by GWE, which correspond to industry-accepted standards, are based on the correlation between a variety of pedestrian activity types and acceptable wind speed ranges for those activities. More specifically:

- Wind conditions are comfortable for *sitting* when gust wind speeds less than or equal to 14 kilometers per hour (km/h) occur at least 70% of the time;
- Wind conditions are comfortable for *standing and strolling* when gust wind speeds less than or equal to 22 km/h occur at least 80% of the time; and
- Wind conditions are comfortable for *walking* when gust wind speeds less than or equal to 30 km/h occur at least 80% of the time.

The GWE guidelines are based on gust wind speeds, since people are most sensitive to wind gusts rather than to constant wind speeds. The guidelines are applied to the intended use of an outdoor area. For example, an entrance to a building not served by a vestibule or 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.

4. ANTICIPATED PEDESTRIAN COMFORT

Based on consideration of the proposed Westrich Towers - 106 Street development, surrounding building massing, and the relationship to the local wind climate, the following statements summarize our opinion of how these influences will affect pedestrian comfort at key areas.

Sidewalk Area along 106 Street NW (Figure 1, Tag A): The sidewalk along 106 Street NW will be sheltered from prominent southeast winds by the study building itself, while remaining relatively exposed to salient westerly and northwesterly winds. The 106 Street NW corridor is also aligned with less-frequent northerly and southerly winds, although these are not expected to be affected by focusing forces due to the lack of high-rise buildings in the near-field along the roadway. Overall, wind conditions along the sidewalk are expected to be suitable for sitting during the summer, for standing or better during the autumn, and walking or better for the remainder of the year, which is acceptable.

West Elevation Patios and Building Access Points (Figure 1, Tag B): The patio and adjacent building access points along the west elevation will experience similar wind exposure to the 106 Street NW sidewalk, with additional protection afforded due to their inset location from the roadway and proximity to the building

façade. Regarding high-level winds, the setback of the tower from the west elevation of the podium will mitigate the effects of downwash experienced at grade. The lobby entrance and any retail entrances along the west side, as well as the patio area, are therefore expected to experience conditions suitable for sitting during the summer and standing or better during the remainder of the year, which is acceptable.

South Elevation Laneway and Vehicular Building Access Points (Figure 1, Tag C): The laneway along the south elevation of the study building, as well as the adjacent vehicular building access points, are well-protected from salient northwesterly winds by the study building itself. The location is also protected from prominent southeasterly and southerly winds by the surrounding urban massing, while remaining relatively exposed to salient westerly winds. Overall, the area is expected to experience wind conditions comfortable for standing or better during the summer, spring and autumn, and walking or better during the winter, which is acceptable.

East Elevation Laneway, Sheltered Parking Access, and Underground Parking Entrance (Figure 1, Tag D): The laneway and parking areas located along the east side of the study building will be well-sheltered from prominent northwest quadrant winds by the study building itself, and to a lesser extent from prominent southerly and southeasterly wind directions by the upwind massing. Overall, the spaces are expected to be comfortable for sitting during the summer and spring, standing or better during the autumn, and walking or better during the winter, which is acceptable.

Potential Rooftop Amenity Spaces: The potential outdoor amenity terrace above Level 16 will be sheltered from north-easterly winds by the study building itself but remains exposed to more prominent wind directions. The tower rooftop above Level 44 will be well shielded from southeasterly winds by the mechanical penthouse, while remaining exposed to prominent southerly and westerly winds with little upwind resistance. Overall, conditions over the spaces are expected to be suitable for standing or walking throughout the year. If these areas are to be used as outdoor amenity spaces, mitigation in the form of 1.8-metre high-solidity wind barriers along the entire perimeter of the spaces is recommended.

Influence of the Proposed Development on Existing Wind Conditions near the Study Site: The introduction of the proposed development is not expected to significantly influence pedestrian wind comfort over neighbouring areas at grade. In particular, although modest changes to wind speeds may occur beyond the study site upon introduction of the proposed development, nearby building entrances, sidewalks, and other pedestrian areas are expected to continue to experience wind conditions similar to those that presently exist without the proposed building in place.

Applicability of Predictions: The forgoing statements and conclusions apply to common weather systems, during which no dangerous or consistently strong wind conditions are expected anywhere over the study site. During such extreme weather events, (e.g. thunderstorms, tornadoes, and downbursts), pedestrian safety is the main concern. However, these events are generally short-lived and infrequent and there is often sufficient warning for pedestrians to take appropriate cover.

5. SUMMARY AND RECOMMENDATIONS

Based on a qualitative assessment of architectural drawings, surrounding building massing, and the Edmonton wind climate, the following general statements summarize our prediction of future wind conditions for the proposed Westrich Towers - 106 Street development.

1. Wind comfort over all grade-level pedestrian-sensitive locations across the study site is expected to be suitable for the anticipated uses without mitigation. These areas include surrounding sidewalks, laneways, loading areas, building access points, grade-level parking spaces, and the patio along the west elevation.

2. Mitigation will be required over the tower rooftops above Levels 16 and 44, as described in Section 4, if these spaces are to be used as rooftop amenity areas.

3. The introduction of the proposed development is not expected to significantly influence pedestrian wind comfort over neighbouring areas at grade. In particular, although modest changes to wind speeds may occur beyond the study site upon introduction of the proposed development, nearby building entrances, sidewalks, parking areas, and other pedestrian areas are expected to continue to experience wind conditions similar to those that presently exist without the proposed building in place.

The foregoing analysis and statements are based on knowledge and experience of wind flow patterns for the study site and in similar settings. As such, this assessment is intended to ensure adequate pedestrian safety relating to wind, and to provide general guidance relating to pedestrian comfort over the full study site.

This concludes our qualitative assessment of pedestrian wind comfort. Please advise the undersigned of any questions or comments.

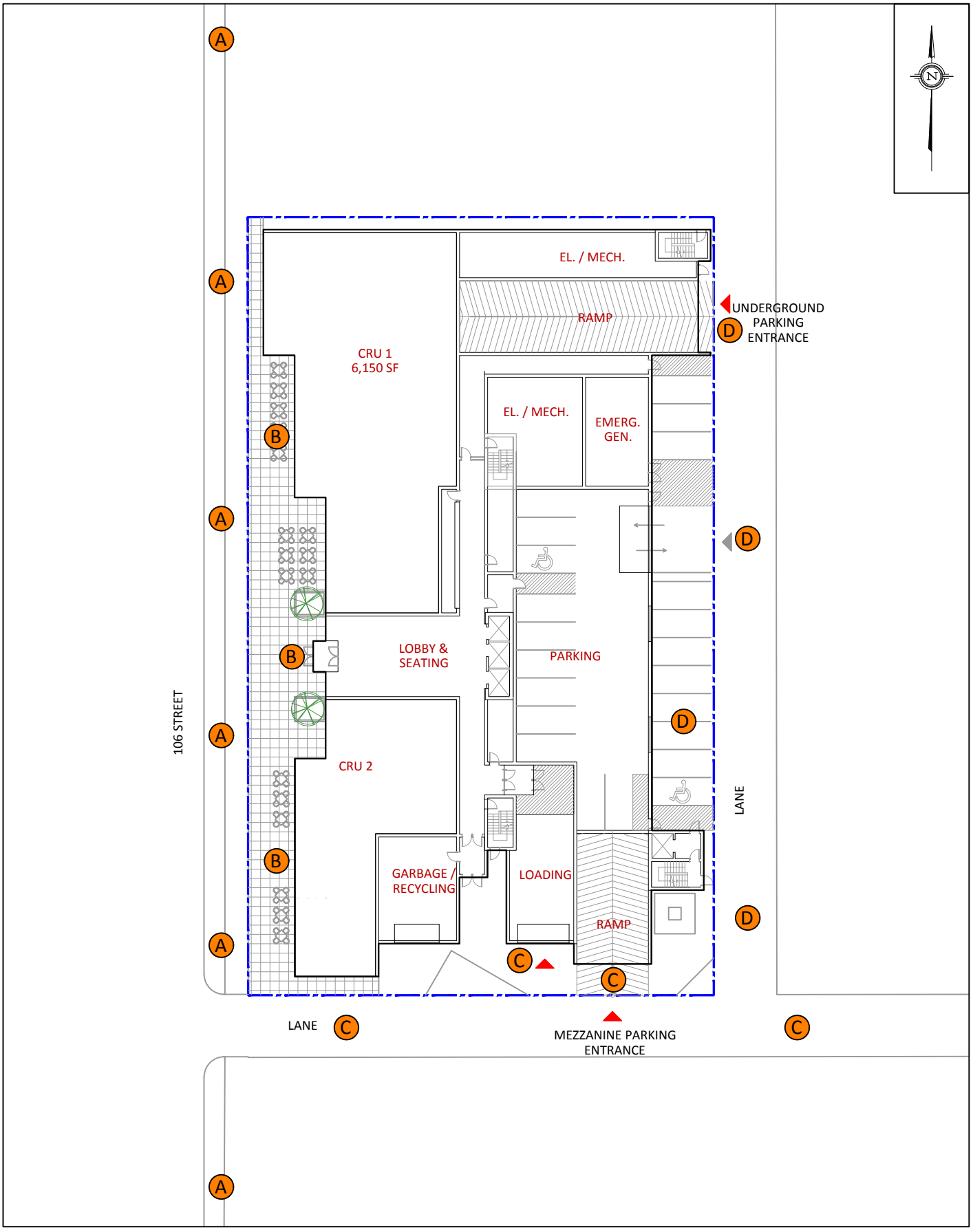
Sincerely,

Gradient Wind Engineering Inc.

Nick Petersen, B.Eng., EIT.,
Junior Wind Scientist

Andrew Sliasas, M.A.Sc., P.Eng.
Principal

GWE18-123-DTPLW (106 St) – R1



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Ottawa, Ontario
(613) 836 0934

GRADIENT WIND ENGINEERING INC

PROJECT	WESTRICH TOWERS - 106 STREET, EDMONTON QUALITATIVE PEDESTRIAN LEVEL WIND ASSESSMENT
SCALE	1:500 (APPROX.)
DRAWING NO.	GWE18-123-DTPLW-1 106 ST
DATE	AUGUST 20, 2018
DRAWN BY	K.A.

DESCRIPTION

FIGURE 1: 106 ST TOWER
GROUND FLOOR PLAN
WITH REFERENCE MARKERS