

## **Chapter 10: Wind Microclimate**

WIND MICROCLIMATE	
AUTHOR	RWDI
SUPPORTING APPENDIX	<b>ES Volume 3, Appendix: Wind Microclimate</b> Annex 1: Legislative and Planning Policy Context; Annex 2: Pedestrian Level Wind Microclimate Assessment (Final Report)
KEY CONSIDERATIONS	This chapter will assess the effects of the Proposed Development on the site and whether the resulting changes in wind speeds would be suitable, in regard to comfort and safety, for the intended usage of sensitive locations in and around the site.
CONSULTATION	An EIA Scoping Report was formally issued to Woking Borough Council (WBC); following this, a meeting with WBC was undertaken to discuss the EIA and scope of the ES. The EIA Scoping Report and WBC's EIA Scoping Opinion is presented in <b>ES Volume 3, Appendix: Methodology (Annex 1)</b> . WBC agreed with the proposed approach to the assessment of wind and no further or specific comments were made on the scope of assessment.

## ASSESSMENT METHODOLOGY

**10.1** The following section outlines the methodologies applied in order to identify and assess the range of potential wind impacts considered likely to arise as a result of the Proposed Development.

### Defining the Baseline

#### Study Area

**10.2** A 1:300 scale model of the existing buildings on and surrounding the site (within a 360 metres (m) radius of the centre of the site) was produced and tested in the wind tunnel in order to provide existing site and surrounding wind conditions (at 98 locations for the baseline scenario, labelled up to probe number 170).

**10.3** The study area of 360m is used as buildings beyond this radius will have no aerodynamic impact on the site during wind tunnel testing. Additionally, the impact of locations further than 360m from the site are taken into account when the terrain roughness of the surrounding area is analysed using the Engineering Science Data Unit (ESDU) software package (as further discussed in the 'Measurement Technique' section of this chapter, 10.24 to 10.27).

#### Current Baseline Conditions

**10.4** The baseline (Configuration 1) wind conditions at the site were characterised by:

- A review of available meteorological data to establish the prevailing wind directions and the adjustment of such data for site specific application;
- Construction of a 1:300 scale model of the existing buildings at and surrounding the site within a 360m radius, and wind tunnel testing of the existing site conditions;
- In total, 68 test locations at the existing site were included on the wind tunnel model, with a further 30 probe locations in the surrounding area; and
- The layout and total number of receptor locations for the baseline assessment at the site (i.e. inside the red boundary line for the site) was informed by the Masterplan (LRW\_7884\_Masterplan\_190522 received by RWDI on 28/05/2019) of the Proposed Development, to ensure a consistent comparison of measurement locations for the different assessment configurations.

#### Likely Evolution of the Baseline Conditions

**10.5** No cumulative schemes have been identified within 360m of the site and, therefore, all configurations are modelled with the existing surrounding buildings.

### Impact Assessment Methodology

#### Demolition and Construction

**10.6** The potential wind microclimate effects during the demolition and construction works have been assessed using the professional judgement of an experienced wind engineer, based on an assessment of the existing

wind microclimate conditions at the site, the wind microclimate conditions of the completed development and an understanding of the effects of wind in the built environment. This approach is taken assuming that the activity on-site during this time (i.e. construction activity) is less sensitive to wind conditions (due to protection from site hoarding, and site access being restricted to site workers) than when the Proposed Development is completed and occupied (which would include entrances and amenity space, for example).

**10.7** The assessment methodology regarding the demolition and construction configurations has been based on the information presented in **ES Volume 1, Chapter 5: Demolition and Construction**.

**10.8** To consider a worst-case scenario during demolition and construction works, the assessment undertaken includes a model of the Proposed Development at a specific stage of demolition and construction works. Configuration 2 represents Block 1 of the Proposed Development being complete and occupied, with the remainder of the existing buildings (e.g. the existing football stadium (Woking Football Club), David Lloyd Leisure Centre (including tennis courts), Woking Gymnastics Club etc.) having been demolished.

**10.9** A qualitative assessment of the wind microclimate during demolition / construction has therefore been undertaken and is based on professional judgement (informed by an assessment of the background wind microclimate in the area), the results of the tested configurations for the baseline, Phase 1 demolition and construction scenario, and completed development scenarios, and RWDI's experience of assessing wind in the built environment.

#### Completed Development

**10.10** To predict the local wind environment associated with the completed development, and the resulting pedestrian comfort within and immediately surrounding the site, wind tunnel testing of the Proposed Development has been undertaken following the construction of a model of the Proposed Development. This model was inserted in the surrounding buildings model and wind measurements were taken at up to 212 locations on-site and 30 locations off-site.

**10.11** Wind tunnel testing is the most well-established and robust means of assessing the pedestrian wind environment. It enables the pedestrian level wind microclimate at a site to be quantified and classified in accordance with the widely accepted Lawson Comfort Criteria<sup>1</sup>.

**10.12** The wind tunnel tests deliver a detailed assessment of the mean and gust wind conditions around the site and the Proposed Development for all wind directions in terms of pedestrian comfort. Strong winds are also reported when they occur.

**10.13** To provide a basis for the assessment of the wind microclimate; a wind tunnel test of the following configurations was carried out:

- Configuration 1: Existing site with existing surrounding buildings (Baseline);
- Configuration 2: Block 1 of the Proposed Development built, with existing site buildings (e.g. the existing stadium, leisure centre, gymnastics club etc.) demolished and existing surrounding buildings;
- Configuration 3: Proposed Development with existing surrounding buildings;
- Configuration 4: Proposed Development with landscaping scheme and wind mitigation measures and existing surrounding buildings

**10.14** Existing landscaping in the surrounding area was included on the models to accurately reflect local wind conditions.

#### Assumptions and Limitations

**10.15** The assessment of the interim demolition and construction configuration has been undertaken qualitatively, as it is assumed that the demolition and construction site will constantly be changing. It is expected that conditions at the site will gradually develop from the baseline conditions (as set out in in Configuration 1, through to Configuration 2, and to the completed Proposed Development in Configuration 3).

**10.16** With the exception of potential future Block 1 occupants (Configuration 2), it is assumed that access to the remainder of the site will be limited to site workers during the demolition and construction phase, and any health and safety risks to these individuals will have been identified and mitigated appropriately prior to work commencing.

<sup>1</sup> Lawson, 2001. *Building Aerodynamics*. Imperial College Press.

- 10.17** The effects of construction equipment, such as cranes or other temporary structures, have not been assessed as they are outside the scope of this assessment.
- 10.18** The wind tunnel model included the surrounding buildings and all relevant features with regards to wind flow, up to a distance of 360m from the centre of the site. A photograph of the wind tunnel model is shown in Figure 10.1; more photographs are included within *ES Volume 3, Appendix: Wind Microclimate – Annex 2*.
- 10.19** The wind assessment is based upon historical meteorological data for Heathrow and London City airports that has been adjusted to the terrain exposure of the site. The selection of measurement locations covers the ground, podium and balcony levels across the site, in areas where wind acceleration could be expected and in areas designed for more inactive pedestrian use. The assessment takes into account the wind conditions for all wind directions.
- 10.20** The existing landscaping (trees) located off-site, to the south of the site, was included as part of the wind tunnel model during the testing of the mitigation measures. Should the condition of these trees materially change at any point in the future, the wind microclimate around the south of the Blocks 4 and 5 of the Proposed Development would likely change. It is RWDI's professional opinion that if these trees are materially affected, further wind tunnel testing should be conducted to understand the potential impact and resultant effect that this would have on the wind microclimate around the Proposed Development, and to ensure that the Proposed Development has wind conditions suitable for the intended uses.

### *Wind Tunnel Testing and Model Details*

- 10.21** A 1:300 scale model of the Proposed Development and existing buildings surrounding the site (within a 360m radius of the centre of the site) was constructed and tested in the wind tunnel. Up to 242 probe locations (numbered up to 243) were instrumented, at ground, podium and balcony levels of the Proposed Development.
- 10.22** The methodology followed for quantifying the pedestrian level wind environment is outlined below:
- Step 1: Measure the building-induced wind speeds at pedestrian level in the wind tunnel;
  - Step 2: Adjust standard meteorological data to account for conditions at the site;
  - Step 3: Combine these to obtain the expected frequency and magnitude of wind speeds at pedestrian level; and
  - Step 4: Compare the results with the Lawson Comfort Criteria to 'grade' conditions on and around the site.

### *Simulation of Atmospheric Winds*

- 10.23** Wind is unsteady, or gusty, and this 'gustiness' or turbulence, varies depending upon the site. Modelling these effects is achieved by a series of spire and floor roughness elements to create a boundary layer that is representative of urban conditions for the site. The detailed proximity model around the site is used to fine-tune the flow and create conditions similar to those expected at full scale. These features can be seen in the background of Figure 10.1.

### *Measurement Technique*

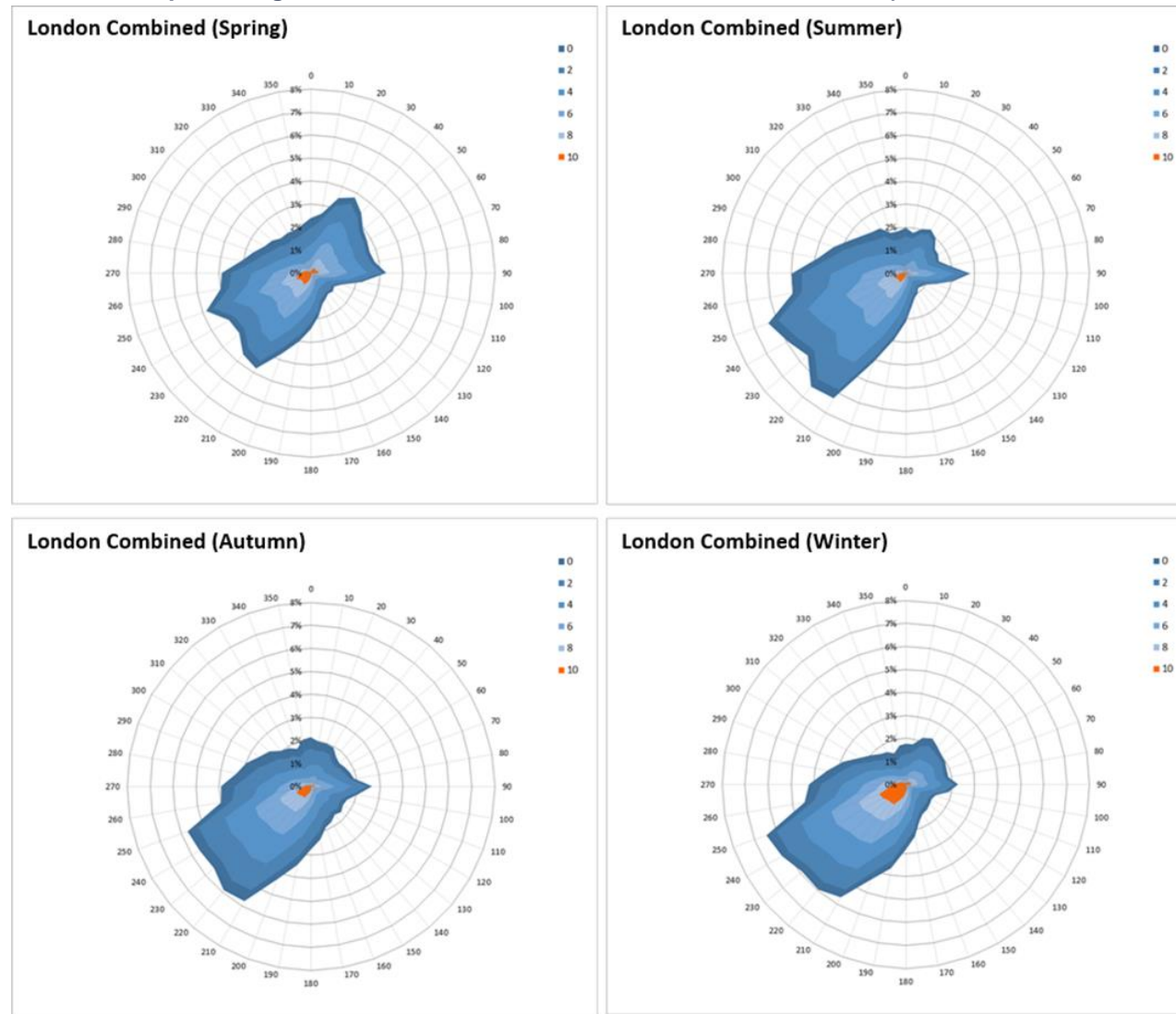
- 10.24** Wind speed measurements are made using Irwin probes, which measure the wind speed at a scaled 1.5m vertical height above the ground. For pedestrian comfort studies, both the mean and peak wind speeds were determined at each measurement location.
- 10.25** The wind speed was measured at 98 locations for the existing baseline situation, 185 locations for the scenario with Block 1 only completed (Configuration 2), 242 locations for the Proposed Development, with and without landscaping, scenarios (Configurations 3 and 4). All configurations were tested for all wind directions in equal increments, with 0° representing wind blowing from the north and 90° wind from the east. The locations measured included potential entrances, amenity spaces and thoroughfares within and around the Proposed Development, as well as off-site locations surrounding the site. Measurement receptors were included at the terrace, and balcony levels of the Proposed Development, and at the ground level for the existing site and the Proposed Development.
- 10.26** The Met Office supply joint frequency tables of wind speeds divided into ranges of the Beaufort scale, and direction on a monthly and annual basis for 30° sectors around the compass. RWDI has an extensive database of meteorological data from a range of meteorological stations around the U.K. The frequency of winds of various strengths for standard reference conditions (10m height in open flat level country terrain at sea level) is shown in Figure 10.2 for spring (March, April and May), summer (June, July and August), autumn (September, October and November) and winter (December, January and February). Meteorological data from

the meteorological stations located at Heathrow and London City airports has been adjusted to accurately reflect the wind microclimate conditions present at the site. The prevailing south-westerly quadrant accounts for the most frequent winds for this study.

**Figure 10.1** Proposed Development Model in the Wind Tunnel



Figure 10.2 Seasonal wind roses from London Combined (in m/s) - (Radial axis indicates the percentage of time for which the stated threshold is exceeded)



10.27 The meteorological station data, as summarised in Table 10.1, is adjusted to the site conditions using the methodology implemented in ESDU 01008<sup>2</sup>, to model the effects of terrain roughness on the wind speed characteristics.

Table 10.1 Site Meteorological Data Adjusted to 120m

Degrees	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
Mean Factor	1.25	1.25	1.25	1.29	1.30	1.30	1.30	1.28	1.26	1.26	1.26	1.25

*Pedestrian Wind Comfort Criteria*

10.28 The assessment of wind conditions requires a 'standard' against which to benchmark the microclimate. The Lawson Comfort Criteria have been established for some thirty years and have been widely used on building developments across the United Kingdom (UK).

10.29 Lawson devised a scale for assessing the suitability of wind conditions in the built environment. The Lawson Comfort Criteria (set out in Table 10.2) define a range of pedestrian activities from sitting through to more

transient activities such walking along a thoroughfare; for each activity, a threshold wind speed and frequency of occurrence beyond which the wind environment would be unsuitable for the stated activity is defined.

10.30 The criteria reflect the fact that sedentary activity, such as sitting, requires a low wind speed whereas, for more transient activity (such as walking), pedestrians would tolerate stronger winds.

10.31 If the wind conditions exceed the threshold relative to an activity considered, then the conditions are unacceptable for the stated activity. If the wind conditions are below the threshold then they are described as tolerable (or suitable) for the stated activity.

Table 10.2 Lawson Comfort Criteria

Colour	Comfort Category	Wind Speed	Descriptor
Red	Uncomfortable	>10 m/s	Winds of this magnitude are considered a nuisance for most activities, and wind mitigation is typically recommended.
Magenta	Walking	8-10 m/s	Relatively high wind speeds that can be tolerated if the objective is to walk, run or cycle without lingering.
Yellow	Strolling	6-8 m/s	Moderate breezes that would be appropriate for strolling along a city/town centre street, plaza or park.
Light Blue	Standing/entrances	4-6 m/s	Gentle breezes suitable for main building entrances, pick-up/drop-off points and bus stops.
Light Green	Sitting	0-4 m/s	Light breezes desired for outdoor restaurants and seating areas where one can read a paper or comfortably sit for long periods.

*Target Wind Conditions*

10.32 For a mixed-use urban site, such as the Proposed Development (and surrounding area), the desired wind microclimate would typically need to have areas suitable for sitting, standing and strolling use.

10.33 Wind conditions classified as acceptable for walking, although not desirable for general thoroughfare use, could be acceptable for sidewalks and pathways when pedestrians are not expected to linger, in other words, where pedestrians would be expected to be 'walking with purpose'.

*Amenity Areas*

10.34 The target conditions in seating areas is a wind microclimate that is suitable for sitting in the summer months. This is because these areas are more likely to be frequently used by pedestrians who would expect to be able to sit comfortably in the summer.

10.35 A mix of wind conditions suitable for sitting and standing use during summer season could be considered acceptable for large mixed-use amenity spaces, including both public realm and private communal areas. However, designated seating areas would require sitting use wind conditions during the summer season.

10.36 Balcony locations would tolerate standing conditions in the summer as these are private amenity areas and no designated seating will be provided; it is expected that residents will use the space as they wish.

*Entrances*

10.37 Near building entrances, a wind environment suitable for standing or calmer is required, as pedestrians will transition from the calm indoors to the windier outdoors throughout the year. The assessment of building entrances, therefore, focuses on the windiest season results.

10.38 At fire escapes, maintenance entrances and back of house entrances, strolling conditions would be considered tolerable.

*Thoroughfares*

10.39 A pedestrian thoroughfare should be suitable for strolling during the windiest season. The assessment of pedestrian thoroughfares therefore focuses on the windiest season results.

10.40 Localised occurrence of walking conditions may be tolerable in areas with limited footfall, or service areas, as long as the strong wind criteria (described below) is not exceeded. Walking conditions would be tolerable on a

<sup>2</sup> ESDU International, Computer program for wind speeds and turbulence properties: flat or hilly sites in terrain with roughness changes, ESDU 01008, 2001 01008

thoroughfare, only if there is no reason for a pedestrian to linger (as per the definitions in Table 10.2), such as in the middle of a road crossing. Otherwise, the target condition would be strolling use wind conditions.

*Strong Winds*

**10.41** The assessments undertaken also provide a notification of stronger winds as specified by Lawson, which are defined as wind speeds in excess of 15 m/s for more than 0.025% of the time (approximately two hours of the year). Strong winds are assessed on an annual basis; however, the greatest proportion of the total can generally be attributed to the windiest season (most commonly winter in the UK).

**10.42** Exceedance of the 15 m/s threshold indicates a safety issue for certain members of the population and the need for remedial measures and careful assessment of the expected use of the location in question; e.g. is it reasonable to expect elderly or very young pedestrians to be present at the location on the windiest day of the year? Wind speeds that exceed 20 m/s for more than 0.025% of the time (approximately two hours of the year) represent a safety issue for all members of the population, which would require mitigation to provide an appropriate wind environment.

**10.43** Strong winds are generally associated with areas which would be classified by the Lawson Comfort Criteria as being acceptable for 'walking' or as 'uncomfortable'; however, they are occasionally concurrent with areas acceptable for 'strolling' use. In a residential-led urban development, 'walking' and 'uncomfortable' conditions would not usually form part of the 'target' wind environment in terms of pedestrian comfort and would usually require mitigation to reduce the frequency of, or even eliminate, any strong winds.

*Significance Criteria*

**Identification of Receptors and Receptor Sensitivity**

*Existing*

**10.44** The Baseline Conditions section the following sensitive receptors that may be affected by the introduction of the Proposed Development:

- Existing Local Residents;
- Pedestrians on-site and within the surrounding nearby area;
- Visitors and staff at the existing football stadium and leisure centre; and
- Cyclists on the roads within the surrounding area.

**10.45** Probes were added to the wind tunnel models at selected receptor locations as shown in Figures 10.3 and 10.4. Locations considered include roads, off-site pedestrian thoroughfares, and bus stops for the baseline scenario.

*Introduced*

**10.46** Future sensitive receptors introduced to the site by the Proposed Development, would include:

- New residents of the Proposed Development;
- People using the ground level amenity spaces; and
- People using the podium and balcony level amenity spaces.

**10.47** All identified receptors are deemed to be of high impact and high magnitude as any locations with windier conditions than considered comfortable or unsafe conditions will require mitigation. The sensitivity of receptors is related to the intended pedestrian usage at each location, as the important consideration is whether the wind conditions experienced at a particular receptor location are suitable for the intended use at that particular location.

**10.48** Probes were added to the wind tunnel models at selected receptor locations as shown in Figures 10.3 to 10.23. Locations considered include roads, pedestrian thoroughfares, entrance locations, amenity spaces and bus stops for the Proposed Development scenario.

**10.49** The significance criteria used in the assessment of residual and potential effects is based upon the relationship between the desired pedestrian use of a particular area of the Proposed Development, using the categories defined by the Lawson Comfort Criteria and the predicted wind conditions at that location within the Proposed Development. This allows for the assessment to take into account any change in pedestrian activity that might arise as a result of the Proposed Development.

**10.50** A seven-point scale has been used within this assessment to assess the significance of effects, as shown in Table 10.3.

**Table 10.3 Effect Significance Criteria**

Recorded Wind Conditions	Significance of Effect
Wind Conditions are 3-steps calmer than desired	Major Beneficial
Wind Conditions are 2 steps calmer than desired	Moderate Beneficial
Wind Conditions are 1 step calmer than desired	Minor Beneficial
Wind Conditions are similar to those desired	Negligible
Wind Conditions are 1 step windier than desired	Minor Adverse
Wind Conditions are 2 steps windier than desired	Moderate Adverse
Wind Conditions are 3 steps windier than desired	Major Adverse

**10.51** Any adverse effect is 'significant' because it implies that a location, or area, has a wind microclimate that is unsuitable for the desired use of that area. On this basis, effects that are adverse need mitigating. Beneficial effects that are minor, moderate or major in scale are not considered to be significant.

**10.52** For wind, the duration of effects has been defined as follows:

- Short term: up to five years;
- Medium term: five to ten years; and
- Long term: more than ten years.

**10.53** Effects during the construction works are direct, local and short-term (temporary) and reversible.

**10.54** Effects once the Proposed Development is completed are direct, local and long-term (permanent) and irreversible unless there is a change in the Proposed Development's massing on the site or the local wind microclimate.

**10.55** Strong winds (affecting pedestrian safety) are not included within this scale of effect assessment but are reported separately as any strong wind exceedance is significant and cannot be scaled to major/moderate/minor. Where strong winds occur, mitigation is required (as per adverse effects related to pedestrian comfort).

*On-Site Results*

**10.56** The adopted scale and nature of effects significance criteria (shown in Table 10.3) is a logical comparison of the measured wind environment with the desired wind environment. An adverse effect implies that a location has a wind environment that is unsuitable for its intended use. It should be noted that all adverse effects are considered to be a significant effect and would, therefore, require mitigation; beneficial effects are not considered to be significant and therefore do not require mitigation.

**10.57** The minor, moderate and major categories (scale of effect criteria, as shown in Table 10.3) indicate the severity of the difference between the desired microclimate and the measured microclimate. As an example, if the desired wind conditions at a particular location are required to be suitable for standing, but the predicted wind conditions are suitable for strolling, the difference between the desired and predicted wind condition is one category windier than desired. In this case, the significance of the effect would be identified as minor adverse. Any adverse effect would be considered significant in EIA terms, which is material to the planning decision process because it implies that a location, or area, has a wind microclimate that is unsuitable for the desired use of that area.

*Off-Site Results*

**10.58** Based on the results of the wind tunnel testing and taking the baseline conditions into consideration, the likely effect at particular locations off-site will also be determined.

**10.59** Should an off-site location be windier than required for the intended use with the Proposed Development in situ, but these wind conditions also occur in the baseline (existing scenario), this would represent a negligible effect.

- 10.60** Off-site locations can only be deemed to have a beneficial effect if the wind conditions have been made better because of the Proposed Development. This means, if the wind conditions are calmer than required in both the baseline and the complete and operational Proposed Development scenarios, this would represent a negligible effect.
- 10.61** If off-site wind conditions have been made worse because of the Proposed Development, but still acceptable for the intended pedestrian usage, this would also represent a negligible effect.
- 10.62** Where wind conditions are suitable for the intended use in the Baseline scenario and become windier than required with the Proposed Development in situ, the significant effect is as discussed for on-site locations (and shown in Table 10.3).

### BASELINE CONDITIONS

#### *Baseline (Configuration 1)*

- 10.63** The current baseline at the site tested in Configuration 1, comprises the existing stadium, leisure centre, gymnastics club and their associated buildings with the existing surrounding buildings in place. The wind assessment for the baseline has been determined by the existing meteorological data for the region and the detailed wind microclimate around the site.

#### *Baseline Wind Conditions*

- 10.64** The baseline wind tunnel test results are graphically shown in Figure 10.3 and Figure 10.4 for the windiest and the summer seasons, respectively. The wind microclimate is relatively calm at most of the 98 locations tested:
- 13 locations would be suitable for sitting during the windiest season (Figure 10.3);
  - 82 locations would be suitable for standing/entrance use during the windiest season; and
  - 3 locations would be suitable for strolling use during the windiest season.
- 10.65** During the summer (when wind conditions would be the same or calmer, the conditions would be suitable for sitting (at 60 probe locations) or standing (at 36 probe locations) at all receptor locations.
- 10.66** The wind conditions in the baseline scenario were assessed with no landscaping.

#### *Thoroughfares*

- 10.67** Pedestrian off-site thoroughfare use is represented by probe locations 71, 72, 82-84, 86, 87, 88, 100-105, 111-114, 116, and 119.
- 10.68** On-site thoroughfares are represented by probe locations 14, 16, 28, 29, 35-40, 42, 43, 44, 46, 54, 58, 70, 98, 117, 118, 121, 125, 126, 136, 138, 141, 144, 149-152, 154, 156 and 161.
- 10.69** Probe locations 7, 8, 18-20, 122-124, and 158-160 represent car parking areas within the site.
- 10.70** Probe locations 72,103,116 and 119 are located off-site on roads which would be accessible to pedestrians and cyclists.
- 10.71** Wind conditions at thoroughfares are suitable for sitting use to strolling use in the windiest season. Therefore, all thoroughfares are suitable for the intended use in the existing scenario.

#### *Bus Stops*

- 10.72** There is a single bus stop located on-site represented by probe location 120 with conditions suitable for intended use all year round.

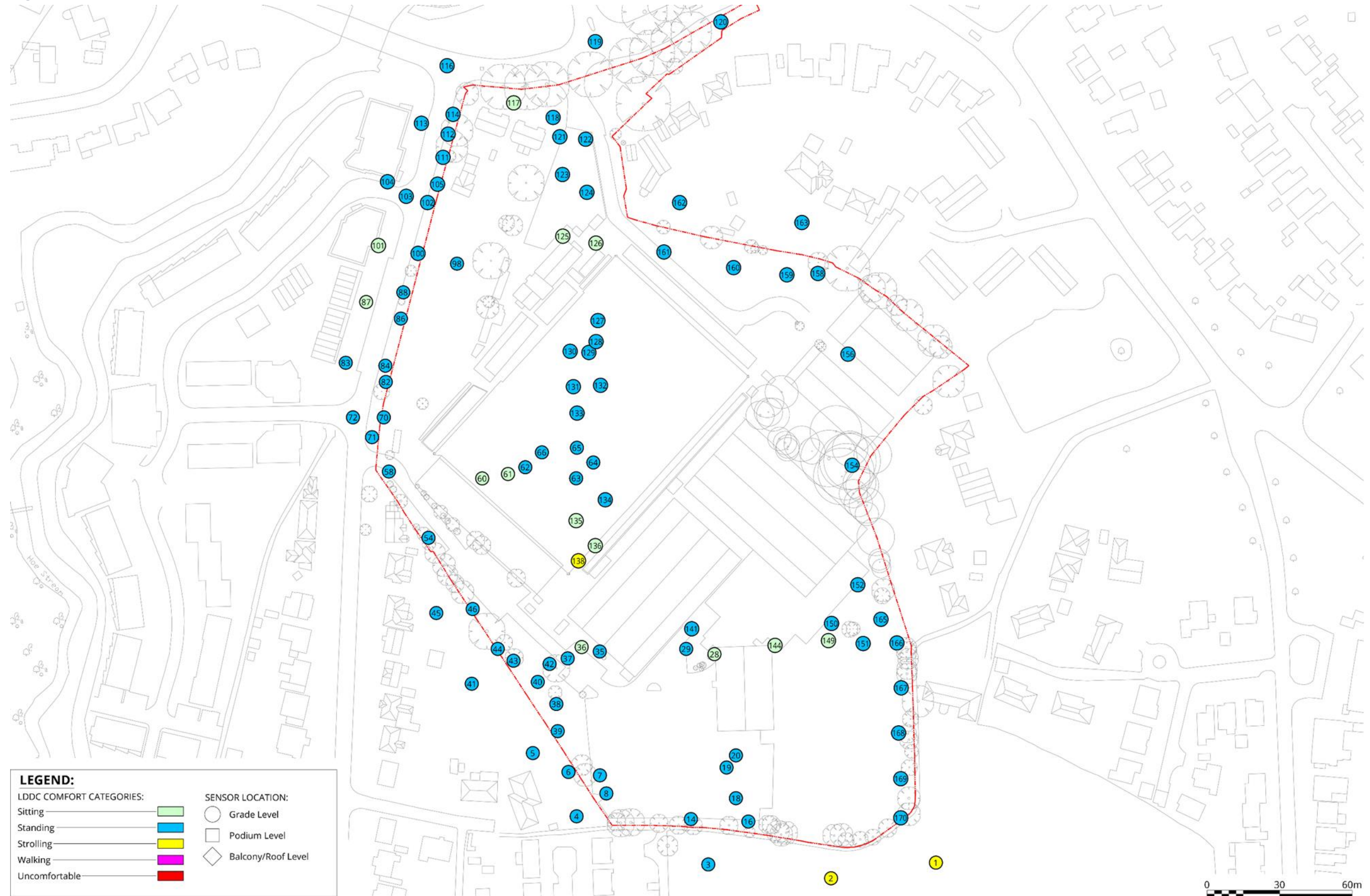
#### *Amenity Areas*

- 10.73** Off-site amenity areas are represented by probe locations 1-6, 41, 45, 162, and 163.
- 10.74** On-site amenity areas are represented by probe locations 60-66, 127-135 and 165-170.
- 10.75** All on and off-site amenity areas have wind conditions suitable for standing or sitting during the summer season making them suitable for intended use.

#### *Strong Winds*

- 10.76** There are no instances of strong winds exceeding the 15m/s safety threshold, either off-site or on-site, in the baseline scenario.

Figure 10.3 Existing Site with Existing Surrounding Buildings at Ground Floor for Windiest Season



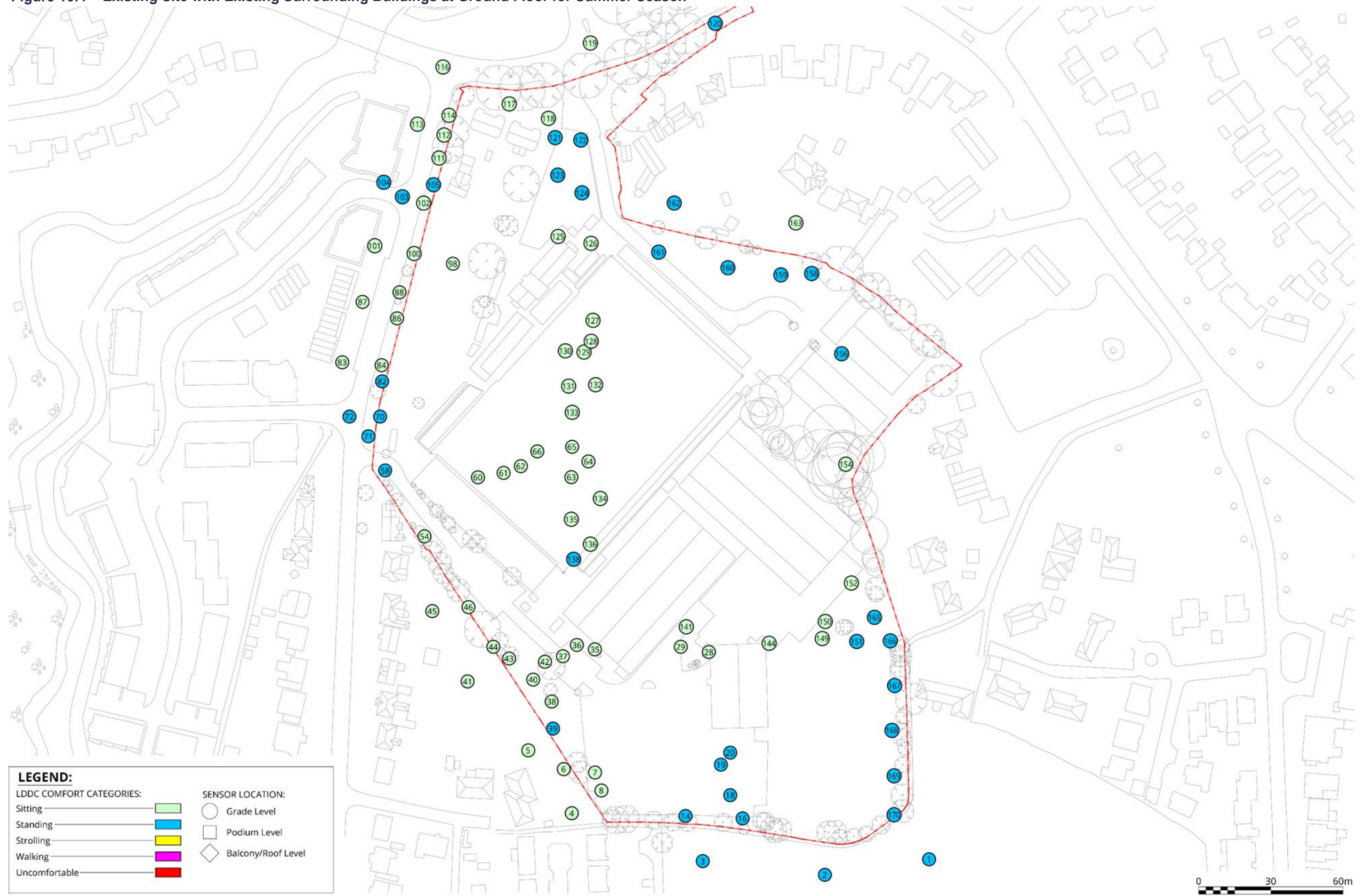
**LEGEND:**

<b>LDDC COMFORT CATEGORIES:</b>		<b>SENSOR LOCATION:</b>	
Sitting	<span style="color: lightgreen;">■</span>	○ Grade Level	
Standing	<span style="color: blue;">■</span>	□ Podium Level	
Strolling	<span style="color: yellow;">■</span>	◇ Balcony/Roof Level	
Walking	<span style="color: purple;">■</span>		
Uncomfortable	<span style="color: red;">■</span>		

**Pedestrian Wind Comfort Conditions - Ground Floor and Podium Level**  
 Configuration 1: Existing Site with Existing Surrounding Buildings  
 Windiest Season

True North  Project #1900950	Drawn by: JLF Figure: 3	
	Approx. Scale @A3: 1:1500	
	Date Revised: July. 1, 2019	

Figure 10.4 Existing Site with Existing Surrounding Buildings at Ground Floor for Summer Season

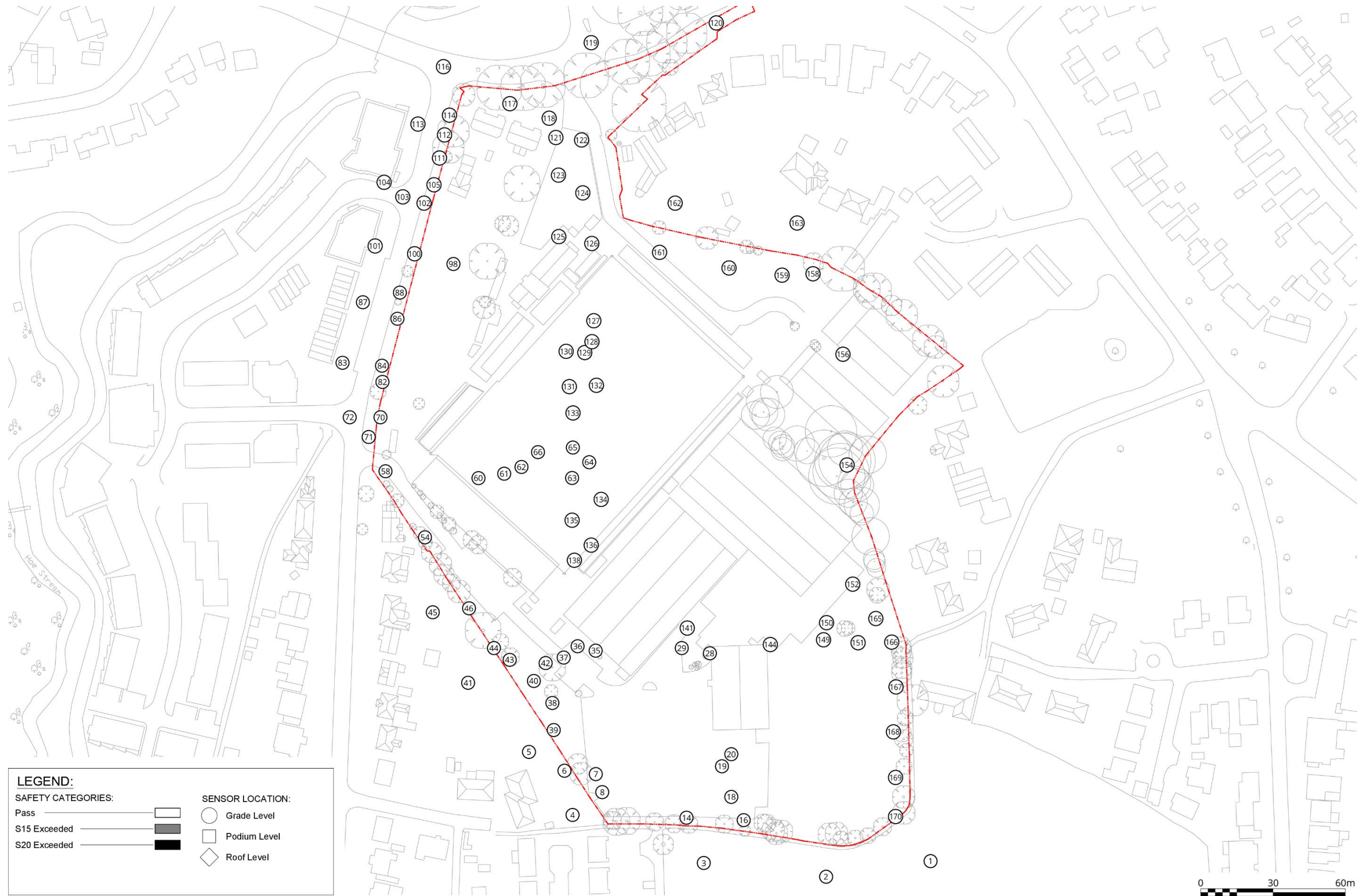


**Pedestrian Wind Comfort Conditions - Ground Floor and Podium Level**  
 Configuration 1: Existing Site with Existing Surrounding Buildings  
 Summer Season

True North 	Drawn by: JLF Figure: 4	
	Approx. Scale @A3: 1:1500	
Project #1900950	Date Revised: July. 1, 2019	



Figure 10.5 Existing Site with Existing Surrounding Buildings Annual Safety



**LEGEND:**

**SAFETY CATEGORIES:**

- Pass
- S15 Exceeded
- S20 Exceeded

**SENSOR LOCATION:**

- Grade Level
- Podium Level
- Roof Level

**Pedestrian Wind Safety Conditions - Ground and Podium Levels**  
 Configuration 1: Existing Site with Existing Surrounding Buildings  
 Annual



Drawn by: JLF Figure: 5  
 Approx. Scale @A3: 1:1500  
 Date Revised: Sept. 18, 2019



Project #1900950

### POTENTIAL EFFECTS

#### *Demolition and Construction (Configuration 2)*

- 10.77** Potential impacts during the demolition and construction of the Proposed Development have been assessed by means of wind tunnel testing of Block 1 of the Proposed Development in the context of the existing surrounds, without any other buildings on-site representing the first phase of construction for the Proposed Development. This configuration has also been modelled devoid of the proposed landscaping scheme so that the measured conditions would be representing a relatively windy worst-case scenario.
- 10.78** It should be noted that subsequent to the wind tunnel testing of this scenario, minor architectural changes were made to Block 1 in the form of canopies installed above entrance locations to the south side of the building and slight massing changes at the south-east corner of the building. These changes would be not be expected to materially change the wind microclimate around Block 1 and therefore the results presented in this report are representative of the wind conditions expected on-site in this scenario.
- 10.79** As construction progresses from Configuration 2 to the complete Proposed Development wind conditions would be expected to gradually change from those presented in Configuration 2 to those in Configuration 3 where effects would range from moderate beneficial to minor adverse. As a result, the mitigation measures developed for the Proposed Development (discussed in Configuration 4) would be required to be in place before Blocks 2 – 5 of the Proposed Development and the proposed stadium become accessible but not before Block 1 is accessible.

#### *Expected Wind Conditions*

- 10.80** The results of the tests undertaken for the ground level and podium/balcony level of the Proposed Development, are graphically shown in Figures 10.6 and 10.7 for the windiest and Figures 10.8 and 10.9 summer seasons respectively. The wind microclimate is relatively calm at most of the 185 locations tested:
- 45 locations would be suitable for sitting use during the windiest season (Figures 10.5 and 10.7).
  - 130 locations would be suitable for standing use during the windiest season; and
  - 10 locations would be suitable for strolling use during the windiest season
- 10.81** During the summer (when wind conditions would be the same or calmer) the conditions would be suitable for sitting (at 113 probe locations) or standing (at 71 probe locations) at all but one receptor location which would have conditions suitable for strolling.

#### *Thoroughfares*

- 10.82** Pedestrian off-site thoroughfare use is represented by probe locations 71, 72, 82-84, 86-88, 100-105, 111-114, 116, and 119.
- 10.83** On-site thoroughfares are represented by probe locations 93, 94, 96, 98, 110, 115, 117, 118, 121, 122, and 124.
- 10.84** Probe locations 72,103,116 and 119 are located off-site on roads which would be accessible to pedestrians and cyclists.

- 10.85** Wind conditions at thoroughfares would be suitable for sitting use to strolling use in the windiest season. Therefore, all thoroughfares would be suitable for the intended use in the existing scenario. This would represent a **negligible to moderate beneficial** effect (not significant).

#### *Entrances*

- 10.86** Entrance locations on site are represented by probe locations 95, 97, 99, 106-109, 123, and 125.
- 10.87** All entrance locations on-site would have wind conditions suitable for sitting or standing use in the windiest season, therefore all entrances are suitable for the intended use with only Block 1 of the Proposed Development built. This would represent a **negligible to minor beneficial** effect (not significant).

#### *Bus Stops*

- 10.88** There is a single bus stop located on-site represented by probe location 120 with conditions suitable for intended use all year round representing a **negligible** effect (not significant).

#### *Amenity Areas*

- 10.89** There are ten ground level amenity spaces off-site represented by probe locations 1-3 (playing fields to the south of site), 4-6, 41, 45 (gardens to the south-west of site), 162 and 163 (gardens to the north of site).
- 10.90** There are also three roof level mixed-use amenity spaces on top of Block 1 of the Proposed Development represented by probe locations 233-235 and 237. Wind conditions would range from suitable for sitting to standing use during the summer season. Given that probe location 235 is not a designated seating area, all locations would be suitable for the intended use. This would represent a **negligible** effect (not significant).

#### *Balconies*

- 10.91** There are six balcony locations represented by probe locations 231, 232, 236, and 238-240 at Block 1 of the Proposed Development. The wind conditions at all six balconies would be suitable for sitting use during the summer season, meaning all balconies would be suitable for the intended use. This would represent a **negligible** effect (not significant).

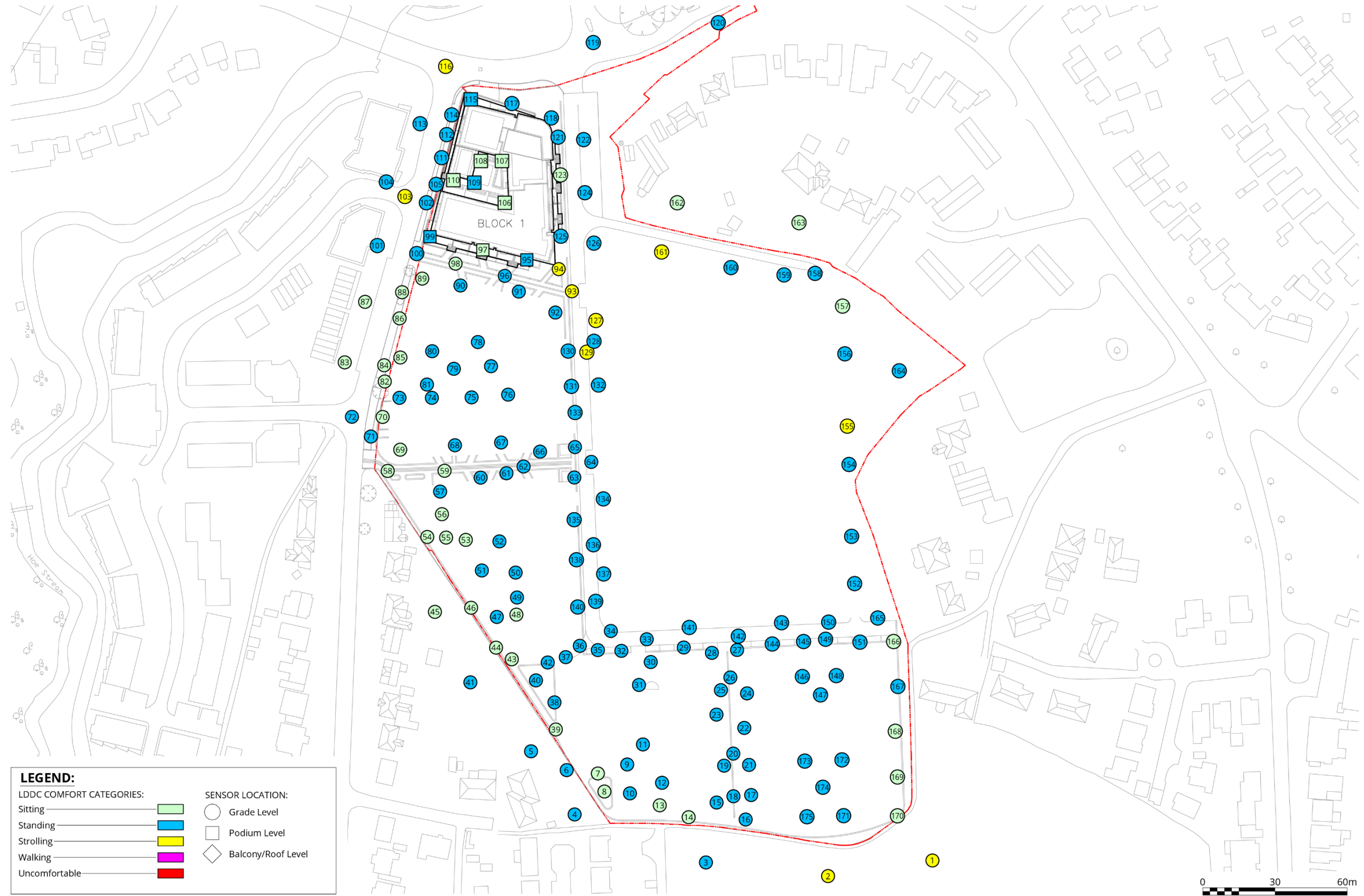
#### *Inaccessible*

- 10.92** As the majority of the site would be a construction site in this configuration, there would be a number of locations that would be considered inaccessible to members of the public, probe locations 7-40, 42-44, 46-70, 73-81, 85, 89-92, 126-161, and 164-175. Wind conditions at these locations would range from suitable for sitting to strolling use during the windiest season making them suitable for the intended use. This would represent a **negligible** effect (not significant).

#### *Strong Winds*

- 10.93** There would be no instances of strong winds exceeding the 15m/s safety threshold anywhere on-site or off-site in Configuration 2 with Block 1 of the Proposed Development built and the Existing Surrounding Buildings (see Figures 10.10 and 10.11).

Figure 10.6 Block 1 of the Proposed Development with Existing Surrounding Buildings at Ground Floor for Windiest Season



**LEGEND:**

**LDDC COMFORT CATEGORIES:**

- Sitting ———— ■
- Standing ———— ■
- Strolling ———— ■
- Walking ———— ■
- Uncomfortable ———— ■

**SENSOR LOCATION:**

- Grade Level
- Podium Level
- ◇ Balcony/Roof Level

**Pedestrian Wind Comfort Conditions - Ground Floor and Podium Level**  
 Configuration 2: Block 1 of the Proposed Development with Existing surrounding Buildings  
 Windiest Season

True North

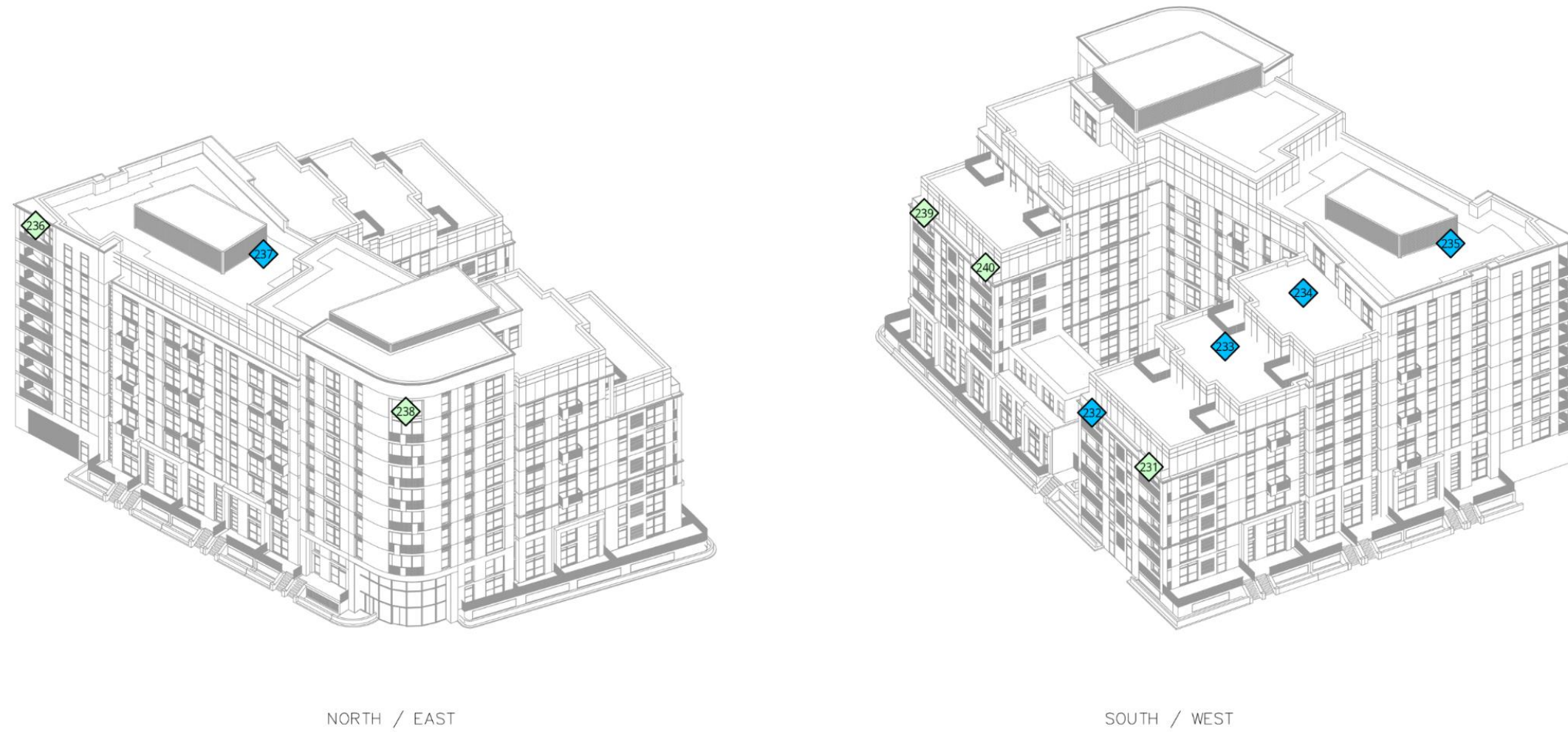
Drawn by: JLF Figure: 6

Approx. Scale @A3: 1:1500

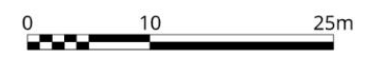
Date Revised: Sept. 18, 2019

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Figure 10.7 Block 1 of the Proposed Development with Existing Surrounding Buildings at Podium and Balcony Levels for Windiest Season

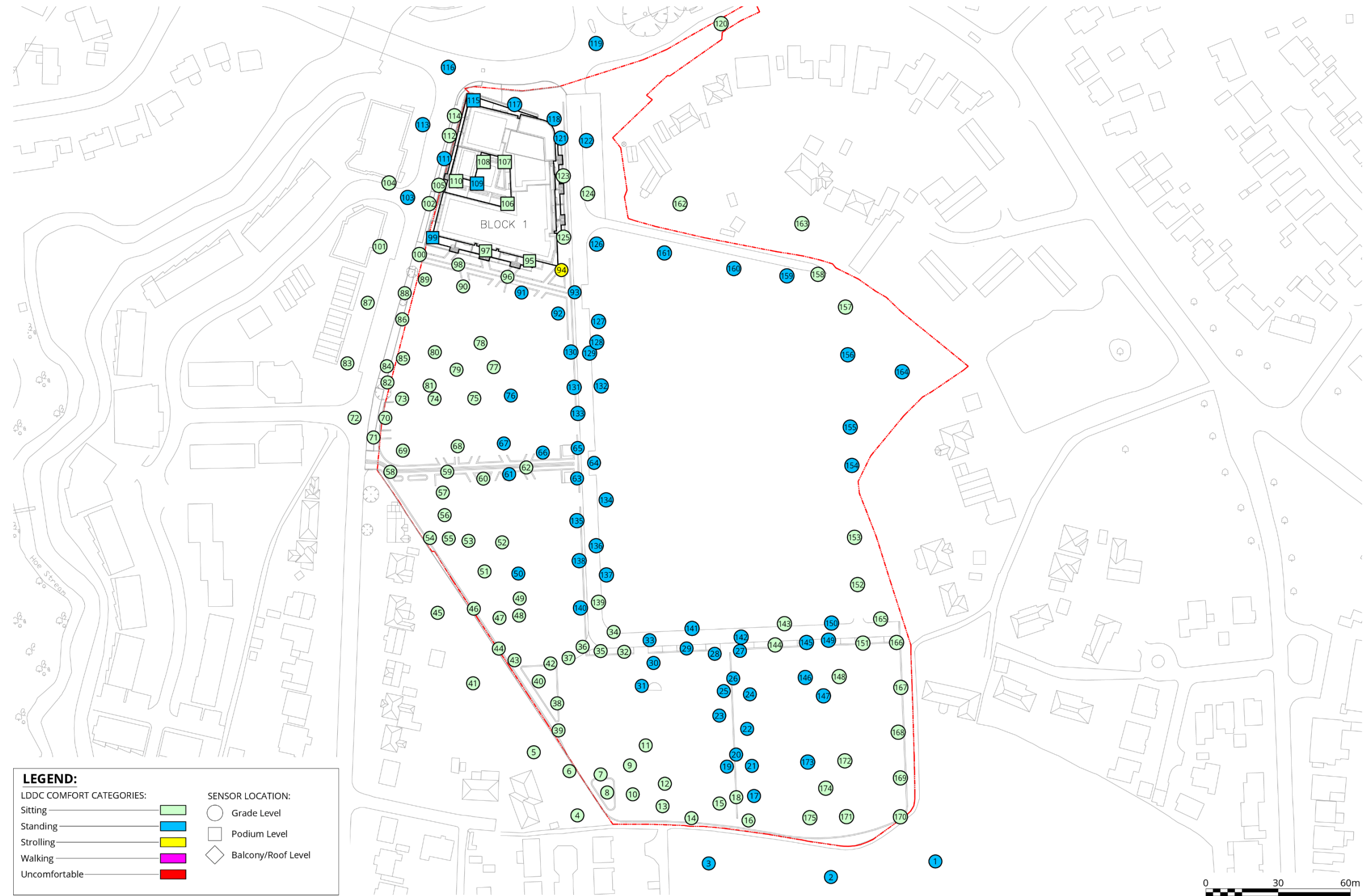


LEGEND:	
LDDC COMFORT CATEGORIES:	
Sitting	<span style="color: green;">■</span>
Standing	<span style="color: blue;">■</span>
Strolling	<span style="color: yellow;">■</span>
Walking	<span style="color: magenta;">■</span>
Uncomfortable	<span style="color: red;">■</span>
SENSOR LOCATION:	
○	Grade Level
□	Podium Level
◇	Balcony/Roof Level



<b>Pedestrian Wind Comfort Conditions - Isometric Views</b> Configuration 2: Block 1 of the Proposed Development with Existing surrounding Buildings Windiest Season  Cai .....	Drawn by: JLF Figure: 7	
	Approx. Scale @A3: 1:600	
	Date Revised: Sept. 18, 2019	

Figure 10.8 Block 1 of the Proposed Development with Existing Surrounding Buildings at Ground Floor for Summer Season



**LEGEND:**

**LDDC COMFORT CATEGORIES:**

- Sitting
- Standing
- Strolling
- Walking
- Uncomfortable

**SENSOR LOCATION:**

- Grade Level
- Podium Level
- Balcony/Roof Level

**Pedestrian Wind Comfort Conditions - Ground Floor and Podium Level**  
 Configuration 2: Block 1 of the Proposed Development with Existing surrounding Buildings  
 Summer Season

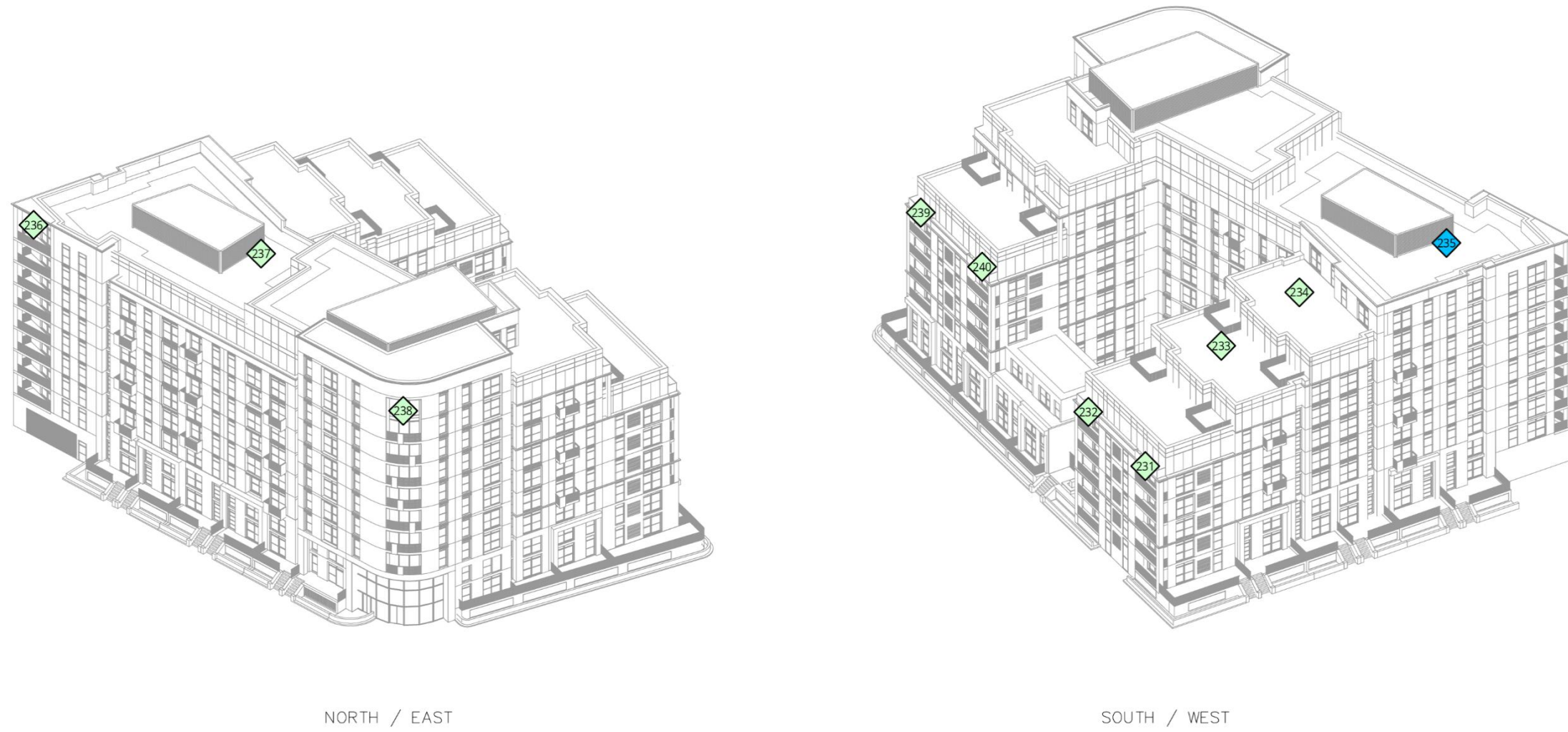
True North

Drawn by: JLF Figure: 8

Approx. Scale @A3: 1:1500

Project #1900950 Date Revised: Sept. 18, 2019

Figure 10.9 Block 1 of the Proposed Development with Existing Surrounding Buildings at Podium and Balcony Levels for Summer Season



**LEGEND:**

LDDC COMFORT CATEGORIES:

- Sitting —
- Standing —
- Strolling —
- Walking —
- Uncomfortable —

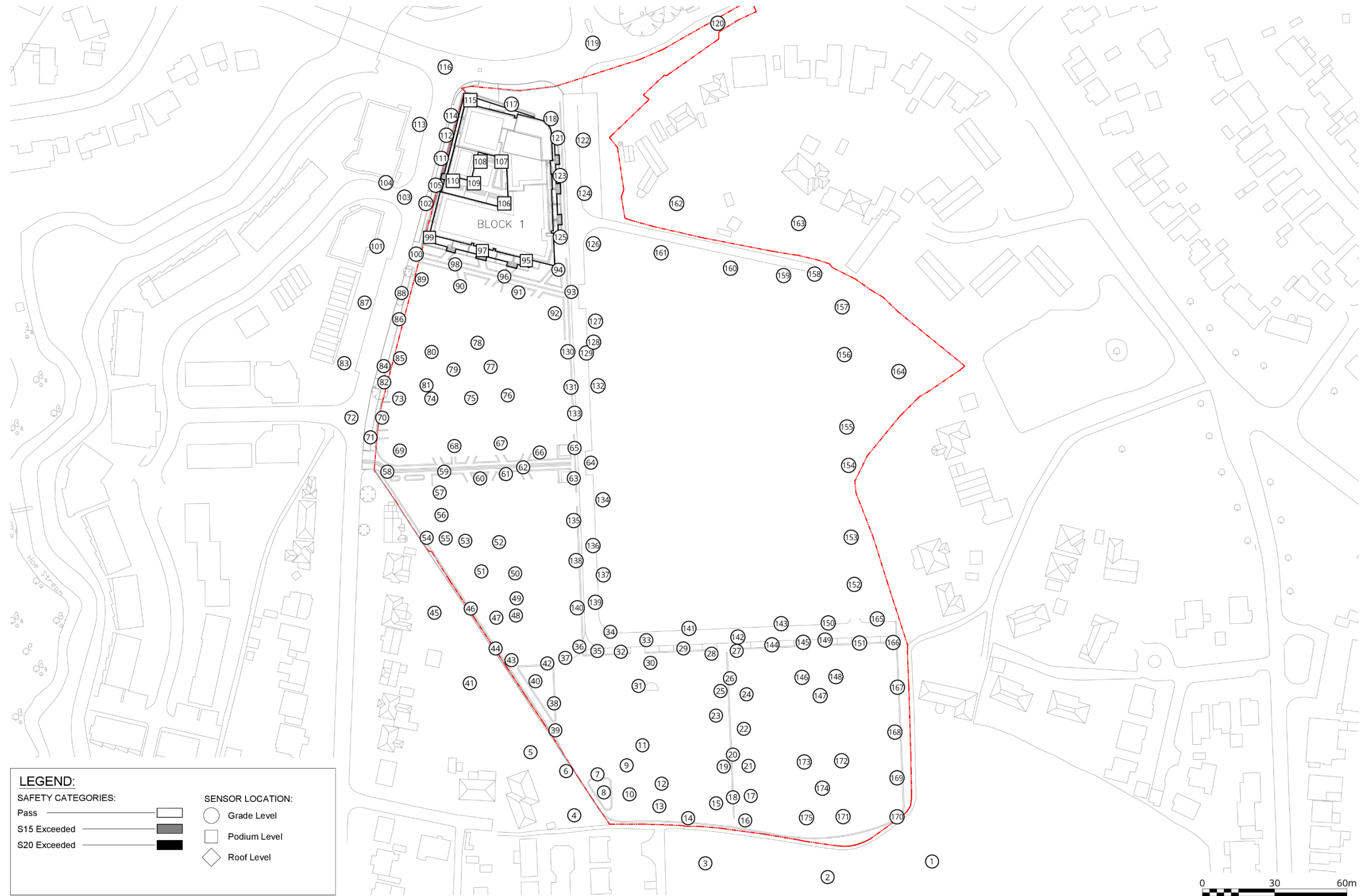
SENSOR LOCATION:

- Grade Level
- Podium Level
- Balcony/Roof Level



<p><b>Pedestrian Wind Comfort Conditions - Isometric Views</b>                  Configuration 2: Block 1 of the Proposed Development with Existing surrounding Buildings                  Summer Season</p>	Drawn by: JLF Figure: 9	
	Approx. Scale @A3: 1:600	
	Date Revised: Sept. 18, 2019	
Project #1900950		

Figure 10.10 Block 1 of the Proposed Development at Ground Floor Annual Safety

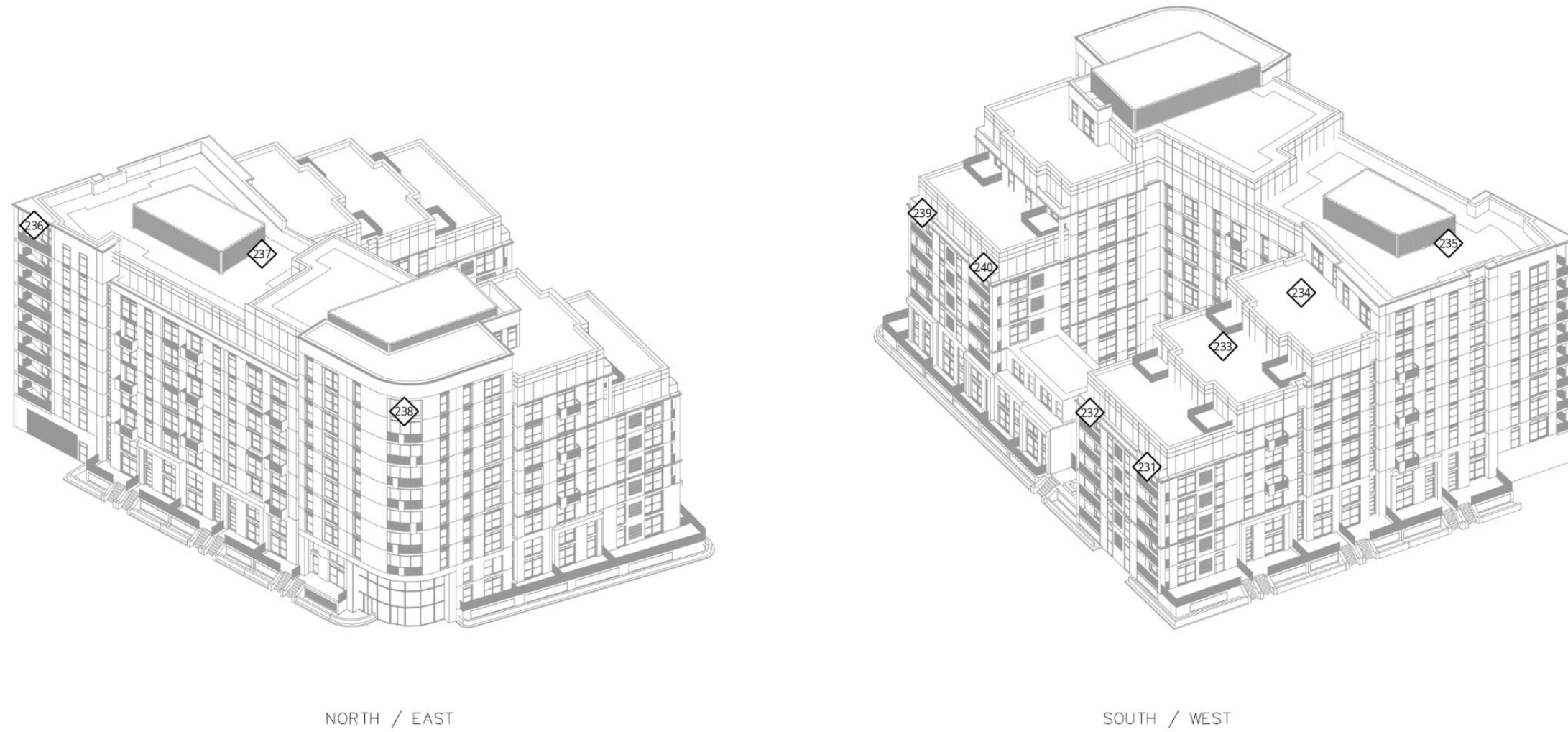


**Pedestrian Wind Safety Conditions - Ground Floor and Podium Level**  
 Configuration 2: Block 1 of the Proposed Development with Existing surrounding Buildings  
 Annual

True North 	Drawn by: JLF	Figure: 10	
	Approx. Scale @A3: 1:1500		
	Date Revised: Sept. 18, 2019		

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Figure 10.11 Block 1 of the Proposed Development at Podium and Balcony Levels Annual Safety



**LEGEND:**

**SAFETY CATEGORIES:**

- Pass
- S15 Exceeded
- S20 Exceeded

**SENSOR LOCATION:**

- Grade Level
- Podium Level
- Roof Level



**Pedestrian Wind Safety Conditions - Isometric Views**  
 Configuration 2: Block 1 of the Proposed Development with Existing surrounding Buildings  
 Annual

Drawn by: JLF	Figure: 11
Approx. Scale @A3: 1:600	
Project #1900950	Date Revised: Sept. 18, 2019





### Proposed Development (Configuration 3)

**10.94** Potential completed development impacts have been determined by means of wind tunnel testing of the scheme in the context of the existing surrounds, without landscaping proposals (Configuration 3) so that the measured conditions would be representing a relatively windy worst-case scenario.

#### Expected Wind Conditions

**10.95** The results of the tests undertaken for the ground level and podium and balcony levels of the Proposed Development, are graphically shown in Figures 10.12 and 10.13 for the windiest and Figures 10.14 and 10.15 for the summer seasons respectively.

**10.96** For Configuration 3, without the proposed landscaping, the wind microclimate at all 242 locations for the windiest season, is summarised as follows:

- 87 locations would be suitable for sitting;
- 119 locations would be suitable for standing use;
- 32 locations would be suitable for strolling; and
- Four locations would be suitable for walking.

**10.97** During the summer (when wind conditions would be the same or calmer) the conditions would be suitable for sitting (143 locations) and standing (91 locations) with eight locations suitable for strolling.

#### Pedestrian Thoroughfares

**10.98** Pedestrian off-site thoroughfare use is represented by locations 71, 72, 82-84, 86-88, 100-105 111-114, 116, and 119.

**10.99** On-site thoroughfares are represented by probe locations 8, 14-16, 18, 20, 26-28, 30, 32-34, 36-40, 43, 44, 46, 47, 54-60, 62-66, 70, 73, 85, 89, 92-94, 96, 98, 110, 115, 117, 118, 121, 122, 124, 126, 127, 129, 132, 136, 137, 139, 142, 145, 149, 150, 152-155, 157-161, 164-166 and 170.

**10.100** Probe locations 72, 103, 116, and 119 are located off-site in a road which would be accessible to pedestrians and cyclists.

**10.101** Almost all thoroughfare locations would have suitable wind conditions during the windiest season, ranging from suitable for strolling use to sitting use. This would represent a **negligible to moderate beneficial** effect (not significant).

**10.102** Four thoroughfare locations (probe locations 62, 96, 126, and 136) would have wind conditions suitable for walking use in the windiest season making them unsuitable for the intended use. This would represent a **minor adverse** effect (significant). These locations would require mitigation measures.

#### Entrances

**10.103** Building entrances to Block 1 of the Proposed Development are represented by probe locations 95, 97, 99, 106-109, 123 and 125.

**10.104** Building entrances to Block 2 of the Proposed Development are represented by probe locations 67-69, 74-76, 78, 80, 90, 91, 130, 131 and 133.

**10.105** Building entrances to Block 3 of the Proposed Development are represented by probe locations 42, 48-50, 52, 53, 61, 135, 138 and 140.

**10.106** Building entrances to Block 4 of the Proposed Development are represented by probe locations 7, 19, 23, 25, 29, and 35.

**10.107** Building entrances to Block 5 of the Proposed Development are represented by probe locations 17, 21, 22, 24, 144, 151, 167-169.

**10.108** Entrances to the proposed stadium are represented by probe locations 128, 134, 141, 143, 156.

**10.109** The majority of entrances on-site would have wind conditions suitable for the intended use, ranging from suitable for standing use to sitting use during the windiest season. These wind conditions would represent a **negligible to minor beneficial** effect (not significant).

**10.110** The exceptions to this at Block 1 of the Proposed Development would be at probe location 95 which would have wind conditions suitable for strolling use during the windiest season.

**10.111** The exceptions to this at Block 2 of the Proposed Development would be at probe locations 67, 91, and 133 which would have wind conditions suitable for strolling use during the windiest season.

**10.112** The exceptions to this at Block 4 of the Proposed Development would be at probe locations 19 and 35 which would have wind conditions suitable for strolling use during the windiest season.

**10.113** The exceptions to this at Block 5 of the Proposed Development would be at probe location 21 which would have wind conditions suitable for strolling use during the windiest season.

**10.114** The exceptions to this at proposed stadium entrances would be at probe locations 128, 134, and 143 which would have wind conditions suitable for strolling use during the windiest season.

**10.115** These wind conditions are one category windier than required for entrance use. This would represent a **minor adverse** effect (significant). These locations would require mitigation measures.

#### Bus Stops

**10.116** There is a single bus stop located on-site represented by probe location 120 with conditions suitable for intended use all year round representing a **negligible** effect (not significant).

#### Amenity Areas

**10.117** Ground level amenity areas are represented by probe locations 9-13, 31, 51, 77, 79, 81 146-148, and 171-175.

**10.118** During the summer season, when amenity areas would be more likely to be used by occupants, visitors and pedestrians, the wind conditions at all of the ground level general amenity areas would range from suitable for sitting use to standing use. Given that there are no designated seating areas at probe locations 9,10, 11, 13, 174 and 175 these wind conditions represent a **negligible** effect (not significant).

**10.119** There are roof level mixed-use amenity spaces on the roofs of all Blocks of the Proposed Development represented by probe locations 186-188, 192-194, 206-211, 215, 216, 218, 219, 229, 230, 233-235, 237, 242 and 243.

**10.120** Wind conditions at the roof level amenity spaces would range from suitable for sitting to standing use during the summer season making all locations suitable for the intended use. Given that there are no designated seating areas at probe locations 186, 188, 192, 193, 206-209, 218, 234, 235, 242, and 243, these wind conditions would represent a **negligible** effect (not significant).

#### Balconies

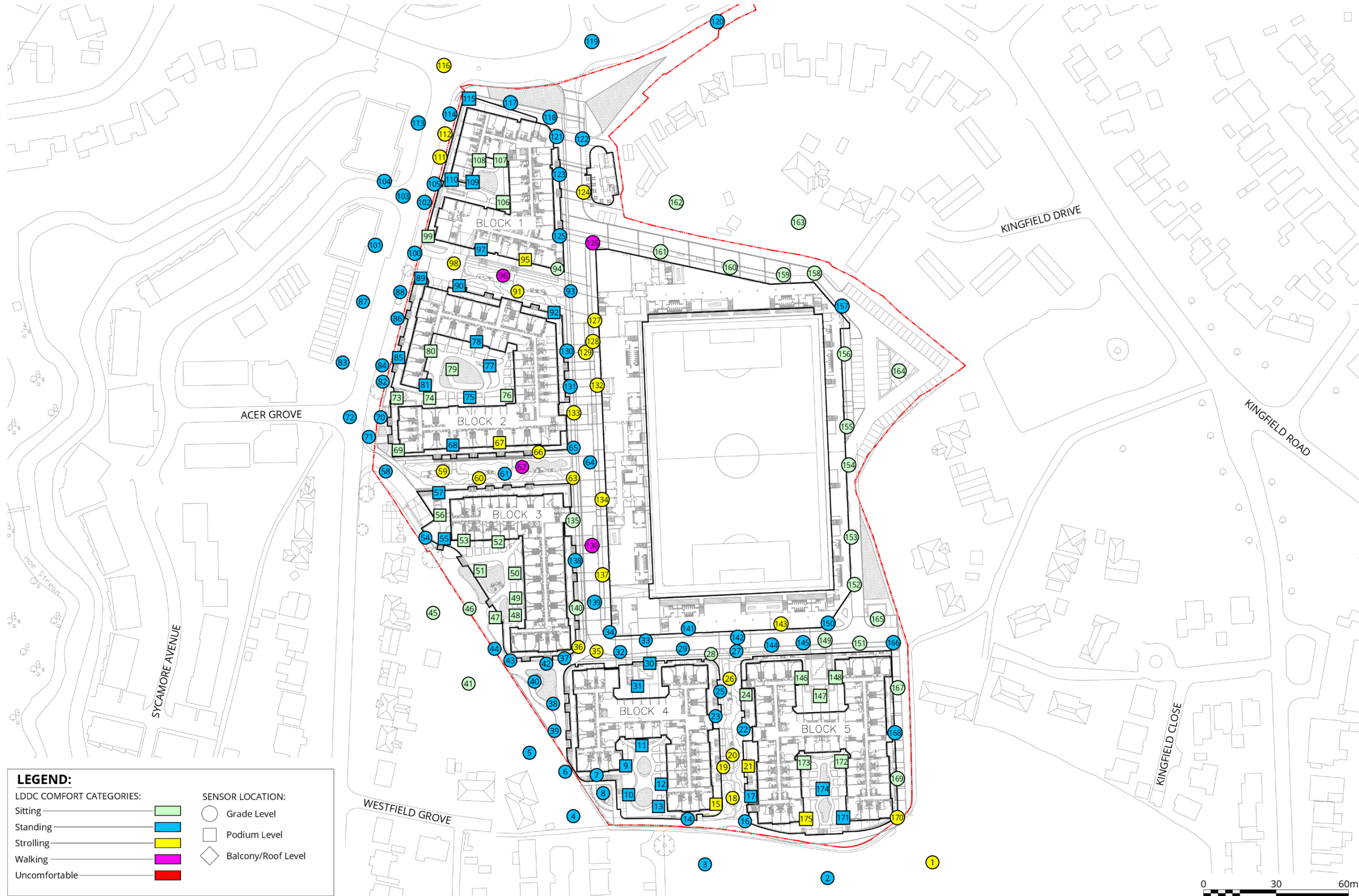
**10.121** Balconies around the Proposed Development are represented by probe locations 176-185, 189-191, 195-199, 201-205, 212-214, 217, 220-228, 231, 232, 236, and 238-241.

**10.122** Wind conditions at all the balconies around the site, with the Proposed Development in place, would range from suitable for standing use to sitting use during the summer season making them suitable for the intended use. This would represent a **negligible** effect (not significant).

#### Strong Winds

**10.123** There would be two instances of strong winds exceeding the 15m/s safety threshold on-site, at the north-west corner of the proposed stadium and along a thoroughfare to the east of the proposed stadium, at probe locations 126 and 136, for 6.4 and 3.3 hours per year respectively (see Figures 10.16 and 10.17). These locations would require mitigation measures before they become accessible to the public.

Figure 10.12 Proposed Development with Existing Surrounding Buildings at Ground Floor for Windiest Season



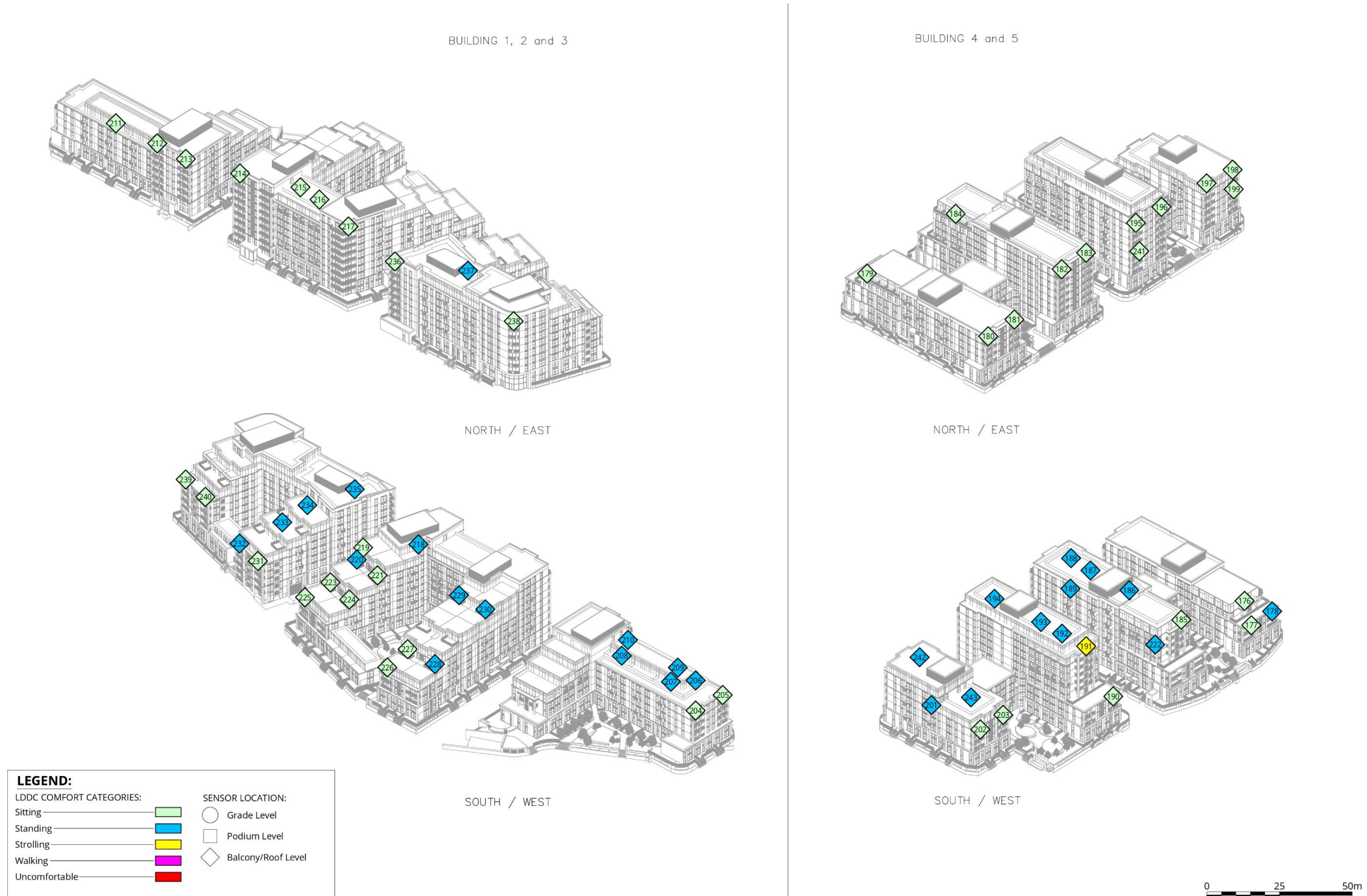
**LEGEND:**

<b>LDDC COMFORT CATEGORIES:</b>	<b>SENSOR LOCATION:</b>
Sitting — <span style="display:inline-block; width:15px; height:10px; background-color:#90EE90; border:1px solid black;"></span>	○ Grade Level
Standing — <span style="display:inline-block; width:15px; height:10px; background-color:#ADD8E6; border:1px solid black;"></span>	□ Podium Level
Strolling — <span style="display:inline-block; width:15px; height:10px; background-color:#FFFF00; border:1px solid black;"></span>	◇ Balcony/Roof Level
Walking — <span style="display:inline-block; width:15px; height:10px; background-color:#FF00FF; border:1px solid black;"></span>	
Uncomfortable — <span style="display:inline-block; width:15px; height:10px; background-color:#FF0000; border:1px solid black;"></span>	

**Pedestrian Wind Comfort Conditions - Ground Floor and Podium Level**  
 Configuration 3: Proposed Development with Existing Surrounding Buildings  
 Windiest Season

True North 	Drawn by: JLF Figure: 12	
	Approx. Scale @A3: 1:1500	
Project #1900950	Date Revised: Sept. 18, 2019	

Figure 10.13 Proposed Development with Existing Surrounding Buildings at Podium and Balcony Levels for Windiest Season



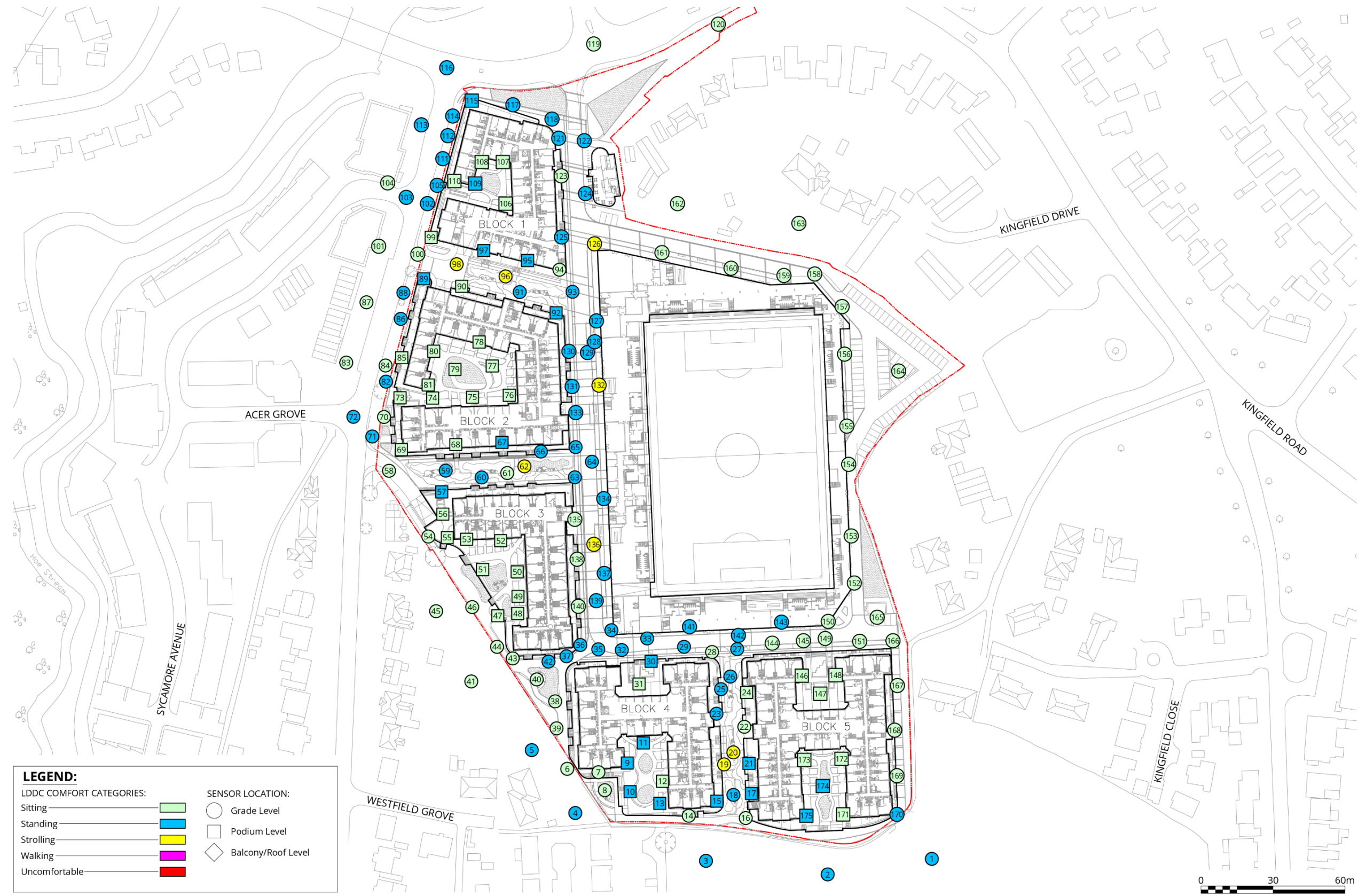
**Pedestrian Wind Comfort Conditions - Isometric Views**  
 Configuration 3: Proposed Development with Existing Surrounding Buildings  
 Windiest Season

Drawn by: JLF Figure: 13  
 Approx. Scale @A3: 1:1250  
 Date Revised: Sept. 18, 2019



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Figure 10.14 Proposed Development with Existing Surrounding Buildings at Ground Floor for Summer Season



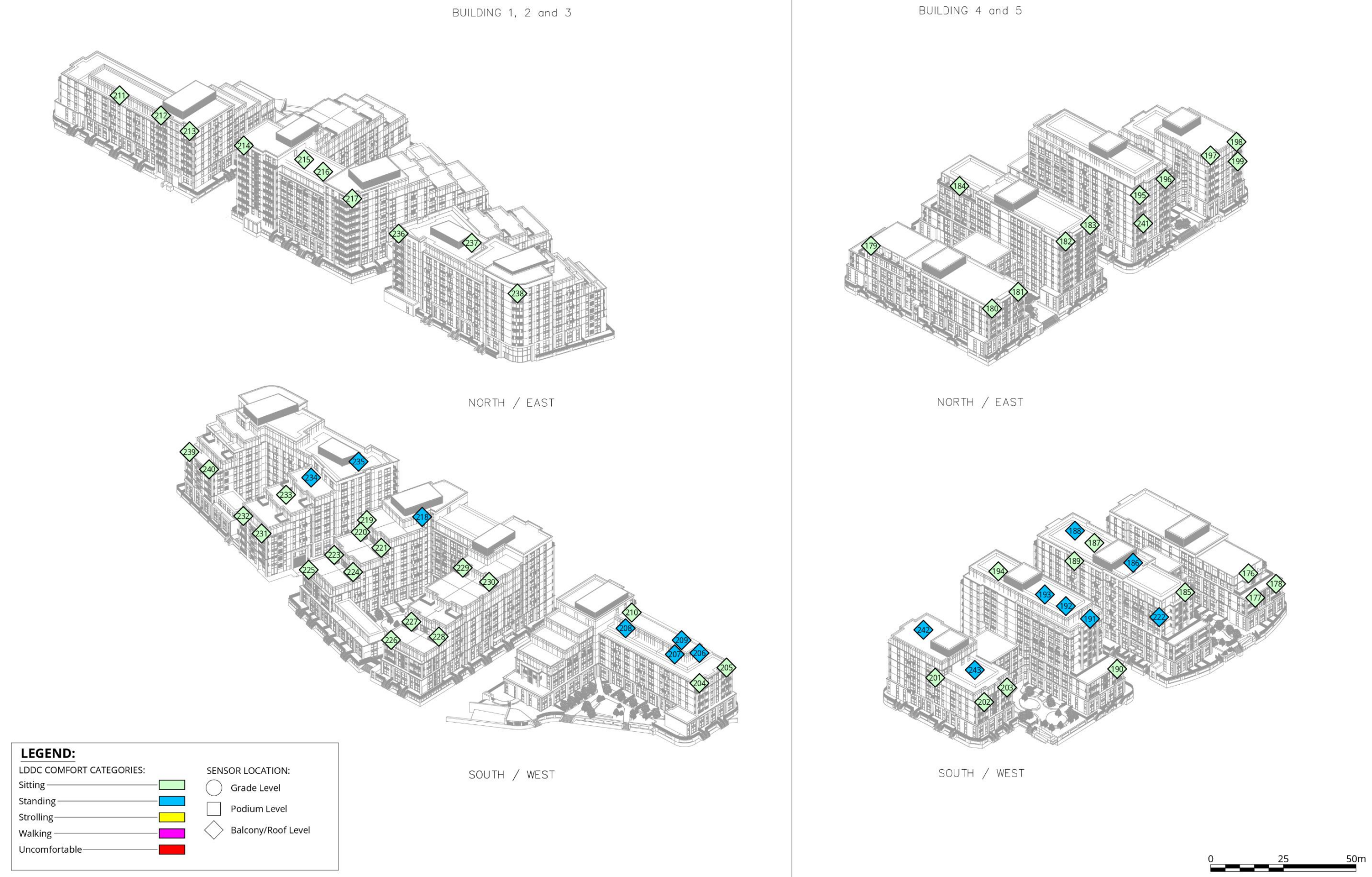
**LEGEND:**

<b>LDDC COMFORT CATEGORIES:</b>		<b>SENSOR LOCATION:</b>	
Sitting	<span style="display:inline-block; width:15px; height:15px; background-color:#90EE90; border:1px solid black;"></span>	Grade Level	<span style="display:inline-block; width:15px; height:15px; border:1px solid black; border-radius:50%;"></span>
Standing	<span style="display:inline-block; width:15px; height:15px; background-color:#66B3FF; border:1px solid black;"></span>	Podium Level	<span style="display:inline-block; width:15px; height:15px; border:1px solid black;"></span>
Strolling	<span style="display:inline-block; width:15px; height:15px; background-color:#FFFF00; border:1px solid black;"></span>	Balcony/Roof Level	<span style="display:inline-block; width:15px; height:15px; border:1px solid black; border-radius:50%;"></span>
Walking	<span style="display:inline-block; width:15px; height:15px; background-color:#FF00FF; border:1px solid black;"></span>		
Uncomfortable	<span style="display:inline-block; width:15px; height:15px; background-color:#FF0000; border:1px solid black;"></span>		

**Pedestrian Wind Comfort Conditions - Ground Floor and Podium Level**  
 Configuration 3: Proposed Development with Existing Surrounding Buildings  
 Summer Season

True North 	Drawn by: JLF Figure: 14	
	Approx. Scale @A3: 1:1500	
Project #1900950	Date Revised: Sept. 18, 2019	

Figure 10.15 Proposed Development with Existing Surrounding Buildings at Podium and Balcony Levels for Summer Season



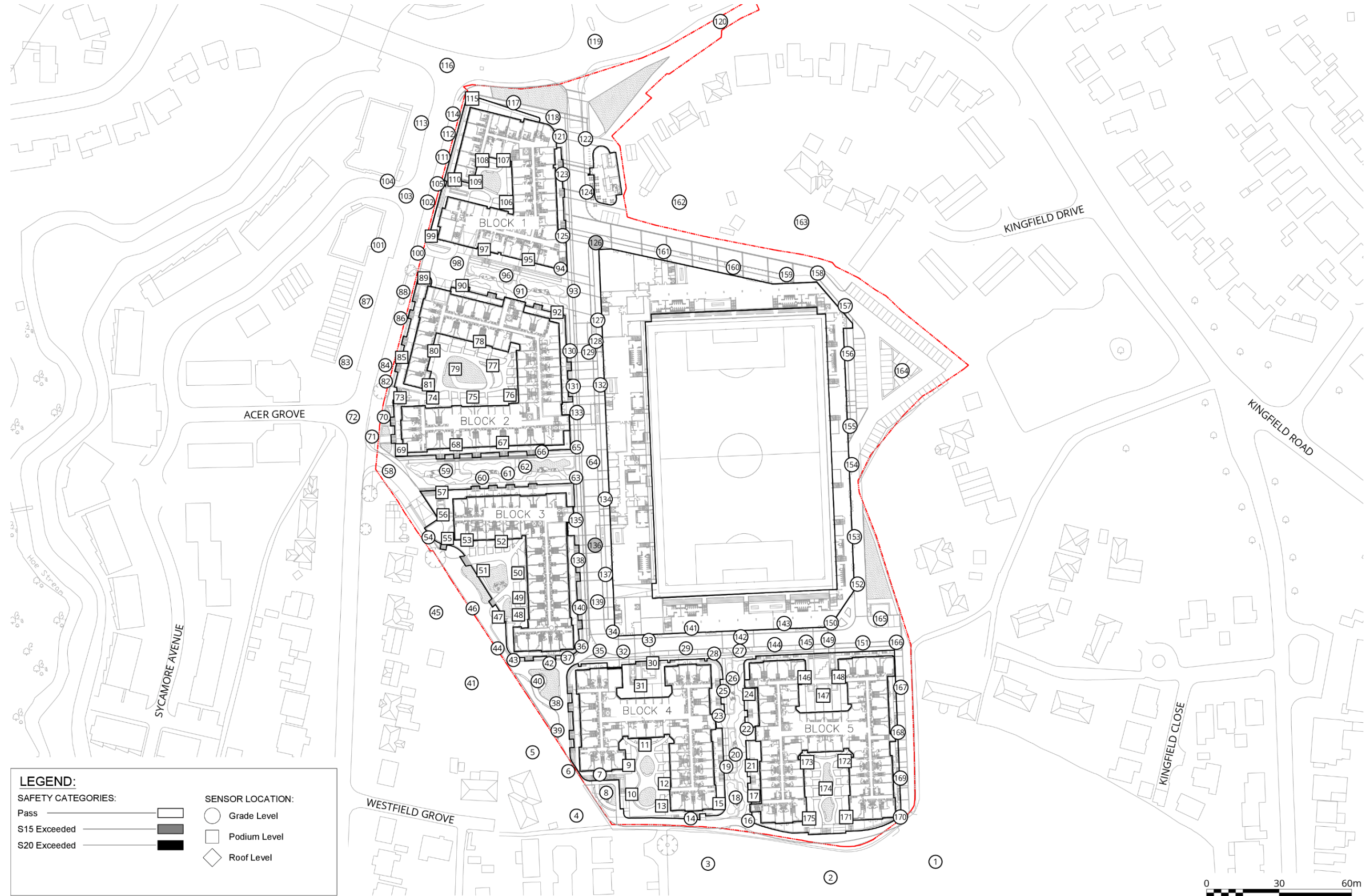
**Pedestrian Wind Comfort Conditions - Isometric Views**  
 Configuration 3: Proposed Development with Existing Surrounding Buildings  
 Summer Season

Drawn by: JLF Figure: 15  
 Approx. Scale @A3: 1:1250  
 Date Revised: Sept. 18, 2019



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Figure 10.16 Proposed Development with Existing Surrounding Buildings at Ground Floor Annual Safety

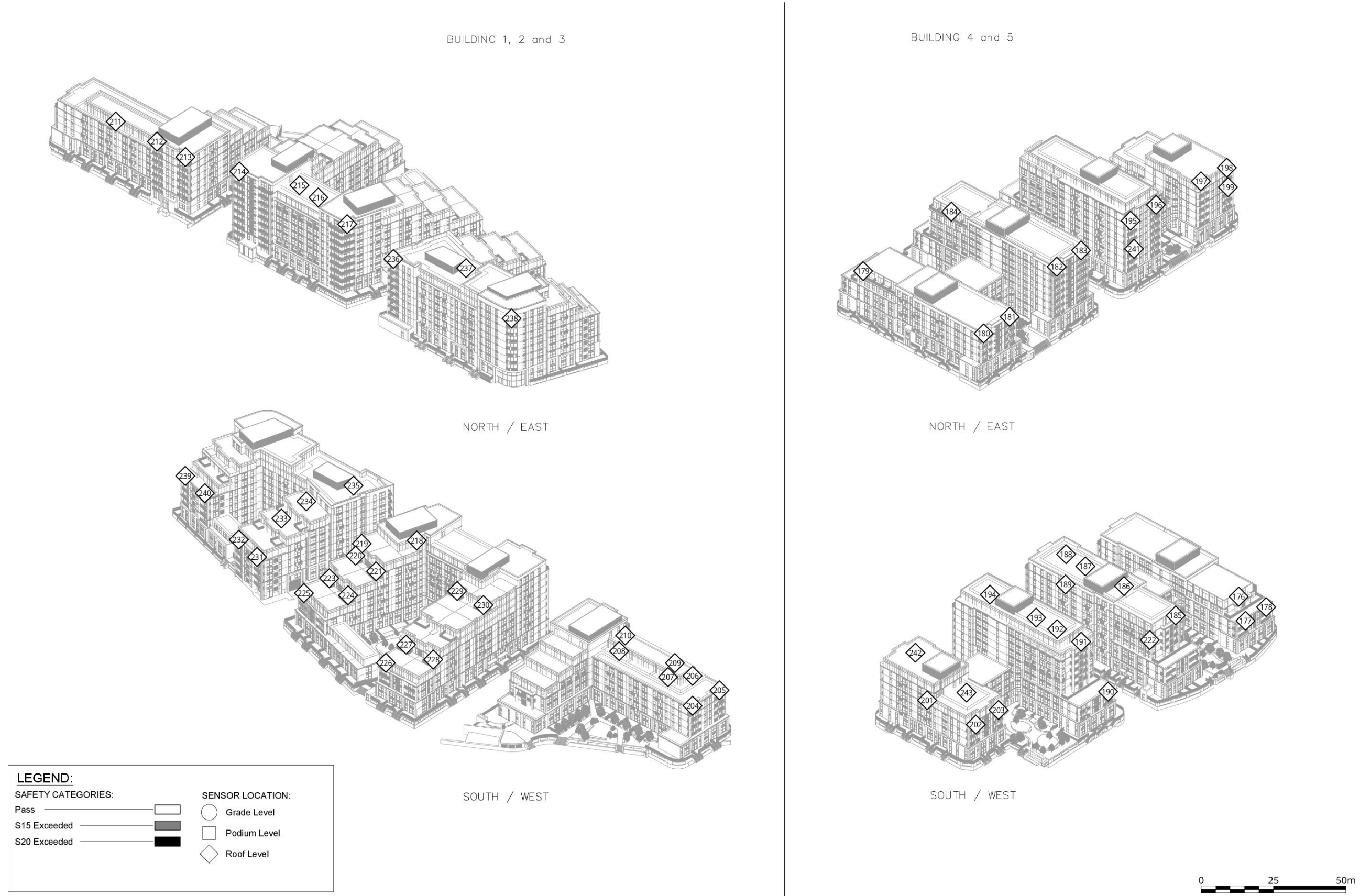


**Pedestrian Wind Safety Conditions - Ground Floor and Podium Level**  
 Configuration 3: Proposed Development with Existing Surrounding Buildings  
 Annual

True North  
 Drawn by: JLF Figure: 16  
 Approx. Scale @A3: 1:1500  
 Project #1900950 Date Revised: Sept. 18, 2019



Figure 10.17 Proposed Development with Existing Surrounding Buildings at Podium and Balcony Levels Annual Safety



**Pedestrian Wind Safety Conditions - Isometric Views**  
 Configuration 3: Proposed Development with Existing Surrounding Buildings  
 Annual

Drawn by: JLF Figure: 17  
 Approx. Scale @A3: 1:1250  
 Date Revised: Sept. 18, 2019



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## MITIGATION AND MONITORING MEASURES

### Proposed Development (Configuration 4)

- 10.124** Potential completed development impacts have been determined by means of wind tunnel testing of the scheme in the context of the existing surrounds, with the proposed landscaping scheme (Configuration 4) so that the measured conditions would be most accurately representing the completed Proposed Development. Additional mitigation measures would be required to ensure the site is safe and comfortable for the intended pedestrian use and a mitigation strategy has been developed. The mitigation measures that would be required to be in place before Blocks 2 – 5 of the completed development and the proposed stadium become accessible to the public are listed below and also identified in Table 10.5 of this document:
- The addition of a 3m tall, 1.5m wide, solid side screen to canopies above entrances at the western façade of Block 5, at the southern façade of Block 2 and at the southern façade of Block 1 (probe locations 21, 67, and 95);
  - The addition of two, 2m tall, 2m wide 50% porous screens located either side of entrances at the north-west of Block 4 (probe location 35);
  - The addition of three, 3m tall, 2m wide, 50% porous baffles with a 3m ground clearance placed at the north west corner of the proposed stadium and spaced 4m apart running south along the proposed stadium façade;
  - The recessing of entrance locations at the eastern façade of Block 4, the northern façade of Block 2, and the eastern façade of the proposed stadium (probe locations 19, 91, and 128) by 1.5m;
  - The addition of two, 5m tall deciduous trees in the amenity space to the south of Block 3 and to the west of Block 4 (north of probe location 40);
  - The addition of three, 5m tall deciduous trees at ground level to the south-east of Block 4;
  - The addition of a 3m tall, 50% porous screen separating entrances at the south façade of the eastern most block of Block 4;
  - The addition of a 3m tall, 5m wide, 50% porous screen extending eastward from the eastern façade at the south-east of Block 4 spanning the entire width of the podium level;
  - The addition of a single 3m tall deciduous tree at the south-east corner of Block 1; and
  - The addition of a 3m tall, 4m wide, 50% porous screen at the eastern end of the podium level at the south façade of Block 1.

### Expected Wind Conditions

- 10.125** The results of the tests undertaken for the ground level and podium and balcony levels of the Proposed Development, are graphically shown in Figures 10.18 and 10.19 for the windiest and Figures 10.20 and 10.21 for the summer seasons respectively.
- 10.126** For Configuration 4, with the proposed landscaping scheme and mitigation measures, the wind microclimate at all 242 locations for the windiest season, is summarised as follows:
- 102 locations would be suitable for sitting;
  - 120 locations would be suitable for standing use; and
  - 20 locations would be suitable for strolling.

- 10.127** During the summer (when wind conditions would be the same or calmer) the conditions would be suitable for sitting (164 locations) and standing (74 locations) with four locations becoming suitable for strolling.

### Pedestrian Thoroughfares

- 10.128** Pedestrian off-site thoroughfare use is represented by the same locations as in Configuration 3.
- 10.129** On-site thoroughfares are represented by the same locations as in Configuration 3.
- 10.130** Probe locations 72, 103, 116, and 119 are located off-Site in a road which would be accessible to pedestrians and cyclists.
- 10.131** All thoroughfare locations, both on and off-site, would have suitable wind conditions during the windiest season, ranging from suitable for strolling use to sitting use. This would represent a **negligible to moderate beneficial** effect (not significant).

### Entrances

- 10.132** Building entrances on-site, are represented by the same locations as in Configuration 3.
- 10.133** All entrances on-site would have wind conditions suitable for the intended use, ranging from suitable for standing use to sitting use during the windiest season. These wind conditions would represent a **negligible to minor beneficial** effect (not significant).

### Bus Stops

- 10.134** There is a single bus stop located on-site represented by probe location 120 with conditions suitable for intended use all year round representing a **negligible** effect (not significant).

### Amenity Areas

- 10.135** Ground level amenity areas are represented by the same locations as in Configuration 3.
- 10.136** During the summer season, when amenity areas are more likely to be used by occupants, visitors and pedestrians, the wind conditions at all of the ground level general amenity areas would range from suitable for sitting use to standing use. Given that there would be no designated seating areas at probe locations 9, 10, 11, 13 and 175 these wind conditions would represent a **negligible** effect (not significant).
- 10.137** There are roof level mixed-use amenity spaces on the roofs of all Blocks of the Proposed Development represented by the same locations as in Configuration 3.
- 10.138** Wind conditions at the roof level amenity spaces would range from suitable for sitting to standing use during the summer season making all locations suitable for the intended use. Given that there would be no designated seating areas at probe locations 186, 192, 193, 207, 209, 218, 234, 235, 242 and 243 these wind conditions would represent a **negligible** effect (not significant).

### Balconies

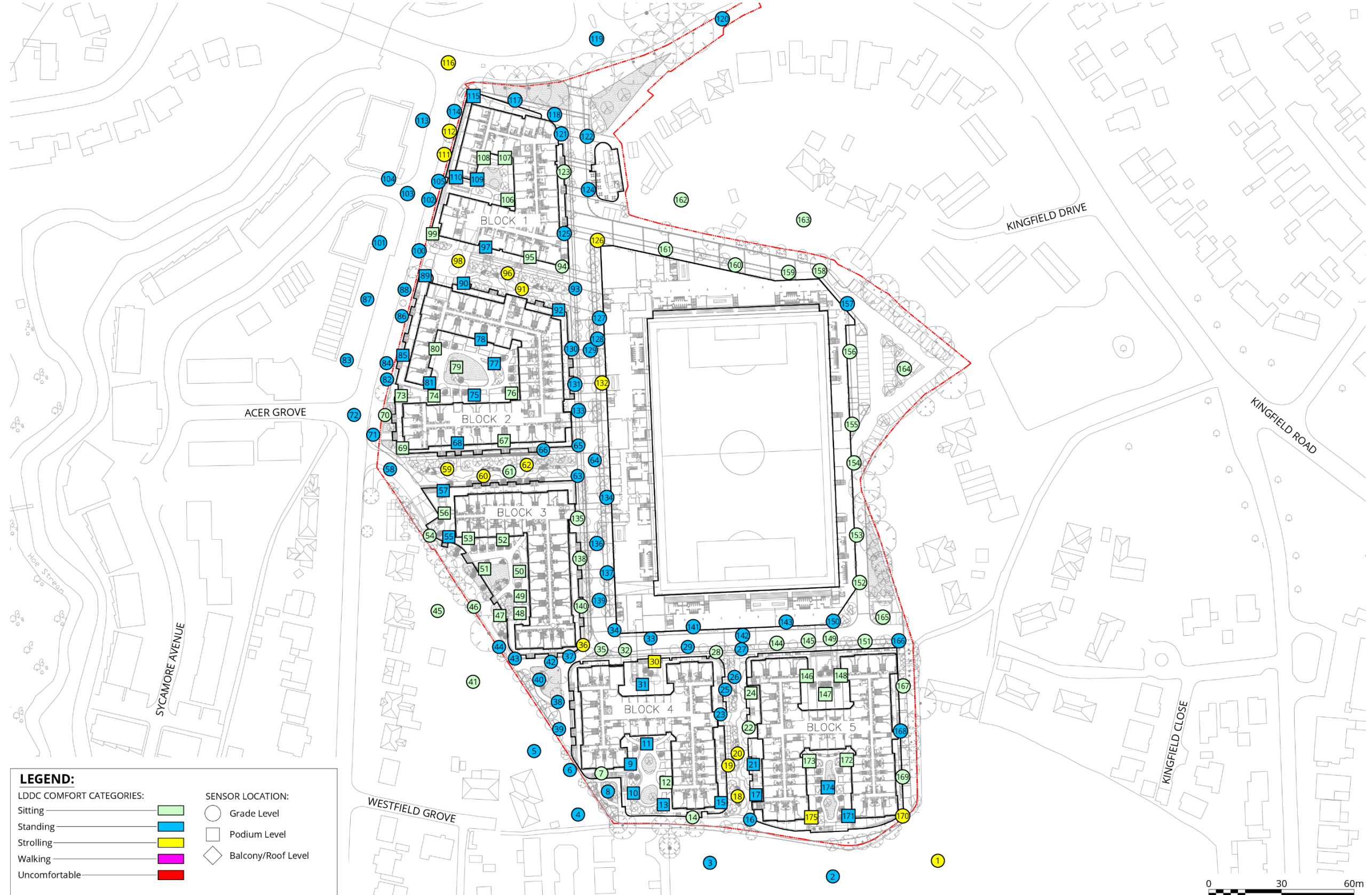
- 10.139** Balconies around the Proposed Development are represented by the same locations as in Configuration 3.
- 10.140** Wind conditions at all the balconies around the site, with the Proposed Development in place, would range from suitable for standing use to sitting use during the summer season making them suitable for the intended use. This would represent a **negligible** effect (not significant).

### Strong Winds

- 10.141** There would be no instances of strong winds exceeding the 15m/s safety threshold anywhere on-site or off-site in Configuration 4 with the Proposed Development, proposed landscaping scheme and mitigation measures in place with the Existing Surrounding Buildings (see Figures 10.22 and 10.23).



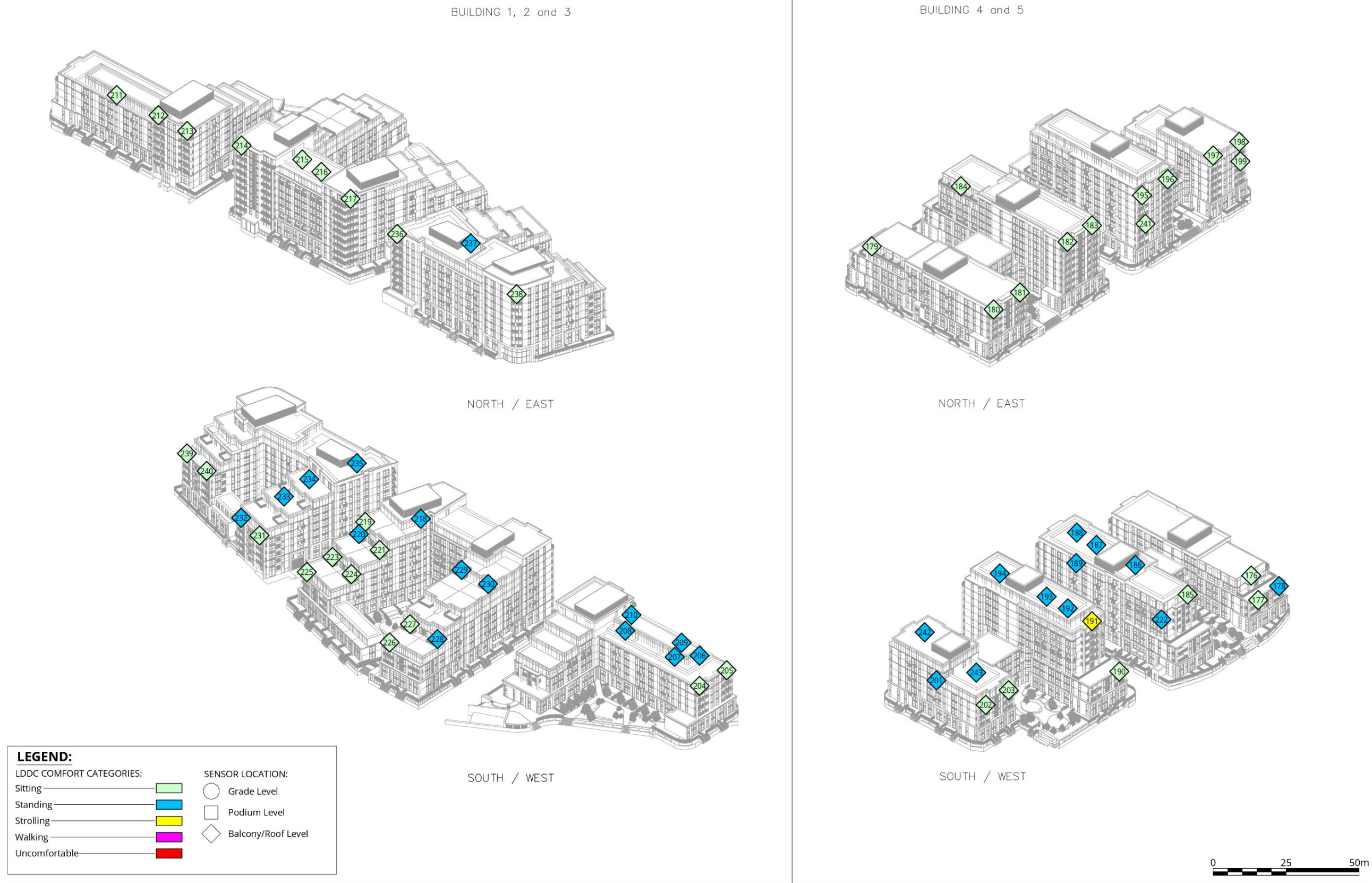
Figure 10.18 Proposed Development with Proposed Landscaping and Mitigation Measures with Existing Surrounding Buildings at Ground Floor for Windiest Season



**Pedestrian Wind Comfort Conditions - Ground Floor and Podium Level**  
 Configuration 4: Proposed Development with Existing Surrounding Buildings and Proposed Landscaping Scheme and Mitigation Measures  
 Windiest Season

True North  Project #1900950	Drawn by: JLF Figure: 18	
	Approx. Scale @A3: 1:1500	
	Date Revised: Sept. 18, 2019	

Figure 10.19 Proposed Development with Proposed Landscaping and Mitigation Measures with Existing Surrounding Buildings at Podium and Balcony Levels for Windiest Season



**Pedestrian Wind Comfort Conditions - Isometric Views**  
 Configuration 4: Proposed Development with Existing Surrounding Buildings and Proposed Landscaping Scheme and Mitigation Measures  
 Windiest Season

Drawn by: JLF Figure: 19  
 Approx. Scale @A3: 1:1250  
 Date Revised: Sept. 18, 2019



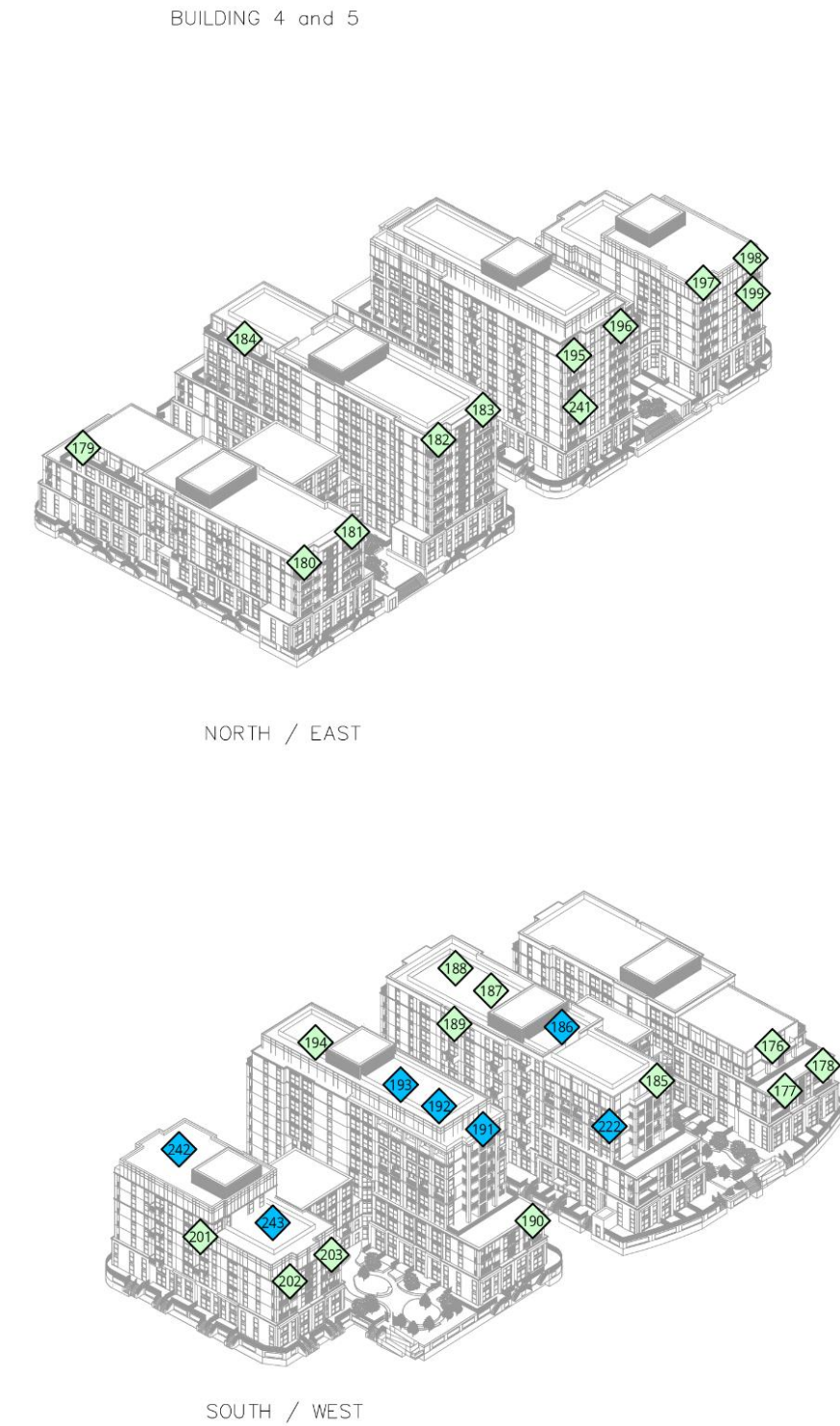
Figure 10.20 Proposed Development with Proposed Landscaping and Mitigation Measures with Existing Surrounding Buildings at Ground Floor for Summer Season



**Pedestrian Wind Comfort Conditions - Ground Floor and Podium Level**  
 Configuration 4: Proposed Development with Existing Surrounding Buildings and Proposed Landscaping Scheme and Mitigation Measures  
 Summer Season

True North 	Drawn by: JLF Figure: 20	
	Approx. Scale @A3: 1:1500	
Project #1900950	Date Revised: Sept. 18, 2019	

Figure 10.21 Proposed Development with Proposed Landscaping and Mitigation Measures with Existing Surrounding Buildings at Podium and Balcony Levels for Summer Season



**LEGEND:**

**LDDC COMFORT CATEGORIES:**

- Sitting — ■
- Standing — ■
- Strolling — ■
- Walking — ■
- Uncomfortable — ■

**SENSOR LOCATION:**

- Grade Level
- Podium Level
- ◇ Balcony/Roof Level



**Pedestrian Wind Comfort Conditions - Isometric Views**  
 Configuration 4: Proposed Development with Existing Surrounding Buildings and Proposed Landscaping Scheme and Mitigation Measures  
 Summer Season

Drawn by: JLF	Figure: 21	
Approx. Scale @A3: 1:1250		
Date Revised: Sept. 18, 2019		

Project #1900950

Figure 10.22 Proposed Development with Proposed Landscaping and Mitigation Measures with Existing Surrounding Buildings at Ground Floor Annual Safety



**LEGEND:**

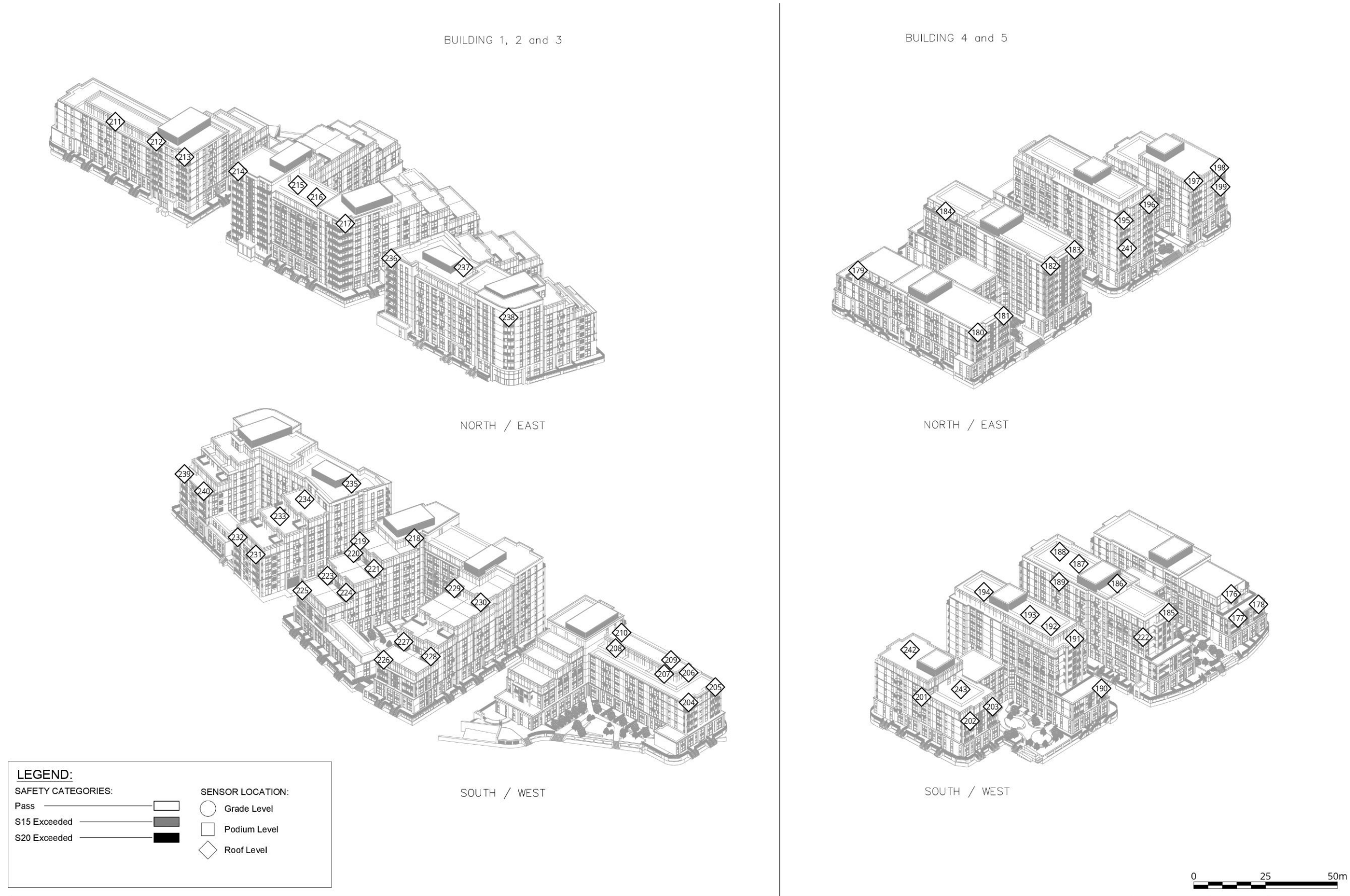
<b>SAFETY CATEGORIES:</b>		<b>SENSOR LOCATION:</b>	
Pass		○ Grade Level	
S15 Exceeded		□ Podium Level	
S20 Exceeded		◇ Roof Level	

**Pedestrian Wind Safety Conditions - Ground Floor and Podium Level**  
 Configuration 4: Proposed Development with Existing Surrounding Buildings and Proposed Landscaping Scheme and Mitigation Measures  
 Annual

True North 	Drawn by: JLF	Figure: 22	
	Approx. Scale @A3: 1:1500	Date Revised: Sept. 18, 2019	

Project #1900950

Figure 10.23 Proposed Development with Proposed Landscaping and Mitigation Measures with Existing Surrounding Buildings at Podium and Balcony Levels Annual Safety



<p><b>Pedestrian Wind Safety Conditions - Isometric Views</b>                  Configuration 4: Proposed Development with Existing Surrounding Buildings and Proposed Landscaping Scheme and Mitigation Measures Annual</p>	Drawn by: JLF Figure: 23	
	Approx. Scale @A3: 1:1250	
	Date Revised: Sept. 18, 2019	

**RESIDUAL EFFECTS**

10.142 The residual effects resulting from the Proposed Development are summarised in Table 10.4.

**Table 10.4 Summary of Residual Effects**

Receptor	Receptor Sensitivity	Residual Effect (Nature and Scale)	Geo	D I	P T	R IR	St Mt Lt
<b>Demolition and Construction</b>							
<b>Off-Site</b>							
Thoroughfares	High	Negligible	L	D	T	IR	St
Bus Stops	High	Negligible	L	D	T	IR	St
<b>On-Site</b>							
Thoroughfares	High	Negligible to Moderate Beneficial	L	D	T	IR	St
Entrances	High	Negligible to Minor Beneficial	L	D	T	IR	St
Podium Level Amenity Spaces	High	Negligible	L	D	T	IR	St
Balconies	High	Negligible	L	D	T	IR	St
<b>Completed Development</b>							
<b>Off-Site</b>							
Thoroughfares	High	Negligible	L	D	P	IR	Lt
Bus Stops	High	Negligible	L	D	P	IR	Lt
<b>On-Site</b>							
Thoroughfares	High	Negligible to Moderate Beneficial	L	D	P	IR	Lt
Entrances	High	Negligible to Minor Beneficial	L	D	P	IR	Lt
Ground Level Amenity Spaces	High	Negligible	L	D	P	IR	Lt
Podium Level Amenity Spaces	High	Negligible	L	D	P	IR	Lt
Balconies	High	Negligible	L	D	P	IR	Lt
<b>Notes:</b> Residual Effect - Scale = Negligible / Minor / Moderate / Major - Nature = Beneficial or Adverse Geo (Geographic Extent) = Local (L), Borough (B), Regional (R), National (N) D = Direct / I = Indirect P = Permanent / T = Temporary R = Reversible / IR= Irreversible St = Short Term / Mt = Medium Term / Lt = Long Term N/A = not applicable / not assessed							

**LIKELY SIGNIFICANT EFFECTS**

10.143 There would be no significant adverse effects arising from the introduction of the Proposed Development with the proposed landscaping scheme and outlined mitigation measures implemented.

**CLIMATE CHANGE**

10.144 The UK Climate Projections (UKCP18) published by the Met Office presents a number of different predicted scenarios. The 'Climate Projects Report' published by UKCP18 presents the probable changes in wind speed

for 2070 - 2099 in both the summer and winter seasons. With these predictions, the current trends in the climate change are not likely to have any significant effects on the predicted wind microclimate conditions in and around the Proposed Development. It is therefore not necessary to provide a quantitative analysis of the increase in storm frequency and its implication on the effect on the Wind Microclimate for the Proposed Development.

**ASSESSMENT OF FUTURE ENVIRONMENT**

**Evolution of the Baseline Scenario**

10.145 In the scenario where the Proposed Development is not built, conditions in and around the site are expected to remain the same as those in the Baseline scenario (Configuration 1) as there are no cumulative schemes within the surrounding area of the site.

**Cumulative Effects Assessment**

10.146 As set out in *ES Volume 1, Chapter 2: EIA Methodology*, no cumulative schemes were identified within the test radius of the site; therefore, the baseline conditions in the future, without the Proposed Development in place are expected to be the same as the current baseline conditions.