6.8 Wind Microclimate

6.8.1 Chapter 13 of the 2022 ES (prepared by Hoare Lea) reported the likely significant wind microclimate effects of the 2023 Consent on existing receptors during the construction and operational phase and considered concentrations at new receptor locations introduced.

6.8.2 This Chapter has been prepared by Buro Happold in order to outline the key changes associated with the Proposed Development in relation to the 2023 Consent and to identify any changes to the findings and conclusions associated with the 2022 ES.

Legislation, Planning Policy and Guidance

6.8.3 A review of UK legislation, planning policy and guidance relevant to the proposals was previously undertaken as part of the 2022 ES.

6.8.4 The UK-wide National Planning Policy Framework (NPPF) was updated in December 2024. There are no national planning policies directly relating to wind microclimate issues; however, the benefits of a high quality built environment are emphasised in the NPPF. An example of this is presented in paragraph 135 d): "…establish or maintain a strong sense of place, using the arrangement of streets, spaces, building types and materials to create attractive, welcoming and distinctive places to live, work and visit …".

6.8.5 There have been no changes to London Borough of Camden (LBC) current local policy and guidance since the 2022 ES. However, LBC is in process of updating the Local Plan[i] . The emerging Camden Local Plan is currently it its consultation stage. At this stage in the plan preparation process, the draft Local Plan policies carry limited weight. However, these will start to carry more weight as the plan moves towards adoption and so have been considered within the application documentation

Assessment Methodology and Significance Criteria

6.8.6 The following section outlines the methodologies applied to identify and assess the potential impacts and likely effects to result from the amendment proposed to the Detailed Element.

Extent of The Study Area

EIA Study Area

6.8.7 The Site boundary plan with plot locations for the outline and detail parts (Proposed Development) is shown in Figure 6.8.1.

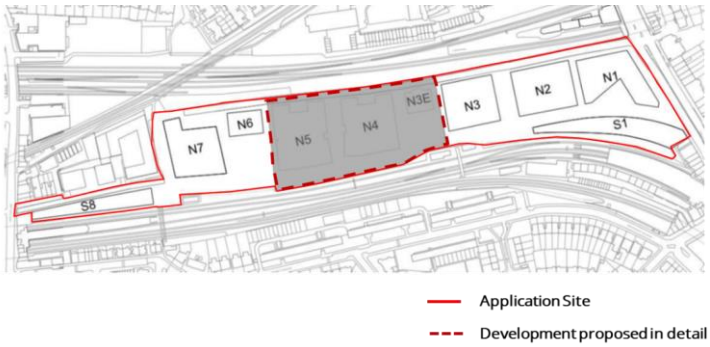

Figure 6.8.1: Site boundary plan

CFD Model Extent

6.8.8 The CFD model has been prepared in accordance with the requirements set out in the City of London Wind Microclimate Guidelines (CoLC, 2019). Surrounding buildings and terrain were included in the model up to a radius of 500m. A total simulation domain of diameter 1,800m was modelled. This distance is appropriate as it explicitly contains all buildings and structures surrounding the Site that are likely to affect the wind flows around it.

Method of Baseline Collection

CFD Modelling Approach

6.8.9 The physical layout of the Site was analysed using a 3D CFD model. CFD modelling involves the solution of the fundamental equations of fluid motion using numerical techniques. The region of interest is divided into numerous small volumes, or cells, and equations are solved within each cell. Values of the variables that are solved in the model are determined in each cell and so a comprehensive assessment of velocity variation within the calculation domain is obtained. To improve the resolution of the results, the computational cell size has been reduced in the areas of most interest. This ensures that large gradients of velocity at street level are modelled accurately.

6.8.10 For buildings outside the development boundary, a 3D context model was developed based on footprints and building heights obtained from aerial survey data. The proposed buildings and surroundings have been modelled according to the information provided by the Design Team. These buildings proposed as part of the Development have been merged with the context information and simplified for CFD modelling purposes. The surrounding topography and landscaping (along with other urban infrastructure elements such as nearby bridges and railway platforms) has been included explicitly in the CFD geometry model to account for any significant wind effects. In accordance with the modelling of the previous 2022 ES, the Site landscaping has not been included, therefore the presented results represent a worst-case scenario.

6.8.11 The computational mesh for the study has been prepared in accordance with the City of London Wind Microclimate Guidelines (CoLC, 2019) and follows the recommended cell sizes near the ground and critical features in the model.

Atmospheric Boundary Layer

6.8.12 The upwind boundaries of the CFD model were prescribed with an atmospheric velocity and turbulence profile corresponding to natural winds. The atmospheric velocity profile was modelled using a log-law, based on communications with ANSYS (i.e. the developers of the CFX CFD software used).

6.8.13 The downwind and upper boundaries were represented as pressure opening boundaries. These are representative of the atmosphere surrounding the Site. They allow air to be entrained into the model domain or air to flow out of the domain.

6.8.14 For each wind direction, a single, steady-state RANS (Reynolds Averaged Navier-Stokes) calculation was undertaken using the commercial ANSYS CFX software. Turbulence was modelled using an SST model, with a production limiter used to ensure realistic flow predictions close to stagnation points. This method allows for the assessment of mean wind speeds.

Wind Data Analysis

6.8.15 For analysis of wind behaviour, it is necessary to know the relevant wind data for the Site. Velocity fluctuation and directional variance are hard to measure accurately.

6.8.16 Both the wind speed frequency and its direction are required for this assessment. This data is commonly presented in the form of wind speed and wind frequency distribution diagrams (wind roses). Data is usually provided for average hourly wind speeds at 10m above ground level. This data is monitored and recorded from meteorological stations across England and reported by the Met Office.

Direction Frequency

6.8.17 The assessment is based on historical averaged wind data collected at the weather station at Heathrow Airport for the period 2002 - 2022, which is expected to be a suitable approximation of the prevailing wind conditions at the site once the differences in terrain are accounted for through wind translation. The prevailing wind at the Site is from the south-west with some secondary wind contributions from the north and north-east. Occasional strong winds also come from the east and south-east.

6.8.18 The annual and seasonal wind roses for Heathrow Airport are shown below in Figure 6.8.2.

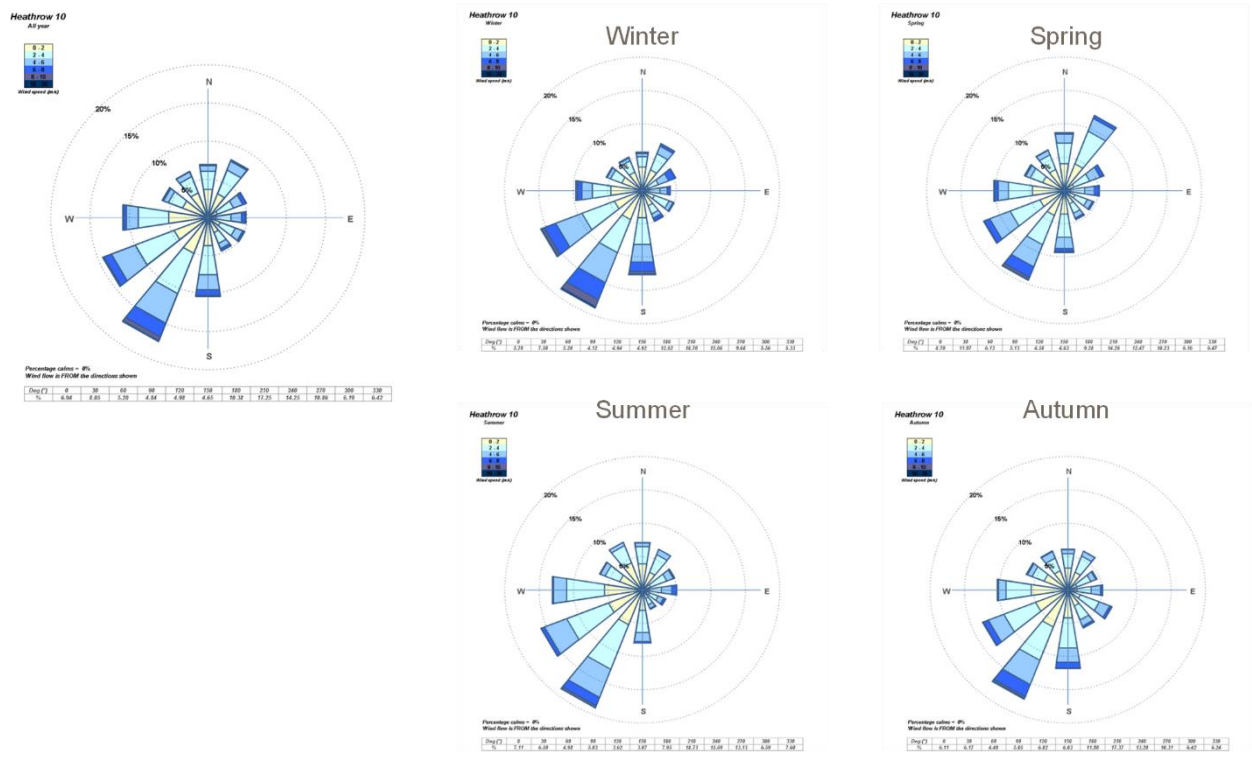

Figure 6.8.2: Annual and seasonal wind roses Heathrow Airport (Met Office)

6.8.19 The wind data from Heathrow Airport has been translated to the Site using the method described in the Designer's Guide to Wind Loading on Building Structures Part 2 (Cook, 1990), accounting for the changes of the terrain roughness between the measured site and the target site.

Method of Assessment

Demolition & Construction Phase

6.8.20 The temporary wind effects during construction have been assessed qualitatively.

Operational Phase

6.8.21 This assessment includes a direct comparison between the baseline conditions and those created by the Proposed Development for 36 wind directions based on the wind statistical data translated to the Site. This Chapter describes the quantitative assessment of the likely wind environment, and the qualitative judgements that are made in order to identify areas of potential concern. This analysis includes an assessment of the relative forms, layouts and massing of the existing Site and the Proposed Development, as well as surrounding landscaping and topography.

6.8.22 Impacts of the likely wind conditions are judged based on the CFD modelling results and Buro Happold's extensive experience of wind assessments, full-scale testing, CFD and wind tunnel modelling of similar developments.

6.8.23 Wind microclimate comfort strongly depends on an individual's activity and so has, therefore, been defined separately for each activity in terms of an average (mean) wind speed exceeded for a certain percentage of the year. In line with the 2022 ES, the assessment has been undertaken according to the City of London Wind Microclimate Guidelines (CoLC, 2019) to investigate the likely pedestrian conditions in and around the Site.

6.8.24 The seating areas on the Site are intended for occasional sitting. These will be more frequently used during summer.

Scenarios Tested

6.8.25 Five scenarios have been tested within this assessment. Scenario 4 and 5 are additions to the Wind Microclimate assessment of the 2022 ES:

- Configuration 1: Existing Site in existing surroundings (Baseline);
- Configuration 2: Proposed Development in existing surroundings (Proposed);
- Configuration 3: Proposed Development in context of future surroundings (Cumulative);
- Configuration 4: Proposed Development with Balcony Mitigation in existing surroundings (Proposed Mitigated); and
- Configuration 5: Severability of the relevant area of Plot S8 (qualitative assessment).

6.8.26 The existing and future surroundings have been updated to reflect the current state of the Site and publicly available information on consented cumulative developments (there has been no change) (for a list of these please refer to Paragraph 6.8.16 onwards - *Likely Cumulative Effects and their Significance*) at the time of this Wind Microclimate ES Addendum. For Configuration 1, this means that a new Baseline scenario was run to account for the fact that the Homebase store at the western end of the car park on the Site has now been demolished (December 2024).

Significance Criteria

6.8.27 The wind comfort criteria used in this assessment are the City of London Guidelines, which is a modified version of the London Docklands Development Corporation (LDDC) criteria. The details of the comfort and safety criteria and significance criteria (receptor sensitivity and magnitude of change) are set out in sections 13.6 and 13.7 of the original 2022 ES (Chapter 13).

Assessment of Baseline Conditions

6.8.28 The 3D model of the geometry used in the CFD simulations for the Baseline scenario is shown in Figure 6.8.3.

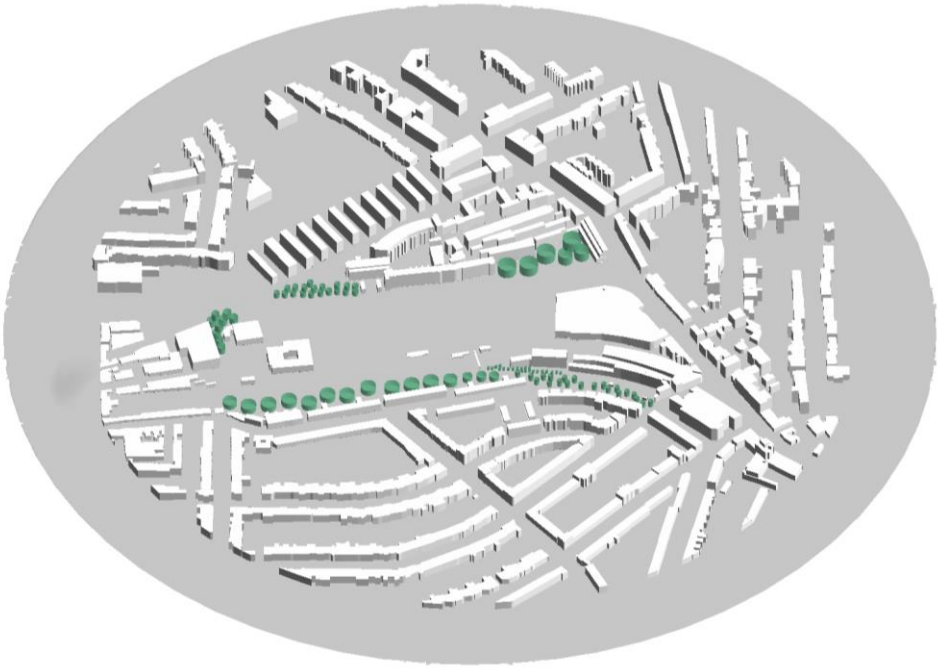

Figure 6.8.3: Modelled Baseline geometry

6.8.29 The annual composite safety map for the new baseline (accounting for the demolition of the Homebase store at the western end of the car park on the existing Site at the time of writing of this ES Addendum) is shown in Figure 6.8.4. No existing safety exceedance locations have been identified within the boundary of the Site in the Baseline scenario. This is in line with the 2022 ES (Chapter 13 Wind Microclimate).

Figure 6.8.4: Baseline - Annual composite safety map

6.8.30 The wind conditions have been analysed for the whole year, as well as for the summer and the winter season. These composite wind comfort maps are presented in Figure 6.8.5 and Figure 6.8.6.

6.8.31 The Site's overall environment shows comfortable wind conditions supporting a mixture of occasional (short-term) sitting to standing conditions. In the summer scenario occasional sitting conditions prevail, with a smaller zone of standing conditions in the eastern part of the Site. Overall, the new baseline wind comfort results are slightly more conservative than those in the 2022 ES.

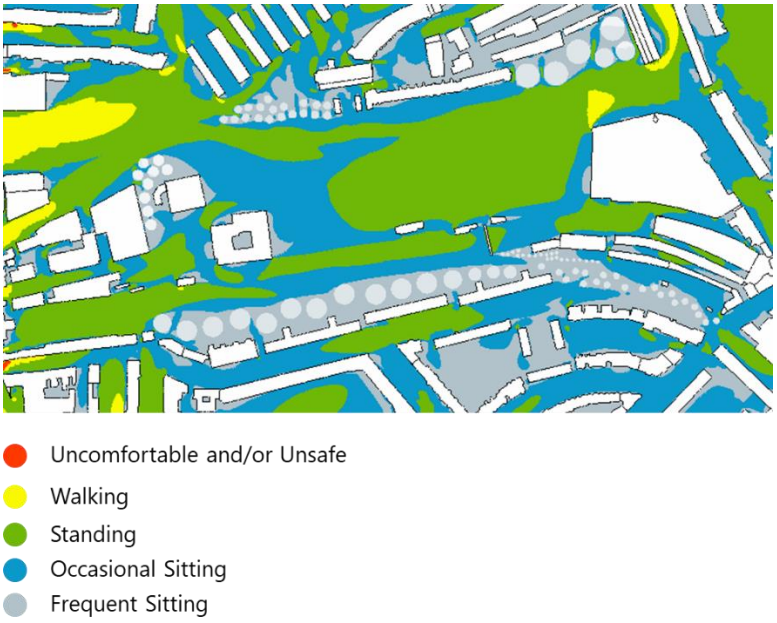

Figure 6.8.5: Baseline - Winter composite comfort map

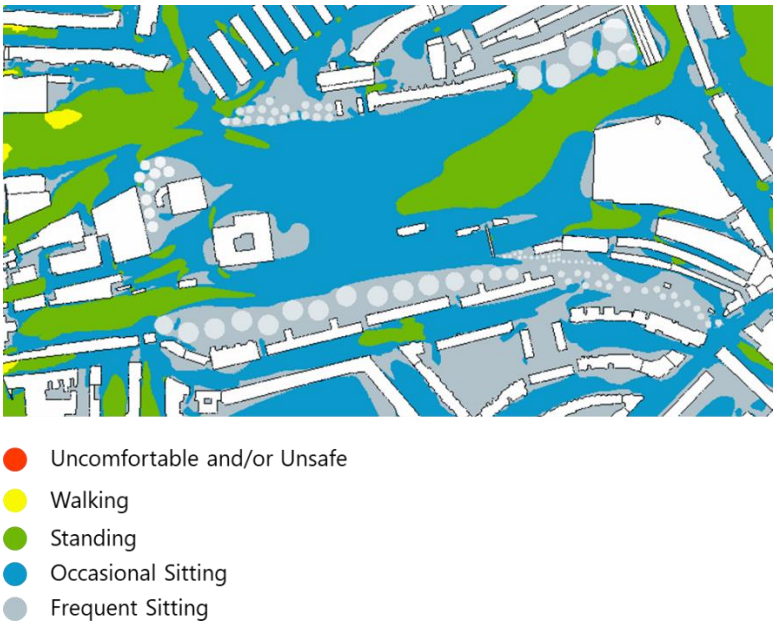

Figure 6.8.6: Baseline - Summer composite comfort map

Assessment of Effects, Mitigation and Residual Effects

Demolition & Construction Phase

6.8.32 This section identifies and assesses the scale and nature of the main effects arising from the Proposed Development during the construction phase.

6.8.33 The likely significant effects during construction have been assessed qualitatively on the basis of the professional judgement of the experienced wind engineer in Buro Happold, taking into account the baseline wind conditions and having regard to the outcomes of the CFD analysis of the completed development. This approach is taken assuming that the construction activities are less sensitive to wind conditions (due to site access being restricted to site workers) than when the Proposed Development is completed and occupied (when there will be full public access, including to sensitive areas such as entrances and amenity space, for example).

Effect

6.8.34 Overall, the wind environment during the demolition and construction of the Development is likely to be variable as the built form is constructed and, as such, all effects during construction would be temporary. The provision of construction hoardings will likely cause negligible to small beneficial changes to wind conditions within the construction site and in proximity to any hoardings, resulting in a negligible effect.

6.8.35 When the construction works are completed, the final conditions described in the 'The Operational Phase' sub-sections of this Chapter will materialise.

Mitigation

6.8.36 The effect during the demolition and construction phase is considered negligible, as per the 2022 ES, therefore no mitigation is required.

Residual Effect

6.8.1 N/A

Operational Phase

6.8.2 This section identifies and assesses the scale and nature of the main effects arising from the Proposed Development during the operational phase.

6.8.3 The 3D model of the geometry used in the CFD simulations for this scenario is shown in Figure 6.8.7.

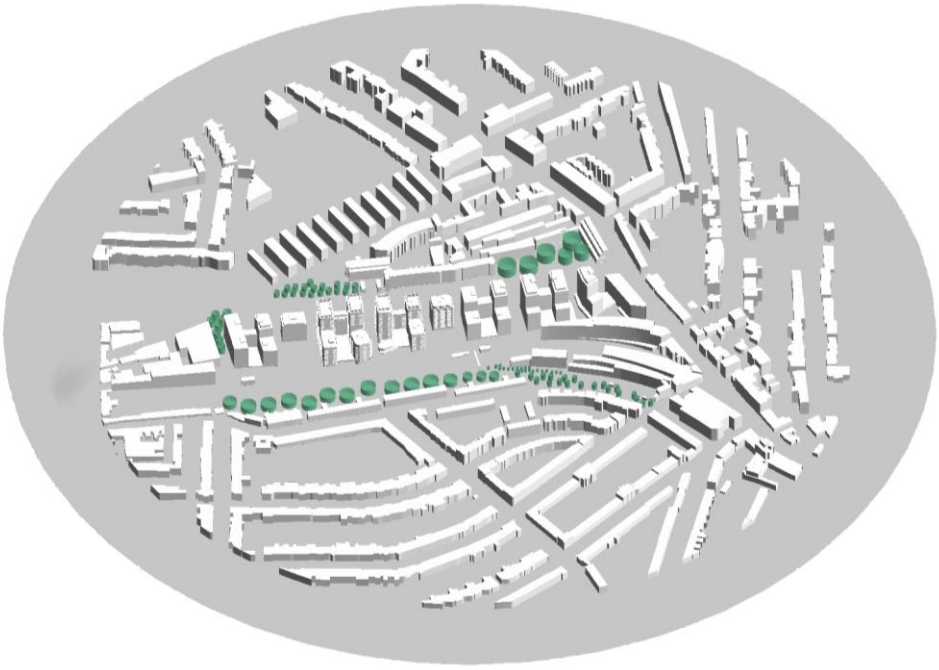

Figure 6.8.7: Modelled Proposed geometry

6.8.4 Detail of the intended uses of the Site is required in order to assess the effects of the wind environment on pedestrian comfort. For neighbouring buildings and open spaces, the likely pedestrian activity will be walking to access the surrounding buildings car parks. For the Proposed Development, information regarding the intended usage of different areas and indicative building plots is taken from the design information provided by the design team. This includes seating areas, building entrances, pedestrian thoroughfares and additional areas where outdoor activities are likely to take place. The ground- and podium-level pedestrian activities identified for the Proposed Development (at full completion) are shown in Figure 6.8.8 and Figure 6.8.9.

6.8.5 The seating areas on the Site are intended for occasional sitting. These will be more frequently used during summer.

Figure 6.8.8: Ground-level pedestrian activities

Figure 6.8.9: Podium-level pedestrian activities

Figure 6.8.10: N5 Roof terrace plan

6.8.6 The ground-level annual composite safety map for Configuration 2 is shown in 6.8.11. No safety exceedance locations have been identified within and around the Site. This conclusion is in line with the 2022 ES.

Figure 6.8.11: Proposed - Annual composite safety map

6.8.7 The ground-level winter and summer composite comfort maps for this configuration are given in 6.8.12 and 6.8.13. The Plot N3E east entrances show a moderate adverse effect of wind conditions which are not suitable for the intended standing use for the worst season (winter, Figure 6.8.12), and therefore require mitigation. This area was also identified as 'walking' in the Proposed winter comfort map of the 2022 ES. All other entrances, standing and seating areas are suitable for their intended use.

Figure 6.8.12: Proposed - Winter composite comfort map

Figure 6.8.13: Proposed - Summer composite comfort map

6.8.8 The podium, balcony and roof terrace annual safety maps are shown in Figure 6.8.14. No safety concerns have been identified on the podiums of N5 and N4. Similarly, no safety exceedances have been found on the N5 roof terraces. This conforms to the conclusions of the 2022 ES. However, several balconies show a safety exceedance (marked in orange in Figure 6.8.14), which is classified as a major significant effect that requires mitigation. It should be noted that the results presented in 6.8.14 show worst-case conditions, as this assumes no wind protection (open railings).

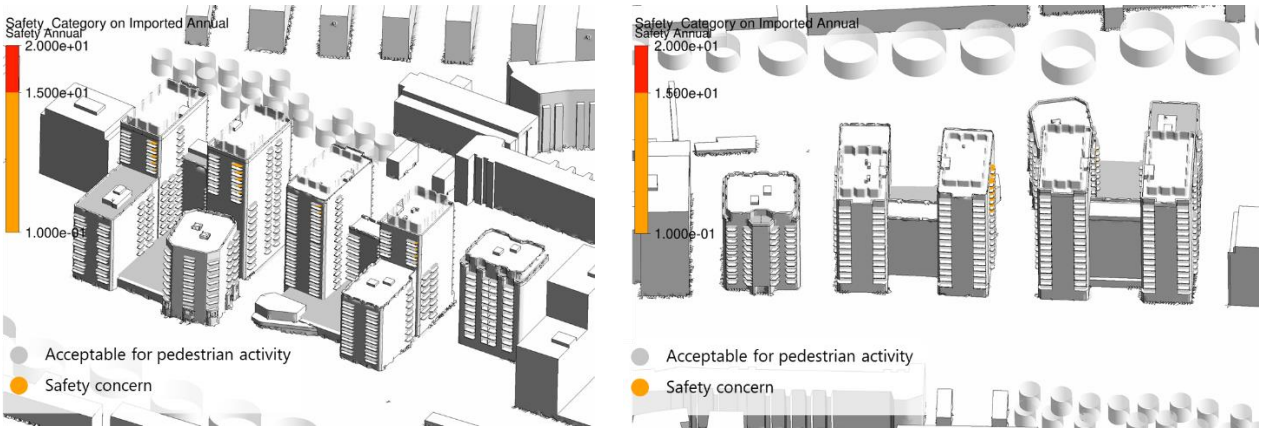

Figure 6.8.14: Proposed - Podiums, balconies, roof terraces - Annual composite safety map

6.8.9 The podium, balcony and roof terrace summer composite comfort conditions are shown in6.8.15. The podiums and roof terraces show conditions which are suitable for their intended use. Some of the balconies show conditions that exceed the required comfort levels. This is considered as a moderate negative effect. This is addressed in Paragraph 6.8.21 onwards (Proposed Mitigation).

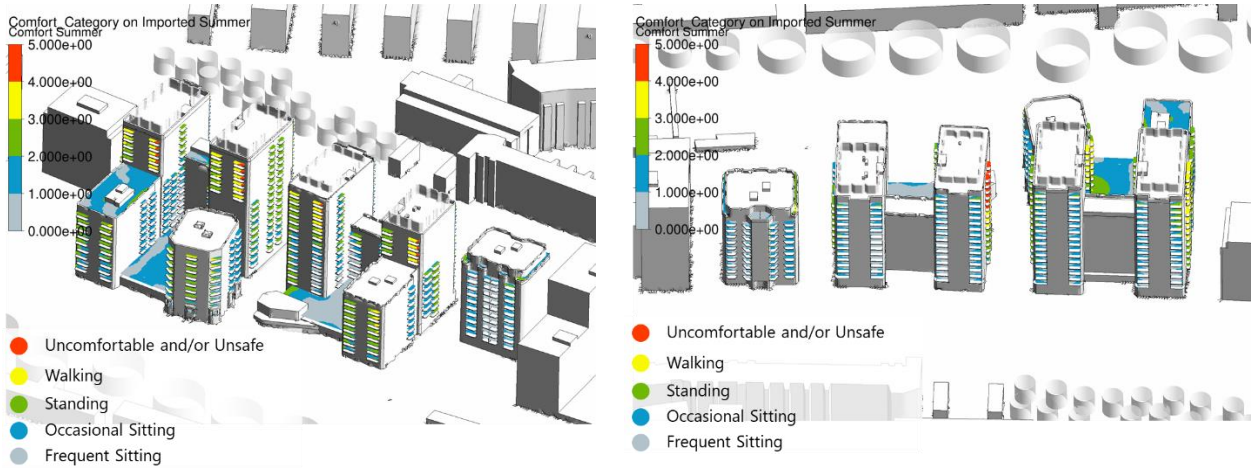

Figure 6.8.15: Proposed - Podiums, balconies, roof terraces - Summer composite comfort map

Ground Level Comfort

6.8.10 Moderate adverse effect at the eastern entrances of block N3E.

Mitigation

6.8.11 Mitigation has been incorporated at this location as part of the Landscape Strategy on the Site (see6.8.16).

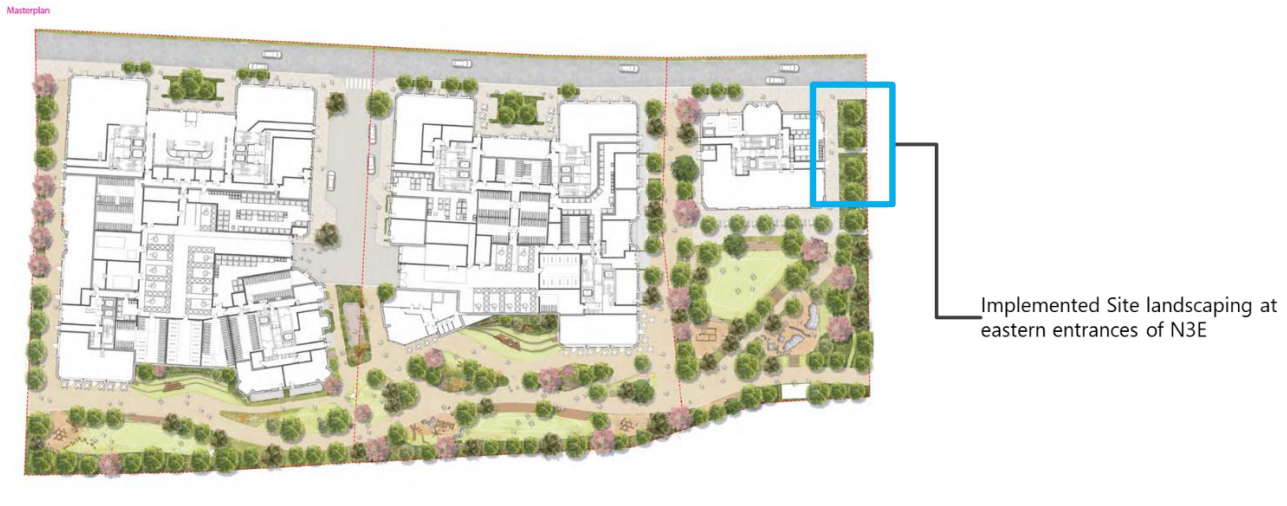

Figure 6.8.16: Mitigation at eastern side of N3E

Residual Effect

6.8.12 It is expected that the implemented mitigation in the form of the landscaping marked in Figure 6.8.16 will reduce the local wind speeds at this location and enhance the comfort conditions for the intended use (standing), making the residual effect negligible as per the "2022 ES.

Balconies

6.8.13 Major negative effect (safety exceedance) on several balconies in the Proposed scenario.

Mitigation

6.8.14 Solid balustrades have been incorporated at the balconies where safety exceedances were identified (see paragraph 6.8.21 onwards).

Residual Effect

6.8.15 An additional CFD scenario has been run to show that the implemented balustrades are effective at mitigating the safety exceedances. The residual effect is negligible as per 2022,this is demonstrated in Paragraph 6.8.21 onwards.

Likely Cumulative Effects and their Significance

6.8.16 The same cumulative schemes as per the 2022 ES have been included in the wind assessment of the Proposed Development in the cumulative surroundings (Configuration 3). Any cumulative schemes not included in the assessment are located outside the boundary of the explicit CFD context model (500m radius) and it is not anticipated that these other schemes would have any significant effect on the wind conditions on the Site.

6.8.17 In this section, the effects of 'Configuration 3: Proposed Development in context of future surroundings (Cumulative)' are summarised.

6.8.18 The 3D model of the geometry used in the CFD simulations for this scenario is shown in 6.8.17.

Figure 6.8.17: Modelled Cumulative geometry

6.8.19 The annual composite safety map for the Cumulative scenario is shown in6.8.18. No safety exceedances have been identified across the Site and surroundings. This is in line with the Wind Microclimate section of Chapter 17 (Cumulative Effects) of the 2022 ES.

Figure 6.8.18: Cumulative - Annual composite safety map

6.8.20 The winter and summer composite comfort maps for this scenario are given in Figure 6.8.19 and Figure 6.8.20. The ES 2022 concluded that no significant changes from the conditions in the Proposed scenario were present. This remains valid for the updated assessment in this Addendum; therefore no cumulative effects are reported.

Figure 6.8.19: Cumulative - Winter composite comfort map

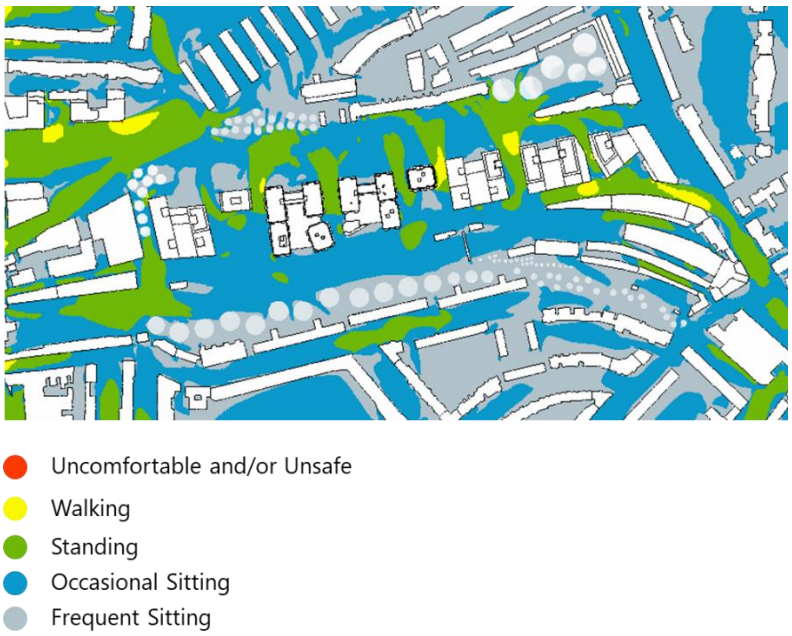

Figure 6.8.20: Cumulative - Summer composite comfort map

Proposed Mitigation

6.8.21 In this additional scenario, balustrades have been incorporated at the balconies that showed a safety concern in the Proposed scenario of Paragraph 6.8.16 onwards

6.8.22 The annual composite safety maps for the balconies with mitigation are shown in Figure 6.8.21. These show that the implemented balustrades are effective at mitigating the safeties. The minimal orange spot remaining at the edge of the balcony is marginal both in extent and annual hours of exceedance (see bottom image showing marginal exceedance of only slightly above 2 hours – blue). This is thus considered negligible.

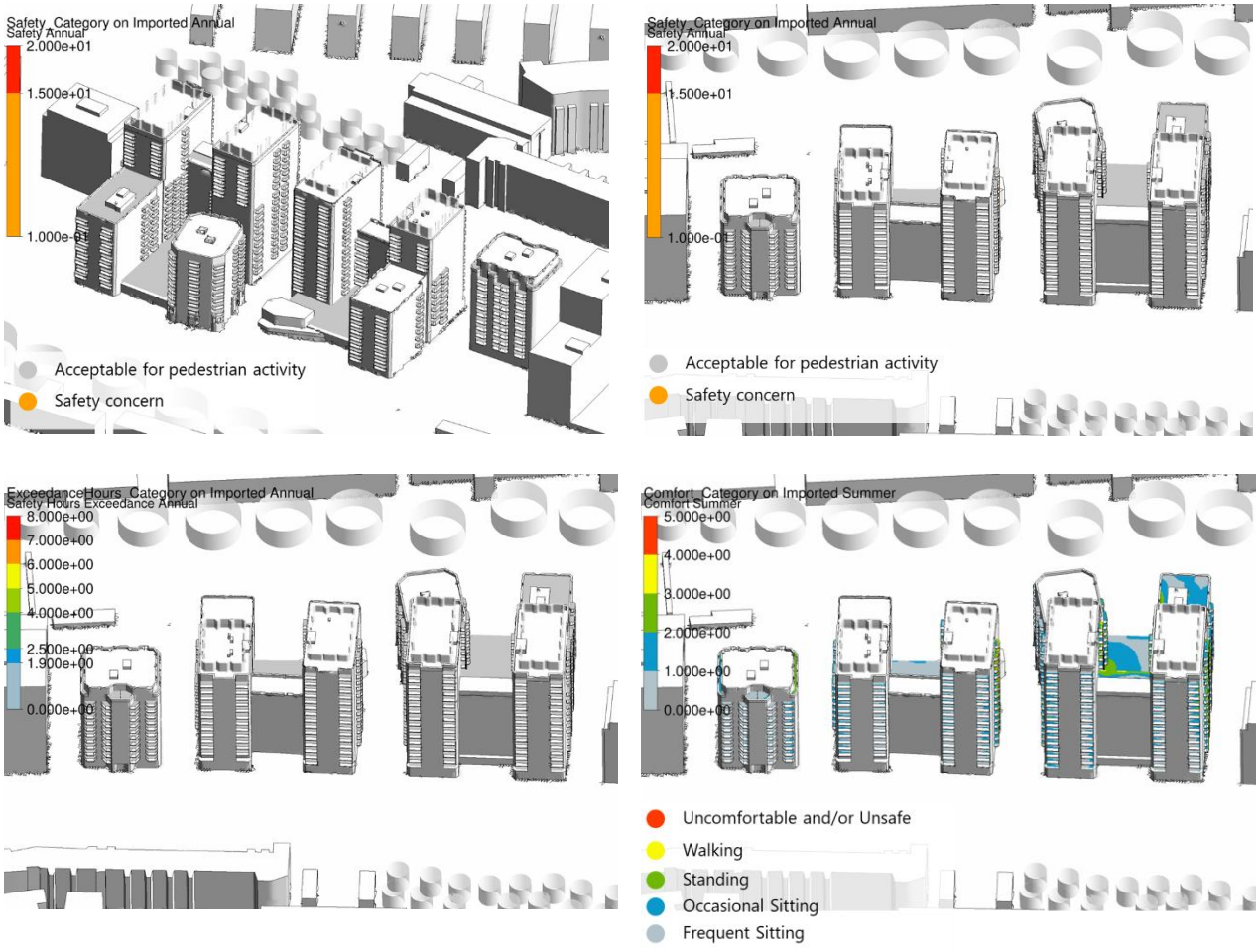

Figure 6.8.21: Proposed Mitigated - Balustrade mitigation - Annual composite safety maps (top figures); Annual safety exceedance hours (bottom left); and Summer composite comfort (bottom right)

Severability

6.8.23 In this section a qualitative assessment is made for the additional scenario related to the severability of Plot S8 and the Builder's Merchant Scheme. The updated severability plan for this scenario is shown in Figure 6.8.22.

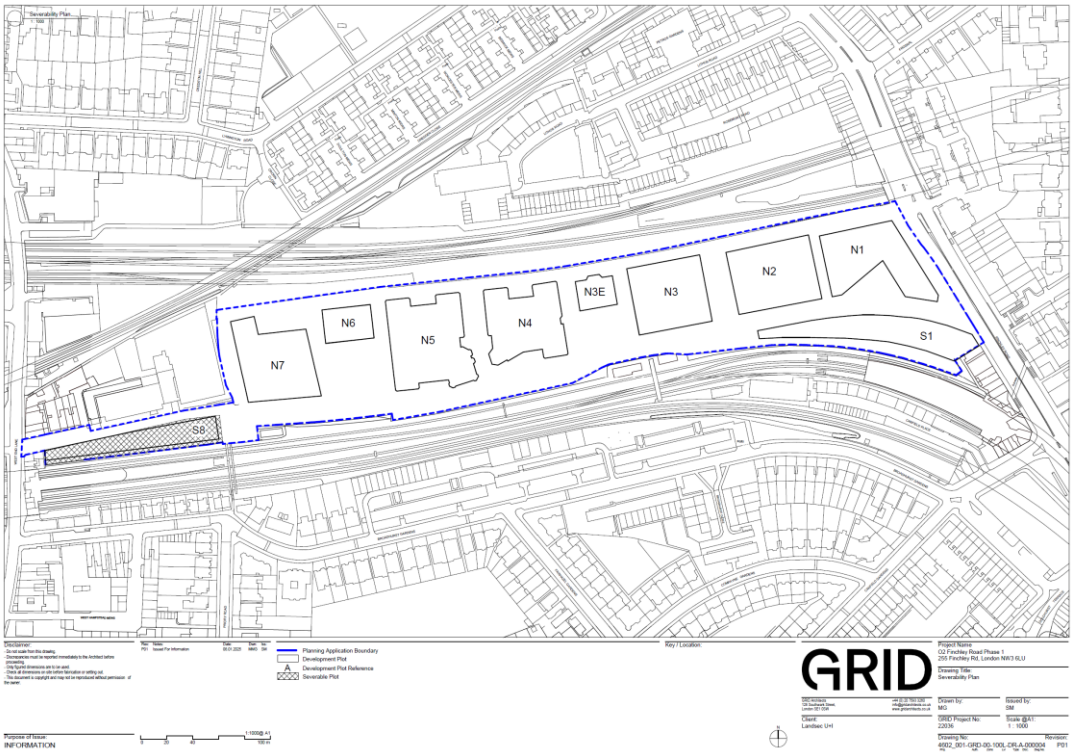

Figure 6.8.22: Severability plan

6.8.24 In this regard, two scenarios arise, which are addressed separately below.

6.8.25 Scenario (i): If the Builders Merchant Scheme came forward in place of S8, before the remainder of the O2 Masterplan was constructed this would only affect the Baseline scenario, but the likely effects due to the Proposed Development would remain unchanged.

6.8.26 Scenario (ii): If the Builders Merchant Scheme was constructed at the same time as the remainder of the wider O2 Masterplan, the effects would be similar to those assessed if S8 was brought forward.

6.8.27 In both scenario's, the effects during the construction phase of the Builder's Merchant Scheme are expected to be negligible.

Limitation and Assumptions

6.8.28 Future surrounding developments (cumulative schemes) are based on publicly available information for current planning permissions/commitments and have been agreed with LBC prior to submission of the S73 Application.

Summary & Conclusions

6.8.29 The conclusions from the Wind Microclimate assessment in this ES Addendum are mostly in agreement with the previous findings in Chapter 13 of the 2022 ES.

6.8.30 Generally comfortable wind conditions for pedestrian activities are expected on the Site with the introduction of the Development.

6.8.31 In the absence of mitigation, a moderate negative effect was identified at the eastern entrances of Plot N3E of the Proposed Development. Suitable mitigation has been incorporated in the Site Landscaping Strategy to enhance the wind conditions at this location to meet the intended use category, likely resulting in a negligible effect

6.8.32 All other pedestrian activities identified at ground level on and surrounding the Site show suitable wind conditions for the intended use.

6.8.33 In the absence of mitigation, a major negative effect (exceedance of the safety criterion) was identified on several balconies of Plot N5 and N4 of the Proposed Development. Solid balustrades have subsequently been integrated into these balconies. These have been demonstrated to be effective at mitigating this negative effect in the additional Proposed Mitigated scenario, resulting in a negligible effect.

6.8.34 No safety or comfort concerns were found on the podiums of N5 and N4 and the roof terraces.

6.8.35 Furthermore, similarly to the 2022 ES, no significant cumulative effects were identified.

References

Lawson, T.V. (2001), Building Aerodynamics, Imperial College Press (125-137).

[i] London Borough of Camden Draft New Camden Local Plan (2024), Available at https://www.camden.gov.uk/documents/20142/4820180/Draft+New+Camden+Local+Plan+2024+v1.pdf/415cc7da-c24a-8237-ddc2-5c72045af9d2?t=1706548115256