

10. Wind Microclimate

10.1 Introduction

- 10.1.1 This chapter assesses the likely significant environmental effects of the proposed Surrey Canal development on the wind microclimate within and around the Application Site.
- 10.1.2 It describes the methods used to assess the effects, the baseline conditions currently existing at the Application Site and in the surrounding area, the likely significant environmental effects of the Proposed Development in relation to wind, and any mitigation measures required to prevent, reduce or offset any likely significant environmental effects.
- 10.1.3 The boundary layer wind tunnel study has provided a detailed quantitative assessment of the wind environment at key locations in and around the Proposed Development in terms of accepted, UK industry standard, pedestrian comfort and safety criteria (Lawson Criteria). The study considers the Proposed Development in the context of existing surrounding conditions and cumulatively with proposed future surrounding developments. The cumulative schemes considered are listed in Chapter 2 of this ES.
- 10.1.4 An interim construction scenario (an environmental assessment 'snapshot'), comprising phase 1 of the Proposed Development, is further considered.
- 10.1.5 This Chapter should be read in conjunction with the Technical Appendix 10.1, which sets out the technical boundary layer wind tunnel study.

10.2 Planning Policy Context

10.2.1 National Planning Policy

There are no national codes of practice or policies relating to the assessment of environmental wind flows in the built environment. The assessment of environmental wind flows lies outside the scope of BS EN 1991-1-4:2005¹, the current European Standard for wind actions on structures, which focuses on wind loading issues. The effect of environmental wind on pedestrian spaces and the subsequent suitability of these spaces for planned usage are described by and compared against the industry standard Lawson criteria, which are recognised as a suitable benchmark for wind assessments.

10.2.2 Regional Planning Policy

Policy 4B.10 of the London Plan Consolidated with Alterations Since 2004 (2008)², 'Large-scale buildings – Design and Impact' states that

“all large scale buildings including tall buildings should be of the highest quality design and, in particular: be sensitive to their impact on microclimates in terms of wind, sun, reflection and overshadowing”.

10.2.3 Policy 7.6 of the consultation Draft Replacement London Plan (2009)³, states that:

Buildings and structures...should not cause unacceptable harm to the amenity of surrounding land and buildings, particularly residential buildings, in relation to privacy, overshadowing, wind and microclimate. This is particularly important for tall buildings.

10.2.4 Policy 7.7 of the consultation Draft Replacement London Plan (2009), states that:

Tall buildings should not... affect adversely their surroundings in terms of microclimate, wind turbulence...

10.2.5 Essential Standard 2.4.5 of the Mayor's Sustainable Design and Construction Supplementary Planning Guidance (2006)⁴ requires proposals to:

“Mitigate any negative impact on the microclimate of existing surrounding public realm and buildings to meet the Lawson criteria for wind comfort and safety”.

10.2.6 Local Planning Policy

Policy URB5 of the Lewisham Unitary Development Plan (adopted in 2004)⁵ states:

“In those situations where the height of the Proposed Development may, in the Council's view generate potential developmental, overshadowing or micro-climatic problems at street level, overshadowing of riverside pathways, channels and the foreshore with detrimental effect to the river environment or in relation to adjoining buildings, the Council will require information to be submitted that will demonstrate that such problems will not result from the proposed high buildings. Applications for high buildings should therefore be accompanied by design statements. An Environmental Impact Assessment may also be required.”

With reasoning as follows:

“Account will also be taken of the effects of wind turbulence and overshadowing in the siting of any high building and applicants must demonstrate that every effort has been made to contain or eliminate such factors.”

10.2.7 Policy 18 of Lewisham Local Development Framework: Core Strategy (submission version October 2010)⁶ states, in relation to the location and design of tall buildings:

“An assessment will be made on the potential developmental, overshadowing or micro-climatic problems at street level.”

- 10.2.8 In summary, both regional and local planning policy requires that new developments do not adversely affect the wind microclimate such that residual conditions are unsuitable for existing and proposed pedestrian activities.

10.3 Methodology and Assessment Criteria

- 10.3.1 The assessment of environmental wind flows in the built environment lies outside the scope of BS EN 1991-1-4:2005, the current European Standard for wind actions on structures, which focuses on wind loading issues. In addition, there are no handbooks or engineering methods from which reliable assessments of the complex environmental wind flows that shape the pedestrian level wind conditions can be derived. Numerical/computational methods such as computational fluid dynamics (CFD) do not apply to turbulent wind flows in the built environment. As a result, a purposely-designed boundary layer wind tunnel study was carried out to provide a reliable quantification of the pedestrian level wind conditions, based on measured wind speeds from a physical model combined with measured long term wind statistics provided by the UK Met Office.
- 10.3.2 The tests were conducted in BMT's Boundary Layer Wind Tunnel, which has test section 4.8 metres wide, 2.4 metres high and 15 metres long with a 4.4 metre diameter multiple plate turntable. A turbulent boundary layer representative of that at the Application Site was set up using an arrangement of roughness elements distributed over the floor of the wind tunnel and a 2 dimensional barrier, with square posts, placed at the entrance to the test section. The target profile for the atmospheric boundary layer simulation was determined from a detailed wind analysis for the Site, based on the widely accepted Deaves and Harris log law wind model of the atmospheric boundary layer (as defined in Engineering Sciences Data Unit Item 01008⁷). The wind analysis takes detailed account of the variation of the upwind terrain on each wind sector and provides wind profiles describing the variation of wind speed and turbulence intensity with height for a full range of wind directions.
- 10.3.3 The physical model of the Proposed Development was based on the illustrative scheme, within the constraints of the parameter plans. For wind microclimate there is no single worst case layout based on parameter plans. A building built out to maximum height / footprint is likely to be the worst case for conditions around the base of that particular building, but may increase the shelter to downwind buildings and thus may not be the worst case for the rest of the masterplan. The likely conditions within the Site are best described by considering the illustrative scheme. Landscaping as proposed in the development specification, within the constraints of the parameter plans, was also represented on the model. Trees were modelled in winter form, as 6m high deciduous trees of a species with substantial retained solidity in winter.

- 10.3.4 The selected model scale of 1:300, was large enough to allow a good representation of the details that are likely to affect the local and overall wind flows at full scale. In addition, this scale enabled a good simulation of the turbulence properties of the wind to be achieved.
- 10.3.5 The wind tunnel model simulates an area greater than 900 m in diameter, up to and beyond the extent of potential significant environmental effects of the Proposed Development. The model includes the Application Site as well as all surrounding buildings that will have potential significant environmental effects. The surrounding buildings and topography have been represented to a sufficient level of detail to reproduce the wind flows at the Application Site and on surrounding land. Existing deciduous trees were modelled in winter, or bare, format.
- 10.3.6 An initial experience based assessment was carried out to identify areas of potential accelerated winds within the Application Site, and to identify the potential extent of likely significant environmental effects within the surrounding study area. Existing and proposed pedestrian activities were also reviewed to identify areas of increased sensitivity to wind effects, such as recreational areas and building entrances. The study area is thus considered to cover the potential likely significant environmental effects of the Proposed Development.
- 10.3.7 Wind speed measurements at the key pedestrian level locations identified were made using probes capable of measuring fluctuating pressure differences that are calibrated against wind speed. A system of probes running simultaneously was used to obtain results from up to 128 locations at a height corresponding to 1.5 metres at full scale. Measurements were taken for a full range of wind directions in increments of 22.5° (0° coinciding with OS grid North). Recordings were taken for a sufficient length of time to determine the mean and 3-second gust wind speeds.
- 10.3.8 For each location the measured wind speeds were combined with long-term wind frequency statistics to assess the wind environment in terms of the exceedance of threshold wind speeds that relate to comfort levels perceived during standard pedestrian activities. Wind frequency statistics, covering a period of 10 years, were obtained from London Weather Centre and transposed, accounting for variations in terrain between the Application Site and the weather centre, to apply directly to the Application Site.
- 10.3.9 The widely accepted, UK industry standard, pedestrian comfort and safety criteria adopted by BMT and applied in the present study are based on the so-called Lawson criteria for pedestrian comfort and safety.
- 10.3.10 Details of the comfort criteria are presented in Table 10.1 and are based on the exceedance of the threshold wind speeds, based on the mean hourly value and on the gust equivalent mean value, occurring less than 5% of the time. The value of 5% has been established as giving a reasonable allowance for extreme and relatively infrequent winds that are tolerable within each category.

Table 10.1: Pedestrian Comfort Criteria

Threshold Mean-hourly Wind Speed Exceeded < 5% of the Time	Comfort Rating	Activity	Qualifying Comments
0 – 4m/s	C4	Long term “Sitting”	Reading a newspaper and eating and drinking
4 – 6m/s	C3	“Standing” or short term sitting	Appropriate for bus stops, window shopping and building entrances
6 – 8m/s	C2	Walking and “strolling”	General areas of walking and sightseeing
8 – 10m/s	C1	Business walking	Local areas around tall buildings where people are not likely to linger
>10m/s	C1+	Uncomfortable	Uncomfortable for all pedestrian activities

10.3.11 Details of the safety criteria are presented in Table 10.2 and are based on the exceedance of the threshold wind speeds, based on the mean hourly value and on the gust equivalent mean value, occurring once per annum. A wind speed greater than 15 metres-per-second occurring once a year is classified as unsuitable for general public and represents a wind speed with the potential to destabilise the less able members of the public such as the elderly, cyclists and children. Able-bodied users are those determined to experience distress when the wind speed exceeds 20 metres-per-second once per year.

Table 10.2: Pedestrian Safety Criteria

Threshold Mean-hourly Wind Speed Exceeded Once Per Annum	Safety Rating		Qualifying Comments
>15m/s	S2	Unsuitable for the general public	Less able and cyclists find conditions physically difficult
>20m/s	S1	Unsuitable for able-bodied	Able-bodied persons find conditions difficult. Physically impossible to remain standing during gusts.

10.3.12 At each geographical point investigated, the suitability of the pedestrian level wind environment in terms of comfort for various activities is assessed based on the Lawson criteria for pedestrian comfort. This assessment takes full account of seasonal variations in wind conditions and pedestrian activities. For example, conditions for recreational activities focus on summer, but also consider spring and autumn, whilst conditions for pedestrian thoroughfare, access or waiting (example bus stops) consider all seasons. The pedestrian level wind environment assessment is summarised in terms of suitability for various activities. The activities considered, and their relation to the comfort criteria detailed above, are shown in Table 10.3.

Table 10.3: Suitability Assessment

Suitability		Lawson Comfort Criteria
Outdoor Seating	For long periods of sitting such as for an outdoor café	'Long term sitting' in summer
Entrances, Waiting areas	For pedestrian ingress/egress at a building entrance, or short periods of sitting or standing such as at a bus stop, taxi rank, meeting point, etc.	'Standing or short term sitting' in all seasons
General Leisure (excluding seating areas)	For leisure uses, excluding long periods of outdoor sitting, such as a park, children's play area, etc.	'Standing or short term sitting' from spring to autumn
Thoroughfare	For access to and passage through the development and surrounding area	'Business walking' / 'Walking or strolling' in all seasons

Definition of Significance

10.3.13 The definition of significance is outlined in Chapter 2 of the ES. With respect to wind microclimate, the significance of the environment effects of the Proposed Development is based on the suitability of wind conditions at each geographical point assessed within the aforementioned study area against the current or planned pedestrian activities. Any effect on pedestrian safety is deemed major. Any effect on pedestrian comfort where conditions become unsuitable (for adverse effect) or suitable (for beneficial effect) for current or planned activities is deemed moderate. Where conditions become marginal or tolerable for current or planned activities the effect is deemed minor.

10.3.14 Where conditions change but remain suitable, or unsuitable, for current or planned activities the effect is not significant.

10.4 Aspects of the Proposed Development of relevance to the assessment

10.4.1 The Proposed Development would benefit from shelter at lower levels from winds approaching from all directions. However a number of tall buildings, with the potential to deflect higher speed winds from higher levels down to ground level, would be introduced. Podiums, incorporated within several of the blocks, would reduce these effects. The substantial soft landscaping proposed in the development specification would also generally alleviate potential channelling of low-level winds along and between the buildings, and around the building corners. Furthermore, both the illustrative scheme and any schemes built out to the maximum footprints within the constraints of the parameter plans incorporate rounded corners at key blocks, which would also be beneficial in locally alleviating accelerated winds at the corners.

10.4.2 In addition, the proposed development would introduce frontages with active retail uses and recreational areas, including outdoor seating, where pedestrian perception of wind effects are increased, leading to requirements for benign conditions suitable for such amenities.

10.4.3 As discussed above, an initial experience-based assessment identified key locations for the wind speed sensors to ensure that all areas of potential accelerated winds and areas of sensitive pedestrian activities have been assessed. The pedestrian level wind environment has thus been assessed at the following key locations both within the Application Site and in the surrounding area:

- Areas of potential accelerated winds;
- Pedestrian access routes;
- Building entrances; and
- Recreational spaces, including roof level residential communal open spaces.

10.5 Baseline Situation

10.5.1 The baseline scenario considered is described in Chapter 2 of this ES.

10.5.2 Based on the long-term wind statistics from London Weather Centre, transposed to the Application Site (as described in Section 10.3, above), prevailing winds generally originate from the South Westerly and Westerly directions whilst North Easterly winds are also common, particularly during late winter and spring. The highest wind speeds generally occur during winter.

- 10.5.3 The Application Site is partially sheltered from wind approaching from all directions and the low-rise industrial buildings distributed across the Site do not represent dominant structures with respect to wind. Resulting conditions within the Site are therefore benign.
- 10.5.4 Full details of the suitability assessment for the baseline situation are presented in graphical format in Figure 10.1.
- 10.5.5 For baseline Site conditions, the pedestrian level wind environment within the Site is suitable for pedestrian passage in relation to recreational activities and for pedestrian ingress/egress to existing buildings, including the Millwall FC Stadium. The open spaces around the stadium are further suitable for short periods of standing, such as for a meeting point.
- 10.5.6 Much of the surrounding area, within the extent of potential significant environmental wind effects, is occupied by railway lines with no pedestrian access. The Away Supporters route around the North Eastern side of the Site, used for stadium events, enjoys suitable conditions for current activities, comprising strolling.
- 10.5.7 The South East corner of the existing Silwood Estate, beyond the railway lines, is also suitable for pedestrian passage and it is expected that the building entrances would be suitable for pedestrian ingress/egress. Adjacent developments to the South of the Site are similarly suitable for pedestrian passage and for pedestrian ingress/egress at building entrances.
- 10.5.8 The proposed location of the Surrey Canal Road Station platforms, to the South East of the Site, would enjoy suitable conditions for at least short periods of sitting or standing and would be suitable for awaiting a train.

10.6 Identification and assessment of Effects

10.6.1 Construction Effects

During the construction process there is potential for wind conditions to differ significantly from the completed scheme, due to differing exposures of early phases relative to prevailing winds. Pedestrian activities within the Site will also be different during construction and will include restrictions on pedestrian movements in some areas for health and safety reasons, construction workers constituting a variable but significant proportion of pedestrians around the Site and users of completed phases sharing pedestrian access with construction workers. Pedestrian perception of conditions both within the Site and in the surrounding area is likely to be as much affected by expectations of conditions around a building site as by the actual wind speeds, with pedestrians more likely to tolerate adverse conditions as they can appreciate it is a temporary situation.

- 10.6.2 In the context of the above comments, an interim scenario (of a 'snapshot' in time during the construction of the Proposed Development) comprising the completed phase 1 of the

Proposed Development, with existing buildings retained across the remainder of the Application Site, has been assessed in detail. Soft landscaping, as set out in the development specification, was included within the phase 1 plots. The resulting suitability assessment for the interim scenario is presented in graphical format in figure 10.2.

10.6.3 Phase 1 Thoroughfares and Entrances

With existing buildings retained across the remainder of the Site, the taller Excelsior 3 and Orion phase 1 plots would be exposed to prevailing winds from the South West. Although landscaping measures incorporated within the development specification would generally be beneficial with respect to pedestrian level wind conditions, the West side of Excelsior 3 and the South West side of Orion would be considered too windy for comfortable pedestrian ingress/egress at envisaged entrance locations. This potential significant environmental effect would be considered moderate but short term adverse. Remaining entrances would be suitable for pedestrian ingress/egress. Thoroughfares within the phase 1 Site would be suitable for leisurely strolling and thus for pedestrian access to, and passage through, the Site.

10.6.4 Phase 1 Active Retail Fronts

Phase 1 building fronts currently envisaged for active retail uses would generally be suitable for at least short periods of standing and would thus be suitable for window-shopping as well as pedestrian ingress/egress at entrances. This environmental effect would not be significant.

10.6.5 Phase 1 Open Spaces

Station Square would be suitable for general recreational activities, including short periods of standing or sitting, and would be suitable for a meeting point for example. This environmental effect would not be significant.

10.6.6 The public space in front of Orion would be suitable for general recreational activities, including short periods of standing or sitting, from spring through to autumn, but may benefit from evolution of the detailed landscaping scheme, pursuant to and consistent with the landscaping referred to on the parameter plans and development specification, to create similarly amenable conditions for a meeting point during winter. This potential significant environmental effect would be considered, at worst, minor adverse.

10.6.7 The roof level residential communal open spaces were assessed with standard 1.1m or 2.1m high parapets, but without landscaping. The raised courtyards on Excelsior would have significant areas suitable for general recreational activities such as children's play spaces. Evolution of the detailed landscaping scheme would however be required to create suitable conditions for outdoor seating, and maximise the amenity value of the spaces. In the absence of landscaping these potential significant environmental effects would be considered minor adverse.

10.6.8 The raised courtyards on Orion would be unsuitable for recreational uses. During winter conditions would further rate as unsuitable, in terms of pedestrian safety, for the general public. This potential significant environmental effect would be considered major adverse, however it is expected that access to the raised courtyards could be restricted during winter storm events, reducing the potential significant environmental effects to moderate adverse. It is also expected that the landscaping could be developed in detail to create suitable conditions for recreational uses.

10.6.9 Retained Existing Site

The pedestrian level wind environment across the remainder of Site would remain as per existing Site conditions. Conditions would thus be suitable for pedestrian passage in relation to recreational activities and for pedestrian ingress/egress to existing buildings, including the Millwall FC Stadium. The open spaces around the stadium would further be suitable for short periods of standing, such as for a meeting point.

10.6.10 Surrounding Area

As for existing Site conditions, the Away Supporters Route around the North Eastern side of the Site, used for stadium events, would enjoy suitable conditions for strolling. The South East corner of the existing Silwood Estate, beyond the railway lines, would also remain suitable for pedestrian passage and it is expected that the building entrances would remain suitable for pedestrian ingress/egress. Adjacent developments to the South of the Site would similarly remain suitable for pedestrian passage and for pedestrian ingress/egress at building entrances.

10.6.11 Wind conditions at the location of the proposed Surrey Canal Road Station platforms, to the South East of the Site, would remain suitable for at least short periods of sitting or standing and would be suitable for awaiting a train.

10.6.12 The proposed phase 1 development would therefore have no significant environmental effects on wind conditions within the surrounding area.

10.6.13 Operational Effects

Full details of the suitability assessment for the Proposed Development, with proposed landscaping as set out in the development specification, are presented in graphical format in figure 10.3. The trees considered comprised 6m high deciduous trees of a species with substantial retained solidity in winter. Fences/walls around the Bolina West private open space and between the North West corner of Stadium Avenue and the railway embankment were 2.1m high.

10.6.14 Thoroughfares and Entrances

Landscaping measures proposed within the development specification, would generally be beneficial with respect to pedestrian level wind conditions. As a result, conditions across the Site would rate as safe for all users and would be suitably comfortable for at least leisurely strolling. Conditions would thus be suitable for pedestrian access to, and passage through, the Site in relation to recreational activities, and the Proposed Development would have no significant effect on wind conditions along the thoroughfares within the Site.

10.6.15 Building fronts currently envisaged as potential entrance locations would generally be suitable for pedestrian ingress/egress, and the potential environmental effect of the Proposed Development across much of the Site would thus not be significant. However, the potential residential entrances on the South West sides of Stockholm 1 and Orion would both be suitable, ideally, only for leisurely strolling during winter. Although marginally windy for comfortable pedestrian ingress/egress during winter, conditions are expected to be tolerable for an entrance, and these potential significant environmental effects would thus be considered minor adverse.

10.6.16 Entrances to the Millwall FC Stadium would remain suitable for pedestrian ingress/egress.

10.6.17 Active Retail Fronts

Building fronts currently envisaged for active retail uses would generally be suitable for at least short periods of standing and would thus be suitable for window-shopping as well as pedestrian ingress/egress at entrances. Conditions would thus be suitable for active fronts, and the potential environmental effect would not be significant.

10.6.18 Open Spaces

Within Bolina Gardens, conditions across the play area would be considered suitable for a children's play space. The remainder of the public space would be suitable for general recreational activities, including short periods of standing or sitting, from spring through to autumn, and would be suitable for a meeting point for example. The East side of the space may benefit from evolution of the detailed landscaping scheme, pursuant to and consistent with the landscaping referred to on the parameter plans and development specification, to create more amenable conditions for outdoor seating. However this potential significant environmental effect would be considered, at worst, minor adverse.

10.6.19 The private open space on the North West side of Bolina West would be suitable for a children's play space or crèche, being suitable for recreational activities including short periods of standing or sitting from spring through to autumn. Much of the space would be also be suitable during winter, with only the East side of the space, immediately adjacent to the building corner, being slightly windy for such activities. Given the area and season affected, the potential environmental effect would not be considered significant.

10.6.20 Wind conditions along Stadium Avenue would be suitable for prolonged periods of outdoor sitting during summer if incidental seating were to be incorporated within the publicly accessible open space. Evolution of the detailed landscaping scheme may be beneficial in extending these amenable conditions into spring and autumn, but the potential environmental effect would not be significant.

10.6.21 Wind conditions along the North East front of Stockholm 1 and the South West front of Stockholm 2 would be suitable for long periods of outdoor sitting from spring through to autumn and would thus be suitable for café outdoor seating.

10.6.22 Station Square would be suitable for general recreational activities, including short periods of standing or sitting, and would be suitable for a meeting point for example. This environmental effect would not be significant.

10.6.23 The public space in front of Orion would be suitable for general recreational activities, including short periods of standing or sitting, from spring through to autumn, but may benefit from evolution of the detailed landscaping scheme to create similarly amenable conditions for a meeting point during winter. This potential significant environmental effect would be considered, at worst, minor adverse.

10.6.24 The roof level residential communal open spaces were assessed with standard 1.1m or 2.1m high parapets but no landscaping. The raised courtyards on Bolina West, Bolina East, Stadium Avenue, Stockholm 1, Stockholm 2, Timber Wharf, Excelsior and Senegal Way would all have significant areas suitable for general recreational activities such as children's play spaces. Evolution of the detailed landscaping scheme, pursuant to and consistent with the landscaping referred to on the parameter plans and development specification, would however be required to create suitable conditions for outdoor seating, and maximise the amenity value of the spaces. In the absence of landscaping these potential significant environmental effects would be considered minor adverse.

10.6.25 The raised courtyards on Bolina North 1 and Bolina North 2 would not be suitable for recreational uses, a potential moderate adverse environmental effect, and may need to be semi-enclosed, such as winter gardens, to ensure suitable conditions for recreational activities. The raised courtyards on Orion would be similarly unsuitable for recreational uses, but it is expected that landscaping could be developed in detail to create suitable conditions.

10.6.26 Surrounding Area

As for existing Site conditions, the Away Supporters Route around the North Eastern side of the Site would enjoy suitable conditions for strolling. The South East corner of the existing Silwood Estate, beyond the railway lines, would also remain suitable for pedestrian passage and it is expected that the building entrances would remain suitable for pedestrian

ingress/egress. Adjacent developments to the South of the Site would similarly remain suitable for pedestrian passage and for pedestrian ingress/egress at building entrances.

10.6.27 Wind conditions at the location of the proposed Surrey Canal Road Station platforms, to the South East of the Site, would remain suitable for at least short periods of sitting or standing and would be suitable for awaiting a train.

10.6.28 The Proposed Development would therefore have no significant environmental effects on wind conditions within the surrounding area.

10.7 Opportunities for Further Mitigation Measures

10.7.1 The pedestrian level wind environment has been assessed for the Proposed Development in accordance with the Development Specification, and within the constraints of the parameter plans. The assessment has highlighted opportunities for further development of the wind mitigation measures at detailed design to further enhance wind conditions for proposed pedestrian activities. The potential further measures are listed as follows:

- Recessed entrances at the South West side of Stockholm 1 and Orion;
- Localised shelter, through introduction of screens, hedges or low-level shrubs, of any seating benches in the public spaces in Bolina Gardens, in front of Orion and along Stadium Avenue
- Development of barrier schemes at the edges of occupied roof level open spaces, potentially culminating in winter gardens on Bolina North 1 and Bolina North 2.
- Introduction of soft landscaping and screens across the larger roof level open spaces, potentially breaking larger spaces into smaller, more sheltered, pockets.

10.8 Summary of Expected Residual Effects

10.8.1 With development and implementation of the further mitigation measures listed in Section 10.7, it is expected that suitable conditions would be created for planned recreational activities and the likely residual effects of the Proposed Development would not be significant.

10.9 Assessment of Cumulative Effects

10.9.1 The surrounding consented schemes listed in Chapter 2 of the ES have been considered with respect to potential likely significant cumulative effects with the Proposed Development.

10.9.2 The extent of the wind tunnel model is considered sufficient to create appropriate wind flows within and immediately surrounding the Application Site, including the area of the potential significant environmental effects. Whilst several of the consented schemes represent

substantial developments, they mostly lie outside the extent of the wind tunnel model and are considered too distant from the Application Site to have any significant cumulative effects with the Proposed Development in terms of wind environment.

10.9.3 The proposed Silwood Estate Phase 4C does lie within the assessment area extent, but comprises a small number of mid-rise residential blocks. Wind tunnel tests were carried out for the Proposed Development with the consented Silwood Estate Phase 4C. No discernable cumulative effects were observed, and the wind conditions were as discussed above for the proposed development with existing surrounds.

10.9.4 On this basis, potential cumulative environmental effects would not be considered significant.

10.10 References

¹ BS EN 1991-1-4: 2005 *Eurocode 1: Actions on Structures – Part 1-4: General Actions – Wind Actions*

² Greater London Authority (2008), *The London Plan Spatial Development Strategy for Greater London Consolidated with Alterations since 2004*

³ Greater London Authority (2009), *The London Plan Spatial Development Strategy for Greater London Consultation draft replacement plan*

⁴ Greater London Authority (2006), *Supplementary Planning Guidance Sustainable Design and Construction The London Plan Supplementary Planning Guidance*

⁵ London Borough of Lewisham (2004), *Lewisham Unitary Development Plan, Adopted Plan – July 2004*

⁶ London Borough of Lewisham (2010) *Local Development Framework, Core Strategy, Development plan document – submission version*

⁷ ESDU 01008. (2005) *Computer program for wind speeds and turbulence properties: flat or hilly sites in terrain with roughness changes*. Engineering Sciences Data Unit.