

## LAKEVIEW VILLAGE

MISSISSAUGA, ON

PEDESTRIAN WIND STUDY

RWDI # 1804164

June 19, 2020

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## EXECUTIVE SUMMARY

RWDI was retained to conduct a pedestrian wind assessment for the proposed Lakeview Village in Mississauga, Ontario (Image 1). Based on our wind-tunnel testing for the proposed development (Image 2) and the local wind records (Image 3), the potential wind comfort and safety conditions are predicted as shown on site plans in Figures 1.1 through 3.5, while the associated wind speeds are listed in Table 1.

These results can be summarized as follows:

- In the summer, wind speeds are typically expected to be comfortable for sitting or standing close to the buildings and comfortable for standing or walking in more exposed areas, which is appropriate. Uncomfortable conditions are predicted in an isolated area along the west side of Lakefront Promenade East.
- Seasonally stronger winds in the winter are expected to result in elevated conditions during this time, with conditions generally comfortable for standing or walking close to the buildings and uncomfortable conditions in the more exposed areas and around exposed building corners.
- Wind speeds that meet the wind safety criterion are anticipated at all but eight among the tested 404 locations.
- Satisfactory wind speeds can be achieved through refined building forms and use of various hard and soft landscape elements. It should be noted that the wind-tunnel test model included basic massing models of the proposed buildings. More detailed building features and articulation to be developed at later stages in the design process will help to disperse strong winds and thereby reduce wind speeds closer to the buildings themselves. The effects of such articulation, as well as the incorporation of any required hardscaping features for wind control, will be further assessed and discussed at the site plan approval stage.



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# 1 INTRODUCTION

RWDI was retained to conduct a pedestrian wind assessment for the proposed Lakeview Village in Mississauga, Ontario. This report presents the project objectives, background and approach, discusses the results from RWDI's assessment, and provides conceptual wind control measures, where necessary.

## 1.1 Project Description

The project site (see Image 1) is located along the southeast side of Lakeshore Road East in Mississauga. The proposed development consists of a masterplan which includes residential, commercial, and institutional buildings. While most buildings are low-rise to mid-rise developments, there are several tall residential towers across the site.



**Image 1: Aerial View of Site and Surroundings (Photo Courtesy of Google™ Earth)**

## 1.2 Objectives

The objective of the study was to assess the effect of the proposed development on local conditions in pedestrian areas on and around the study site and provide recommendations for minimizing adverse effects, if needed. This quantitative assessment was based on wind speed measurements on a scale model of the project and its surroundings in one of RWDI's boundary-layer wind tunnels. These measurements were combined with the local wind records and compared to appropriate criteria for gauging wind comfort and safety in pedestrian areas. The assessment focused on critical pedestrian areas, including the building perimeters, sidewalks and walkways on the project site, and the proposed park areas.



## 2 BACKGROUND AND APPROACH

### 2.1 Wind Tunnel Study Model

To assess the wind environment around the proposed project, a 1:400 scale model of the project site and surroundings was constructed for the wind tunnel test of the Proposed configuration which included the proposed project with existing surroundings.

The wind tunnel model included all relevant surrounding buildings and topography within an approximate 960 m radius of the study site. The wind and turbulence profiles in the atmospheric boundary layer beyond the modelled area were also simulated in RWDI's wind tunnel. The wind tunnel model was instrumented with 404 wind speed sensors to measure mean and gust speeds at a full-scale height of approximately 1.5 m above local grade in pedestrian areas throughout the study site. Sensors were not included on the building rooftops as the design of these areas may be subject to change as the design progresses, and as such, wind conditions in these areas will be assessed and further discussed at the site plan approval stage. Wind speeds were measured for 36 directions in 10° increments. The measurements at each sensor location were recorded in the form of ratios of local mean and gust speeds to the mean wind speed at a reference height above the model. The placement of wind measurement locations was based on our experience and understanding of the pedestrian usage for this site.



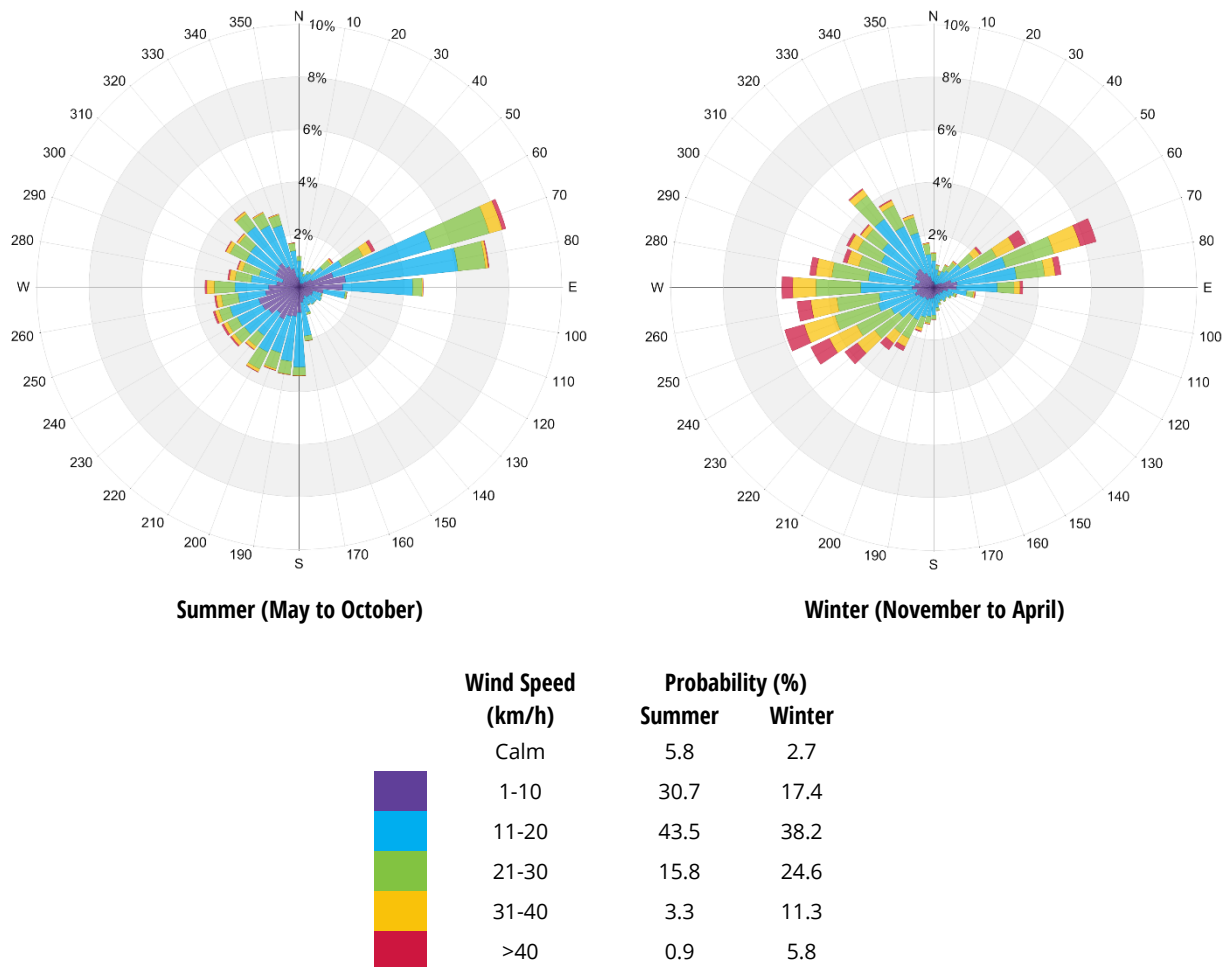


**Image 2: Wind Tunnel Study Model**

## 2.2 Meteorological Data

Wind statistics recorded at Billy Bishop Toronto City Airport between 1987 and 2017, inclusive, were analyzed for the summer (May to October) and winter (November to April) seasons. Image 3 graphically depicts the directional distributions of wind frequencies and speeds for these two seasons. Winds from the southwest, west, northwest, and east directions are predominant during both summer and winter. During the winter season, the prevailing winds from these directions are expected to be stronger, as indicated by the wind roses. Strong winds of a mean speed greater than 30 km/h measured at the airport (at an anemometer height of 10 m) occur for 4.2% and 17.1% of the time during the summer and winter seasons, respectively.

Wind statistics were combined with the wind tunnel data to predict the frequency of occurrence of full-scale wind speeds. The full-scale wind predictions were then compared with the wind criteria for pedestrian comfort and safety.



**Image 3: Directional Distribution of Winds Approaching Billy Bishop Toronto City Airport from 1987 to 2017**

## 2.3 Mississauga Pedestrian Wind Criteria

The Mississauga pedestrian wind criteria, developed in June 2014, are specified in the Urban Design Terms of Reference, "Pedestrian Wind Comfort and Safety Studies". The following defines the criterion in detail.

Comfort Category	GEM Speed (km/h)	Description
<b>Sitting</b>	$\leq 10$	Calm or light breezes desired for outdoor restaurants and seating areas where one can read a paper without having it blown away
<b>Standing</b>	$\leq 15$	Gentle breezes suitable for main building entrances and bus stops
<b>Walking</b>	$\leq 20$	Relatively high speeds that can be tolerated if one's objective is to walk, run or cycle without lingering
<b>Uncomfortable</b>	$> 20$	Strong winds of this magnitude are considered a nuisance for most activities, and wind mitigation is typically recommended

**Notes:**

- (1) GEM speed = max (mean speed, gust speed/1.85);
- (2) GEM speeds listed above are based on a seasonal exceedance of 20% of the time between 6:00 and 23:00.

Safety Criterion	Gust Speed (km/h)	Description
<b>Exceeded</b>	$> 90$	Excessive gust speeds that can adversely affect a pedestrian's balance and footing. Wind mitigation is typically required.

**Notes:**

- (1) Based on an annual exceedance of 9 hours or 0.1% of the time for 24 hours a day.



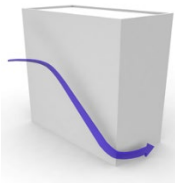
## 2.4 Generalized Wind Flows

In our discussion of wind conditions, reference may be made to the following generalized wind flows (Image 4):



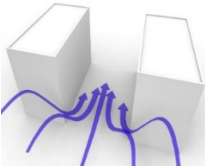
### ***DOWNWASHING***

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.



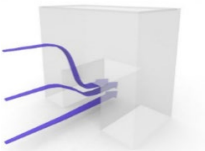
### ***CORNER ACCELERATION***

When winds approach at an oblique angle to a tall façade and are deflected down, a localized increase in the wind activity or corner acceleration can be expected around the exposed building corners at pedestrian level.



### ***CHANNELLING EFFECT***

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



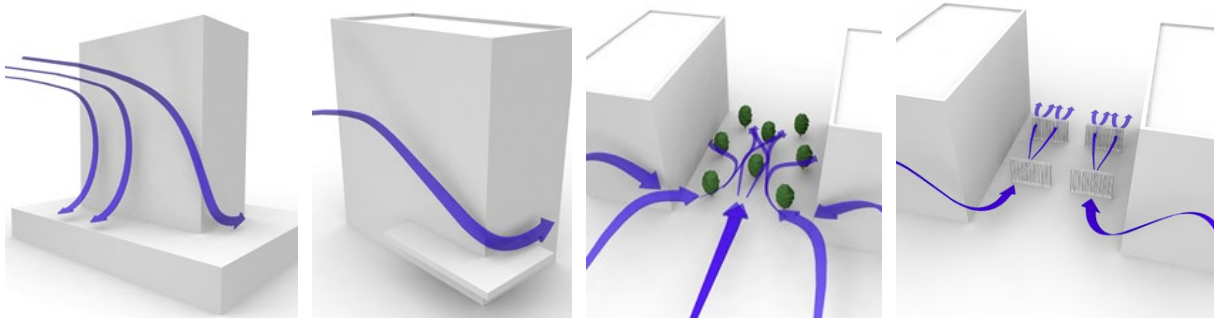
### ***PASSAGE FLOW***

When passageways under buildings are situated in the path of prevailing winds, wind flow tends to accelerate through the narrow gap.

**Image 4: Generalized Wind Flows**

If these building/wind combinations occur for prevailing winds, there is a greater potential for increased wind activity. However, the tower setbacks away from the edges of the podiums, as well as the significant distances between the towers themselves, are positive design features for reducing downwashing and channeling winds (see Image 5) around the site and increased wind speeds would be expected if these measures were not present. A further reduction in wind speeds can be achieved through design details such as deep canopies close to grade, windscreens, tall trees with dense landscaping, etc. (Image 5).

### ***Podium/tower setback, canopy, landscaping and wind screens (left to right)***



**Image 5: Common Wind Control Measures**

## 3 RESULTS AND DISCUSSION

Figure 0 shows the key plan of the entire site, with the site itself sectioned off into Areas 1 through 5. The predicted wind conditions are shown on site plans in Figures 1.1 through 1.5 for summer wind comfort conditions, Figures 2.1 through 2.5 for winter wind comfort conditions, and Figures 3.1 through 3.5 for annual wind safety conditions, all located in the “Figures” section of this report and each respectively showing Areas 1 through 5. These conditions and the associated wind speeds are also represented in Table 1, located in the “Tables” section of this report. The following is a detailed discussion of the suitability of the predicted wind conditions for the anticipated pedestrian use of each area of interest.

Wind conditions comfortable for walking are appropriate for sidewalks and walkways around the project site as pedestrians will be active and less likely to remain in one area for prolonged periods of time. Lower wind speeds, conducive to standing, are preferred at main entrances where pedestrians are apt to linger. Wind speeds comfortable for sitting or standing are preferred for areas intended for passive activities, such as parks, especially during the summer when these areas are typically in use.

It should be noted that the wind-tunnel test model included basic massing models of the proposed buildings. More detailed building features and articulation to be developed at later stages in the design process will help to disperse strong winds and thereby reduce wind speeds closer to the buildings themselves.

### 3.1 Summer Wind Conditions

In the summer (Figures 1.1 through 1.5), wind speeds are typically expected to be comfortable for sitting or standing close to the buildings and comfortable for walking in the more exposed areas of the project site or near the taller towers, which is appropriate for the sidewalks and walkways on and around the site. Wind speeds comfortable for walking may be higher than desired for the Western Pier (Figure 1.1), Panorama Point Park (Figure 1.1), and Inspiration Park (Figure 1.3) park areas along the Lake Ontario frontage. The proposed landscaping, which was not included in the wind tunnel testing, will reduce the wind activity in these areas. Uncomfortable conditions are predicted in an isolated area along the west side of Lakefront Promenade East in Area 2 (see Location 36, Figure 1.2) as strong westerly and southwesterly prevailing winds downwash from the west tower façade and accelerate around the north corner of the podium (see Image 4). The potential wind control measures are discussed in greater detail in Section 3.2.

It should be noted that wind speeds comfortable for walking or higher may be higher than desired for main entrances. Should any entrances be located where such conditions are predicted, a reduction in wind speeds can be achieved by recessing these entrances into the building façades. If feasible, alternative options include placing windscreens or dense coniferous landscaping on both sides of the entrance. The requirement for any such wind control measures can be further assessed and discussed at the site plan approval stage. Examples of recessed entrances and landscaping or windscreens are shown in Image 6.



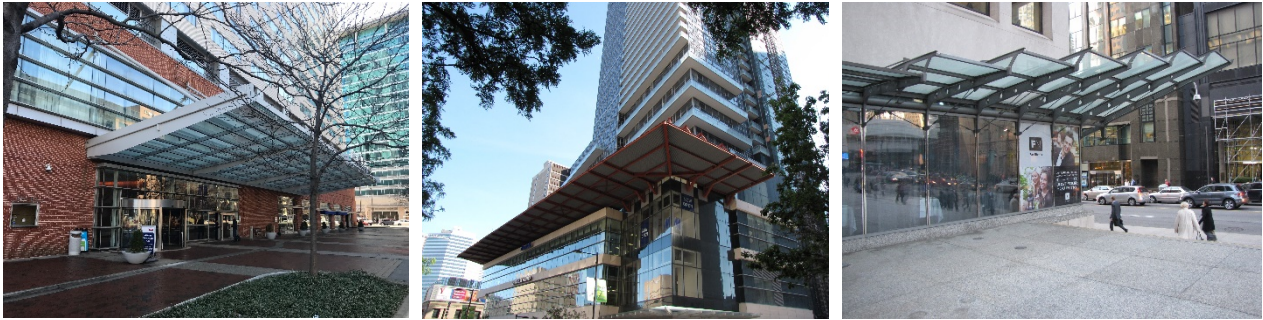
**Image 6: Examples of Recessed Entrances and Landscaping or Windscreens Near Entrances**

## **3.2 Winter Wind Conditions**

Seasonally stronger winds in the winter (Figures 2.1 through 2.5) are expected to result in elevated conditions during this time, with conditions generally anticipated to be comfortable for standing or walking close to the buildings. Wind conditions comfortable for walking or better are suitable for the sidewalks and walkways; however, these conditions may be too windy for entrances and the park areas. Uncomfortable conditions are predicted in the more exposed areas, around exposed building corners, and near the taller towers on the site. They primarily result from exposure to strong westerly, southwesterly, and east-northeasterly winter winds for the more open areas and from these winds downwashing from the tower façades, accelerating around their corners, and channelling between the towers themselves (see Image 4) for the areas near the taller towers.

A reduction in wind speeds can be achieved through improved building forms (e.g., shape, orientation, distance, podium, setback, etc.) and the use of canopies, windscreens and dense coniferous landscaping planted in areas of higher wind activity. However, the tower setbacks away from the edges of the podiums, as well as the significant distances between the towers themselves, are positive design features for reducing downwashing and channeling winds (see Image 5) around the site and increased wind speeds would be expected if these measures were not present. The use of any such hardscaping features for reducing wind speeds around the project site can be further assessed and discussed at the site plan approval stage. Examples of deep canopies are shown in Image 7 and windscreens and coniferous landscaping are shown in Image 8.





**Image 7: Examples of Deep Canopies for Tower Corners**



**Image 8: Examples of Coniferous Landscaping (Top) and Windscreens (Bottom)**

### **3.3 Wind Safety (Annual Conditions)**

Wind speeds that meet the wind safety criterion are anticipated at all but eight among the tested 404 locations around the project site (Locations 36, 48, and 71 in Figure 3.2; Locations 156 and 167 in Figure 3.3; Location 244 in Figure 3.4; and Locations 364 and 369 in Figure 3.5). Potentially severe wind speeds occur around exposed tower corners and within east-west passageways, and stem primarily from east-northeasterly and southwesterly winds and likely occur during the winter months. The wind control measures discussed above for improving wind comfort would also help in reducing the wind safety exceedances. Basic massing models of the proposed buildings were included in the wind-tunnel test model. More detailed building features and articulation to be developed at later stages in the design process will help to disperse strong winds and thereby reduce wind speeds closer to the buildings themselves. The effects of such articulation, as well as the incorporation of any required hardscaping features for wind control, will be further assessed and discussed at the site plan approval stage.

## 4 APPLICABILITY OF RESULTS

The wind conditions presented in this report pertain to the model of the Lakeview Village project, constructed using the drawings and information listed below. Should there be any design changes that deviate from this list of drawings, the presented wind conditions may change. Therefore, if changes in the design are made, it is recommended that RWDI be contacted and requested to review their potential effects on wind conditions.

File Name	File Type	Date Received (mm/dd/yyyy)
20200327_Lakeview_Refined DMP 4.0.skp	SketchUp	04/06/2020

## 5 REFERENCES

1. ASCE Task Committee on Outdoor Human Comfort (2004). *Outdoor Human Comfort and Its Assessment*, 68 pages, American Society of Civil Engineers, Reston, Virginia, USA.
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10. Wu, H., Williams, C.J., Baker, H.A. and Waechter, W.F. (2004), "Knowledge-based Desk-Top Analysis of Pedestrian Wind Conditions", *ASCE Structure Congress 2004*, Nashville, Tennessee.



# FIGURES



## Key Plan of Entire Site

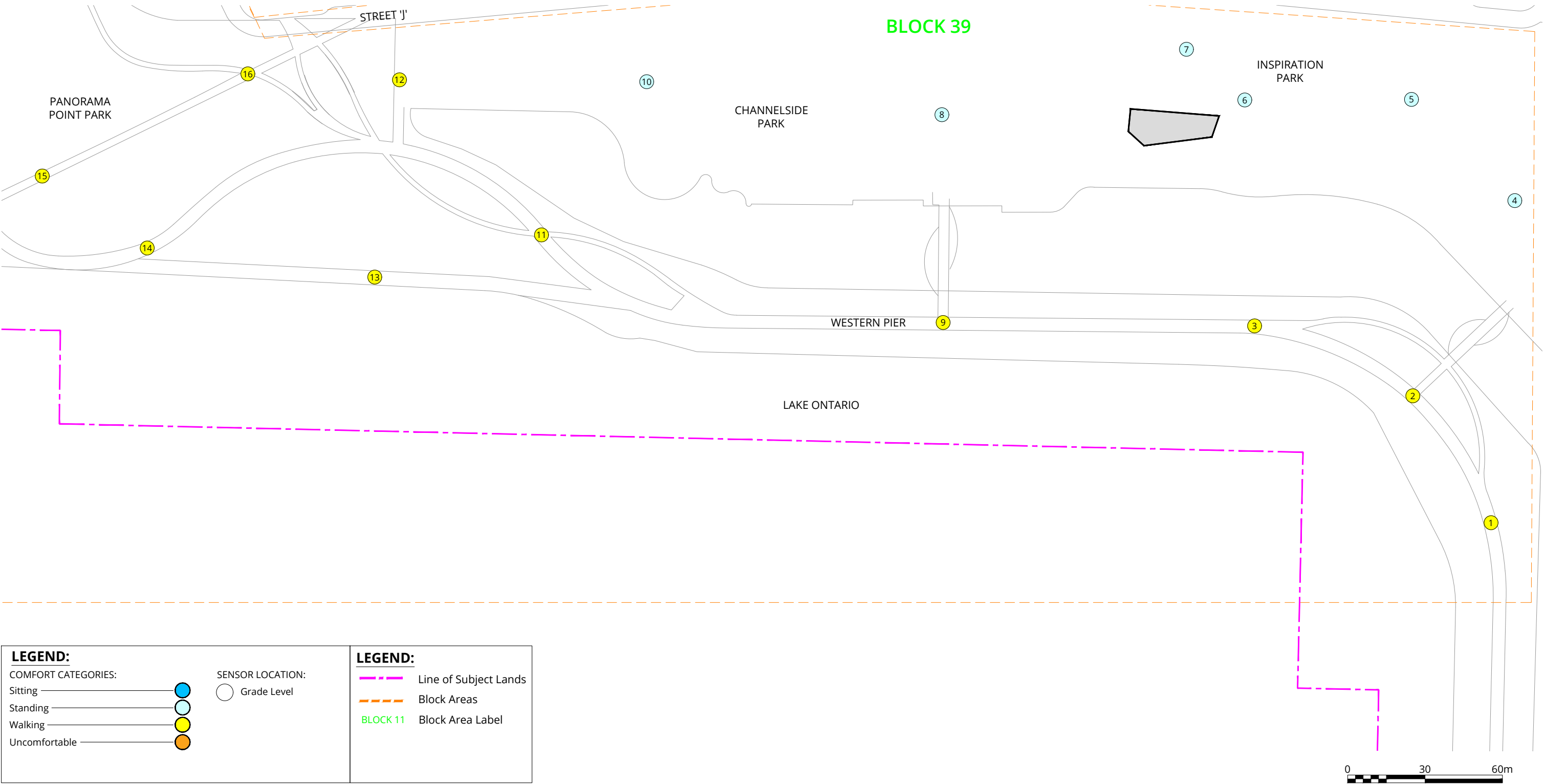
Lakeview Village Masterplan - Mississauga, ON



Project #1804164

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Date Revised: Jun. 18, 2020	





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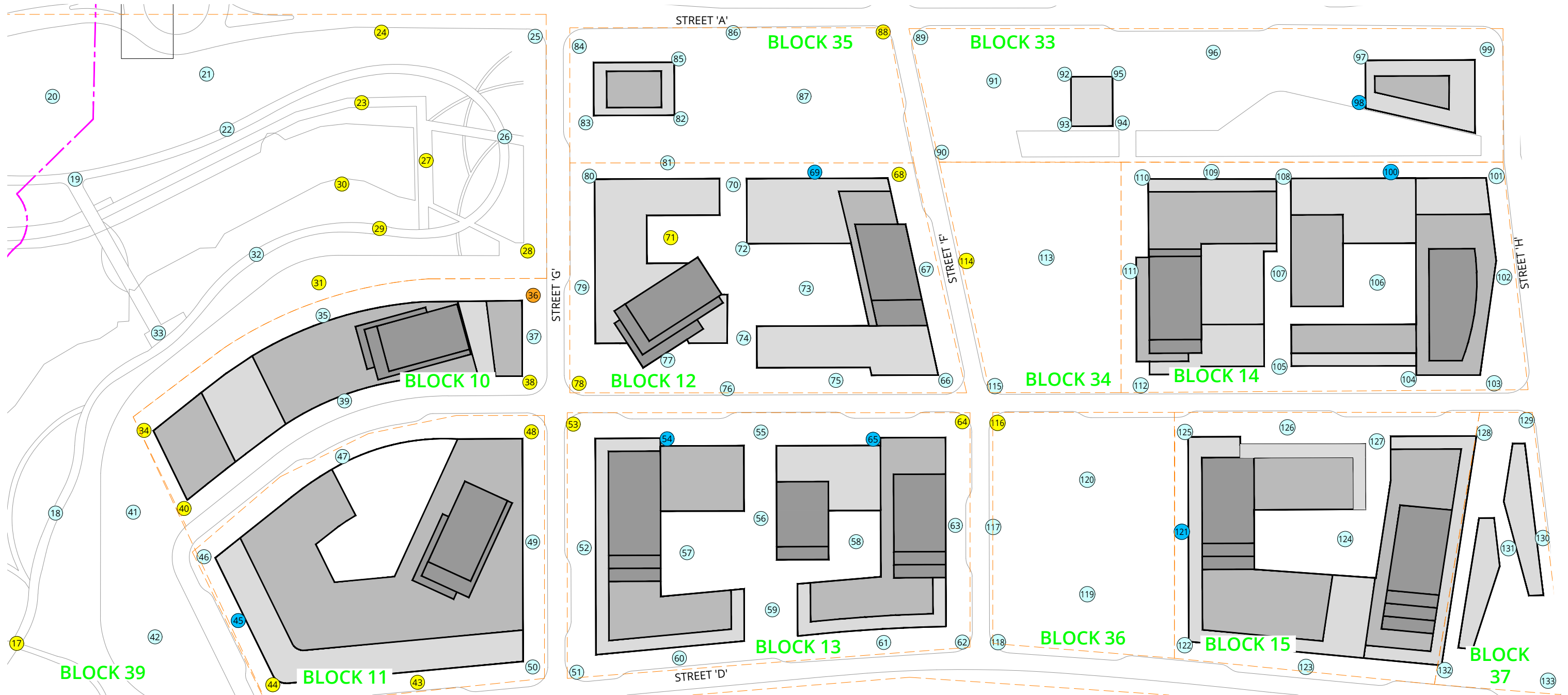
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BLOCK 11	Block Area Label




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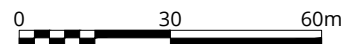
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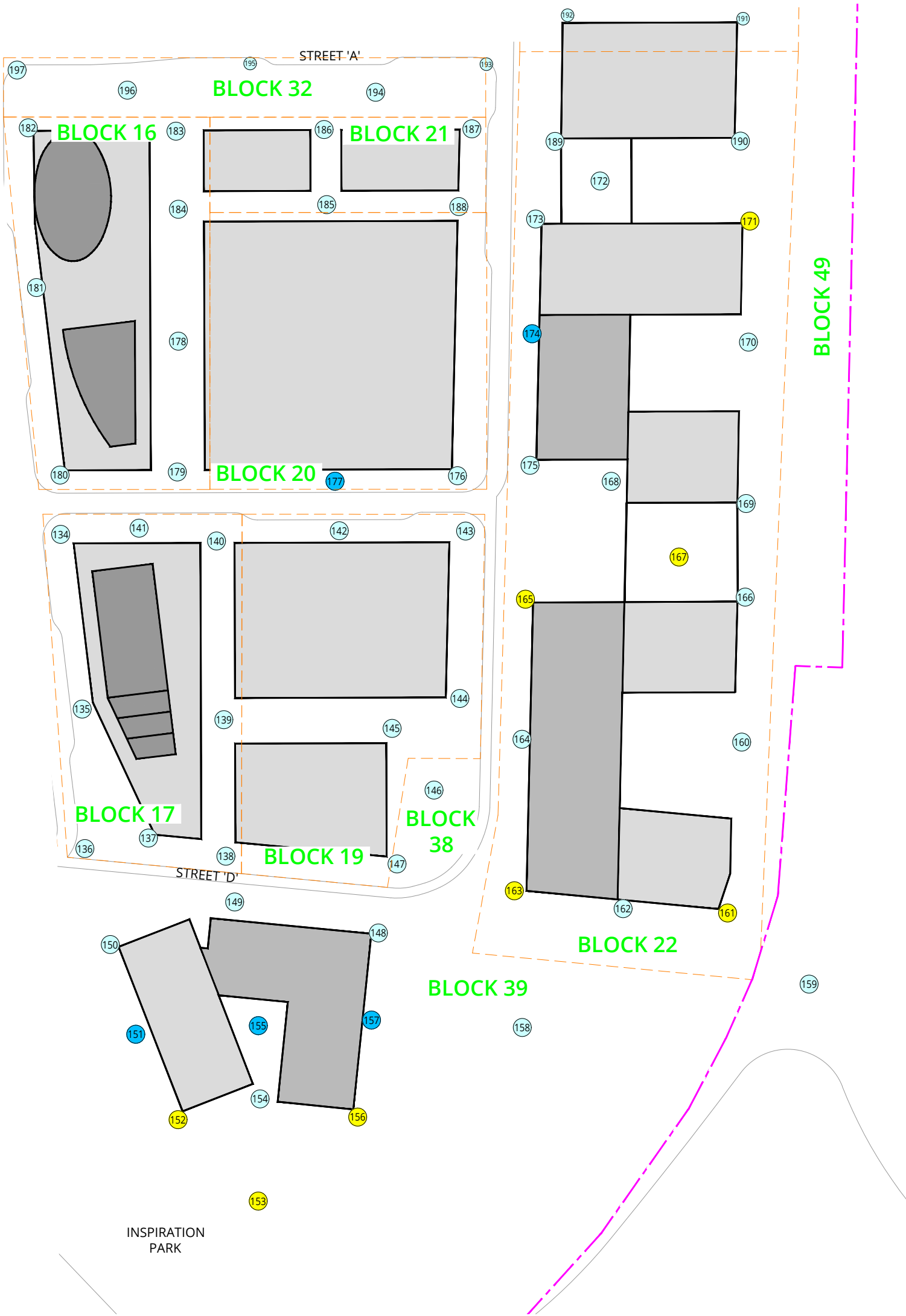
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**LEGEND:**

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-  Block Areas
-  BLOCK 11 Block Area Label





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- Walking ———— (yellow circle)
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SENSOR LOCATION:

- Grade Level (white circle)

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- Block Areas (dashed orange line)
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**Pedestrian Wind Comfort Conditions**

Proposed Configuration  
Summer (May to October, 6:00 to 23:00)

Lakeview Village Masterplan - Mississauga, ON



Project #1804164

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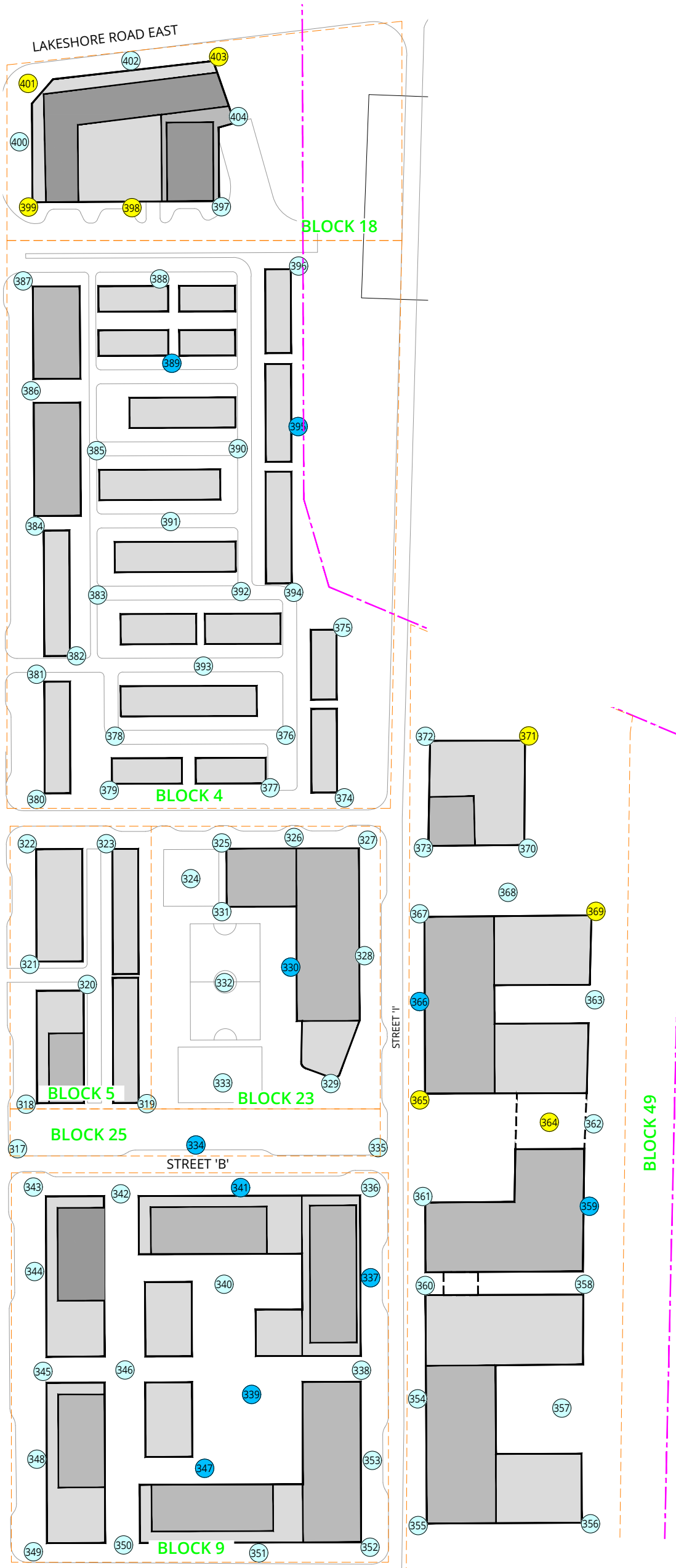
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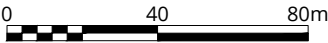
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- Uncomfortable ———— (orange circle)

SENSOR LOCATION:

- (white circle) Grade Level

**LEGEND:**

- (dashed pink line) Line of Subject Lands
- (dashed orange line) Block Areas
- (green text) BLOCK 11 Block Area Label



**Pedestrian Wind Comfort Conditions**

Proposed Configuration  
Summer (May to October, 6:00 to 23:00)

Lakeview Village Masterplan - Mississauga, ON



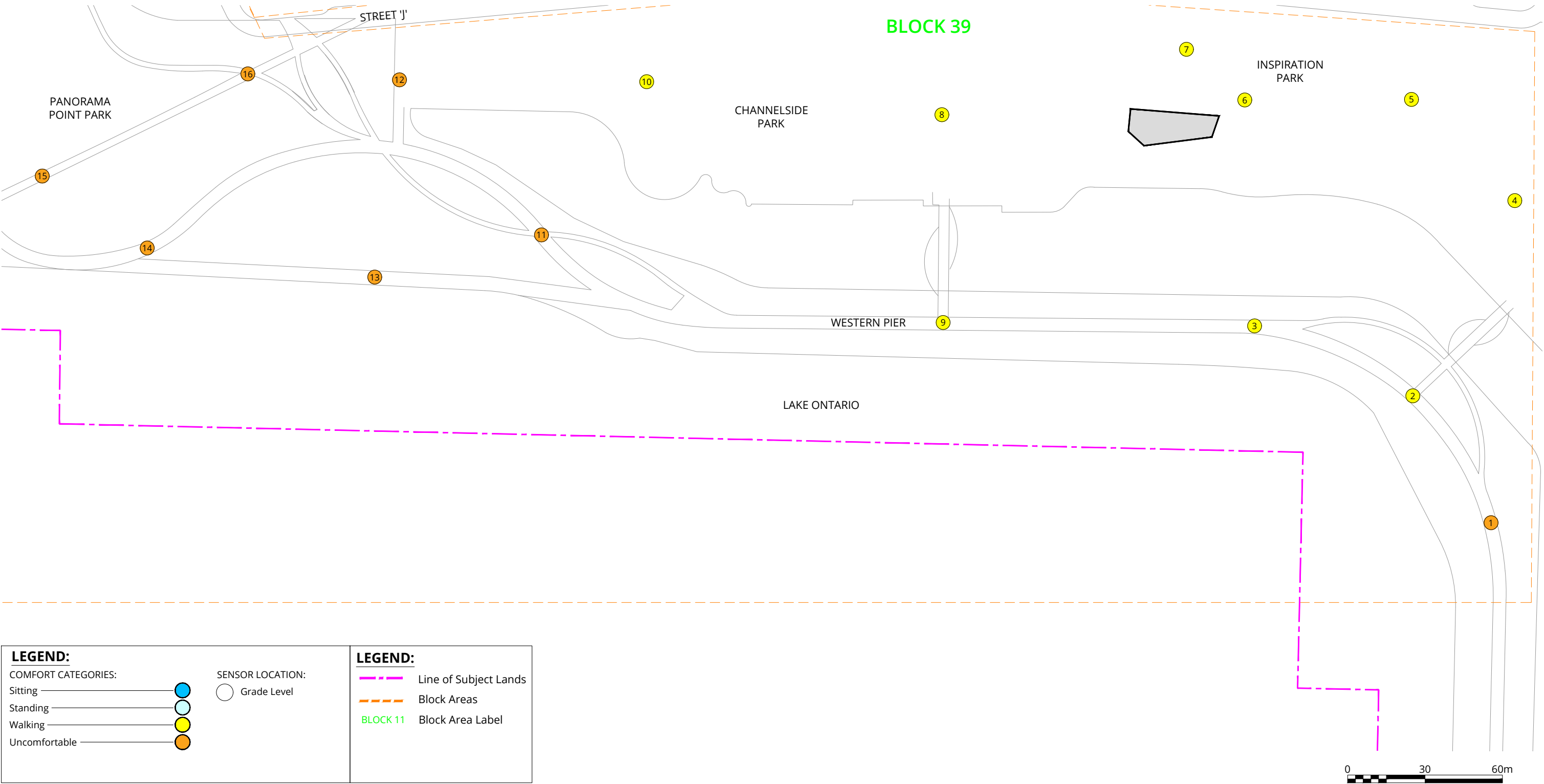
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Project #1804164





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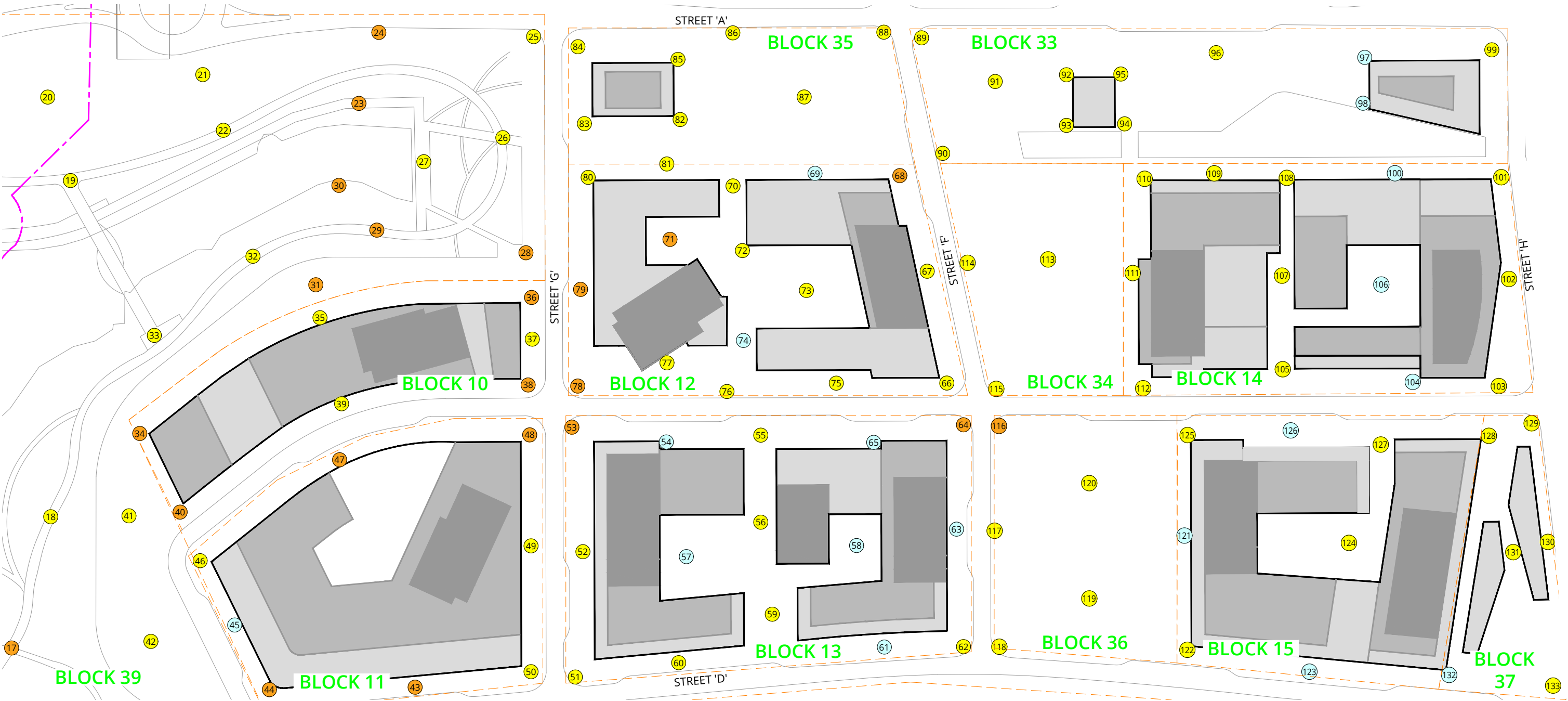
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Walking	●
Uncomfortable	●

SENSOR LOCATION:

○ Grade Level





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---	Block Areas
BLOCK 11	Block Area Label




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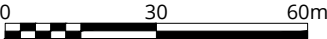
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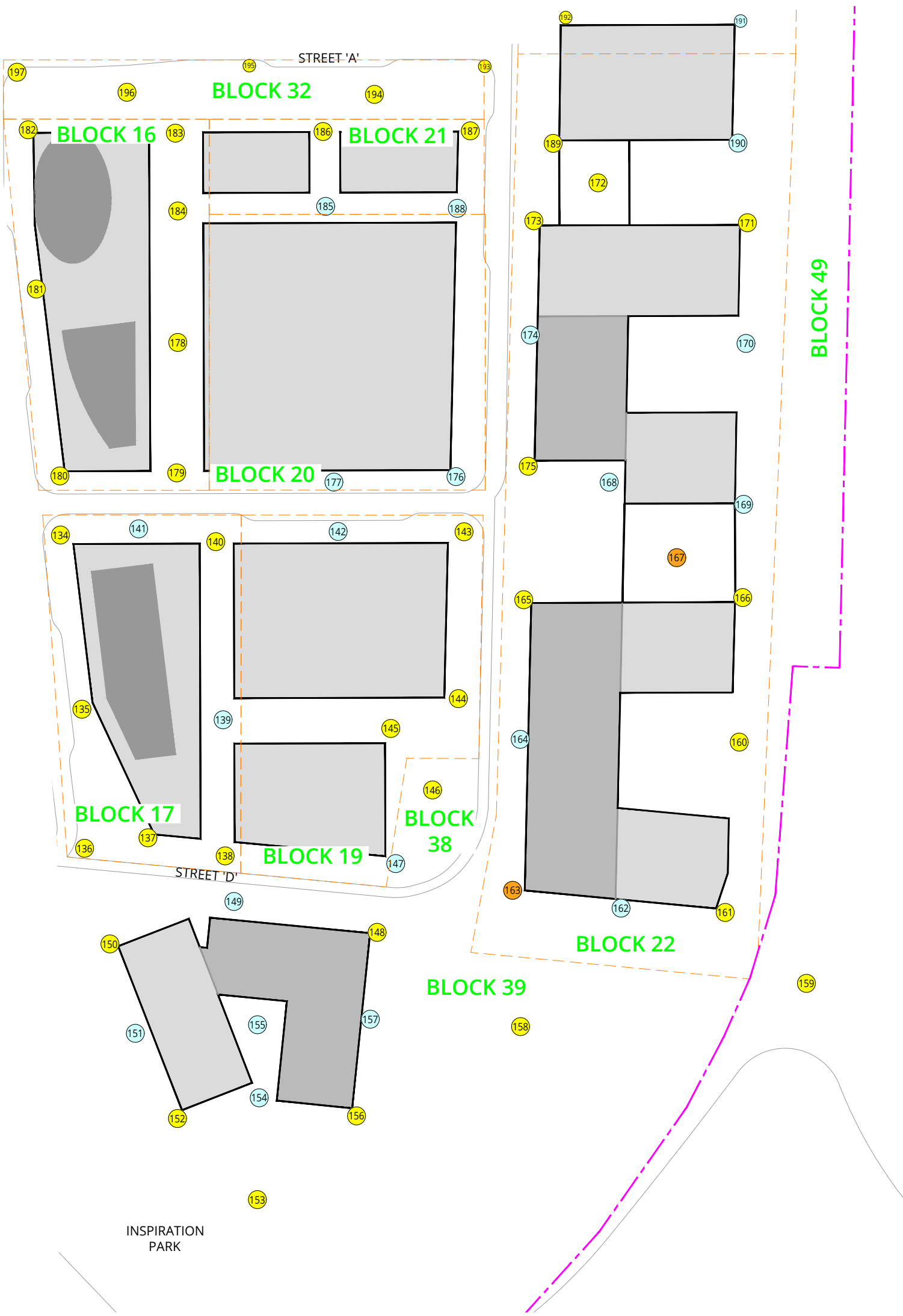
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-  Block Areas
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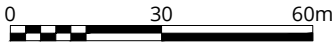
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- Walking — (yellow circle)
- Uncomfortable — (orange circle)

SENSOR LOCATION:

- (white circle) Grade Level

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- (dashed orange line) Block Areas
- (green text) BLOCK 11 Block Area Label



**Pedestrian Wind Comfort Conditions**

Proposed Configuration  
Winter (November to April, 6:00 to 23:00)

Lakeview Village Masterplan - Mississauga, ON



Project #1804164

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Approx. Scale: 1:1500

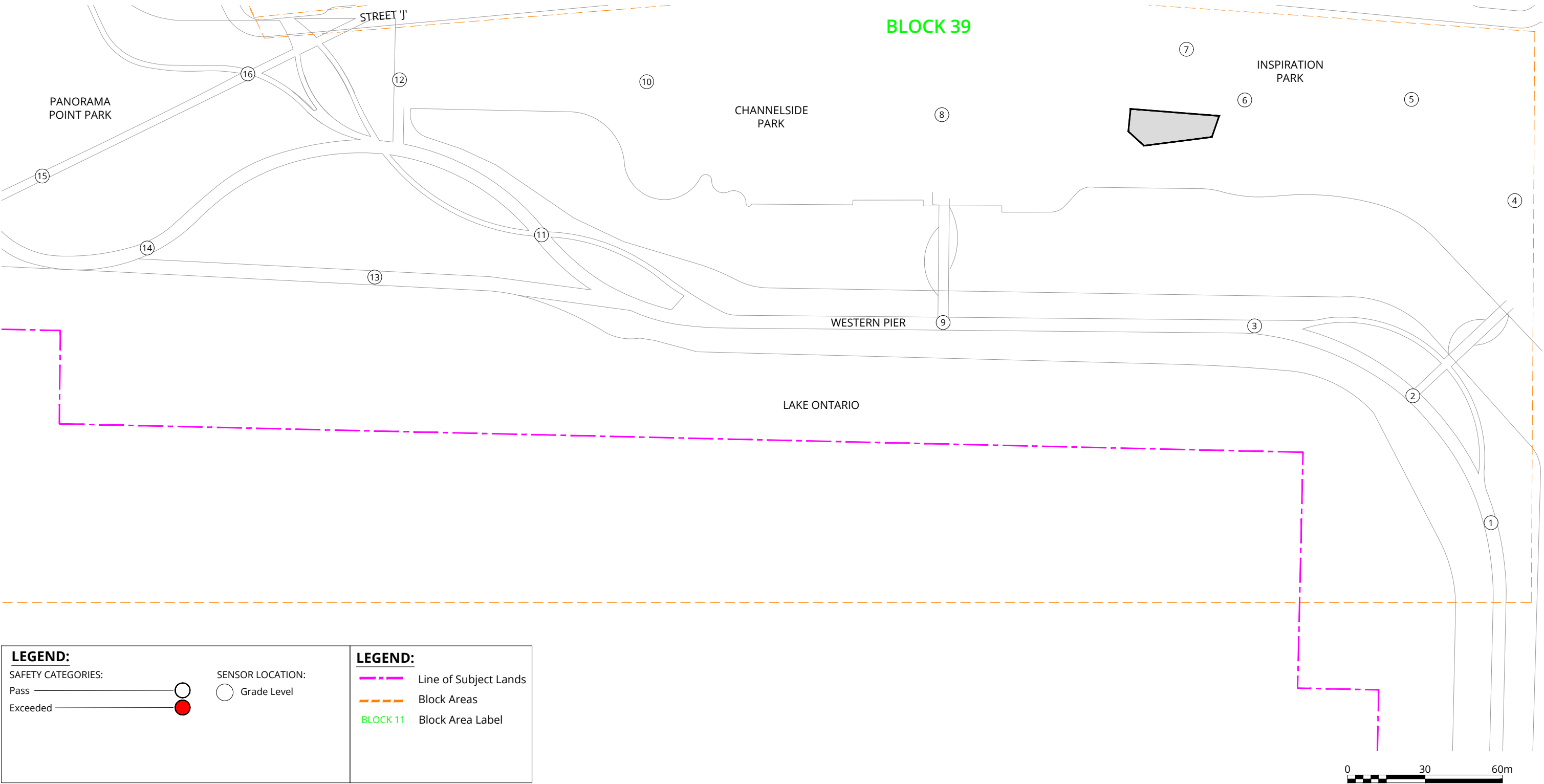
Date Revised: May 12, 2020











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SAFETY CATEGORIES:

Pass ———— ○

Exceeded ———— ●

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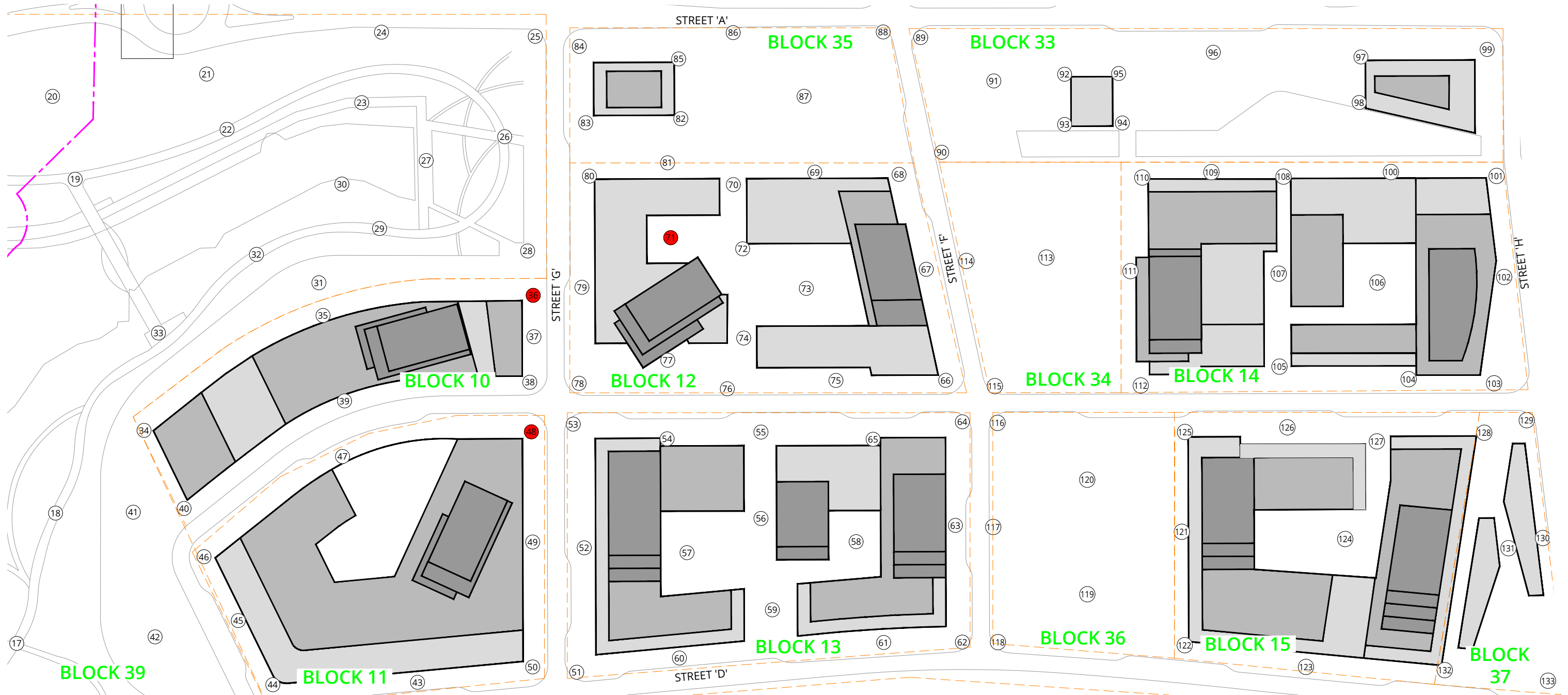
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**LEGEND:**

——— Line of Subject Lands

——— Block Areas

BLOCK 11 Block Area Label



**LEGEND:**

SAFETY CATEGORIES:

Pass ———— ○

Exceeded ———— ●

SENSOR LOCATION:

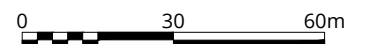
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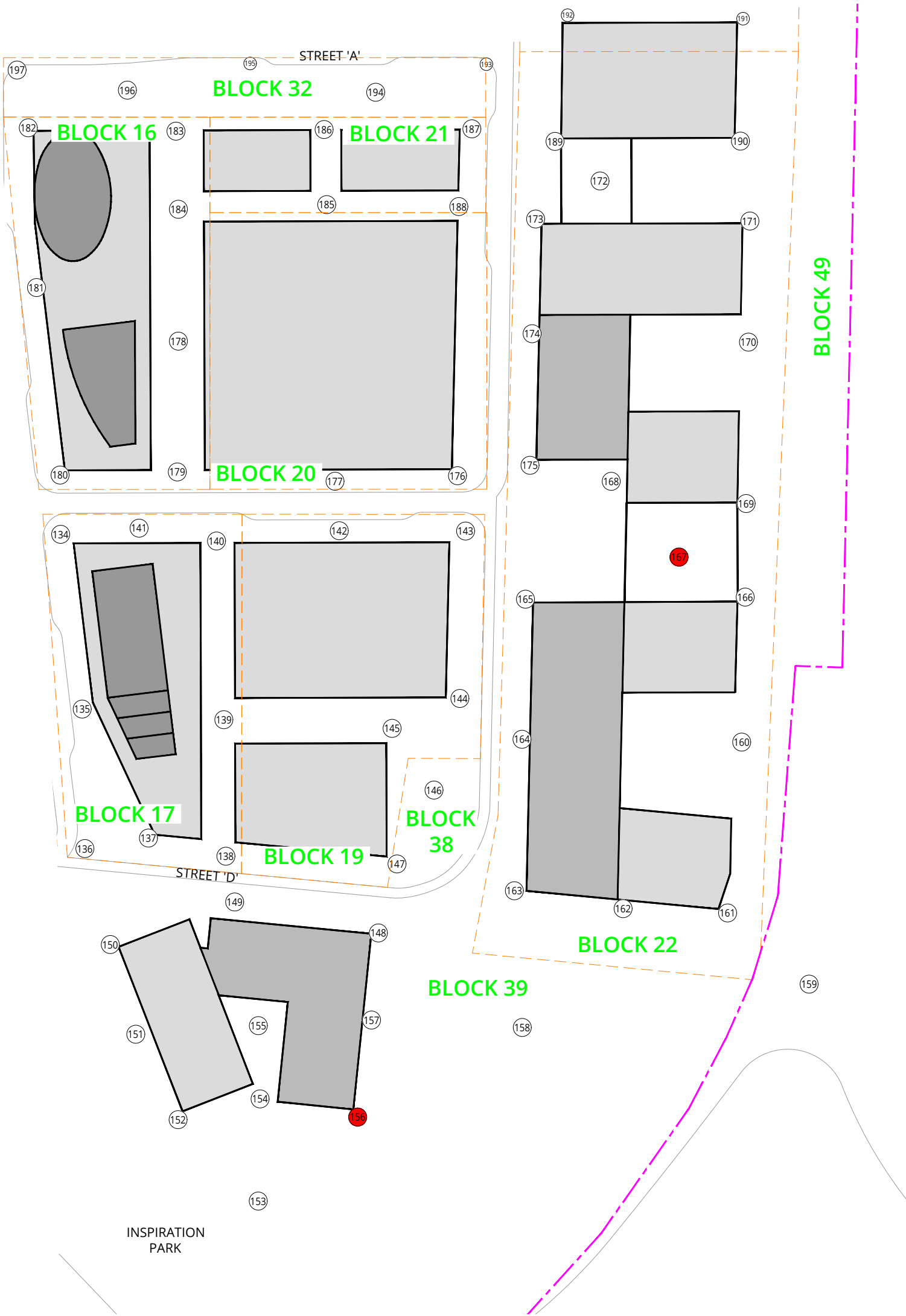
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— — — — — Block Areas



BLOCK 11 Block Area Label






**LEGEND:**




SAFETY CATEGORIES:

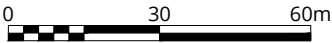
Pass   
Exceeded 

SENSOR LOCATION:

 Grade Level

**LEGEND:**

 Line of Subject Lands  
 Block Areas  
 BLOCK 11 Block Area Label



**Pedestrian Wind Safety Conditions**

Proposed Configuration  
Annual (January to December, 0:00 to 23:00)

Lakeview Village Masterplan - Mississauga, ON



Project #1804164

Drawn by: ck Figure: 3.3

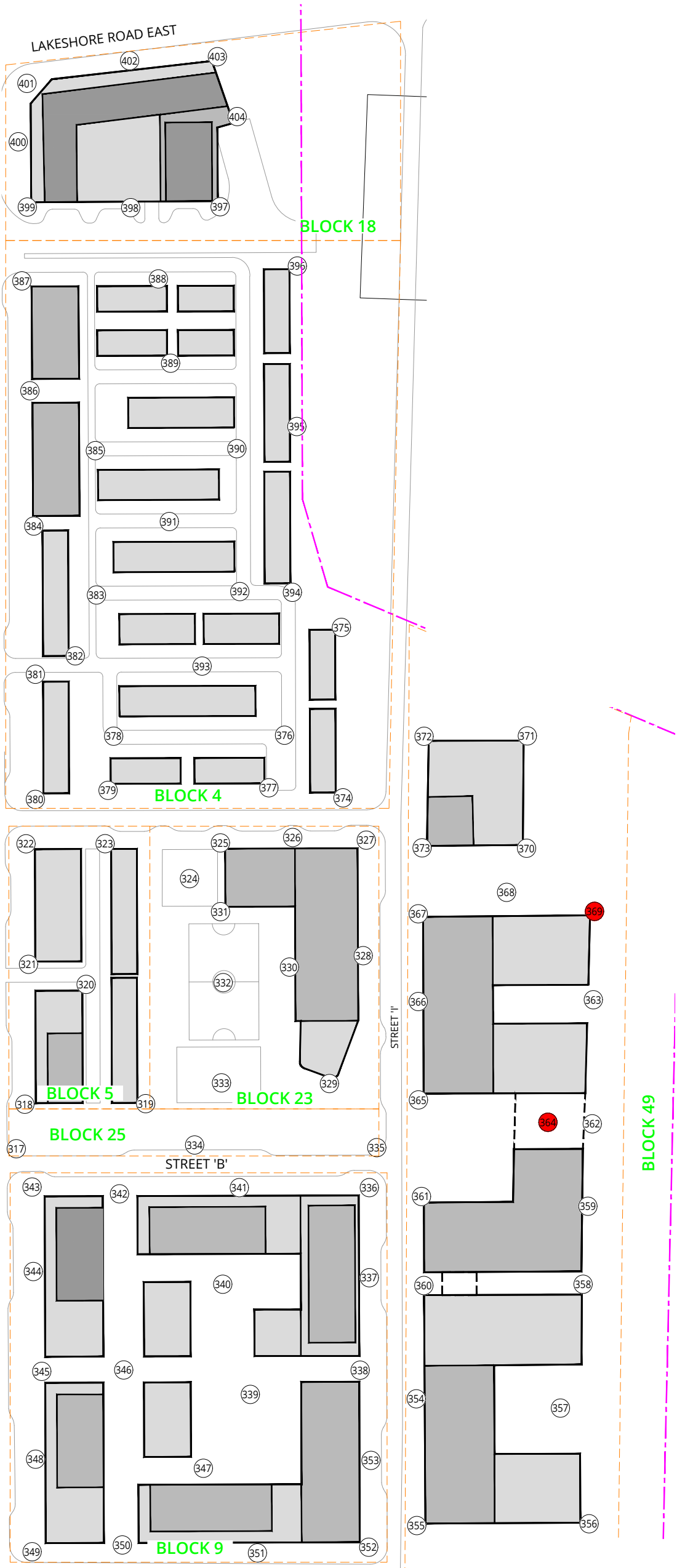
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Date Revised: May 12, 2020












**LEGEND:**




SAFETY CATEGORIES:

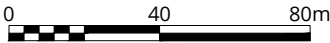
Pass   
Exceeded 

SENSOR LOCATION:

 Grade Level

**LEGEND:**

 Line of Subject Lands  
 Block Areas  
 BLOCK 11 Block Area Label



**Pedestrian Wind Safety Conditions**  
Proposed Configuration  
Annual (January to December, 0:00 to 23:00)

Lakeview Village Masterplan - Mississauga, ON



Project #1804164

Drawn by:	ck	Figure: 3.5
Approx. Scale:	1:2000	
Date Revised:	May 12, 2020	



# TABLES

**Table 1: Pedestrian Wind Comfort and Safety Conditions**

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
1	Proposed	16	Walking	21	Uncomfortable	71	Pass
2	Proposed	16	Walking	20	Walking	71	Pass
3	Proposed	16	Walking	20	Walking	71	Pass
4	Proposed	14	Standing	18	Walking	64	Pass
5	Proposed	14	Standing	17	Walking	70	Pass
6	Proposed	14	Standing	18	Walking	70	Pass
7	Proposed	14	Standing	18	Walking	69	Pass
8	Proposed	15	Standing	19	Walking	69	Pass
9	Proposed	16	Walking	20	Walking	69	Pass
10	Proposed	15	Standing	20	Walking	73	Pass
11	Proposed	16	Walking	23	Uncomfortable	74	Pass
12	Proposed	16	Walking	22	Uncomfortable	73	Pass
13	Proposed	17	Walking	23	Uncomfortable	71	Pass
14	Proposed	17	Walking	22	Uncomfortable	72	Pass
15	Proposed	17	Walking	22	Uncomfortable	72	Pass
16	Proposed	16	Walking	21	Uncomfortable	73	Pass
17	Proposed	16	Walking	21	Uncomfortable	68	Pass
18	Proposed	15	Standing	19	Walking	67	Pass
19	Proposed	14	Standing	19	Walking	63	Pass
20	Proposed	15	Standing	18	Walking	71	Pass
21	Proposed	15	Standing	20	Walking	79	Pass
22	Proposed	15	Standing	19	Walking	79	Pass
23	Proposed	16	Walking	21	Uncomfortable	82	Pass
24	Proposed	17	Walking	22	Uncomfortable	79	Pass
25	Proposed	15	Standing	19	Walking	74	Pass



**Table 1: Pedestrian Wind Comfort and Safety Conditions**

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
26	Proposed	15	Standing	19	Walking	72	Pass
27	Proposed	16	Walking	20	Walking	73	Pass
28	Proposed	17	Walking	23	Uncomfortable	88	Pass
29	Proposed	18	Walking	21	Uncomfortable	81	Pass
30	Proposed	17	Walking	21	Uncomfortable	85	Pass
31	Proposed	17	Walking	21	Uncomfortable	74	Pass
32	Proposed	15	Standing	18	Walking	69	Pass
33	Proposed	15	Standing	17	Walking	69	Pass
34	Proposed	18	Walking	22	Uncomfortable	82	Pass
35	Proposed	12	Standing	16	Walking	60	Pass
36	Proposed	21	Uncomfortable	28	Uncomfortable	101	Exceeded
37	Proposed	14	Standing	16	Walking	81	Pass
38	Proposed	19	Walking	24	Uncomfortable	86	Pass
39	Proposed	13	Standing	16	Walking	74	Pass
40	Proposed	16	Walking	22	Uncomfortable	89	Pass
41	Proposed	13	Standing	18	Walking	67	Pass
42	Proposed	13	Standing	18	Walking	63	Pass
43	Proposed	16	Walking	21	Uncomfortable	78	Pass
44	Proposed	17	Walking	25	Uncomfortable	87	Pass
45	Proposed	10	Sitting	15	Standing	58	Pass
46	Proposed	13	Standing	18	Walking	70	Pass
47	Proposed	15	Standing	21	Uncomfortable	81	Pass
48	Proposed	19	Walking	26	Uncomfortable	96	Exceeded
49	Proposed	15	Standing	19	Walking	70	Pass
50	Proposed	15	Standing	19	Walking	74	Pass

**Table 1: Pedestrian Wind Comfort and Safety Conditions**

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
51	Proposed	14	Standing	19	Walking	76	Pass
52	Proposed	15	Standing	20	Walking	88	Pass
53	Proposed	17	Walking	22	Uncomfortable	80	Pass
54	Proposed	10	Sitting	14	Standing	58	Pass
55	Proposed	14	Standing	17	Walking	63	Pass
56	Proposed	13	Standing	17	Walking	66	Pass
57	Proposed	12	Standing	15	Standing	66	Pass
58	Proposed	11	Standing	13	Standing	52	Pass
59	Proposed	13	Standing	17	Walking	68	Pass
60	Proposed	13	Standing	16	Walking	70	Pass
61	Proposed	12	Standing	15	Standing	65	Pass
62	Proposed	14	Standing	17	Walking	70	Pass
63	Proposed	11	Standing	14	Standing	65	Pass
64	Proposed	17	Walking	21	Uncomfortable	81	Pass
65	Proposed	10	Sitting	13	Standing	48	Pass
66	Proposed	15	Standing	18	Walking	88	Pass
67	Proposed	14	Standing	17	Walking	81	Pass
68	Proposed	16	Walking	22	Uncomfortable	84	Pass
69	Proposed	10	Sitting	15	Standing	56	Pass
70	Proposed	14	Standing	18	Walking	75	Pass
71	Proposed	17	Walking	22	Uncomfortable	94	Exceeded
72	Proposed	14	Standing	17	Walking	76	Pass
73	Proposed	14	Standing	17	Walking	81	Pass
74	Proposed	11	Standing	15	Standing	59	Pass
75	Proposed	13	Standing	16	Walking	85	Pass

**Table 1: Pedestrian Wind Comfort and Safety Conditions**

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
76	Proposed	14	Standing	17	Walking	67	Pass
77	Proposed	13	Standing	18	Walking	80	Pass
78	Proposed	17	Walking	22	Uncomfortable	88	Pass
79	Proposed	15	Standing	22	Uncomfortable	77	Pass
80	Proposed	14	Standing	17	Walking	69	Pass
81	Proposed	14	Standing	18	Walking	67	Pass
82	Proposed	14	Standing	17	Walking	68	Pass
83	Proposed	13	Standing	17	Walking	67	Pass
84	Proposed	15	Standing	18	Walking	72	Pass
85	Proposed	14	Standing	18	Walking	71	Pass
86	Proposed	14	Standing	17	Walking	66	Pass
87	Proposed	13	Standing	17	Walking	65	Pass
88	Proposed	16	Walking	19	Walking	82	Pass
89	Proposed	15	Standing	19	Walking	78	Pass
90	Proposed	15	Standing	20	Walking	73	Pass
91	Proposed	15	Standing	19	Walking	78	Pass
92	Proposed	13	Standing	18	Walking	70	Pass
93	Proposed	13	Standing	16	Walking	66	Pass
94	Proposed	12	Standing	16	Walking	59	Pass
95	Proposed	12	Standing	18	Walking	71	Pass
96	Proposed	12	Standing	18	Walking	71	Pass
97	Proposed	11	Standing	14	Standing	57	Pass
98	Proposed	10	Sitting	14	Standing	57	Pass
99	Proposed	12	Standing	16	Walking	67	Pass
100	Proposed	10	Sitting	15	Standing	59	Pass

**Table 1: Pedestrian Wind Comfort and Safety Conditions**

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
101	Proposed	13	Standing	19	Walking	68	Pass
102	Proposed	14	Standing	18	Walking	73	Pass
103	Proposed	14	Standing	17	Walking	68	Pass
104	Proposed	13	Standing	15	Standing	85	Pass
105	Proposed	15	Standing	17	Walking	74	Pass
106	Proposed	11	Standing	15	Standing	59	Pass
107	Proposed	13	Standing	16	Walking	62	Pass
108	Proposed	12	Standing	16	Walking	58	Pass
109	Proposed	11	Standing	16	Walking	68	Pass
110	Proposed	14	Standing	18	Walking	72	Pass
111	Proposed	13	Standing	18	Walking	73	Pass
112	Proposed	12	Standing	17	Walking	78	Pass
113	Proposed	14	Standing	18	Walking	69	Pass
114	Proposed	16	Walking	19	Walking	81	Pass
115	Proposed	15	Standing	20	Walking	85	Pass
116	Proposed	16	Walking	21	Uncomfortable	86	Pass
117	Proposed	13	Standing	16	Walking	75	Pass
118	Proposed	14	Standing	16	Walking	62	Pass
119	Proposed	13	Standing	16	Walking	62	Pass
120	Proposed	14	Standing	19	Walking	72	Pass
121	Proposed	10	Sitting	13	Standing	61	Pass
122	Proposed	14	Standing	18	Walking	74	Pass
123	Proposed	13	Standing	15	Standing	70	Pass
124	Proposed	14	Standing	17	Walking	71	Pass
125	Proposed	15	Standing	19	Walking	77	Pass

**Table 1: Pedestrian Wind Comfort and Safety Conditions**

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
126	Proposed	11	Standing	15	Standing	57	Pass
127	Proposed	13	Standing	16	Walking	70	Pass
128	Proposed	15	Standing	18	Walking	82	Pass
129	Proposed	13	Standing	17	Walking	65	Pass
130	Proposed	15	Standing	18	Walking	85	Pass
131	Proposed	14	Standing	16	Walking	72	Pass
132	Proposed	14	Standing	15	Standing	72	Pass
133	Proposed	12	Standing	16	Walking	64	Pass
134	Proposed	15	Standing	18	Walking	71	Pass
135	Proposed	15	Standing	18	Walking	72	Pass
136	Proposed	12	Standing	16	Walking	67	Pass
137	Proposed	14	Standing	18	Walking	77	Pass
138	Proposed	14	Standing	17	Walking	74	Pass
139	Proposed	12	Standing	13	Standing	65	Pass
140	Proposed	12	Standing	16	Walking	58	Pass
141	Proposed	12	Standing	15	Standing	56	Pass
142	Proposed	11	Standing	13	Standing	53	Pass
143	Proposed	13	Standing	16	Walking	65	Pass
144	Proposed	15	Standing	18	Walking	75	Pass
145	Proposed	13	Standing	16	Walking	76	Pass
146	Proposed	12	Standing	17	Walking	70	Pass
147	Proposed	13	Standing	15	Standing	64	Pass
148	Proposed	14	Standing	18	Walking	71	Pass
149	Proposed	13	Standing	15	Standing	59	Pass
150	Proposed	13	Standing	17	Walking	65	Pass



**Table 1: Pedestrian Wind Comfort and Safety Conditions**

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
151	Proposed	10	Sitting	13	Standing	51	Pass
152	Proposed	16	Walking	20	Walking	76	Pass
153	Proposed	16	Walking	20	Walking	71	Pass
154	Proposed	11	Standing	15	Standing	59	Pass
155	Proposed	10	Sitting	13	Standing	55	Pass
156	Proposed	16	Walking	18	Walking	93	Exceeded
157	Proposed	10	Sitting	12	Standing	61	Pass
158	Proposed	14	Standing	19	Walking	71	Pass
159	Proposed	13	Standing	16	Walking	64	Pass
160	Proposed	13	Standing	16	Walking	65	Pass
161	Proposed	17	Walking	19	Walking	85	Pass
162	Proposed	12	Standing	14	Standing	71	Pass
163	Proposed	17	Walking	21	Uncomfortable	79	Pass
164	Proposed	11	Standing	15	Standing	63	Pass
165	Proposed	16	Walking	20	Walking	78	Pass
166	Proposed	14	Standing	18	Walking	73	Pass
167	Proposed	17	Walking	21	Uncomfortable	98	Exceeded
168	Proposed	11	Standing	13	Standing	57	Pass
169	Proposed	11	Standing	15	Standing	64	Pass
170	Proposed	12	Standing	15	Standing	66	Pass
171	Proposed	17	Walking	20	Walking	88	Pass
172	Proposed	14	Standing	17	Walking	73	Pass
173	Proposed	14	Standing	17	Walking	64	Pass
174	Proposed	10	Sitting	12	Standing	50	Pass
175	Proposed	13	Standing	18	Walking	70	Pass

**Table 1: Pedestrian Wind Comfort and Safety Conditions**

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
176	Proposed	12	Standing	15	Standing	63	Pass
177	Proposed	10	Sitting	11	Standing	55	Pass
178	Proposed	12	Standing	16	Walking	64	Pass
179	Proposed	14	Standing	16	Walking	70	Pass
180	Proposed	14	Standing	17	Walking	78	Pass
181	Proposed	14	Standing	17	Walking	63	Pass
182	Proposed	14	Standing	18	Walking	68	Pass
183	Proposed	14	Standing	18	Walking	74	Pass
184	Proposed	12	Standing	16	Walking	65	Pass
185	Proposed	12	Standing	15	Standing	61	Pass
186	Proposed	12	Standing	17	Walking	67	Pass
187	Proposed	13	Standing	18	Walking	69	Pass
188	Proposed	12	Standing	15	Standing	65	Pass
189	Proposed	14	Standing	18	Walking	76	Pass
190	Proposed	11	Standing	14	Standing	70	Pass
191	Proposed	11	Standing	13	Standing	68	Pass
192	Proposed	13	Standing	18	Walking	65	Pass
193	Proposed	12	Standing	16	Walking	58	Pass
194	Proposed	14	Standing	19	Walking	74	Pass
195	Proposed	14	Standing	19	Walking	70	Pass
196	Proposed	14	Standing	18	Walking	71	Pass
197	Proposed	14	Standing	18	Walking	71	Pass
198	Proposed	14	Standing	16	Walking	68	Pass
199	Proposed	10	Sitting	12	Standing	64	Pass
200	Proposed	11	Standing	13	Standing	64	Pass

**Table 1: Pedestrian Wind Comfort and Safety Conditions**

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
201	Proposed	11	Standing	14	Standing	59	Pass
202	Proposed	14	Standing	19	Walking	78	Pass
203	Proposed	13	Standing	17	Walking	69	Pass
204	Proposed	12	Standing	16	Walking	60	Pass
205	Proposed	11	Standing	14	Standing	56	Pass
206	Proposed	12	Standing	15	Standing	57	Pass
207	Proposed	12	Standing	16	Walking	58	Pass
208	Proposed	12	Standing	15	Standing	63	Pass
209	Proposed	12	Standing	17	Walking	69	Pass
210	Proposed	13	Standing	18	Walking	72	Pass
211	Proposed	13	Standing	18	Walking	80	Pass
212	Proposed	13	Standing	16	Walking	73	Pass
213	Proposed	15	Standing	20	Walking	79	Pass
214	Proposed	15	Standing	18	Walking	78	Pass
215	Proposed	14	Standing	21	Uncomfortable	86	Pass
216	Proposed	11	Standing	17	Walking	81	Pass
217	Proposed	15	Standing	20	Walking	73	Pass
218	Proposed	13	Standing	19	Walking	79	Pass
219	Proposed	12	Standing	15	Standing	64	Pass
220	Proposed	15	Standing	20	Walking	74	Pass
221	Proposed	13	Standing	17	Walking	64	Pass
222	Proposed	9	Sitting	13	Standing	51	Pass
223	Proposed	13	Standing	18	Walking	67	Pass
224	Proposed	13	Standing	17	Walking	65	Pass
225	Proposed	14	Standing	18	Walking	69	Pass

**Table 1: Pedestrian Wind Comfort and Safety Conditions**

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
226	Proposed	13	Standing	16	Walking	67	Pass
227	Proposed	16	Walking	19	Walking	74	Pass
228	Proposed	16	Walking	19	Walking	74	Pass
229	Proposed	12	Standing	15	Standing	64	Pass
230	Proposed	12	Standing	15	Standing	66	Pass
231	Proposed	13	Standing	18	Walking	71	Pass
232	Proposed	14	Standing	17	Walking	71	Pass
233	Proposed	15	Standing	21	Uncomfortable	82	Pass
234	Proposed	12	Standing	16	Walking	63	Pass
235	Proposed	15	Standing	21	Uncomfortable	80	Pass
236	Proposed	11	Standing	16	Walking	62	Pass
237	Proposed	14	Standing	17	Walking	63	Pass
238	Proposed	13	Standing	16	Walking	65	Pass
239	Proposed	15	Standing	17	Walking	73	Pass
240	Proposed	15	Standing	18	Walking	68	Pass
241	Proposed	15	Standing	16	Walking	77	Pass
242	Proposed	17	Walking	21	Uncomfortable	79	Pass
243	Proposed	16	Walking	19	Walking	70	Pass
244	Proposed	16	Walking	18	Walking	93	Exceeded
245	Proposed	14	Standing	17	Walking	72	Pass
246	Proposed	13	Standing	15	Standing	59	Pass
247	Proposed	14	Standing	18	Walking	72	Pass
248	Proposed	11	Standing	16	Walking	66	Pass
249	Proposed	16	Walking	20	Walking	76	Pass
250	Proposed	16	Walking	19	Walking	74	Pass

**Table 1: Pedestrian Wind Comfort and Safety Conditions**

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
251	Proposed	13	Standing	17	Walking	67	Pass
252	Proposed	14	Standing	19	Walking	70	Pass
253	Proposed	16	Walking	21	Uncomfortable	75	Pass
254	Proposed	18	Walking	22	Uncomfortable	82	Pass
255	Proposed	18	Walking	25	Uncomfortable	88	Pass
256	Proposed	14	Standing	19	Walking	72	Pass
257	Proposed	13	Standing	17	Walking	62	Pass
258	Proposed	12	Standing	16	Walking	59	Pass
259	Proposed	13	Standing	16	Walking	57	Pass
260	Proposed	13	Standing	16	Walking	60	Pass
261	Proposed	13	Standing	19	Walking	76	Pass
262	Proposed	13	Standing	17	Walking	62	Pass
263	Proposed	11	Standing	14	Standing	61	Pass
264	Proposed	10	Sitting	13	Standing	50	Pass
265	Proposed	11	Standing	14	Standing	59	Pass
266	Proposed	12	Standing	15	Standing	56	Pass
267	Proposed	13	Standing	18	Walking	77	Pass
268	Proposed	13	Standing	18	Walking	70	Pass
269	Proposed	15	Standing	19	Walking	75	Pass
270	Proposed	13	Standing	16	Walking	63	Pass
271	Proposed	11	Standing	15	Standing	59	Pass
272	Proposed	9	Sitting	13	Standing	50	Pass
273	Proposed	10	Sitting	14	Standing	58	Pass
274	Proposed	9	Sitting	12	Standing	47	Pass
275	Proposed	11	Standing	15	Standing	58	Pass



**Table 1: Pedestrian Wind Comfort and Safety Conditions**

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
276	Proposed	10	Sitting	15	Standing	59	Pass
277	Proposed	9	Sitting	12	Standing	47	Pass
278	Proposed	11	Standing	15	Standing	61	Pass
279	Proposed	9	Sitting	13	Standing	51	Pass
280	Proposed	11	Standing	14	Standing	54	Pass
281	Proposed	15	Standing	20	Walking	75	Pass
282	Proposed	14	Standing	19	Walking	80	Pass
283	Proposed	12	Standing	16	Walking	64	Pass
284	Proposed	15	Standing	21	Uncomfortable	80	Pass
285	Proposed	14	Standing	18	Walking	78	Pass
286	Proposed	13	Standing	19	Walking	74	Pass
287	Proposed	12	Standing	15	Standing	61	Pass
288	Proposed	13	Standing	17	Walking	62	Pass
289	Proposed	13	Standing	17	Walking	72	Pass
290	Proposed	14	Standing	19	Walking	72	Pass
291	Proposed	14	Standing	18	Walking	68	Pass
292	Proposed	14	Standing	20	Walking	75	Pass
293	Proposed	14	Standing	18	Walking	66	Pass
294	Proposed	14	Standing	18	Walking	72	Pass
295	Proposed	13	Standing	17	Walking	64	Pass
296	Proposed	12	Standing	17	Walking	66	Pass
297	Proposed	11	Standing	15	Standing	64	Pass
298	Proposed	11	Standing	15	Standing	55	Pass
299	Proposed	11	Standing	14	Standing	53	Pass
300	Proposed	12	Standing	16	Walking	60	Pass

**Table 1: Pedestrian Wind Comfort and Safety Conditions**

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
301	Proposed	13	Standing	19	Walking	68	Pass
302	Proposed	11	Standing	15	Standing	57	Pass
303	Proposed	10	Sitting	14	Standing	53	Pass
304	Proposed	10	Sitting	14	Standing	53	Pass
305	Proposed	9	Sitting	11	Standing	44	Pass
306	Proposed	10	Sitting	14	Standing	53	Pass
307	Proposed	12	Standing	16	Walking	62	Pass
308	Proposed	14	Standing	19	Walking	75	Pass
309	Proposed	17	Walking	22	Uncomfortable	89	Pass
310	Proposed	16	Walking	22	Uncomfortable	88	Pass
311	Proposed	15	Standing	18	Walking	73	Pass
312	Proposed	15	Standing	20	Walking	80	Pass
313	Proposed	11	Standing	13	Standing	57	Pass
314	Proposed	11	Standing	15	Standing	54	Pass
315	Proposed	11	Standing	13	Standing	58	Pass
316	Proposed	12	Standing	16	Walking	65	Pass
317	Proposed	12	Standing	17	Walking	68	Pass
318	Proposed	13	Standing	19	Walking	74	Pass
319	Proposed	12	Standing	14	Standing	64	Pass
320	Proposed	13	Standing	19	Walking	74	Pass
321	Proposed	14	Standing	20	Walking	78	Pass
322	Proposed	12	Standing	16	Walking	62	Pass
323	Proposed	13	Standing	18	Walking	70	Pass
324	Proposed	12	Standing	16	Walking	60	Pass
325	Proposed	12	Standing	16	Walking	58	Pass

**Table 1: Pedestrian Wind Comfort and Safety Conditions**

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
326	Proposed	12	Standing	16	Walking	60	Pass
327	Proposed	12	Standing	17	Walking	62	Pass
328	Proposed	12	Standing	16	Walking	63	Pass
329	Proposed	12	Standing	14	Standing	78	Pass
330	Proposed	8	Sitting	12	Standing	46	Pass
331	Proposed	12	Standing	17	Walking	65	Pass
332	Proposed	11	Standing	15	Standing	58	Pass
333	Proposed	12	Standing	16	Walking	66	Pass
334	Proposed	10	Sitting	14	Standing	56	Pass
335	Proposed	15	Standing	20	Walking	83	Pass
336	Proposed	13	Standing	19	Walking	74	Pass
337	Proposed	10	Sitting	13	Standing	52	Pass
338	Proposed	11	Standing	14	Standing	58	Pass
339	Proposed	9	Sitting	13	Standing	49	Pass
340	Proposed	11	Standing	13	Standing	57	Pass
341	Proposed	9	Sitting	14	Standing	53	Pass
342	Proposed	14	Standing	19	Walking	73	Pass
343	Proposed	13	Standing	18	Walking	66	Pass
344	Proposed	12	Standing	16	Walking	65	Pass
345	Proposed	12	Standing	18	Walking	69	Pass
346	Proposed	13	Standing	18	Walking	71	Pass
347	Proposed	10	Sitting	15	Standing	55	Pass
348	Proposed	12	Standing	17	Walking	69	Pass
349	Proposed	14	Standing	18	Walking	75	Pass
350	Proposed	13	Standing	15	Standing	66	Pass

**Table 1: Pedestrian Wind Comfort and Safety Conditions**

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
351	Proposed	12	Standing	14	Standing	69	Pass
352	Proposed	12	Standing	15	Standing	62	Pass
353	Proposed	14	Standing	16	Walking	75	Pass
354	Proposed	11	Standing	16	Walking	62	Pass
355	Proposed	15	Standing	19	Walking	76	Pass
356	Proposed	13	Standing	16	Walking	70	Pass
357	Proposed	11	Standing	13	Standing	64	Pass
358	Proposed	13	Standing	16	Walking	82	Pass
359	Proposed	10	Sitting	13	Standing	58	Pass
360	Proposed	11	Standing	17	Walking	63	Pass
361	Proposed	12	Standing	18	Walking	71	Pass
362	Proposed	15	Standing	19	Walking	78	Pass
363	Proposed	13	Standing	17	Walking	66	Pass
364	Proposed	17	Walking	23	Uncomfortable	92	Exceeded
365	Proposed	16	Walking	23	Uncomfortable	83	Pass
366	Proposed	10	Sitting	15	Standing	59	Pass
367	Proposed	13	Standing	18	Walking	70	Pass
368	Proposed	14	Standing	20	Walking	75	Pass
369	Proposed	20	Walking	26	Uncomfortable	96	Exceeded
370	Proposed	14	Standing	19	Walking	78	Pass
371	Proposed	16	Walking	21	Uncomfortable	78	Pass
372	Proposed	12	Standing	17	Walking	63	Pass
373	Proposed	13	Standing	17	Walking	69	Pass
374	Proposed	12	Standing	16	Walking	66	Pass
375	Proposed	13	Standing	18	Walking	73	Pass

**Table 1: Pedestrian Wind Comfort and Safety Conditions**

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
376	Proposed	12	Standing	15	Standing	69	Pass
377	Proposed	12	Standing	14	Standing	62	Pass
378	Proposed	12	Standing	16	Walking	71	Pass
379	Proposed	12	Standing	15	Standing	63	Pass
380	Proposed	13	Standing	19	Walking	71	Pass
381	Proposed	12	Standing	16	Walking	60	Pass
382	Proposed	12	Standing	15	Standing	69	Pass
383	Proposed	11	Standing	15	Standing	64	Pass
384	Proposed	13	Standing	18	Walking	70	Pass
385	Proposed	11	Standing	14	Standing	68	Pass
386	Proposed	14	Standing	20	Walking	75	Pass
387	Proposed	13	Standing	18	Walking	74	Pass
388	Proposed	15	Standing	22	Uncomfortable	83	Pass
389	Proposed	10	Sitting	13	Standing	49	Pass
390	Proposed	11	Standing	15	Standing	58	Pass
391	Proposed	12	Standing	16	Walking	63	Pass
392	Proposed	12	Standing	16	Walking	61	Pass
393	Proposed	13	Standing	17	Walking	64	Pass
394	Proposed	14	Standing	18	Walking	70	Pass
395	Proposed	10	Sitting	12	Standing	53	Pass
396	Proposed	14	Standing	18	Walking	69	Pass
397	Proposed	15	Standing	19	Walking	75	Pass
398	Proposed	16	Walking	22	Uncomfortable	82	Pass
399	Proposed	17	Walking	23	Uncomfortable	83	Pass
400	Proposed	13	Standing	17	Walking	71	Pass

**Table 1: Pedestrian Wind Comfort and Safety Conditions**

Location	Configuration	Wind Comfort				Wind Safety	
		Summer		Winter		Annual	
		Speed (km/h)	Rating	Speed (km/h)	Rating	Speed (km/h)	Rating
<b>401</b>	Proposed	18	Walking	23	Uncomfortable	85	Pass
<b>402</b>	Proposed	12	Standing	18	Walking	71	Pass
<b>403</b>	Proposed	18	Walking	24	Uncomfortable	87	Pass
<b>404</b>	Proposed	15	Standing	17	Walking	82	Pass

Seasons		Hours	Comfort Speed (km/h)	Safety Speed (km/h)
Summer	May - October	6:00 - 23:00 for comfort	(20% Seasonal Exceedance)	(> 0.1% Annual Exceedance)
Winter	November - April	0:00 - 23:00 for safety	≤ 10 Sitting	≤ 90 Pass
<b>Configuration</b>			11 - 15 Standing	> 90 Exceeded
<b>Proposed</b> Proposed buildings with existing surroundings			16 - 20 Walking	
			> 20 Uncomfortable	