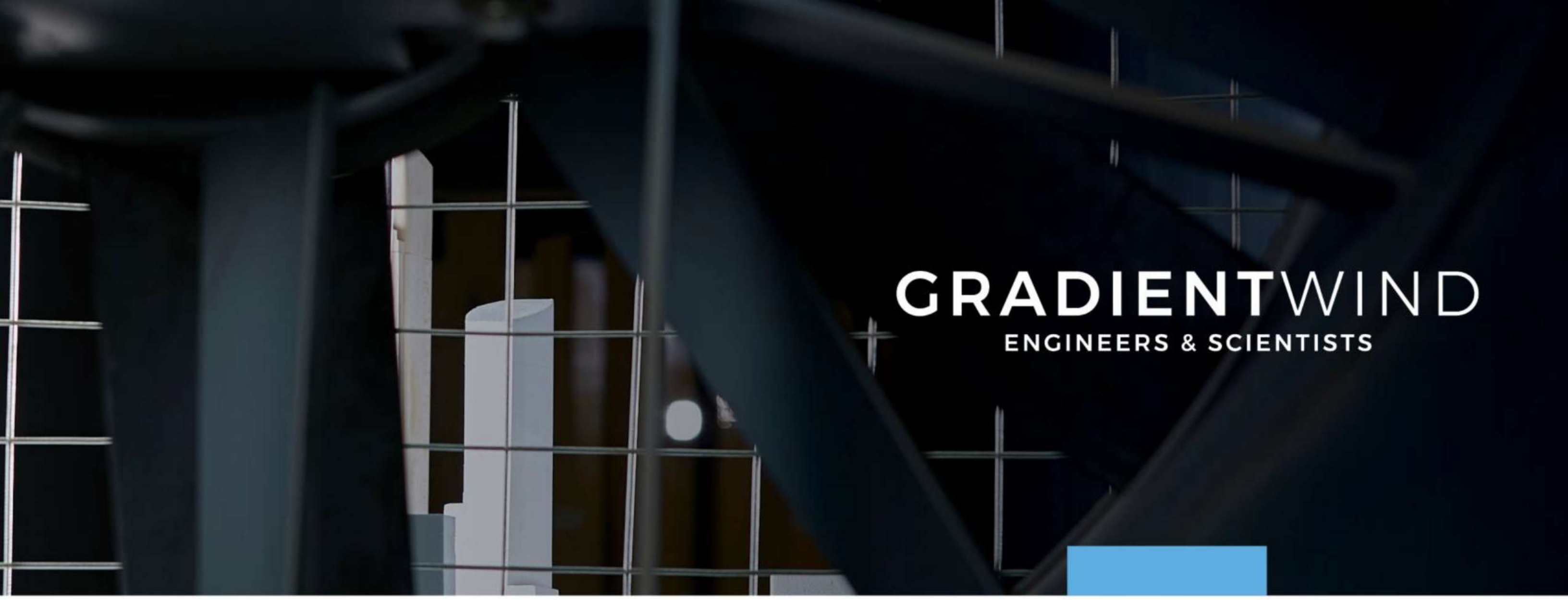
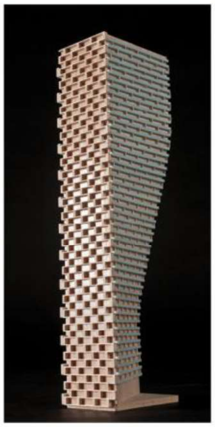


GRADIENTWIND
ENGINEERS & SCIENTISTS

PEDESTRIAN LEVEL WIND STUDY

694 698 Niagara Street
Welland, Ontario

Report: 25 133 PLW



November 4, 2025

PREPARED FOR
1000044827 Ontario Inc.
4071 Maitland Street
Beamsville, ON L3J 0R7

PREPARED BY
Sunny Kang, B.A.S., Project Coordinator
Justin Denne, MASc., Junior Wind Scientist
David Huitema, M.Eng., P.Eng., CFD Lead Engineer

EXECUTIVE SUMMARY

This report describes a pedestrian level wind (PLW) study to satisfy application submission requirements for the proposed residential development located at 694-698 Niagara Street in Welland, Ontario (hereinafter referred to as the "subject site" or "proposed development"). Our mandate within this study is to investigate pedestrian wind conditions within and surrounding the subject site, and to identify areas where wind conditions may interfere with certain pedestrian activities so that mitigation measures may be considered, where required.

The study involves simulation of wind speeds for sixteen (16) wind directions in a three-dimensional (3D) computer model using the computational fluid dynamics (CFD) technique, combined with meteorological data integration, to assess pedestrian wind comfort and safety within and surrounding the subject site. A complete summary of the predicted wind conditions is provided in Section 5 and illustrated in Figures 3A-4D, and is summarized as follows:

1) All grade-level areas within and surrounding the subject site are predicted to experience conditions that are considered acceptable for the intended pedestrian uses throughout the year prior to and following the future buildout. Specifically, conditions over surrounding public sidewalks, Woodlawn Cemetery, neighbouring surface parking lots and drive aisles, the proposed drive aisle, surface parking, and walkways, and in the vicinity of building access points, are considered acceptable.

2) The foregoing statements and conclusions apply to common weather systems, during which no dangerous wind conditions, as defined in Section 4.4, are expected over the subject site. During extreme weather events, (for example, 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.

TABLE OF CONTENTS

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was retained by 1000044827 Ontario Inc. to undertake a pedestrian level wind (PLW) study to satisfy application submission requirements for the proposed residential development located at 694-698 Niagara Street in Welland, Ontario (hereinafter referred to as the "subject site" or "proposed development"). Our mandate within this study is to investigate wind conditions within and surrounding the subject site, and to identify areas where wind conditions may interfere with certain pedestrian activities so that mitigation measures may be considered, where required.

The study is based on industry standard computer simulations using the computational fluid dynamics (CFD) technique and data analysis procedures, Niagara Region wind comfort and safety criteria, architectural drawings provided by Brouwer Architecture Inc. in September 2025, surrounding street layouts and existing and approved future building massing information obtained from the Town of Welland, and recent site imagery.

2. TERMS OF REFERENCE

The subject site is located at 694-698 Niagara Street in Welland, situated approximately 125 metres (m) to the southeast of the intersection of Niagara Street and Woodlawn Road on a parcel of land bordered by Niagara Street to the west, Woodlawn Cemetery to the north, and low-rise residential dwellings to the east and south. The proposed development comprises a rectangular 7-storey residential building.

The ground floor of the proposed development includes an entrance lobby to the west with a main entrance at the southwest corner, a utility space to the north, a waste management space at the southeast corner, and indoor parking spaces throughout the remainder of the level. Access to the indoor parking is provided by garage doors near the southeast and southwest corners from a drive aisle extending perpendicular from Niagara Road. This drive aisle also provides access to the surface parking proposed along the south side of the subject site. Level 2 includes indoor amenities at the northwest corner and residential units throughout the remainder of the level, while Levels 3-7 are reserved for residential occupancy. The building steps back from the west elevation at Level 3 and from the east elevation at Level 6.

Regarding wind exposures, the near-field surroundings of the subject site (defined as an area falling within a 200-m-radius of the subject site) are characterized by a gas station to the northwest, a low-rise commercial plaza with surface parking lots farther to the north, the Woodlawn Cemetery from the north-northwest clockwise to the east-northeast, low-rise residential dwellings from the east clockwise to the west-southwest, and mid-rise residential buildings to the west. Notably, a future development comprising five buildings ranging from 4-16 storeys is proposed at 670 Niagara Street, approximately 40 m to the south of the subject site. The far-field surroundings (defined as the area beyond the near field and within a two-kilometre (km) radius) comprise a mix of the low-rise massing of Welland and green spaces in all directions, with large green and open spaces along the Welland River and Welland Canal extending from the south to the northeast and from the northeast to the south, respectively.

Given uncertainty at the time of writing regarding the status of the application at 670 Niagara Street, four massing scenarios were considered in the present study. Figures 1A and 1B illustrate the subject site and surrounding context, representing the future buildout massing scenario (that is, with the inclusion of 670 Niagara Street) and proposed future massing scenario (that is, without the inclusion of 670 Niagara Street), respectively, while Figures 1C and 1D illustrate the subject site and surrounding context, representing the future existing (with the inclusion of 670 Niagara Street) and existing massing scenarios (without 670 Niagara Street), respectively. Figures 2A-2P illustrate the computational models used to conduct the study.

3. OBJECTIVES

The principal objectives of this study are to (i) determine pedestrian level wind conditions at key areas within and surrounding the subject site; (ii) identify areas where wind conditions may interfere with the intended uses of outdoor spaces; and (iii) recommend suitable mitigation measures, where required.

4. METHODOLOGY

The approach followed to quantify wind conditions over the site is based on CFD simulations of wind speeds across the subject site within a virtual environment, meteorological analysis of the Welland area wind climate, and synthesis of computational data with Niagara Region wind criteria[1]. The following sections describe the analysis procedures, including a discussion of the noted pedestrian wind criteria.

4.1 Computer-Based Context Modelling

A computer based PLW study was performed to determine the influence of the wind environment on pedestrian comfort over the proposed development site. Pedestrian comfort predictions, based on the mechanical effects of wind, were determined by combining measured wind speed data from CFD simulations with statistical weather data obtained from the Niagara Central Dorothy Rungeling Airport in Pelham, Ontario. The general concept and approach to CFD modelling is to represent building and topographic details in the immediate vicinity of the subject site on the surrounding model, and to create suitable atmospheric wind profiles at the model boundary. The wind profiles are designed to have similar mean and turbulent wind properties consistent with actual site exposures.

An industry standard practice is to omit trees, vegetation, and other existing and proposed landscape elements from the model due to the difficulty of providing accurate seasonal representation of vegetation. The omission of trees and other landscaping elements produces stronger wind speed values.

4.2 Wind Speed Measurements

The PLW analysis was performed by simulating wind flows and gathering velocity data over a CFD model of the subject site for 16 wind directions. The CFD simulation model was centered on the proposed development, complete with surrounding massing within a radius of 505 m. The process was performed for four context massing scenarios, as noted in Section 2.

[1] Niagara Region, *Pedestrian Level Wind Study Terms of Reference Guide*, 2022

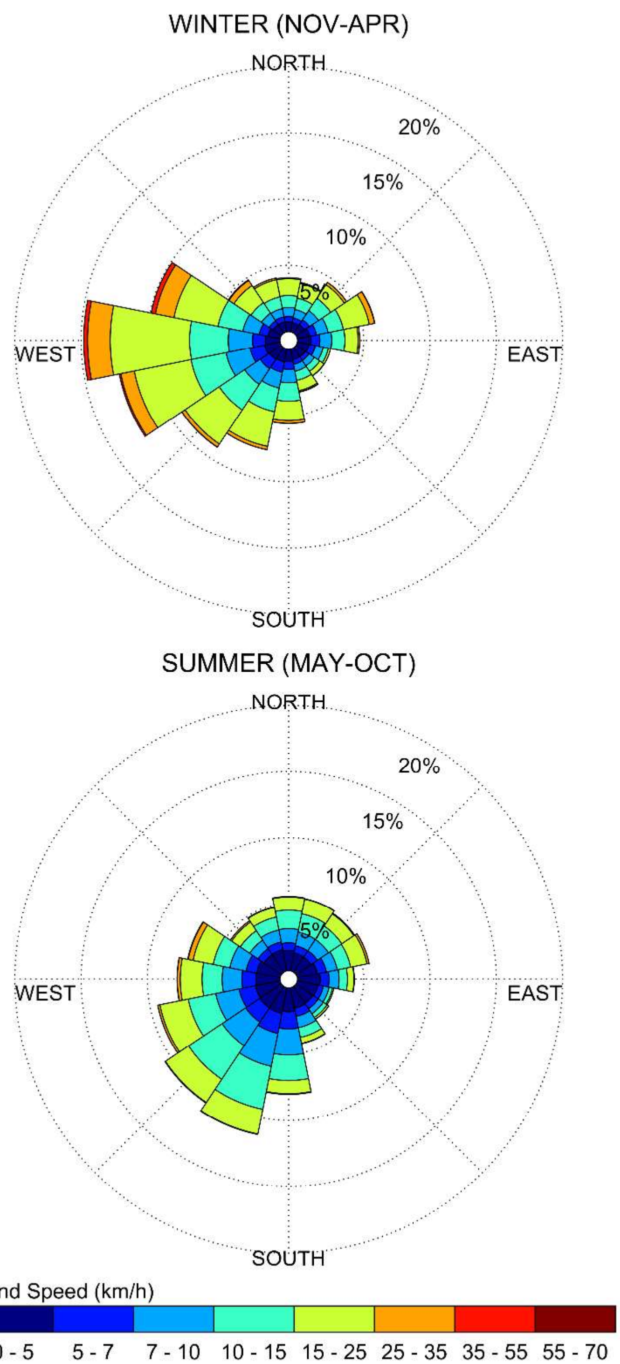
Mean and peak wind speed data obtained over the subject site for each wind direction were interpolated to 36 wind directions at 10° intervals, representing the full compass azimuth. Measured wind speeds approximately 1.5 m above local grade were referenced to the wind speed at gradient height to generate mean and peak velocity ratios, which were used to calculate full-scale values. Gradient height represents the theoretical depth of the boundary layer of the earth's atmosphere, above which the mean wind speed remains constant. Further details of the wind flow simulation technique are presented in Appendix A.

4.3 Historical Wind Speed and Direction Data

A statistical model for winds in Welland was developed from approximately 20 years of hourly meteorological wind data recorded at Niagara Central Dorothy Rungeling Airport. Wind speed and direction data were analyzed during the appropriate hours of pedestrian usage (that is, between 06:00 and 23:00) and divided into two distinct seasons, as stipulated in the wind criteria. Specifically, the summer season is defined as May though October, and the winter season is defined as November through April, inclusive.

The statistical model of the Welland area 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 kilometers per hour (km/h). 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 the measurement period. The preferred wind speeds and directions can be identified by the longer length of the bars. For Lincoln, the most common winds occur for southwesterly wind directions, followed by those from the east, while the most common wind speeds are below 36 km/h. The directional preference and relative magnitude of wind speed changes somewhat from season to season.

SEASONAL DISTRIBUTION OF WIND
NIAGARA CENTRAL DOROTHY RUNGELING AIRPORT, PELHAM, ONTARIO



Notes:

1. Radial distances indicate percentage of time of wind events.
2. Wind speeds are mean hourly in km/h, measured at 10 m above the ground.

4.4 Pedestrian Wind Comfort and Safety Criteria – Niagara Region

Pedestrian wind comfort and safety criteria are based on the mechanical effects of wind without consideration of other meteorological conditions (that is, temperature and relative humidity). The comfort criteria assume that pedestrians are appropriately dressed for a specified outdoor activity during any given season. Since both mean and gust wind speeds affect pedestrian comfort, their combined effect is defined in the Niagara Region Pedestrian Level Wind Study Terms of Reference Guide. Specifically, the criteria are defined as a Gust Equivalent Mean (GEM) wind speed, which is the greater of the mean wind speed or the gust wind speed divided by 1.85.

The wind speed ranges are based on the Beaufort scale, which describes the effects of forces produced by varying wind speed levels on objects. Four pedestrian comfort classes and corresponding gust wind speed ranges are used to assess pedestrian comfort: (1) Sitting; (2) Standing; (3) Walking; and (4) Uncomfortable. Wind conditions suitable for sitting are represented by the colour blue, standing by green, and walking by yellow; uncomfortable conditions are represented by the colour orange, consistent with the Niagara Region Terms of Reference. Specifically, the comfort classes, associated wind speed ranges, and limiting criteria are summarized as follows:

PEDESTRIAN WIND COMFORT CLASS DEFINITIONS

Wind Comfort Class	GEM Speed (km/h)	Description
SITTING	≤ 10	GEM wind speeds no greater than 10 km/h occurring at least 80% of the time are considered acceptable for sedentary activities, including sitting.
STANDING	≤ 15	GEM wind speeds no greater than 15 km/h occurring at least 80% of the time are considered acceptable for activities such as standing, strolling, or more vigorous activities.
WALKING	≤ 20	GEM wind speeds no greater than 20 km/h occurring at least 80% of the time are considered acceptable for walking or more vigorous activities.
UNCOMFORTABLE	> 20	Uncomfortable conditions are characterized by predicted values that fall below the 80% target for walking. Brisk walking and exercise, such as jogging, are considered acceptable for moderate excesses of this criterion.

Regarding wind safety, gust wind speeds greater than 90 km/h, occurring more than 0.1% of the time on an annual basis (based on wind events recorded for 24 hours a day), are classified as dangerous. From calculations of stability, it can be shown that gust wind speeds of 90 km/h would be the approximate threshold wind speed that would cause an average elderly person in good health to fall.

Experience and research on people's perception of mechanical wind effects has shown that if the wind speed levels are exceeded for more than 20% of the time, the activity level would be judged to be uncomfortable by most people. For instance, if GEM wind speeds of 10 km/h were exceeded for more than 20% of the time most pedestrians would judge that location to be too windy for sitting. Similarly, if GEM wind speeds of 20 km/h at a location were exceeded for more than 20% of the time, walking or less vigorous activities would be considered uncomfortable. As these criteria are based on subjective reactions of a population to wind forces, their application is partly based on experience and judgment.

Once the pedestrian wind speed predictions have been established throughout the subject site, the assessment of pedestrian comfort involves determining the suitability of the predicted wind conditions for discrete regions within and surrounding the subject site. This step involves comparing the predicted comfort classes to the target comfort classes, which are dictated by the location type for each region (that is, a sidewalk, building entrance, amenity space, or other). An overview of common pedestrian location types and their typical windiest target comfort classes are summarized below. Depending on the programming of a space, the desired comfort class may differ from this table.

TARGET PEDESTRIAN WIND COMFORT CLASSES FOR VARIOUS LOCATION TYPES

Location Types	Target Comfort Classes
Primary Building Entrance	Standing
Secondary Building Access Point	Walking
Public Sidewalk / Bicycle Path	Walking
Café / Patio / Bench / Garden	Sitting / Standing
Transit/Bus Stop (Without Shelter)	Standing
Transit/Bus Stop (With Shelter)	Walking
Public Park / Plaza / Amenity Space	Sitting / Standing
Garage / Service Entrance / Parking Lot	Walking

5. RESULTS AND DISCUSSION

The following discussion of the predicted pedestrian wind conditions for the subject site is accompanied by Figures 3A-4D which illustrate wind conditions at grade level for the four massing scenarios considered in the present study: Scenario A is referred to as the "future buildout", comprising both the proposed development and 670 Niagara Street in the existing context; Scenario B is referred to as the "proposed development" scenario, comprising Scenario A without 670 Niagara Street; Scenario C is referred to as the "future existing" scenario comprises the interim case without the proposed development yet with 670 Niagara Street; and Scenario D comprises the "existing massing" scenario without either the proposed development or 670 Niagara Street. Wind conditions are presented as continuous contours of wind comfort and correspond to the various comfort classes noted in Section 4.4.

Conditions at all areas studied are considered acceptable for the intended pedestrian uses. The details of these conditions are summarized in the following pages for each area of interest.

5.1 Wind Comfort Conditions

Under all massing scenarios, wind comfort conditions over the nearby sidewalks along Gadsby Avenue are predicted to be suitable for sitting throughout the year, and conditions over the nearby sidewalks along Niagara Street, the Woodlawn Cemetery, and the neighbouring surface parking lot to the west are predicted to be suitable for sitting during the summer, becoming suitable for standing, or better, during the winter. The noted conditions are considered acceptable.

Wind conditions over the walkways along the south and west sides of the proposed development and over the proposed drive aisle and surface parking within the subject site are predicted to be suitable for sitting during the summer, becoming suitable for a mix of sitting and standing during the winter. Owing to the protection of the building façade, conditions in the vicinity of the building access points serving the proposed development are predicted to be suitable for sitting throughout the year. The noted conditions are considered acceptable.

5.2 Wind Safety

Within the context of typical weather patterns, which exclude anomalous localized storm events such as tornadoes and downbursts, no pedestrian areas within or surrounding the subject are expected to experience conditions that could be considered dangerous, as defined in Section 4.4.

5.3 Applicability of Results

Pedestrian wind comfort and safety have been quantified for the specific configuration of existing and foreseeable construction around the subject site. Future changes (that is, construction or demolition) of these surroundings may cause changes to the wind effects in two ways, namely: (i) changes beyond the immediate vicinity of the subject site would alter the wind profile approaching the subject site; and (ii) development in proximity to the subject site would cause changes to local flow patterns.

6. SUMMARY AND RECOMMENDATIONS

A complete summary of the predicted wind conditions is provided in Section 5 of this report and illustrated in Figures 3A-4D. Based on computer simulations using the CFD technique, meteorological data analysis of the Welland wind climate, Niagara Region wind comfort and safety criteria, and experience with numerous similar developments, the study concludes the following:

1) All grade-level areas within and surrounding the subject site are predicted to experience conditions that are considered acceptable for the intended pedestrian uses throughout the year prior to and following the future buildout. Specifically, conditions over surrounding public sidewalks, Woodlawn Cemetery, neighbouring surface parking lots and drive aisles, the proposed drive aisle, surface parking, and walkways, and in the vicinity of building access points, are considered acceptable.

2) The foregoing statements and conclusions apply to common weather systems, during which no dangerous wind conditions, as defined in Section 4.4, are expected over the subject site. During extreme weather events, (for example, 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.

Sincerely,

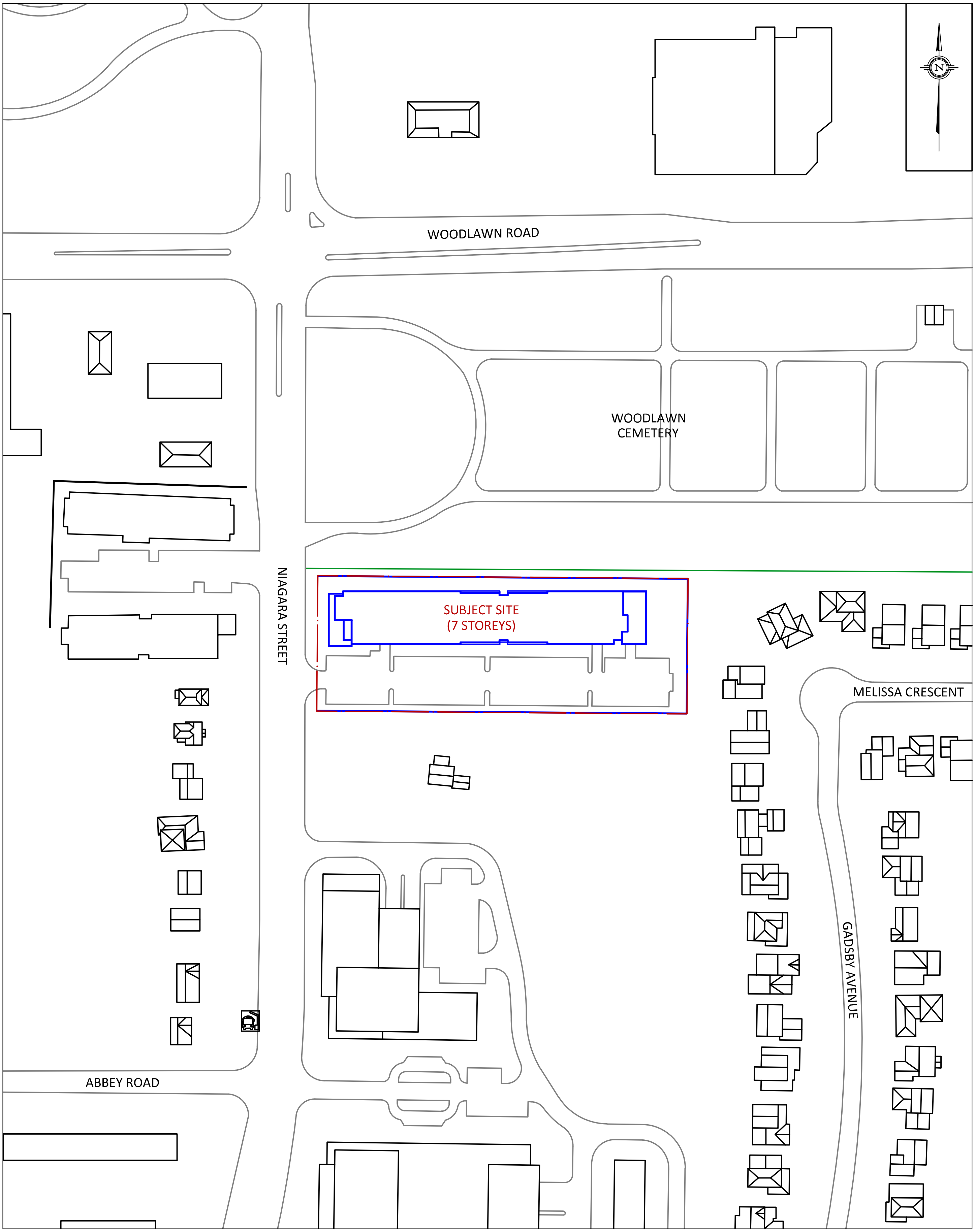
Gradient Wind Engineering Inc.

LICENSED PROFESSIONAL ENGINEER
D. T. HUITEMA
100561777
November 04, 2025
PROVINCE OF ONTARIO

Justin Denne, M.A.Sc.
Junior Wind Scientist

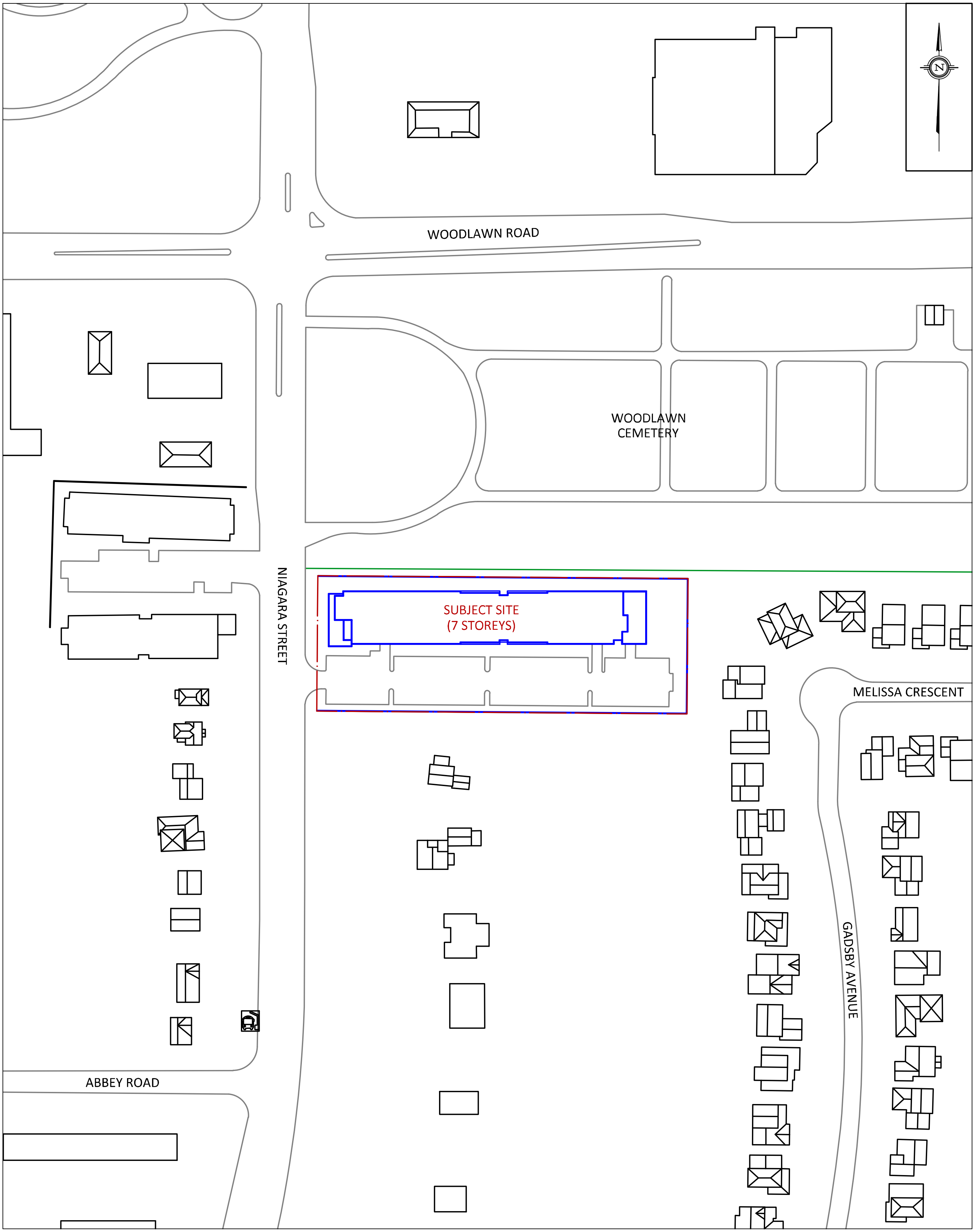
David Huitema, M.Eng., P.Eng.
CFD Lead Engineer

Sunny Kang, B.A.S.
Project Coordinator



GRADIENTWIND
ENGINEERS & SCIENTISTS
127 WALGREEN ROAD, OTTAWA, ON
613 836 0934 • GRADIENTWIND.COM

PROJECT		DESCRIPTION
694-698 NIAGARA STREET, WELLAND PEDESTRIAN LEVEL WIND STUDY		FIGURE 1A: FUTURE BUILDOUT SITE PLAN AND SURROUNDING CONTEXT
SCALE: 1:2000	DRAWING NO.: 25-133-PLW-1A	
DATE: OCTOBER 20, 2025	DRAWN BY: S.K.	



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PROJECT	694-698 NIAGARA STREET, WELLAND PEDESTRIAN LEVEL WIND STUDY		
SCALE	1:2000	DRAWING NO.	25-133-PLW-1B
DATE	OCTOBER 20, 2025	DRAWN BY	S.K.

DESCRIPTION

FIGURE 1B:
PROPOSED DEVELOPMENT SITE PLAN AND SURROUNDING CONTEXT

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PROJECT	694-698 NIAGARA STREET, WELLAND PEDESTRIAN LEVEL WIND STUDY
SCALE	1:2000
DRAWING NO.	25-133-PLW-1C
DATE	OCTOBER 20, 2025
DRAWN BY	S.K.
DESCRIPTION	FIGURE 1C: FUTURE EXISTING SITE PLAN AND SURROUNDING CONTEXT

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PROJECT	694-698 NIAGARA STREET, WELLAND PEDESTRIAN LEVEL WIND STUDY		
SCALE	1:2000	DRAWING NO.	25-133-PLW-1D
DATE	OCTOBER 20, 2025	DRAWN BY	S.K.

DESCRIPTION

FIGURE 1D:
EXISTING SITE PLAN AND SURROUNDING CONTEXT

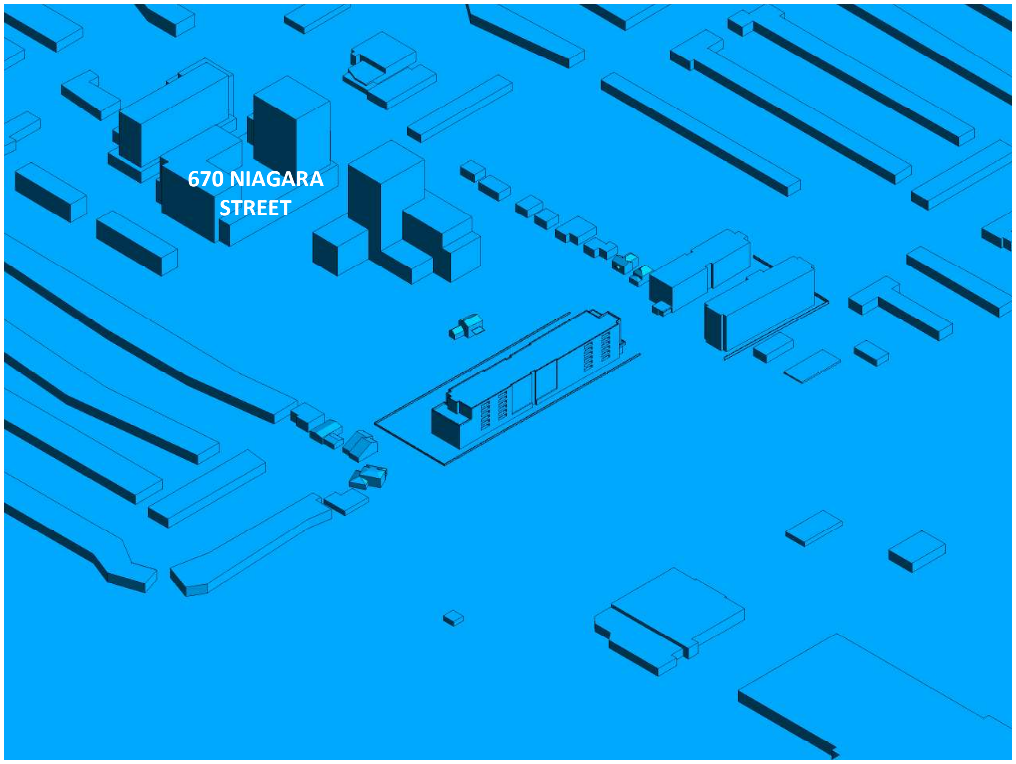


FIGURE 2A: COMPUTATIONAL MODEL, FUTURE BUILDOUT, NORTHEAST PERSPECTIVE

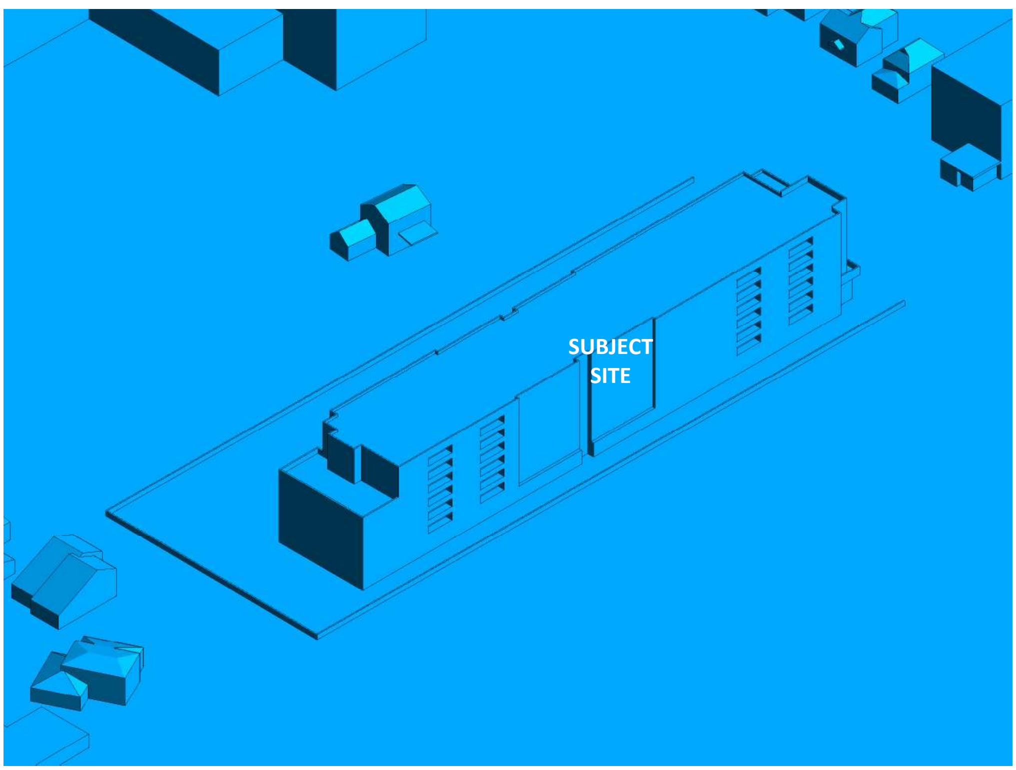


FIGURE 2B: CLOSE-UP VIEW OF FIGURE 2A

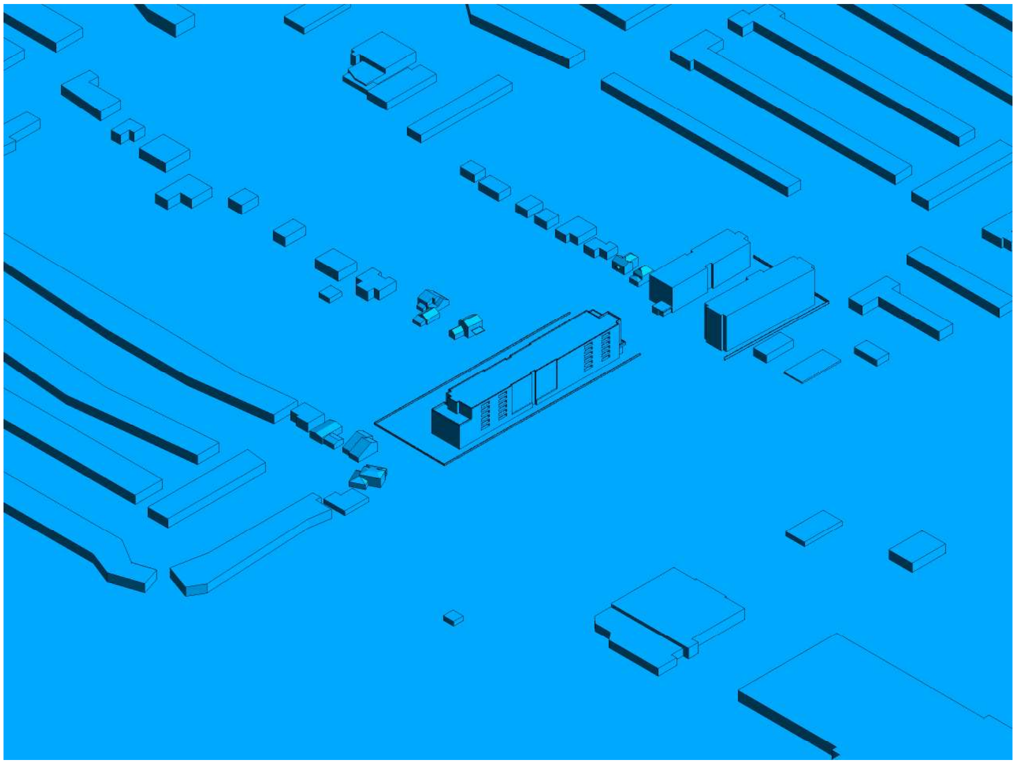


FIGURE 2C: COMPUTATIONAL MODEL, PROPOSED DEVELOPMENT, NORTHEAST PERSPECTIVE

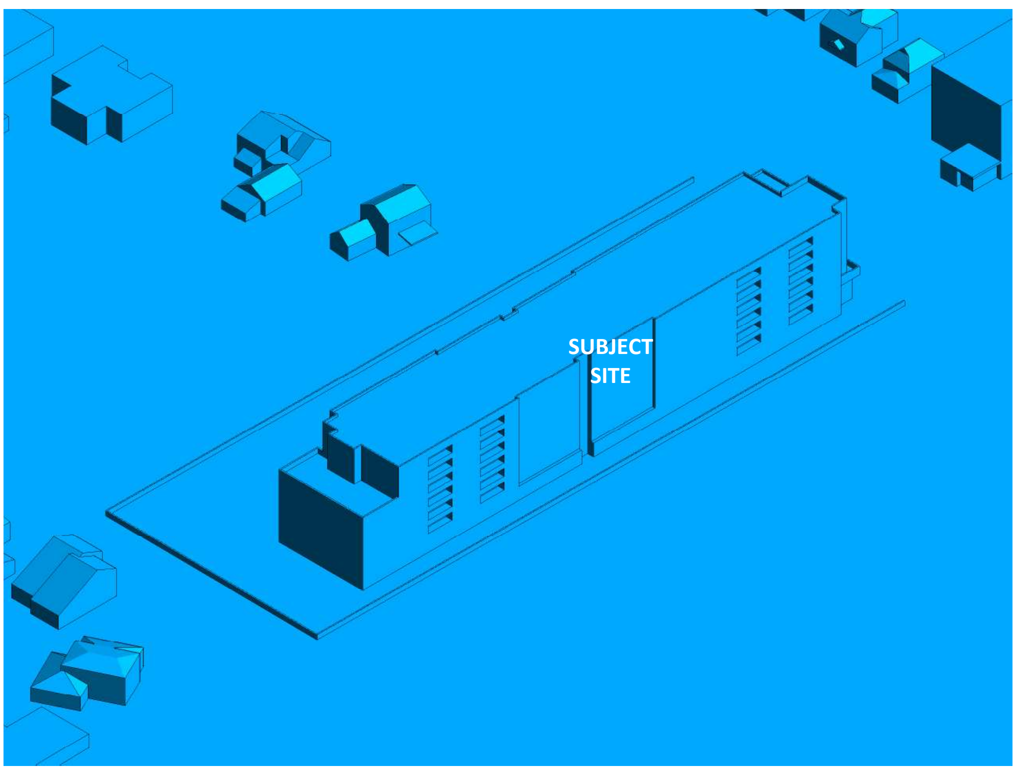


FIGURE 2D: CLOSE-UP VIEW OF FIGURE 2C

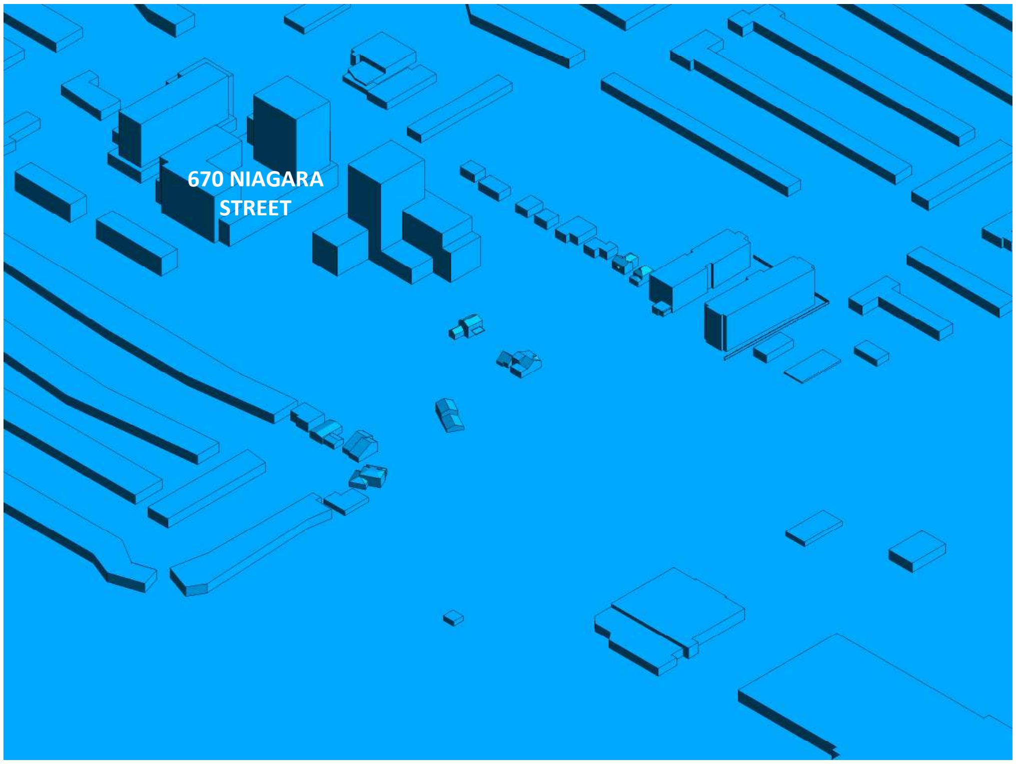


FIGURE 2E: COMPUTATIONAL MODEL, FUTURE EXISTING, NORTHEAST PERSPECTIVE

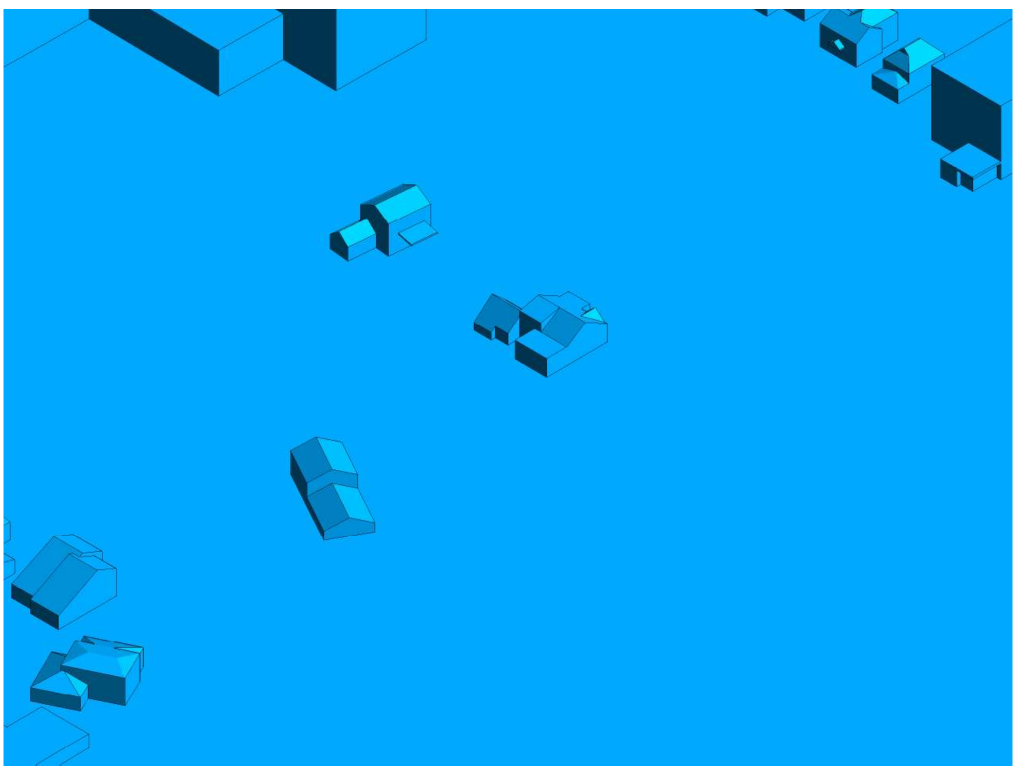


FIGURE 2F: CLOSE-UP VIEW OF FIGURE 2E

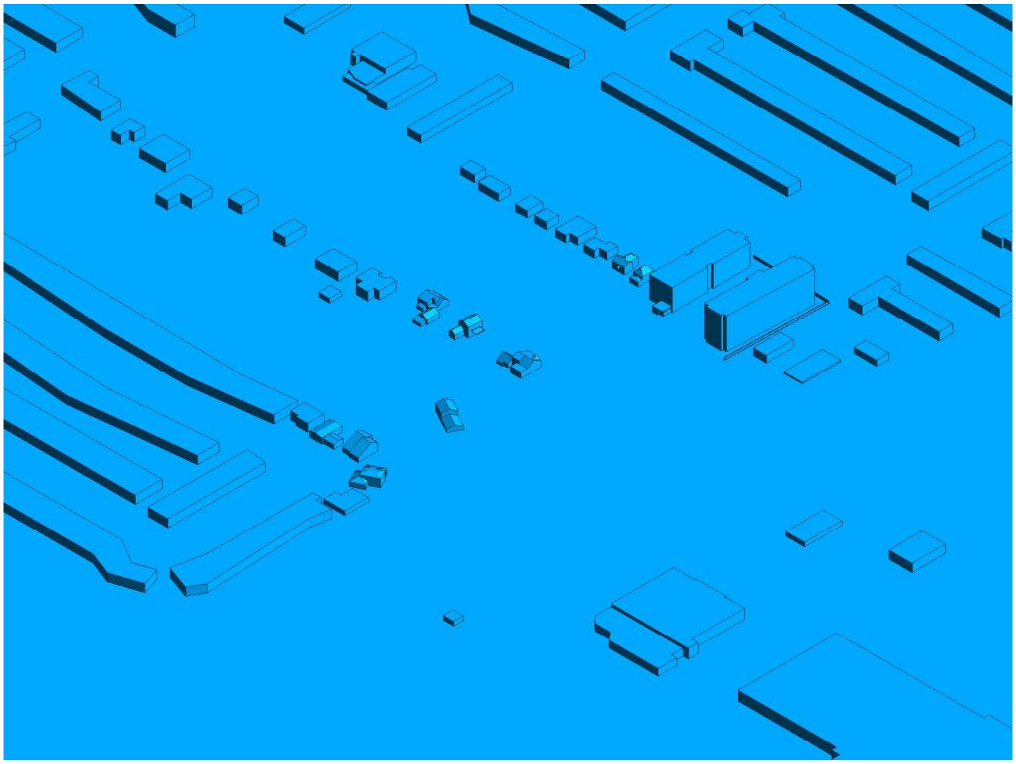


FIGURE 2G: COMPUTATIONAL MODEL, EXISTING MASSING, NORTHEAST PERSPECTIVE

FIGURE 2H: CLOSE-UP VIEW OF FIGURE 2G

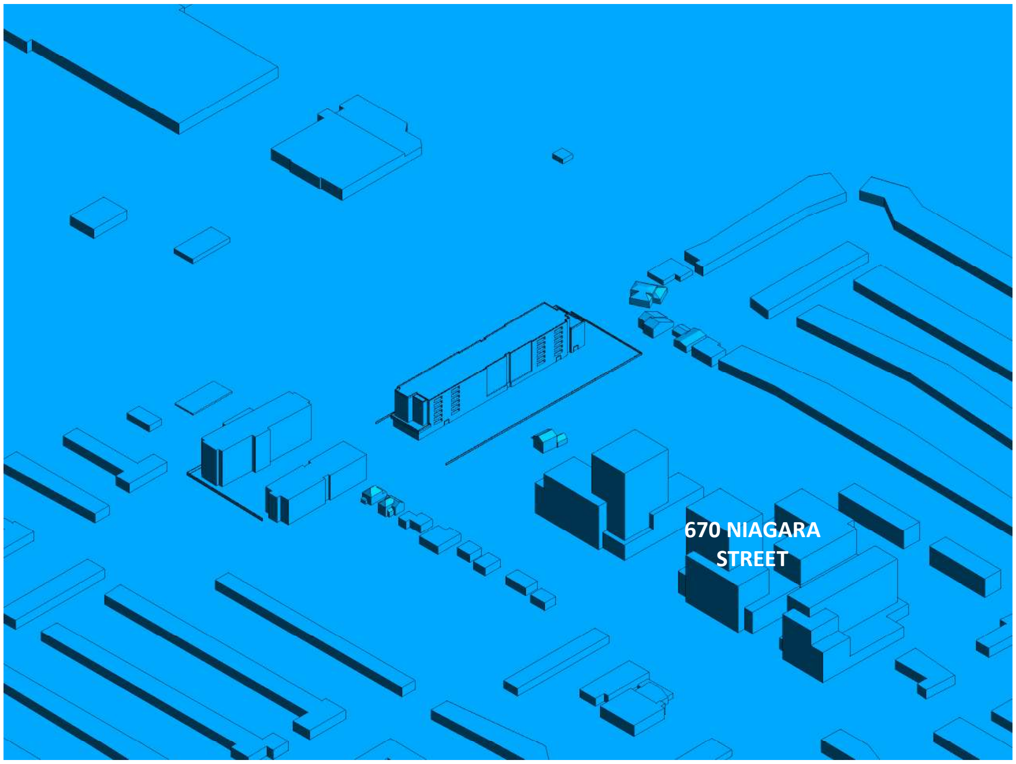


FIGURE 2I: COMPUTATIONAL MODEL, FUTURE BUILDOUT, SOUTHWEST PERSPECTIVE

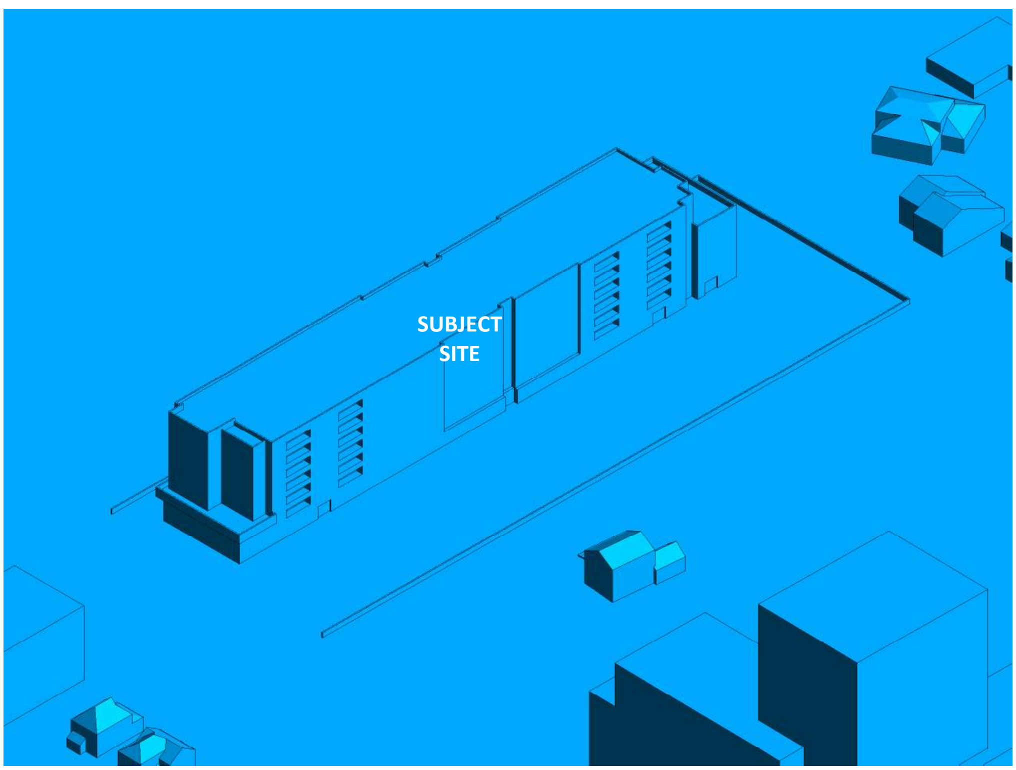


FIGURE 2J: CLOSE-UP VIEW OF FIGURE 2I

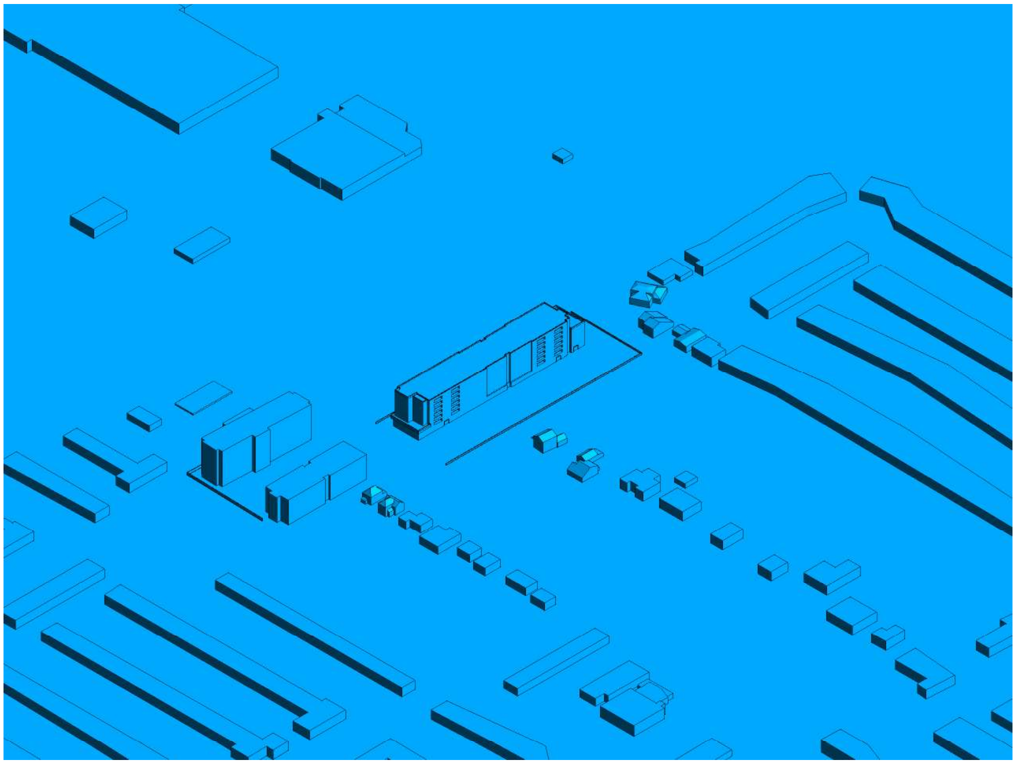


FIGURE 2K: COMPUTATIONAL MODEL, PROPOSED DEVELOPMENT, SOUTHWEST PERSPECTIVE

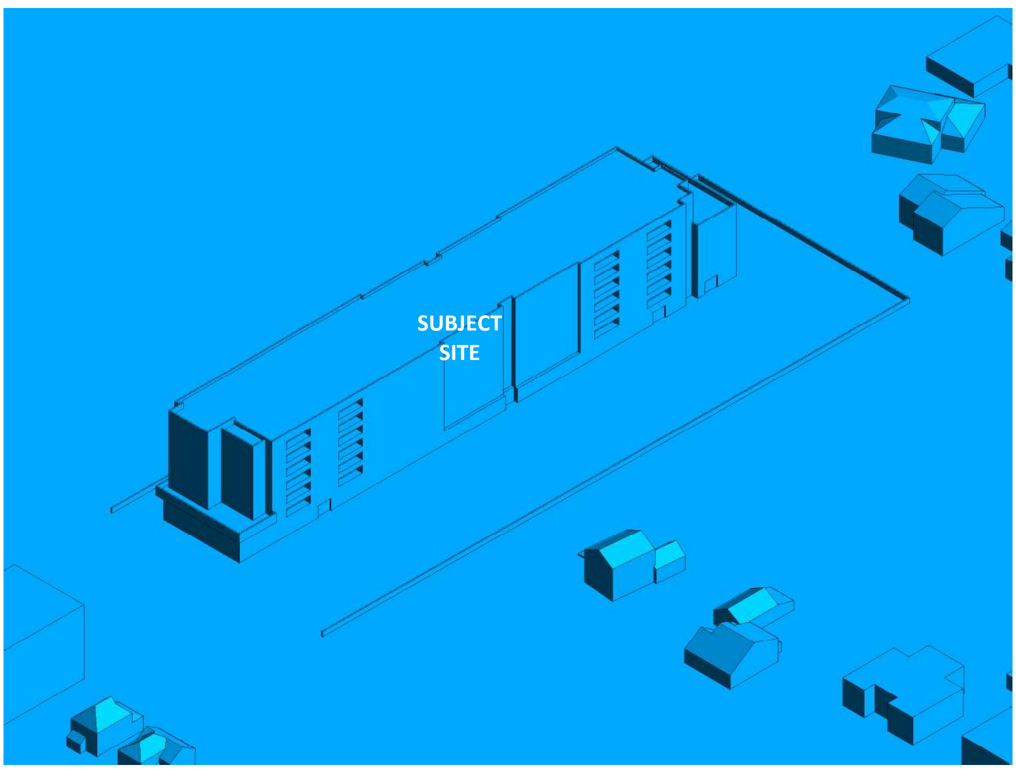


FIGURE 2L: CLOSE-UP VIEW OF FIGURE 2K

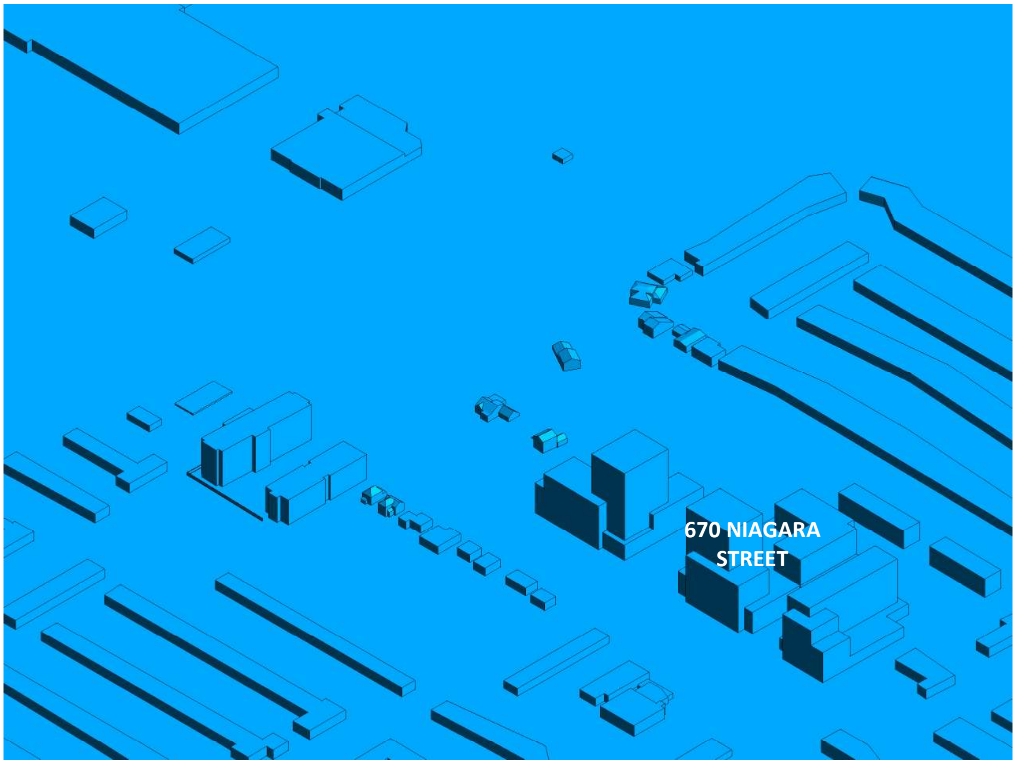


FIGURE 2M: COMPUTATIONAL MODEL, FUTURE EXISTING, SOUTHWEST PERSPECTIVE

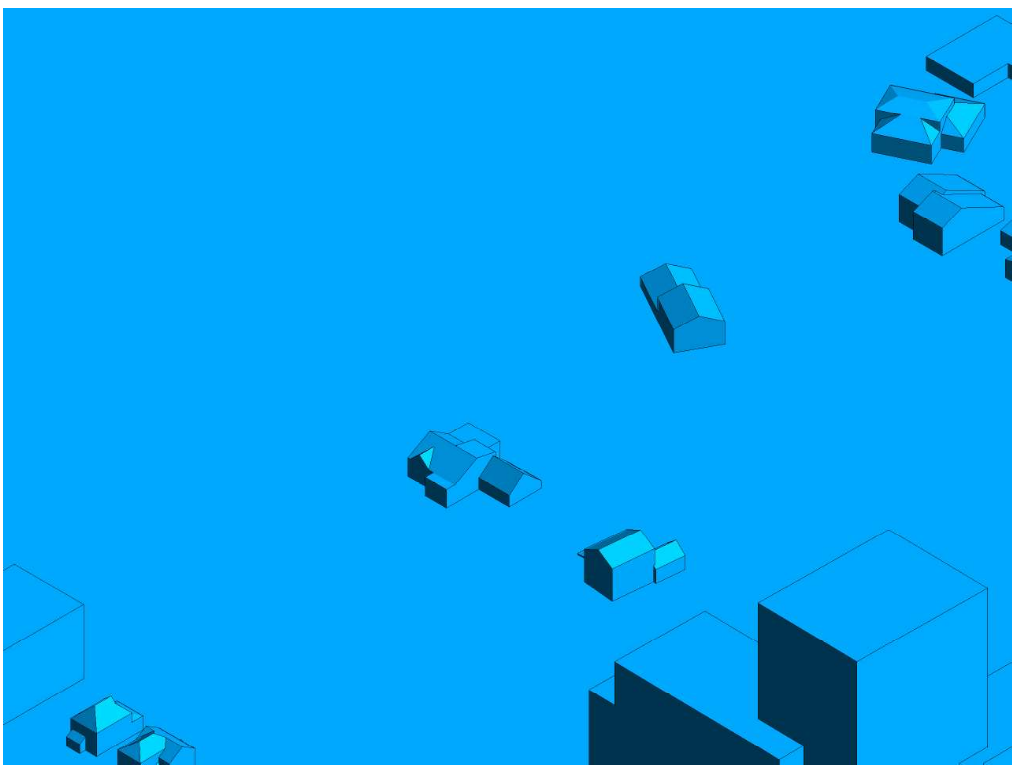


FIGURE 2N: CLOSE-UP VIEW OF FIGURE 2M

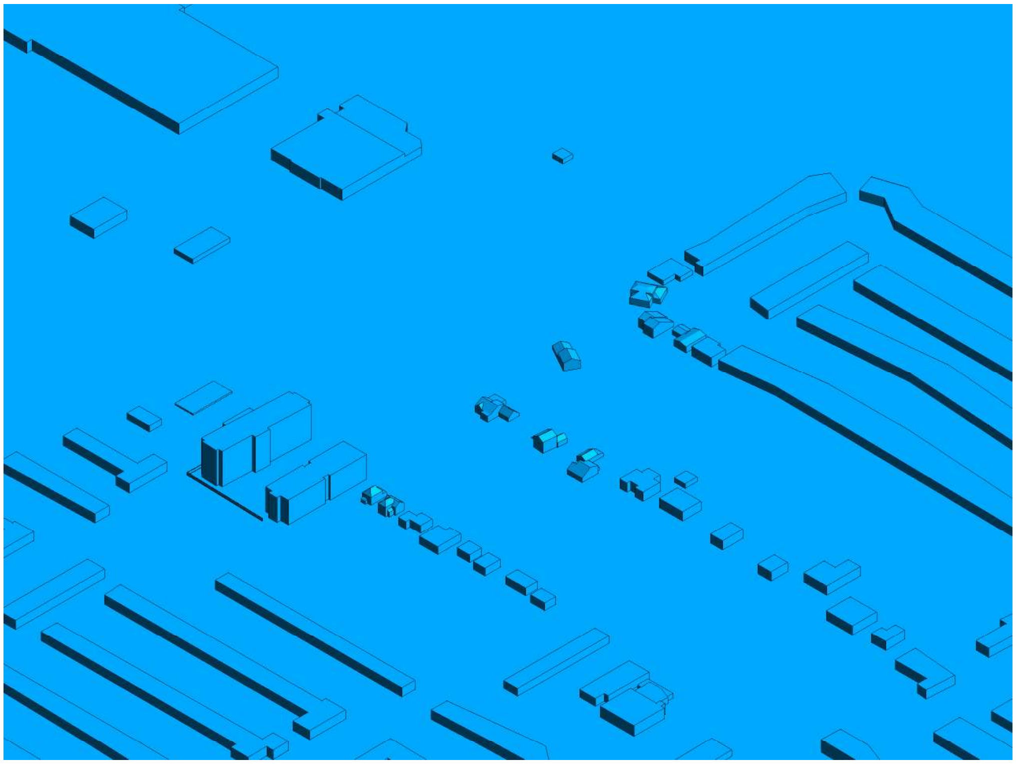


FIGURE 2O: COMPUTATIONAL MODEL, EXISTING MASSING, SOUTHWEST PERSPECTIVE

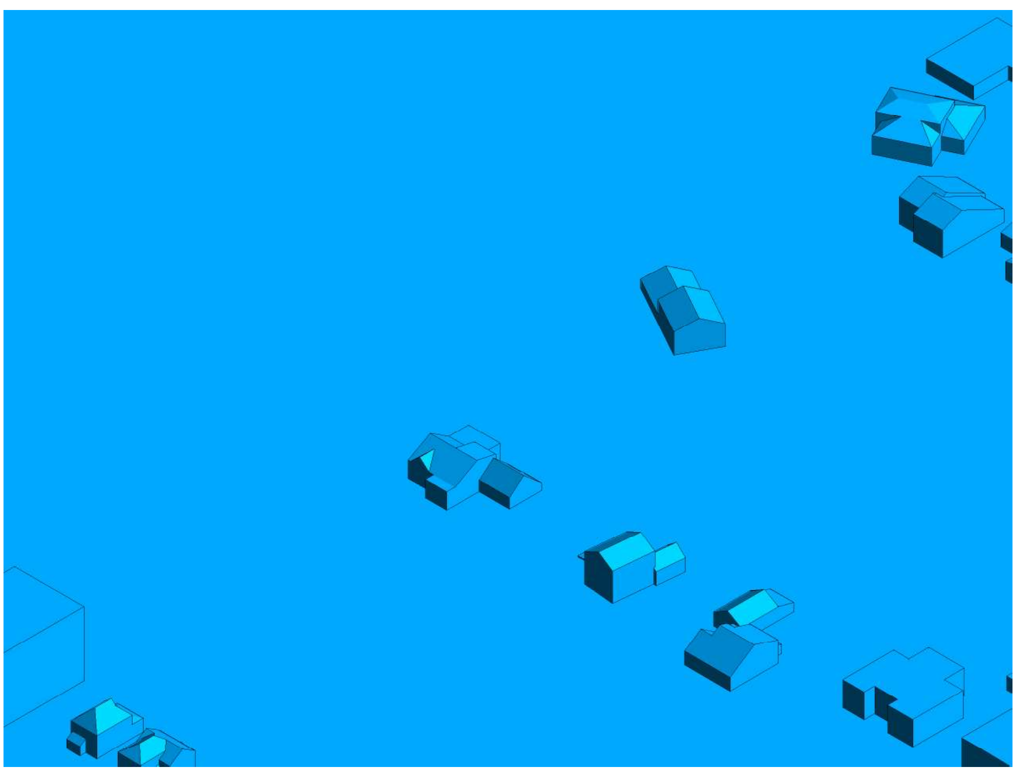


FIGURE 2P: CLOSE-UP VIEW OF FIGURE 2O

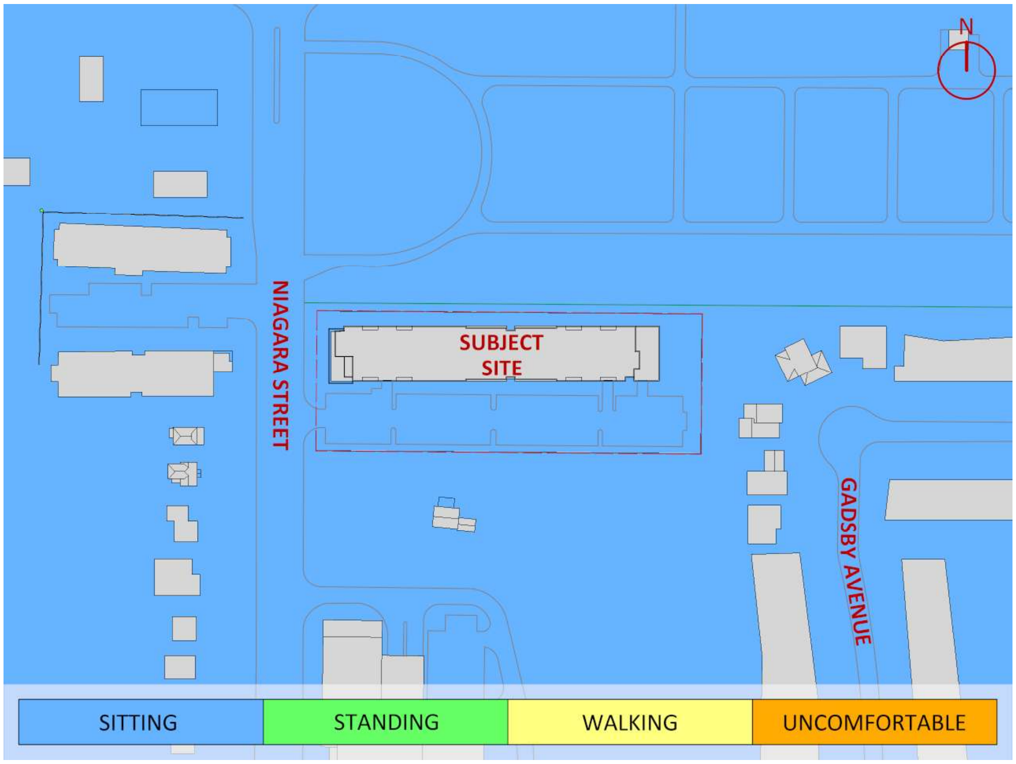


FIGURE 3A: SUMMER – FUTURE BUILDOUT – WIND COMFORT, GRADE LEVEL

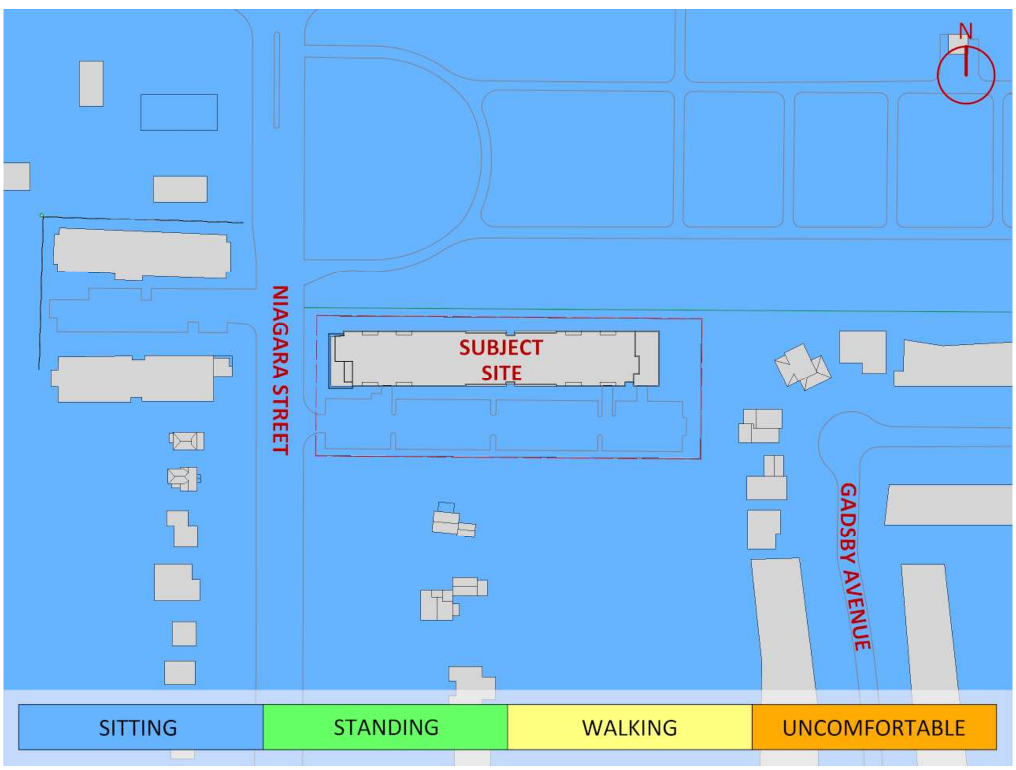


FIGURE 3B: SUMMER – PROPOSED DEVELOPMENT – WIND COMFORT, GRADE LEVEL

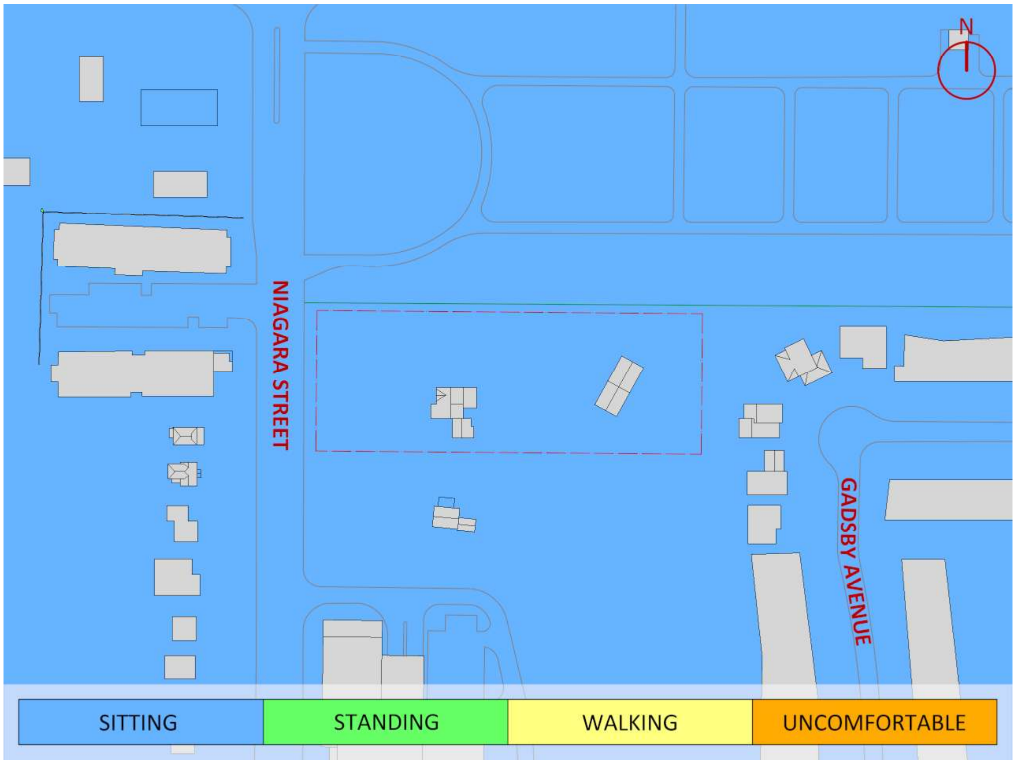


FIGURE 3C: SUMMER – FUTURE EXISTING – WIND COMFORT, GRADE LEVEL

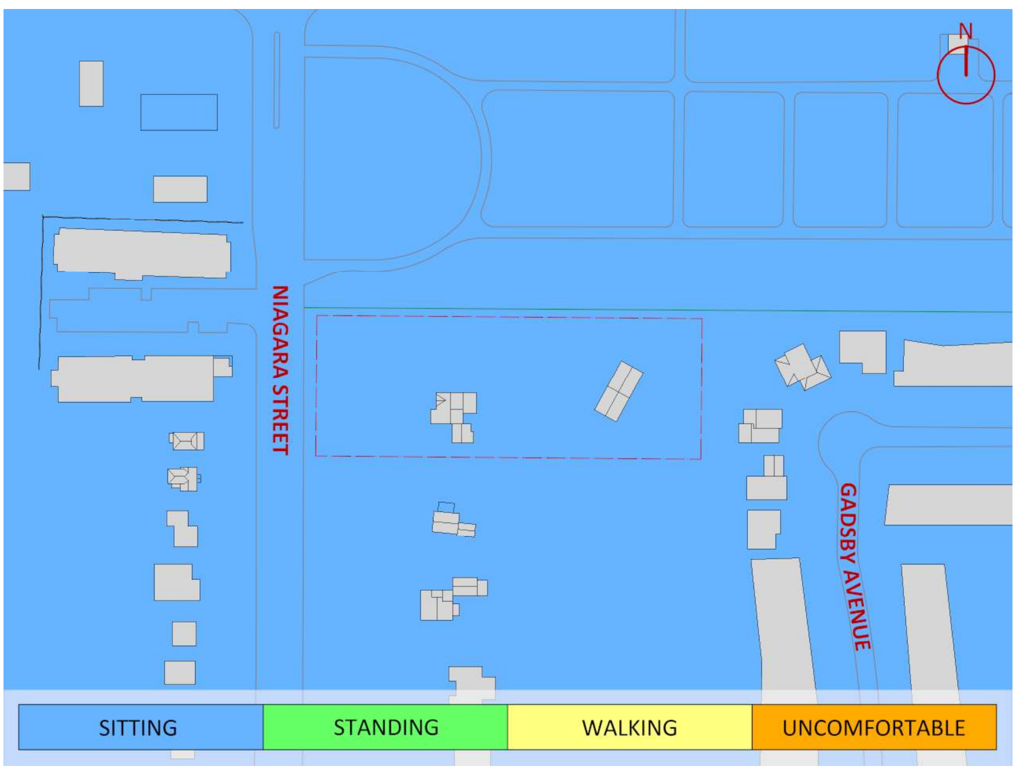


FIGURE 3D: SUMMER – EXISTING MASSING – WIND COMFORT, GRADE LEVEL

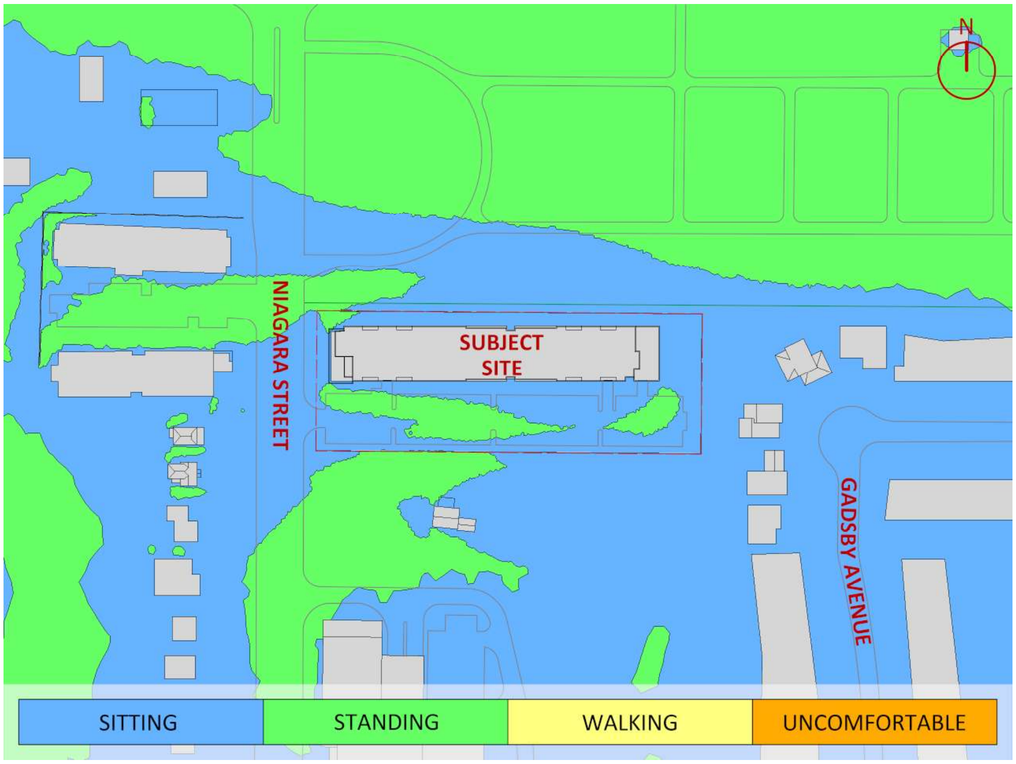


FIGURE 4A: WINTER – FUTURE BUILDOUT – WIND COMFORT, GRADE LEVEL

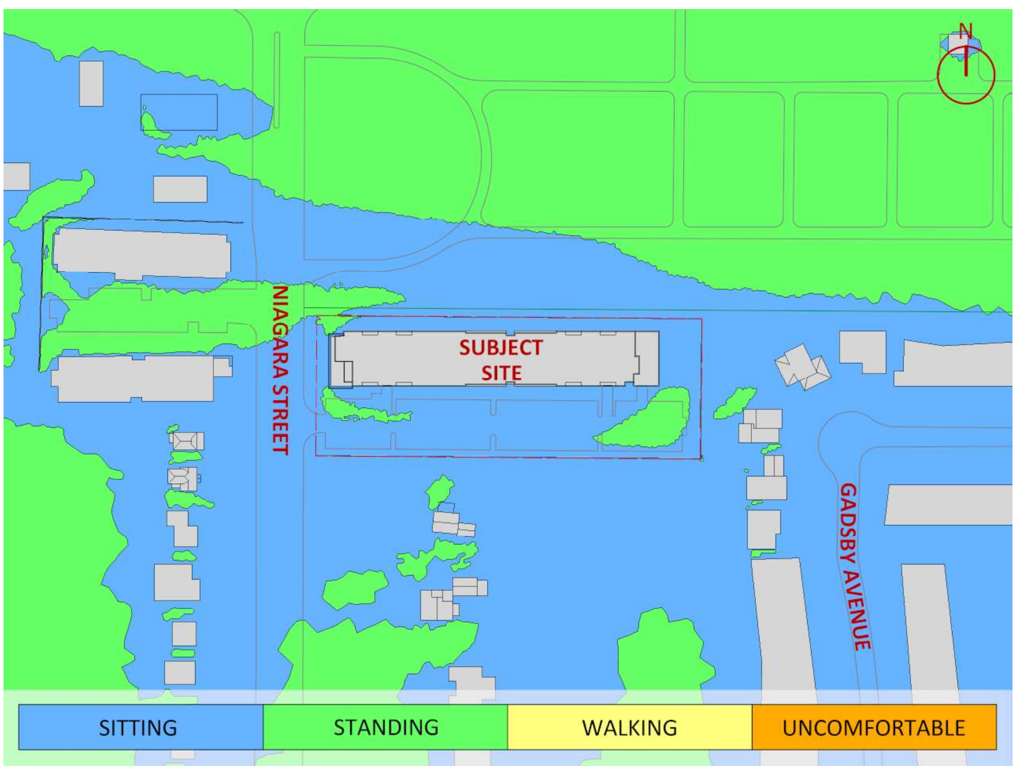


FIGURE 4B: WINTER – PROPOSED DEVELOPMENT – WIND COMFORT, GRADE LEVEL

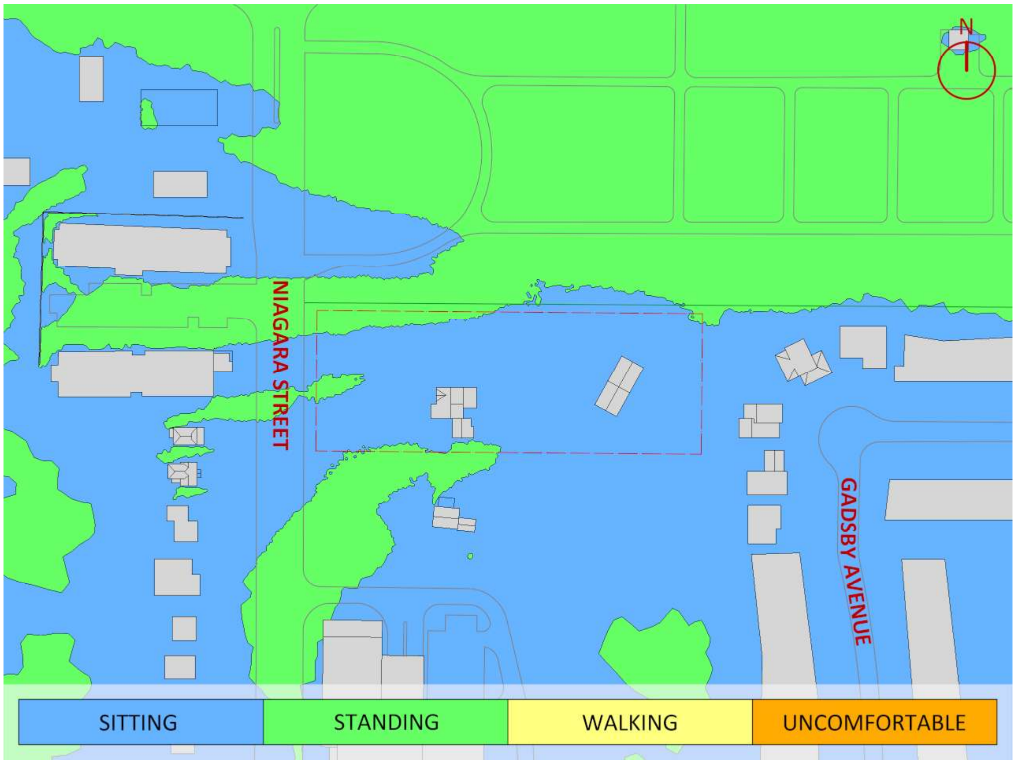


FIGURE 4C: WINTER – FUTURE EXISTING – WIND COMFORT, GRADE LEVEL

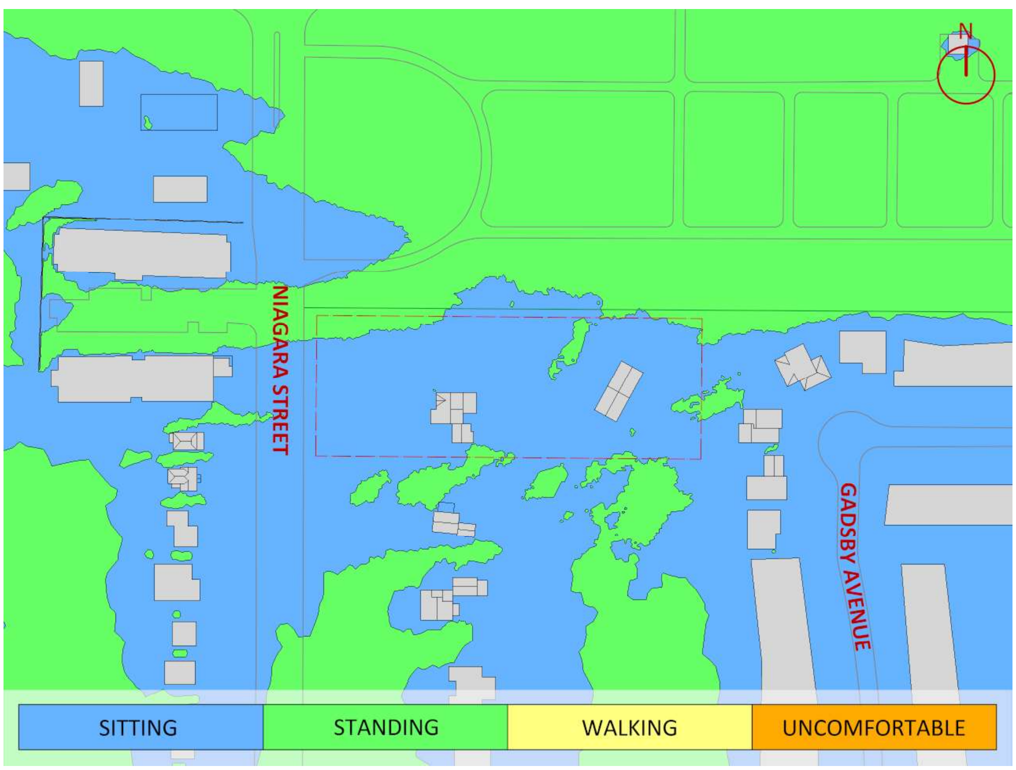
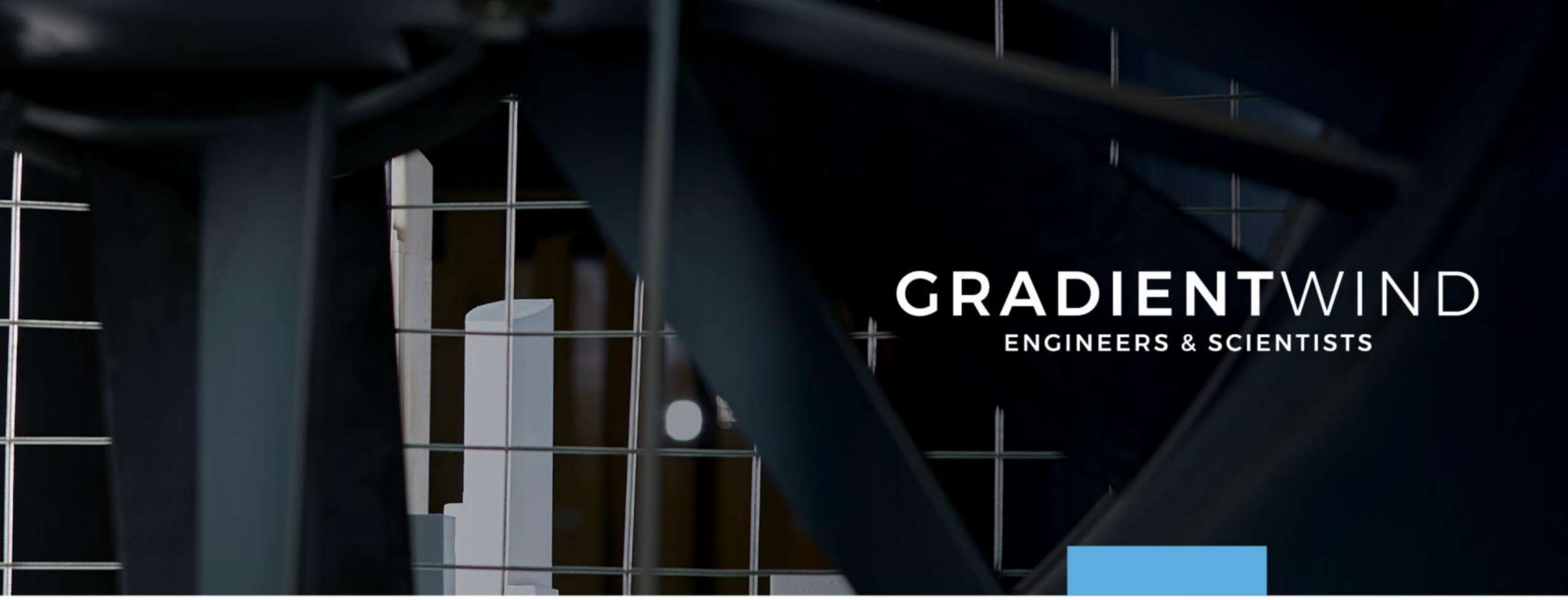
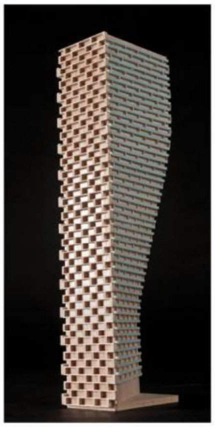


FIGURE 4D: WINTER – EXISTING MASSING – WIND COMFORT, GRADE LEVEL





APPENDIX A

SIMULATION OF THE ATMOSPHERIC BOUNDARY LAYER

SIMULATION OF THE ATMOSPHERIC BOUNDARY LAYER

The atmospheric boundary layer (ABL) is defined by the velocity and turbulence profiles according to industry standard practices. The mean wind profile can be represented, to a good approximation, by a power law relation, Equation (1), giving height above ground versus wind speed [1], [2].

$$U = U_g \left(\frac{Z}{Z_g}\right)^{\alpha} \qquad \text{Equation (1)}$$

where $\boldsymbol{U}$ = mean wind speed, $\boldsymbol{U_g}$ = gradient wind speed, $\boldsymbol{Z}$ = height above ground, $\boldsymbol{Z_g}$ = depth of the boundary layer (gradient height), and α is the power law exponent.

For the model, U_g is set to 6.5 metres per second (m/s), which approximately corresponds to the 50% mean wind speed for Welland based on historical climate data and statistical analyses. When the results are normalized by this velocity, they are relatively insensitive to the selection of gradient wind speed.

Z_g is set to 540 m. The selection of gradient height is relatively unimportant, so long as it exceeds the building heights surrounding the subject site. The value has been selected to correspond to our physical wind tunnel reference value.

α is determined based on the upstream exposure of the far-field surroundings (that is, the area that is not captured within the simulation model).

Table 1 presents the values of α used in this study, while Table 2 presents several reference values of α. When the upstream exposure of the far-field surroundings is a mixture of multiple types of terrain, the α values are a weighted average with terrain that is closer to the subject site given greater weight.

TABLE 1: UPSTREAM EXPOSURE (ALPHA VALUE) VS TRUE WIND DIRECTION

Wind Direction (Degrees True)	Alpha Value (α)
0	0.22
22.5	0.22
45	0.21
67.5	0.20
90	0.20
112.5	0.21
135	0.21
157.5	0.23
180	0.24
202.5	0.23
225	0.23
247.5	0.23
270	0.24
292.5	0.24
315	0.24
337.5	0.24

TABLE 2: DEFINITION OF UPSTREAM EXPOSURE (ALPHA VALUE)

Upstream Exposure Type	Alpha Value (α)
Open Water	0.14-0.15
Open Field	0.16-0.19
Light Suburban	0.21-0.24
Heavy Suburban	0.24-0.27
Light Urban	0.28-0.30
Heavy Urban	0.31-0.33

The turbulence model in the computational fluid dynamics (CFD) simulations is a two-equation shear-stress transport (SST) model, and thus the ABL turbulence profile requires that two parameters be defined at the inlet of the domain. The turbulence profile is defined following the recommendations of the Architectural Institute of Japan for flat terrain [3].

$$I(Z) = \begin{cases} 0.1\left(\dfrac{Z}{Z_g}\right)^{-\alpha-0.05}, & Z > 10\text{ m} \\ 0.1\left(\dfrac{10}{Z_g}\right)^{-\alpha-0.05}, & Z \leq 10\text{ m} \end{cases}$$ Equation (2)

$$L_t(Z) = \begin{cases} 100\text{ m}\sqrt{\dfrac{Z}{30}}, & Z > 30\text{ m} \\ 100\text{ m}, & Z \leq 30\text{ m} \end{cases}$$ Equation (3)

where ***I*** = turbulence intensity, L_t = turbulence length scale, ***Z*** = height above ground, and **α** is the power law exponent used for the velocity profile in Equation (1).

Boundary conditions on all other domain boundaries are defined as follows: the ground is a no-slip surface; the side walls of the domain have a symmetry boundary condition; the top of the domain has a specified shear, which maintains a constant wind speed at gradient height; and the outlet has a static pressure boundary condition.

REFERENCES

[1] P. Arya, "Chapter 10: Near-neutral Boundary Layers," in *Introduction to Micrometeorology*, San Diego, California, Academic Press, 2001.

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[3] Y. Tamura, H. Kawai, Y. Uematsu, K. Kondo, and T. Okhuma, "Revision of AIJ Recommendations for Wind Loads on Buildings," in *The International Wind Engineering Symposium, IWES 2003*, Taiwan, 2003.