

Blossom Street

12 Wind Microclimate

Replacement Environmental Statement

Volume I

12 Wind Microclimate

Preface – Update 2015

- This replacement November 2015 Environmental Statement (hereafter referred as the 'November 2015 Replacement ES' or 'this Replacement ES') takes into account the design changes to the Blossom Street project (refer *Chapter 4: Proposed Development*) that have occurred since the submission of the application in December 2014 ES and concludes if any changes to the likely significant effects occur as a result of those changes. This Replacement ES consolidates the environmental assessment of the design changes into a single ES, presenting commentary (under the heading 'Update 2015') for the design changes in the March 2015 ES Addendum (the 'March 2015 ES Addendum') by blue text, and the design changes arising from the current design changes by red text. Where relevant, text removed will be denoted by strike-through, e.g. effect, and updated tables and figures will be denoted by the suffix 'A' (e.g. Table 2.10A).
- This Replacement ES adopts the following terminology to describe the development descriptions and design changes:
 - Proposed Development: description of the development presented in the December 2014 ES;
 - Revised Scheme: description of the scheme incorporating the design changes to the Proposed Development in March 2015 (the design changes referred as the 'March 2015 amendments'), assessed within the March 2015 ES Addendum;
 - Amended Proposed Development: description of the development incorporating the current design changes to the Revised Scheme (the design changes referred as the 'November 2015 amendments'), to be assessed within the November 2015 Replacement ES.
- Further details in regard to the approach taken in this November 2015 Replacement ES are outlined in *Chapter 2: EIA Methodology*.

Introduction

- 12.1 This chapter presents the findings of an assessment of the potential effects of the Proposed Development on the local wind microclimate at the Site and within the surrounding area. In particular, it considers the potential effects of wind on pedestrian comfort and summarises the findings of the wind tunnel tests. Strong winds are also reported.
- 12.2 This ES chapter sets out the relevant planning policies; the methods used to assess the potential effects; the baseline conditions currently existing at the Site and its immediate surrounds (off-site locations); and potential impacts on the wind microclimate of the Proposed Development. Where appropriate, the mitigation measures required to prevent, reduce or offset any potential effects are identified, alongside a summary of the likely residual effects. The chapter concludes with an assessment on the cumulative effects associated with other development schemes in the vicinity of the Proposed Development.
- 12.3 This ES chapter has been prepared by RWDI, a specialist wind engineering consultancy. The full results of the wind tunnel tests are presented within *ES Volume III: Technical Appendix G*.

Legislation and Planning Framework

National Legislation

- 12.4 There is no National Legislation directly relating to wind microclimate issues for the Proposed Development.

National Policy and Guidance

National Planning Policy Framework (2012)

- 12.5 The National Planning Policy Framework (NPPF) was adopted in March 2012 and sets out the Government's economic, environmental and social planning policies for England. These policies outline the Government's vision of sustainable development, which should be interpreted and applied locally to meet local and community aspirations.

- 12.6 There are no national planning policies within the National Planning Policy Framework (NPPF) (Ref. 12-1) directly relating to wind microclimate issues, however, the NPPF emphasises the benefits of a high quality built environment, for example (paragraph 58)
- "... using streetscapes and buildings to create attractive and comfortable places to live, work and visit..."*

Planning Practice Guidance (2014)

- 12.7 The Planning Practice Guidance (PPG) (Ref. 12-2) identifies the potential for a building's size and shape (particularly in the case of tall and large buildings) to affect the wind microclimate. Under the section addressing 'Design: How should buildings and the spaces between them be considered?', the PPG states in Paragraphs 25 and 26 ('Consider form' and 'Consider Scale' respectively) that:
- 'Some forms pose specific design challenges, for example how taller buildings meet the ground and how they affect local wind [...] patterns should be carefully considered.'* and that: *'Account should be taken of local climatic condition, including [...] wind'.*

Regional Policy and Guidance

The London Plan (2011)

- 12.8 The planning guidance within The London Plan (Ref. 12-3) places great importance on the creation and maintenance of a high quality environment for London. Under Policy 7.6B 'Architecture' the London Plan states that:
- "...buildings and structures should:*
- d. *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;*
 - f. *provide high quality indoor and outdoor spaces and integrate well with the surrounding streets and open spaces;*
 - g. *be adaptable to different activities and land uses, particularly at ground level."*
- 12.9 Policy 7.7 'Location and Design of Tall and Large Buildings', the London Plan states that:
- A. *"Tall and large buildings should be part of a plan-led approach to changing or developing an area by the identification of appropriate, sensitive and inappropriate locations. Tall and large buildings should not have an unacceptably harmful impact on their surroundings.*
 - B. *Applications for tall or large buildings should include an urban design analysis that demonstrates the proposal is part of a strategy that will meet the criteria below. This is particularly important if the site is not identified as a location for tall or large buildings in the borough's LDF.*
 - C. *Tall buildings: a. should not affect their surroundings adversely in terms of microclimate, wind turbulence..."*
- 12.10 Wind microclimate is therefore an important factor in achieving the desired planning policy objective. Additionally, consideration of pedestrian comfort is referenced in Policy 5.3 'Sustainable Design and Construction', Policy 6.10 'Walking', Policy 7.4 'Local Character' and Policy 7.5 'Public Realm' and although no specific reference is made to wind microclimate, the objective of these policies would imply the inclusion of wind as a factor for assessing levels of comfort within London's external spaces.

Revised Early Minor Alterations to the London Plan (2013)

- 12.11 The Revised Early Minor Alterations (REMA) to the London Plan (Ref. 12-4) do not affect the guidance already noted in the London Plan 2011 which is relevant to the wind microclimate.

Draft Further Alterations to the London Plan (2014)

- 12.12 On 15 January 2014 the Mayor published for a twelve week period of public consultation. The further alterations were prepared primarily to address key housing and employment issues emerging from an analysis of census data released since the publication of the London Plan in July 2011, and which indicate a substantial increase in the capital's population.

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12.13 These Draft Further Alterations to the London Plan (FALP) (Ref. 12-5) are not anticipated to have any effect on the content or wind microclimate recommendations presented in this chapter.

Sustainable Design & Construction Supplementary Planning Guidance (2014)

12.14 The Greater London Authority (GLA) Sustainable Design and Construction Supplementary Planning Guidance (SPG) (Ref. 12-6) states in section 2.3.7 that:

'Large buildings have the ability to alter their local environment and affect the micro-climate. For example, not only can particularly tall buildings cast a long shadow effecting buildings several streets away, they can influence how wind travels across a site, potentially making it unpleasant at ground level or limiting the potential to naturally ventilate buildings. One way to assess the impact of a large building on the comfort of the street environment is the Lawson Comfort Criteria. This tool sets out a scale for assessing the suitability of wind conditions in the urban environment based upon threshold values of wind speed and frequency of occurrence. It sets out a range of pedestrian activities from sitting through to crossing the road and for each activity defines a wind speed and frequency of occurrence. Where a proposed development is significantly taller than its surrounding environment, developers should carry out an assessment of its potential impact on the conditions at ground level, and ensure the resulting design of the development provides suitable conditions for the intended uses.'

12.15 The approach to assessing the potential impacts arising from the Proposed Development has been undertaken within a wind tunnel to simulate the wind microclimate conditions, and the likely effects on sensitive receptors has adopted the Lawson Comfort Criteria to assess the suitability of the conditions within key locations.

Local Policy and Guidance

LBTH Core Strategy (2010)

12.16 The London Borough of Tower Hamlets (LBTH) Core Strategy (Ref. 12-7) is one of the key tools that the Borough will be using to realise the vision of the Community Plan. It provides a 15 year plan which will shape what the Borough will look like in the future. It is one of a series of documents forming part of the Local Development Framework (LDF), and hence should be read in conjunction with these. In particular, other Development Plan Documents (DPDs) include those covered in the recently adopted Managing Development Document (MDD) DPD (refer below).

12.17 The Core Strategy does not contain any strategic objectives or spatial policies directly relating to wind microclimate issues..

LBTH Managing Development Document (MDD) (2013)

12.18 The LBTH Managing Development Document (MDD) DPD (Ref. 12-8) provides several policies which are relevant to wind microclimate. In particular, Policy DM23 'Streets and Public Realm' states:

"Development should be well-connected with the surrounding area and should be easily accessible for all people by [...] ensuring development and the public realm are comfortable and useable..."

12.19 Policy DM24 'Place-Sensitive Design' notes:

"...development will be required to be designed to the highest quality standards, incorporating principles of good design...taking into account impacts on microclimate..."

12.20 Policy DM25 'Amenity' states:

"In applying part (1e) of the policy, consideration needs to be given to impacts of new development on microclimate. If this is not carefully considered adverse impacts could include wind turbulence at ground level."

12.21 Policy DM26 'Building Heights' goes on to state:

"...proposals for tall buildings will be required to not adversely impact on the microclimate of the surrounding area, including the proposal site and public spaces"

LBTH EIA Scoping Guidance (2012)

12.22 The LBTH published EIA Scoping Guidance in January 2012 (Ref. 12-9). Section 4.42 of the LBTH EIA Scoping Guidance is relevant to wind microclimate and states:

"...assessment of wind effects should be undertaken using wind tunnel modelling (for buildings over 10 storeys high)...to determine whether the pedestrian level wind microclimate meets the Lawson Comfort Criteria for the uses for which is it intended"

Other Relevant Policy and Guidance

12.23 There is no other relevant policy and guidance which is directly applicable to the Proposed Development and the assessment of wind microclimate effects.

Legislation and Planning Framework - Update 2015

March 2015 ES Addendum

12.24 Since the submission of the December 2014 ES, there have been no changes to legislation or planning policy relevant to wind microclimate that affect the assessment in the December 2014 ES.

November 2015 Amendments

The London Plan (2015)

12.25 The adoption of the FALP in March 2015 resulted in the consolidation of changes to the London Plan (2011) to become the 'London Plan (2015)' (Ref. 12-11). The London Plan (2015) also incorporates the REMA, which were published in October 2013.

12.26 No significant changes were made to the policy relating to the assessment as part of the adoption of the London Plan 2015 and does not alter the overarching content of the policy review undertaken as part of the December 2014 ES.

Minor Alterations to the London Plan (2015)

12.27 On 11 May 2015 the Mayor of London published for six weeks public consultation (11th May to 22nd June) two sets of Minor Alterations to the London Plan – on Housing Standards and on Parking Standards (Ref. 12-12). Both sets of minor alterations were to be considered at a public examination, commencing on 21 October 2015.

12.28 These minor alterations have been prepared to bring the London Plan in line with new national housing standards and car parking policy.

12.29 The proposed minor alterations do not affect the assessment, and would not alter the overarching content of the policy review undertaken as part of the December 2014 ES.

Assessment Methodology and Significance Criteria

Consultation

12.30 LBTH has been consulted throughout the evolution of the Proposed Development. The scope of the wind microclimate assessment for the EIA was set out in the EIA Scoping Report submitted to LBTH in July 2014. The EIA Scoping Opinion identified a list of the information to be accounted for within the assessment. These have been addressed within this chapter (refer below) or where topics have not been addressed, reasons are provided.

12.31 Matters addressed include:

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Table 12.1 Matters raised within Scoping Opinion

Topic	Reference in Chapter / Application Documentation
London Borough of Tower Hamlets	
The ES should provide a qualitative assessment of wind effects during demolition/ construction.	Refer 'Potential Effects and Mitigation Measures – Effects During Demolition and Construction' section
The operational assessment will require wind tunnel modelling	Wind tunnel assessment has been undertaken – refer 'Method of Assessment – Operational' section
The Council would also like the wind model to test any mitigation/ landscaping as part of the EIA, to ensure that it is satisfactory.	The results assess a worst case scenario as the wind tunnel test was conducted on a model devoid of trees, landscaping detail or mitigation in order to obtain conservative results (i.e. generate a relatively windy microclimate).
The wind tunnel should also test cumulative developments.	Refer 'Effect Interactions and Cumulative Effects' section
The assessment should assess the wind climate to be experienced on balconies, open space and roof terraces as appropriate.	Refer 'Potential Effects and Mitigation Measures' section
It would be useful if the surrounding receptors were shown on a figure, and the types of receptor (thoroughfare, balcony, entrance etc.) clearly differentiated on the supporting figures	Refer 'Potential Effects and Mitigation Measures' section
A full statistical breakdown of the wind microclimate should be provided. All data should be submitted in a form which can be independently verified and should include digital copies of any drawings, 3D models, calculation sheets, etc.	Refer ES Volume III: Technical Appendix G

Significance Criteria

Effect Significance Terminology Overview

- 12.32** The assessment of effect significance outlined within the below sections is consistent with the terminology and criteria outlined within **Chapter 2: EIA Methodology** of this ES and accords with the relevant standards and guidance. The terminology used to describe the sensitivity of resources / receptors and magnitude of the impact will be as follows:
- High;
 - Medium;
 - Low; and
 - Very Low.
- 12.33** The key terminology to be used to describe the classification of effects is as follows and is further described in the 'Criteria for Effects on Wind Microclimate' section of this chapter:
- Major;
 - Moderate;
 - Minor; and
 - Negligible.
- 12.34** The nature of the effects may be either adverse (negative) or beneficial (positive).
- 12.35** Following the classification of an effect using this methodology, a clear statement is then made as to whether the effect is significant or not significant.

Method of Assessment

Demolition and Construction

- 12.36** For the assessment during the construction phase, the potential effects have not been directly assessed by the wind tunnel tests. Instead, professional judgement has been used to assess likely wind conditions during this stage of the Development.

Operational

- 12.37** 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 widely accepted Lawson Comfort Criteria (Ref. 12-10).
- 12.38** The wind tunnel test results deliver a detailed assessment of the average (mean) and gust (peak) wind conditions around the existing Site and Proposed Development. Configurations for all wind directions are assessed in terms of pedestrian comfort. Strong winds (defined as wind speeds in excess of Beaufort Force 6 for more than 1 hour per year) if they occur, are also identified.
- 12.39** To produce the results within the tunnel, a 1:300 scale model of the existing buildings at and the surrounding area within a 360 metre (m) radius of the centre of the Site was constructed. The buildings comprising the Proposed Development and the cumulative surrounding developments were also constructed and assessed within the wind tunnel model.
- 12.40** The methodology for quantifying the pedestrian level wind environment of the existing conditions and the Proposed Development configurations is outlined below:
- Step 1: Measure the building-induced wind speeds at pedestrian level in the wind tunnel;
 - Step 2: Adjust standard meteorological data to account for conditions at the Site and local surrounds;
 - Step 3: Combine the data from steps 1 and 2 to obtain the expected frequency and magnitude of wind speeds at pedestrian level; and
 - Step 4: Compare the results with the Lawson Comfort Criteria to 'grade' conditions around the Site and local surrounds.

Simulation of Atmospheric Winds

- 12.41** Wind is unsteady, or gusty, and this 'gustiness' or turbulence varies depending upon the Site. Modelling these potential impacts is achieved by a series of grid, barrier and floor roughness elements to create a boundary layer that is representative of urban or open country conditions, as is appropriate. These features can be seen in the background of Figure 12.1.

Measurement Technique

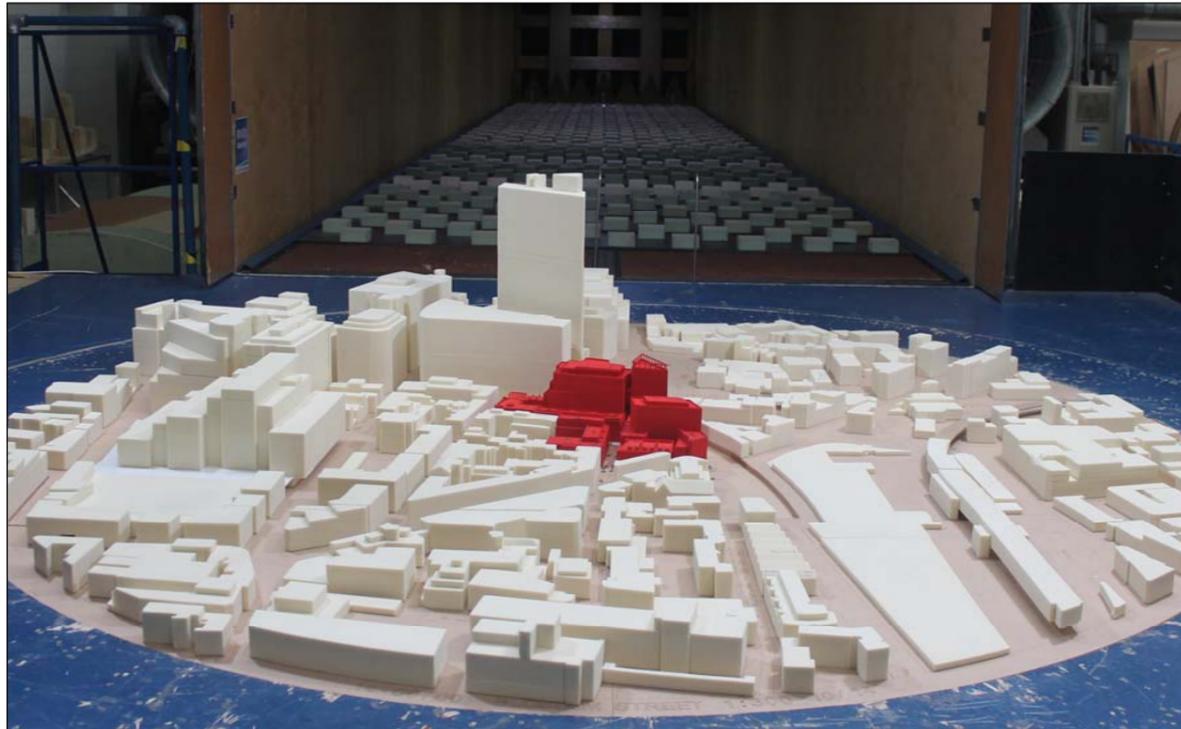
- 12.42** Wind speed measurements are made using Irwin probes at selected locations at the Site and surrounding area to represent sensitive receptors, such as entrances, amenity areas and thoroughfares, which are able to measure the wind speed at a scaled height 1.5m above the ground. For pedestrian comfort studies, both the mean wind speed and peak wind speed were determined at each measurement location.
- 12.43** The wind speed was measured at up to 126 locations under the existing conditions and the Proposed Development configurations for all wind directions in equal increments, with 0° representing wind blowing from the north and 90° wind from the east and so on.

Configurations Assessed

- 12.44** The following configurations were assessed in the wind tunnel:
- Configuration 1: Existing Site (baseline) with existing surrounds;
 - Configuration 2: Proposed Development with existing surrounds; and
 - Configuration 3: Proposed Development with existing surrounds and cumulative surrounds.

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Figure 12.1 Photograph of the Proposed Development Model in the Wind Tunnel



Assumptions and Limitations

- 12.45** Results are presented for the windiest season (usually the winter season in the UK, i.e. December, January and February) and summer (June, July, August). The Lawson Comfort Criteria defines the environment for pedestrian activities to be met during the windiest season whereas others, primarily seating and amenity areas, are dependent upon the summer time conditions because they are more frequently used during this period.
- 12.46** The wind tunnel tests have been conducted on a model devoid of trees or landscape detail in order to obtain conservative, or 'worst case', results (i.e. generate a relatively windy microclimate).
- 12.47** The changes to the massing, orientation and overall layout of the buildings on the Site alter both the local wind flow and pedestrian activity within the Site. For on-site receptors, it is therefore recognised that the assessment of modelled wind conditions against desired conditions is a more useful assessment than a direct comparison with the baseline conditions. However, it is acknowledged that such a comparison would also be useful for the reader to understand the changes from the existing wind conditions across the Site due to the Proposed Development. A summary of this comparison is provided later in this chapter.
- 12.48** For off-site surrounding areas, where pedestrian activity is assumed to remain the same between the baseline and Proposed Development configurations, a direct comparison with the baseline conditions is more relevant and is therefore addressed in the main discussion.

Lawson Comfort Criteria

- 12.49** A scale for assessing the suitability of wind conditions in the built environment adopts the Lawson Comfort Criteria (Ref. 12-10). The Criteria (set out in Table 12.2 below) define a range of pedestrian activities from sitting, through to more transient activities such as crossing the road, and for each activity defines a threshold

wind speed (in Beaufort Force Scale) and frequency of occurrence beyond which the wind environment would be unsuitable for each activity.

- 12.50** The Lawson Criteria reflect the fact that sedentary activity, such as sitting, requires a low wind speed whereas for more transient activity (such as walking) pedestrians would tolerate stronger winds.
- 12.51** If the wind conditions exceed the threshold then the conditions are deemed to be unacceptable for the stated activity. If the wind conditions are below the threshold then they are described as tolerable (or suitable) for the stated activity. For example, if the wind speed exceeds Beaufort Force 4 (B4) for more than 4% of the time then the conditions would be unacceptable for leisure walking (Refer Table 12.2).

Table 12.2 The Lawson Comfort Criteria

Description	Threshold (% wind speed exceed > Beaufort Force)	Suitable Activity Description
Roads and Car Parks	6% > B5	Open areas where pedestrians are not expected to linger.
Business Walking	2% > B5	'Purposeful' walking or where, in a business district, pedestrians may be more tolerant of the wind because their presence on-site is required for work.
Leisure Walking	4% > B4	Strolling.
Pedestrian Standing	6% > B3	Waiting at bus-stops, window shopping, etc.
Entrance Doors	6% > B3	Pedestrians entering/leaving a building.
Sitting	1% > B3	Long-term sitting, for example, sitting outside a café.

Table 12.3 The Beaufort Scale for Wind on Land

Beaufort Force	Hours Average Wind Speed (m/s)	Description of Wind	Noticeable Wind Impact
0	< 0.45	Calm	Smoke rises vertically.
1	0.45 - 1.55	Light Air	Direction shown by smoke drift but not by vanes.
2	1.55 - 3.35	Gentle Breeze	Wind felt on face; leaves rustle; wind vane moves.
3	3.35 - 5.60	Light Breeze	Leaves and twigs in motion; wind extends a flag.
4	5.60 - 8.25	Moderate Breeze	Raises dust and loose paper; small branches move.
5	8.25 - 10.95	Fresh Breeze	Small trees, in leaf, sway.
6	10.95 - 14.10	Strong Breeze	Large branches begin to move; telephone wires whistle.
7	14.10 - 17.20	Near Gale	Whole trees in motion.
8	17.20 - 20.80	Gale	Twigs break off; personal progress impeded.
9	20.80 - 24.35	Strong Gale	Slight structural damage; chimney pots removed.
10	24.35 - 28.40	Storm	Trees uprooted; considerable structural damage.
11	28.40 - 32.40	Violent Storm	Damage is widespread; unusual in the U.K.
12	> 32.40	Hurricane	Countryside is devastated; only occurs in tropical countries.

Target Wind Conditions

- 12.52** For a residential led, mixed-use urban site, such as the Proposed Development (and surrounding area), the desired wind microclimate would typically need to have areas suitable for sitting, standing/entrance use and leisure walking.

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12.53 The business walking and roadway classifications may be satisfactory in isolated areas, but these classifications are also associated with occasional strong winds (which are described in the next section of this chapter).

Private Balconies, Roof Terraces and Amenity Areas

12.54 The target condition in seating areas, or other amenity spaces, is a wind microclimate that is suitable for sitting in the summer months. This is because these areas are more likely to be frequently used by pedestrians who would expect to be able to sit comfortably in the summer. If an area is classified as suitable for sitting in the summer, in RWDI's experience, the stronger winds that occur during the winter season usually mean that the area would be classified as suitable for standing at this time of year, unless additional shelter was provided.

12.55 Upper level terraces and balconies are assessed on the basis that these are amenity spaces. The assessment of significance for amenity areas is therefore focused on the summer season conditions.

Entrances

12.56 Near building entrances a wind environment suitable for standing or calmer is desired throughout the year because these are used throughout the year. Should an entrance be placed near a location where leisure or business walking conditions (i.e. stronger winds) are predicted, this would be considered unsuitable for pedestrian egress and ingress and therefore would require mitigation. The assessment of significance for building entrances therefore focuses on the windiest season result.

Thoroughfares

12.57 A pedestrian thoroughfare should be suitable for leisure walking during the windiest season. The assessment of significance for pedestrian thoroughfares therefore focuses on the windiest season result.

Strong Winds

12.58 The assessments undertaken also provide a notification of stronger winds, which are defined as wind speeds in excess of Beaufort Force 6 for more than 1 hour per year. The assessment determines the amount of time that the wind speed exceeds Beaufort Force 6 (B6), B7 or B8 at each receptor. It is noted that these stronger winds are associated with the business walking and roadway classifications.

12.59 When the wind speed exceeds Beaufort Force 6 on a pedestrian thoroughfare for only a few hours per year this is unlikely to cause nuisance to pedestrians, whereas wind speeds in excess of Beaufort Force 7 or 8 would impede walking. In these instances mitigation may be necessary at the location or further assessment required of whether pedestrian access might be restricted on the windiest days of the year.

Criteria for Effects on Wind Microclimate

12.60 The criteria used in the assessment of the potential effects is based on the relationship between the desired pedestrian uses (as defined by the Lawson Comfort Criteria) in relation to the wind conditions measured at a particular receptor location with the Proposed Development in place. This allows for the assessment to take into account any change in pedestrian activity that might accompany the Proposed Development. The assessment criteria for the modelled wind microclimate, as shown in Table 12.4, is an increasing scale to reflect the increasing magnitude of impact.

12.61 In line with Lawson's overall methodology, strong winds are reported separately from the Comfort Criteria assessment and do not form part of the significance criteria.

Table 12.4 Criteria for Wind Microclimate Assessment within the General Surrounds

Modelled Wind Microclimate Criteria	Effect Classification and Significance
Wind Conditions are 3-steps calmer / windier than desired.	Major
Wind Conditions are 2-steps calmer / windier than desired.	Moderate

Modelled Wind Microclimate Criteria	Effect Classification and Significance
Wind Conditions are 1-step calmer / windier than desired.	Minor
Wind Conditions are similar to those desired.	Negligible

12.62 The nature of the effect will be described as beneficial or adverse (in line with paragraph 12.34).

12.63 An adverse effect implies that a location has a wind environment that is windier than the desired conditions and mitigation should therefore be considered. Where potential adverse effects are identified, a corresponding entry has been included in the 'Mitigation and Monitoring Measures' section of this chapter to describe the remedial measures expected to mitigate the effect.

12.64 Potential adverse effects that are assessed as minor, moderate and major effects are all considered to be significant, i.e. they would require mitigation in order for local conditions to become suitable for the intended use of the area. As an example, if the design wind conditions at a particular location are required to be suitable for standing, but the modelled wind conditions are identified as being suitable for leisure walking (i.e. in accord with the Lawson Criteria, refer Table 12.2), the difference between the desired and modelled wind conditions is described as being one-step windier than desired. In this case, the potential effect would be identified as being of minor significance and adverse (i.e. windier than desired).

Assessment Methodology and Significance Criteria - Update 2015

March 2015 ES Addendum

12.65 The December 2014 Scheme was originally assessed for wind microclimate effects in support of the December 2014 ES. That assessment was based on scale model wind tunnel testing of the scheme in the context of both existing and consented future surrounding buildings. The wind microclimate assessment in the December 2014 ES concluded that, with mitigation measures in place (specifically localised screening around the entrance to Site 1A), the local wind microclimate would be suitable for the intended uses of the site and surrounding area.

12.66 The potential impacts within this March 2015 ES Addendum have been assessed using professional judgement, based on the results of the previous wind tunnel tests and a review of the Revised Scheme. An experienced-based assessment such as this is considered to be an appropriate method, given that the proposed changes to the scheme are minor.

November 2015 Amendments

12.67 The proposed approach to assessing the impact of the Amended Proposed Development is to qualitatively review the impact of the November 2015 Amendments using professional judgement with the aid of the wind tunnel results acquired for the December 2014 ES.

12.68 The November 2015 Amendments are relatively minor in terms of considering the potential impact on wind microclimate conditions and a qualitative review is considered an appropriate method for assessment.

Baseline Conditions

Meteorological Data

12.69 The UK Meteorological Office supplies records of the number of hours that wind occurs for ranges of wind speed (using the Beaufort Scale) and by direction. Meteorological data for London (Heathrow, Gatwick and Stansted Airports), shown in Figure 12.2, were used in this assessment as this is deemed to provide the best representation of the local wind microclimate for the London area.

12.70 The meteorological data obtained for London indicates that the prevailing wind throughout the year is from the southwest (i.e. 210 to 240 degrees on the compass). This is typical for many areas of southern England. There is a secondary peak from the northeast during the late spring and early summer. The winds from the northeast are not as strong as the prevailing winds from the southwest, although the winds are colder.

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12.71 The meteorological data were corrected to standard conditions of 10m above open flat level country terrain. The meteorological model was then adjusted to the Site conditions taking account of the terrain roughness using the BREVe3 software package which models the wind characteristics caused by changes in the terrain roughness at the stated reference height of 120m above the surface. The results are shown in Table 12.5 below.

Table 12.5 Site Meteorological Data Adjustment

Mean Factors at Reference Height (120m above the ground level)												
Direction (°N)	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
Mean Factor	1.40	1.43	1.43	1.43	1.38	1.37	1.42	1.41	1.39	1.35	1.36	1.37

Configuration 1 – Existing Site (baseline) with Existing Surrounds

Pedestrian Comfort

12.72 Figure 12.3 and Figure 12.4 show the windiest season and summer results for the existing Site scenario and the surrounding areas (i.e. the baseline).

12.73 The results from the Baseline scenario show that the existing Site is suitable for its intended use with all locations observing leisure walking or calmer wind conditions.

12.74 The majority of the Site shows sitting results, with standing and leisure walking to the west and south-west of the Site on Shoreditch High Street and Folgate Street. The generally calm conditions throughout the existing Site are a result of the layout and massing of the existing buildings, which are of a similar height to (or lower than) the nearby surrounding buildings to the west, southwest and south. In this configuration, the wind will tend to stay above roof level and would not generally penetrate down to street level.

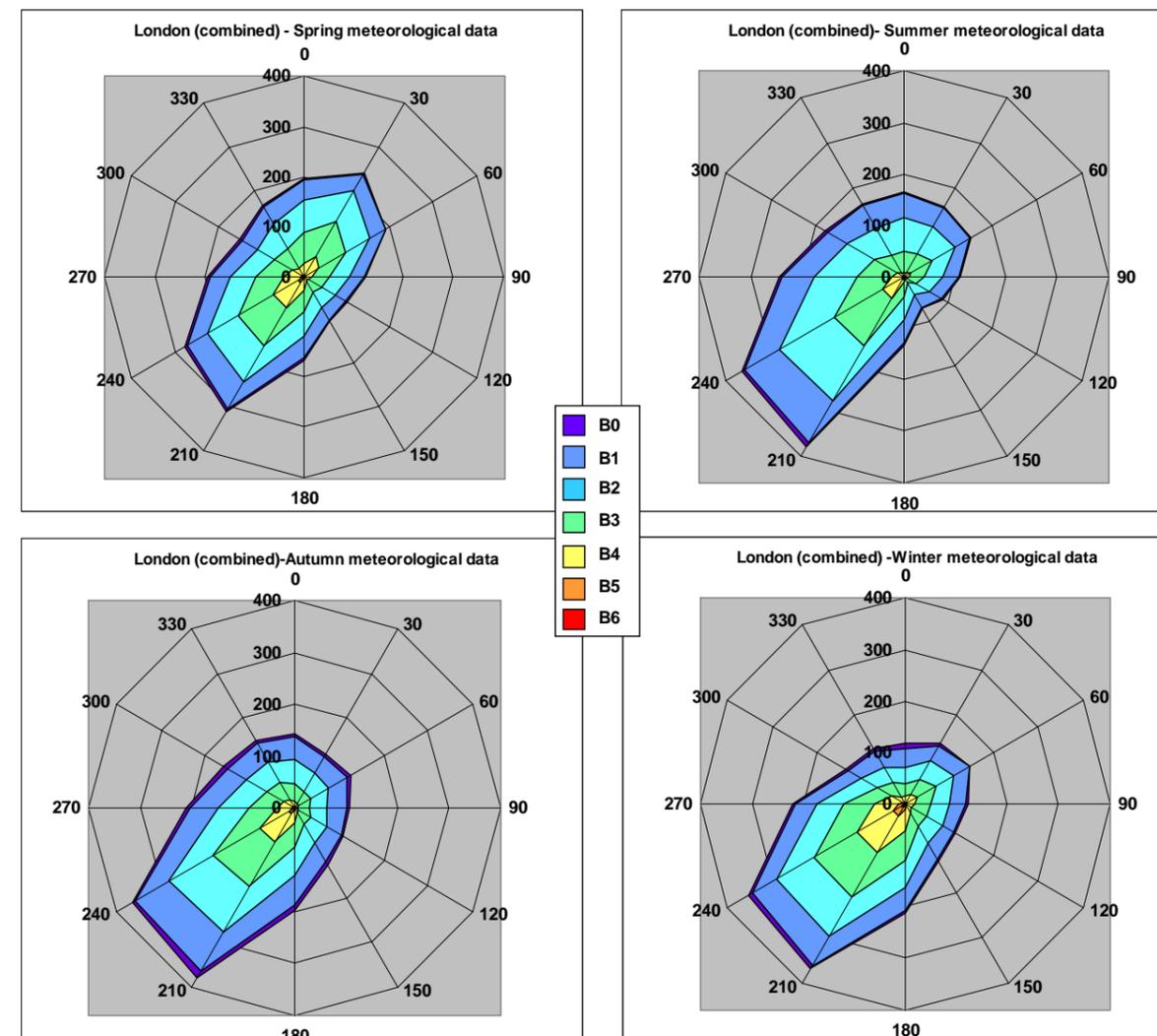
12.75 It is worth noting that the layout of the receptors for the baseline assessment is dependent upon the ground floor plan of the Proposed Development. Consequently, there are “empty” areas within the existing Site that will be occupied by the buildings of the Proposed Development. These areas have not been instrumented in the baseline scenario because:

- (a) there is no worthwhile comparison to be made, and
- (b) the assessment of potential impacts is concerned primarily with the intended use of the completed development (for which these receptors would be irrelevant).

Strong Winds

12.76 There were two occurrences of strong winds, both in exceedance of Beaufort 6 for up to 3.1 hours per annum, located at receptors 3 and 15. These receptors are located on existing thoroughfares around the Site, where occasional strong winds of this magnitude would not be expected to cause a nuisance.

Figure 12.2 Seasonal Wind Roses for London, UK



Baseline Conditions - Update 2015

March 2015 ES Addendum

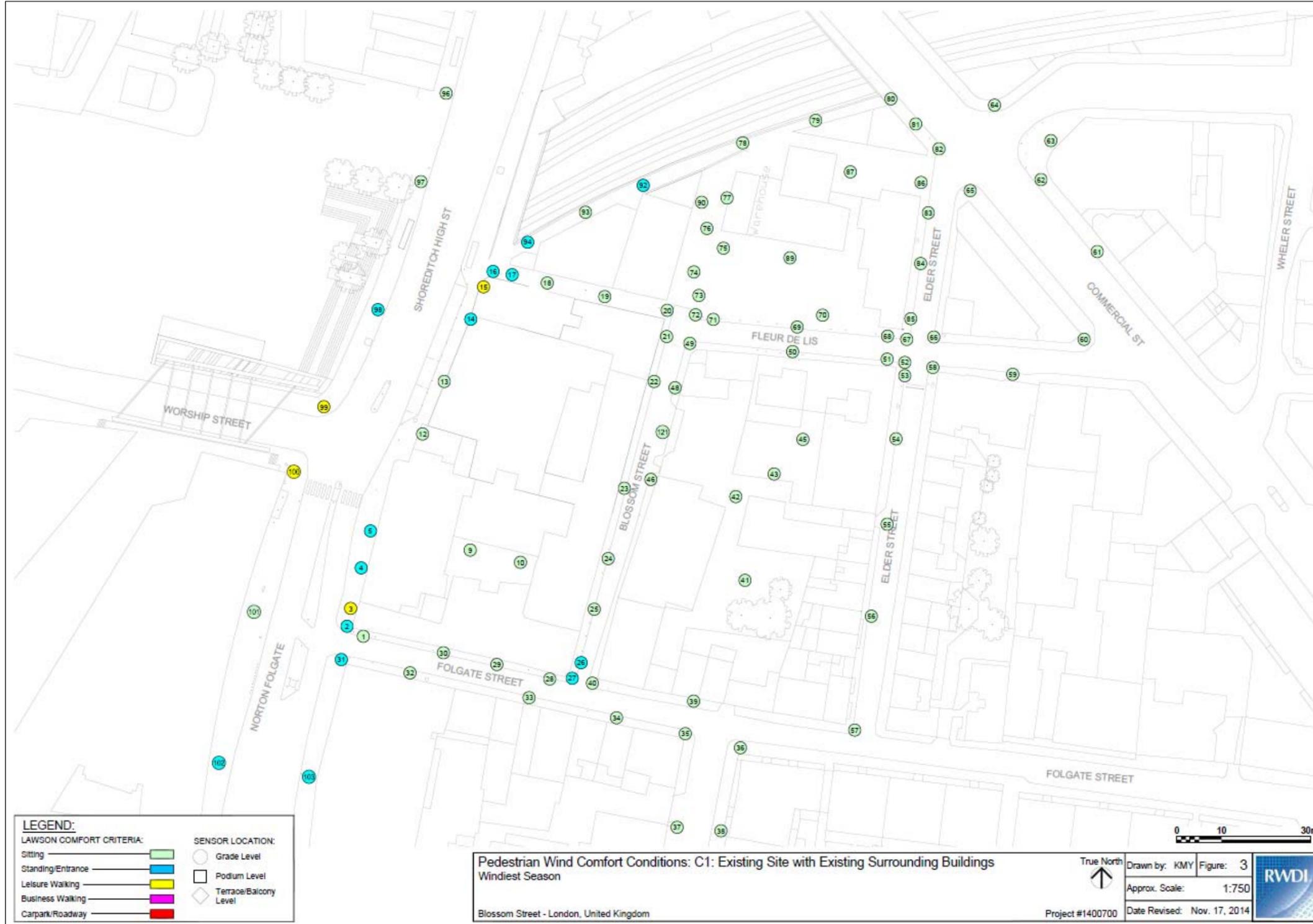
12.77 There are no changes to baseline conditions that were described in the December 2014 ES.

November 2015 Amendments

12.78 It is considered that there have not been any material changes to the baseline wind microclimate condition since the preparation of the December 2014 ES and subsequent March 2015 ES Addendum. It is considered that the baseline remains valid for enabling the qualitative assessment of the likely impacts arising from the Amended Proposed Development.

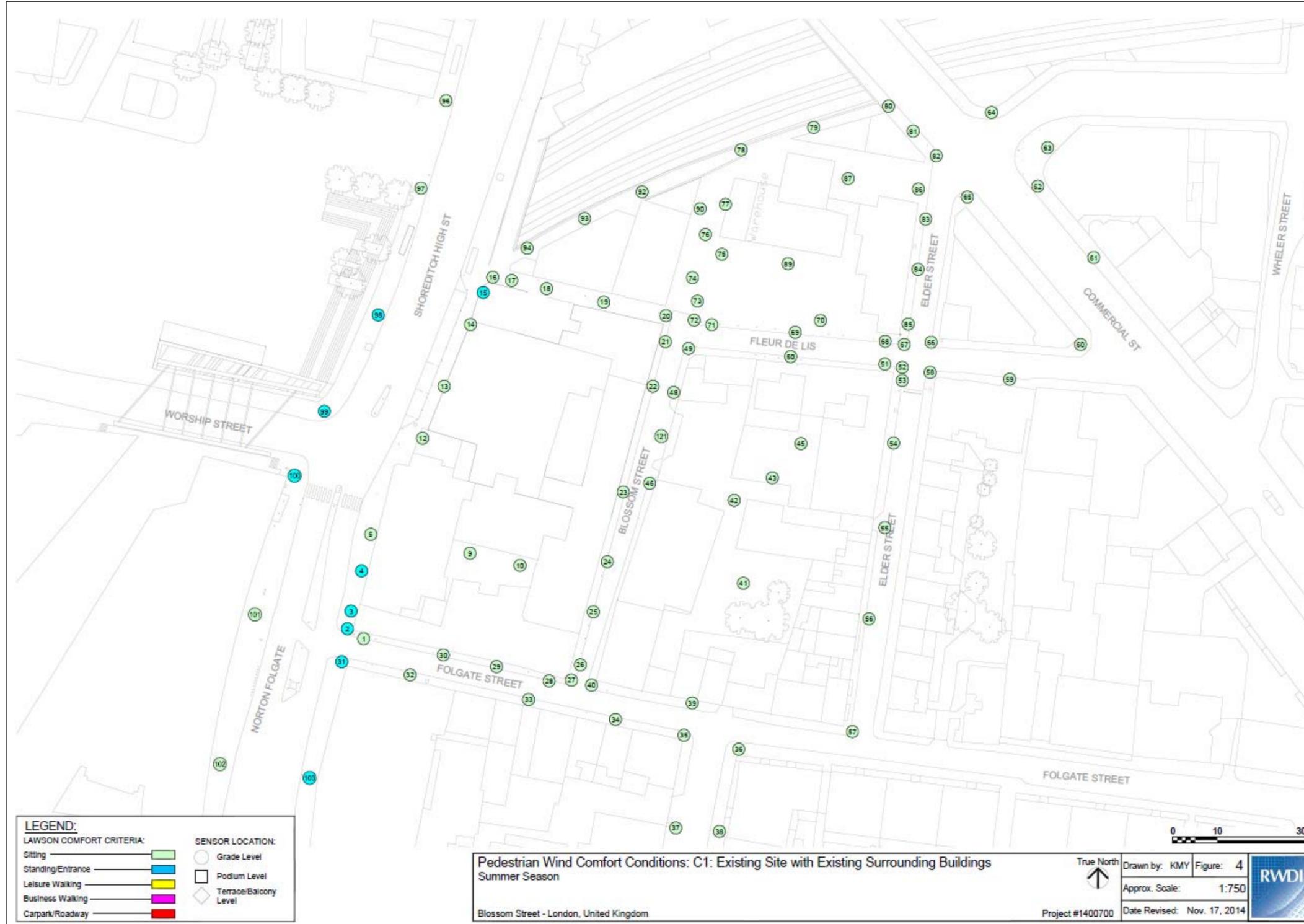
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Figure 12.3 Configuration 1: Existing Site (Baseline) with Existing Surrounds (Windiest Season)



12 Wind Microclimate

Figure 12.4 Configuration 1: Existing Site (Baseline) with Existing Surrounds (Summer Season)



12 Wind Microclimate

Environmental Design and Management

12.79 If applicable, the way that potential environmental impacts have been or will be avoided, prevented, reduced or off-set through design and / or management of the Proposed Development are outlined below and will be taken into account as part of the assessment of potential effects. Proposed environmental enhancements are also described where relevant.

Demolition and Construction

12.80 No design and / or management measures are recommended at this stage of the Proposed Development.

Operational

12.81 No design and / or management measures are proposed at this stage of the Proposed Development.

Environmental Design and Management - Update 2015

March 2015 ES Addendum

12.82 No further environmental design and / or management measures were considered.

November 2015 Amendments

12.83 No further environmental design and / or management measures were considered.

Potential Effects and Mitigation Measures

12.84 This section discusses the wind microclimate potential impacts and likely effects to sensitive receptors arising as a result of the Proposed Development, during both the demolition and construction phase, and during the operational phase.

12.85 Where adverse effects are predicted to occur, mitigation measures have been identified in order to reduce the magnitude of the impacts to an acceptable level.

Site Preparation, Demolition and Construction Effects

12.86 The potential effects on wind microclimate at the Site during the construction phase have not been directly assessed by the wind tunnel tests. Instead, professional judgement has been used to assess the likely conditions during these stages of development.

12.87 The current baseline conditions reflect a wind microclimate at the existing Site that is broadly in keeping with other parts of central London. An increase in the local windiness as a result of the demolition of the existing buildings is unlikely to create conditions unsuitable for a working construction site or pedestrian thoroughfares around the currently cleared Site. Therefore the likely effect is expected to be **negligible** at worst.

12.88 As construction of the Proposed Development proceeds, the wind conditions at the Site would gradually adjust to those of the completed development, as described in the following sections.

Site Preparation, Demolition and Construction Effects - Update 2015

March 2015 ES Addendum

12.89 Since the submission of the December 2014 ES, no changes have been made to the demolition and construction methodology. Therefore the conclusions from the demolition and construction assessment presented in the December 2014 ES remains valid.

November 2015 Amendments

12.90 No changes have been made to the demolition and construction methodology, and therefore the conclusions from the demolition and construction assessment presented in the December 2014 ES and March 2015 ES Addendum remains valid.

Effects Once the Site is Operational

Configuration 2 – Proposed Development with Existing Surrounds

12.91 Figure 12.5 and Figure 12.6 show the windiest and summer season results for the ground floor level, and Figure 12.7 shows the summer season terrace results respectively for the Proposed Development with existing surrounds (Configuration 2).

Thoroughfares

12.92 Pedestrian thoroughfares in and around the Site had wind conditions ranging from winds suitable for sitting to leisure walking during the windiest season, representing a **moderate beneficial to negligible** effect.

12.93 The highest local wind speeds tended to occur towards the west and south-west of the Site and along Blossom Street; however, the conditions remained suitable for their intended use.

Entrances

12.94 Entrances at receptor locations 4, 5, 11-15, 21-23, 25, 27-30, 69, 73, 77, 81, 89, 91, 93 and 95 showed standing or sitting wind conditions. A standing wind condition is desired for an entrance and therefore these results represent a **negligible to minor beneficial** effect.

12.95 In contrast, one of the side entrances to the S1a (south-west corner of the Site, receptor location 3) observed leisure walking condition, recording a one category windier than desired magnitude (i.e. standing / entrance), representing a **minor adverse** effect at this point.

Amenity Spaces

12.96 During the summer season, ground floor level amenity spaces at receptor locations 9 and 10 (within Blossom Yard, between S1a and S1b); location 41 (neighbouring property, south of S3); locations 43-45 (Residents Courtyard, within S3); locations 70, 75 and 86-89 (within Site 2) all observed wind conditions suitable for sitting. These results represent a **negligible** effect.

12.97 Private terraces on various levels and roofs (across the entire Site - receptor locations 104-120 and 122-127) all showed results of wind conditions suitable for sitting during the summer season. These results represent a **negligible** effect.

Strong Winds

12.98 There were three locations in Configuration 2 (Proposed Development with Existing Surrounds, Ground Level (Windiest Season)) where occasional strong winds in excess of Beaufort Force 6 occurred.

12.99 Receptor 3 (located at an entrance to S1a) observed winds in excess of Beaufort 6 for 3.1 hours per annum. This location would benefit from mitigation (i.e. localised screening – refer 'Mitigation and Monitoring Measures' section) in order to reduce or eliminate the potential impact arising during strong winds.

12.100 Receptor locations 76 (north of the Site, located between S1c and S2) and 100 (located off-site, corner of Shoreditch High Street and Worship Street, to the west of S1a) observed winds in excess of Beaufort 6 for up to 2.3 hours per annum. The receptor locations however are located on thoroughfares where infrequent strong winds are unlikely to be a nuisance.

Summary

12.101 The Existing Site is relatively calm, and in the presence of the Proposed Development, the Site is windier, specifically along Blossom Street; however still acceptable for its intended use.

12.102 Only one receptor location across the total Site observed windier results than required (receptor location 3), which is an entrance to S1a located at the south-western corner of the Site. Localised mitigation measures have been recommended later in this chapter which will provide sufficient shelter to reduce wind speeds to acceptable conditions.

12 Wind Microclimate

12.103 All amenity spaces (located on the ground floor), several elevated levels and rooftop terraces across the Site all showed suitable sitting wind environments during the summer season.

Effects Once the Site is Operational – Update 2015

March 2015 ES Addendum

12.104 The proposed scheme changes are described in Table 12.R1, together with their potential impact (if any) on the wind microclimate.

Table 12.R1 Assessment of the Revised Scheme on Wind Microclimate

Proposed Amendment	Assessment of Potential Effects
Omission of three 2-storey bridge links oversailing Fleur De Lis passage	The wind tunnel tests conducted in December 2014 show that the bridge links do not have a significant effect on the wind conditions. Comparing the results from the baseline with the Proposed Development, the wind microclimate on Fleur de Lis Street in the vicinity of the bridges is fairly calm in both scenarios (suitable for standing or sitting). As such, the removal of the bridge links will not have any significant effect and the results of the previous assessment remain valid.
New facades to S1 and S1c where bridge links omitted to match proposed planning scheme	Minor façade changes will not affect the wind microclimate.
Resetting out of floor to floor levels on S1c from 3.9m to 3.5m and increase in storeys from 13 to 14 - within planning parapet height	Given that the changes to floor levels occur within the planning parapet height (as assessed in the December 2014 ES), there will be no effect to the wind microclimate. Internal changes that do not significantly alter the external geometry of the development do not affect the wind microclimate.
Resetting out of elevations to match new floor to floor	No effect on wind microclimate.
Northern edge of core to S1c has increased by approx. 800mm	No effect on wind microclimate
Additional lift to S1c – goodslift / passenger lift	No effect on wind microclimate
Resetting out of top floor terrace	All terrace locations assessed in the December 2014 ES were found to have calm conditions that would be suitable for sitting during the summer (i.e. suitable for their intended use). Having reviewed the revised drawings, it is expected that the reconfigured top floor terrace will have similar conditions to the December 2014 scheme and therefore no adverse effects are anticipated.
Minor changes to entrances on Elder Street Elevation to S3	The wind conditions along Elder Street were found to be calm (suitable for sitting) in the December 2014 assessment, even during the windiest season. This is due to the substantial shelter provided to the street by the arrangement of the proposed and neighbouring buildings. Minor changes to the entrances will not affect these conditions, and the entrances will remain suitable their intended use.

12.105 The conclusions from the completed and operational wind microclimate assessment presented in the December 2014 ES remain valid.

November 2015 Amendments

12.106 The results of the qualitative assessment of the Amended Proposed Development, in terms of the likely impact of the November 2015 Amendments, is presented in Table 12.R2.

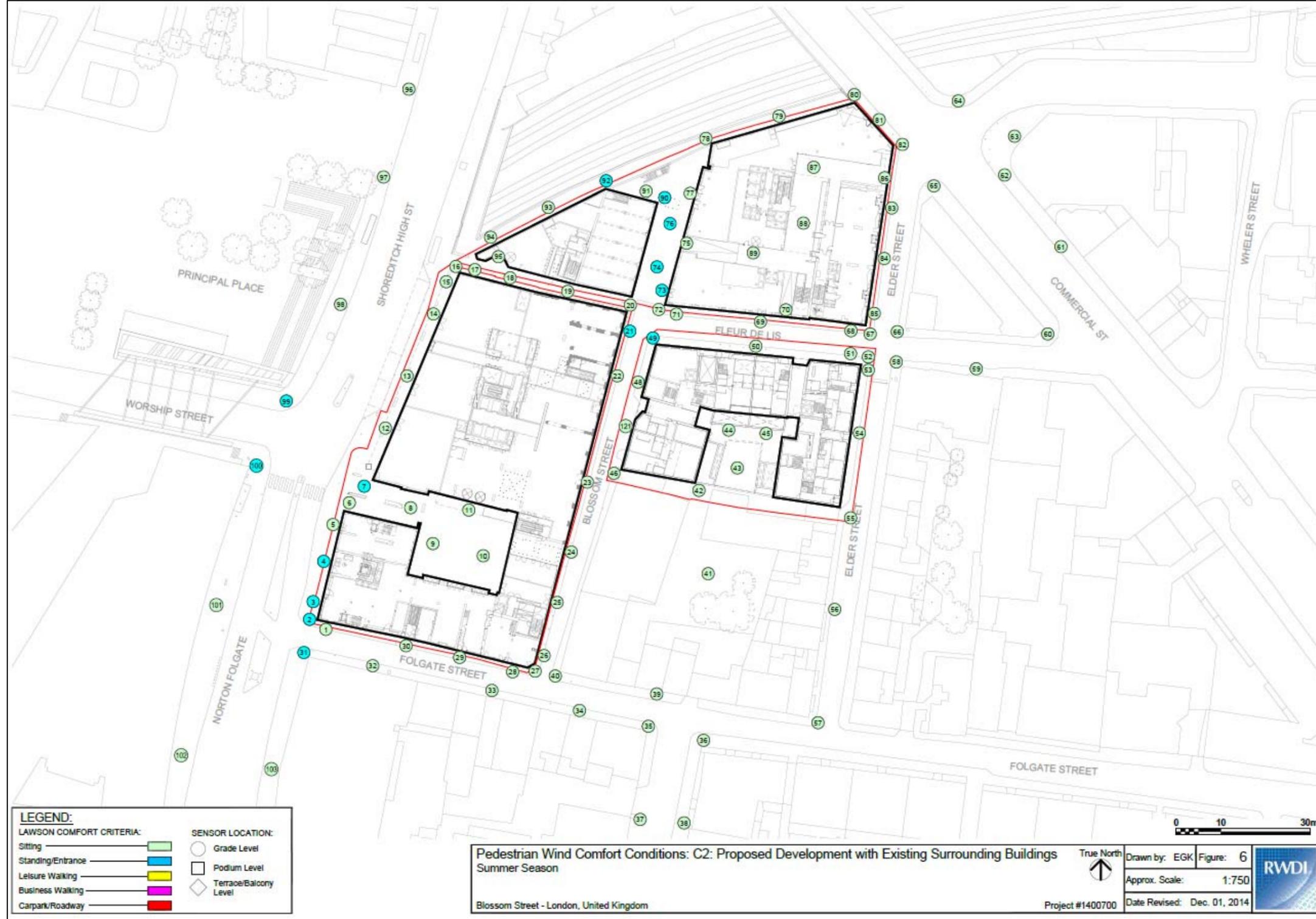
Table 12.R2 Assessment of the Revised Scheme on Wind Microclimate

Proposed Amendment	Assessment of Potential Effects
Retention of No 12 & 13 Blossom Street, Including Pitched Roofs	The wind tunnel probe locations at terrace level (probes 104-106) on S1 all recorded in the December 2014 ES calm wind conditions suitable for sitting use. The winds in these areas are only slightly increased as a result of easterly wind down washing on the taller east façade of S1, or channeling winds from a southerly direction. It is considered the changes to the roof and height are not likely to have a significant effect and the conclusions remain valid.
No 12 & 13 will operate as a separate building, independent of S1	No effect on wind microclimate
Entrance to No 12/3 office will be off Fleur De Lis Street	The new entrance location is represented by wind tunnel probe location 19 in the December 2014 ES. The wind tunnel tests conducted in December 2014 ES showed probe location 19 to be very calm for all configurations, recording win speeds suitable for sitting even during the windiest season. Therefore this entrance location should present suitable wind conditions for users.
Retail use at Ground Floor	No effect on wind microclimate
Office use above for SME's	No effect on wind microclimate
Minor shift to core to S1	No effect on wind microclimate
Bike and Bin entrance to S1 basement off Blossom Street	No effect on wind microclimate

12.107 The conclusions from the completed and operational wind microclimate assessment presented in the December 2014 ES and March 2015 ES Addendum remain valid.

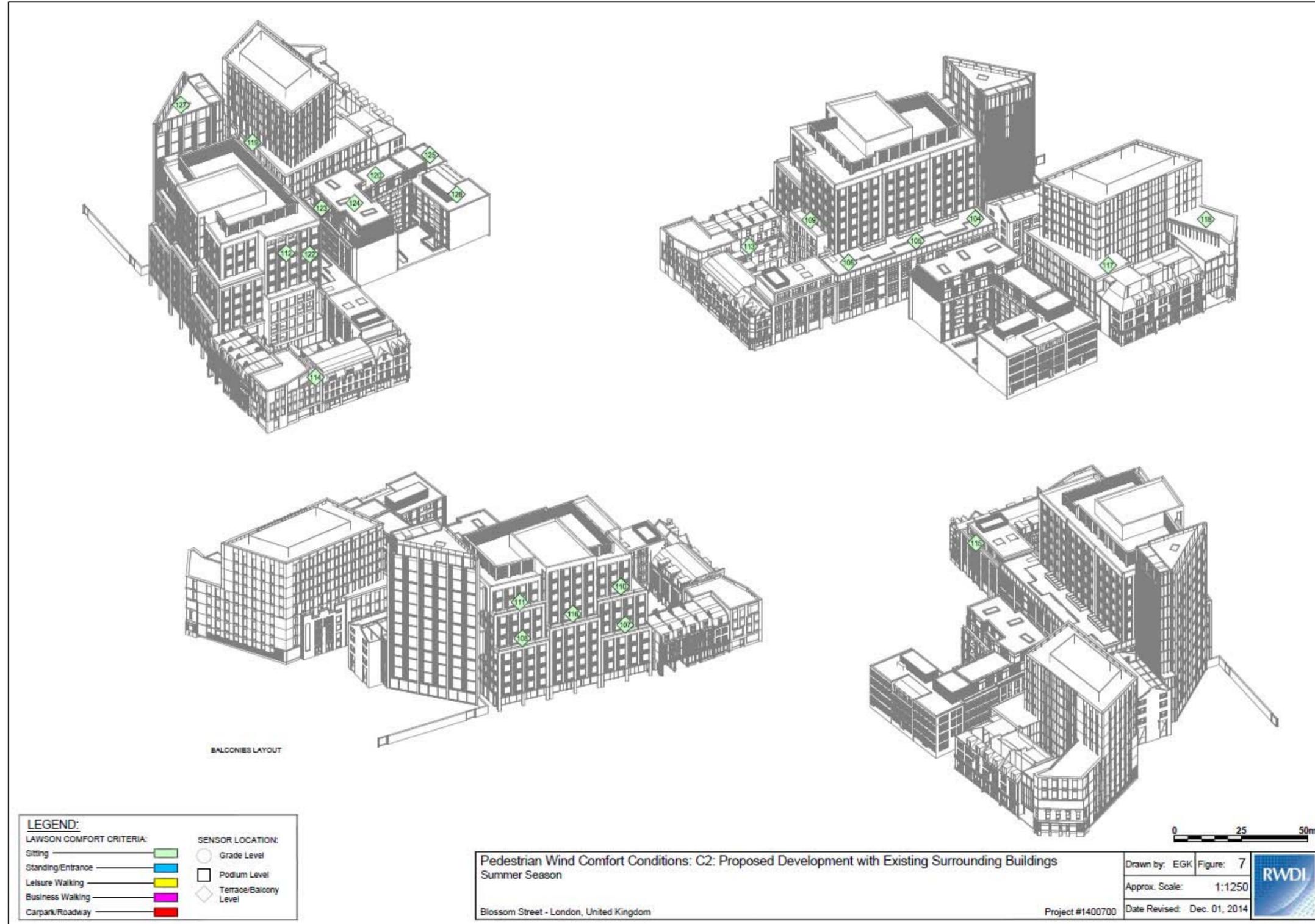
12 Wind Microclimate

Figure 12.6 Configuration 2: Proposed Development with Existing Surrounds, Ground Level (Summer Season)



12 Wind Microclimate

Figure 12.7 Configuration 2: Proposed Development with Existing Surrounds, Terrace Level (Summer Season)



12 Wind Microclimate

Mitigation and Monitoring Measures

12.108 From the assessment, this section outlines the mitigation measures proposed that are over-and-above the environmental design and management measures covered previously. Where appropriate, future monitoring and / or environmental management required to verify the predictions and / or fine tune mitigation measures or ensure the potential effects are adequately controlled, are also outlined.

12.109 The measures below accounted for both the demolition and construction, and operational phases, are outline below.

Demolition and Construction

12.110 No mitigation is recommended for the Proposed Development.

Operational

Thoroughfares

12.111 There are no thoroughfare locations that require mitigation.

Entrances

12.112 Only one receptor location (receptor location 3) across the total Site observed windier results than required, which is an entrance to S1a located at the south-western corner of the Site.

12.113 Simple mitigation, in the form of localised screening around the entrance (which could either take the form of solid or porous screens, planted trellises or shrubs in planters) would provide sufficient shelter to this entranceway.

12.114 Based on RWDI's professional judgement and experience of other similar mitigation schemes, the residual effect after implementation of the mitigation is likely to be **negligible to minor beneficial**.

Amenity Spaces

12.115 There were no requirements for mitigation measures for ground, terrace or rooftop amenity spaces across the Site.

Mitigation and Monitoring Measures - Update 2015

March 2015 ES Addendum

12.116 No additional mitigation measures or changes to those measures identified previously are assessed as being required to alleviate the impacts associated with the proposed changes.

November 2015 Amendments

12.117 No additional mitigation measures or changes to those measures identified previously are assessed as being required to alleviate the impacts associated with the November 2015 Amendments.

Residual Effects and Conclusions

Residual Effects – Update 2015

12.118 Table 12.6 below summarises the likely residual effects of the Proposed Development in terms of wind microclimate (Configuration 2 – Configuration 2: Proposed Development with Existing Surrounds) presents the residual effects following the assessment of the Amended Proposed Development.

Table 12.6 Summary of Mitigation Measures and Residual Effects

Resource / Receptor	Effect (incorp. environmental design & management)	Mitigation and Monitoring	Residual Effect (incorp. mitigation & monitoring)	Significance Conclusion
Thoroughfares	Negligible to Moderate Beneficial	None required	Negligible to Moderate Beneficial	Significant
Entrances	Minor Adverse to Minor Beneficial	Localised screening around the entrance to S1a (receptor location 3).	Negligible to Minor Beneficial	Not Significant
Amenity spaces (summer)	Negligible	None Required	Negligible	Not Significant

Conclusion – Update 2015

12.119 Overall, the Amended Proposed Development does not result in any changes to the scale and magnitude of the wind microclimate effects identified in the December 2014 ES. As such, the conclusions set out within the March 2015 ES Addendum, and the December 2014 ES, remain valid.

Effect Interactions and Cumulative Effects Assessment

Assessment of Combined Effect of Individual Effects on a Single Receptor

12.120 A combined effect occurs when a single receptor is affected by more than one impact at any point in time. An exercise which tabulates the residual effects of this assessment against relevant receptors, and so identifies the potential for the combined effect, has been undertaken.

12.121 Reference should be made to **Chapter 16: Effect Interactions** of this ES for further details.

Assessment of Cumulative Effect of the Proposed Development with Other Development Schemes (Configuration 3)

12.122 The Proposed Development has been considered along with other nearby consented schemes (also referred to as cumulative schemes), as detailed within **Chapter 2: EIA Methodology** of this ES. The results of this assessment are discussed below.

Configuration 3: Proposed Development with Existing Surrounds and Other Development Schemes

12.123 Figure 12.8 and Figure 12.9 show the windiest season and summer season results for the ground level, and Figure 12.10 shows the summer season terrace level results respectively for the Proposed Development with Existing and Cumulative Surrounds.

12.124 Generally the cumulative buildings provide some shelter to the Proposed Development as the wind environment is the same or calmer than in Configuration 2.

Thoroughfares

12.125 Pedestrian thoroughfares in and around the Site are suitable for their intended use with wind conditions ranging from leisure walking to sitting. These results represent a **negligible to moderate beneficial** effect.

12.126 Wind speeds tend to be higher towards the west and south-west of the Site and between Site 1 and Site 2; however, these areas would remain suitable for thoroughfare use.

12 Wind Microclimate

Entrances

12.127 All entrances, at receptor locations 3, 4, 5, 11-15, 21-23, 25, 27-30, 69, 73, 77, 81, 89, 91, 93 and 95, showed wind conditions ranging from standing to sitting; a standing wind condition is desired for entrances and therefore the results represent a **negligible** to **minor beneficial** effect.

Amenity Spaces

12.128 During the summer season, ground floor level amenity spaces at receptors 9 and 10 (between plots S1a and S1b), 41 (neighbouring property, south of S3), 43-45 (Residents Courtyard, within S3), 70, 75 and 86-89 (walkway under S2) remained the same as Configuration 2 (all observed wind conditions suitable for sitting). The results represent a **negligible** effect.

12.129 Private terraces on various levels and roofs (across the entire Site - receptors 104-120 and 122-127) all showed results of wind conditions suitable for sitting during the summer season. The results represent a **negligible** effect.

Strong Winds

12.130 There was one occurrence of strong wind, at receptor location 103, which is on a public thoroughfare along Norton Folgate located to the south-west of the Site. This receptor observed winds in exceedance of Beaufort 6 for 1.0 hours per annum. As this is an infrequent occurrence and along a thoroughfare, it is unlikely to cause a nuisance to pedestrians and therefore would require no mitigation.

Assessment of Cumulative Effect of the Site with Other Development Schemes - Update 2015

March 2015 ES Addendum

12.131 As there are no new cumulative schemes and the alterations to the scheme are minor the cumulative effects reported in the December 2014 ES remain valid.

November 2015 Amendments

12.132 As per the approach adopted for assessing the impact of the Amendment Proposed Development, having regard to the assessment of the Site with other development schemes the assessment has similarly adopted the approach to qualitatively assess using professional judgement, with the aid of the wind tunnel results acquired for the December 2014 ES.

12.133 The updated cumulative list (refer *Chapter 2: EIA Methodology*) is very similar to the tested cumulative configuration in the December 2014 ES. The only addition falling within the radius adopted for the wind tunnel modelling is the amended Bishopsgate Goodsyrd development, located to the north-east of the Site. The size and scale of this cumulative scheme is likely to only provide additional shelter from north-easterly winds, which currently pass over relatively low rise buildings.

12.134 It is considered that the updated cumulative list for consideration in this Replacement ES is expected to have minimal change to the wind microclimate and not change the conclusions in terms of cumulative effects reported in the December 2014 ES. Therefore the likely effects reported in the December 2014 ES remain valid.

Summary of the 2011 Consent

12.135 A wind study was undertaken for the 2011 Consented Scheme. Prior to the approval of the final scheme, minor design modifications warranted a review of the assessment undertaken.

12.136 The modifications to the scheme were reviewed and the external form of the building was largely unchanged –the main factor that may potentially affect the wind study results.

12.137 There were no obvious changes visible to the parts of the building in direct contact with the streets (Blossom Place, Folgate Street and Norton Folgate), which are most exposed to the effects of wind approaching from all directions.

12.138 There had been slight modifications to the courtyard layout, but were not expected to have great impact – as the area is shielded from direct contact with the wind. Also, the size of the passages leading to the courtyard did not appear to have changed.

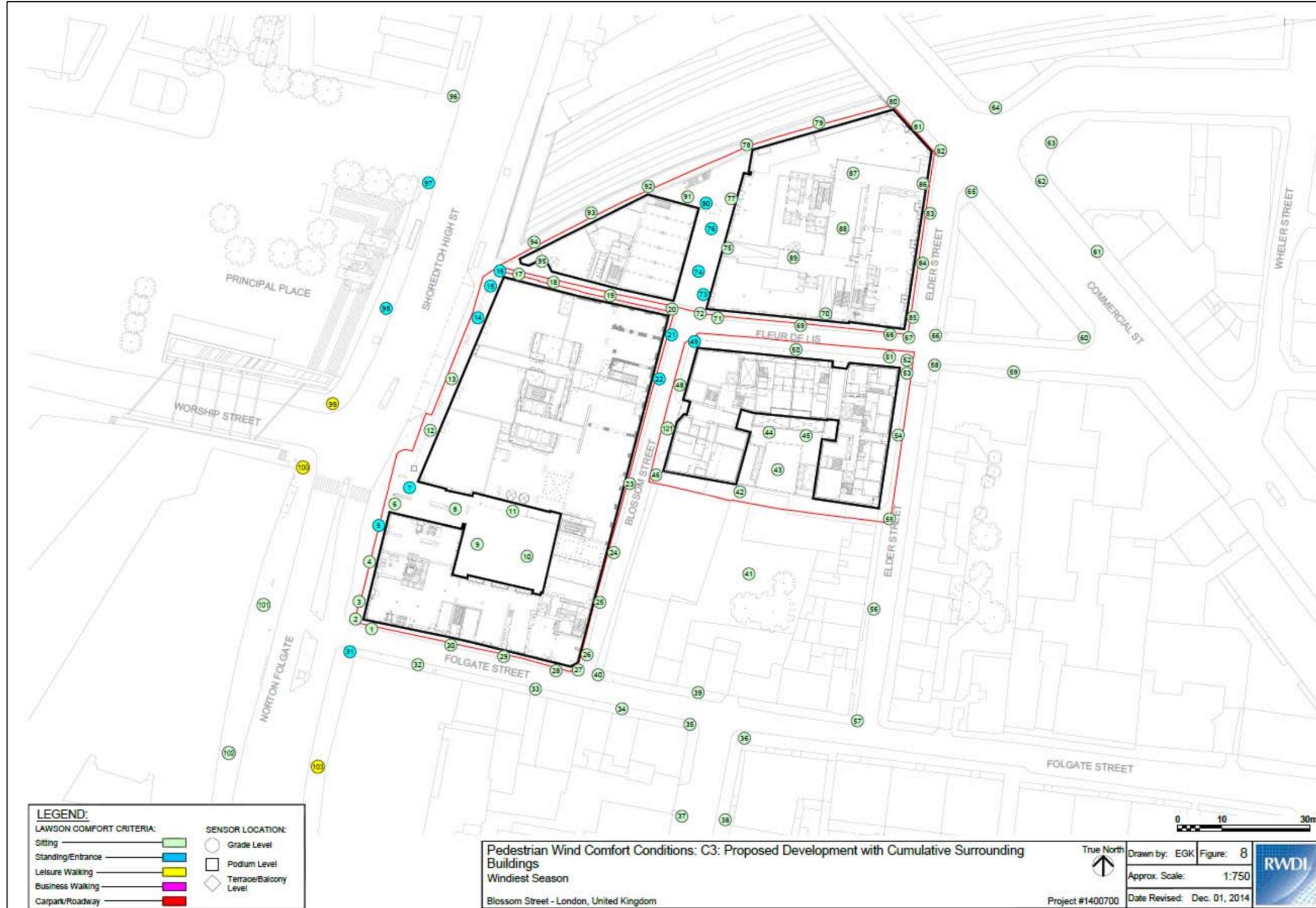
12.139 Therefore the conclusions were that it is not expected that there is to be an appreciable change in the results due to the building modifications.

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- Ref. 12-3 Greater London Authority, (2011); The London Plan, Spatial Development Strategy for Greater London. Greater London Authority, London.
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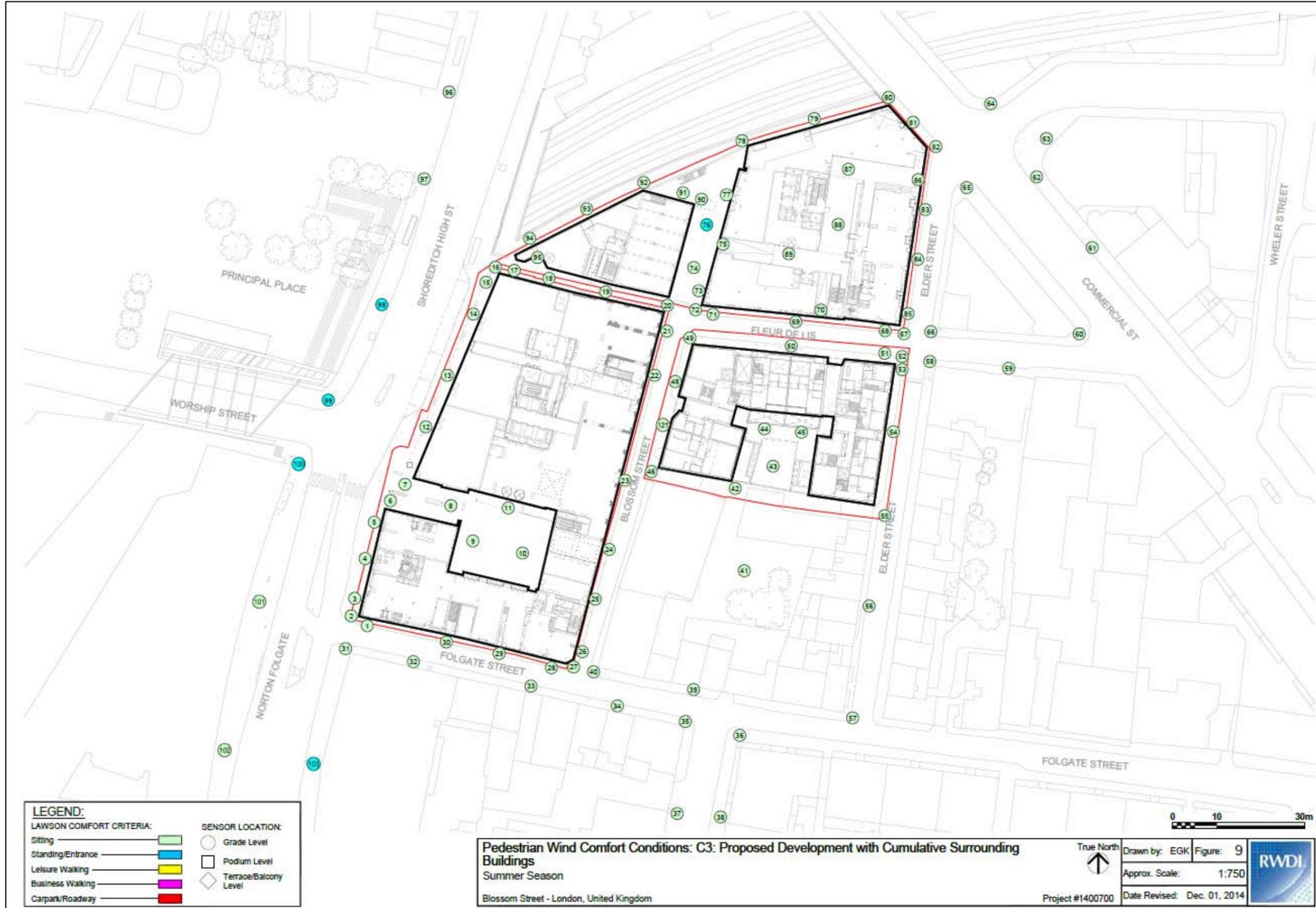
12 Wind Microclimate

Figure 12.8 Configuration 3: Proposed Development with Existing Surrounds and Cumulative Surrounding Buildings, Ground Level (Windiest Season)



12 Wind Microclimate

Figure 12.9 Configuration 3: Proposed Development with Existing Surrounds and Cumulative Surrounding Buildings, Ground Level (Summer Season)



12 Wind Microclimate

Figure 12.10 Configuration 3: Proposed Development with Existing Surrounds and Cumulative Surrounding Buildings, Terrace Level (Summer Season)

