FINAL REPORT

POPE'S ROAD

BRIXTON, LONDON, UK

PEDESTRIAN LEVEL WIND MICROCLIMATE ASSESSMENT

RWDI #2003956 REV B

2ND JULY 2020

SUBMITTED TO

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VERSION HISTORY

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EXECUTIVE SUMMARY

The objective of this study was to determine the ground and elevated level wind environment within and around the proposed Pope's Road development in Brixton, London, UK.

This report presents a description of the methodology used and the results of four configurations tested in the wind tunnel, namely:

- Configuration 1: Existing Site with Existing Surrounding Buildings;
- Configuration 2: Proposed Development with Existing Surrounding Buildings;
- Configuration 3: Proposed Development with Existing Surrounding Buildings and Wind Mitigation Measures; and
- Configuration 4: Proposed Development with Cumulative Surrounding Buildings and Wind Mitigation Measures.

The meteorological data for the Site indicates prevailing winds from the south-west quadrant throughout the year with secondary winds from the north-east direction which are more prevalent during the spring months.

Wind conditions around the Existing Site (Configuration 1) are generally calm, as expected for a relatively low-rise area without any significantly tall buildings. Wind conditions range from suitable for sitting use to strolling use during the windiest season. During the summer season wind conditions would range from suitable for sitting use to strolling use. Strong winds exceeding 15 m/s for more than 2.2 hours yearly would occur at measurement location 108 in the baseline scenario.

With the inclusion of the Proposed Development (Configuration 2), there would be a significant change in the aerodynamics on-Site, resulting in a general increase of the wind speeds around the Site. Wind conditions during the windiest season would generally range from suitable for sitting to strolling use, with walking use wind conditions at measurement location 89 at the north-western corner of the Proposed Development. The bike store represented by measurement location 144 would have strolling use wind conditions during the windiest season. Wind conditions during the summer season would generally range from suitable for sitting use to strolling use, with conditions one category windier than required at the amenity space represented by measurement location 130. Strong winds exceeding 15 m/s for more than 2.2 hours per year would occur at measurement location 89 in this configuration.

With the inclusion of the wind mitigation strategy developed through an iterative wind tunnel testing, wind conditions in Configuration 3 (Proposed Development in the context of existing surroundings) would generally range from suitable for sitting use to strolling use during the windiest season, with one instance of walking use wind conditions at measurement location 89. Strolling use wind conditions would persist at the bike store represented by measurement location 144; this location would benefit from the inclusion of two 50-70% porous screens (1.5m wide and 2m tall) on either side of the archway or dense landscaping of similar size which would provide beneficial shelter at this location during the windiest season. All the entrances to the Proposed Development and existing surrounding buildings would have suitable wind conditions for the intended uses throughout the year, as well as the upper level amenity locations during the summer season (if no long-term seating is intended at terrace locations 118 and 119). No instances of strong winds exceeding 15 m/s for more than 2.2 hours per year would occur at or surrounding the Proposed Development in Configuration 3.

Configuration 4 assessed the wind conditions at and surrounding the Proposed Development in the context of the cumulative schemes, with the developed wind mitigation measures. Wind conditions would be largely consistent with Configuration 3, ranging from suitable for sitting use to strolling use during the windiest season, and generally one category calmer during the summer season. However, windier than desired conditions would occur at the entrance at location 80 during the windiest season, as the wind speed would exceed the strolling category threshold for 5.65% of the time during the windiest season at this location, just above the 5% threshold underneath which this location would have wind conditions suitable for standing use. Wind mitigation measures likely to provide beneficial shelter at this location as well as at terrace locations 118 and 119 if long-term seating is intended have been suggested within Section 6 "Wind Mitigation Measures". Strong winds exceeding 15 m/s for more than 2.2 hours throughout the year would not occur with the implementation of the wind mitigation measures tested in this configuration.

1. INTRODUCTION

RWDI was retained by Trium Environmental Consulting LLP to conduct a pedestrian level wind (PLW) microclimate assessment for the proposed Pope's Road development in Brixton, London, UK (planning application ref. 20/01347/FUL). This report presents the background, objectives, methodology, results and discussion from RWDI's assessment.

The Applicant, in consultation with the local planning authority (and other stakeholders) is amending the planning application and the key changes are:

- Set back of Western Elevation by 2.5m to provide additional public realm;
- Connection of eastern and western blocks on fourth floor;
- Adjustments to design of central block in-between West and East block; and
- Inclusion of dedicated community space.

In light of the revised scheme, we have reviewed the following, to the extent applicable to the wind microclimate around the Site:

- 200610_3DModel_DesignFreeze_Addendum received on 11th June 2020; and
- 200615_DrawingSet-DesignFreeze_PlanningAddendum received on 16th June 2020.

This report replaces in full the previous pedestrian level wind (PLW) microclimate assessment issued by RWDI in March 2020 in support of the planning application for the Proposed Development. A summary of the overall conclusion and recommendations from the investigation is presented in Section 7 "Conclusions".

2. BACKGROUND AND APPROACH

Wind tunnel tests were conducted on a 1:300 scale model of the Proposed Development. The investigation quantifies the wind conditions within and around the Site, by comparing the measured wind speed and frequency of occurrence with the Lawson Comfort Criteria. Meteorological data for London has been combined, analysed and adjusted to the Site conditions by modelling the effect of terrain roughness on the wind speeds approaching the Site.

Measurements were taken at up to 145 locations for 36 wind directions, in 10° increments. The measurements covered ground level locations along the building facades and at corners, near main entrances, on pedestrian routes within and around the Site and on elevated amenity spaces. Analysis was conducted on a seasonal basis but the report focuses on the windiest season results (generally the winter season) and those for the summer season, when pedestrian activity, such as within amenity areas, generally require calmer conditions.

This report presents a description of the methodology used and the results of the four configurations tested in the wind tunnel, namely:

- Configuration 1: Existing Site with Existing Surrounding Buildings;
- Configuration 2: Proposed Development with Existing Surrounding Buildings;
- Configuration 3: Proposed Development with Existing Surrounding Buildings and Wind Mitigation Measures; and

- Configuration 4: Proposed Development with Cumulative Surrounding Buildings and Wind Mitigation Measures

2.1 Site Description and Surroundings

The development Site is located in Brixton, London. The OS Landranger grid reference is TQ312754.

The application Site comprises a funnel shaped parcel of land situated between two large railway viaducts. The site is bound by Pope's Road to the West, at its widest point, and Valentia Place to the East, at its narrowest point. The Site comprises a single storey building currently in use as a retail store.

The surrounding buildings are generally low- to medium-rise buildings, which represent a suburban terrain. This results in a relatively turbulent (i.e. more 'gusty') wind environment with a lower mean wind speed compared to an open countryside terrain where the mean wind speed would be higher and the turbulence or 'gustiness' lower. Figure 1 shows an aerial view of the Site and surroundings.

Figure 1: Aerial view of the existing Site (approximate extent of the Site in yellow)

2.2 The Proposed Development

The proposed development comprises of the demolition of the existing building and erection of a part G + 21, part G + 9 storey building comprising flexible A1/A3/B1/D1/D2 uses at basement, ground and first floor, with restaurant (A3) use on floor 8 and B1 accommodation on floors 2 to 19, with plant enclosures at roof level, and associated cycle parking, servicing and all necessary enabling works.

The office tower to the west will include balconies at levels 14, 16 and 18 on both the western and eastern façades. The nine-storey high office to the east of the Site will include an amenity terrace at level eight on the western elevation, facing the office building. Figure 2 shows the wind tunnel model of the Proposed Development.

Figure 2: Wind tunnel model of the Proposed Development (Configuration 2) (view from south)

3. METHODOLOGY AND ASSESSMENT CRITERIA

Wind tunnel testing is the most well-established and robust means of assessing the pedestrian wind microclimate with the Proposed Development in place. It enables the wind conditions at the Site to be quantified and classified in accordance with the Criteria. To produce the results within the tunnel, a 1:300 scale model of the existing buildings at the Site and the surrounding area within a 360 metre (m) radius of the centre of the Site was constructed.

The basic methodology for quantifying the pedestrian level wind environment is outlined below:

1. Measure the wind speeds at pedestrian level in the wind tunnel relative to a reference wind speed;
2. Adjust standard meteorological data to account for conditions at the Site;
3. Combine these to obtain the expected frequency and magnitude of wind speeds at pedestrian level; and
4. Compare the results with the Criteria to 'grade' conditions around the Site.

3.1 Simulation of Atmospheric Winds

The wind is turbulent, or gusty, and this turbulence varies depending upon the Site. It is necessary to reflect these differences in the wind tunnel test. In addition, the atmospheric boundary layer is a shear flow which means that the mean wind speed increases with height. Modelling these effects is achieved by a combination of spires and floor roughness elements to create a naturally grown boundary layer that is representative of urban or open country conditions, as appropriate. The detailed proximity model around the Site is used to fine-tune the flow and create conditions similar to those expected at full scale.

3.2 Measurement Technique

Wind speed measurements were made using Irwin probes. For pedestrian comfort studies, both the mean wind speed and the peak wind speed are measured at selected locations at the Site and surrounding area to represent sensitive locations, such as entrances, amenity areas and thoroughfares, at a scaled height of 1.5m above ground level. The typical equivalent full-scale time period for measuring the mean wind speed is around 90 minutes, whereas the peak wind speed is taken as the wind speed exceeded for 1% of the time.

Wind speed at each location was measured for 36 wind directions in 10° increments, with 0° representing wind blowing from the north and 90° wind blowing from the east.

3.3 Scaling

The length scale of the model was 1:300 and the velocity scale was approximately 1:2 for strong winds. Consequently, the time scale for the tests was 1:150, or in other words 1 second in the wind tunnel is equivalent to 150 seconds at full scale.

3.4 Meteorological Data

Combined meteorological data derived from the meteorological stations of Heathrow Airport and London City Airport, which together are representative of the region in and around London, have been corrected to standard conditions of 10m above flat level open country terrain. The meteorological station data are then adjusted to the site conditions using the methodology implemented in the ESDU 01008[1] software package.

Approximately 30 years of meteorological data for the London area was used in this report and is presented in Appendix B as wind roses by season (refer to Figure 31 of Appendix B) with the wind speed divided into 2 m/s ranges. The radial axis indicates the cumulative number of hours per season that the wind speed exceeds the particular wind speed. The seasons are defined as spring (March, April and May), summer (June, July and August), autumn (September, October and November) and winter (December, January and February).

The meteorological data indicate that the prevailing wind direction throughout the year is from the south-west. This is typical for many areas of southern England. There is a secondary peak from north-easterly winds, especially during the spring; however, these tend to be colder winds.

The combination of meteorological data and velocity ratios permits the percentage of time that wind speeds are exceeded on the site to be evaluated. The locations can then be assessed using 'comfort criteria', as described below.

3.5 Pedestrian Comfort

The assessment of the wind conditions requires a standard against which the measurements can be compared. This report uses the Lawson Comfort Criteria, which have been established for over thirty years. The Criteria, which seek to define the reaction of an average pedestrian to the wind, are described in Table 1. If the measured wind conditions exceed the threshold wind speed for more than 5% of the time, then they are unacceptable for the stated pedestrian activity and the expectation is that there may be complaints of nuisance or people will not use the area for its intended purpose.

The Criteria sets out four pedestrian activities and reflect the fact that less active pursuits require more benign wind conditions. The four categories are sitting, standing, strolling and walking, in ascending order of activity level, with a fifth category for conditions that are uncomfortable for all uses. In other words, the wind conditions in an area for sitting need to be calmer than a location that people merely walk past.

The distinction between strolling and walking is that in the strolling scenario pedestrians are more likely to take on a leisurely pace, with the intention of taking time to move through the area, whereas in the walking scenario pedestrians are intending to move through the area quickly and are therefore expected to be more tolerant of stronger winds.

The Criteria are derived for open air conditions and assume that pedestrians will be suitably dressed for the season. Thermal comfort is discussed with reference to acceptable wind environments but not evaluated as part of the assessment.

[1] ESDU International, Computer program for wind speeds and turbulence properties: flat or hilly sites in terrain with roughness changes, ESDU 01008, 2001 01008

The coloured key in Table 1 corresponds to the presentation of wind tunnel test results described in the results section of this report.

Table 1: Lawson Comfort Criteria

Key	Comfort Category	Threshold	Description
	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
	Standing	4-6 m/s	Gentle breezes acceptable for main building entrances, pick-up/drop-off points and bus stops
	Strolling	6-8 m/s	Moderate breezes that would be appropriate for strolling along a city/town street, plaza or park
	Walking	8-10 m/s	Relatively high speeds that can be tolerated if one's objective is to walk, run or cycle without lingering
	Uncomfortable	>10 m/s	Winds of this magnitude are considered a nuisance for most activities, and wind mitigation is typically recommended

3.6 Strong Winds

In addition, the criteria stipulate two strong wind threshold limits; when winds exceed 15 m/s or 20 m/s for more than 0.025% of the time (2.2 hours per year). The lower limit, 15 m/s, if exceeded may require remedial measures depending on the sensitivity of the location i.e. is it reasonable to expect an elderly or very young pedestrian to be present at the location on the windiest day of the year? Wind speeds that exceed the 20 m/s threshold for more than 0.025% of the time (2.2 hours per year) would represent a safety risk for all members of the population and would therefore require mitigation to provide an appropriate wind environment.

Strong winds are generally associated with areas which would be classified as acceptable for walking or as uncomfortable. In a mixed-use urban development scheme, walking and uncomfortable conditions would not usually form a part of the 'target' wind environment and would usually require mitigation due to pedestrian comfort considerations. The same mitigation would also typically reduce the frequency of, or even eliminate, any strong winds.

4. RESULTS

4.1 Details of Analysis

To account for the difference in height and terrain roughness between meteorological conditions at the airports and the Site, it is necessary to apply adjustment factors to the wind tunnel velocity ratios. Adjustment factors (mean factors) were computed for wind directions from 0° through to 360°. The reference height in the wind tunnel was at the equivalent full-scale height of 120 metres. Table 2 within Appendix C presents the mean factors for the Site.

4.2 Desired Pedestrian Activity around the Proposed Development

Generally, for a mixed-use development, the target conditions are:

1. Strolling during the windiest season on pedestrian thoroughfares;
2. Standing conditions at main entrances, bus stops and railway platforms throughout the year, with strolling use wind conditions at secondary entrances such as fire exit; and
3. Sitting conditions at outdoor seating and amenity areas during the summer season when these areas are more likely to be frequently used by pedestrians.

The walking and uncomfortable classifications are usually avoided because of their association with occasional strong winds, unless they are on a minor pedestrian route or a route where pedestrian access could be controlled in the event of strong winds.

Achieving a sitting classification in the summer usually means that the same location would be acceptable for standing in the windiest season because winds are stronger at this time. This is considered an acceptable occurrence for the majority of external amenity spaces because other factors such as air temperature and precipitation influence people's perceptions about the 'need' to use seating in the middle of winter.

For a large terrace or amenity space, a mix of sitting to standing use wind conditions is acceptable provided that any desired seating areas are situated in areas having sitting wind conditions.

4.3 Performance against the Lawson Comfort Criteria

The wind microclimate within and around the Site has been assessed and classified using the Lawson Comfort Criteria defined in Table 1. The results of the assessment for each configuration are described below and presented graphically in Figures 3 to 14 in the "Figure" Section.

4.3.1 Configuration 1 - Existing Site with Existing Surrounding Buildings

The wind microclimate results for Configuration 1 are shown in the following figures:

- Figure 3: Windiest Season (Ground Floor);
- Figure 4: Summer Season (Ground Floor); and
- Figure 5: Strong Winds Exceedances (Ground Floor).

In Configuration 1, the Site was assessed devoid of existing landscaping.

4.3.2 Configuration 2 – Proposed Development with Existing Surrounding Buildings

The wind microclimate results for Configuration 2 are shown in the following figures:

- Figure 6: Windiest Season (Ground Floor);
- Figure 7: Summer Season (Ground Floor and Isometric Views); and
- Figure 8: Strong Winds Exceedances (Ground Floor and Isometric Views).

Wind conditions in Configuration 2 were assessed devoid of existing or proposed landscaping or wind mitigation measures in order to present the worst-case (i.e. windy) wind environment.

4.3.3 Configuration 3 – Proposed Development with Existing Surrounding Buildings and Wind Mitigation Measures

The wind microclimate results for Configuration 3 are shown in the following figures:

- Figure 9: Windiest Season (Ground Floor);
- Figure 10: Summer Season (Ground Floor and Isometric Views); and
- Figure 11: Strong Winds Exceedances (Ground Floor and Isometric Views).

Wind conditions in Configuration 3 were assessed with the proposed landscaping and wind mitigation measures developed through iterative wind tunnel testing to ensure a suitable wind environment.

4.3.4 Configuration 4 – Proposed Development with Cumulative Surrounding Buildings and Wind Mitigation Measures

The wind microclimate results for Configuration 4 are shown in the following figures:

- Figure 12: Windiest Season (Ground Floor);
- Figure 13: Summer Season (Ground Floor and Isometric Views); and
- Figure 14: Strong Winds Exceedances (Ground Floor and Isometric Views).

Wind conditions in Configuration 4 were assessed with the proposed landscaping and wind mitigation measures developed through iterative wind tunnel testing to ensure a suitable wind environment.

The following cumulative schemes were included in the wind tunnel model for Configuration 4:

- Flat 1, 15 Kellet Road (reference 16 04647 FUL);
- London Soner Square R/O Electric Avenue (reference 14 06904 FUL); and
- May Developments, Canterbury Arms Extended Planning App (ref 1507141 FUL).

4.4 Occurrence of Strong Winds

Areas with occasional strong winds exceeding the 15 m/s or 20 m/s thresholds are presented in the annual safety exceedances figures for each configuration. Strong winds in excess of 15 m/s would be considered a safety issue and would require mitigation, apart from where these conditions are pre-existing and occur in the baseline (Configuration 1).

Table 3: Annual Exceedance of Strong Winds

Location	Strong Wind Exceedance	Main Wind Direction	Hours per Annum
Configuration 1: Existing Site with Existing Surrounding Buildings			
108	S15	210°	2.3
Configuration 2: Proposed Development with Existing Surrounding Buildings			
89	S15	260°	3.4
Configuration 3: Proposed Development with Existing Surrounding Buildings and Wind Mitigation Measures			
There would be no safety exceedances in this configuration			
Configuration 4: Proposed Development with Cumulative Surrounding Buildings and Wind Mitigation Measures			
There would be no safety exceedances in this configuration			

5. DISCUSSION

This discussion compares the measured wind conditions (shown in Figures 3-14 in the "Figure" Section) to the anticipated usage of the Site, to provide an assessment of whether the conditions are suitable or too windy for the intended use. A map of the intended uses at each location is shown in Figures 32 and 33 of Appendix D.

Any locations not specifically mentioned are suitable for or calmer than required for the desired pedestrian usage. Locations that are windier than desired for their intended pedestrian use would require mitigation.

5.1 Configuration 1: Existing Site with Existing Surrounding Buildings

The discussion of the wind microclimate in Configuration 1 is based on the results shown in Figures 3 and 4, respectively for the windiest and summer season. Figure 5 reports the occurrence of strong winds throughout the year.

5.1.1 Pedestrian Comfort

The wind environment at and surrounding the existing Site is generally calm throughout the year, with wind conditions ranging from suitable for sitting to strolling use during the windiest season. Wind conditions during the summer season are generally calmer, ranging from suitable for sitting use to strolling use at all locations.

Thoroughfares (Figure 3)

Wind conditions at all thoroughfare locations at and surrounding the Site range from suitable for sitting use to strolling use during the windiest season (Figure 3). The windiest area is to the north of the Site along Pope's Road, with strolling use wind conditions at measurement locations 106-108 and to the south of the Site at measurement location 141

Bus Stops and Railway Platforms (Figure 3)

The bus stop on Atlantic Road represented by measurement location 10 would have wind conditions suitable for sitting use during the windiest season (Figure 3). Sitting use wind conditions would also occur at the railway platforms to the south of the Site represented by measurement locations 13 and 16-18.

Entrances (Figure 3)

Entrances to the surrounding buildings are represented by measurement locations 9, 21, 75, 80, 85, 98, and 115. All these entrance locations would have standing use or calmer wind conditions during the windiest season (Figure 3).

5.1.2 Strong Winds

One instance of strong winds exceeding 15 m/s for approximately 2.3 hours per year would occur in the baseline scenario at measurement location 108 on Pope's Road.

5.2 Configuration 2: Proposed Development with Existing Surrounding Buildings

Configuration 2 assessed the wind environment around the Proposed Development in the context of the existing surrounding buildings. The discussion of the wind microclimate in Configuration 2 is based on the results shown in Figure 6 during the windiest season at ground level, while Figure 7 reports the wind conditions at both ground and elevated levels during the summer season. Figure 8 shows the strong winds exceedances at both ground and elevated levels.

5.2.1 Pedestrian Comfort

With the inclusion of the Proposed Development there would be a change in the wind environment around the Site, and wind conditions at and surrounding the Proposed Development would become slightly windier. The inclusion of the Proposed Development would present a greater obstruction to the oncoming flow compared to the existing Site, therefore the winds would be redirected to nearby locations creating localised windier than desired conditions.

Thoroughfares (Figure 6)

With the inclusion of the Proposed Development, wind conditions at and surrounding the Site would be windier than in the baseline scenario (Configuration 1), especially to the west and south of the Proposed Development. Wind conditions at all thoroughfare locations would range from suitable for sitting use to walking use during the windiest season (Figure 6). The windiest areas would be at the western corners of the Proposed Development (measurement locations 26, 27, 88, and 89), below the railway bridge to the north (measurement location 87), and along Pope's Road to the north of the Site. Walking use wind conditions would occur at measurement location 89 at the north-western corner of the Proposed Development; these wind conditions are considered acceptable as pedestrians are not expected to linger in this area, and wind conditions at all the nearby thoroughfare locations along the western side of the Proposed Development (measurement locations 23-27, 88, 90, 96, and 97) would have strolling use or calmer wind conditions during the windiest season.

The bike store represented by measurement location 144 underneath the railway bridge to the north of the Site would have strolling use wind conditions during the windiest season; this location would benefit from localised wind mitigation.

Bus Stops and Railway Platforms (Figure 6)

Sitting use wind conditions would persist at the bus stop along Atlantic Road (measurement location 10) and at the railway platforms represented by measurement locations 13 and 16-18 (Figure 6). These would be acceptable conditions, therefore no wind mitigation measures would be required at these locations.

Entrances (Figure 6)

Entrances to the Proposed Development are represented by measurement locations 30, 31, 34, 63, 70, 91, 92, and 93. Most of the entrances would have standing use or calmer wind conditions during the windiest season, therefore no mitigation would be required at these locations (Figure 6). Entrance location 34 would have strolling use wind conditions during the windiest season; however, this is a secondary entrance and strolling use wind conditions would be considered acceptable for this infrequent use, and no wind mitigation would be required.

All the entrances to the surrounding buildings (measurement locations 9, 21, 75, 80, 85, 98, and 115) would have wind conditions ranging from suitable for sitting use to standing use during the windiest season (Figure 6). This is considered acceptable for the intended use, and no mitigation would be required at any of these locations.

Amenity Spaces (Figure 7)

Wind conditions during the summer season at both ground level and at the upper level amenity locations of the Proposed Development are shown in Figure 7. A mix of sitting use to standing use wind conditions would occur at all the office building balconies exposed to east (measurement locations 123-128), which would be acceptable for the intended amenity use.

Wind conditions at the balconies exposed to west (measurement locations 120-122 and 129-131) would range from suitable for standing use to strolling use during the summer season, with strolling use wind conditions (one category windier than required) at measurement location 130. Therefore, wind mitigation measures would be required at this location to provide calmer wind conditions during the summer season.

The office terrace to the east represented by measurement locations 118 and 119 would have standing use wind conditions during the summer season; if long-term seating will be intended at these locations, wind mitigation measures would be required to provide calmer wind conditions during the summer season.

5.2.2 Strong Winds

Instances of strong winds exceeding 15 m/s for approximately 3.4 hours per year would occur in Configuration 2 at measurement locations 89 at the n (Figure 8). Strong winds would represent a safety concern for pedestrians, and therefore this location would require mitigation measures.

5.3 Configuration 3: Proposed Development with Existing Surrounding Buildings and Wind Mitigation Measures

Configuration 3 assessed the wind environment around the Proposed Development in the context of the existing surrounding buildings with wind mitigation measures in place. The wind mitigation strategy has been developed through a wind mitigation workshop with the design team present. Further details of the wind mitigation strategy can be found in Section 6 "Wind Mitigation Measures". The discussion of the wind microclimate in Configuration 3 is based on the results shown in Figure 9 during the windiest season at ground level, while Figure 10 reports the wind conditions at both ground and elevated levels during the summer season. Figure 11 shows the strong winds exceedances at both ground and elevated levels.

5.3.1 Pedestrian Comfort

With the inclusion of the wind mitigation strategy described in Section 6 "Wind Mitigation Measures" calmer wind conditions would occur at and surrounding the Proposed Development throughout the year. During the windiest season, wind conditions at ground level would range from suitable for sitting use to walking use, while wind conditions one category calmer would be expected during the summer season.

Thoroughfares (Figure 9)

With the inclusion of the wind mitigation strategy, wind conditions at and surrounding the Proposed Development (Figure 9) would be similar to or calmer than those in Configuration 2. Thoroughfare locations would generally have the required strolling use or calmer wind conditions during the windiest season, however, wind conditions at measurement location 89 would marginally exceed the threshold for walking use. This is considered acceptable as pedestrians are not expected to linger in this area, and wind conditions at all the nearby thoroughfare locations along the western side of the Proposed Development (measurement locations 23-27, 88, 90, 96, and 97) would have strolling use or calmer wind conditions during the windiest season.

Strolling use wind conditions at the bike store represented by measurement location 144 underneath the railway bridge to the north of the Site would persist in Configuration 3; this location would benefit from the inclusion of two 50-70% porous screens (1.5m wide and 2m tall) on either side of the archway or dense landscaping of similar size which would provide beneficial shelter at this location during the windiest season.

Bus Stops and Railway Platforms (Figure 9)

Wind conditions at the bus stop along Atlantic Road (measurement location 10) and at the railway platforms represented by measurement locations 13 and 16-18 would remain consistent with Configuration 2, suitable for standing use or calmer during the windiest season (Figure 9).

Entrances (Figure 9)

Most of the entrances to the Proposed Development (measurement locations 30, 31, 63, 70, 91, 92, and 93) would have standing use or calmer wind conditions during the windiest season in Configuration 3 (Figure 9). Entrance location 34 along the southern side of the Proposed Development would have strolling use wind conditions during the windiest season; however, this is a secondary entrance and strolling use wind conditions would be considered acceptable at this entrance. No additional wind mitigation would be required.

All the entrances to the surrounding buildings (measurement locations 9, 21, 75, 80, 85, 98, and 115) would have standing use or calmer wind conditions during the windiest season (Figure 9).

Amenity Spaces (Figure 10)

With the inclusion of the wind mitigation measures described in Section 6 "Wind Mitigation Measures", wind conditions at all balcony locations (measurement locations 120-131) would range from suitable for sitting use to standing use during the summer season. These wind conditions would be suitable for the intended amenity use, therefore, no additional wind mitigation measures would be required at these locations.

Wind conditions at the office terrace (measurement locations 118 and 119) would remain suitable for standing use during the summer season. If long-term seating will be intended at these locations, localised mitigation measures would be required around seating locations, in the form of 1m high dense shrubs or screens which are expected to provide localised shelter.

5.3.2 Strong Winds

With the inclusion of the wind mitigation strategy developed through a wind mitigation workshop, there would be no instances of strong winds exceeding 15 m/s for more than 2.2 hours per year (Figure 11).

5.4 Configuration 4: Proposed Development with Cumulative Surrounding Buildings and Wind Mitigation Measures

Configuration 4 assessed the wind environment around the Proposed Development in the context of the cumulative surrounding buildings. The wind mitigation strategy tested in Configuration 3 has been included in Configuration 4, and further details of the wind mitigation measures can be found in Section 6 "Wind Mitigation Measures". The discussion of the wind microclimate in Configuration 4 is based on the results shown in Figure 12 during the windiest season at ground level, while Figure 13 reports the wind conditions at both ground and elevated levels during the summer season. Figure 14 shows the strong winds exceedances at both ground and elevated levels.

5.4.1 Pedestrian Comfort

Wind conditions at and surrounding the Proposed Development in the context of the cumulative schemes and with the wind mitigation measures in place would generally range from suitable for sitting use to walking use during the windiest season, with one category calmer wind conditions expected during the summer season.

Thoroughfares (Figure 12)

With the inclusion of the cumulative schemes, wind conditions at thoroughfare locations at and surrounding the Proposed Development would be largely consistent with Configuration 3 (Figure 12). Isolated instances of walking use wind conditions would occur in this configuration at measurement location 84 along Brixton Station Road and at the north-western corner of the Proposed Development at measurement location 89. Pedestrians are not expected to linger in these areas, therefore walking use wind conditions are considered suitable for the intended use and no further mitigation will be required at these locations.

Bus Stops and Railway Platforms (Figure 12)

The bus stop along Atlantic Road represented by measurement location 10, and the railway platforms represented by measurement locations 13 and 16-18 would have wind conditions suitable for the intended uses, ranging from suitable for sitting use during the windiest season (Figure 12).

Entrances (Figure 12)

Wind conditions at all entrances to the Proposed Development (measurement locations 30, 31, 63, 70, 91, 92, and 93) would have standing use or calmer wind conditions during the windiest season in Configuration 3 (Figure 12). Entrance location 34 on the southern side of the Proposed Development would have strolling use wind conditions during the windiest season; however, this is a secondary entrance and strolling use wind conditions would be considered acceptable at this entrance. No additional wind mitigation would be required.

The majority of the entrances to the surrounding buildings (measurement locations 9, 21, 75, 85, 98, and 115) would have wind conditions suitable for standing use or calmer during the windiest season, as depicted in Figure 12. However, strolling use wind conditions would occur at the entrance location 80 during the windiest season; this location would have wind conditions just above the strolling threshold during the windiest season (the wind speed would exceed the strolling category threshold for 5.65% of the time during the windiest season at this location, just above the 5% threshold underneath which this location would have wind conditions suitable for standing use). This location would benefit from localised wind mitigation measures in the context of the cumulative schemes along the southern side of Brixton Station Road between measurement locations 135 and 80. However, given the proximity to the public highway, it is unlikely that any such mitigation can be erected.

Amenity Spaces (Figure 13)

Wind conditions at all balconies (measurement locations 120-131) would remain consistent with Configuration 3, ranging from suitable for sitting use to standing use during the summer season (Figure 13). This would be acceptable for the intended amenity use, and no additional mitigation would be required at these locations.

The inclusion of wind mitigation measures at the office terrace represented by measurement locations 118 and 119 would provide beneficial shelter, resulting in standing use conditions during the summer season. This is considered acceptable at this large amenity terrace if no long-term seating will be intended, therefore no additional mitigation would be required at these locations.

5.4.2 Strong Winds

With the cumulative schemes in place, and with the inclusion of the wind mitigation measures described in Section 6 "Wind Mitigation Measures" there would be no instances of strong winds exceeding 15 m/s for more than 2.2 hours yearly, as shown in Figure 14.

6. WIND MITIGATION MEASURES

Wind conditions at and surrounding the Proposed Development in the context of the existing surrounding buildings (Configuration 2) would be generally suitable for the intended uses throughout the year, however, a few isolated locations would be windier than required, and would require wind mitigation measures:

- Amenity location 130;
- Bike store location 144; and
- Strong winds at measurement locations 89.

Configurations 3 and 4 included several wind mitigation measures which were developed through iterative wind tunnel testing during a wind mitigation workshop held on November 26th 2019 with the design team present. The final wind mitigation strategy tested in both Configurations 3 and 4 included the following measures:

- Four screens of 2m by 3m in size (with approximately 50% porosity) along the western side of the Proposed Development, perpendicular to its western façade;
- One screen of 1m x 3m in size (with approximately 50% porosity) at the south-western corner of the ground floor step-back and perpendicular to the southern façade of the Proposed Development;
- Two evergreen trees of approximately 7m in height, at the north-western and south-western corners of the Proposed Development;
- A 1m wide, solid canopy along the western façade of the Proposed Development, installed at 9.8m from ground level (level 2 of the Proposed Development);
- A solid balustrade of 2m in height at all balcony locations along the western and eastern sides of the Proposed Development, as well as on the office terrace;
- Dense planting/trees (of 3m in height) and a line of shrubs (of 1m in height) located along the edges of all the balconies of the Proposed Development; and
- Two deciduous trees of 3m in height at the western corners and a line of shrubs (of 1m height) along the edges of the office terrace.

These wind mitigation measures are shown in Figures 21-28 of Appendix A.

The bike store location represented by measurement location 144 would have strolling use wind conditions during the windiest season in Configuration 3; this location would benefit from the inclusion of two 50-70% porous screens (1.5m wide and 2m tall) on either side of the archway or dense landscaping of similar size which would provide beneficial shelter at this location during the windiest season. With these features in place, suitable wind conditions are expected to occur during the windiest season at this location.

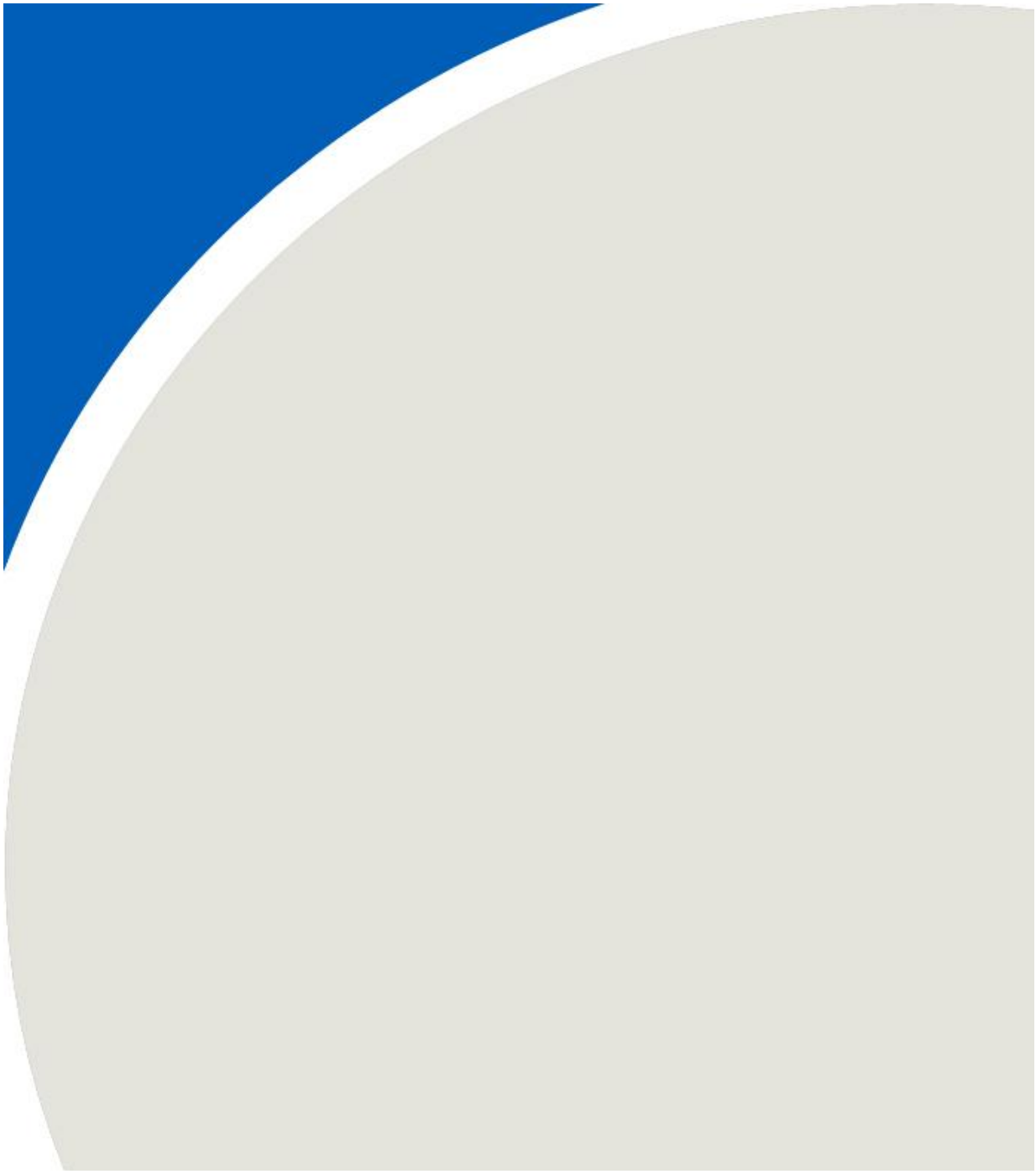
Wind conditions at entrance location 80 would marginally exceed the threshold for strolling use during the windiest season only in the context of the cumulative surrounding buildings (Configuration 4), as the wind speed would exceed the strolling category threshold for 5.65% of the time during the windiest season at this location, just above the 5% threshold underneath which this location would have wind conditions suitable for standing use. Despite this location would marginally exceed the comfort category threshold during the windiest season, wind conditions would be safe as no strong winds exceeding the safety threshold for more than 2.2 hours per year at this location. Wind mitigation measures likely to provide beneficial shelter at this entrance would be off-site measures along the southern side of Brixton Station Road. However, given the proximity to the public highway, it is unlikely that any such mitigation can be erected.

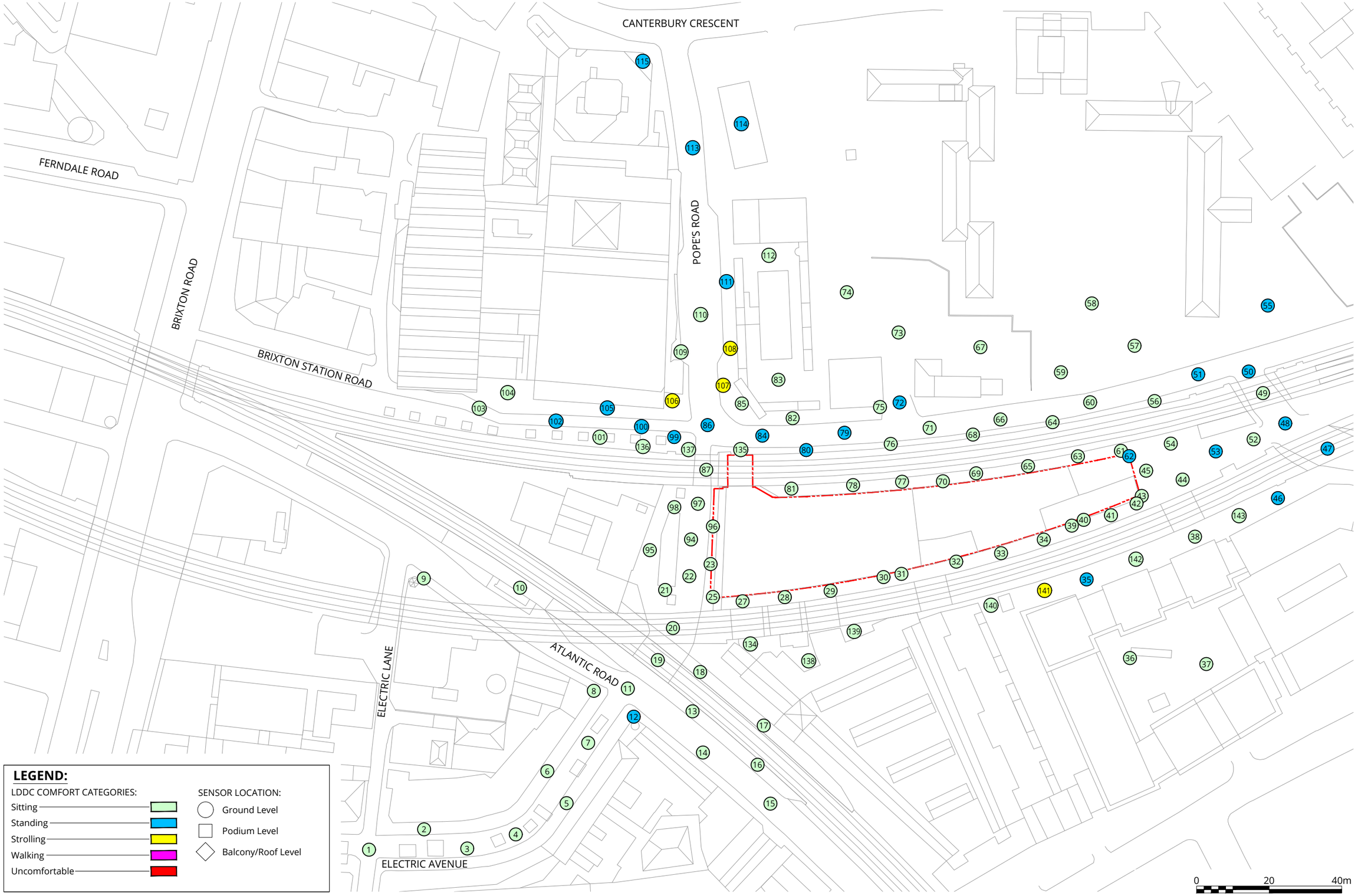
Wind conditions at the office terrace represented by measurement locations 118 and 119 would be suitable for standing use during the summer season in both the context of the existing and cumulative surrounding buildings with the wind mitigation measures in place; if long-term seating will be intended at this location, localised wind mitigation measures in the form of 1m high dense shrubs or screening around seating areas are expected to provide beneficial shelter and suitable wind conditions for the intended amenity use.

7. CONCLUSIONS

1. The meteorological data for the Site indicates prevailing winds from the south-west quadrant throughout the year with secondary winds from the north-east direction which are more prevalent during the spring months.
2. Wind conditions around the Existing Site (Configuration 1) are generally calm, as expected for a relatively low-rise area without any significantly tall buildings. Wind conditions range from suitable for sitting to strolling use during the windiest season. Wind conditions would be generally calmer during the summer season, ranging from suitable for sitting use to strolling use. Strong winds exceeding 15 m/s for more than 2.2 hours yearly would occur at measurement location 108 in the baseline scenario.
3. With the inclusion of the Proposed Development in the context of the existing surroundings (Configuration 2), wind conditions during the windiest season would range from sitting use to walking use. Walking use wind conditions would occur at measurement location 89 at the north-western corner of the Proposed Development. During the summer season, one category windier than required wind conditions would occur at the amenity location 130. Strong winds exceeding 15 m/s for more than 2.2 hours per year would occur at measurement location 89 in this configuration.
4. Configuration 3 tested the wind conditions at and surrounding the Proposed Development in the context of the existing surroundings, with the wind mitigation strategy in place. Wind conditions during the windiest season would range from suitable for sitting use to walking use, with walking wind conditions at measurement location 89 at the north-western corner of the Proposed Development. All amenity spaces would have suitable wind conditions during the summer season, and no instance of strong winds would occur at any location throughout the year.
5. With the inclusion of the cumulative schemes in Configuration 4, wind conditions at and surrounding the Proposed Development would be largely consistent with Configuration 3, but windier conditions would occur to the north of the Site along Brixton Station Road during the windiest season, with walking use wind conditions at measurement location 84 and strolling use wind conditions at entrance location 80. Entrance location 80 would benefit from localised wind mitigation measures. However, given the proximity to the public highway, it is unlikely that any such mitigation can be erected. All the upper levels amenity locations would have suitable conditions for the intended amenity use during the summer season, and strong winds would not exceed the safety threshold for more than 2.2 hours per year at any location throughout the year.
6. Overall, with the inclusion of the wind mitigation strategy, wind conditions at and surrounding the Proposed Development would be safe and comfortable for all uses throughout the year; however slightly windier than desired wind conditions would occur at measurement location 80 in the context of the cumulative surroundings (Configuration 4), and at the office terrace represented by measurement locations 118 and 119 if long term seating will be intended at this amenity space. Wind mitigation measures likely to provide beneficial shelter at these locations have been suggested within Section 6 "Wind Mitigation Measures".

FIGURES





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

Pope's Road - Brixton, London, UK

True North

Project #2003956

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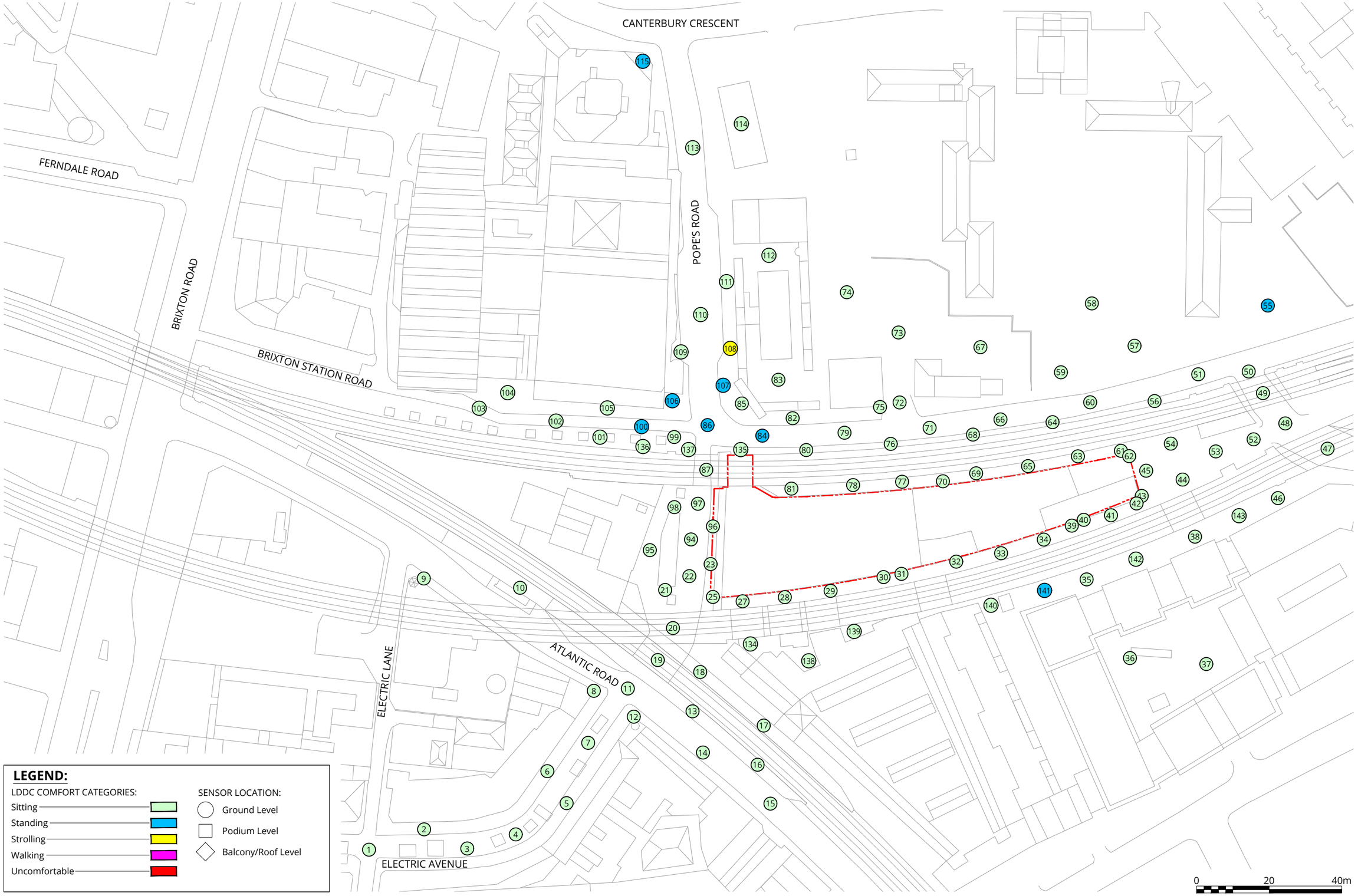
Date Revised:	June. 26, 2020		



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

Pope's Road - Brixton, London, UK

True North

Project #2003956

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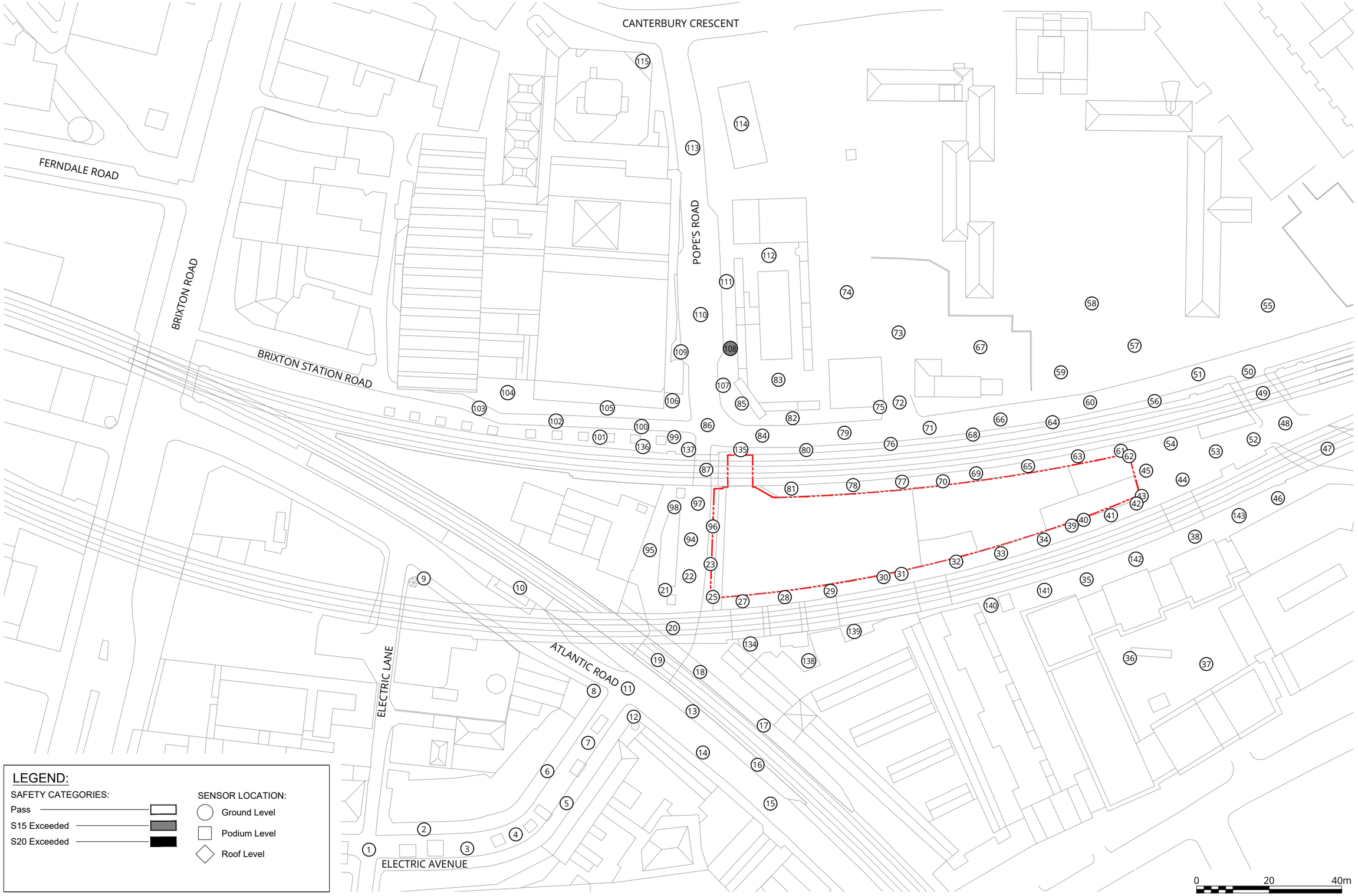

Pedestrian Wind Safety Conditions - Ground Floor
Configuration 1: Existing Site with Existing Surrounding Buildings
Annual

Pope's Road - Brixton, London, UK

True North

Project #2003956

Drawn by:	EN	Figure:	5
Approx. Scale @A3:	1:1000		
Date Revised:	June. 26, 2020		

Pedestrian Wind Comfort Conditions - Ground Floor
Configuration 2: Proposed Development with Existing Surrounding Buildings
Windiest Season

Pope's Road - Brixton, London, UK

True North

Project #2003956

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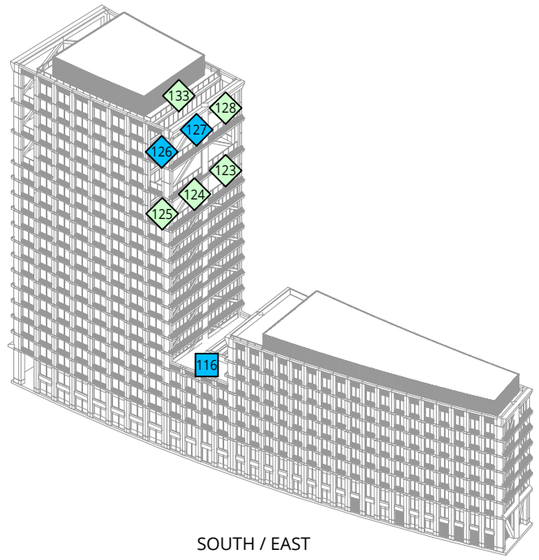
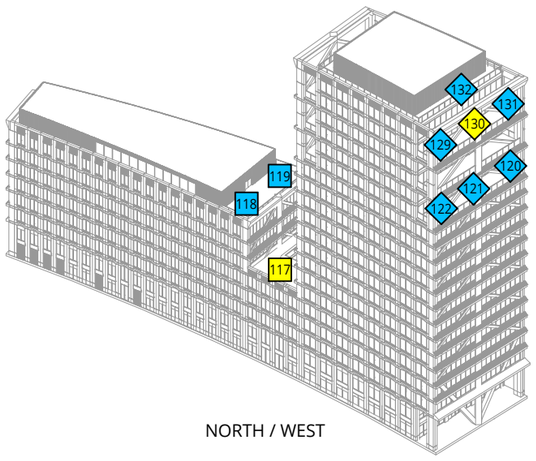
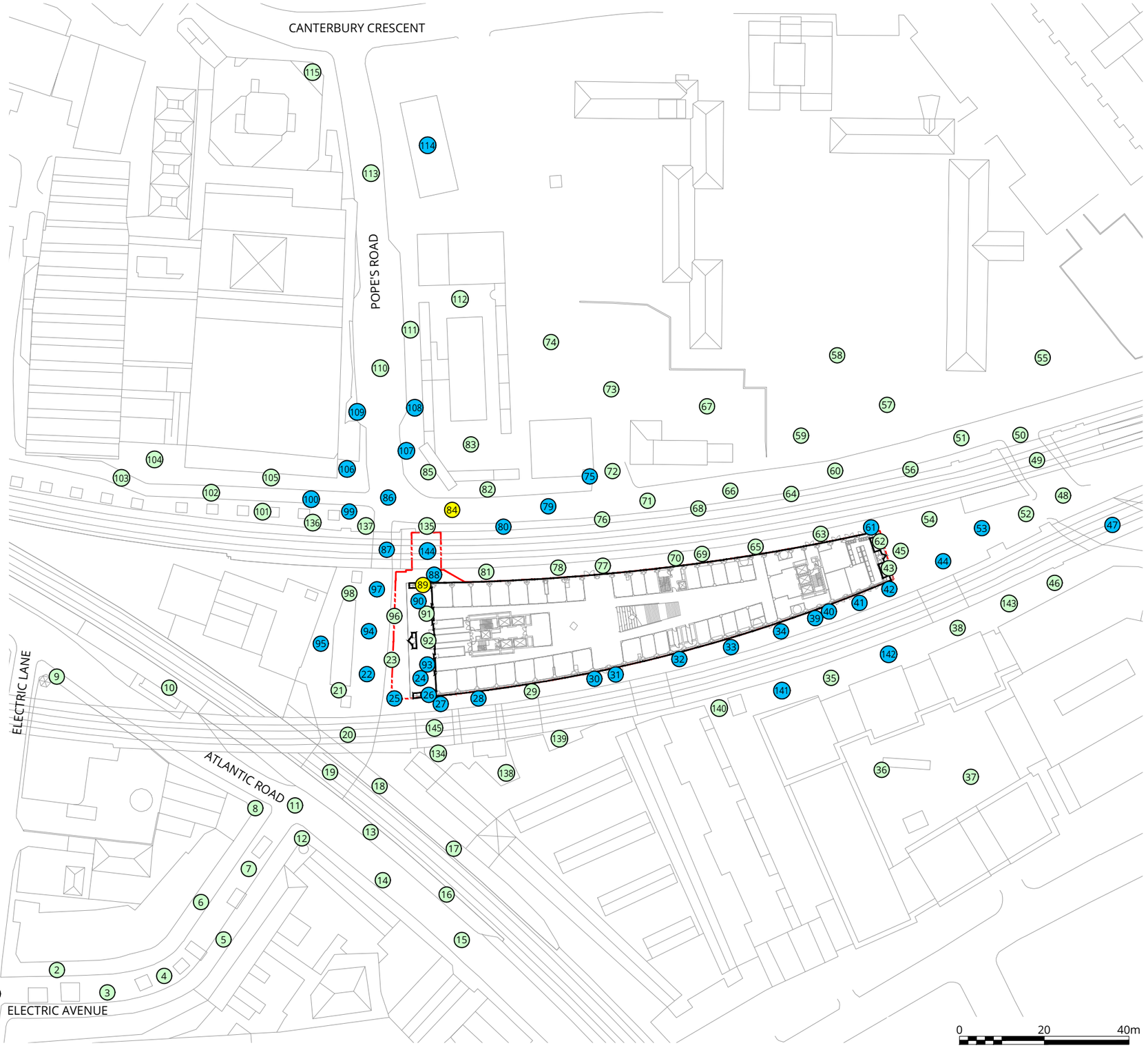


SOUTH / EAST



NORTH / WEST

Isometric Views 1:1250 0 25 50m



LEGEND:

LDDC COMFORT CATEGORIES:
- Sitting
- Standing
- Strolling
- Walking
- Uncomfortable

SENSOR LOCATION:
- Ground Level
- Podium Level
- Balcony/Roof Level

Pedestrian Wind Comfort Conditions - Ground Floor and Isometric Views
Configuration 2: Proposed Development with Existing Surrounding Buildings
Summer Season

Pope's Road - Brixton, London, UK

True North

Project #2003956

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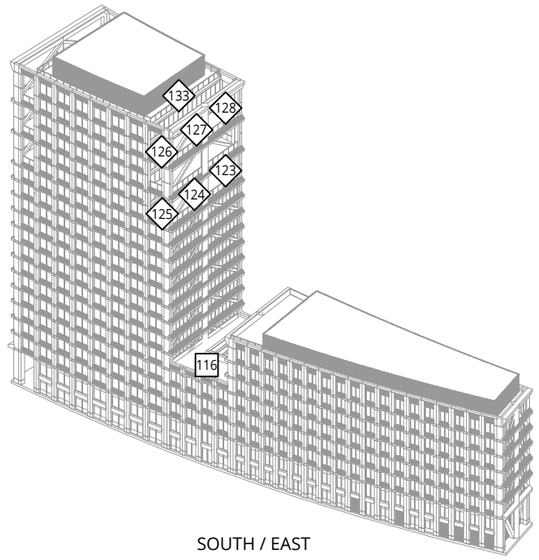

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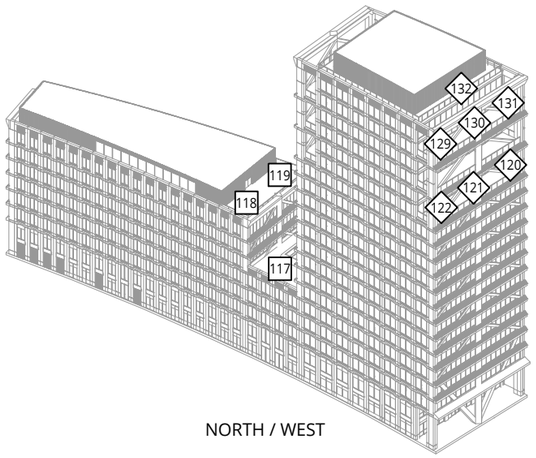
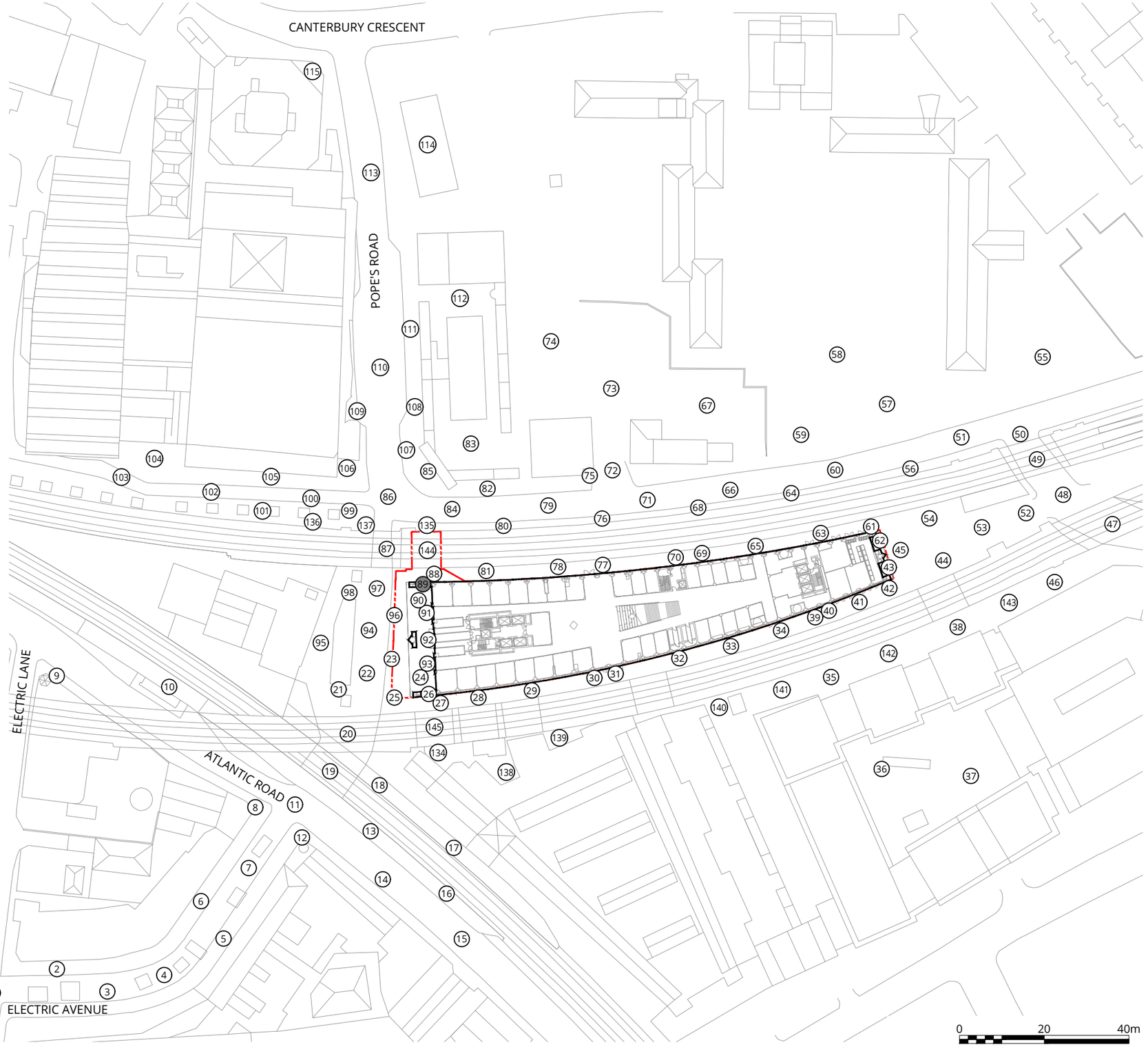


NORTH / WEST

Isometric Views 1:1250 0 25 50m



LEGEND:

SAFETY CATEGORIES:
- Pass
- S15 Exceeded
- S20 Exceeded

SENSOR LOCATION:
- Ground Level
- Podium Level
- Roof Level

Pedestrian Wind Safety Conditions - Ground Floor and Isometric Views
Configuration 2: Proposed Development with Existing Surrounding Buildings
Annual

Pope's Road - Brixton, London, UK

True North

Project #2003956

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Approx. Scale @A3:	1:1000		
Date Revised:	June. 26, 2020		

Pedestrian Wind Comfort Conditions - Ground Floor
Configuration 3: Proposed Development with Existing Surrounding Buildings and Wind Mitigation Measures
Windiest Season

Pope's Road - Brixton, London, UK

True North

Project #2003956

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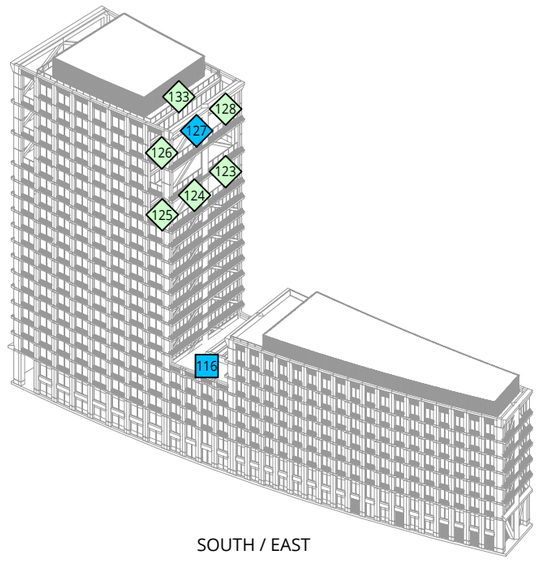

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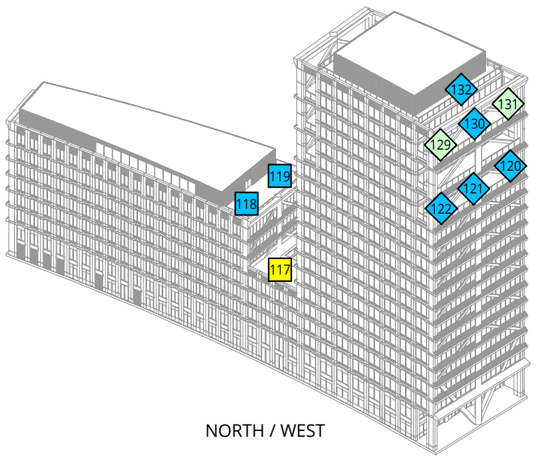

NORTH / WEST

Isometric Views 1:1250 0 25 50m

LEGEND:

LDDC COMFORT CATEGORIES:
- Sitting
- Standing
- Strolling
- Walking
- Uncomfortable

SENSOR LOCATION:
- Ground Level
- Podium Level
- Balcony/Roof Level

Pedestrian Wind Comfort Conditions - Ground Floor and Isometric Views
Configuration 3: Proposed Development with Existing Surrounding Buildings and Wind Mitigation Measures
Summer Season

Pope's Road - Brixton, London, UK

True North

Project #2003956

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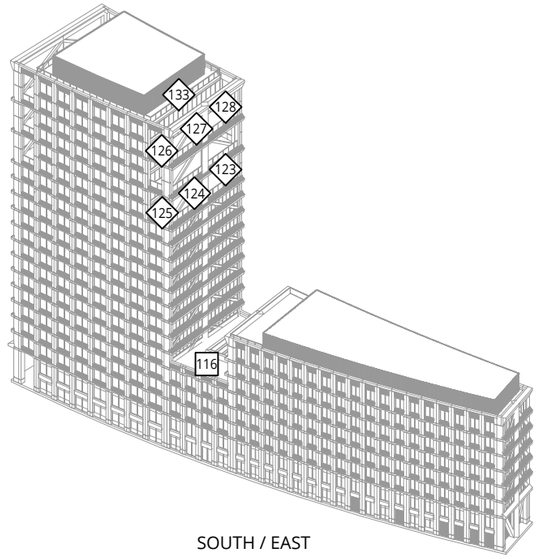

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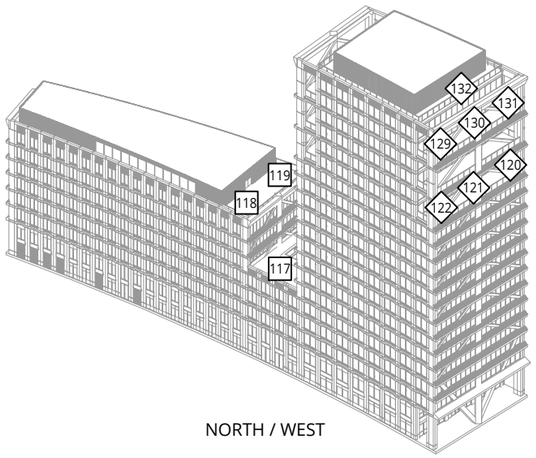

NORTH / WEST

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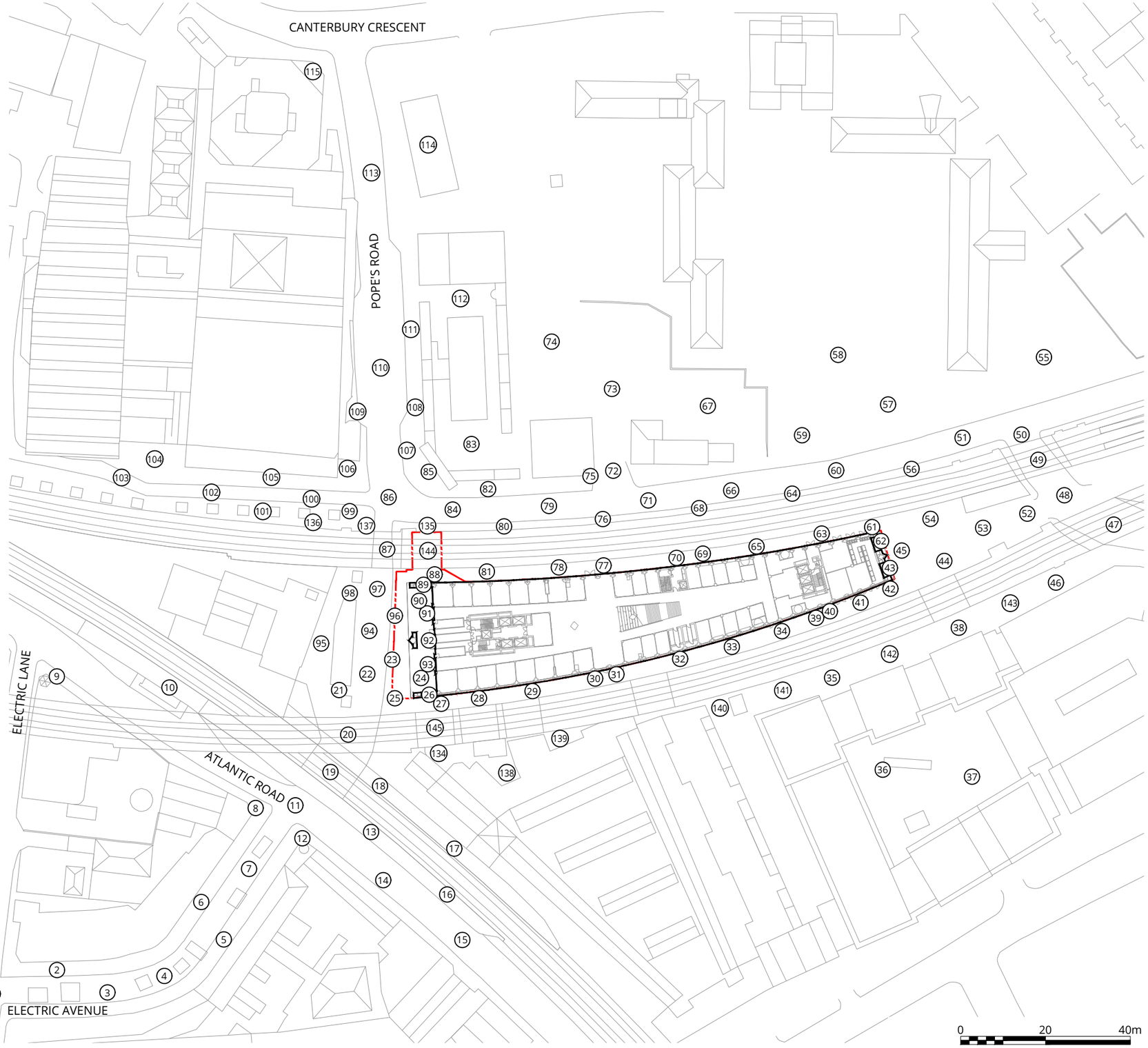

LEGEND:

SAFETY CATEGORIES:
- Pass
- S15 Exceeded
- S20 Exceeded

SENSOR LOCATION:
- Ground Level
- Podium Level
- Roof Level

Pedestrian Wind Safety Conditions - Ground Floor and Isometric Views
Configuration 3: Proposed Development with Existing Surrounding Buildings and Wind Mitigation Measures
Annual

Pope's Road - Brixton, London, UK

True North

Project #2003956

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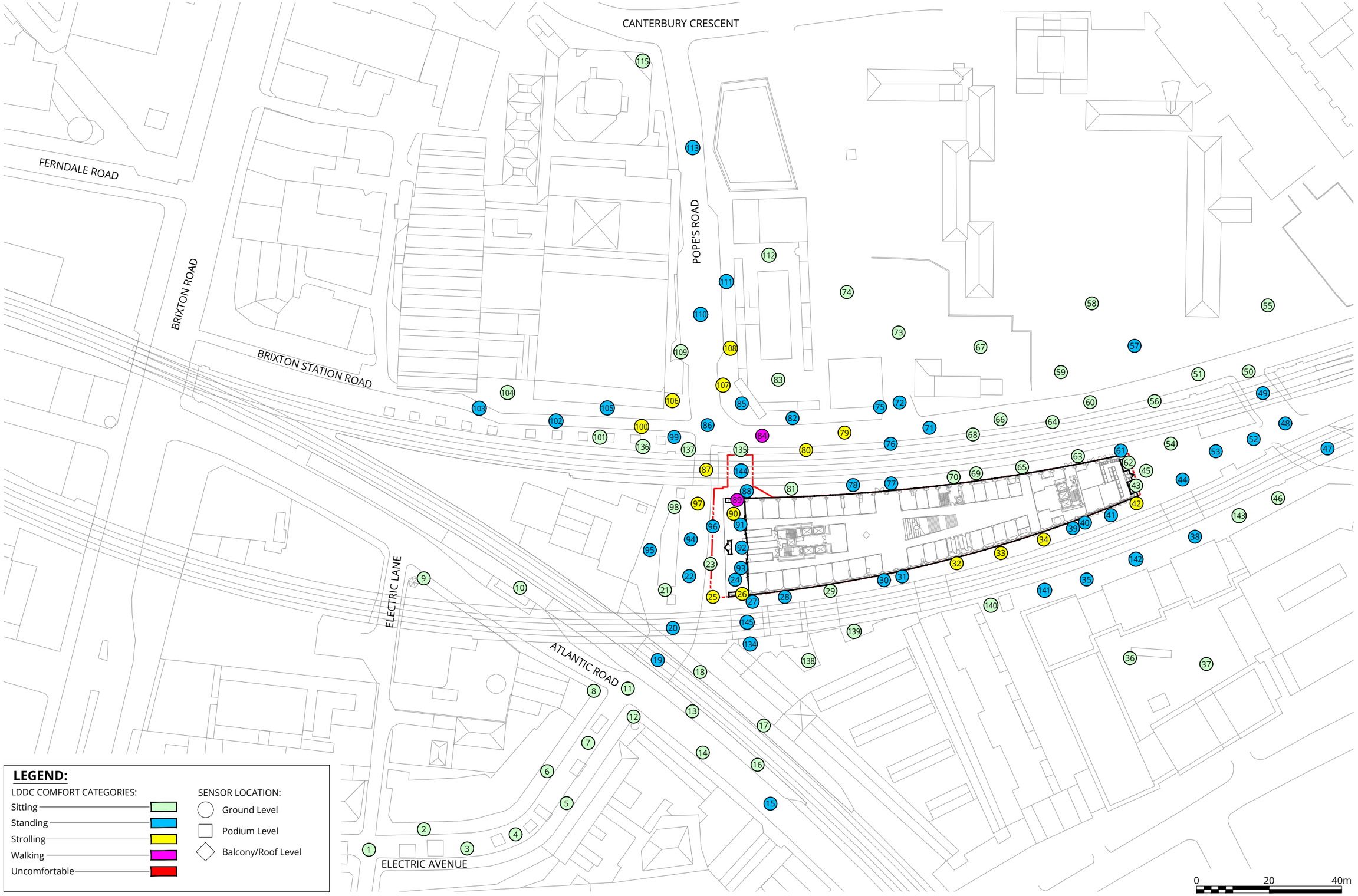

Pedestrian Wind Comfort Conditions - Ground Floor
Configuration 4: Proposed Development with Cumulative Surrounding Buildings and Wind Mitigation Measures
Windiest Season

Pope's Road - Brixton, London, UK

True North

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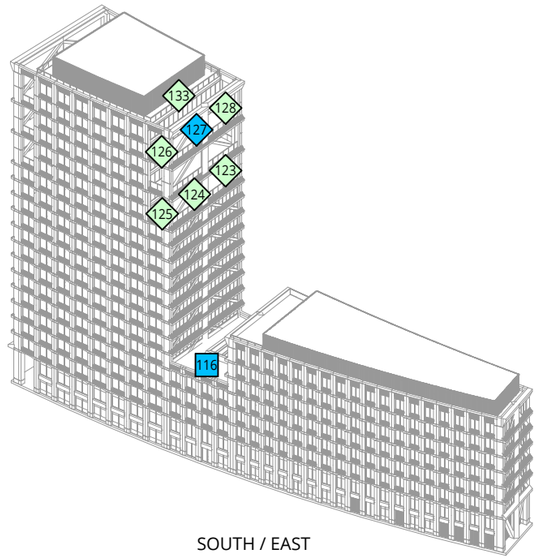
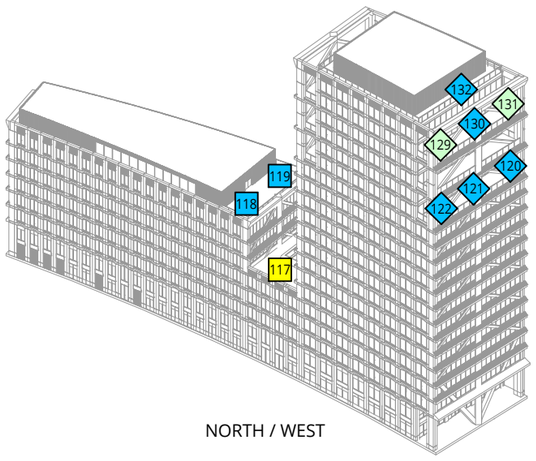
Approx. Scale @A3: 1:1000
Project #2003956 | Date Revised: June. 26, 2020



SOUTH / EAST



NORTH / WEST

Isometric Views 1:1250 0 25 50m

LEGEND:

LDDC COMFORT CATEGORIES:
- Sitting
- Standing
- Strolling
- Walking
- Uncomfortable

SENSOR LOCATION:
- Ground Level
- Podium Level
- Balcony/Roof Level

Pedestrian Wind Comfort Conditions - Ground Floor and Isometric Views
Configuration 4: Proposed Development with Cumulative Surrounding Buildings and Wind Mitigation Measures
Summer Season

Pope's Road - Brixton, London, UK

True North

Project #2003956

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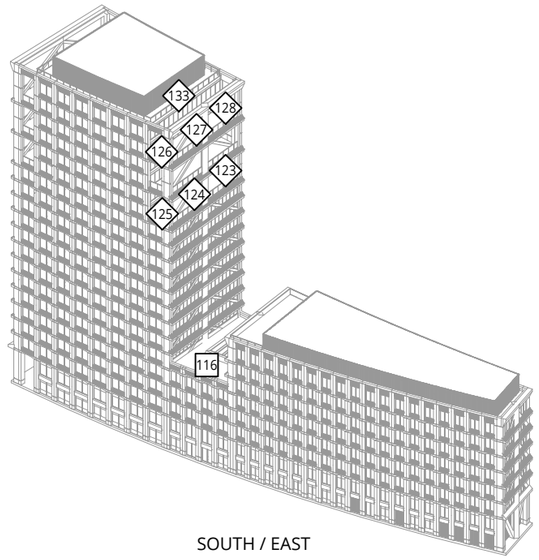

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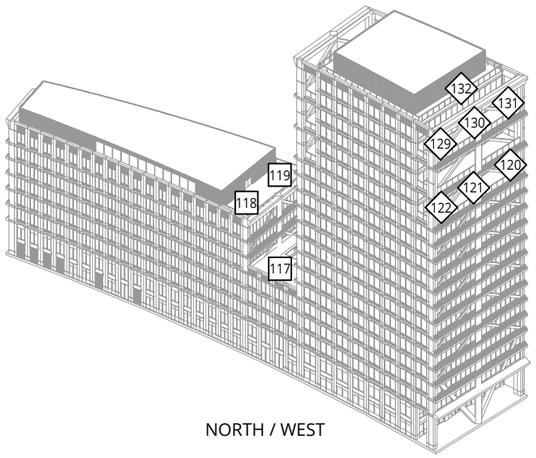
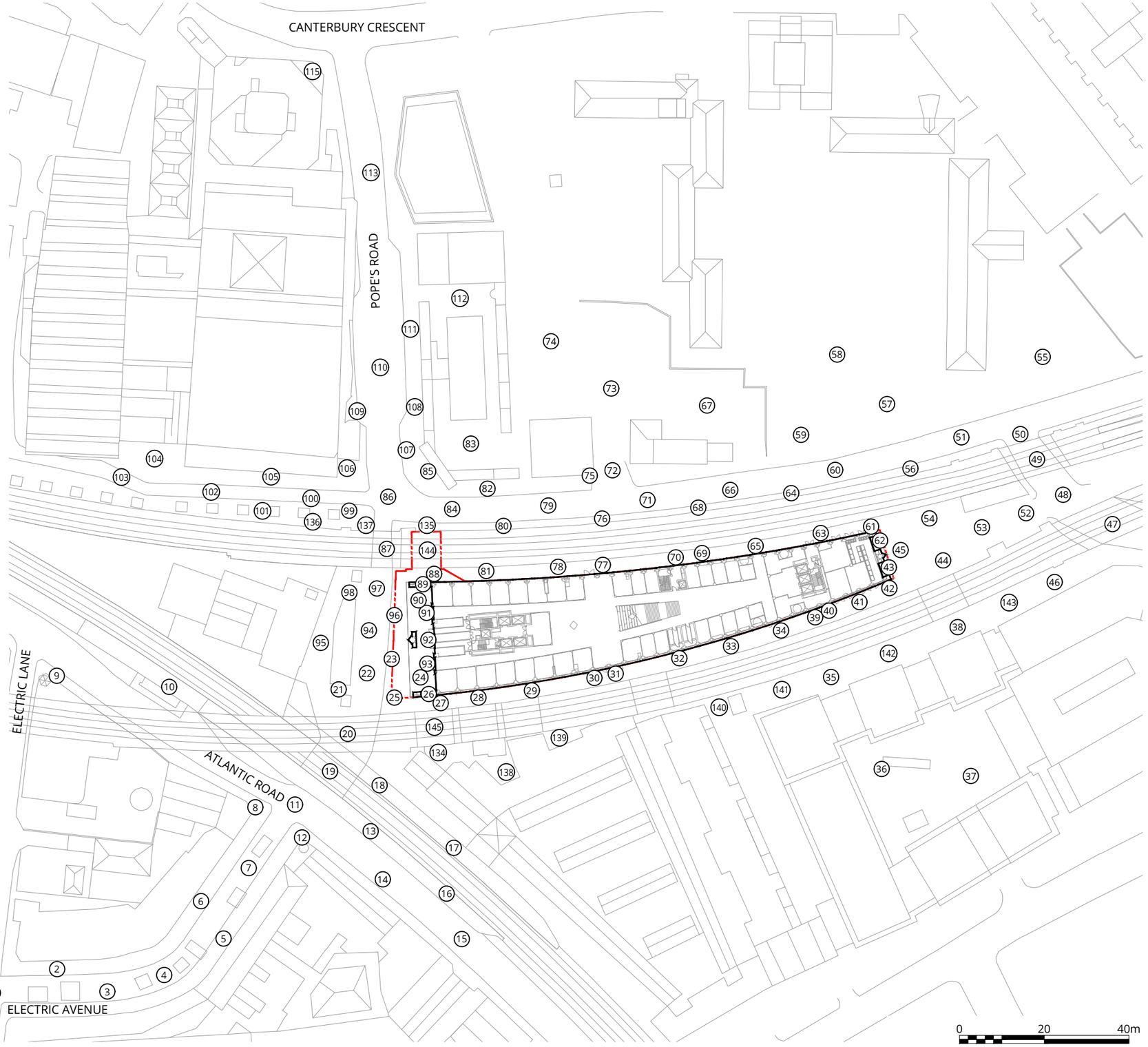


NORTH / WEST

Isometric Views 1:1250 0 25 50m



LEGEND:

SAFETY CATEGORIES:
- Pass
- S15 Exceeded
- S20 Exceeded

SENSOR LOCATION:
- Ground Level
- Podium Level
- Roof Level

Pedestrian Wind Safety Conditions - Ground Floor and Isometric Views
Configuration 4: Proposed Development with Cumulative Surrounding Buildings and Wind Mitigation Measures
Annual

Pope's Road - Brixton, London, UK

True North

Project #2003956

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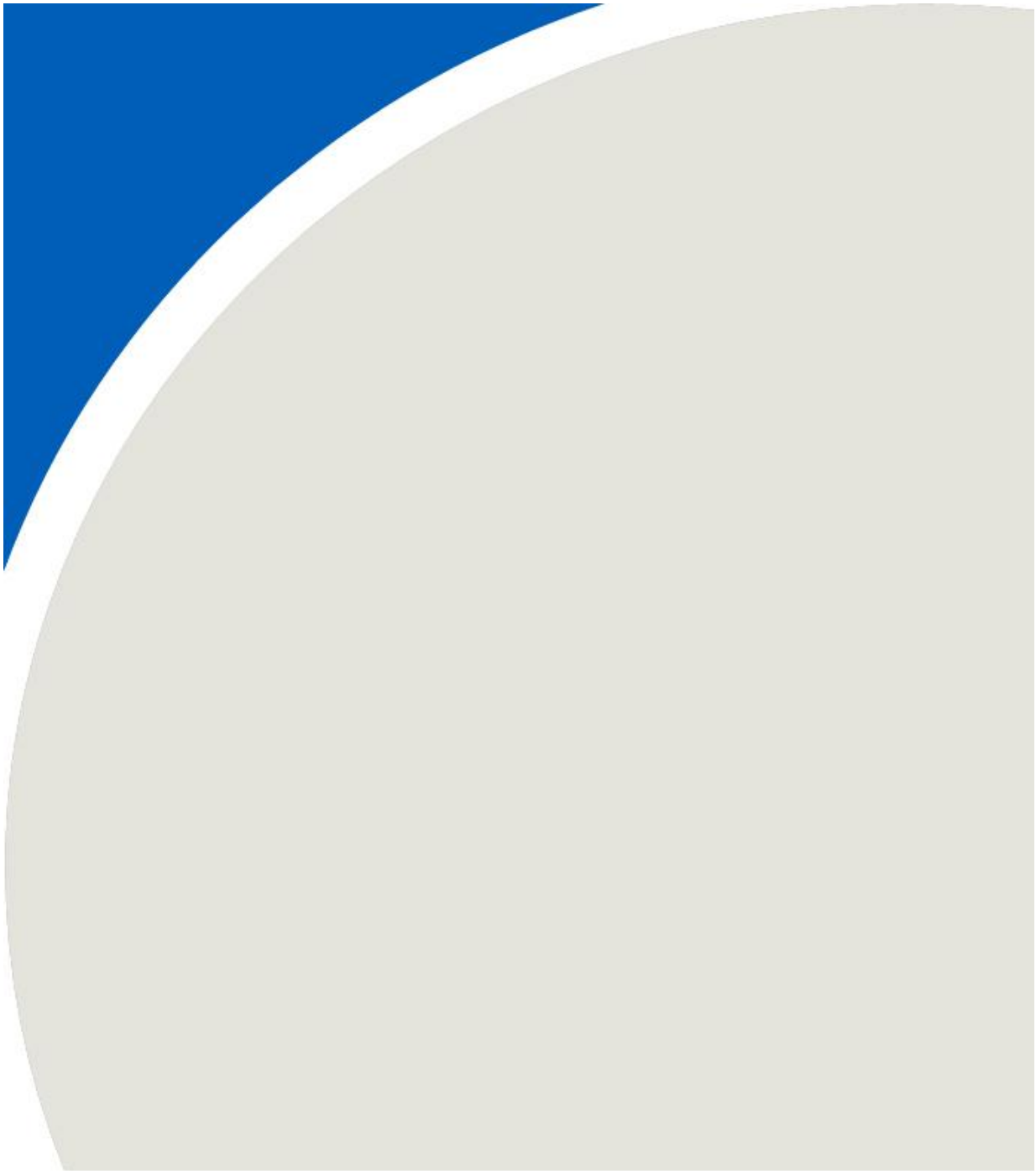
Date Revised:	June. 26, 2020		

APPENDICES



APPENDIX A: WIND TUNNEL PHOTOS

Figure 15: Existing Site with Existing Surrounding Buildings (Configuration 1) – View in the Wind Tunnel (from the south)

Figure 16: Existing Site with Existing Surrounding Buildings (Configuration 1) – View in the Wind Tunnel (from the west)

Figure 17: Proposed Development with Existing Surrounding Buildings (Configuration 2) – View in the Wind Tunnel (from the south)

Figure 18: Proposed Development with Existing Surrounding Buildings (Configuration 2) – View in the Wind Tunnel (from the west)

Figure 19: Proposed Development with Existing Surrounding Buildings and Wind Mitigation Measures (Configuration 3) – View in the Wind Tunnel (from the south)

Figure 20: Proposed Development with Existing Surrounding Buildings and Wind Mitigation Measures (Configuration 3) – View in the Wind Tunnel (from the west)

Figure 21: Proposed Development with Existing Surrounding Buildings and Wind Mitigation Measures (Configuration 3) – Wind Tunnel Photo

Figure 22: Proposed Development with Existing Surrounding Buildings and Wind Mitigation Measures (Configuration 3) – Wind Tunnel Photo

Figure 23: Proposed Development with Existing Surrounding Buildings and Wind Mitigation Measures (Configuration 3) – Wind Tunnel Photo

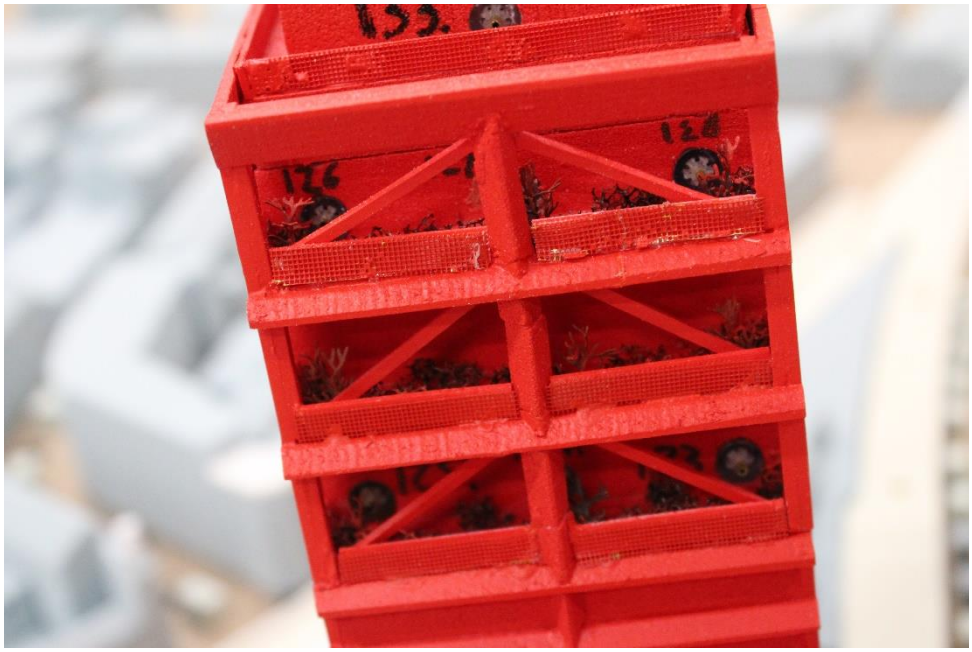


Figure 24: Proposed Development with Existing Surrounding Buildings and Wind Mitigation Measures (Configuration 3) – Wind Tunnel Photo

Figure 25: Proposed Development with Existing Surrounding Buildings and Wind Mitigation Measures (Configuration 3) – Wind Tunnel Photo

Figure 26: Proposed Development with Existing Surrounding Buildings and Wind Mitigation Measures (Configuration 3) – Wind Tunnel Photo

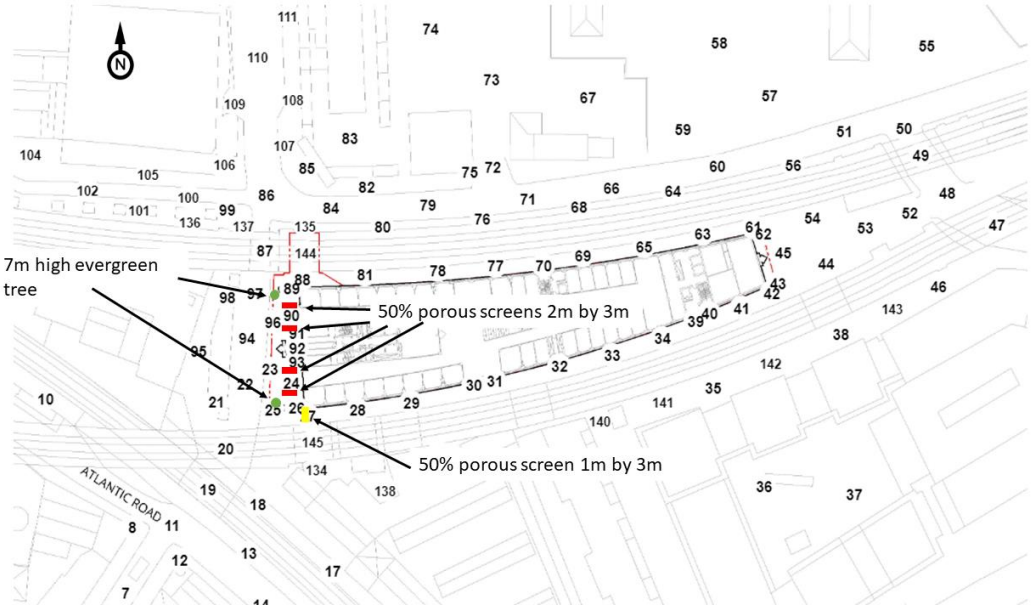


Figure 27: Proposed Development with Existing Surrounding Buildings and Wind Mitigation Measures (Configuration 3) – Ground level mitigation measures

Figure 28: Proposed Development with Existing Surrounding Buildings and Wind Mitigation Measures (Configuration 3) – Wind Tunnel Photo

Figure 29: Proposed Development with Cumulative Surrounding Buildings and Wind Mitigation Measures (Configuration 4) – View in the Wind Tunnel (from the south)

Figure 30: Proposed Development with Cumulative Surrounding Buildings and Wind Mitigation Measures (Configuration 4) – View in the Wind Tunnel (from the west)

APPENDIX B: METEORLOGICAL DATA

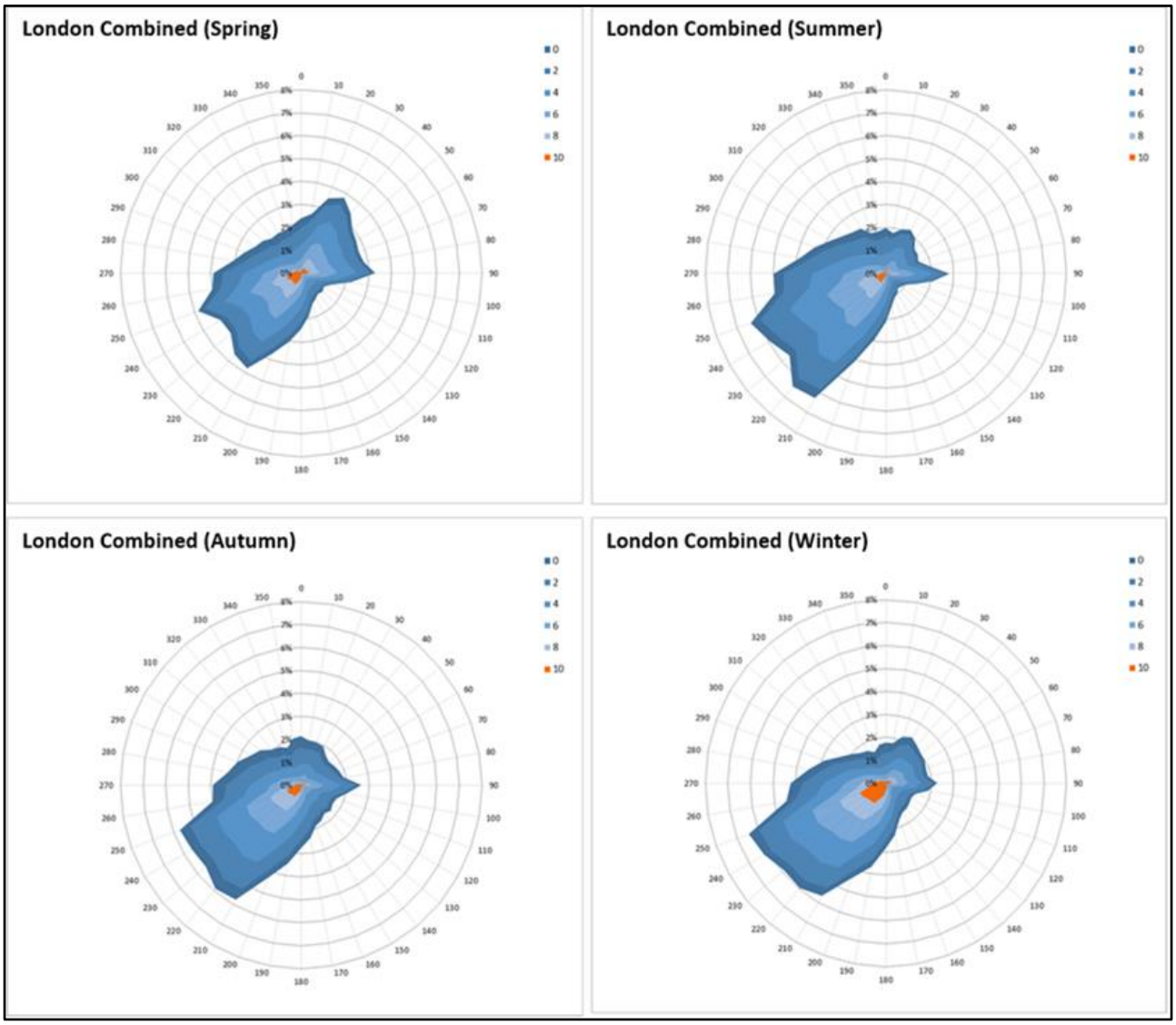


Figure 31: Wind Rose for London (Heathrow and London City Airports)

APPENDIX C: MEAN FACTORS

Table 2: Mean factors at 120m above ground level

Wind Direction	0°	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°	110°	120°	130°	140°	150°	160°	170°	180°	190°	200°	210°	220°	230°	240°	250°	260°	270°	280°	290°	300°	310°	320°	330°	340°	350°
Mean Factor at 120 m	1.16	1.16	1.16	1.16	1.20	1.17	1.17	1.23	1.25	1.25	1.25	1.25	1.25	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.20	1.20	1.20	1.20	1.20	1.20	1.19	1.19	1.19	1.19	1.16	1.16	1.16	1.16

APPENDIX D: INTENDED USES

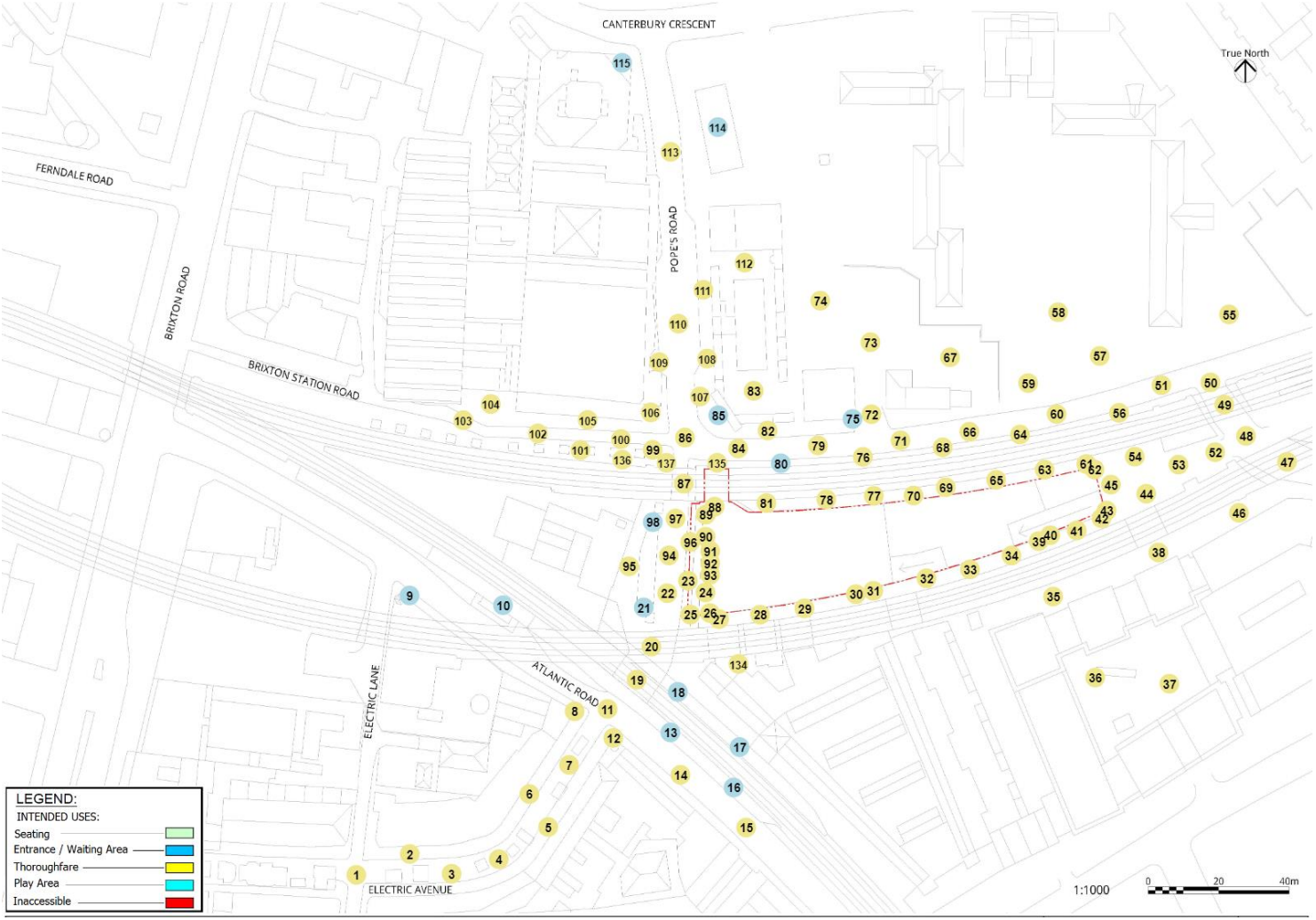


Figure 32: Intended uses – Ground Level – Configuration 1

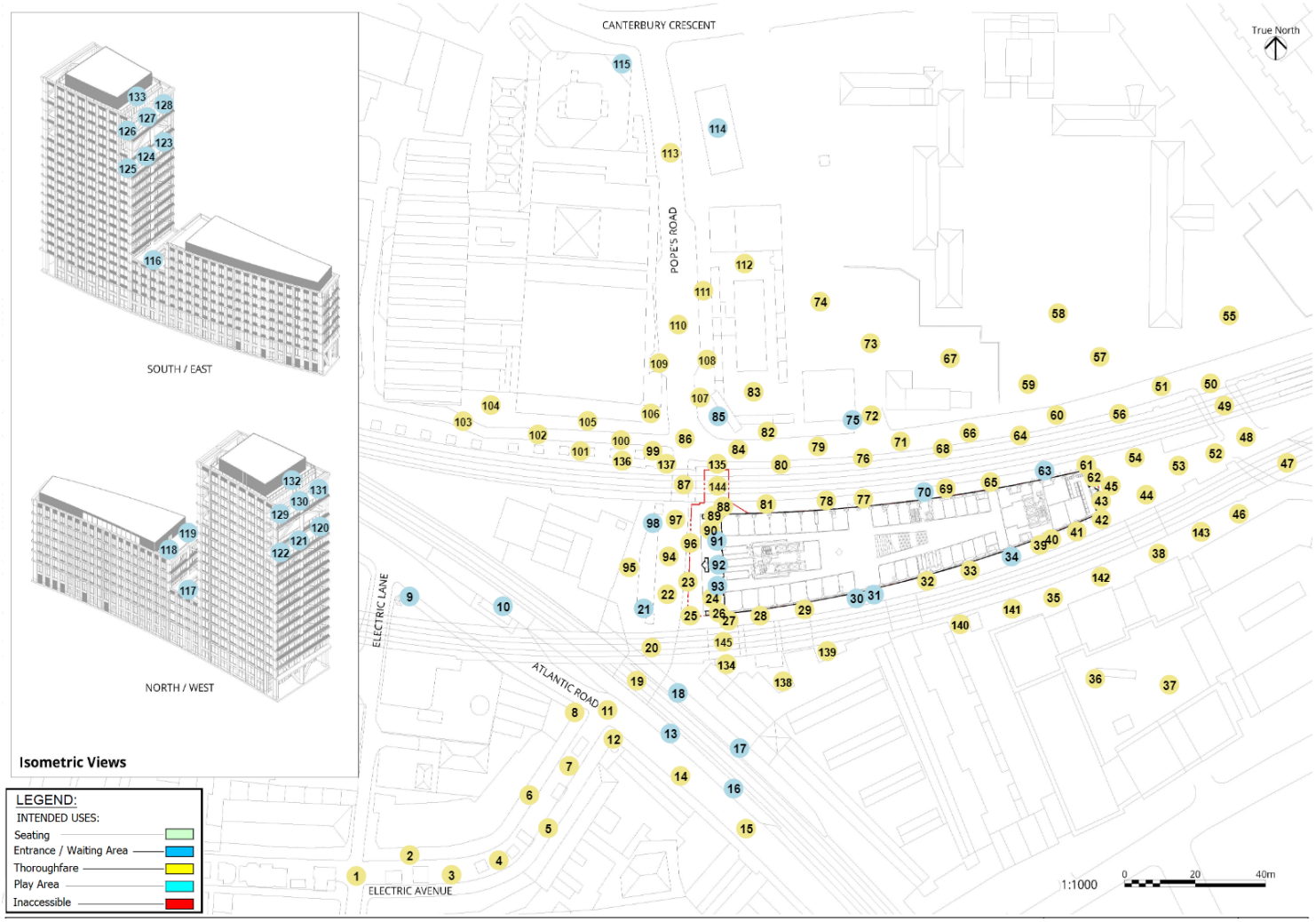


Figure 33: Intended uses – Ground and balcony/terrace Levels – Configurations 2-4