CENTRE POINT

ES Volume III: Technical Appendices

URS

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Environmental Statement
Volume III

Centre Point

EIA Scoping Report

Almacantar Ltd

20th February 2013

URS

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1. INTRODUCTION

1.1. Background

Almacantar Ltd (the 'Applicant') is seeking full planning permission for restoration and refurbishment at a site referred to as 'Centre Point' which comprises Centre Point Tower, Centre Point House and the Centre Point Link building (hereafter referred to as the 'Proposed Development'). The site is currently occupied by a mixed use complex that comprises office space and a restaurant/bar in the 34 storey Centre Point Tower, office and retail space in the Centre Point Link building and offices, residential and retail use in Centre Point House. Various land uses surround the site, including retail, residential, and leisure uses. The site location and context is shown in **Figure 1**. The site is identified for the purposes of the EIA Scoping by the 'redline boundary' presented in **Figure 2**.

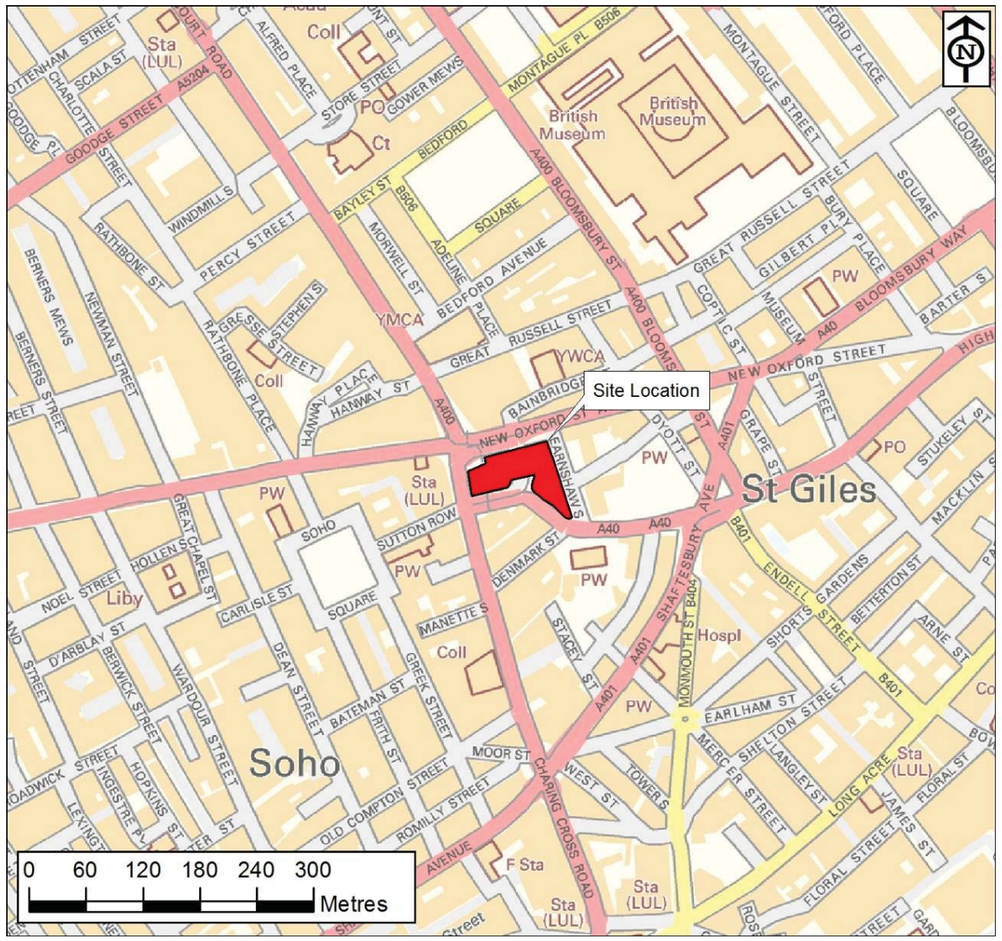
The site is located within the administrative boundary of the London Borough of Camden (LBC). The site is approximately 0.74 hectares (ha) in size and is bounded to the west by Charing Cross Road, to the east by Earnshaw Street, to the south by St. Giles High Street and to the north by New Oxford Street. The site is centred at National Grid Reference (NGR) 529905, 181355.

The Grade II Listed Centre Point Tower is to be restored and refurbished with a change of use from office to residential. The restoration works include but are not necessarily limited to; restoration of the exterior façade, clean up and repair of the façade materials and replacement glazing to help improve the environmental performance of the building. The inside of Centre Point Tower is to be refurbished to account for the change in use from office to residential. In addition, there will be some alterations to the ground floor layout to facilitate integration of the building into the proposed new public realm (the subject of a separate application) around the base of Centre Point Tower, the Link Building and Centre Point House. A new structure will be erected on the site of the existing Intrepid Fox public house, to the south of Centre Point House.

The Centre Point Link building is to be refurbished and will undergo a change of use from office to retail with the retail offer linked to the retail use on the lower floors of Centre Point House (basement, ground and first floor).

The residential units within Centre Point House are to be refurbished as is the retail use on the lower floors. The existing office use within Centre Point House will no longer remain.

Figure 1: Site Location and Context



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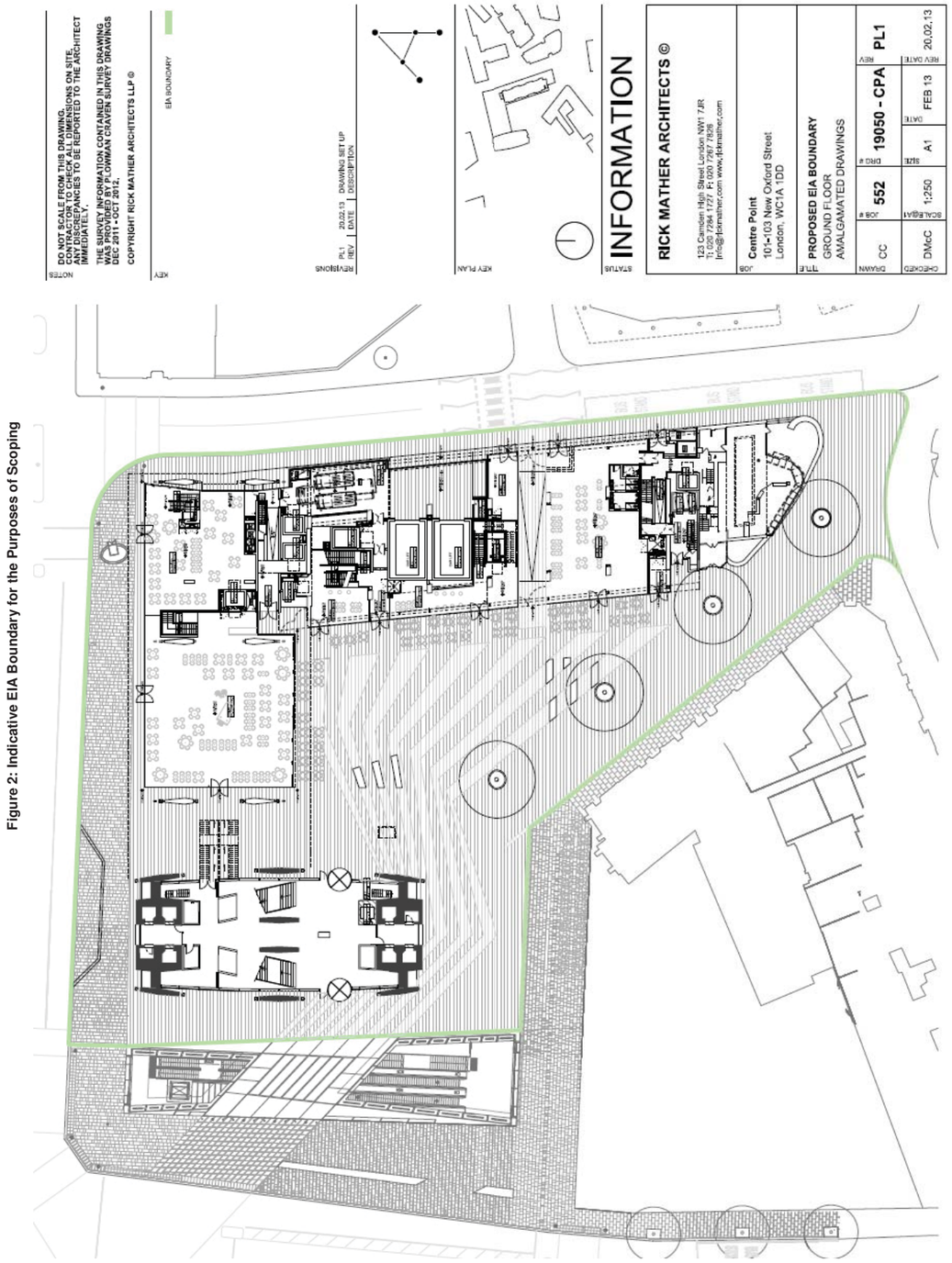


Figure 2: Indicative EIA Boundary for the Purposes of Scoping

1.2. The Need for an Environmental Impact Assessment (EIA)

The Grade II Listed Centre Point Tower, Centre Point House and Link building occupy the site. The proposed Centre Point restoration and refurbishment works have the potential for significant environmental effects (in relation to air quality, wind microclimate and noise and vibration) on the environment and therefore the Applicant recognises that the Proposed Development will constitute 'Environmental Impact Assessment (EIA) development' under the Town and Country Planning (EIA) (England and Wales) Regulations 2011 (the EIA Regulations). An Environmental Statement (ES) will therefore be submitted to accompany the planning application which will report the findings of the EIA.

Applications for development which are covered by the EIA Regulations are termed 'EIA applications'. The actual requirement for an EIA is either mandatory or conditional depending on the classification of the development project and likelihood of significant environmental effects.

EIA applications are divided into 'Schedule 1 Applications' (major developments) and 'Schedule 2 Applications' (other developments) under the Regulations, which govern all planning applications.

Schedule 1 developments require a mandatory EIA and include developments which by their nature could result in significant environmental effects (such as major chemical plants, nuclear power stations and motorways). For other developments, which fall under Schedule 2, the need for an EIA is determined on the basis of set criteria as follows:

The development falls within one of the classes of development stated in Schedule 2; AND

1. EITHER it exceeds the size threshold for that class of development in Schedule 2;
2. AND/OR it is in a sensitive area; AND
3. It is likely to have significant effects on the environment.

The Proposed Development falls within the description in Column 1, Paragraph 10(b) of Schedule 2, namely:

"(b) Urban development projects, including the construction of shopping centres and car parks, sports stadiums, leisure centres and multiplex cinemas."

The development area exceeds the threshold of 0.5 ha as defined in Schedule 2, and is thus considered Schedule 2 development. An EIA is to be carried out based upon the potential to result in significant effects on the environment. URS Infrastructure & Environment UK Ltd (URS) has been commissioned by the Applicant to undertake the EIA and prepare the ES in line with the EIA Regulations and relevant EIA guidance.

1.3. The Purpose of Scoping in the EIA Process

Scoping forms one of the first stages of the EIA process. It refers to the activity of identifying those environmental aspects that may be significantly affected by the Proposed Development. In doing so, the potential significance of impacts associated with each environmental aspect becomes more clearly defined resulting in the identification of a number of issues to be addressed in the EIA.

This Scoping Report describes the technical studies to be undertaken in order to provide a comprehensive assessment of likely significant effects arising and to determine suitable mitigation measures for the refurbishment, extension and alteration stages of work and once the Centre Point development is completed and occupied. The purpose is to provide the LBC with an early opportunity to comment on the scope of work proposed for the EIA and the content of the ES.

This Scoping Report constitutes a formal request for a scoping opinion in accordance with Schedule 13 of the EIA Regulations. This Scoping Report requests the formal scoping opinion of the LBC in consultation with statutory consultees under Regulation 13 of the EIA Regulations. A copy of the Scoping Report will be appended to the ES along with a copy of the Scoping Opinion received from the LBC.

Once the initial scope of the EIA has been established, the next step of the process is to gather further baseline environmental and socio-economic information against which the likely significant environmental effects of the Proposed Development (also referred to in this report as "impacts") can be assessed. An explanation of the 'baseline' of which the Proposed Development will be assessed against is provided in section 5.1 of this EIA Scoping Report. The EIA scenarios are summarised in section 5.3 of this EIA Scoping Report.

The methodology for the assessment of effects varies depending on the effect in question, and the outcome of the assessment is compared against a pre-agreed set of significance criteria in order to quantify the degree of beneficial or adverse effect.

Where adverse effects are predicted, the EIA process provides the opportunity to identify measures to mitigate or compensate these to an acceptable level, often through consultation with stakeholders. The effects that remain at the end of the process are termed 'residual effects'.

The EIA process and findings will be documented in the ES, which will include a description of the mitigation and compensatory measures proposed.

1.4. Structure of the Scoping Report

The remainder of this Scoping Report is structured as follows:

- **Section 2** describes the existing site and surrounding area;
- **Section 3** provides a description of the Proposed Development and sensitive receptors;
- **Section 4** defines the consultees that will be involved during the EIA process;
- **Section 5** provides a description of the environmental and socio-economic issues that are to be addressed by the EIA;
- **Section 6** describes the environmental issues that are considered not to be significant and have therefore been scoped out of the EIA; and
- **Section 7** details the proposed structure of the ES.

2. THE SITE AND THE SURROUNDING AREA

The site is approximately 0.74 ha in size and is located within the LBC. The site is bounded to the west by Charing Cross Road, to the east by Earnshaw Street, to the south by St. Giles High Street and to the north by New Oxford Street. The existing Centre Point development was designed by architect Richard Seifert and built from 1963-1966 to comprise a mixed use development complex. The Centre Point development includes the 36 storey including 1 mezzanine level (141.06m Above Ground Level (AGL)) Centre Point Tower, 10 storey including 2 mezzanine levels (56.41m AOD) Centre Point House and 4 storey including 1 mezzanine level (41.13m AOD) Centre Point Link.

An existing area breakdown by use GEA (Gross External Area) is described as follows:

- Office space: 28,263.3 m^2;
- Retail space: 7,553 m^2; and
- Residential space: 4,231.4 m^2.

Centre Point Tower features offices from the ground to the 30th floor, a private club and restaurant are at the 31st, 32nd and 33rd (part) floors and plant is located on the 33rd (part) and the 34th floor. Centre Point Link consists of conference facilities and offices for the Confederation of British Industry (CBI) and Centre Point House features offices, 36 residential units and retail uses at the lower floors (basement, ground and mezzanine). Fountains were originally located at the foot of the tower; however these have been compulsorily purchased under the Crossrail Act and demolished as part of the Crossrail and Tottenham Court Road Station Upgrade (TCRSU) works.

The site is well served (i.e. Public Transport Accessibility Level (PTAL) rating of 6b) by London Underground Limited (LUL) public transport services and lies directly adjacent to Tottenham Court Road Underground Station entrance. There are several other LUL stations within a short walk from the site. Tottenham Court Road Station provides access to the Northern Line and the Central Line. To the west of the site is Oxford Circus Underground Station that provides access to the Bakerloo Line and Victoria Line. To the north-west is Goodge Street underground station that provides access to the Northern Line. To the east is Holborn Underground Station that connects to the Piccadilly Line and Central Line. Oxford Street and Charing Cross Road provide a number of bus stops with frequent bus services and Charing Cross Road is designated as a 'red route' by Transport for London (TfL).

Surrounding the site, the British Museum (Grade I listed building) lies 400m to the north-east, beyond which public space is provided at Soho Square Garden 100m to the west and Russell Square 650m away. The Royal Opera House (Grade I listed) lies 600m to the south-east and 750m to the south west is Piccadilly Circus. To the south are the National Portrait Gallery (Grade I listed), the National Gallery (Grade I listed) and Trafalgar Square at 800m, 850m and 900m respectively. The Centre Point development was designated Grade II listed in 1995.

The London Borough of Camden designates the site as being within:

- The Central London Area;
- The Denmark Street Conservation Area;
- A Central London Frontage;

- The Tottenham Court Road Growth Area; and
- The St Giles Circus Draft Site Allocation.

2.1 Crossrail and TCRSU Works

The Proposed Development is located adjacent to on-going TCRSU and Crossrail works which have estimated completion dates of mid-2017 and mid-2018 respectively. The combined worksite will cover both sides of Charing Cross Road to the south of the junction with Oxford Street; on the western side it covers the corner of Oxford Street/Charing Cross Road to Goslett Yard. To the eastern side, works cover the area between Charing Cross Road and Centre Point towards the south. Works additionally take place beneath Charing Cross Road and along the western end of New Oxford Street.

The LUL ticket hall will be replaced with a new ticket hall, and two new LUL/Crossrail ticket halls with associated entrances will be located to the west of Centre Point Tower. Additional banks of escalators will be provided that lead to the Northern Line and Crossrail platforms. With the permanent closure of Andrew Borde and part of St. Giles High Street, a new plaza will transform the public realm and pedestrian environment in the area.

3. DESCRIPTION OF THE PROPOSED DEVELOPMENT

The Grade II Listed Centre Point Tower is to be restored and refurbished with a change of use from office to residential. The restoration works include but are not necessarily limited to restoration of the exterior façade, including clean up and repair of the façade materials and replacement glazing to help improve the environmental performance of the building. The inside of Centre Point Tower is to be refurbished to account for the change in use from office to residential. In addition, there will be some alterations to the ground floor layout to facilitate integration of the building into the proposed new public realm around the base of Centre Point Tower, the Link Building and Centre Point House (the public realm enhancements will be the subject of a separate application).

The Centre Point Link building is to be refurbished and will undergo a change of use from office to retail with the retail offer linked to the retail use on the lower floors of Centre Point House (basement, ground and mezzanine levels).

The residential units within Centre Point House are to be refurbished as is the retail use on the lower floors. The existing office use within Centre Point House will no longer remain.

A new structure will replace the existing Intrepid Fox public house, at the southern end of Centre Point House. This will comprise of new residential units split over eight floors.

In addition to the restoration and refurbishment works, the Proposed Development forms part of (but remains distinct in planning application terms) a larger emerging regeneration of the area including new public realm in the area of St Giles Circus. The Gillespie's Urban Realm Design defines an integrated public realm that provides for an inclusive, high quality and legible environment. As part of a separate application, the northern end of St Giles High Street (north) will be converted to public realm and include provision of active retail unit in the newly created space.

3.1 Potential Environmental Sensitivities/Sensitive Receptors

When undertaking an EIA it is important to understand which receptors will be considered as part of the assessment. The following potential sensitive receptors have been identified:

- Users of the adjacent Tottenham Court Road Underground Station;
- New Crossrail Infrastructure and LUL public realm improvements;
- The Denmark Street Conservation Area;
- Nearby Leisure and Tourism facilities including existing retail uses / patrons;
- Listed buildings in the surrounding area including Centre Point itself (Grade II), St Patrick's Church (Grade II), British Museum (Grade I), St. Giles in the Fields Church (Grade I) Royal Opera House (Grade I), Cabman's Shelter at Russell Square (Grade II), Covent Garden (Multiple Listed Buildings), Criterion Theatre (Grade II*) National Gallery (Grade I), National Portrait Gallery (Grade I);
- Occupiers of adjacent commercial, retail and private/residential property including Shaldon Mansions, residential units on Charing Cross Road, Tottenham Public House, 12a Soho Square, The Royal George Public House and 16 Soho Square;
- Nearby open public space including Bedford Square Gardens and St. Giles Churchyard and Playground; and
- Pedestrians, cyclists and road users.

4. CONSULTATION

The process of consultation is important to the development of a comprehensive and balanced EIA. Views of the interested parties serve to focus the environmental studies and to identify specific issues that require further investigation. Consultation is an ongoing process as part of design development.

For the consultation process it will be important to involve key consultees in the evolution of the design and preliminary assessment of environmental impacts. These will include, but not be limited to:

- London Borough of Camden (LBC);
- Environment Agency (EA);
- Transport for London (TfL);
- London Underground Limited (LUL);
- Crossrail;
- English Heritage (EH);
- 20th Century Society; and
- Local residents and other interested parties.

5. ENVIRONMENTAL TOPICS TO BE ADDRESSED WITHIN THE EIA

The EIA and associated technical studies will reflect current guidelines and relevant legislation and will be carried out in accordance with statutory guidance. For the EIA to be an effective decision-making tool, it needs to focus upon the areas where there are likely to be significant environmental effects.

The EIA will consider the impacts and effects associated with the following environmental topics:

- Air Quality;
- Archaeology (Buried Heritage Assets);
- Daylight/Sunlight & Overshadowing and Light Pollution;
- Ground Conditions / Contaminated Land;
- Noise & Vibration;
- Refurbishment, Demolition and Construction;
- Socio-economics;
- Traffic and Transportation;
- Townscape, Conservation and Visual;
- Water Resources, Drainage and Flood Risk; and
- Wind Microclimate;

The following sections of this report provide the detail on each of the above environmental topics, specifically, the proposed scope of each technical assessment and the assessment methodology.

In addition to the above, the following chapters will be provided as part of the ES:

- Introduction;
- EIA Methodology (see below for further details);
- Alternatives & Design Evolution;
- The Proposed Development;
- Cumulative Impact Assessment (see below for further details);
- Residual Impact Assessment; and
- Glossary & Abbreviations.

The ES will make reference to and, where appropriate, provide as a technical appendix to the ES, other relevant planning application documents.

5.1. EIA Methodology

The EIA will address the direct effects of the Proposed Development on the environment in addition to the indirect, cumulative, short, medium and long term, permanent, temporary, beneficial and adverse effects. The main mitigation measures envisaged in order to avoid, reduce or remedy significant adverse effects will be described.

BASELINE SCENARIO

In order to assess the potential impacts and associated environmental effects in relation to a proposed development, it is necessary to determine the environmental conditions that currently exist on a site and within the immediate environs of a site. These are known as 'baseline conditions'.

However, in the case of the Centre Point site, the adjacent Crossrail and TCRSU works are already underway, and therefore it is not possible to accurately determine current (2013) baseline conditions as these change from day to day.

The 2011 EIA Regulations recognise that this situation can occasionally occur and so require that a baseline be defined that: "*Recognises changes to conditions at the site and conditions 'projected forward' to take account of all 'committed development*."

Both the TCRSU and Crossrail works are underway. It is therefore reasonable to consider the TCRSU works as committed development along with the committed development of Crossrail under the Crossrail Act. It is thus considered that these completed works i.e. their end state, should comprise the baseline conditions for the assessment of impacts associated with Centre Point.

As such, by including the committed development of the Crossrail and the TCRSU works, the baseline position would be a baseline projected forward to 2018 at the point in time when Crossrail and LUL complete their works.

The Number One Oxford Street over-site developments (OSDs) (sites A, B, C and D) form part of the overall Crossrail project and so should also be considered as committed development under the Crossrail Act (be it not fully committed in planning terms as the planning applications for the OSDs currently remain undetermined). As such, the baseline for the Centre Point EIA will also take into account the Number One Oxford Street OSD at Sites A, B, C and D. Therefore, the baseline is projected forwards to 2018, the point in time when it is expected that the TCRSU works, Crossrail and Crossrail OSDs will be complete and operational.

In terms of public realm, traffic and bus routes/stands, the 2018 baseline assumes:

- The completion of public realm works around Centre Point Tower up to the western kerb line of St Giles High Street (north);
- St Giles High Street (north) would remain open for buses and service traffic;
- Denmark Street would be as existing;
- Two-way bus operations in Tottenham Court Road and two-way traffic in Gower Street would not have been implemented; and
- The closure of Sutton Place (proposed under the Crossrail OSD at Number One Oxford Street).

Schemes nearby which are currently under construction will also be factored into the baseline scenario. These schemes include:

- Sites at 74-90 Regent Street, 1-19 Quadrant Arcade, 19 & 27-29 Glasshouse Street;
- Regent Palace Hotel, 9 Glasshouse Street, 50-72 Regent Street; and
- British Museum, Great Russell Street.

As far as is reasonably practicable, the EIA will take account of this projected baseline for the purposes of the assessment of environmental impacts attributable to the Proposed Development. The Townscape, Conservation and Visual Impact Assessment will, however, provide an assessment of the impacts of the Proposed Centre Point Development against today's (2013) baseline as this provides for an assessment of the Proposed Development against a verified baseline image. It is not practicable to generate a verified 2018 project future baseline and so the former is considered to be a more robust approach to the assessment of townscape, conservation and visual impacts. The townscape conservation and visual impact assessment will take account of the committed development at Number One Oxford Street sites A and B OSD.

5.2 Cumulative Impact Assessment

The EIA will address cumulative impacts and effects. Cumulative effects can occur as either interactions between impacts associated with just one project or interactions between the impacts of a number of projects in an area. As a result, two types of cumulative impact interaction will be considered within the ES as follows:

1. The combined effect of individual impacts arising as a result of the Proposed Development, for example impacts in relation to noise, airborne dust or traffic impacting on a single receptor; and
2. The combined effects of the Proposed Development with several other development schemes which may on an individual basis be insignificant but together (i.e. cumulatively) have a significant effect.

In some EIA guidance documents, these two types of cumulative impact interactions are referred to as 'Type 1' and 'Type 2' cumulative impacts respectively.

Type 1 Cumulative Impacts

A review of the residual impacts presented within the ES will be undertaken, along with an exercise which tabulates the impacts against receptors or receptor groups in order to identify the potential for impact interactions and so combined cumulative effects. Only residual impacts classified as being of minor, moderate or major significance will be considered in relation to the potential for the combined effects of individual impacts. Insignificant Residual impacts will be excluded from the assessment of the combined effects of individual impacts as, by virtue of their definition, are considered to be imperceptible impacts to an environmental/socio-economic resource or receptor.

Where there is more than one impact on a particular receptor, the potential for impact interactions will be determined. If there is the potential for impact interactions then consideration will be given as to whether there is the potential for any resultant combined cumulative effects. Combined cumulative impacts will then be presented within the Cumulative Impact Assessment chapter of the ES.

Type 2 Cumulative Impacts

The review of the combined impacts of the Proposed Development with other cumulative schemes (or 'Type 2' cumulative impacts) will be presented within each of the technical chapters of the ES.

The EIA will consider other schemes located within 1 kilometre (km) from the Proposed Development site area. The 1km distance has been applied to ensure all schemes with the potential to interact in a cumulative manner within the vicinity of the Proposed Development site area are taken into account. The schemes to be considered as part of the cumulative assessment of Volume I of the ES will comprise consented schemes and those with a resolution to grant consent. In order to be considered as significant, the schemes identified either comprise of over 50 residential units or provide over 10,000 square metres (m^2) of floorspace.

A provisional list of the schemes to be considered within the cumulative impact assessment is provided below (Table 1) and presented within **Figure 3**.

Table 1: Schemes to be Considered in the Cumulative Impact Assessment

Scheme	Description of Scheme	Status
Noho Square (former Middlesex Hospital)	Partial demolition and redevelopment for ten storey buildings for mixed use purposes comprising 261 residential units (Class C3), office (Class B1), retail (Class A1), financial and professional services (Class A2), restaurant (Class A3) and community/health uses; creation of new public open space; new vehicular and pedestrian accesses; works to the public highway; basement car and cycle parking; associated works including landscaping, servicing areas and plant; retention and repair of existing chapel, No.10 Mortimer Street and Nassau Street facades.	Consented
Odeon West End site	Demolition of existing buildings and redevelopment of the site to provide two-screen cinema (Class D2), hotel (Class C1), residential dwellings (Class C3) (33 units), restaurant/cafe accommodation (Class A3), with associated access and servicing, and hard and soft landscaping.	Consented
The Consolidated Scheme	Redevelopment involving the erection of three buildings (5 and 7 storey buildings facing Centre Point Tower and a 4 storey building on Denmark Place).	Pending consideration

Further to the above list, there may be additional schemes outside of the 1km distance that shall be considered in connection with specific environmental topics e.g. the Townscape and Visual Impact Assessment. This assessment is wider reaching than the majority of the technical aspects covered within Volume I of the ES. Justification of the reasons behind including other schemes within the aforementioned studies will be provided.

5.3 Summary of EIA Scenarios

Based on the above, the EIA will assess the following four scenarios:

1. Restoration and refurbishment of Centre Point Tower, Centre Point House and Centre Point Link. Demolition of the Intrepid Fox building and construction of the new building:

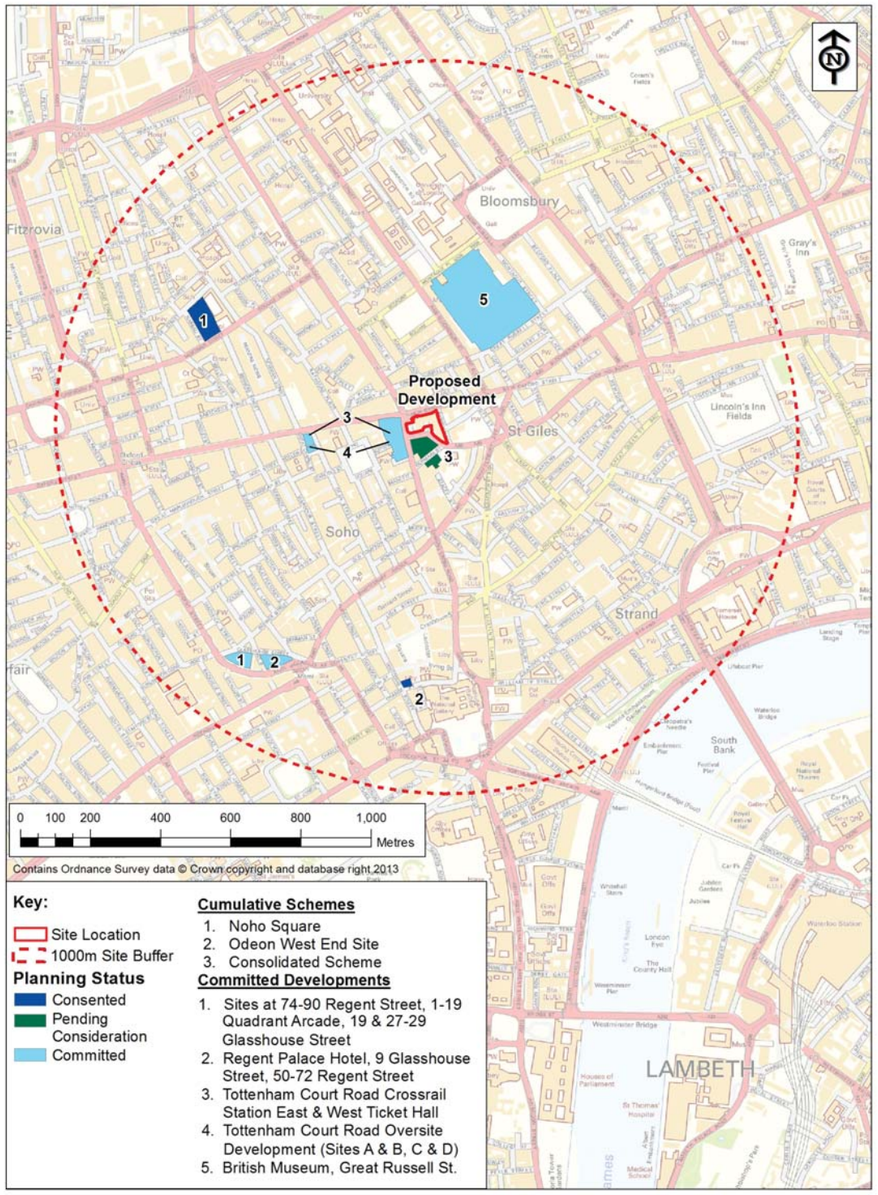
- Centre Point Tower - January 2014 to January 2016 (acknowledging overlap with Crossrail, TCRSU works and construction of the adjacent No. 1 Oxford Street Over-Site Development)
- Centre Point House - January 2014 to July 2016 (acknowledging overlap with Crossrail, TCRSU works and construction of the adjacent No. 1 Oxford Street Over-Site Development)
- Centre Point Link – dates to be confirmed (acknowledging overlap with Crossrail, TCRSU works and construction of the adjacent No. 1 Oxford Street Over-Site Development)
- Demolition of Intrepid Fox and construction of new building – dates to be confirmed, however this is anticipated to be completed within the same timescale as the Centre Point House works (January 2014 to July 2016) (acknowledging overlap with Crossrail, TCRSU works and construction of the adjacent No. 1 Oxford Street Over-Site Development)

2. Baseline 2018 (completed Crossrail, OSDs and TCRSU works)

3. Completed operational Centre Point development. Centre Point development completed and occupied 2018 (with Crossrail, TCRSU and OSDs complete).

4. Cumulative Impact Assessment. Cumulative impact assessment scenario (completed and operational Centre Point development plus Noho Square (former Middlesex Hospital), Odeon West End and the Consolidated Scheme.

Figure 3: Schemes to be considered within the Cumulative Impact Assessment and Committed / Consented Developments factored into the 2018 Projected Baseline



6. ALTERNATIVES AND DESIGN EVOLUTION

As a requirement of the 2011 EIA Regulations, there will be a consideration of the alternative development options that were considered by the applicant and the reason why the Proposed Development was decided upon. Of relevance to the Centre Point site, the following alternatives will be considered within the ES.

- 'Do nothing scenario' – the consequences of no site preparation, refurbishment, demolition and construction taking place; and
- 'Alternative designs' – the ES will summarise the evolution of the current design proposal, the modifications which have taken place to date and any environmental considerations which have led to those modifications. A summary of the main alternatives considered, such as alternative uses, massing in relation to the proposed extensions and materials will be presented together with a justification for the final design.

Further to the description of alternatives, this chapter of the ES will set out the site opportunities and constraints, site and urban design analysis, townscape and massing options, design evolution and a summary of the final scheme.

6.1 Proposed Development

This chapter will describe the Proposed Development and provide information on the following:

- Schedule of areas for residential, retail, storage and plant areas by Gross External Area (GEA), Gross Internal Area (GIA) and Net Internal Area (NIA) for Centre Point Tower, Centre Point Link and Centre Point House;
- Form, Height and Massing of the Proposed Development principally in relation to the additional construction associated with the new structure on the site of the Intrepid Fox public house;
- Arrangement of accommodation at each level for Centre Point Tower, Centre Point House and Link buildings;
- Below ground and public realm works;
- External materials and external lighting;
- External lighting;
- Access and parking;
- Utilities and drainage;
- Energy and sustainability; and
- Servicing and waste collection.

6.2 Refurbishment, Demolition & Construction

The ES will include a refurbishment, demolition and construction chapter that will provide a programme of activities on site and details for the methods, resources and logistics for site preparation, refurbishment, demolition and construction.

Information will be provided in relation to (but not limited to) the following; use of tower cranes during refurbishment of Centre Point Tower, materials and resource use, plant and equipment, hours of work, site logistics, outline refurbishment and construction method statement, public relations and management of trade contractors. An outline Environmental Management Plan (EMP) will be set out that describes the measures that the applicant will take (both on site and off site) in order to minimise and manage potential environmental impacts from the site preparation, refurbishment, demolition and construction works in addition to the interface with the Crossrail and LUL works and other construction projects in the area and will cover (but not be limited to) the following:

a) The control of dust, noise and vibration on-site and off-site;

b) Traffic management, highways safety and highways congestion, including mitigation measures where necessary;

c) The control of gaseous and particulate matter emissions;

d) Protection of listed buildings;

e) Stability of on-site and adjacent properties;

f) Protection of any off-site features that may be damaged due to works;

g) Site waste management; and

h) Management of the amenity to surrounding residential and other sensitive uses.

The outline EMP will take into account LBC's *'Guide for Contractors Working in Camden'* (2008), Camden's Planning Guidance CPG 6 '*Amenity*' and the London Councils' guidance on *'The Control of Dust and Emissions from Construction and Demolition'* (2006).

7. SOCIO-ECONOMICS

The ES will provide a socio-economic impact assessment. The assessment will consider the socio-economic impacts during the site preparation, refurbishment, demolition, construction and operational phases of the Proposed Development.

The socio-economic assessment will review the relevant policy at the local (LBC), regional (Mayor of London, GLA, and London Development Agency) and national (in terms of urban regeneration and neighbourhood renewal) levels to identify the key issues of relevance to the Proposed Development. Wherever possible, the impacts of the socio-economic impact assessment will be appraised against relevant national standards such as those provided by HM Treasury and English Partnerships. Where relevant standards do not exist, professional experience and expert judgement will be applied and justified.

The socio-economics ES chapter will include a baseline assessment at the borough level that will provide a description of the existing socio-economic conditions including;

population and labour force, skills and unemployment, housing, industry and economy for the existing 2013 baseline and projected baseline post Crossrail and LUL. The baseline assessment will also provide a review of the community and social facilities including; primary healthcare facilities, schools, open space and child play space.

The baseline assessment will be carried out using a range of established statistical sources including the 2001 Census, Office of National Statistics Labour Force and Neighbourhood Statistics, population forecasts from the GLA, capacity data from sources such as the Annual School Census and the National Health Service where available and information from the Applicant and the LBC.

Once the baseline conditions are established, a full socio-economics impact assessment will be undertaken and will involve:

1. Assessment of the likely scale, permanence and significance of impacts associated with:

   a) Direct, indirect, induced output and employment of the site preparation, demolition, construction and refurbishment phases of the Proposed Development;

   b) Direct, indirect, induced output and employment once the scheme is operational; and

   c) Broader social and community impact of the scheme (e.g. impacts on local social infrastructure provision).

2. Cumulative socio-economic impact assessment.

The assessment will incorporate the benefits that will arise from the upgraded Tottenham Court Road Underground Station, Crossrail and public realm improvements. In addition, the assessment will identify the impacts and benefits of the change of use from employment to residential space and the provision of retail in the context of a high level local area analysis.

8. TRAFFIC AND TRANSPORTATION

A Transport Assessment (TA) will be undertaken in line with local, regional and national planning policy. The TA will be submitted as a stand-alone document, though the ES will provide a summary traffic and transportation chapter which presents the key issues, the conclusions of the TA and the likely significance of identified impacts.

In order to establish the exact scope of works and the parameters for assessment, discussions have been held with officers from the LBC and with TfL to agree the detailed methodology and approach to the TA and impact assessment.

The assessment work to be undertaken will comprise:

a) Establishment of transport data for public transport facilities, pedestrian and cycle network facilities, traffic flows, pedestrian flows and accident records;

b) Changes to local traffic flows during site preparation, refurbishment, demolition, construction and operation phases including any pedestrian and traffic management measures that may be required;

c) A walking and cycling assessment to determine the facilities and capacities available to pedestrians and cyclists, including cycle demand, parking requirements and associated enhancements if appropriate;

d) Junction and highway network assessments accompanied by the appraisal of future passenger demand on Crossrail / London Underground / Buses;

e) An outline Delivery and Servicing Plan (DSP to provide the servicing strategy (including waste management) for the site including initiatives to better manage all types of freight vehicle movement and promote sustainable freight travel;

f) Parking provision including, car, cycle, motorbike and disabled parking spaces;

g) A Contractors Logistics Plan (CCP);

h) Traffic impact associated with the scheme considered in the cumulative impact assessment; and

i) Consideration of mitigation measures where appropriate to reduce adverse effects of changes in trip generation and distribution.

The TA and traffic and transportation chapter will be produced in accordance with Camden's Planning Guidance document CPG7 and take into account statutory guidance as provided by the National Planning Policy Framework (NPPF) and Transport for London's (TfL) Transport Assessment Best Practice Guidance Document (2010), as well as guidance published by the Institution of Highways and Transportation, the former Department of the Environment, Transport and the Regions, and the former London Planning Advisory Committee.

9. WIND MICROCLIMATE

The ES will include a wind microclimate impact assessment in line with local, regional and national planning policy.

The assessment will show how the Proposed Development is expected to affect the local wind environment and will be assessed in terms of the Lawson Comfort Criteria in both summer and winter conditions. In addition, the assessment will describe how the Proposed Development addresses the local wind environment and include reference to specific features of the site or the development that make a contribution to the wind environment including the requirement for any mitigation. The areas that the assessment will cover include:

a) Public and private open spaces on and adjacent to the site;

b) Entrance and exit areas;

c) Bus stands / bus stops;

d) Outdoor dining areas;

e) Thoroughfares; and

f) Pedestrian crossing points

The Proposed Development will introduce new uses and people into the area and hence the ES will quantify the potential changes to the local wind environment (both

on-site and within the surrounding area) in terms of pedestrian amenity and public open space.

Using an adapted version of the existing (1:300) scale model of the Proposed Development, wind tunnel testing will be undertaken for the following scenarios:

a) Baseline 2018 (completed Crossrail, OSDs and TCRSU works).

b) Completed operational Centre Point development

c) Cumulative impact assessment scenario (completed and operational Centre Point development plus Noho Square (former Middlesex Hospital), Odeon West End and the Consolidated Scheme.

The wind tunnel models will be manufactured and tested in a boundary layer wind tunnel test facility. Mean and peak wind speeds will be measured around the base of the buildings forming the Proposed Development and other surrounding buildings in addition to the locations noted above for all wind directions. These results will be combined with long-term meteorological statistics for the area. The results of this analysis will then be compared with the well established Lawson Comfort Criteria to determine the suitability of the different areas for sitting, standing, entering a building, leisure walking, business walking or crossing the road. Where poor wind conditions already exist, mitigation measures will be incorporated where possible to improve wind conditions.

The wind tunnel tests will demonstrate the resultant changes in levels of windiness associated with the Proposed Development but also the suitability of the wind microclimate for the intended pedestrian use across the site and surrounds. The results of the assessments will be presented within the ES chapter.

10. DAYLIGHT, SUNLIGHT, OVERSHADOWING, LIGHT SPILLAGE AND SOLAR GLARE

An assessment of daylight, sunlight and overshadowing will be carried out focussing on the impacts to the existing residential units within the adjacent residential properties and any existing residential accommodation within Centre Point House as a result of the proposed redevelopment of The Intrepid Fox Public House. The assessment will include the potential overshadowing impact to any existing open spaces and review the potential for light pollution and solar glare.

The methodology for the assessment of daylight, sunlight and overshadowing is set out in the Building Research Establishment (BRE) handbook 'Site layout planning for daylight and sunlight 2011'. This handbook is a guide which provides advice on site layout planning to achieve good sunlighting and daylighting within buildings and in the open spaces between them. It is intended to be used in conjunction with the interior daylight recommendations in the British Standard BS8206 Part II and the Applications Manual Window Design of the Chartered Institute of Building Services Engineers (CIBSE).

The potential impact of the Proposed Development on daylight and sunlight in relation to adjacent residential buildings will be assessed against the existing baseline and include an assessment of the cumulative scenario.

Each neighbouring residential property will be assessed for the Vertical Sky Component (VSC) and No Sky Line (NSL) for daylight, and the Total and Winter

Annual Probable Sunlight Hours (APSH) for sunlight. From a daylight and sunlight perspective, it is essential to understand and take account of the distinctive characteristics of the Proposed Development's site area.

Solar glare is particularly important at pedestrian and vehicular junctions where the glare can cause temporary blinding of either vehicle operators or pedestrians at such junctions. An analysis of the potential for changes to the fenestration of Centre Point Tower (changes as a result of the required restoration of the façade and renewal of the glazing) and as a result of the proposed development of The Intrepid Fox Public House, to glare will be made from a selection of key viewpoints located at pedestrian and vehicular junctions.

11. AIR QUALITY

All of Camden is a designated Air Quality Management Area due to the high concentrations of nitrogen dioxide (NO_2) exceeding the national Air Quality Strategy objectives. As such, potential air quality impacts are a key issue for the site and surrounding area.

The technical study will comprise the following scope of works:

- Baseline, or existing, background air quality will be determined using local automatic monitoring stations, supplemented by the Defra Background Maps and Local Authority diffusion tubes where applicable (and available). For example the 'CA21 Bloomsbury St', 'CA11 Tottenham Court Road', and 'CA14-Russell Square Gardens' diffusion tubes are located less than 1km from the site. Given the good availability of existing secondary data, and the large level of uncertainty associated with undertaking additional diffusion tube monitoring (±20-25%) it is not proposed to conduct any further diffusion tube monitoring as part of this project, either as part of the baseline data collection or in order to validate the model findings.

- The ADMS-Roads model will be used to model baseline concentrations taking into account present-day road traffic flows, as well as to assess the impact to local air quality associated with any additional road traffic during the construction and operation of the proposed development. The study would be desk-based and comprise a number of traffic flow scenarios, including the present-day and a given future date both with and without the Proposed Development. The modelling will focus upon NO_2 and PM_{10}, the two main pollutants of concern from road traffic in LBC. The assessment will utilise the updated Emissions Factors Toolkit (version 5.1.3) incorporating COPERT4v8.1 emission factors for NO_X, which was updated in August 2012. The dispersion modelling shall be the carried out in accordance with the Institute of Air Quality Management (IAQM) 'Position on the Description of Air Quality Impacts and the Assessment of their Significance', EPUK publication 'Development Control: Planning for Air Quality (2010 Update)', the Air Quality and Planning Guidance, London Councils (2007) and Technical Guidance Note (TG09).

- Any heating plant over 200 kW capacity associated with the completed development (e.g. CHPs or boilers for heating and hot water provision) will be modelled using the ADMS-4 atmospheric dispersion model. Plant less than 200 kW will be considered insignificant.

- In light of recent debate about whether air quality in London is improving as forecast, it will be conservatively assumed that there will be no change in

background concentrations or vehicle emissions between the present-day and at least 2016. This is considered a worst-case approach, based on the recent advice given by Defra, which suggests that background concentrations and vehicle emissions have remained relatively stable since 2002-2004 and will continue to do so until about 2016 (when a new vehicle standard comes into effect).

- The potential impacts and nuisance from construction dust and site plant exhaust emissions generated during site preparation, refurbishment, demolition and construction works will be considered using relevant case studies, supported by screening runs to model emission factors where appropriate. Specific attention will be paid to LBC's *'Guide for Contractors Working in Camden'* (2008) and the London Councils' guidance on *'The Control of Dust and Emissions from Construction and Demolition'* (2006).

- Site specific mitigation measures shall be recommended to minimise potential impact to local air quality from the generation of dust and on site emissions during the construction phase.

The assessment of potential impacts and their significance will be based on the criteria outlined in the Environmental Protection UK '*Development Control: Planning for Air Quality 2010 Update*'. The criteria will be modified slightly to use the terms 'major', 'moderate', 'minor' and 'negligible'.

12. NOISE AND VIBRATION

The ES chapter will be based upon a report titled 'Residential Planning Noise Report' that provides a comprehensive assessment in line with the requirements of the NPPF. The report will be appended to the ES and cross referred as necessary. In addition, the ES chapter will include:

a) A planning policy review;

b) Assessment methodology and impact significance criteria;

c) Analysis of the baseline scenario;

d) Site preparation, refurbishment, demolition and construction noise impact assessment;

e) Vibration impact assessment;

f) Review of the potential for structure borne noise;

g) A review of structure borne noise caused by the Central Line;

h) Cumulative impact assessment; and

i) Residual impact assessment and conclusions.

Based on existing background noise levels at nearby sensitive receptors, suitable noise limits for building services plant associated with the Proposed Development will be recommended according to guidelines presented in BS4142. Relative changes in traffic noise along surrounding roads and potential impacts due to traffic associated with the Proposed Development will be assessed against the guidance provided using the calculation of road traffic noise (CRTN) method and that provided in the Design

Manual for Roads and Bridges (DMRB); mitigation measures will be advised where necessary, taking account of Policy DP28 'Noise and Vibration' of the Camden Development Policies.

13. WATER RESOURCES, DRAINAGE AND FLOOD RISK

Environment Agency (EA) flood maps indicate that the site is located within Flood Zone 1; an area at low risk of flooding. This zone comprises land assessed as having a less than 1 in 1000 annual probability of river flooding in any year (<0.1%). Furthermore, the site is located more than 1100m from the River Thames and is therefore considered to be at low risk of fluvial flooding.

The water resources, drainage and flood risk chapter of the ES will include a review of the relevant legislation and national, regional and local planning policy and the baseline conditions relating to hydrology, hydrogeology and groundwater, surface water resources, aquifers, abstractions, source protection zones, water quality and water services.

Following the policy and baseline review, an assessment of the impact of the Proposed Development during site preparation, demolition, construction, refurbishment and operational phases will be undertaken and recommendations made for mitigation measures to minimise the impact of the Proposed Development on water resources. The need for mitigation measures will be addressed and any residual impacts identified.

A Flood Risk Assessment and Drainage Strategy are being prepared for the site. This will include liaison with the EA over surface water run off requirements. The Water Resources, Drainage and Flood Risk chapter of the ES will be prepared based upon these studies, with a copy of the full reports appended to the ES.

The Flood Risk Assessment & Drainage Strategy will be undertaken in accordance with all current guidance and specifically in line with the technical guidance accompanying the NPPF to determine the potential for flooding. The FRA will include recommendations for flood risk mitigation. This will include a review of appropriate Sustainable Drainage Systems (SuDS), and identification of any off-site impacts and residual risks. The proposals will commit to meeting the requirements of the relevant authorities and the NPPF and will provide detail on how surface water runoff on site will be collected, managed and controlled prior to discharge, so as to minimise the potential risk of flooding.

14. GROUND CONDITIONS

The ES chapter will be prepared based upon a phase I desktop ground conditions report. The full report will be appended to the ES and cross referred as necessary.

The chapter will include:

a) Legislative and Planning Policy Context including reference to Core Strategy policy CS16 'Improving Camden's health and well-being', the NPPF, British Standards and the local guidance document '*Contaminated Land: A Guide to Help Developers Meet Planning Requirements*';

b) The impact assessment methodology, including details of consultation, criteria for assessing receptor sensitivity, impact magnitude and residual significance;

c) Description of baseline conditions – geological conditions, made ground, ground condition, groundwater conditions, contamination potential, underground structures, unexploded ordnance, asbestos;

d) Assessment of potential impacts (both during site refurbishment, extension and alteration works and once the Proposed Development is complete and occupied);

e) An outline remediation and/or mitigation strategy to address any unacceptable risks from contamination to future users, groundwater or the wider environment;

f) Assessment of residual ground conditions impacts during site refurbishment, extension and alteration works and once the Proposed Development is complete and occupied;

g) A cumulative impact assessment.

15. ARCHAEOLOGY (BURIED HERITAGE ASSETS)

The Proposed Development is located in an Archaeological Priority Area (London Suburbs). As such, an archaeological desk-based assessment will be undertaken to determine the character and significance of the buried heritage assets at the site, which will inform the potential for and significance of any impacts on buried heritage assets by the Proposed Development, in accordance with the NPPF. The assessment (forming a technical appendix) will inform the ES chapter, in which the significance of impacts and corresponding effects will be assessed and any mitigation recommendations will be made. The significance of residual impacts remaining will be assessed according to accepted criteria for assessing historic sites.

The following guidance documents will be taken into consideration;

a) NPPF (Section 12);

b) Institute for Archaeologists, Codes Standards and Guidance (2008);

c) English Heritage, Greater London Archaeology Advisory Service: Standards for Archaeological Work London Region (2009); and

d) English Heritage, Historic Environment Planning Practice Guide (2010);

16. TOWNSCAPE, CONSERVATION AND VISUAL IMPACT ASSESSMENT

Volume II of the ES will include a townscape, conservation and visual impact assessment of the Proposed Development. The assessment will be supported by verified images of the Proposed Development and will include consideration of a number of pre-selected views together with consideration of the townscape character in the area around the site and any locations of particular sensitivity, including those with heritage designations such as conservation areas, world heritage sites, listed buildings and their settings. This will be informed by consideration of the historical development of the site and surrounding areas.

The Proposed Development will be assessed in architectural and urban design terms in accordance with the following scenarios:

1) 2013 'Present Day Position';

2) Completed Proposed Development including committed OSDs at Sites A and B (One Oxford Street) dependent on availability of information; and

3) Cumulative scenario.

A series of locations have been considered for the assessment of views as set out in the 'Centre Point Candidate Viewpoint Study' prepared by Miller Hare in January 2012 (Appendix A). The study consists of a series of views presented as a pair of images showing a photograph of the existing condition alongside a study render of the cumulative condition. These comparative views are designed to test the visibility and appearance of the Proposed Development from a range of publicly accessible locations around the site. The selected views will be agreed with the LBC officers. Accurate rendered and wireline visual representations of the Proposed Development will be provided from the agreed viewpoints in order to assess the potential effects of the Proposed Development upon selected key views and townscape.

The methodology for the selection and assessment of views to be set out in the townscape and visual impact assessment will cover:

a) Rationale for the selection of views;

b) Explanation of the guidance and criteria used to assess the views; and

c) Means of verifying views.

The townscape and visual impact assessment will address:

a) The history of the site and surrounding area with particular emphasis on the evolving relationship of the site with its surroundings;

b) Review of nearby conservation areas and listed buildings and their settings;

c) Local, regional and national planning policy and design guidance in relation to design, townscape and historic environment matters;

d) A review of statutory and other significant views and constraints;

e) Long, medium and short-distance views; and

f) Implications of the above for the design concept, including design mitigation.

17. NON-SIGNIFICANT ENVIRONMENTAL TOPICS

The aim of the Scoping Phase is to focus the EIA on those environmental aspects that may be significantly impacted by the development proposals. In so doing, the significance of impacts associated with each environmental aspect becomes more clearly defined, resulting in certain effects being considered 'non-significant'. It is the intention to scope the following out of the ES:

17.1 Ecology

An Ecological Assessment (see Appendix B) has been prepared by an independent ecologist and reviewed by URS. The site was found to be dominated by buildings and hard standing; the only vegetation recorded comprises ornamental plants and weeds on the roofs of the buildings and a mature small-leaved lime tree at the southern end of the site. The report concludes that the buildings and single small-leaved lime tree have

potential to support nesting birds. The site was not found to provide suitable habitat for any other protected species.

Based on the information presented in the Ecological Assessment, it is proposed that Ecology be scoped out of the EIA. There is not considered to be the potential for the Proposed Development to result in significant ecological impacts.

17.2 Electronic Interference

The introduction of new structures of significant height and bulk into an environment can cause disruption to the reception of electromagnetic waves for TV and radio reception. However, as the Proposed Development is largely a refurbishment project and there are no significant proposed massing alterations to the tallest element of the Centre Point development, the potential impact of the Proposed Development on TV and radio reception is considered low. Further to this, analogue signals will cease to be transmitted throughout 2012 and will be replaced by digital signals. As such it is proposed that electronic interference is scoped out of the EIA.

17.3 Aviation

The Proposed Development will not alter the position with regards to the Civil Aviation Authority (CAA), London City and Heathrow safeguarded operations. This is because the Proposed Development is largely a refurbishment project and there are no significant proposed massing alterations to the tallest element of the Centre Point development. Of relevance however will be the possible use of tower cranes throughout refurbishment of Centre Point Tower. This will be considered within the ES, however it is proposed that a full aviation impact assessment is scoped out of the EIA.

18. SUMMARY OF KEY ISSUES

Table 2 below provides a summary of potential environmental and socio-economic issues.

Table 2: Summary of Key Issues

Environmental Issue	
Site Preparation Refurbishment, Demolition and Construction	Dust, noise and vibration on site and off site. Ground contamination. Buried heritage assets. Employment. Increased vehicle movements. Road closures. Exhaust emissions. Water consumption. Drainage. Generation of wastes. Energy use. Restrictions on pedestrian access to walkways to walkways and footpaths. Traffic management highways safety and highways congestion. Protection of listed buildings. Stability of on-site and adjacent properties / ground movements. Amenity of surrounding residential and other sensitive uses.
Socio-Economics	Generation of direct employment during preparation, demolition, construction, refurbishment and operational phases including the associated demand for

Environmental Issue	
	goods and services. Impacts in terms of additional local spending and the provision of new housing and retail space. Impacts arising from increased demand for social infrastructure as a result of the increase in population including education, health, open space and children's play space.
Traffic and Transportation	Potential changes to local traffic flow patterns during construction. Changes to number and routing of vehicle movements. Restrictions to pedestrian access to walkways and footpaths during construction. Potential disruption to cyclists and road vehicle users during the preparation, demolition, construction and refurbishment works. Building servicing / waste collection arrangements. Impacts on the operation of the public transport network Impacts of potential relocation of bus stops and stands..
Wind Microclimate	Changes to the speed and direction of wind including downdrafts potentially created by Centre Point Tower affecting the local wind environment and pedestrian comfort and safety. Wind impact upon public and private open spaces on and adjacent to the site, entrance and exit areas, shop windows, bus stops, outdoor dining areas, thoroughfares and pedestrian crossing points. Wind impact to adjacent building entrances / associated outdoor uses.
Daylight, Sunlight, Overshadowing and Light Spillage	Potential reduction in daylight and sunlight levels to neighbouring residential properties. Potential overshadowing of public amenity areas. Potential light pollution impacts. Potential solar glare impacts.
Air Quality	Generation of dust arising from site preparation, demolition, construction and refurbishment activities. Introduction of sensitive receptors to potentially elevated concentrations of air pollutants. Exhaust emissions. Potential impacts to air quality from operational activities and servicing. Impact of the relocation and/or creation of bus stands on local air quality.
Noise and Vibration	Noise and vibration from site preparation, demolition, construction and refurbishment activities. Potential noise disturbance from operational activities and servicing including heating and ventilation plant. Potential vibration impacts to adjacent buildings during site preparation, alteration and extension works. Potential structure borne noise caused by the Central Line.
Water Resources, Drainage and Flood Risk	Potential impact to ground and surface water, arising from site preparation, refurbishment, demolition and construction activities. Impact to Thames Water Utilities Limited's water supply and drainage infrastructure. Potential risk of on-site and off-site flooding. Surface run-off.
Ground Conditions	Potential impacts to health should any contamination be encountered. Potential pathway to ground and surface water should contamination be encountered.
Archaeology (Buried	Potential impact of site preparation, refurbishment, demolition and construction

Environmental Issue	
Heritage Assets)	upon heritage assets.
Townscape, Conservation and Visual	Appearance/visual impact of construction works on surrounding area and from adjacent sensitive receptors Changes to townscape and site setting including setting of Listed Buildings and Conservation Areas (including Grade II Listed Centre Point). Long term changes to local and long views. Potential improvements to the public realm/public open space.

19. PROPOSED STRUCTURE OF THE ENVIRONMENTAL STATEMENT

The ES will comprise the following set of documents.

Non-Technical Summary (NTS): this document will provide a summary of the key issues and findings of the EIA. The NTS will be presented in non-technical language to assist the reader to understand the site context, the Proposed Development, the design alternatives, the environmental issues arising and proposed mitigation measures.

Volume I: Environmental Statement. This will contain the full text of the EIA with the proposed chapter headings as follows:

a) Introduction

b) EIA Methodology

c) Alternatives and Design Evolution

d) The Proposed Development

e) Refurbishment, Demolition & Construction

f) Socio-Economics

g) Traffic and Transportation

h) Wind Microclimate

i) Daylight, Sunlight, Overshadowing, Solar Glare and Light Pollution

j) Air Quality

k) Noise and Vibration

l) Water Resources, Drainage and Flood Risk

m) Archaeology (Buried Heritage Assets)

n) Ground Conditions

o) Cumulative Impact Assessment

p) Residual Impact Assessment

ES Volume II: Townscape, Conservation and Visual Impact Assessment: The ES will include a stand-alone Townscape, Conservation and Visual Assessment accompanied by a full set of views and verified images.

ES Volume III: Technical Appendices: This will provide supplementary details of the environmental studies conducted during the EIA including relevant data tables, figures and photographs.

Appendix A: Viewpoint Study, January 2012. View Map

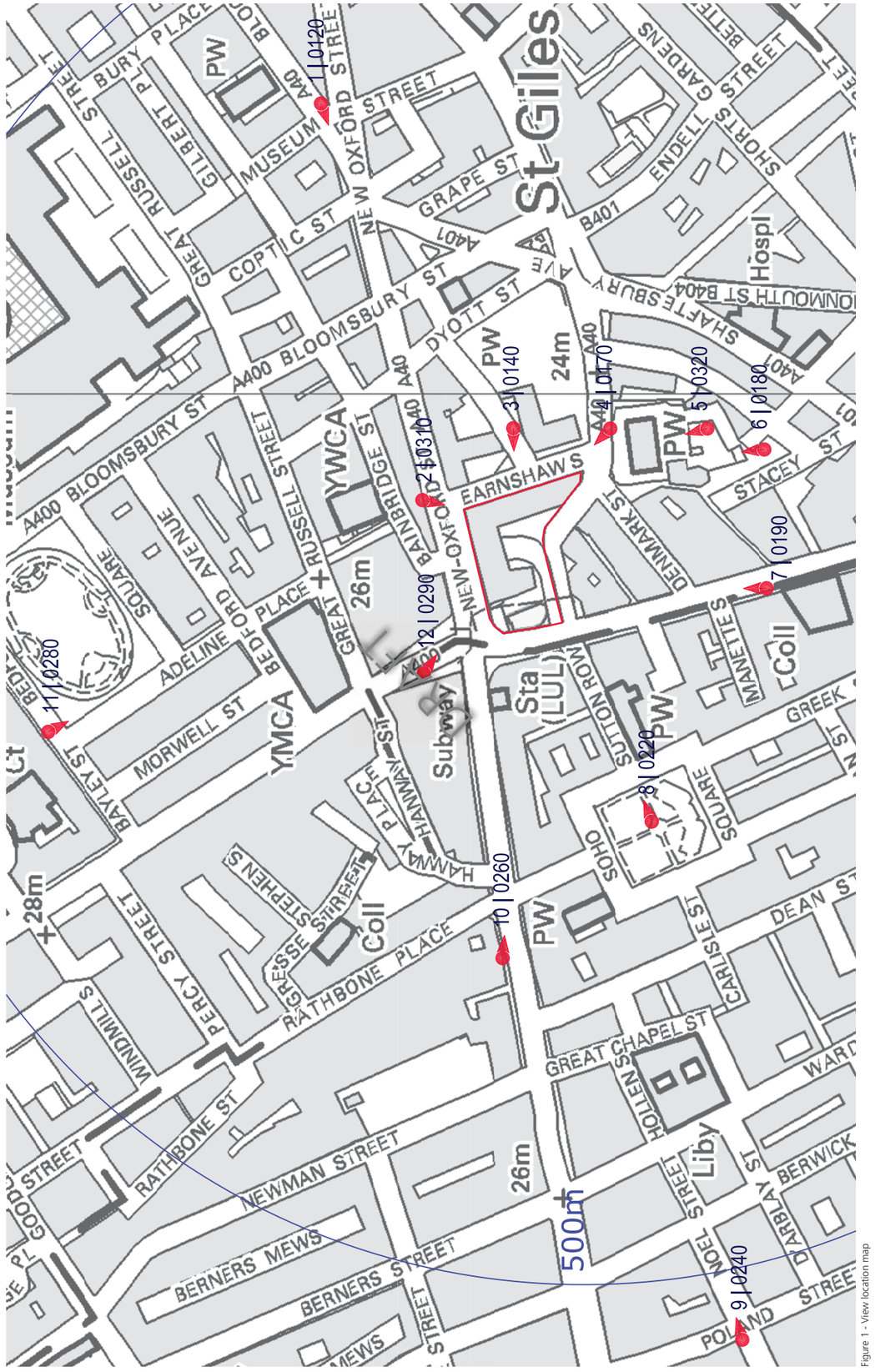


Figure 1 - View location map

Appendix B: Centre Point Ecological Assessment, February 2012

Almacantar Ltd.

Centre Point

Ecological Assessment

February 2012

Prepared for:

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Report Status:	Draft	
Reference:	R933/106610_V1/2012	
	Name	Date
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Checked and Approved By:	Steve Morgan Director of Environment	10.02.2012

EXECUTIVE SUMMARY

Grontmij has been appointed by Almacantar Ltd to carry out an ecological assessment of the Centre Point scheme for a proposed mixed development including residential and retail units and the creation of a public space. The ecological asessment consisted of a desk review of available data and an extended Phase 1 habitat survey to assess the site and surrounding habitats and the production of an ecological report. The scope also included production of a BREEAM Code for Sustainable Homes ecological assessment report.

No statutory conservation sites were identified, within 2km of the scheme, however we are still waiting to confirm the data on any non-statutory conservation sites in the area.

The habitats on site were deemed to be of low ecological value, currently consisting of occupied office buildings, cafes, restaurants, pubs as well as hardstanding areas. No invasive plant species are present on site. Using the BREEAM Code for Sustainable Homes criteria the site is also assessed as being of low ecological value. The total number of credits cannot yet be calculated but based on the value of the site at present, assuming that key ecological recommendations and 30% of additional recommendations are followed, and if the design results in a minor negative change or improves the present species per hectare the scheme can achieve between 4 to 7 credits.

Best practice methods should be undertaken to avoid impacts to nesting birds. There is no suitable habitat on site for any other protected species.

1 INTRODUCTION

1.1 Scope of ecology work

Grontmij Limited (Grontmij) has been appointed by Almacantar Ltd to carry out an ecological assessment of the Centre Point project in London, hereafter referred to as 'the scheme'.

The purpose of the survey was to determine whether there were any protected species, or habitats and species of conservation value in the vicinity of the scheme which may be adversely affected by the proposed works. The survey report also identifies any constraints imposed by these in relation to environmental legislation and makes appropriate recommendations to reduce impacts.

The scope of work included a desk based review of all pertinent information, an extended Phase 1 habitat survey and the production of an ecological report. The scope also included production of a BREEAM Code for Sustainable Homes ecological assessment report.

1.2 Project description

The scheme is a mixed development including provision or residential and retail units as well as the creation of a public space.

2 METHODS

Information from the following sources was reviewed as part of the desk study:

- Information on the Multi-Agency Geographical Information for the Countryside (MAGIC) website;
- Information on the National Biodiversity Network (NBN) website in relation to protected species;
- Biological information supplied by Greenspace Information for Greater London (GIGL);
- 1: 25,000 Ordnance Survey map.

The extended Phase 1 habitat survey included the following:

- Identification of all main habitats within the study area.
- Identification of any invasive plant species (e.g. Japanese knotweed, giant hogweed and Himalayan balsam).
- Assessment of the value of habitats that will have to be removed / destroyed by the scheme.
- As recommended by Joint Nature Conservation Committee (JNCC)[1] and Institute for Ecology and Environmental Management (IEEM)[2] guidelines the survey identifies the potential for protected species including:
    - Great crested newt ponds and terrestrial habitat.
    - Badger setts.
    - Potential bat roosts and foraging habitat.
    - Nesting habitats for birds.
    - Otters and otter habitat.
    - Reptile habitat including potential hibernaculae.
    - Water vole habitat.
    - Potential habitat for native white-clawed crayfish in water courses.

The extended Phase 1 habitat survey of the scheme was undertaken on the 3rd February 2012 by Robert Randall (MIEEM). The survey was undertaken in sunny conditions and an air temperature around 6°C.

3 CONSTRAINTS

The level of access gained and results gathered allow accurate assessments of the scheme's ecological value and presence of protected and notable species to be made.

[1] JNCC (2010). Handbook for Phase 1 Habitat Survey.
[2] IEEM (2012). Guidelines for Ecological Impact Assessment in the United Kingdom, online (http://www.ieem.net/ecia).

4 DESK REVIEW

4.1 Conservation sites

The MAGIC website was used to check for the presence of statutory and some non-statutory conservation sites within a 2km radius of the scheme. Additional data on non-statutory conservation sites was provided by GIGL.

No statutory conservation sites were identified, within 2km of the scheme, however we are still waiting to confirm the data on any non-statutory conservation sites in the area from GIGL.

4.2 Species records

Protected species data supplied by GIGL (within a 2km radius of the scheme) and the NBN gateway website (10km squares TR28 and TR38) demonstrate that various species have been found in the desk study search area. This information is summarised in Table 1.

Table 1: Summary of protected species records within 10km of the scheme

Species	Location	Source
Great crested newt	The closest record is from Hornsey 7km north of the scheme. The most recent record is from 1985.	NBN
Badger	No records within 10km of the scheme.	NBN
Bats	Six species of bat have been recorded: Daubenton's, Natterer's, noctule, Leisler's, soprano pipistrelle and brown long-eared. The closest and most recent record of brown long-eared bat from Hampstead approximately 5km north of the scheme in 2011.	NBN
Hazel dormouse	No records within 10km of the scheme.	NBN
Reptiles	Three species of reptile have been recorded: grass snake, slow worm and common lizard. The closest reptile record is of a grass snake 500m from the scheme and the most recent record is of common lizard in 2007.	NBN

5 SITE SURVEY

A Phase 1 habitat map of the scheme is provided as ***Figure 1*** with associated Target Notes detailed in ***Appendix A***. Photographs are shown in ***Appendix B***.

5.1 Habitat description and impact assessment

The scheme is dominated by buildings and hard surfaces (***Photograph 1***), with mixed usage including residential, offices, cafes, restaurants and a public house. There is a road that runs through the site but the two buildings are connected by an elevated walkway (***Photograph 2***, Target Note 1).

There are a few planted cabbage palm plants on the roof of the public house (***Photograph* 3**, Target Note 3) numerous weeds of broken have colonised the area on the roof of the public house including herb robert. Seven potted box bushes are present above the entrance to one of the offices (***Photograph 4***, Target Note 2).

A mature small-leaved lime tree is located on the southern end of the site near the public house (***Photograph* 5**, Target Note 4). The box, herb robert and small-leaved lime are native species but the cabbage palm is not native. No hedgerows are present on or adjacent to the site, and no aquatic habitats are present.

The habitats listed above are assessed[3] as being of low ecological value, based on frequency of this habitat in the local landscape, species diversity and structure. Using the BREEAM Code for Sustainable Homes criteria the site is also assessed as being of low ecological value.

5.2 Invasive plant species

No invasive plant species are present on site.

[3] IEEM (2012). Guidelines for Ecological Impact Assessment in the United Kingdom, online (http://www.ieem.net/ecia).

6 PROTECTED SPECIES OF WILDLIFE

Although several species are afforded protection under the Wildlife and Countryside Act (as amended) (1981) only those considered as relevant to the scheme are included. As there are no aquatic habitats within or adjacent to the site, no impacts to species such as otter, water vole or white-clawed crayfish will occur. As there are no hedgerows or woodland habitat on or adjacent to the site no impacts to hazel dormouse will occur. A brief summary of the legislation surrounding each species or group is provided in ***Appendix C***.

6.1 Great crested newt

There are no ponds marked on the engineering drawings or 1: 25,000 Ordnance Survey map within 500m of the scheme. No further survey is recommended.

6.2 Reptiles

There is no suitable habitat on site for reptiles. No further survey is recommended.

6.3 Birds

Habitat on site with potential to support nesting birds is limited to ledges and roof space and the small-leaved lime tree.

During the survey, one species of bird was seen and heard, this was feral pigeon. This species is not of conservation concern based on population assessments by leading governmental and non-governmental conservation organisations[4].

If demolition of buildings is likely to proceed in the breeding season (generally taken as March to August inclusive) then the roof space and window ledges should be checked in advance by an experienced ecologist.

If the small-leaved lime tree needs to be removed as part of the scheme it is recommended that this is done outside of the breeding season. If this cannot be achieved the tree should be checked in advance by an experienced ecologist and then, assuming no nests are present the tree can be cleared. If active nests are found, clearance work will have to be delayed until the young have fledged.

6.4 Badger

There is no suitable habitat on site for badgers. No further survey is recommended.

6.5 Bats

The buildings and the small-leaved lime tree on site were assessed for their bat roost potential and none of them have suitable features for supporting a roost. The habitat on site is also of low value to bats for foraging. No further surveys are recommended.

[4] Eaton MA, Brown AF, Noble DG, Musgrove AJ, Hearn R, Aebischer NJ, Gibbons DW, Evans A and Gregory RD (2009). Birds of Conservation Concern 3: the population status of birds in the United Kingdom, Channel Islands and the Isle of Man. *British Birds* 102, pp296-341.

7 RECOMMENDATIONS

The following recommendations are made to avoid infringing ecological legislation and encountering delays during construction:

- Impacts to nesting birds should be avoided by removal of the small-leaved lime tree (if required) outside the breeding season or checking the tree in advance of clearance to ensure no active nests are present. Works to roofs and window ledges suitable for nesting birds should be done outside of the breeding season (breeding season considered to be March to August inclusive).

- Where new tree planting is proposed, native specimens of local origin should be chosen where possible.

- To enhance opportunities for nesting birds and bats on site, dedicated nest boxes of various suitable designs as well as bat boxes, tiles and bricks should be positioned within new structures. Various products exist and liaison with an ecologist could rapidly lead to the production of a suitable box provision strategy, to determine box numbers, locations, integration with lighting scheme and appropriate target species.

- Consideration should be given to including green or brown roofs in the design. These features could increase botanical and habitat diversity across the site, and attract various invertebrates, improving overall site biodiversity.

This report is based on the study area plan provided; should the work not occur for 12 months or more then it is recommended that a repeat walkover survey is undertaken. This would be to ensure the baseline ecology and potential for protected species to occur has not changed in the intervening period. Similarly, if the scheme design changes ecologists at Grontmij should be consulted for further advice.

FIGURES

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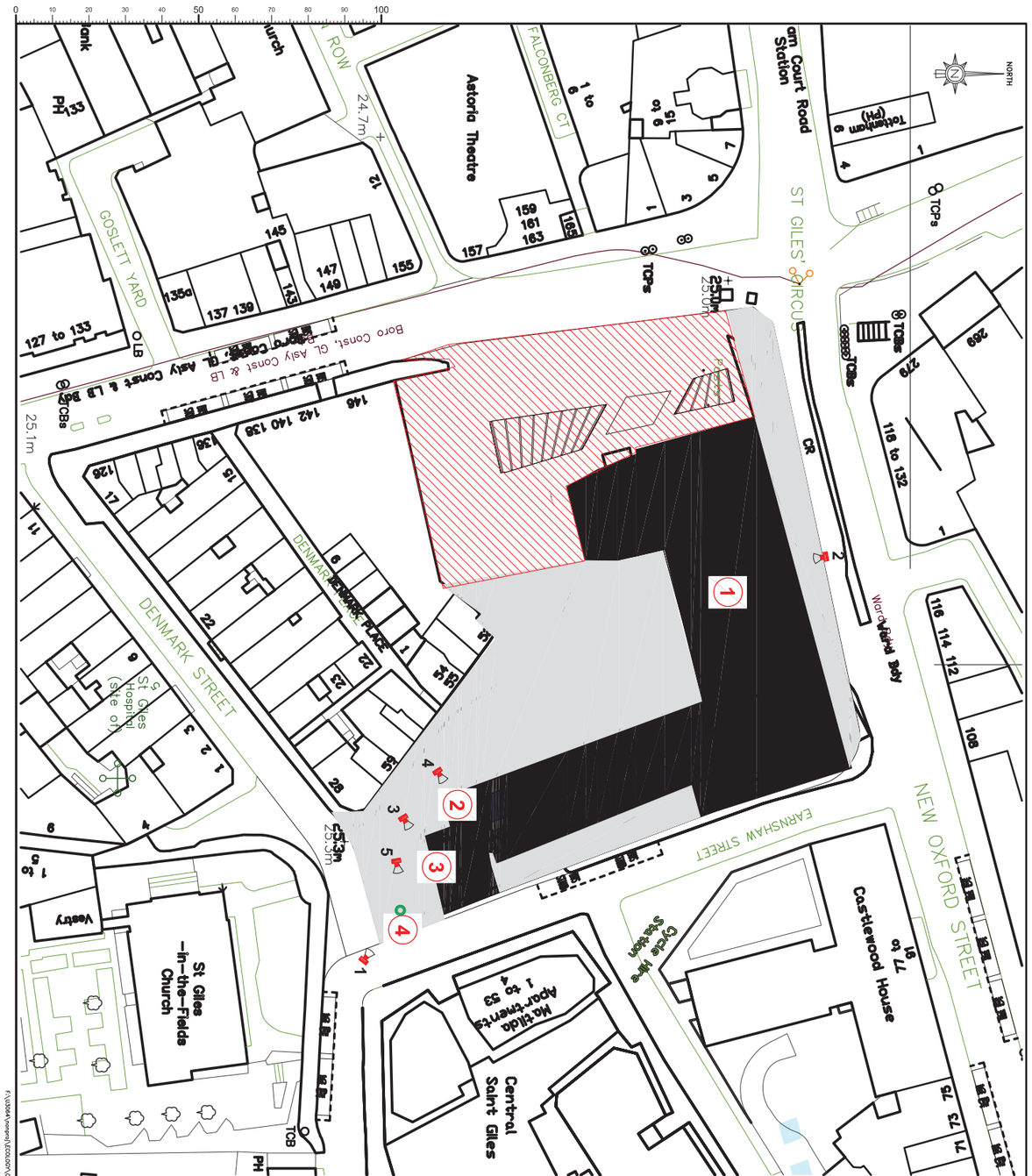
Figure 1: Phase 1 habitat map with target notes.

APPENDIX A

TARGET NOTES



NOTES

TARGET NOTE 1
PHOTOGRAPH 1
BUILDING
HARDSTANDING
CROSS RAIL SITE
MATURE TREE

REV	AMENDMENTS	BY	CHKD	APPD	DATE
A		SG	RR	SM	09/02/12

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CLIENT
ALMACANTAR LTD.

PROJECT
CENTRE POINT

TITLE
FIGURE 1: PHASE 1 HABITAT
MAP WITH TARGET NOTES

STATUS
DRAFT

DRAWN	CHECKED	APPROVED
SG	RR	SM
DATE 09/02/12	DATE 09/02/12	DATE 09/02/12

SCALE 1:2500
ORIGINAL DRAWING SIZE 297 x 420 - A3

DRAWING No. 106610_P1HS
REV. A

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Target Note	Description
1	Elevated walkway connected to the two buildings associated with Centre Point.
2	Seven potted and managed box plants.
3	Potted cabbage palm trees with weeds growing including herb robert.
4	Small-leaved lime tree.

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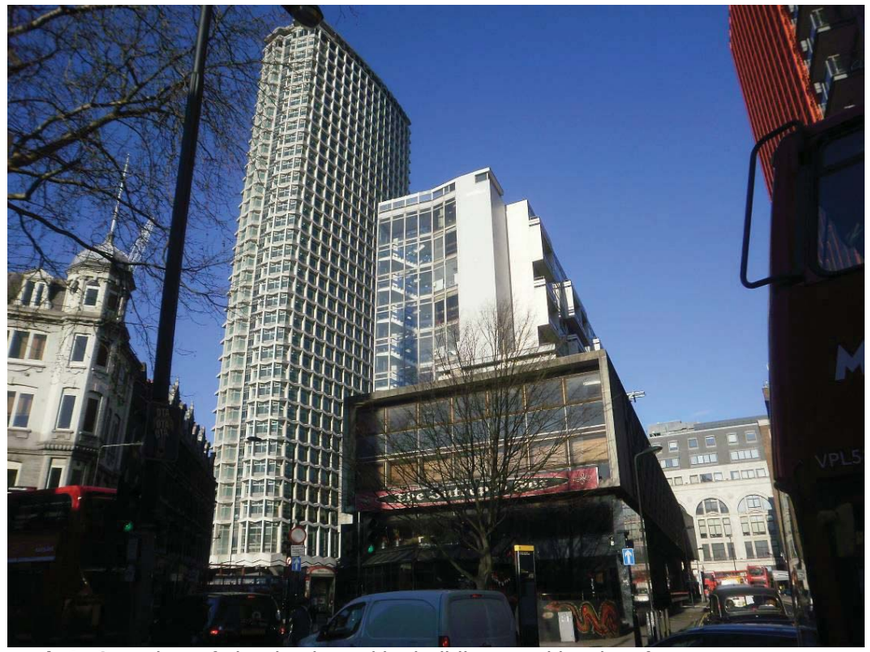
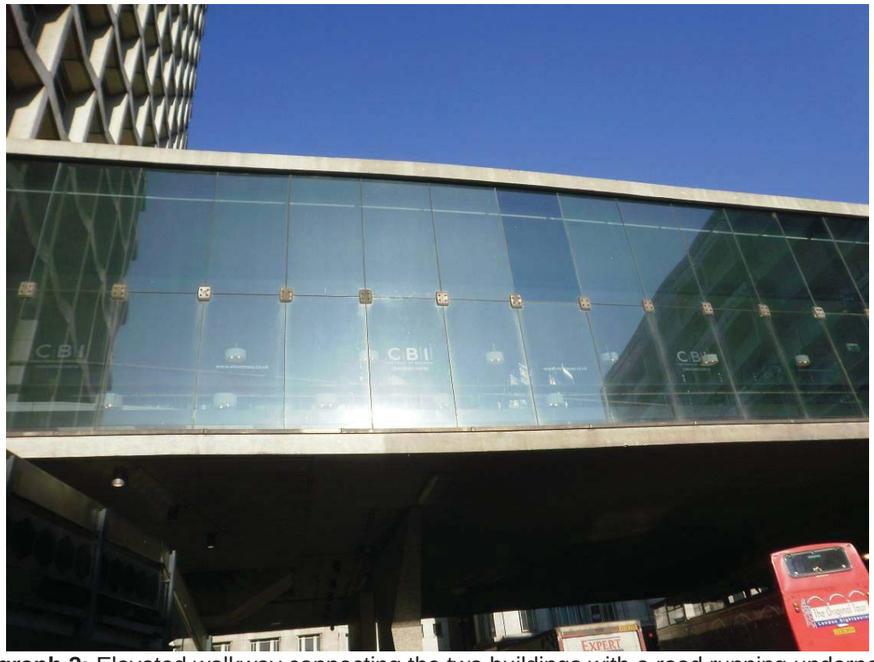
APPENDIX B

SITE PHOTOGRAPHS



Photograph 1: Overview of site dominated by buildings and hard surfaces.



Photograph 2: Elevated walkway connecting the two buildings with a road running underneath (Target Note 1).

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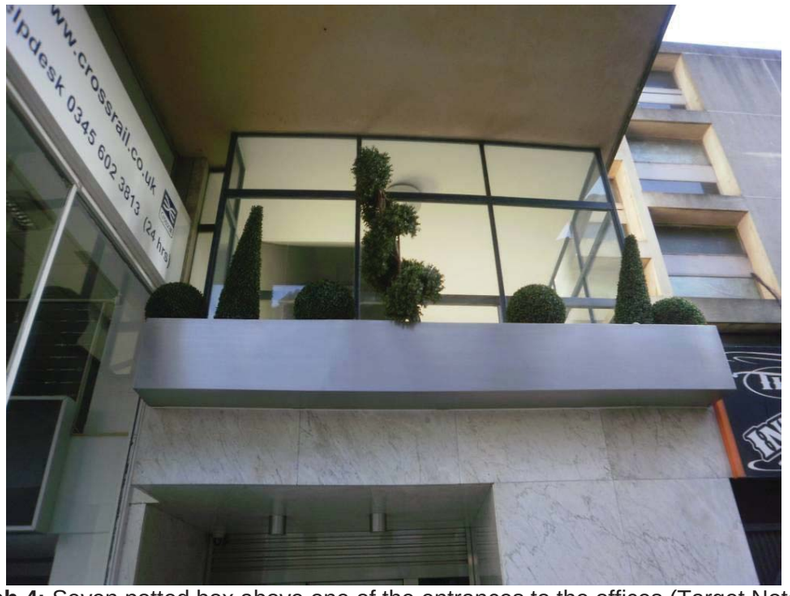
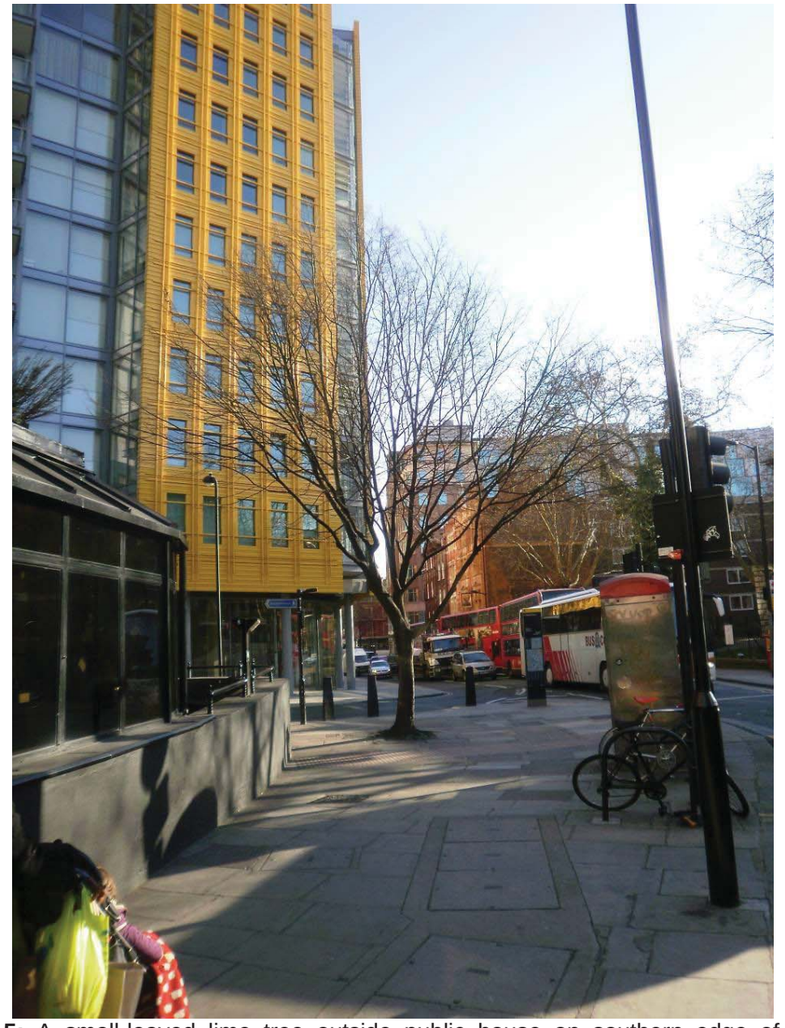
Photograph 3: Cabbage palm plants with numerous weeds on top of public house (Target Note 3).



Photograph 4: Seven potted box above one of the entrances to the offices (Target Note 2).



Photograph 5: A small-leaved lime tree outside public house on southern edge of scheme (Target Note 4).

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APPENDIX C

SUMMARY OF RELEVANT LEGISLATION

The following is a summary of statutes covering protected species of wildlife relevant to this scheme:

Badger

Badgers are protected under the following:

- The Protection of Badgers Act, 1992.

This statute makes it an offence to kill, ill treat or wilfully harm a badger or attempt to do so; or interfere with a sett (any structure or place which displays signs indicating current use by a badger) and disturbing a badger which may be occupying it. Where planning permission has been granted, Natural England may issue a licence to interfere with setts for development purposes. However, licences are only usually issued for works between July and November, a period when badgers are unlikely to have dependent young below ground.

Bats

All bats in the UK are protected under British and European law:

- Included in Annex II and IV of EC Directive 92/43/EEC on the Conservation of Natural Habitats and of the Wild Fauna and Flora (the Habitats Directive 1992) as obligated by the Bern Convention (1979) which implements the Conservation of Habitats and Species Regulations 2010 making it a European protected species (listed under Schedule 2).
- Schedule 5 of the Wildlife and Countryside Act (1981) (as amended by the Countryside Rights of Way Act 2000).
- Appendix II on The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention).
- Section 41 of the Natural Environment and Rural Communities Act (2006).

Under these statutes, it is an offence to damage or destroy any bat roosts, intentionally or recklessly obstruct a bat roost, deliberately, intentionally or recklessly disturb a bat or intentionally kill, injure or take any bat.

Reptiles

All reptiles are protected under the following:

- Schedule 5 of the Wildlife and Countryside Act (1981) (as amended by the Countryside Rights of Way Act 2000). In respect of Section 9.5 only – protected against intentional killing, injuring or taking and sale of any live or dead specimen, or any part of or anything derived from such an animal.
- Section 41 of the Natural Environment and Rural Communities Act (2006).
- Sand lizard and Smooth snake are also included in Annex II and IV of the Habitats Directive, 1992.

All reptiles are protected against intentional killing and injuring. This should be interpreted as meaning that if the harming of a reptile can reasonably be avoided then any act causing harm is quite probably illegal, and measures should be put in place to avoid this happening. It is also an offence to damage or destroy any place used for shelter or protection by sand lizard or smooth snake, or intentionally or recklessly disturb these animals while they occupy such a place.

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Great crested newt

The great crested newt is protected under British and European law:

- Included in Annex II and IV of the Habitats Directive 1992 as obligated above.
- Schedule 5 of the Wildlife and Countryside Act (1981) (as amended by the Countryside Rights of Way Act 2000).
- Section 41 of the Natural Environment and Rural Communities Act (2006).

The above makes it an offence to deliberately capture or kill a great crested newt, damage any place used for shelter or protection by the species, including breeding ponds and terrestrial habitats, or intentionally or recklessly disturb a great crested newt whilst it is occupying a place of shelter.

Nesting birds

Birds are protected under the following:

- Section 1 of the Wildlife and Countryside Act 1981 (as amended by the Countryside Rights of Way Act 2000).
- Bird species which are listed on Schedule 1 of the Wildlife and Countryside Act (1981) receive greater protection and special penalties are imposed for offences.
- Council Directive 79/409/EEC on the Conservation of Wild Birds (The Birds Directive 1979) as obligated by the Bern Convention (1979) and Bonn Convention (1979).

Under these statutes it is an offence to intentionally kill, injure or take any wild bird or take, damage or destroy the nest (whilst being built or in use) or eggs. For species listed on Schedule 1, a person is guilty of an offence if they disturb these species while nest building, or is in or near a nest containing eggs or young; or disturbs dependent young of such a bird.

Appendix B: Pedestrian Level Wind Microclimate Assessment Wind Tunnel Study

Environmental Statement
Volume III

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Centre Point House, Option B Scheme

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Final Report

Pedestrian Level Wind Microclimate Assessment
Wind Tunnel Study

RWDI # 13-00909C-PLW
March 27th, 2013

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TABLES

FIGURES

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VERSION HISTORY

INDEX	DATE	PAGES	AUTHOR
A	7th March 2013	All	E. Palombi
B	18th March 2013	All	E. Palombi
C	27th March 2013	All	A. Gypps

CHECKED BY:

W. Pearce

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OBJECTIVE

The objective of this study was to provide a pedestrian level wind microclimate assessment, based on a series of wind tunnel tests, for the proposed Centre Point House development, Option B, in London. This report presents a description of the methodology used and the main wind tunnel test results for the proposed development, baseline and cumulative scenario, with respect to the windiest (generally winter) and summer seasons. Results are presented in terms of the well-known Lawson Comfort Criteria.

1. Summary

Wind tunnel tests were conducted on a 1:300 scale model of the Option B scheme for the proposed Centre Point House development (referred to as the Proposed Development in the rest of this report) in central London. The investigation quantifies the wind conditions within and around the Site, by comparing the measured wind speed and frequency of occurrence with the well-established Lawson Comfort Criteria.

Measurements were taken at up to 67 locations for all wind directions. These covered ground level locations along the building facades, near building corners and main entrances, on pedestrian routes and amongst ground level external amenity spaces within the Proposed Development and the existing buildings immediately surrounding the Site. Measurements were also taken on selected terraces. Analysis was conducted on a seasonal basis but the report focuses on the worst case results (or the windiest season) and those for the summer season, when relatively calm conditions are required in amenity areas.

Three configurations of the wind tunnel model were tested:

- Configuration 1: Existing Site (baseline) with existing surrounds;
- Configuration 2: Proposed Development (Option B) with existing surrounds; and
- Configuration 3: Proposed Development (Option B) with cumulative surrounding buildings.

The wind tunnel tests have been conducted on a model devoid of trees or landscape detail in order to obtain conservative results (i.e. generate a relatively windy microclimate). In general, planting and other landscape enhancements would provide shelter within the Site and surrounds compared to the wind conditions described in this report, particularly in summer when the trees and plants are established and in full leaf. General comments on wind behaviour in the built environment are presented in Appendix E and basic mitigation techniques like the inclusion of entrance recessing, vertical screening, planting and landscaping amongst the building massing throughout the Site are discussed in Appendix F. Both of these appendices contain generic information provided for information purposes.

Meteorological data for London has been analysed and adjusted to the Site by modelling the effect of terrain roughness on the wind speeds approaching the Site. Results are presented in a series of ‘dot-plots’ to indicate the measured comfort criteria for the windiest and summer seasons for each configuration.

The overall conclusion from the assessment is that the wind microclimate around the Proposed Development is largely compatible with the intended pedestrian use of the Site. Additional mitigation measures, such as screening and landscaping, have been recommended within the external space at the centre of the Site and at the upper level terraces.

2. Site Description

2.1 Site Location & Surroundings

The OS Landranger reference grid for the site is TQ298813. The site is bounded by New Oxford Street to the north, Charing Cross Road to the west, St Giles High Street to the south and Earnshaw Street to the east. The immediate surrounding buildings are mid-rise and in the range of five to nine storeys. Figure 1 shows an aerial view of the site with an approximate site location highlighted in yellow.

The Site comprises the existing Centre Point Landmark Tower and the lower rise buildings, which extend eastward from Centre Point Tower and then turn southwards along Earnshaw Street.

2.2 Proposed Development

The Proposed Development retains the Centre Point Tower, but with a change of use, and incorporates changes to the lower-rise buildings. Option B of the affordable residential accommodation was modelled and tested as part of the Proposed Development on the southeast corner of the Site. Appendix A shows a selection of photographs of the wind tunnel model used in this assessment.

3. Wind Tunnel Testing: Procedure and Methodology

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

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

3.1 Simulation of Atmospheric Winds

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

3.2 Measurement Technique

Wind speed measurements were made using Irwin probes. These probes measure the pressure at a scaled 1.5 m height above ground and also at the surface, from which the wind speed is obtained using a calibrated relationship. For pedestrian comfort studies, the mean wind speed is required as well as a measure of the peak wind speed at each measurement location. The typical equivalent full scale time period for measuring the mean wind speed is around 15 minutes, whereas the peak wind speed is taken as the wind speed exceeded for 1% of the time.

Wind speeds at each location were measured for all wind directions with 0° representing a wind blowing from the north and 90° a wind blowing from the east.

3.3 Scaling

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

3.4 Meteorological Data

Meteorological data derived from the main airport meteorological stations (i.e. Heathrow, Gatwick and Stansted) in London have been corrected to standard conditions of 10m above open flat level country

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terrain. The meteorological station data is then adjusted to the Site conditions using the methodology implemented in the BREVe3 software package.

The meteorological data for London used in this report are presented in Appendix B as wind roses by season (refer to Figure 18) with the wind speed divided into Beaufort Force ranges (see Table 4, Appendix C). The radial axis indicates the cumulative number of hours per season that the wind speed exceeds the particular Beaufort Force. The seasons are defined as spring (March, April and May), summer (June, July and August), autumn (September, October and November) and winter (December, January and February).

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

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

3.5 Pedestrian Comfort

The assessment of the wind conditions requires a standard against which the measurements can be compared. This report uses the Lawson Criteria, which have been established for some thirty years and have been widely used on building developments across the United Kingdom. The comfort criteria, seek to define the reaction of an average pedestrian to the wind, are described in Table 3 and illustrated in Figure 19 (both found in Appendix C). If the measured wind conditions exceed the threshold then conditions are unacceptable for the stated pedestrian activity and the expectation is that there may be complaints of nuisance or people will not use the area for its intended purpose.

The criteria set out six pedestrian activities and reflect the fact that less active pursuits require more benign wind conditions. The six categories are sitting, standing, entering/leaving a building, leisure walking, business walking and roadway/car-park, in ascending order of activity level. In other words, the wind conditions in an area for sitting need to be calmer than a location that people merely walk past. The distinction between leisure walking and business walking is that in the business scenario, where pedestrians are on-site because their livelihood depends upon it, they will be more tolerant of stronger winds.

The criteria are derived for open air conditions and assume that pedestrians will be suitably dressed for the season (in other words thermal comfort is not considered).

3.6 Strong Winds

Lawson also specified a lower limit strong wind threshold when winds exceed Beaufort Force 6. Notification of exceedance greater than one hour in the year is required. Exceedence of this threshold may indicate a need for remedial measures or a careful assessment of the expected use of that location, e.g. is it reasonable to expect vulnerable pedestrians to be present at the location on the windiest day of the year?

In the UK, stronger winds are associated with areas which would be classified as suitable for business walking or roadway use. In a mixed-use, urban development, business walking and roadway conditions would not usually form part of the 'target' wind environment and would usually require mitigation due to pedestrian comfort considerations. This mitigation would also reduce the frequency of, or even eliminate, any strong winds.

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For locations where the wind speed exceeds Beaufort Force 6, which are found on a pedestrian thoroughfare, the results are unlikely to generate nuisance to pedestrians. However, where there is an exceedance of Beaufort Force 7 or 8, we would expect pedestrians to experience difficulty in walking.

If the wind speed exceeds B6 in a proposed external seating area or outside an entrance, these conditions would be unacceptable and would require mitigation. However, if the wind speed exceeded B6 then the area is likely to be classified as suitable for leisure walking, business walking or roadway use and so would require mitigation to satisfy the Lawson Comfort Criteria in any case.

It is RWDI's practice to report incidence when B6, B7 and B8 are exceeded for more than 1 hour per annum. The results for this study are presented in Table 2 which also shows the wind direction that contributes most to the strong winds.

4. Results

4.1 Details of the Analysis

To account for the differences in height and terrain roughness between meteorological conditions at the airport and the Site it is necessary to apply correction factors to the wind tunnel velocity ratios. Correction factors (mean factors) were computed for a full range of wind directions from 0° through to 360°. The reference height in the wind tunnel was at the equivalent full-scale height of 120 metres. Table 1 presents the mean factors for the Centre Point Site.

4.2 Target Wind Conditions

For an urban, mixed-use development, the target wind conditions are as follows:

- leisure walking during the windiest season on pedestrian thoroughfares;
- standing /entrance conditions at main entrances and within drop-off areas throughout the year; and
- sitting at external seating and amenity areas, including private and/or public terraces at the roof levels of the Proposed Development, during the summer season when these areas are more likely to be frequently used by pedestrians.

4.3 Performance Against the Lawson Criteria

Appendix D presents Tables of the comfort criteria around the Existing Site (Configuration 1) and the Proposed Development with the existing (Configuration 2) and cumulative (Configuration 3) surrounds scenarios, for all seasons. The results presented in Figures 3 to 14 are extracted from Appendix D.

5. Discussion

5.1 Baseline Assessment

5.1.1 Configuration 1: The Existing Site with existing surrounds

Pedestrian Comfort

Figure 3 and Figure 4 show the windiest and summer season results for the Baseline scenario at ground level whereas Figure 5 and Figure 6 show the equivalent results at the terrace levels. Wind speeds were measured at a total of 56 ground level receptors within and around the Site and 10 receptors at the elevated terrace level.

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The wind microclimate at the ground level receptors, for the windiest season (typically winter), is summarised as follows:

- Fourteen locations are suitable for sitting;
- Thirty-two locations are suitable for standing; and
- Ten locations are suitable for leisure walking.

For the terrace locations there were:

- Four locations are suitable for sitting;
- Five locations are suitable for standing; and
- One location is suitable for leisure walking.

The baseline wind microclimate within and around the Site is predominantly suitable for standing/entrance use and sitting during the windiest season. However, there are windier areas, where the wind microclimate is suitable for leisure walking at locations 3, 14, 26, 27, 28, 34, 35, 36 and 38 at ground level and location 58 on the terrace level. The majority of receptors where the wind microclimate is classified as suitable for leisure walking are at the southern elevation of the Centre Point Tower.

Strong Winds

For Configuration 1, the wind speed exceeds Beaufort Force 6, on occasion, at locations 3, 27, 28, 34, 38 and 50 for up to 4.8 hours per year. There are no locations where the wind speed exceeds Beaufort Force 7 or 8 for more than 1.0 hour per year. These results are listed in Table 2.

5.2 Proposed Development Assessment

5.2.1 Configuration 2: Proposed Development with existing surrounds

Pedestrian Comfort

Figure 7 and Figure 8 show the windiest and summer season results, at ground level, for the Proposed Development with existing surrounds. Figure 9 and Figure 10 show the equivalent results on the terrace levels. Wind speeds were measured at 57 ground level locations within and around the Site and at 10 terrace locations on the Site.

The wind microclimate at all ground level locations, for the windiest season (typically winter), is summarised as follows:

- Fifteen locations are suitable for sitting;
- Thirty-four locations are suitable for standing; and
- Eight locations are suitable for leisure walking.

For the receptors at terrace levels there were:

- Three locations suitable for sitting;
- Four locations suitable for standing; and
- Three locations suitable for leisure walking.

When compared with the baseline:

- Locations 5, 20, 51, 62 and 64 are one category windier, whereas, location 65 is two categories windier (during the windiest season); and
- Locations 14, 19, 30 and 35 are one category calmer.

The windiest season (i.e. winter) wind conditions at ground level for the Proposed Development with existing surrounding buildings are suitable for a mix of sitting, standing or leisure walking at all locations. The windier areas, where the wind microclimate is suitable for leisure walking, are at locations 3, 26, 27, 28, 34, 36, 38 and 50 at ground level and locations 58, 64 and 65 on the terrace level. The majority of receptors where the wind microclimate is classified as suitable for leisure walking are around the southern elevation of the Centre Point Tower.

Receptors 9, 14, 15, 18, 20, 21, 25, 29, 47 and 48 are outside entrances. From Figure 7 the wind microclimate at each of these locations is suitable for either sitting or standing/entrance during the windiest season. No mitigation is necessary as the local wind environment at these entrances is suitable, or calmer than required, for pedestrian egress and ingress.

Throughout the summer months, when winds are lighter, most locations are suitable for sitting (Figure 8 and Figure 10). There is a cluster of locations to the south of the Tower where the wind microclimate is suitable for standing and then isolated areas at the northwest corner of the Tower and on New Oxford Street.

The wind microclimate at the upper level terraces is suitable for a mix of standing and sitting. Where standing conditions are reported in Figure 10, these areas are windier than desired for external amenity and would require mitigation.

Strong Winds

For Configuration 2, the wind speed exceeds Beaufort Force 6, on occasion, at locations 3, 27, 28, 50 and 64 for up to 4.0 hours per year. There are no locations where the wind speed exceeds Beaufort Force 7 or 8 for more than 1.0 hour per year. These results are listed in Table 2.

When compared with the results for the Baseline the strong winds at locations 3, 27, 28 and 50 are all less frequent in the presence of the Proposed Development. Receptor 64 is on a terrace which would require mitigation and recommendations are provided in Section 6 of this report.

5.2.2 Configuration 3: Proposed Development with cumulative surrounding buildings

Pedestrian Comfort

The wind tunnel model was modified to incorporate cumulative developments and in particular, the development immediately south of the Centre Point Tower[1]. The remaining developments in the list of cumulative schemes are considered to be sufficiently removed from the Site that they would not affect the wind conditions within and around the proposed buildings, particularly when the prevailing winds blow.

When tested with the cumulative developments in situ, the wind microclimate at all ground level locations, for the windiest season (typically winter), is summarised as follows:

- Fifteen locations are suitable for sitting;
- Thirty-four locations are suitable for standing; and

[1] The neighbouring Crossrail scheme was included as part of the existing (baseline) surrounds as it is currently under construction.

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- Eight locations are suitable for leisure walking.

For the receptors at terrace level there were:

- Three locations suitable for sitting;
- Four locations suitable for standing; and
- Three locations suitable for leisure walking.

These results were equivalent to the results for Configuration 2. When compared with the baseline:

- Locations 5, 20, 51, 62 and 64 are one category windier, whereas, location 65 is two categories windier; and
- Locations 14, 19, 30 and 35 are one category calmer.

Strong Winds

For Configuration 3, the wind speed exceeds Beaufort Force 6, on occasion, at locations 3, 28, 38 and 50 for up to 2.7 hours per year. The wind speed at location 34 exceeds Beaufort Force 7 for up to 1.0 hours per year. These results are listed in Table 2.

When compared with the results for the Baseline, the strong winds at locations 3, 28, 38 and 50 are either the same as, or less frequent in the presence of the Proposed Development with cumulative developments.

The strong winds, in excess of Beaufort Force 7, at receptor 34 are expected to impede walking

6. Mitigation Measures

The assessment above, and summarised in Figures 3 to 14, assumed that no planting or landscaping was present around or within the Site, which is a conservative (i.e. windier) scenario because it assumes no beneficial shelter. In general, planting and other landscape enhancements would increase shelter within the Proposed Development compared to the wind conditions described above, particularly when the trees and plants are established and in full leaf.

The comparisons of the baseline wind microclimate with the results for Configurations 2 and 3 show a similar wind environment after development with the windiest zone in the area to the south of the Centre Point Tower for all configurations.

Taller balustrades or planting is recommended at the south and west facing terraces where standing conditions are expected at locations 64, 65 and 68 during the summer season. Taller balustrades at least 1.5m in height, are expected to shelter these amenity spaces from the prevailing winds throughout the year and create a summertime wind microclimate suitable for sitting. Moreover, the additional shelter is expected to eliminate the occurrence of strong winds in excess of B6 on the private terrace at location 64.

The stronger winds that occur at location 34, between the two buildings which form part of the cumulative scheme to the south of the Centre Point Tower, are considered to be related to the massing of the cumulative scheme. Landscaping the space between the Centre Point Tower and the cumulative development would disrupt winds blowing through this space.

7. Concluding Remarks

In conclusion:

1. The meteorological data for the site indicate prevailing winds from the south westerly quadrant throughout the year, and secondary winds from the north easterly direction particularly during the springtime.
2. In the wind assessment no landscaping or planting has been considered around the Proposed Development, which is a conservative assumption particularly during the summer season when trees and plants are in leaf. The proposed landscaping is expected to create a calmer environment than reported in this assessment.
3. The wind microclimate during the windiest season, for the Baseline, is predominantly suitable for either sitting or standing within and around the site. However, there are leisure walking conditions in isolated areas but predominantly on the south side of the Centre Point Tower. There are also some locations (Table 2) where the wind speed exceeds Beaufort Force 6 on occasion.
4. For the Proposed Development with existing surrounds, at ground level and on the terraces, the wind microclimate around the Proposed Development is suitable for sitting, standing/entrance use or leisure walking. These results are compatible with the intended pedestrian use of the site and are similar to the results for the Baseline which reflects the similarities in the massing as far as the wind is concerned. The locations where the wind speed exceeds Beaufort Force 6 are listed in Table 6 and at ground level receptors are generally less frequent than for the Baseline. Mitigation is suggested with the central area of the Site at ground and at the upper level terraces where the local conditions are windier than desired.
5. When neighbouring cumulative developments are built, the wind microclimate within and around the Proposed Development remains similar to that for Configuration 2. However, it is noted that there are windier conditions and occasional strong winds, in excess of Beaufort Force 7, in the gap between the two cumulative buildings south of the Centre Point Tower. The wind environment at location 34 is related to the presence of the cumulative scheme.

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Wind Direction>>	0	30	60	90	120	150	180	210	240	270	300	330
Mean Factor at 10m	0.58	0.59	0.59	0.60	0.58	0.58	0.61	0.58	0.58	0.57	0.58	0.59
Mean Factor at 120m	1.37	1.41	1.40	1.44	1.35	1.36	1.45	1.39	1.38	1.34	1.34	1.36

Table 1: BREVe3 mean factors at 10m and 120m above ground level

Location	Beaufort Force Exceedence	Direction	Hours per Annum
Configuration 1 – Existing Site (Baseline) with Existing Surrounds			
3	B6	240	3.6
27	B6	60	2.9
28	B6	60	2.1
34	B6	240	1.6
38	B6	260	1.1
50	B6	220	4.8
Configuration 2 – Proposed Development with Existing Surrounds			
3	B6	240	2.6
27	B6	60	1.4
28	B6	50	1.8
50	B6	220	4.0
64	B6	270	1.5
Configuration 3 – Proposed Development with Cumulative Surrounding Buildings			
3	B6	240	1.6
28	B6	70	1.0
38	B6	260	1.1
50	B6	220	2.7
34	B7	250	1.0

Table 2: Annual Exceedance of Strong Winds (& Most Frequent Wind Direction)

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Figure 1: Aerial Photograph of the Existing Site - Approximate Site highlighted in yellow

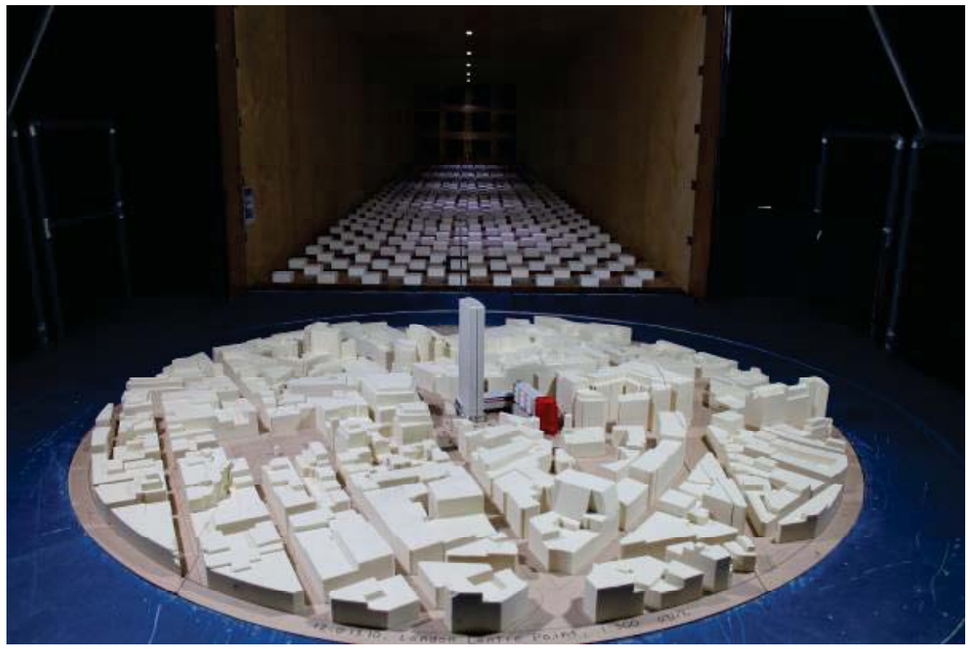

Figure 2: View of Proposed Development in the Wind Tunnel (looking north)

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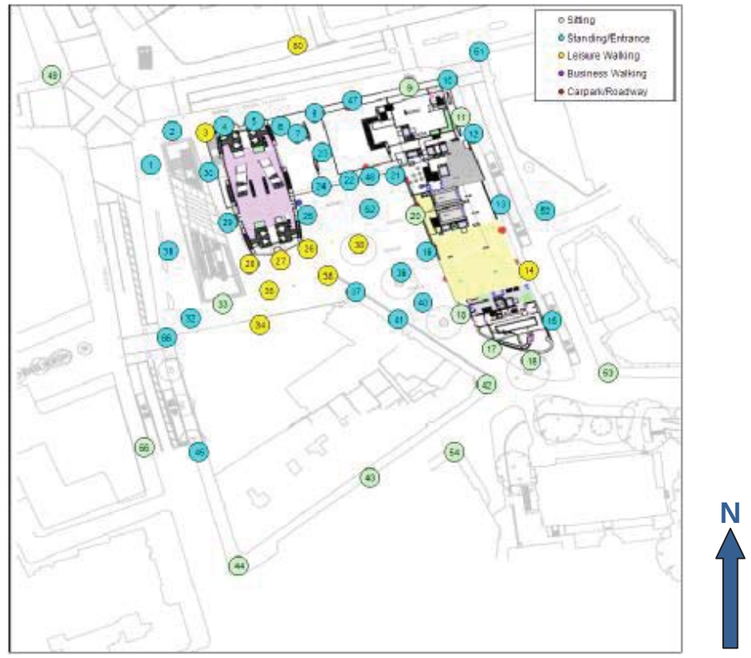

Figure 3: Baseline (Configuration 1): Ground Level – Lawson Comfort Criteria (Windiest Season)

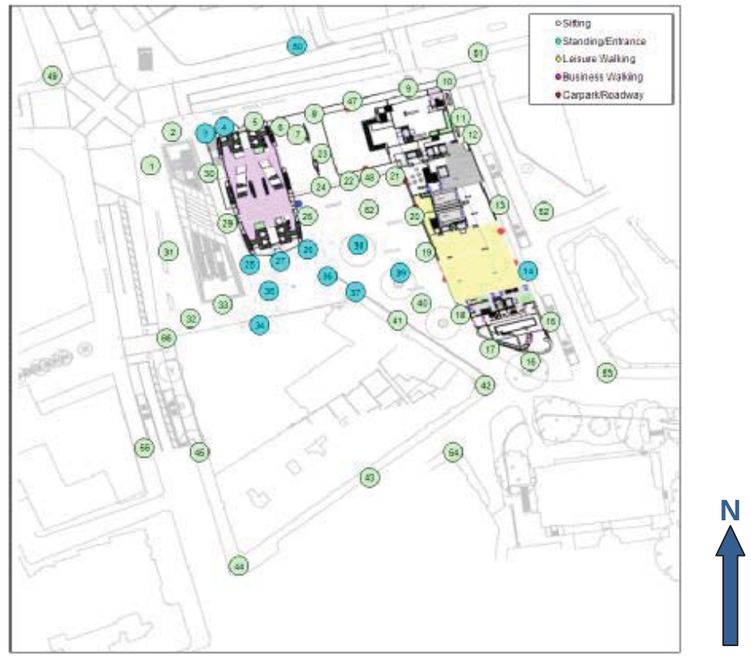

Figure 4: Baseline (Configuration 1): Ground Level – Lawson Comfort Criteria (Summer Season)

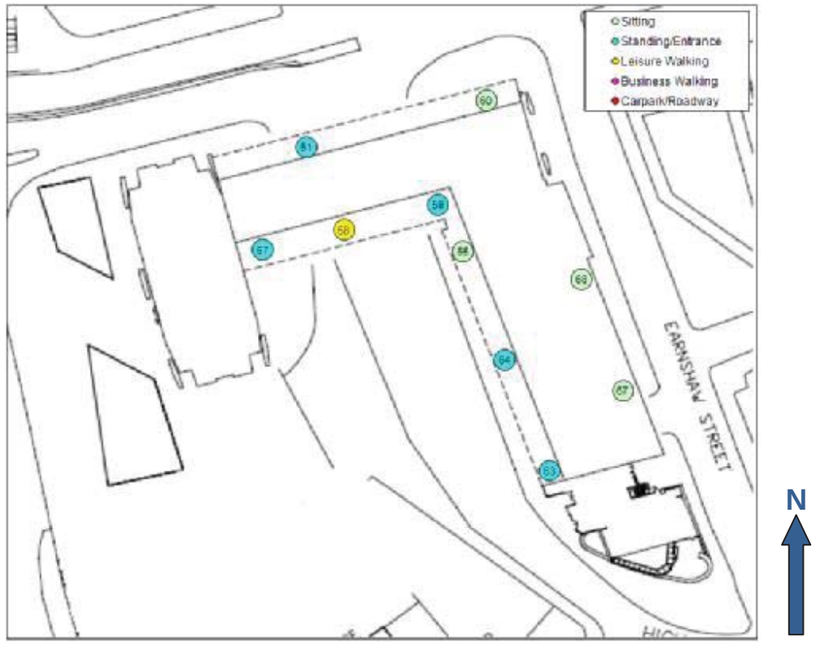

Figure 5: Baseline (Configuration 1): Upper Terrace Levels – Lawson Comfort Criteria (Windiest Season)

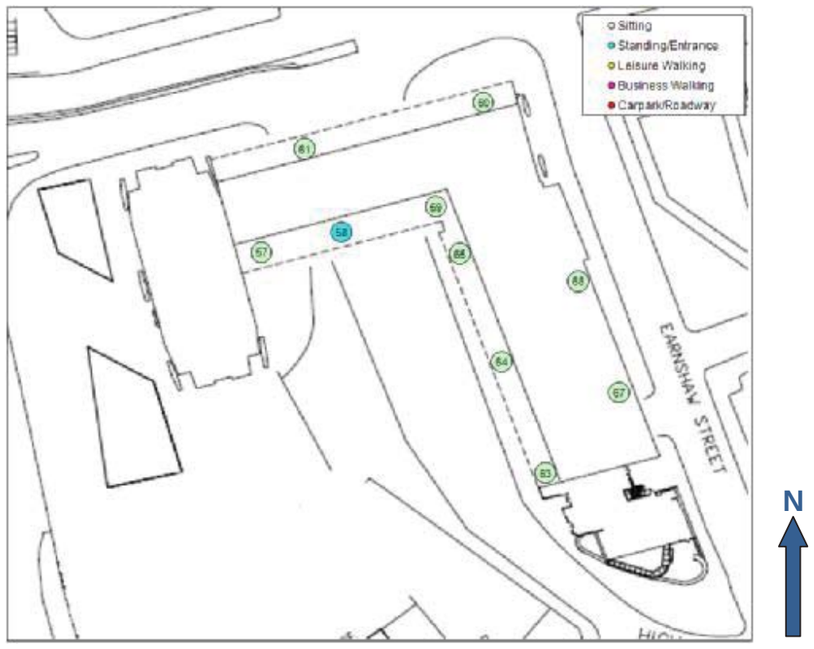

Figure 6: Baseline (Configuration 1): Upper Terrace Levels – Lawson Comfort Criteria (Summer Season)

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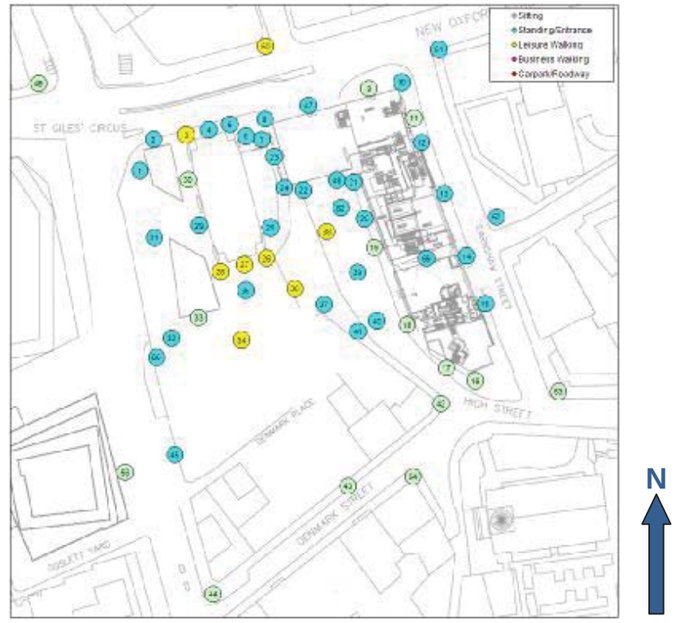

Figure 7: Proposed Development (Configuration 2): Ground Level – Lawson Comfort Criteria (Windiest Season)

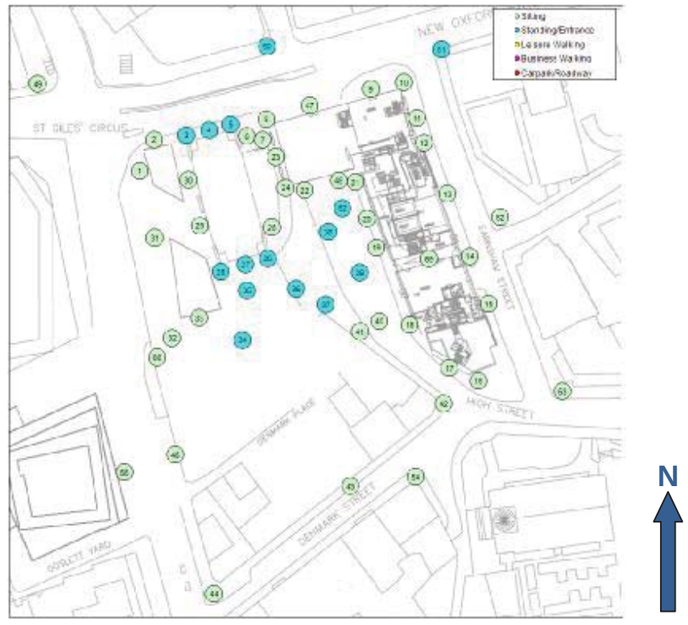

Figure 8: Proposed Development (Configuration 2): Ground Level – Lawson Comfort Criteria (Summer Season)

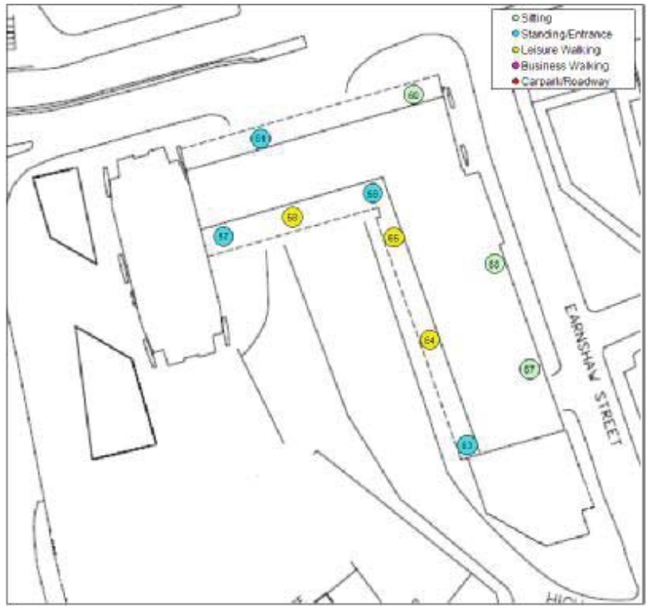

Figure 9: Proposed Development (Configuration 2): Upper Terrace Levels – Lawson Comfort Criteria (Windiest Season)

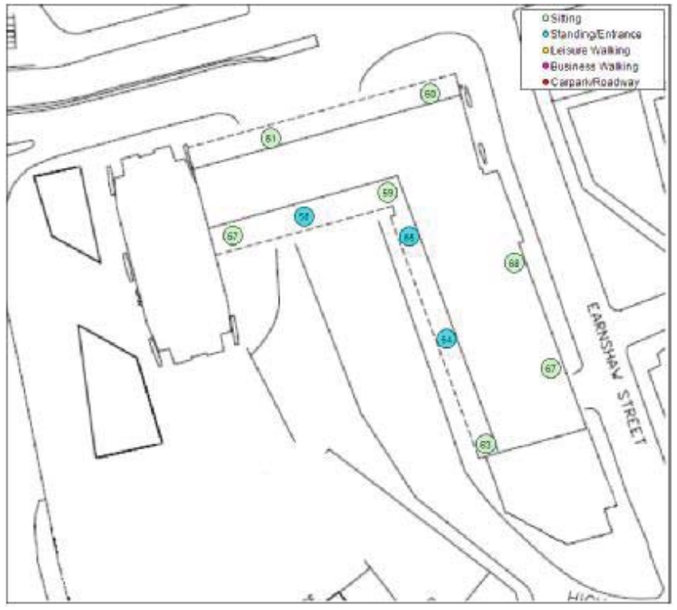

Figure 10: Proposed Development (Configuration 2): Upper Terrace Levels – Lawson Comfort Criteria (Summer Season)

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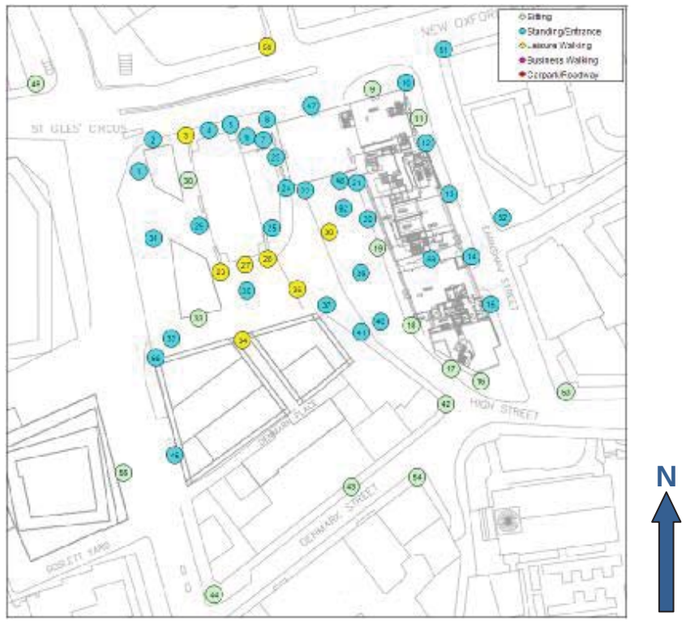

Figure 11: Cumulative Scenario (Configuration 3): Ground Level – Lawson Comfort Criteria (Windiest Season)

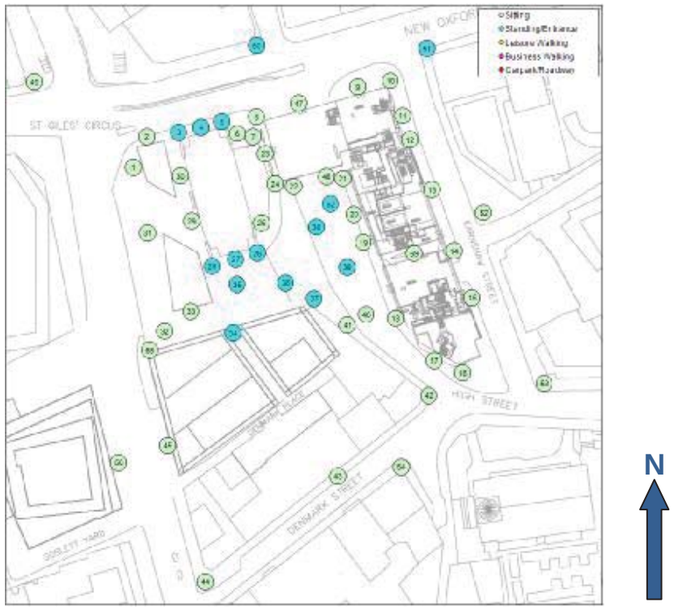

Figure 12: Cumulative Scenario (Configuration 3): Ground Level – Lawson Comfort Criteria (Summer Season)

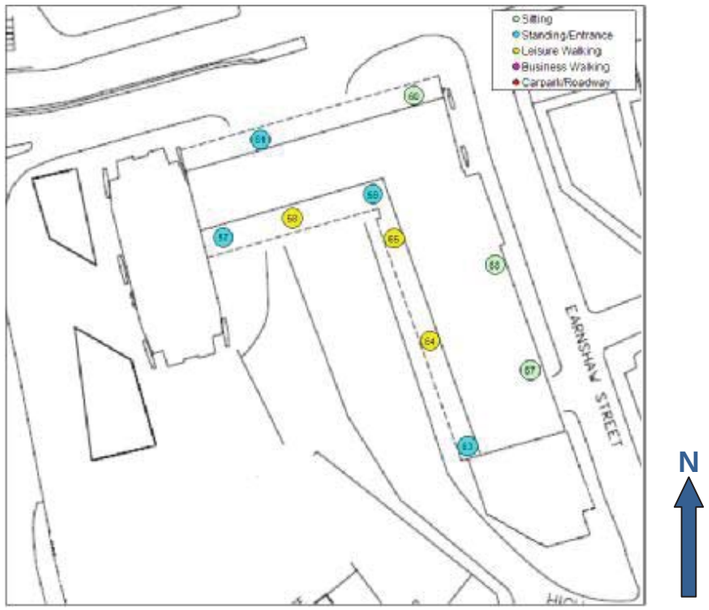

Figure 13: Cumulative Scenario (Configuration 3): Upper Terrace Levels – Lawson Comfort Criteria (Windiest Season)

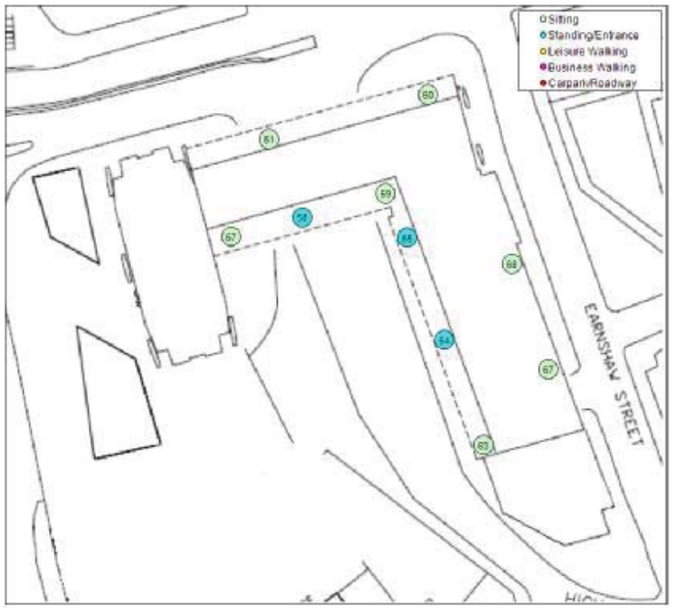

Figure 14: Cumulative Scenario (Configuration 3): Upper Terrace Levels – Lawson Comfort Criteria (Summer Season)

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Appendix A: Photographs of the Wind Tunnel Model

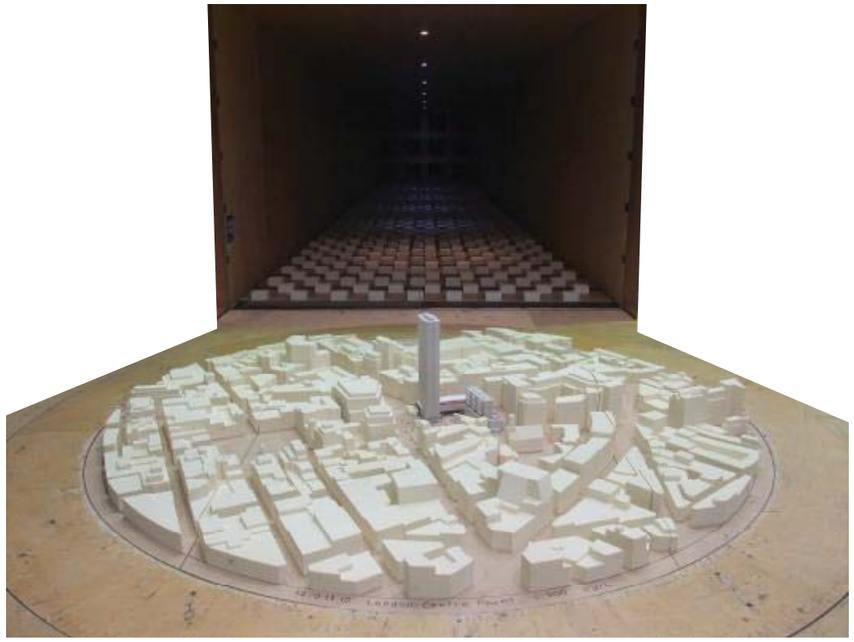

Figure 15: Baseline (Configuration 1) – View in the Wind Tunnel (view from south)

Figure 16: Proposed Development (Configuration 2) – View in the Wind Tunnel (top view from north)

Figure 17: Cumulative Scenario (Configuration 3) – View in the Wind Tunnel (top view from south)

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Appendix B: Meteorological Data

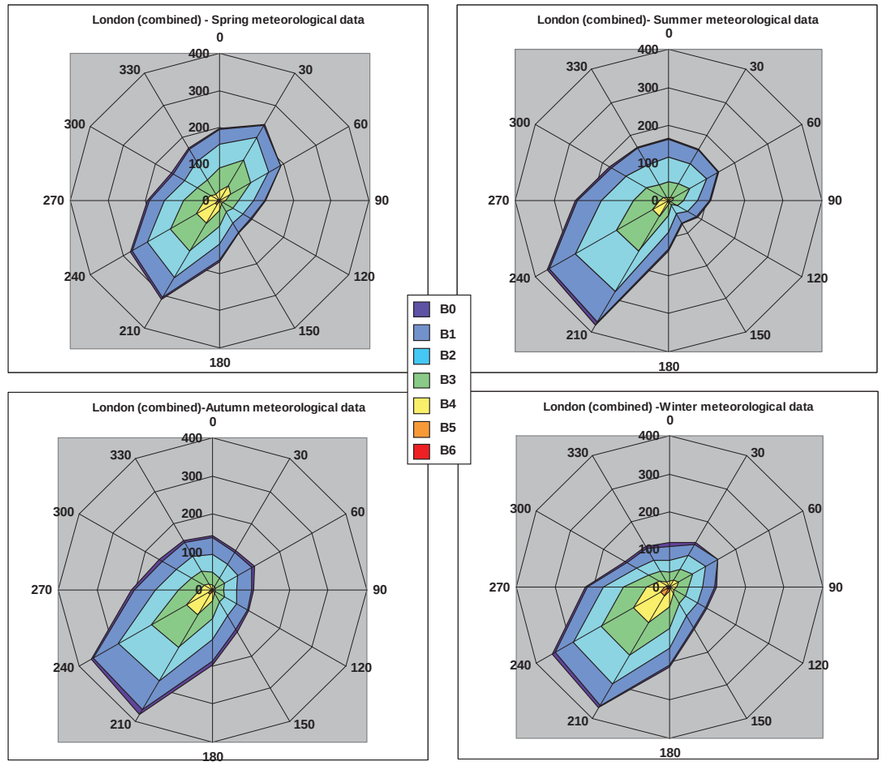

Figure 18: Seasonal wind roses for London, United Kingdom (in Beaufort Force)
(Hours that wind speed is greater than the stated Beaufort Force)

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Appendix C: Lawson Comfort Criteria

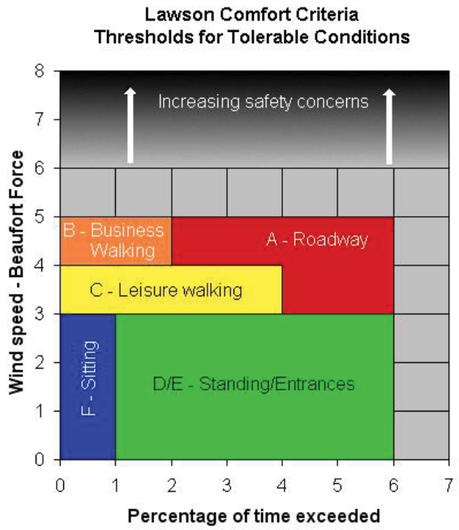

Figure 19: Graphical representation of the Lawson Comfort Criteria

DESCRIPTION	LETTER	**THRESHOLD**
Roads and Car Parks	A	6% > B5
Business Walking	B	2% > B5
Pedestrian Walk-through	C	4% > B4
Pedestrian Standing	D	6% > B3
Entrance Doors	E	6% > B3
Sitting	F	1% > B3

Table 3: Lawson Comfort Criteria

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BEAUFORT FORCE	HOURLY-AVERAGE WIND SPEED (m/s)	DESCRIPTION OF WIND	NOTICEABLE WIND EFFECT
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	Light Breeze	Wind felt on face; leaves rustle; wind vane moves
3	3.35 – 5.60	Gentle Breeze	Leaves & 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

Table 4: The Beaufort Land Scale

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Appendix D: Comfort Criteria Results

Results are presented for the existing and developed site for both mean wind speeds and gust wind speeds. In each table the first column contains the location numbers. The remaining columns are the pedestrian activity for which the measured wind conditions were tolerable.

Location	All	Spring	Summer	Autumn	Winter
1	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
2	Standing/Entrance	Standing/Entrance	Sitting	Sitting	Standing/Entrance
3	Leisure Walking	Leisure Walking	Standing/Entrance	Leisure Walking	Leisure Walking
4	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance
5	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
6	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
7	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
8	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
9	Sitting	Sitting	Sitting	Sitting	Sitting
10	Sitting	Sitting	Sitting	Sitting	Sitting
11	Sitting	Sitting	Sitting	Sitting	Sitting
12	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
13	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
14	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Leisure Walking
15	Standing/Entrance	Sitting	Sitting	Sitting	Standing/Entrance
16	Sitting	Sitting	Sitting	Sitting	Sitting
17	Sitting	Sitting	Sitting	Sitting	Sitting
18	Sitting	Sitting	Sitting	Sitting	Sitting
19	Sitting	Sitting	Sitting	Sitting	Sitting
20	Sitting	Sitting	Sitting	Sitting	Sitting
21	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
22	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
23	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
24	Standing/Entrance	Standing/Entrance	Sitting	Sitting	Standing/Entrance
25	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
26	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Leisure Walking
27	Standing/Entrance	Leisure Walking	Standing/Entrance	Standing/Entrance	Leisure Walking
28	Standing/Entrance	Leisure Walking	Standing/Entrance	Standing/Entrance	Leisure Walking
29	Standing/Entrance	Standing/Entrance	Sitting	Sitting	Standing/Entrance
30	Sitting	Standing/Entrance	Sitting	Sitting	Standing/Entrance
31	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
32	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
33	Sitting	Sitting	Sitting	Sitting	Sitting
34	Leisure Walking	Leisure Walking	Standing/Entrance	Standing/Entrance	Leisure Walking
35	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Leisure Walking
36	Leisure Walking	Leisure Walking	Standing/Entrance	Standing/Entrance	Leisure Walking
37	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance
38	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Leisure Walking
39	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance
40	Standing/Entrance	Standing/Entrance	Sitting	Sitting	Standing/Entrance
41	Standing/Entrance	Standing/Entrance	Sitting	Sitting	Standing/Entrance
42	Sitting	Sitting	Sitting	Sitting	Sitting
43	Sitting	Sitting	Sitting	Sitting	Sitting

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44	Sitting	Sitting	Sitting	Sitting	Sitting
45	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
46	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
47	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
48	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
49	Sitting	Sitting	Sitting	Sitting	Sitting
50	Leisure Walking	Leisure Walking	Standing/Entrance	Leisure Walking	Leisure Walking
51	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
52	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
53	Sitting	Sitting	Sitting	Sitting	Sitting
54	Sitting	Sitting	Sitting	Sitting	Sitting
55	Sitting	Sitting	Sitting	Sitting	Sitting
56	Sitting	Sitting	Sitting	Sitting	Sitting
57	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
58	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Leisure Walking
59	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
60	Sitting	Sitting	Sitting	Sitting	Sitting
61	Standing/Entrance	Standing/Entrance	Sitting	Sitting	Standing/Entrance
62	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
63	Standing/Entrance	Sitting	Sitting	Standing/Entrance	Standing/Entrance
64	Standing/Entrance	Sitting	Sitting	Sitting	Standing/Entrance
65	Sitting	Sitting	Sitting	Sitting	Sitting
66	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
67	Sitting	Sitting	Sitting	Sitting	Sitting
68	Sitting	Sitting	Sitting	Sitting	Sitting

Table 5: Comfort Criteria Derived From Mean Wind Speeds – *Baseline*

Location	All	Spring	Summer	Autumn	Winter
1	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
2	Standing/Entrance	Standing/Entrance	Sitting	Sitting	Standing/Entrance
3	Leisure Walking	Leisure Walking	Standing/Entrance	Leisure Walking	Leisure Walking
4	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance
5	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
6	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
7	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
8	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
9	Sitting	Sitting	Sitting	Sitting	Sitting
10	Sitting	Sitting	Sitting	Sitting	Sitting
11	Sitting	Sitting	Sitting	Sitting	Sitting
12	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
13	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
14	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Leisure Walking
15	Standing/Entrance	Sitting	Sitting	Sitting	Standing/Entrance
16	Sitting	Sitting	Sitting	Sitting	Sitting
17	Sitting	Sitting	Sitting	Sitting	Sitting
18	Sitting	Sitting	Sitting	Sitting	Sitting
19	Sitting	Sitting	Sitting	Sitting	Sitting
20	Sitting	Sitting	Sitting	Sitting	Sitting
21	Sitting	Sitting	Sitting	Sitting	Standing/Entrance

22	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
23	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
24	Standing/Entrance	Standing/Entrance	Sitting	Sitting	Standing/Entrance
25	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
26	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Leisure Walking
27	Standing/Entrance	Leisure Walking	Standing/Entrance	Standing/Entrance	Leisure Walking
28	Standing/Entrance	Leisure Walking	Standing/Entrance	Standing/Entrance	Leisure Walking
29	Standing/Entrance	Standing/Entrance	Sitting	Sitting	Standing/Entrance
30	Sitting	Standing/Entrance	Sitting	Sitting	Standing/Entrance
31	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
32	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
33	Sitting	Sitting	Sitting	Sitting	Sitting
34	Leisure Walking	Leisure Walking	Standing/Entrance	Standing/Entrance	Leisure Walking
35	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Leisure Walking
36	Leisure Walking	Leisure Walking	Standing/Entrance	Standing/Entrance	Leisure Walking
37	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance
38	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Leisure Walking
39	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance
40	Standing/Entrance	Standing/Entrance	Sitting	Sitting	Standing/Entrance
41	Standing/Entrance	Standing/Entrance	Sitting	Sitting	Standing/Entrance
42	Sitting	Sitting	Sitting	Sitting	Sitting
43	Sitting	Sitting	Sitting	Sitting	Sitting
44	Sitting	Sitting	Sitting	Sitting	Sitting
45	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
46	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
47	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
48	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
49	Sitting	Sitting	Sitting	Sitting	Sitting
50	Leisure Walking	Leisure Walking	Standing/Entrance	Leisure Walking	Leisure Walking
51	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
52	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
53	Sitting	Sitting	Sitting	Sitting	Sitting
54	Sitting	Sitting	Sitting	Sitting	Sitting
55	Sitting	Sitting	Sitting	Sitting	Sitting
56	Sitting	Sitting	Sitting	Sitting	Sitting
57	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
58	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Leisure Walking
59	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
60	Sitting	Sitting	Sitting	Sitting	Sitting
61	Standing/Entrance	Standing/Entrance	Sitting	Sitting	Standing/Entrance
62	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
63	Standing/Entrance	Sitting	Sitting	Standing/Entrance	Standing/Entrance
64	Standing/Entrance	Sitting	Sitting	Sitting	Standing/Entrance
65	Sitting	Sitting	Sitting	Sitting	Sitting
66	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
67	Sitting	Sitting	Sitting	Sitting	Sitting
68	Sitting	Sitting	Sitting	Sitting	Sitting

Table 6: Comfort Criteria Derived From Gust Wind Speeds – *Baseline*

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Location	All	Spring	Summer	Autumn	Winter
1	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
2	Standing/Entrance	Standing/Entrance	Sitting	Sitting	Standing/Entrance
3	Leisure Walking	Leisure Walking	Standing/Entrance	Leisure Walking	Leisure Walking
4	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance
5	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance
6	Standing/Entrance	Standing/Entrance	Sitting	Sitting	Standing/Entrance
7	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
8	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
9	Sitting	Sitting	Sitting	Sitting	Sitting
10	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
11	Sitting	Sitting	Sitting	Sitting	Sitting
12	Standing/Entrance	Standing/Entrance	Sitting	Sitting	Standing/Entrance
13	Standing/Entrance	Sitting	Sitting	Standing/Entrance	Standing/Entrance
14	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
15	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
16	Sitting	Sitting	Sitting	Sitting	Sitting
17	Sitting	Sitting	Sitting	Sitting	Sitting
18	Sitting	Sitting	Sitting	Sitting	Sitting
19	Sitting	Sitting	Sitting	Sitting	Sitting
20	Sitting	Sitting	Sitting	Sitting	Sitting
21	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
22	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
23	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
24	Standing/Entrance	Standing/Entrance	Sitting	Sitting	Standing/Entrance
25	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
26	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance
27	Standing/Entrance	Leisure Walking	Standing/Entrance	Standing/Entrance	Leisure Walking
28	Leisure Walking	Leisure Walking	Standing/Entrance	Standing/Entrance	Leisure Walking
29	Standing/Entrance	Standing/Entrance	Sitting	Sitting	Standing/Entrance
30	Sitting	Sitting	Sitting	Sitting	Sitting
31	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
32	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
33	Sitting	Sitting	Sitting	Sitting	Sitting
34	Standing/Entrance	Leisure Walking	Standing/Entrance	Standing/Entrance	Leisure Walking
35	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance
36	Standing/Entrance	Leisure Walking	Standing/Entrance	Standing/Entrance	Leisure Walking
37	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance
38	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Leisure Walking
39	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance
40	Standing/Entrance	Standing/Entrance	Sitting	Sitting	Standing/Entrance
41	Standing/Entrance	Standing/Entrance	Sitting	Sitting	Standing/Entrance
42	Sitting	Sitting	Sitting	Sitting	Sitting
43	Sitting	Sitting	Sitting	Sitting	Sitting
44	Sitting	Sitting	Sitting	Sitting	Sitting
45	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
46	Sitting	Sitting	Sitting	Sitting	Sitting
47	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
48	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance

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49	Sitting	Sitting	Sitting	Sitting	Sitting
50	Leisure Walking	Leisure Walking	Standing/Entrance	Leisure Walking	Leisure Walking
51	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance
52	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
53	Sitting	Sitting	Sitting	Sitting	Sitting
54	Sitting	Sitting	Sitting	Sitting	Sitting
55	Sitting	Sitting	Sitting	Sitting	Sitting
56	Sitting	Sitting	Sitting	Sitting	Sitting
57	Sitting	Sitting	Sitting	Sitting	Sitting
58	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Leisure Walking
59	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
60	Sitting	Sitting	Sitting	Sitting	Sitting
61	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
62	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance
63	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
64	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Leisure Walking
65	Leisure Walking	Leisure Walking	Standing/Entrance	Leisure Walking	Leisure Walking
66	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
67	Sitting	Sitting	Sitting	Sitting	Sitting
68	Sitting	Sitting	Sitting	Sitting	Sitting
69	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance

Table 7: Comfort Criteria Derived From Mean Wind Speeds – *Configuration 2*

Location	All	Spring	Summer	Autumn	Winter
1	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
2	Standing/Entrance	Standing/Entrance	Sitting	Sitting	Standing/Entrance
3	Leisure Walking	Leisure Walking	Standing/Entrance	Leisure Walking	Leisure Walking
4	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance
5	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance
6	Standing/Entrance	Standing/Entrance	Sitting	Sitting	Standing/Entrance
7	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
8	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
9	Sitting	Sitting	Sitting	Sitting	Sitting
10	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
11	Sitting	Sitting	Sitting	Sitting	Sitting
12	Standing/Entrance	Standing/Entrance	Sitting	Sitting	Standing/Entrance
13	Standing/Entrance	Sitting	Sitting	Standing/Entrance	Standing/Entrance
14	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
15	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
16	Sitting	Sitting	Sitting	Sitting	Sitting
17	Sitting	Sitting	Sitting	Sitting	Sitting
18	Sitting	Sitting	Sitting	Sitting	Sitting
19	Sitting	Sitting	Sitting	Sitting	Sitting
20	Sitting	Sitting	Sitting	Sitting	Sitting
21	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
22	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
23	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
24	Standing/Entrance	Standing/Entrance	Sitting	Sitting	Standing/Entrance
25	Sitting	Sitting	Sitting	Sitting	Standing/Entrance

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26	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance
27	Standing/Entrance	Leisure Walking	Standing/Entrance	Standing/Entrance	Leisure Walking
28	Leisure Walking	Leisure Walking	Standing/Entrance	Standing/Entrance	Leisure Walking
29	Standing/Entrance	Standing/Entrance	Sitting	Sitting	Standing/Entrance
30	Sitting	Sitting	Sitting	Sitting	Sitting
31	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
32	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
33	Sitting	Sitting	Sitting	Sitting	Sitting
34	Standing/Entrance	Leisure Walking	Standing/Entrance	Standing/Entrance	Leisure Walking
35	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance
36	Standing/Entrance	Leisure Walking	Standing/Entrance	Standing/Entrance	Leisure Walking
37	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance
38	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Leisure Walking
39	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance
40	Standing/Entrance	Standing/Entrance	Sitting	Sitting	Standing/Entrance
41	Standing/Entrance	Standing/Entrance	Sitting	Sitting	Standing/Entrance
42	Sitting	Sitting	Sitting	Sitting	Sitting
43	Sitting	Sitting	Sitting	Sitting	Sitting
44	Sitting	Sitting	Sitting	Sitting	Sitting
45	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
46	Sitting	Sitting	Sitting	Sitting	Sitting
47	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
48	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
49	Sitting	Sitting	Sitting	Sitting	Sitting
50	Leisure Walking	Leisure Walking	Standing/Entrance	Leisure Walking	Leisure Walking
51	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance
52	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
53	Sitting	Sitting	Sitting	Sitting	Sitting
54	Sitting	Sitting	Sitting	Sitting	Sitting
55	Sitting	Sitting	Sitting	Sitting	Sitting
56	Sitting	Sitting	Sitting	Sitting	Sitting
57	Sitting	Sitting	Sitting	Sitting	Sitting
58	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Leisure Walking
59	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
60	Sitting	Sitting	Sitting	Sitting	Sitting
61	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
62	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance
63	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
64	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Leisure Walking
65	Leisure Walking	Leisure Walking	Standing/Entrance	Leisure Walking	Leisure Walking
66	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
67	Sitting	Sitting	Sitting	Sitting	Sitting
68	Sitting	Sitting	Sitting	Sitting	Sitting
69	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance

Table 8: Comfort Criteria Derived From Gust Wind Speeds – *Configuration 2*

Location	All	Spring	Summer	Autumn	Winter

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1	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
2	Sitting	Standing/Entrance	Sitting	Sitting	Standing/Entrance
3	Leisure Walking	Leisure Walking	Standing/Entrance	Leisure Walking	Leisure Walking
4	Standing/Entrance	Standing/Entrance	Sitting	Sitting	Standing/Entrance
5	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance
6	Sitting	Standing/Entrance	Sitting	Sitting	Standing/Entrance
7	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
8	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
9	Sitting	Sitting	Sitting	Sitting	Sitting
10	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
11	Sitting	Sitting	Sitting	Sitting	Sitting
12	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
13	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
14	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
15	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
16	Sitting	Sitting	Sitting	Sitting	Sitting
17	Sitting	Sitting	Sitting	Sitting	Sitting
18	Sitting	Sitting	Sitting	Sitting	Sitting
19	Sitting	Sitting	Sitting	Sitting	Sitting
20	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
21	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
22	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
23	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
24	Standing/Entrance	Standing/Entrance	Sitting	Sitting	Standing/Entrance
25	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
26	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance
27	Standing/Entrance	Leisure Walking	Standing/Entrance	Standing/Entrance	Standing/Entrance
28	Standing/Entrance	Leisure Walking	Standing/Entrance	Standing/Entrance	Leisure Walking
29	Standing/Entrance	Standing/Entrance	Sitting	Sitting	Standing/Entrance
30	Sitting	Sitting	Sitting	Sitting	Sitting
31	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
32	Sitting	Sitting	Sitting	Sitting	Sitting
33	Sitting	Sitting	Sitting	Sitting	Sitting
34	Leisure Walking	Standing/Entrance	Standing/Entrance	Leisure Walking	Leisure Walking
35	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Leisure Walking
36	Leisure Walking	Leisure Walking	Standing/Entrance	Standing/Entrance	Leisure Walking
37	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance
38	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Leisure Walking
39	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance
40	Standing/Entrance	Standing/Entrance	Sitting	Sitting	Standing/Entrance
41	Sitting	Standing/Entrance	Sitting	Sitting	Standing/Entrance
42	Sitting	Sitting	Sitting	Sitting	Sitting
43	Sitting	Sitting	Sitting	Sitting	Sitting
44	Sitting	Sitting	Sitting	Sitting	Sitting
45	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
46	Sitting	Sitting	Sitting	Sitting	Sitting
47	Standing/Entrance	Sitting	Sitting	Sitting	Standing/Entrance
48	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
49	Sitting	Sitting	Sitting	Sitting	Sitting
50	Leisure Walking	Leisure Walking	Standing/Entrance	Leisure Walking	Leisure Walking

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51	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
52	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
53	Sitting	Sitting	Sitting	Sitting	Sitting
54	Sitting	Sitting	Sitting	Sitting	Sitting
55	Sitting	Sitting	Sitting	Sitting	Sitting
56	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
57	Sitting	Sitting	Sitting	Sitting	Sitting
58	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Leisure Walking
59	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
60	Sitting	Sitting	Sitting	Sitting	Sitting
61	Standing/Entrance	Standing/Entrance	Sitting	Sitting	Standing/Entrance
62	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
63	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
64	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Leisure Walking
65	Leisure Walking	Standing/Entrance	Standing/Entrance	Standing/Entrance	Leisure Walking
66	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
67	Sitting	Sitting	Sitting	Sitting	Sitting
68	Sitting	Sitting	Sitting	Sitting	Sitting
69	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance

Table 9: Comfort Criteria Derived From Mean Wind Speeds – *Configuration 3*

Location	All	Spring	Summer	Autumn	Winter
1	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
2	Sitting	Standing/Entrance	Sitting	Sitting	Standing/Entrance
3	Leisure Walking	Leisure Walking	Standing/Entrance	Leisure Walking	Leisure Walking
4	Standing/Entrance	Standing/Entrance	Sitting	Sitting	Standing/Entrance
5	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance
6	Sitting	Standing/Entrance	Sitting	Sitting	Standing/Entrance
7	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
8	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
9	Sitting	Sitting	Sitting	Sitting	Sitting
10	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
11	Sitting	Sitting	Sitting	Sitting	Sitting
12	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
13	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
14	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
15	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
16	Sitting	Sitting	Sitting	Sitting	Sitting
17	Sitting	Sitting	Sitting	Sitting	Sitting
18	Sitting	Sitting	Sitting	Sitting	Sitting
19	Sitting	Sitting	Sitting	Sitting	Sitting
20	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
21	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
22	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
23	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
24	Standing/Entrance	Standing/Entrance	Sitting	Sitting	Standing/Entrance
25	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
26	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance
27	Standing/Entrance	Leisure Walking	Standing/Entrance	Standing/Entrance	Standing/Entrance

28	Standing/Entrance	Leisure Walking	Standing/Entrance	Standing/Entrance	Leisure Walking
29	Standing/Entrance	Standing/Entrance	Sitting	Sitting	Standing/Entrance
30	Sitting	Sitting	Sitting	Sitting	Sitting
31	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
32	Sitting	Sitting	Sitting	Sitting	Sitting
33	Sitting	Sitting	Sitting	Sitting	Sitting
34	Leisure Walking	Standing/Entrance	Standing/Entrance	Leisure Walking	Leisure Walking
35	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Leisure Walking
36	Leisure Walking	Leisure Walking	Standing/Entrance	Standing/Entrance	Leisure Walking
37	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance
38	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Leisure Walking
39	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance
40	Standing/Entrance	Standing/Entrance	Sitting	Sitting	Standing/Entrance
41	Sitting	Standing/Entrance	Sitting	Sitting	Standing/Entrance
42	Sitting	Sitting	Sitting	Sitting	Sitting
43	Sitting	Sitting	Sitting	Sitting	Sitting
44	Sitting	Sitting	Sitting	Sitting	Sitting
45	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
46	Sitting	Sitting	Sitting	Sitting	Sitting
47	Standing/Entrance	Sitting	Sitting	Sitting	Standing/Entrance
48	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
49	Sitting	Sitting	Sitting	Sitting	Sitting
50	Leisure Walking	Leisure Walking	Standing/Entrance	Leisure Walking	Leisure Walking
51	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
52	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
53	Sitting	Sitting	Sitting	Sitting	Sitting
54	Sitting	Sitting	Sitting	Sitting	Sitting
55	Sitting	Sitting	Sitting	Sitting	Sitting
56	Sitting	Sitting	Sitting	Sitting	Standing/Entrance
57	Sitting	Sitting	Sitting	Sitting	Sitting
58	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Leisure Walking
59	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
60	Sitting	Sitting	Sitting	Sitting	Sitting
61	Standing/Entrance	Standing/Entrance	Sitting	Sitting	Standing/Entrance
62	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
63	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
64	Standing/Entrance	Standing/Entrance	Standing/Entrance	Standing/Entrance	Leisure Walking
65	Leisure Walking	Standing/Entrance	Standing/Entrance	Standing/Entrance	Leisure Walking
66	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance
67	Sitting	Sitting	Sitting	Sitting	Sitting
68	Sitting	Sitting	Sitting	Sitting	Sitting
69	Standing/Entrance	Standing/Entrance	Sitting	Standing/Entrance	Standing/Entrance

Table 10: Comfort Criteria Derived From Gust Wind Speeds – *Configuration 3*

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Appendix E: General Comments on Wind in the Built Environment

Urban airflow

As the wind approaches a built-up area it is displaced upwards to roof level and tends to blow across the roof tops with gusts down to street level that are a function of the relative heights-to-width of the street canyon. When the height-to width ratio of the street canyon is greater than 0.7 the skimming flow regime dominates and the wind blows across the top of the street with little penetration down to ground level, whereas a height-to-width ratio less than 0.4 produces conditions similar to the isolated building scenario[2]. However, when there is an increase in building height across the street this can reinforce the rotating, or vortex, air movements within the street. Relatively open spaces, even inside a city, can be windy as the wind blows down from roof level into the open space.

Calm areas are generally desirable for pedestrian comfort. However, very slow air movement can result in poor ventilation of pollutants and in these areas it is desirable that pollutant sources are limited.

Seasonal variability

Pedestrian activity differs during the summer and winter months when other climatic conditions, for example air temperature, have a marked impact. The Lawson Criteria assume that pedestrians will be suitably dressed for the season and when making a worst-case assessment it is reasonable to assume that pedestrians will not be sitting at a street-side café on the windiest days of the year.

Entrances

Pedestrians are particularly sensitive to wind conditions at entrances because of the potentially marked change between the controlled environment inside the building and external conditions. For this reason it is important that conditions immediately adjacent to an entrance are relatively benign or that there is a sheltered ‘buffer’ zone, which allows pedestrians time to acclimatise. For recessed entrances the recess creates a buffer zone but is also prone to accumulating wind-blown debris because of the trapped vortex, or rotational, flows that can occur in the recess. Entrances are also used throughout the year so that even during the windiest days of the year the entrance should be relatively sheltered.

Entrances on different building elevations are also susceptible to pressure-driven through flows when opened simultaneously. The windward façade is generally positively pressurised whereas the side and/or downwind façades are at a lower pressure. If the entrances are into a central atrium then the different external surface pressures can be directly connected when doors are opened simultaneously. This can lead to nuisance draughts and in extreme cases difficulty in opening doors or whistling as the pressure difference forces the doors slightly ajar. Revolving doors eliminate the problem because the pressure seal across the building envelope is maintained. The extent of any potential nuisance is in part related to the footfall through the entrances because this will affect the probability of doors being opened simultaneously. Lobby doors are another means of limiting the impact of nuisance draughts but again the likelihood of both sets of lobby doors being opened simultaneously should be considered when selecting and sizing this option.

Landscaping

Landscaping is a very useful means of softening the streetscape and creating naturalised shelter within and around the site. There are generally two ways in which landscaping works; relatively dense lines of planting act like a solid screen deflecting the wind, whereas more open planting removes energy from the wind as it flows through the screen. In both cases shelter is created but for the case

[2] T. R. Oke, ‘Boundary Layer Climates’, Routledge, © 1987

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of the more solid screen winds can remain relatively strong at the extreme ends of the screen. If we consider the case of street canyons in UK towns and cities, the tree canopy minimises the penetration of vertical gusts down to pedestrian level and horizontal winds are displaced upwards by the canopy.

Another consideration is the seasonal variation of the species. Deciduous varieties create a denser screen during the summer months but during the winter months offer limited protection due to the bare branches. Evergreen varieties offer more consistent shelter throughout the year. When considering seasonal variability, account should be taken of the more transient pedestrian activity during the winter months where other climatic factors, e.g. air temperature, impact upon the way in which pedestrians will use a site. Finally, the maturity of the planting is significant; semi-mature species offer reasonable protection from an early stage in the life of the development, whereas immature planting will take time to establish.

Colonnades

In this discussion a colonnade is defined as a covered walkway where the cover is generally provided by overhanging upper storeys of the building. In other words the building footprint at ground level is set-back. Colonnades create shelter from the direct effects of downdraught but are exposed to horizontal winds which can be channelled along the colonnade. If the colonnade connects windward and leeward elevations of the building then a pressure-driven flow is generated through the colonnade. If the building façade at ground level is curved then this can also be expected to accelerate the winds through the colonnade.

Colonnades do not necessarily provide shelter from the wind. Consequently, it may be necessary to increase resistance to air movement along the colonnade, and/or to prevent penetration of wind into the colonnade, by suitable screening.

Covered open spaces

Developments which are covered but open, either along the sides of the roof or at low level, will have internal environmental conditions that are variable and dependent upon the prevailing weather conditions. The canopy, typically a lightweight glazed canopy or fabric roof, may increase shelter from the rain and thereby improve the utility of the covered space; however, when the external air temperature is low and there is a breeze along the street it will generally be the case that pedestrians will need to be suitably dressed.

The challenge with these covered but open spaces is that the perception of shelter due to the canopy roof creates an expectation of shelter from both rain and wind. Put another way, if the wind conditions on a ‘normal’ street are identical to those in a covered street the pedestrian perception will be that the conditions beneath the canopy are less benign.

To design against this it is necessary that the wind conditions along a covered street are relatively benign. It is also important that the retail tenants on the street, particularly those operating food kiosks or cafes with ‘external’ seating, appreciate the variability of the weather conditions or are suitably catered for in terms of demountable screens and (say) patio heaters to enhance conditions locally.

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Appendix F: General Mitigation Principles

Landscaping

Landscaping is generally a useful means of mitigating winds and softening the streetscape. However, unless the planting is relatively dense or organised into rows to create a shelter belt then the impact is relatively localised. There are two further considerations namely the maturity of the specimens and the selection of deciduous or evergreen species. Semi-mature plants offer shelter from a relatively early stage in the life of the development and potentially avoid the site developing a reputation as windy before the landscaping has reached optimum spread. Deciduous varieties offer maximum shelter from the wind during the summer months, when the winds are light; the degree of shelter provided when the branches are bare is greatly diminished and is a function of the density of the branch structure. In general the assumption is that there will be relatively little benefit obtained from deciduous trees during the windier winter months.

Sculptural Screening

Sculptural screens may be solid or porous and again are primarily used to create localised shelter at pedestrian level. Porous screens allow the wind to ‘bleed’ through removing energy from the wind in the process. Solid screens act more as a deflector and care has to be taken that the target of the deflected wind is not a sensitive pedestrian area.

Canopies and Wind Gutters

The function of horizontal canopies and wind gutters is to slow down and redirect the wind around the building above the canopy. In this respect the ground level wind conditions without the canopy are translated upwards to above the canopy. In order for the canopy to work efficiently the wind flowing down the building façade pressurises the top of the canopy as the energy of its motion is converted to pressure, if the canopy runs to the windward corners of the building then this pressurised area has a direct pathway to the corner suctions and this encourages the flow of air along the top of the canopy. Some degree of caution must, however, be exercised because if the nuisance at ground level is caused by a horizontal wind then the canopy will prevent any upward diffusion and deceleration of the wind speed and can therefore make matters worse.

If there is a suitable opening through the building then in principle this can be used as a means of ‘bleeding’ air from the windward façade to the leeward façade, thereby reducing downdraught and ground level wind speeds. The size of the ‘wind gap’, its location on the building and the pressure differential through the wind gap relative to those around the building are expected to influence the efficiency of the wind gap.