10 DAYLIGHT, SUNLIGHT, OVERSHADOWING AND SOLAR GLARE

Introduction

11.1 This chapter of the ES assesses the potential impacts and likely effects of the proposed development with respect to daylight, sunlight, overshadowing and solar glare during the demolition and construction works and once the proposed development is complete and operational.

11.2 This chapter describes the methodology used to assess the potential impacts and likely effects; the baseline conditions currently existing at the application site and surrounding study area; where necessary the mitigation measures required to prevent, reduce or offset any significant adverse effects; and the likely residual effects after these measures have been adopted.

11.3 This chapter is supported by the following appendices in ES Volume 3:

- Technical Appendix 10.1 – Drawings of the Baseline, the Proposed Development and the Cumulative Scenario;
- Technical Appendix 10.2 – Daylight and Sunlight Results for Neighbouring Properties for both the Proposed Development and the Cumulative Scenario;
- Technical Appendix 10.3 – Overshadowing Assessment; and
- Technical Appendix 10.4 – Solar Glare Assessment.

Methodology

11.4 The assessment has been undertaken in accordance with the Building Research Establishment publication 'Site Layout Planning for Daylight and Sunlight. A Guide to Good Practice.' (2011), commonly referred to as the 'BRE guidelines' [1].

11.5 The assessment scope and methodology have been informed by the following relevant national, regional and local legislation and policy:

- NPPF[2];
- PPG;
- Reading Borough Local Plan 2019[3];
- Reading Central Area Action Plan 2009[4];
- Reading Station Area Framework (RSAF)[5];
- British Standard 8206 Part 2: Code of Practice for Daylighting, 2008[6];
- Commission Internationale de L'Eclairage (CIE) 146:2002 and 147:2002 Collection on Glare, 2002[7];
- CIBSE Lighting Guide LG10 - Daylighting - A Guide for Designers, 2014[8]; and
- Information paper IP 3/87 Solar dazzle reflected from sloping glazed facades, 1987[9].

Consultation

11.6 No consultations have been undertaken in addition to the formal EIA scoping process. At the time of undertaking this assessment, the EIA Scoping Opinion remains outstanding.

Assessment Scope

11.7 The assessment has been based on a series of development parameters, assumptions and commitments as described in Chapter 2: EIA Process and Methodology; Chapter 4: Proposed Development Description; and Chapter 5: Demolition and Construction Environmental Management. Due to the flexibility being sought in respect of land use classes and associated development scenarios, the daylight, sunlight, overshadowing and solar glare assessments have been undertaken of the worst-case massing proposals represented by the maximum height residential scheme as shown on Parameter Plan PP-104, due to its height. The solar glare assessment has assumed a worst-case uniform reflective façade treatment for the proposed development.

Technical Scope

11.8 The assessment has considered the following:

- The effect of the proposed development on daylight and sunlight availability at adjacent existing receptors;
- The effect of the proposed development on levels of sunlight at adjacent existing receptors; and
- The effect of the proposed development on existing receptors in respect of potential solar glare.

Spatial Scope

11.9 In respect of daylight and sunlight, the study area comprises sensitive residential receptors within the immediate surroundings of the application site that may be affected by the newly introduced massing of the proposed development.

11.10 In respect of the overshadowing, professional judgement and experience were used to determine the open space and private amenity receptors considered to be in close enough proximity to be affected by shadow cast from the proposed development.

11.11 For the solar glare assessment, professional judgement and experience were used to identify the transport receptors considered to be in close enough proximity to be affected by glare arising from the façade of the proposed development.

[1] Littlefair, P.J, 2011. Building Research Establishment – Site Layout Planning for Daylight and Sunlight. A Guide to Good Practice. Building Research Establishment..BREPress.
[2] Secretary of State for Ministry of Housing, Communities and Local Government, 2019. National Planning Policy Framework.
[3] Reading Borough Council, 2019. Reading Borough Local Plan. RBC.
[4] Reading Borough Council, 2009. Reading Central Area Action Plan.
[5] Reading Borough Council, 2010. Reading Station Area Framework.
[6] British Standards Institution, 2008. British Standard 8206 Part 2: Code of Practice for Daylighting. BSI. London.
[7] Commission Internationale de L'Eclairage, 2002. CIE Collection on Glare 146:2002. Austria. CIE
[8] Chartered Institution of Building Services Engineers, 2014. Lighting for the Built Environment LG10: Daylighting - A Guide for Designers. London. The Society of Light and Lighting.
[9] Littlefair, P.J, 1987. Information paper IP 3/87 Solar dazzle reflected from sloping glazed facades. BRE. BREPress.

Temporal Scope

11.12 The assessment considers the potential impacts and likely effects of the proposed development during the demolition and construction stage and the completed development stage.

11.13 For the completed development stage, the following scenarios have been assessed and are reported within this chapter:

- Existing baseline;
- Existing baseline + proposed development;
- Existing baseline + proposed development + cumulative schemes; and
- Existing baseline + Reading Station Area Framework.

11.14 The assessment of the Reading Station Area Framework (RSAF) has been included in order to provide a comparison against the results for the proposed development. The RSAF is considered a material consideration and represents the massing and density envisaged by the RBC for the application site and the wider Reading Railway Station regeneration area.

Baseline Characterisation Method

Desk Study

11.15 A desk top review of the site location was undertaken to identify the potential neighbouring sensitive receptors. Information on residential properties was obtained from public records on RBC's website and online property sources (i.e. Rightmove). Online research endeavoured to establish the internal configuration of residential properties and assisted with the site visit.

Field Study

11.16 A site visit was undertaken in May 2018 and October 2019. This was carried out in order to confirm the existing application site and study area conditions. Photographs were taken during the visit in order to inform the computer modelling and observations made with regard to the potential internal configuration of the sensitive receptors. During the site visit, the location for the assessment of the potential for solar glare was considered.

Modelling

11.17 In respect of daylight and sunlight, the baseline conditions were determined by producing a 3D computer model of the neighbouring properties and the existing structures on the application site. The 3D computer modelling was undertaken by means of a 3D context massing model, site survey, site photographs and online research in relation to the neighbouring residential receptors and orientated with reference to Ordnance Survey information. Information on the dimensions of only 19 % of the rooms within the neighbouring properties were obtained, with the remainder being based on assumptions. The analysis was carried out using MBS Software.

11.18 No baseline modelling was undertaken in respect of overshadowing and solar glare.

Assessment Method

Methodology

11.19 A technical analysis was undertaken to establish the potential impacts of the proposed development with regard to daylight, sunlight and overshadowing enjoyed by the sensitive receptors. The analysis was based on a 3D computer model, created in AutoCAD, of the existing situation on the application site, the neighbouring properties and use of the following information:

- Photographs taken during the site visit;
- Full measured survey;
- Information obtained from public records on RBC's website;
- Information obtained from online property sources (i.e. Rightmove); and
- Drawings produced by the Applicant's appointed Architects which form part of the EIA.

11.20 A specialist computer programme (MBS) was used to undertake the required technical analysis of Vertical Sky Component (VSC), No Sky Line (NSL), Annual Probable Sunlight Hours (APSH), permanent shadow and solar glare in accordance with the BRE guidelines. This process used Waldram diagrams to quantify the levels of daylight and sunlight in both the baseline condition and with the completed proposed development.

11.21 The assessments comprised the following:

- Identify the neighbouring receptors that are likely to be impacted by the proposed development;
- Through detailed modelling, determine the effects that the proposed development would have on the daylight and sunlight compared with the existing situation and consider the results against numerical targets; and
- Assess the cumulative effect of the proposed development and approved developments on existing receptors.

Daylight and Sunlight

11.22 The BRE guidelines suggests that residential properties have the greatest need for good daylight and sunlight and that key habitable rooms should be considered. The BRE guidelines states "*the guidelines are intended for use for rooms in adjoining dwellings where light is required, including living rooms, kitchens and bedrooms*". Bedrooms are considered less important as they are mainly occupied at night-time. The guidelines also highlight other property types which may be considered as 'sensitive receptors' such as schools, hospitals, hotels and hostels, small workshops and some offices, if they have a reasonable expectation for daylight.

11.23 Within the guidelines there are several methods for calculating daylight; however, there are two methods that are predominantly used; these being the measurement of the Vertical Sky Component (VSC) and Daylight Distribution (DD) with regard to neighbouring sensitive receptors.

11.24 The BRE guidelines advise that in urban areas, particularly in areas of regeneration, the VSC and DD test may not be the most appropriate assessment due to the relationship between buildings and the fact that VSC and DD is based on the existing and proposed condition. Therefore, where there is a clear sky or there are particularly low-rise buildings existing on the application site, as in the case here, results are distorted. Where the VSC and DD values fall considerably short of the numerical values in the BRE guidelines, analysis results have been considered against alternative targets consistent with the application site's urban location, considering, e.g. massing and obstruction angles in the existing situation or existing buildings that are particularly close to an application site's boundary. In this situation, the BRE guidelines describe an appropriate methodology to assess cases where an existing building has windows unusually close to the application site boundary and taking more than their fair share of light.

11.25 With regard to sunlight, the Annual Probable Sunlight Hours (APSH) are calculated, as well as consideration of the levels during the winter months, for all windows facing within 90° of due south to the neighbouring residential properties, in both the baseline condition and with the proposed development implemented.

11.26 As with daylight, where appropriate, alternative targets which are consistent with sites located in dense urban locations have been adopted to assess sunlight access to the neighbouring buildings.

11.27 Daylight and sunlight assessments of the neighbouring residential properties have been undertaken using the VSC, NSL and APSH calculations. All properties that may possibly be affected have been included in the assessment.

11.28 To establish whether a neighbouring residential property is required to be considered, it is calculated whether the proposed development will bisect a 25° line drawn from the centre of the window to the lowest window within the neighbouring property, serving a habitable room, as indicated on Figure 10.1. Where this plane is bisected, a more detailed daylight and sunlight assessment is required.

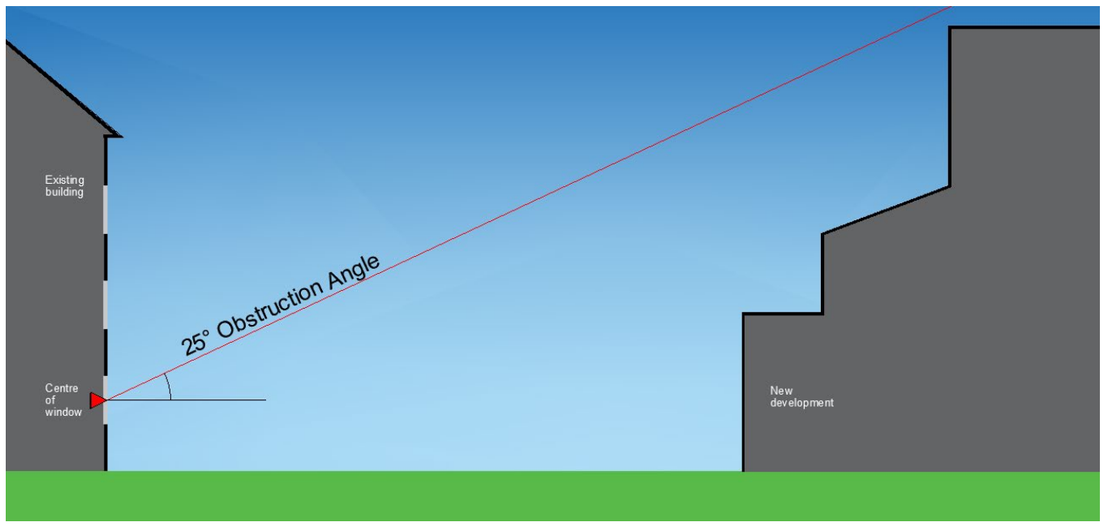

Figure 10.1: Initial 25° Daylight and Sunlight Analysis

Vertical Sky Component

11.29 The VSC analysis establishes the amount of available daylight received directly from the sky for each individual window. The reference point for the analysis is the centre of the window, on the plane of the outer window wall.

11.30 This is the ratio of the direct sky illuminance falling on the vertical wall at a reference point, to the simultaneous horizontal illuminance under an unobstructed sky. The VSC does not include reflected light.

11.31 To maintain good levels of daylight, the BRE guidelines recommend a VSC of 27 % or greater. However, within an urban environment, the guidelines recognise that a lower VSC is acceptable. Given the application site context and based on similar sites, professional judgement has been used to establish that a VSC of 15 % could be considered acceptable for such an urban context. However, on balance, it is considered that a VSC of 20 % is a more appropriate alternative target.

11.32 Where windows are affected by the proposed development, or cumulative effects of the proposed developments and a VSC of less than 20 % is calculated, a comparison of existing and proposed levels of VSC should be made. Where possible, the proposed development VSC should not be less than 80 % of the pre-development VSC.

Daylight Distribution

11.33 As well as calculating the VSC, the assessment for surrounding receptors has also considered the distribution of the daylight within the neighbouring residential properties by plotting the No Sky Line (NSL). This is the point within the room that at desk top level can see no sky and the BRE guidelines recommend that a significant portion of the room (80 %) or at least 0.8 times the existing area is in front of this line. For such an urban context, 50 % is considered to be an appropriate alternative target.

11.34 Concerning the neighbouring residential properties, no access has been obtained to measure the internal arrangements and, therefore, where possible, plans obtained from online planning records have been used.

Annual Probable Sunlight Hours

11.35 The BRE has produced sunlight templates for London, Manchester and Edinburgh which indicate the APSH for these regions. For this study, the London template has been used.

11.36 A sunlight analysis is undertaken using a similar method for calculating the VSC. Within residential accommodation, the BRE guidelines under paragraph 3.2.3 state that the criteria for a sunlight analysis is that the main windows that are "*within 90^0 of due south*" should be assessed by measuring the APSH. Windows more than 90^0 from due south do not therefore need to be analysed. Within residential accommodation, sunlight is mainly required for living rooms and is regarded as less important in bedrooms and kitchens, although the guidelines advise that care should be taken not to block out too much sun.

11.37 The APSH is defined as the total number of hours in the year that sun is expected to shine on unobstructed ground.

11.38 The BRE guidelines suggest that a window enjoys adequate sunlight if it receives at least 25 % APSH throughout the year, with at least 5 % during the winter months; 21st September to 21st March. Where this is not achieved, if the difference between the baseline and the proposed assessment is more than 4 % or less or provided the total APSH including the winter months is within 0.8 times the existing, the window will not be adversely affected.

Overshadowing

11.39 Part 3.3 of the BRE guidelines provides guidance and methodology for assessing the implications a proposal will have on the overshadowing of gardens and amenity areas and sets out recommendations for the minimum area that should achieve at least two hours of sunlight on 21st March.

11.40 The open spaces that it states would normally be considered are:

- Gardens, usually the main back gardens of a house;
- Parks and playing fields;
- Children's playgrounds;
- Outdoor swimming pools and paddling pools;
- Sitting out areas such as those between non-domestic buildings and in public spaces; and
- Focal points for views such as a group of monuments or fountains.

11.41 The guidelines go on to state under paragraph 3.3.17:

"*It is recommended that for it to appear adequately sunlit throughout the year, at least half of a garden or amenity area should receive at least two hours of sunlight on 21 March. If as a result of new development an existing garden or amenity area does not meet the above, and the area which can receive two hours of sun on 21 March is less than 0.8 times its former value, then the loss of sunlight is likely to be noticeable. If a detailed calculation cannot be carried out, it is recommended that the centre of the area should receive at least two hours of sunlight on 21 March*."

11.42 The overshadowing assessment has been undertaken in relation to all relevant existing public amenity space currently within the vicinity of the application site that may be affected by the proposed development.

11.43 The assessment has also considered the potential public and communal amenity space within the proposed development, with reference to the development parameters as described in Chapter 4: Proposed Development Description, and the access to direct sunlight this would enjoy.

Solar Glare

11.44 Where solar glare occurs, it can cause a temporary impairment to drivers' sight. As a result, the effect of reflective elements of the façade treatment are considered.

11.45 With reference to solar glare, the BRE guidelines make the following statement under Clause 5.8.1:

"Glare or dazzle can occur when sunlight is reflected from a glazed façade or area of metal cladding. This can affect road users outside and the occupants of adjoining buildings. The problem can occur either when there are large areas of reflective glass or cladding on the façade, or when there are areas of glass or cladding which slope back so that high altitude sunlight can be reflected along the ground. Thus, solar dazzle is only a long-term problem for some heavily glazed (or mirror clad) buildings…"

11.46 The assessment has considered potentially sensitive Test Points (TP) surrounding the application site.

11.47 It considers the potential for solar glare or dazzle from the glazing or reflective facades of the proposed development in relation to each of the specific points. The key factor being the contrast between the brightness of the façade compared with the background ambient luminance.

11.48 Building Research Establishment Information Paper referenced IP8/87 states:

"Glare or dazzle can occur when sunlight is reflected from a glazed façade. For vertical facades this problem usually occurs only when the sun is low in the sky; but some types of modern design incorporate sloping facades which can, under certain circumstances, reflect unwanted high altitude sunlight in-to the eyes of motorists, pedestrians and people in nearby buildings. Addressed to architects, consulting engineers, planning consultants and planners, this paper presents a new method which can be used at the design stage to calculate whether such solar dazzle will be reflected from a proposed building façade."

11.49 Guidance on determination of significance is contained in Appendix I of the BRE guidelines, which states: "The assessment of impact will depend on a combination of factors and there is no simple rule of thumb that can be applied."

11.50 The assessment for each sensitive receptor has been carried out at drivers' eye height, considered to be 1.5m for cars and at the appropriate distance from the junction, taking into account direction of travel and the relevant traffic element.

11.51 The Field of Vision is the extent of the observable world that is seen at any given moment.

"*The normal human visual field extends to approximately 60 degrees nasally (towards the nose or inward) in each eye, to 100 degrees temporally (away from the nose or outward) and approximately 60 degrees above and 75 degrees below the horizontal meridian. In the United Kingdom, the minimum field requirement for driving is 60 degrees either side of the vertical meridian and 20 degrees above and below horizontal. The macula corresponds to the central 13 degrees of the visual field, the fovea to the central 3 degrees, they are most sensitive to solar glare."*

11.52 Occurrences of solar glare at angles beyond 30^0 would be of little significance. When driving in a typical car, the windscreen would normally obstruct the driver's view beyond angles of 30^0 from the line of sight.

11.53 The assessment is undertaken using a specialist computer programme (MBS). It considers the path of the sun for the entire year assuming a perfectly clear sky and then uses the data from weather information for the closest location, to calculate the potential for glare to occur, which factors in whether at each time of day throughout the year sunlight is likely to occur, this factor being between 0 % and 50 % with reference to the BRE's information paper IP 3/87 'Solar dazzle reflected from sloping glazed facades'.

Assessment Criteria

11.54 The criteria set out in the BRE guidelines has been used to assess if the likely effects from the proposed development on the neighbouring receptors is significant or not. This is determined by considering the sensitivity of the receptor, magnitude of impact, and scale of effect (including the duration of the effect and the geographical extent of the effect) and the application of professional judgement.

11.55 The assessment has considered the effects on the neighbouring residential receptors, with reference to the levels set out in the BRE guidelines: these being negligible, minor, moderate or major. The assessment has considered the VSC achieved by each window serving a habitable room and the DD to each habitable room with reference to the numerical values set out in the BRE guidelines. The assessment has also considered the sunlight enjoyed by windows facing within 90° due south with reference to the APSH enjoyed during the summer months, as well as during winter months.

11.56 As clearly stated in the BRE guidelines, they need to be applied flexibly.

11.57 In relation to the proposed amenity space within the proposed development, the publicly open space between and surrounding the building plots within the application site boundary were assessed to identify those areas that would enjoy at least 2hrs of direct sunlight on 21 March, in accordance with the BRE guidelines.

11.58 The solar glare analysis has considered the potential for glare to occur from the façade of the proposed development based on a uniform reflectivity and the appropriate climate data, to establish the potential for and duration of solar glare in relation to the line of sight.

11.59 To consider the significance of likely effects, the results of the analysis have been compared against the recommendations set out in the BRE guidelines, as summarised in Table 10.1.

Table 10.1: Summary of Assessment Criteria

Issue		BRE Criteria
Daylight	VSC	A window may be adversely affected if its VSC measured at the centre of the window is less than 27 % and less than 0.8 times its former value, although for such a location a VSC of 20% is considered appropriate
	NSL	A room may be adversely affected if less than 0.8 times its existing area lies infront of the NSL, although for such a location, 50 % of the room in front of the NSL is considered appropriate.
Sunlight	APSH	A window may be adversely affected if a point at the centre of the window receives in the year less than 25 % of the annual probable sunlight hours including at least 5 % of the winter probable sunlight hours. (APSH) during the winter months (21st September to 21st March) and less than 0.8 times its former sunlight hours during either period.
Overshadowing		The BRE recommend that for gardens and open spaces to appear adequately sunlight throughout the year, at least half of the area (50 %) should receive at least two hours of sunlight on 21st March.
Solar Glare		Motorists may experience glare from the potential for solar dazzle for long periods within 30^0 of the line of sight.

11.60 However, in some instances, a further daylight assessment has been undertaken against alternative targets, as described in the assessment method section, namely a VSC of 20 % and at least 50 % of a rooms area able to see skylight, as the BRE guidelines are based on a low density urban location. This is considered to be suitably justifiable given the urban nature of the application site and by virtue of the results of the assessment against the RSAF massing, which confirmed the appropriateness of the alternative targets.

Receptor Sensitivity Criteria

11.61 The sensitivity of receptors has been classified as low, medium or high, in line with the criteria set out in Table 10.2.

Table 10.2: Receptor Sensitivity Criteria

Sensitivity	Criteria

Table 10.2: Receptor Sensitivity Criteria	
Low	Small number or low sensitivity of viewers assumed. Viewers with a passing interest in their surroundings and momentary viewing periods. Infrequent users of open spaces around the proposed development.
Medium	Viewers with everyday access to this environment but perhaps with less expectations as they are spending shorter periods of time in the space or are within an office environment. They may have previously used the space and therefore will be aware of the change, but it would affect them less. Areas of residential properties that are not main living rooms and therefore less time is spent in these spaces.
High	Viewers likely to feel the immediate impact to their surroundings and notice a significant reduction in the amount of natural light to their environment. Such receptors would include areas where viewers spend a large amount of time and expect access to high levels of daylight, such as living areas or residential properties.

Impact Magnitude Criteria

11.62 The magnitude of impact has been classified as very small, small, medium, high and is based on professional judgement with reference to the criteria set out in Table 10.3.

Table 10.3: Impact Magnitude Criteria	
Magnitude of Impact	**Criteria**
High	Daylight and Sunlight numerical values less than BRE guidance targets by more than 50 %.
Medium	Daylight and Sunlight numerical values less than BRE guidance targets by no more than 50 %.
Small	Daylight and Sunlight numerical values less than BRE guidance targets by no more than 20 %.
Very Small	BRE guidance numerical targets for Daylight and Sunlight met.

Significance Criteria

11.63 The BRE guidelines have been used to produce significance criteria to assess the likely effects of the proposed development. Within Appendix I of the guidelines it states:

"Adverse impacts occur when there is a significant decrease in the amount of skylight and sunlight reaching an existing building where it is required, or in the amount of sunlight reaching an open space. The assessment of impact will depend on a combination of factors, and there is no simple rule of thumb that can be applied."

"Where the loss of skylight or sunlight fully meets the guidelines in this book, the impact is assessed as negligible or minor adverse. Where the loss of light is well within the guidelines, or only a small number of windows or limited area of open space lose light (within the guidelines), a classification of negligible impact is more appropriate. Where the loss of light is only just within the guidelines, and a larger number of windows or open space area are affected, a minor adverse impact would be more appropriate, especially if there is a particularly strong requirement for daylight and sunlight in the affected building or open space."

"Where the loss of skylight or sunlight does not meet the guidelines in this book, the impact is assessed as minor, moderate or major adverse. Factors tending towards a minor adverse impact include:

- *only a small number of windows or limited area of open space are affected;*
- *the loss of light is only marginally outside the guidelines;*
- *an affected room has other sources of skylight or sunlight;*
- *the affected building or open space only has a low-level requirement for skylight or sunlight; and*
- *there are particular reasons why an alternative, less stringent, guideline should be applied"*

"Factors tending towards a major adverse impact include:

- *a large number of windows or large area of open space are affected;*
- *the loss of light is substantially outside the guidelines;*
- *all the windows in a particular property are affected; and*
- *the affected indoor or outdoor spaces have a particularly strong requirement for skylight or sunlight, e.g. a living room in a dwelling or a children's playground"*

"Beneficial impacts occur when there is a significant increase in the amount of skylight and sunlight reaching an existing building where it is required, or in the amount of sunlight reaching an open space. Beneficial impacts should be worked out using the same principles as adverse impacts. Thus, a tiny increase in light would be classified as a negligible impact, not a minor beneficial impact."

11.64 With reference to the BRE guidelines, the Tables 10.4 – 10.8 provide numerical values to assist in the assessment of the significance of the effect, although it should be noted that in each instance, professional judgement has been applied taking into account particular factors/considerations, as stated in paragraph 1.6 of the BRE guidelines.

Table 10.4: Vertical Sky Component Criteria	
Window Reduction	**Scale of Effect**
Less than 20% reduction or >27% VSC	Negligible
Between 20 % and 29.9 % reduction	Minor
Between 30 % and 39.9 % reduction	Moderate
Greater than 40 % reduction	Major

Table 10.5: Daylight Distribution Criteria	
Window Reduction	**Scale of Effect**
Proposed area is >0.8 times former value	Negligible
Proposed area is between 0.6 and 0.79 times former value	Minor
Proposed area is between 0.4 and 0.59 times former value	Moderate
Proposed area is <0.4 times former value	Major

Table 10.6: Annual Probable Sunlight Hours Criteria	
Window Reduction	**Scale of Effect**
Less than 20% reduction or >25% APSH	Negligible
Between 20% and 29.9% reduction	Minor
Between 30% and 39.9% reduction	Moderate
Greater than 40% reduction	Major

Table 10.7: Annual Probable Sunlight Hours Winter Test Criteria

Window Reduction	Scale of Effect
Proposed APSH in winter >5%	Negligible
Proposed APSH in winter <5% between 0.6 and 0.79 times former value	Minor
Proposed APSH in winter <5% between 0.4 and 0.59 times former value	Moderate
Less than 0.4 times former value	Major

Table 10.8: Overshadowing Criteria

Percentage of Amenity Area that receives 2 hours Sunlight on 21 March	Scale of Effect
>50% or >0.8 times existing	Negligible
>40% or >0.6 times existing	Minor
>25% or >0.4 times existing	Moderate
>25% or >0.4 times existing	Major

11.65 In respect of solar glare, there are no numerical values available to identify the effect on sensitive receptors. In relation to each sensitive receptor location, professional judgement has been used to determine the scale of effect and associated significance. Complete avoidance of glare is not possible; however, its duration and frequency will determine its effect. The criteria in Table 10.9 informed the assessment.

Table 10.9: Solar glare Criteria

Scale of Effect	Description of Solar Glare Effect
Negligible	No solar dazzle visible or if visible, all occurs outside the driver's typical field of view.
Minor	Solar dazzle visible within the driver's typical field of view for short periods of time, e.g over one or two months of the year
Moderate	Solar dazzle visible within the driver's typical field of view for long periods of time, e.g over the majority of the year
Major	Solar dazzle visible within 3^0 of the driver's line of sight.

11.66 The nature of the effects may be either adverse (negative), beneficial (positive) or neutral.

11.67 Where the numerical criteria of the BRE guidelines is achieved, a Negligible effect has been reported.

11.68 As a general rule, the following criteria has been applied:

- 'Moderate' or 'major' effects are deemed to be 'significant';
- 'Minor' effects are considered to be 'not significant', although they may be a matter of local concern; and
- 'Negligible' effects are considered to be 'not significant' and not a matter of local or wider concern.

11.69 Where an effect is given as a range such as minor to moderate, professional judgement has been used to determine the significance with reference to the greater of the two effects.

Assumptions and Limitations

11.70 When considering the neighbouring sensitive receptors for the assessment, research was undertaken using online resources. This provided information on the internal configuration of 19 % of these. Based on this information, reasonable assumptions were made on the internal layout of the remaining, in conjunction with on-site observations.

11.71 The assumptions made for the Vastern Road properties are: -

- 17 to 29 Vastern Road:
  - Single aspect ground floor reception room 4.4 m x 3.4 m
  - First floor single aspect bedroom 3.6 m x 4.6 m
  - Second floor bedroom 4.5 m x 4.3 m
  - Note, 29 Vastern Road only has windows at ground and first floor.
- 31-33 Vastern Road
  - Single aspect ground floor reception room 4.2 m x 3.5 m
  - First floor single aspect bedroom 4.4 m x 3.5 m
  - Second floor bedroom 3.5 m x 1.6 m
- 35-49 Vastern Road
  - Single aspect ground floor reception room 4.2 m x 3.3 m
  - First floor single aspect bedroom 4.4 m x 3.3 m
  - Second floor bedroom 5.8 m x 4.5 m
- With regard to 87-89, 91 and 93-99 Caversham Road, floor plans were obtained for 87-89 and 93-99 from RBC's website and in relation to 91 Caversham Road, the following assumptions have been made:
  - First floor rooms 3.55 m x 4.65 m
  - Second floor bedroom 3.55 m x 4.65 m

11.72 There are no neighbouring non-domestic buildings that have a reasonable expectation of daylight identified.

11.73 No existing amenity space were identified in the vicinity of the application site that required an overshadowing analysis. In relation to the proposed development, 10 % of the site area is to be delivered as open space, which includes the thoroughfares between each of the plots (A-D). Therefore, an overshadowing assessment has been undertaken of this area.

11.74 In relation to the solar glare analysis, this does not quantify the intensity but just whether there is a potential for it to occur.

11.75 Whilst care has been taken to identify all sensitive receptors, there may be other sensitive receptors where solar dazzle could occur. However, the assessor considers the assessment presented in this chapter to be robust and representative.

11.76 The assessment has only considered the potential for solar glare from the proposed development in the local vicinity, and it has been assumed that the facades of the proposed development would be finished with a material with reflection properties equivalent to glass.

Baseline Conditions

Existing Baseline

11.77 The application site is occupied by four low-rise pavilion style commercial units and one building extending to approximately 2-3 storeys in height. The wider context of the application site is characterised by low rise urban development with a mixture of commercial, industrial and residential uses.

11.78 The application site is considered to be underdeveloped for such an urban location and therefore the neighbouring properties currently enjoy a very high level of daylight and sunlight.

11.79 Overshadowing and solar glare are not comparative assessments and therefore no baseline conditions have been recorded.

Sensitive Receptors

Daylight and Sunlight

11.80 The BRE guidelines state that habitable rooms within surrounding residential properties that can expect to receive a reasonable amount of daylight should be assessed. In the first instance, a 25° line analysis was undertaken to establish which of the neighbouring properties subtend this angle and therefore receive a good level of daylight.

11.81 The properties that do not subtend 25° therefore need to be assessed. The receptors identified as sensitive to the proposed development and which have been scoped into the assessment are set out in Table 10.10.

Table 10.10: Summary of Sensitive Receptors

Receptor	Sensitivity
17-49 Vastern Road	High
87-89 Caversham Road	High
91 Caversham Road	High
93-99 Caversham Road	High

11.82 The location of these properties is illustrated in Figure 10.2.

Figure 10.2: Existing Residential Receptors

11.83 Within each receptor, only the windows that face the proposed development have been analysed. The location of neighbouring non-domestic buildings where a reasonable expectation of daylight is required, identified of the windows analysed are indicated on drawing numbers 2271-102 in Appendix 10.1.

Overshadowing

11.84 Based on on-site observations, there are no neighbouring amenity areas that would be affected by the proposed development and therefore assessment of surrounding amenity areas has not been considered further. Instead the assessment has focussed on the amenity space to be provided on-site as part of the proposed development, based on the interpretation of the development parameters set out in Chapter 4: Proposed Development Description.

Solar Glare

11.85 Based on on-site observations, the key locations that have been considered are traffic junctions adjacent to the application site, sections of road where it is considered that drivers of vehicles are likely to be affected having regard to the direction of traffic flow. The eight locations considered in the assessment are:

- Test Point 1 – Caversham Road southbound to round-a-bout with Vastern Road
- Test Point 2 – Vastern Road westbound to De Montford Road Junction
- Test Point 3 – De Montford Road Junction with Vastern Road
- Test Point 4 – Vastern Road westbound to Lynmouth Road Junction
- Test Point 5 – Lynmouth Road Junction with Vastern Road
- Test Point 6 – Vastern Road eastbound
- Test Point 7 – Vastern Road eastbound to Lynmouth Road Junction
- Test Point 8 – Caversham Road northbound to Northfield Road Junction

11.86 The location of these test points is illustrated in Figure 10.3

Figure10.3: Solar Glare Test Point Scenarios

Baseline Daylight and Sunlight

11.87 The daylight analysis of the residential receptors has considered the VSC enjoyed by 75 windows and the DD within 62 rooms these serve.

11.88 The APSH has considered 61 rooms that face within 90° of due south.

11.89 The results of the baseline daylight assessment demonstrate that all 75 windows achieve a VSC of at least 27 % with all except 15 second floor bedrooms of the 62 rooms these serve, having a significant portion of their area seeing skylight and therefore achieving the recommended DD.

11.90 With regard to the sunlight baseline assessment, all 61 rooms achieve an APSH of at least 25 % with at least 5 % during the winter months.

11.91 Within the baseline condition, not all rooms achieve the recommended DD set out in the BRE guidelines as the rooms are served by small windows which restrict the access to daylight.

11.92 Table 10.11 summarises the baseline results for daylight and sunlight to the neighbouring residential properties.

Table 10.11: Baseline Daylight Results

Receptor	Number of Windows		
	Assessed	Achieve BRE Guidelines	%
17-49 Vastern Road	57	57	100
87-89 Caversham Road	6	6	100
91 Caversham Road	3	3	100
93-99 Caversham Road	9	9	100
Total	75	75	100

11.93 Table 10.12 summarises the baseline DD results.

Table 10.12: Baseline Daylight Distribution Results

Receptor	Number of Rooms		
	Assessed	Achieve BRE Guidelines	%
17-49 Vastern Road	50	36	72
87-89 Caversham Road	4	4	100
91 Caversham Road	2	2	100
93-99 Caversham Road	6	6	100
Total	62	47	77

11.94 Table 10.13 summarises the baseline sunlight results.

Table 10.13: Baseline Sunlight Results

Receptor	Number of Rooms		
	Assessed	Achieve BRE Guidelines	%
17-49 Vastern Road	50	50	100
87-89 Caversham Road	4	4	100
91 Caversham Road	2	2	100
93-99 Caversham Road	5	5	100
Total	61	61	100

Table 10.13: Baseline Sunlight Results

Assessment of Effects

Demolition and Construction Effects

11.95 During the demolition and construction stage, there are likely to be negligible, short-term improvements to daylight and sunlight enjoyed by the surrounding sensitive receptors, owing to the low scale of the existing structures on the application site. In respect of solar glare, there would be no effect or potentially a short-term improvement with the buildings removed, although due to their low scale and form of construction, this is considered Negligible.

11.96 Throughout the construction of the proposed development, the magnitude of impact and the resultant effect on daylight, sunlight, overshadowing and solar glare would gradually increase as the massing increases. No technical analysis has been undertaken of the potential effect as the situation would be constantly changing. The effects would almost certainly be less than that of the completed proposed development and therefore the effect during this period would be temporary and range from **Negligible Beneficial** to **Moderate Adverse**, but due to the temporary nature, would not be significant.

Completed Development Effects

11.97 The proposed development is expected to generate potential direct daylight, sunlight and solar glare impacts.

11.98 The detailed results of the analysis are set out in Appendix 10.2 and are summarised for each receptor below. The receptors have been assessed based on the numerical values set out in the BRE guidelines. In the case of daylight to 17-49 Vastern Road, an assessment against the alternative targets as set out in the Assessment Methodology section has also been undertaken.

11.99 Professional judgement has been used when considering the significance of the effect taking into account the urban context of the application site.

Daylight to Surrounding Sensitive Receptors

17-49 Vastern Road

11.100 These 17 properties are located to the north of the application site on the opposite side of Vastern Road. They are within two blocks of terraced houses providing residential accommodation over two or three storeys.

11.101 The daylight analysis has considered 57 windows serving these properties, with the results set out on Table 10.14.

Table 10.14: 17-49 Vastern Road – Summary of VSC Results

No. of windows analysed	No of windows achieving BRE Guidelines for VSC	Negligible <20 % existing or >27 % VSC	Minor 20 – 29 % reduction	Moderate 30 – 39 % reduction	Major >40 %
57	0	0	0	39	18

11.102 Of the 17 properties analysed, information relating to the internal configuration has been obtained on 19 % of these. This information has been used to form the basis of the assumptions made in relation to

the remaining properties. Due to the underdeveloped nature of the application site, they currently enjoy exceptional levels of daylight for such an urban location.

11.103 The results of the analysis against the BRE criteria (27%) show that the majority (39) experience a reduction of between 30-40 %. A further 18 would experience a reduction of just over 40 %. No windows would experience a reduction over 50 %. The effect would therefore appear to be **Moderate** to **Major Adverse**.

11.104 This however does not reflect the true situation, as the resulting VSC is being expressed as a percentage of the baseline assessment where these properties are experiencing an exceptionally high VSC considering the urban location.

11.105 In respect of the actual level of daylight that these windows would continue to enjoy, Appendix 10.2 demonstrate that all 57 windows would achieve a VSC of at least 20 %, which is considered an appropriate alternative numerical target for an urban area. Based on professional judgment, it is considered that the proposals would have a **Minor to Moderate** Adverse effect on the VSC enjoyed by these properties.

11.106 The results of the DD analysis, based on the assumptions made, are summarised in Table 10.15.

Table 10.15: 17-49 Vastern Road – Summary of DD Results

No. of rooms analysed	No of rooms achieving BRE Guidelines for DD	Negligible >0.8 existing	Minor 0.6 – 0.79 %	Moderate 0.4 – 0.59 %	Major <0.4 %
50	14	14	25	7	4

11.107 Of the 50 rooms considered, 33 of these are bedrooms which the BRE guidelines state are considered less important.

11.108 In relation to the 17 living rooms, considered against the BRE criteria (>80% or 0.8 times the existing area in front of the NSL) 15 of these would achieve the BRE guideline targets or experience a Minor effect. Concerning the remaining two living rooms, these would experience a Moderate effect.

11.109 With regard to the 33 bedrooms analysed, which the BRE guidelines state are less important, 27 % of these would achieve the BRE guidelines numerical values and the effect would be negligible. 45 % of the bedrooms would experience a Moderate effect, with 15 % experiencing a Moderate or Major effect. All the bedrooms that experience a Moderate or Major effect are the large second floor bedrooms that are served by small windows and in the baseline condition do not achieve the numerical values within the BRE guidelines despite the under developed nature of the application site. Accordingly, the effect on DD would be **Minor to Major Adverse** and significant.

11.110 Taking into account the underdeveloped nature of the site for such a location, all except one living room and all except the second-floor bedrooms, would achieve the alternative target, having more than 50 % of their area in front of the NSL.

11.111 Based on the BRE criteria it is considered that the effect on daylight enjoyed by these receptors would be **Moderate Adverse**, which would be considered significant.

11.112 However, taking into account the underdeveloped nature of the application site for such an urban location and the exceptionally high levels of daylight enjoyed in the baseline scenario, it is more appropriate to consider the actual levels of retained daylight that would be achieved in the proposed scenario, rather than considering these as a percentage reduction of the baseline.

11.113 Accordingly, when assessed against the alternative targets, the effect on these receptors would be **Minor to Moderate Adverse**, with only a number of isolated locations experiencing **Moderate Adverse** effects, which, on balance, would not be considered significant.

87-89 Caversham Road

11.114 This property is located to the west of the application site on the opposite side of Caversham. Commercial accommodation is provided at ground floor level with residential accommodation on the two upper floors. The magnitude impact on these properties would be Very Small with an isolated location where it would be Small**.**

11.115 The results of the VSC analysis are summarised in Table 10.16.

Table 10.16: 87-89 Caversham Road – Summary of VSC Results

No. of windows analysed	No of windows achieving BRE Guidelines for VSC	Negligible <20 % existing or >27 % VSC	Minor 20 – 29 % reduction	Moderate 30 – 39 % reduction	Major >40 %
6	3	3	2	1	0

11.116 The results of the analysis demonstrate that three of the windows assessed would not achieve the BRE guidelines numerical values. However, all would achieve a VSC of at least 26.6 % as set out in Appendix 10.2 and therefore the effect is considered to be **Negligible**.

11.117 The results of the DD analysis, based on the assumptions made, are summarised in Table 10.17.

Table 10.17: 87-89 Caversham Road – Summary of DD Results

No. of rooms analysed	No of rooms achieving BRE Guidelines for VSC	Negligible >0.8 existing	Minor 0.6 – 0.79	Moderate 0.4 – 0.59	Major <0.4 existing
4	4	4	0	0	0

11.118 The results demonstrate that despite the urban location of these properties, all rooms would achieve the BRE guidelines numerical values for DD and the effect would therefore be **Negligible**.

11.119 As a result, the effect on the daylight enjoyed by these properties would be **Negligible Adverse**.

91 Caversham Road

11.120 This property is located to the west of the application site on the opposite side of Caversham Road. Based on the site visit undertaken, the property provides commercial accommodation at ground floor level with residential accommodation on the two upper floors. The magnitude of impact on this property would be Very Small.

11.121 The results of the VSC analysis are summarised in Table 10.18.

Table 10.18: 91 Caversham Road – Summary of VSC Results

No. of windows analysed	No of windows achieving BRE Guidelines for VSC	Negligible <20 % existing or >27 % VSC	Minor 20 – 29 % reduction	Moderate 30 – 39 % reduction	Major >40 %
3	3	3	0	0	0

11.122 The results of the analysis demonstrate that all windows would achieve the BRE guidelines numerical values. The effect would therefore be Negligible.

11.123 The results of the DD analysis, based on the assumptions made, are summarised in Table 10.19.

Table 10.19: 91 Caversham Road – Summary of DD Results

No. of rooms analysed	No of rooms achieving BRE Guidelines for DD	Negligible >0.8 existing	Minor 0.6 – 0.79	Moderate 0.5 – 0.59	Major <0.4 existing
2	2	2	0	0	0

11.124 The results of the DD analysis demonstrate that despite the urban location of this property, the BRE guidelines numerical values would be achieved and therefore the effect on this property would be Negligible.

11.125 The effect on the daylight enjoyed by this property would therefore be **Negligible Adverse**.

93-97 Caversham Road

11.126 This property is located to the west of the application site on the opposite side of Caversham Road. Based on the site visit undertaken, the property appears to provide commercial accommodation at ground floor with the two upper floors providing residential accommodation. The magnitude of impact on this property would be Very Small.

11.127 The results of the VSC analysis are summarised in Table 10.20.

Table 10.20: 93-97 Caversham Road – Summary of VSC Results

No. of windows analysed	No of windows achieving BRE Guidelines for VSC	Negligible <20 % existing or >27 % existing	Minor 20 – 29 % reduction	Moderate 30 – 39 % reduction	Major >40 %
9	9	9	0	0	0

11.128 As the summary table shows, all windows analysed would achieve the BRE guideline numerical values. It is therefore considered that the effect on this property would be Negligible.

11.129 The results of the DD analysis, based on the assumptions made, are summarised in Table 10.21.

Table 10.21: 93-97 Caversham Road – Summary of DD Results

No. of rooms analysed	No of rooms achieving guidelines for DD	Negligible >0.8 existing	Minor 0.6 – 0.79	Moderate 0.4 – 0.59	Major <0.4 existing
6	6	6	0	0	0

11.130 The results of the analysis demonstrate that the BRE guideline numerical values for DD would be achieved, despite the urban location of these properties. The effect on this property would therefore be **Negligible**.

11.131 The effect on the daylight enjoyed by this property would therefore be **Negligible Adverse**.

Sunlight

11.132 A sunlight assessment has been undertaken for each of the neighbouring residential receptors based on the criteria contained within the BRE guidelines. The BRE guidelines state that a window may be adversely affected if it receives less than 25 % of the APSH, including at least 5 % during the winter months (21 September to 21 March) and less than 0.8 times the existing value.

11.133 The results of the analysis are set out in Appendix 10.2 and are summarised for each of the neighbouring residential receptors below.

17-49 Vastern Road

11.134 Table 10.22 presents the summary results of the APSH analysis and Table 10.23 presents the summary results for the APSH analysis during the winter months. These demonstrate that the magnitude of impact would be Very Small.

Table 10.22: 17-49 Vastern Road – Sunlight (APSH) Results

No. of rooms analysed	No. of rooms achieving BRE Guidelines for APSH	Negligible >25 % or reduction <20 %	Minor Reduction between 20 – 29 %	Moderate Reduction between 30 – 39 %	Major Reduction >40 %
50	50	50	0	0	0

Table 10.23: 17-49 Vastern Road – Sunlight (APSH during winter months) Results

No. of rooms analysed	No. of rooms achieving BRE Guidelines for APSH winter	Negligible >5 % or 0.8 existing	Minor Between 0.6 – 0.79 existing	Moderate Between 0.4 – 0.59 existing	Major <0.4 existing
50	50	50	0	0	0

11.135 The results of the analysis indicate that the BRE guidelines numerical values would be achieved and therefore the effect of the proposed development would be **Negligible Adverse**.

87-89 Caversham Road

11.136 Table 10.24 presents the summary results of the APSH analysis and Table 10.25 presents the summary results for the APSH analysis during the winter months. These demonstrate that the magnitude of impact would be Very Small.

Table 10.24: 87-89 Caversham Road – Sunlight (APSH) Results

No. of rooms analysed	No. of rooms achieving BRE Guidelines for APSH	Negligible >25 % or reduction <20 %	Minor Reduction between 20 – 29 %	Moderate Reduction between 30 – 39 %	Major Reduction >40 %
4	4	4	0	0	0

Table 10.25: 87-89 Caversham Road – Sunlight (APSH during winter months) Results

No. of rooms analysed	No. of rooms achieving BRE Guidelines for APSH winter	Negligible >5 % or 0.8 existing	Minor Between 0.6 – 0.79 existing	Moderate Between 0.4 – 0.59 existing	Major <0.4 existing
4	4	4	0	0	0

11.137 The results of the analysis indicate that for both APSH and APSH during the winter months, the BRE guidelines numerical values would be achieved and therefore the effect of the proposed development would be **Negligible Adverse**.

91 Caversham Road

11.138 Table 10.26 summarises the results of the APSH analysis, whereas Table 10.27 sets out the results of the APSH analysis during the winter months. These demonstrate that the magnitude of impact would be Very Small.

Table 10.26: 91 Caversham Road – Sunlight (APSH) Results

No. of rooms analysed	No. of rooms achieving BRE Guidelines for APSH	Negligible >25 % or reduction <20 %	Minor Reduction between 20 – 29 %	Moderate Reduction between 30 – 39 %	Major Reduction >40 %
2	2	2	0	0	0

Table 10.27: 91 Caversham Road – Sunlight (APSH during winter months) Results

No. of rooms analysed	No. of rooms achieving BRE Guidelines for APSH winter	Negligible >5 % or 0.8 existing	Minor Between 0.6 – 0.79 existing	Moderate Between 0.4 – 0.59 existing	Major <0.4 existing
2	2	2	0	0	0

11.139 The results of the analysis demonstrate that for both APSH and APSH during the winter months, the numerical values within the BRE guidelines are achieved and therefore the proposed development would have a **Negligible Adverse** effect.

93-97 Caversham Road

11.140 Table 10.28 summarises the results of the APSH analysis and Table 10.29 sets out the APSH achieved during the winter months. These demonstrate that the magnitude of impact would be Very Small.

Table 10.28: 93-97 Caversham Road – Sunlight (APSH) Results

No. of rooms analysed	No. of rooms achieving BRE Guidelines for APSH	Negligible >25 % or reduction <20 %	Minor Reduction between 20 – 29 %	Moderate Reduction between 30 – 39 %	Major Reduction >40 %
6	6	6	0	0	0

Table 10.29: 93-97 Caversham Road – Sunlight (APSH during winter months) Results

No. of rooms analysed	No. of rooms achieving BRE Guidelines for APSH winter	Negligible >5 % or 0.8 existing	Minor Between 0.6 – 0.79 existing	Moderate Between 0.4 – 0.59 existing	Major <0.4 existing
6	6	6	0	0	0

11.141 The results of the analysis demonstrate that for both APSH and APSH during the winter months, the numerical values within the BRE guidelines are achieved and therefore the proposed development would have a **Negligible Adverse** effect.

Overshadowing

11.142 This analysis has considered only the access to direct sunlight for amenity space introduced by the proposed development, as there is no amenity space to the north of the application site.

11.143 The results of this assessment are presented in drawing number 2271-111 in Appendix 10.3 and demonstrate that the numerical values set out in the BRE guidelines are achieved and therefore the proposed development would provide amenity space with good access to sunlight, with more than 50 % enjoying at least two hours or direct sunlight on 21 March. Accordingly, the effect would be **Negligible**.

Solar Glare

11.144 The BRE guidelines state that key locations around an application site should be considered to establish whether there is potential for solar glare or dazzle to be caused. The main factor to be considered is the contrast between the brightness of the façade compared with the background ambient luminance.

11.145 The assessment has considered the potential reflection of the sun on what has been assumed as a fully glazed façade for the proposed massing.

11.146 The detailed results of the assessment are presented in Appendix 10.4 and a summary provided in the following paragraphs.

Test Point 1 – Caversham Road southbound to Vastern Road Roundabout

11.147 The tinted zones on drawing number 2271-112 attached at Appendix 10.4 show the results of the solar glare at this point.

11.148 The analysis indicates that the reflected solar dazzle could occur intermittently throughout the year; approximately 1,072 hours per year. The sunlight availability protractor, as set out in the BRE's information paper "*Solar dazzle reflected from sloping glazed facades*", indicates that sunlight is obtained between 0 % and 50 % of the time.

11.149 Therefore, using the appropriate climate data, solar dazzle could occur at this point for approximately 266 hours per year. This is considered to be a **Moderate Adverse** effect, localised and temporary periodic effect and would be reduced further once the detailed faced treatment is included.

Test Point 2 - Vastern Road westbound to De Montford Road Junction

11.150 The tinted zones on drawing number 2271-113 attached at Appendix 10.4 shows the results of the solar glare for this point.

11.151 The analysis indicates that reflected solar dazzle could occur intermittently throughout the year; approximately 1,294 hours per year. The sunlight availability protractor, as set out in the BRE's Information Paper "*Solar dazzle reflected from sloping glazed facades.*" indicates that sunlight is obtained between 0 % and 50 % of the time.

11.152 Therefore, using the appropriate climate data, solar dazzle could occur at this point for approximately 326 hours per year. This is considered to be a **Moderate Adverse** effect, localised and temporary periodic effect and would be reduced further once the detailed faced treatment is included and mitigated by the driver using the sun visor as a large area of the façade is above the line of this.

Test Point 3 - De Montford Road Junction with Vastern Road

11.153 The tinted zones on drawing number 2271-114 attached at Appendix 10.4 shows the results of the solar glare for this point.

11.154 The analysis indicates that reflected solar dazzle could occur intermittently throughout the year; approximately 1,114 hours per year. The sunlight availability protractor, as set out in the BRE's Information Paper "*Solar dazzle reflected from sloping glazed facades.*", indicates that sunlight is obtained between 0 % and 50 % of the time.

11.155 Therefore, solar dazzle could occur at this point for approximately 298 hours per year. This is considered to be a **Minor Adverse** effect, localised and temporary periodic effect and would be reduced further once the detailed faced treatment is included.

Test Point 4 - Vastern Road westbound to Lynmouth Road Junction

11.156 The tinted zones on drawing number 2271-117 attached at Appendix 10.4 shows the results of the solar glare for this point.

11.157 The analysis indicates that reflected solar dazzle could occur intermittently throughout the year; approximately 884 hours per year. The sunlight availability protractor, as set out in the BRE's Information Paper *"Solar dazzle reflected from sloping glazed facades."* indicates that sunlight is obtained between 0 % and 50 % of the time.

11.158 Therefore, solar dazzle could occur at this point for approximately 174 hours per year. This is considered to be a **Minor Adverse** effect, localised and temporary periodic effect and would be reduced further once the detailed faced treatment is included.

Test Point 5 - Lynmouth Road Junction with Vastern Road

11.159 The tinted zones on drawing number 2271-115 attached at Appendix 10.4 shows the results of the solar glare for this point.

11.160 The analysis indicates that reflected solar dazzle could occur intermittently throughout the year; approximately 1,034 hours per year. The sunlight availability protractor, as set out in the BRE's Information Paper *"Solar dazzle reflected from sloping glazed facades."* indicates that sunlight is obtained between 0 % and 50 % of the time.

11.161 Therefore, solar dazzle could occur at this point for approximately 282 hours per year. This is considered to be a **Minor Adverse** effect, localised and temporary periodic effect and would be reduced further once the detailed faced treatment is included.

Test Point 6 - Vastern Road eastbound

11.162 The tinted zones on drawing number 2271-118 attached at Appendix 10.4 shows the results of the solar glare for this point.

11.163 The analysis indicates that reflected solar dazzle could occur intermittently throughout the year, but primarily between 16 January and 25 November; approximately 776 hours per year. The sunlight availability protractor, as set out in the BRE's Information Paper *"Solar dazzle reflected from sloping glazed facades."* indicates that sunlight is obtained between 0 % and 50 % of the time.

11.164 Therefore, solar dazzle could occur at this point for approximately 186 hours per year. This is considered to be a **Minor Adverse** effect, localised and temporary periodic effect and would be reduced further once the detailed faced treatment is included.

Test Point 7 - Vastern Road eastbound to Lynmouth Road Junction

11.165 The tinted zones on drawing number 2271-116 attached at Appendix 10.4 shows the results of the solar glare for this point.

11.166 The analysis indicates that reflected solar dazzle could occur intermittently throughout the year; approximately 1,192 hours per year. The sunlight availability protractor, as set out in the BRE's Information Paper *"Solar dazzle reflected from sloping glazed facades."* indicates that sunlight is obtained between 0 % and 50 % of the time.

11.167 Therefore, solar dazzle could occur at this point for approximately 306 hours per year. This is considered to be a **Minor Adverse** effect, localised and temporary periodic effect and would be reduced further once the detailed faced treatment is included.

Test Point 8 - Caversham Road northbound Northfield Road Junction

11.168 The tinted zones on drawing number 2271-119 attached at Appendix 10.4 shows the results of the solar glare for this point.

11.169 The analysis indicates that reflected solar dazzle could occur intermittently throughout the year; approximately 424 hours per year. The sunlight availability protractor, as set out in the BRE's Information Paper *"Solar dazzle reflected from sloping glazed facades."* indicates that sunlight is obtained between 0 % and 50 % of the time.

11.170 Therefore, solar dazzle could occur at this point for approximately 122 hours per year. This is considered to be a **Minor Adverse** effect, localised and temporary periodic effect and would be reduced further once the detailed faced treatment is included.

Assessment of Residual Effects

Additional Mitigation

11.171 The assessment of daylight, sunlight and overshadowing has been undertaken of the worst-case height and massing proposals. It is expected that during the detailed design, the building envelope would be reduced and refined by means of setbacks and articulation. However, no account can be taken of this at the outline planning stage.

11.172 The solar glare assessment has been based upon the indicative façade materials submitted with the Application and a worst case fully reflective facade. As the façade details progress during the detailed design the façade materiality and design would be refined further, and any solar glare effects would be reduced to the greatest extent feasible.

11.173 Effective mitigation could comprise the selection of non-reflective materials, fins or louvres which would act to reduce or obscure the solar rays and prevent instances of solar reflection from glazing elements and consequently reduce solar glare effects.

Enhancement Measures

11.174 No enhancement measures are proposed in respect of daylight, sunlight, overshadowing or solar glare.

Demolition and Construction Residual Effects

11.175 During the demolition and construction of the proposed development, no mitigation would be required in relation to daylight, sunlight, overshadowing and solar glare. Accordingly, the likely effects presented in the previous section remain unchanged for the residual effects, namely temporary **Negligible Beneficial to Moderate Adverse** for daylight, sunlight and solar glare.

Completed Development Residual Effects

11.176 Whilst additional mitigation measures would be explored during the detailed design to reduce effects on identified receptors, these cannot be assessed at the outline stage of planning.

11.177 Accordingly, the likely daylight effects reported in the previous section remain unchanged for the residual effects, namely:

- 17-49 Vastern Road: **Moderate Adverse** and significant when assessed against the BRE Criteria, but Minor to Moderate and not significant when assessed against the alternative targets;
- 87-89 Caversham Road: **Negligible**;
- 91 Caversham Road: **Negligible**; and
- 93-97 Caversham Road: **Negligible.**

11.178 Accordingly, the likely sunlight effects reported in the previous section remain unchanged for the residual effects, namely:

- 17-49 Vastern Road: **Negligible;**
- 87-89 Caversham Road: **Negligible**;
- 91 Caversham Road: N**egligible**; and
- 93-97 Caversham Road: **Negligible**.

11.179 In respect of overshadowing the effect on the proposed on-site amenity space would be **Negligible**.

11.180 In respect of solar glare, the residual effect would be **Minor Adverse** for all of the eight sensitive receptors.

Summary of Residual Effects

11.181 A summary of the results of residual effects are presented below in Table 10.30. Those effects reported in blue text are the residual effects assessed against the alternative targets.

Table 10.30: Summary of Residual Daylight, Sunlight, Overshadowing and Solar Glare Effects

Receptor	Residual Effect	Additional Mitigation	Scale of Effect **	Nature of Residual Effect*				
				+ -	D I	P T	R IR	St Mt Lt
Demolition and Construction								
17-49 Vastern Road 87-89 Caversham Road 91 Caversham Road 93-97 Caversham Road	Temporary change in daylight and sunlight levels at surrounding residential receptors	N/A	Negligible to Moderate	+ -	D	T	R	St
11 Road Testing Points	Change in solar glare levels	N/A	Negligible to Moderate	+ -	D	T	R	St
Completed Development								
17-49 Vastern Road	Reduction in access to daylight and sunlight	N/A	Moderate Minor to Moderate	- - -	D	P	IR	Lt
87-89 Caversham Road	Reduction in access to daylight and sunlight	N/A	Negligible	-	D	P	IR	Lt
91 Caversham Road	Reduction in access to daylight and sunlight	N/A	Negligible	-	D	P	IR	Lt
93-97 Caversham Road	Reduction in access to daylight and sunlight	N/A	Negligible	-	D	P	IR	Lt
On-site Amenity Space	Sunlight availability within amenity space	N/A	Negligible	N/A	N/A	N/A	N/A	N/A
8 Road Receptor Points	Creation of solar glare	N/A	Minor	-	D	P	IR	Lt

Notes:
* - = Adverse/ + = Beneficial/ +/- Neutral; D = Direct/ I = Indirect; P = Permanent/ T = Temporary; R=Reversible/ IR= Irreversible; St- Short term/ Mt –Medium term/ Lt –Long term.
**Negligible/Minor/Moderate/Major

11.182 The effects of the proposed development on daylight to 17-49 Vastern Road would be significant when assessed against the BRE targets. When assessed against the alternative targets, the effects are not considered to be significant.

11.183 All other residual daylight, sunlight, overshadowing and solar glare effects would not be significant.

Cumulative Effects

11.184 There are a number of schemes that are within close proximity to the application site, as set out in Chapter 2: EIA Process and Methodology. Of these only the following two have been included within the cumulative scenario as these are located in close proximity to the application site:

- Former Royal Mail site; and
- Former Scottish and Southern Energy site.

11.185 The location of these and the massing that has been considered is indicated on drawing numbers 2271-106 and 107 in Appendix 10.1.

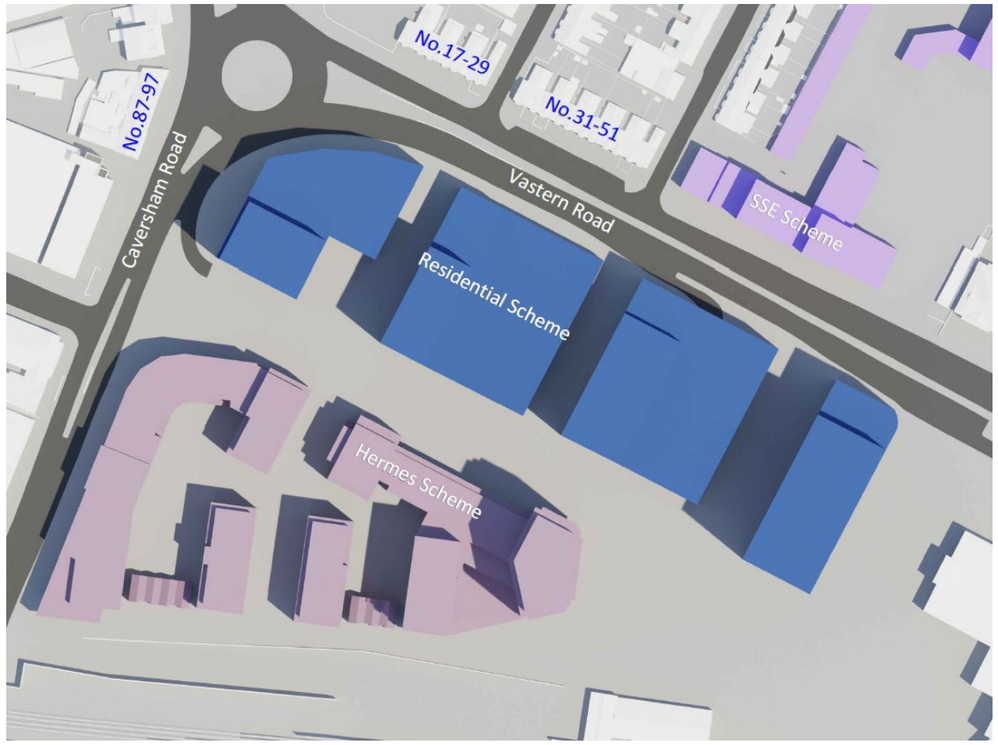

Figure 10.4: Cumulative Schemes Location Plan

Demolition and Construction Cumulative Effects

11.186 During the demolition stage, there may be a negligible short-term improvement to daylight and sunlight enjoyed by the surrounding sensitive receptors, owing to the low scale of the existing structures or their relationship to the receptors.

11.187 Throughout the construction works, the effects on the surrounding sensitive receptors is not possible to determine as the potential effects on daylight and sunlight would slowly increase as the massing progressed to its final extent. The use of scaffolding, hoarding etc. may also have a temporary effect, increasing the obstruction. Based on professional judgement, the cumulative daylight, sunlight and solar glare effect would remain temporary **Negligible Beneficial** to **Moderate Adverse** and not significant.

Completed Development Cumulative Effects

11.188 The results of the cumulative assessment on the neighbouring residential receptors are set out in the tables attached at Appendix 10.2 and summarised in Tables 10.31 to 10.46 below.

17-49 Vastern Road

11.189 The cumulative assessment of 17-49 Vastern Road is summarised in Tables 10.31 and 10.32. These demonstrate that the overall cumulative magnitude of impact on these receptors would remain Medium to High and the effect on these receptors would remain **Moderate Adverse and** significant when considered against the BRE criteria, but **Minor to Moderate** and not significant when considered against the alternative targets.

Table 10.31: 17-49 Vastern Road – Summary of VSC Results

No. of windows analysed	No of windows achieving BRE Guidelines for VSC	Negligible	Minor	Moderate	Major
57	0	0	0	37	20

Table 10.32: 17-49 Vastern Road – Summary of DD Results

No. of rooms analysed	No of rooms achieving BRE Guidelines for DD	Negligible	Minor	Moderate	Major
50	14	14	25	7	4

11.190 In relation to the cumulative sunlight assessment, Tables 10.33 and 10.34 demonstrate that the magnitude of impact would be Very Small, and the effect would remain **Negligible Adverse.**

Table 10.33: 17-49 Vastern Road – Sunlight (APSH) Results

No. of rooms analysed	No. of rooms achieving BRE Guidelines for APSH	Negligible	Minor	Moderate	Major
57	57	57	0	0	0

11.191

Table 10.34: 17-49 Vastern Road – Sunlight (APSH during winter months) Results

No. of rooms analysed	No. of rooms achieving BRE Guidelines for APSH winter	Negligible	Minor	Moderate	Major
57	57	57	0	0	0

87-89 Caversham Road

11.192 Concerning 87-89 Caversham Road, the analysis demonstrates that whilst there would be a reduction in VSC, all windows would achieve a VSC of greater than 24 %, above the 20 % considered appropriate for such an urban location. All rooms would achieve the recommended DD. The magnitude of impact would be Small and the effect **Moderate Adverse** and not significant.

Table 10.35: 87-89 Caversham Road – Summary of VSC Results

No. of windows analysed	No of windows achieving BRE Guidelines for VSC	Negligible	Minor	Moderate	Major
6	0	0	6	6	0

Table 10.36: 87-89 Caversham Road – Summary of DD Results

No. of rooms analysed	No of rooms achieving BRE Guidelines for DD	Negligible	Minor	Moderate	Major
4	4	4	0	0	0

11.193 The magnitude of impact on sunlight would remain Very Small and the effect would remain **Negligible Adverse**.

Table 10.37: 87-89 Caversham Road – Sunlight (APSH) Results

No. of rooms analysed	No. of rooms achieving BRE Guidelines for APSH	Negligible	Minor	Moderate	Major
4	4	4	0	0	0

Table 10.38: 87-89 Caversham Road – Sunlight (APSH during winter months) Results

No. of rooms analysed	No. of rooms achieving BRE Guidelines for APSH winter	Negligible	Minor	Moderate	Major
4	4	4	0	0	0

91 Caversham Road

11.194 Of the three windows serving 91 Caversham Road, two would experience a **Moderate Adverse** effect based on the VSC assessment, but all rooms would achieve the recommended DD. It is therefore considered that the magnitude of impact would be Small and the effect would be **Negligible Adverse**.

Table 10.39: 91 Caversham Road – Summary of VSC Results

No. of windows analysed	No of windows achieving BRE Guidelines for VSC	Negligible	Minor	Moderate	Major
3	1	1	2	0	0

Table 10.40: 91 Caversham Road – Summary of DD Results

No. of rooms analysed	No of rooms achieving BRE Guidelines for DD	Negligible	Minor	Moderate	Major
2	2	2	0	0	0

11.195 The magnitude of impact on sunlight would be Very Small and the effect on sunlight would be **Negligible Adverse**.

Table 10.41: 91 Caversham Road – Sunlight (APSH) Results

No. of rooms analysed	No. of rooms achieving BRE Guidelines for APSH	Negligible	Minor	Moderate	Major
2	2	2	0	0	0

Table 10.42: 91 Caversham Road – Sunlight (APSH during winter months) Results

No. of rooms analysed	No. of rooms achieving BRE Guidelines for APSH winter	Negligible	Minor	Moderate	Major
2	2	0	0	0	0

93-97 Caversham Road

11.196 For 93-97 Caversham Road, of the eight windows analysed, seven would experience a **Negligible Adverse** effect, with the other experiencing a VSC only just below 27 %. With all rooms achieving the recommended DD, the magnitude of impact would be Small and the effect **Negligible Adverse**.

Table 10.43: 93-97 Caversham Road – Summary of VSC Results

No. of windows analysed	No of windows achieving BRE Guidelines for VSC	Negligible	Minor	Moderate	Major
9	8	8	1	0	0

Table 10.44: 93-97 Caversham Road – Summary of DD Results

No. of rooms analysed	No of rooms achieving BRE Guidelines for DD	Negligible	Minor	Moderate	Major
6	6	6	0	0	0

11.197 The magnitude of impact on sunlight would be Very Small and the effects **Negligible Adverse**.

Table 10.45: 93-97 Caversham Road – Sunlight (APSH) Results

No. of rooms analysed	No. of rooms achieving BRE Guidelines for APSH	Negligible	Minor	Moderate	Major
6	6	6	0	0	0

Table 10.46: 93-97 Caversham Road – Sunlight (APSH during winter months) Results

No. of rooms analysed	No. of rooms achieving BRE Guidelines for APSH winter	Negligible	Minor	Moderate	Major
6	6	6	0	0	0

Comparison against Reading Station Area Framework

11.198 The RSAF recognised the need for a comprehensive approach to the area's future redevelopment and following a series of height, massing and sectional studies, provides guidance on the scale mass and density of new developments. This massing is indicated on drawing number 2271-104 and 105 attached in Appendix 10.2.

11.199 This assessment considers the effects that the massing set out in the RSAF would have on the surrounding residential receptors and demonstrates what numerical values for such an urban location are considered appropriate, applying the BRE guidelines flexibly.

11.200 The results demonstrate that the RSAF envisaged by the RBC, whilst resulting in less windows and rooms not achieving the numerical values in the BRE guidelines compared with the results for the proposed

development, would result in a similar scale of effects as experienced with the proposed development. As this RSAF has been adopted by the RBC, it is considered to be a material consideration which sets a precedent for the levels of daylight and sunlight which could be considered reasonable and acceptable in planning terms and therefore justifies the use of alternative targets.

17-49 Vastern Road

11.201 The summary of the results for 17-49 Vastern Road demonstrate that the RSAF massing would have a magnitude of impact of Medium to High and **Minor** to **Moderate Adverse** effects on the VSC and DD enjoyed by these properties.

Table 10.47: 17-49 Vastern Road – Summary of VSC Results

No. of windows analysed	No of windows achieving BRE Guidelines for VSC	Negligible	Minor	Moderate	Major
57	40	35	4	13	0

Table 10.48: 17-49 Vastern Road – Summary of DD Results

No. of rooms analysed	No of rooms achieving BRE Guidelines for DD	Negligible	Minor	Moderate	Major
50	25	25	13	7	5

11.202 The RSAF massing would have a Very Small impact and a **Negligible Adverse** effect on the sunlight enjoyed by 17-29 Vastern Road.

Table 10.49: 17-49 Vastern Road – Sunlight (APSH) Results

No. of rooms analysed	No. of rooms achieving BRE Guidelines for APSH	Negligible	Minor	Moderate	Major
50	50	50	0	0	0

Table 10.50: 17-49 Vastern Road – Sunlight (APSH during winter months) Results

No. of rooms analysed	No. of rooms achieving BRE Guidelines for APSH winter	Negligible	Minor	Moderate	Major
50	50	50	0	0	

87-89 Caversham Road

11.203 The assessment of the effect the RSAF massing on 87-89 Caversham Road demonstrates that in relation to both VSC and DD, the magnitude of impact would be Very Small with a **Negligible Adverse** effect.

Table 10.51: 87-89 Caversham Road – Summary of VSC Results

No. of windows analysed	No of windows achieving BRE Guidelines for VSC	Negligible	Minor	Moderate	Major
6	6	6	0	0	0

Table 10.52: 87-89 Caversham Road – Summary of DD Results

No. of rooms analysed	No of rooms achieving BRE Guidelines for DD	Negligible	Minor	Moderate	Major
4	4	4	0	0	0

11.204 The impact on sunlight would be Very Small with a **Negligible Adverse** effect.

Table 10.53: 87-89 Caversham Road – Sunlight (APSH) Results

No. of rooms analysed	No. of rooms achieving BRE Guidelines for APSH	Negligible	Minor	Moderate	Major
4	4	4	0	0	0

Table 10.54: 87-89 Caversham Road – Sunlight (APSH during winter months) Results

No. of rooms analysed	No. of rooms achieving BRE Guidelines for APSH winter	Negligible	Minor	Moderate	Major
4	4	4	0	0	0

91 Caversham Road

11.205 The assessment of the effect the RSAF massing on 91 Caversham Road demonstrates that in relation to both VSC and DD, the impact would be Very Small with a **Negligible Adverse** effect.

Table 10.55: 91 Caversham Road – Summary of VSC Results

No. of windows analysed	No of windows achieving BRE Guidelines for VSC	Negligible	Minor	Moderate	Major
3	**3**	**3**	**0**	**0**	**0**

Table 10.56: 91 Caversham Road – Summary of DD Results

No. of rooms analysed	No of rooms achieving BRE Guidelines for DD	Negligible	Minor	Moderate	Major
2	2	2	0	0	0

11.206 The impact on sunlight will be **Very Small** with a **Negligible** effect.

Table 10.57: 91 Caversham Road – Sunlight (APSH) Results

No. of rooms analysed	No. of rooms achieving BRE Guidelines for APSH	Negligible	Minor	Moderate	Major
2	2	2	0	0	0

Table 10.58: 91 Caversham Road – Sunlight (APSH during winter months) Results

No. of windows analysed	No. of windows achieving BRE Guidelines for APSH winter	Negligible	Minor	Moderate	Major
2	2	0	0	0	0

93-97 Caversham Road

11.207 The assessment of the effect the RSAF massing on 93-97 Caversham Road demonstrates that in relation to both VSC and DD, the impact would be Very Small with a **Negligible Adverse** effect.

Table 10.59: 93-97 Caversham Road – Summary of VSC Results

No. of windows analysed	No of windows achieving BRE guidelines for VSC	Negligible	Minor	Moderate	Major
9	9	9	0	0	0

Table 10.60: 93-97 Caversham Road – Summary of DD Results

No. of rooms analysed	No of rooms achieving BRE guidelines for DD	Negligible	Minor	Moderate	Major
6	6	6	0	0	0

11.208 The impact on sunlight would be Very Small with a **Negligible Adverse** effect.

Table 10.61: 93-97 Caversham Road – Sunlight (APSH) Results

No. of rooms analysed	No. of rooms achieving BRE Guidelines for APSH	Negligible	Minor	Moderate	Major
6	6	6	0	0	0

Table 10.62: 93-97 Caversham Road – Sunlight (APSH during winter months) Results

No. of rooms analysed	No. of rooms achieving BRE Guidelines for APSH winter	Negligible	Minor	Moderate	Major
6	6	6	0	0	0

11 CUMULATIVE EFFECTS

Introduction

11.1 The Town and Country Planning (Environmental Impact Assessment) Regulations 2017[1] (hereafter referred to as 'the EIA Regulations') require that the likely significant environmental effects of a development are taken into account, including cumulative effects.

11.2 There is no prescriptive guidance on the methodology for the assessment of cumulative effects; however, The Planning Inspectorate (PINS) document 'Using the 'Rochdale Envelope' (July 2018)[2] which was drafted in relation to infrastructure projects, states the following:

"The potential cumulative impacts with other developments will also need to be carefully identified such that the likely significant effects can be shown to have been identified and assessed against the baseline position (which would include built and operational development). In assessing cumulative impacts, other development should be identified through consultation with the local planning authorities and other relevant authorities."

11.3 PINS have also published an Advice Note[3] on the approach to cumulative effects assessment relevant to nationally significant infrastructure projects, which provides more useful context.

11.4 The Institute of Environmental Management and Assessment (IEMA) Guidance[4] identifies two types of cumulative effects:

- Inter-project effects – incremental changes caused by other development schemes occurring together with the proposed development and the cumulative effects combining to worsen the effect of a particular impact; and
- Intra-project effects – those effects that occur as a result of impact interaction between different environmental topics within the same project. For example, a project might affect bird species as a result of direct loss of habitat and by noise and light disturbance. Each of these when considered in isolation may have a limited effect but taken together the sum is greater than the parts.

Inter-Project Cumulative Effects

11.5 A list of cumulative schemes for consideration in the inter-project cumulative effect assessment of the proposed development was presented to RBC as part of the EIA Scoping Opinion Request Report (ES Volume 3: Technical Appendix 2.1). Details of the full list of cumulative schemes are presented in Chapter 2: EIA Process and Methodology of this ES Volume.

11.6 Inter-project effects have been addressed in each technical chapter of the ES (Chapters 6-10 of ES Volume 1 and Chapters 1 and 2 of ES Volume 2), as appropriate. To avoid significant repetition, information on the potential combined effects of the proposed development together with cumulative schemes is not presented within this chapter of the ES.

Intra-Project Cumulative Effects

11.7 The potential for intra-project cumulative effects is considered within this Chapter.

Intra-Project Cumulative Effects

Assessment Approach

11.8 As mentioned earlier, there is no established EIA methodology for assessing and quantifying the combined effects of individual effects on sensitive receptors. Accordingly, Ramboll has developed an approach which uses the defined residual effects of the proposed development to determine the potential for interactions between effects and consequently the potential for significant intra-project cumulative effects to arise.

11.9 The approach comprised the following steps:

1. a review of the likely residual effects (and in particular the likely significant environmental effects) presented within the ES was undertaken;
2. the likely receptors or receptor groups were identified;
3. the individual effects which may affect a singular receptor or receptor group were listed in a tabular/matrix format;
4. the potential for individual effects to interact were identified; and
5. the scale of the combined intra-project cumulative effects was assessed.

11.10 To ensure a proportionate approach, negligible and neutral effects have been disregarded.

11.11 It is noted that intra-project cumulative effects are more likely to arise when the receptor or receptor group is more sensitive to change, such as human receptors.

11.12 Where there is more than one effect likely to arise on a particular receptor or receptor group, the potential for effect interactions and the scale of the combined effect have been determined. The results of the assessment are presented within a tabular/matrix format within the following section of this chapter.

11.13 The assessment has been based on professional judgement and experience.

Assessment Results

11.14 Based on the methodology detailed above, Table 11.1 and Table 11.2 present the review of the potential for interactions of individual effects during the demolition and construction works and once the proposed development is complete and operational, respectively.

[1] Secretary of State, 2017. Town and Country Planning (Environmental Impact Assessment) Regulations 2017, London, HMSO.
[2] The Planning Inspectorate. July 2018. Using the 'Rochdale Envelope'.
[3] The Planning Inspectorate, December 2015. Cumulative Effects Assessment.
[4] Institute of Environmental Management and Assessment. The State of Environmental Impact Assessment Practice in the UK. 2011.

Likely Residual Effects		Relevant Receptor Groups													
		Existing commercial uses	Existing off-site residential occupants	Future on-site commercial occupants	Future on-site residential occupants	Existing working age residents	Existing and future pedestrians	Existing social infrastructure	Users of exisiting off-site amenity space	Users of future on-site amenity space	Existing surrounding townscape character and views	Existing transport infrastructure	Off-site Bus Stop users	Local Economy	Listed Building
Socio-Economics	Generation of construction employment														
	Local expenditure														
Air Quality	Dust Soiling and PM10 due to demolition and construction works														
	NO2 and PM10 due to vehicle emissions														
Noise and Vibration	Demolition and Construction Noise														
	Demolition and Construction Traffic														
	Demolition and Construction Vibration														
Wind Microclimate	Wind conditions suitable for strolling														
Daylight, Sunlight and Overshadowing	Temporary change in daylight and sunlight levels														
	Change in solar glare levels														
Townscape and Visual	Detraction from the character of a Conservation Area														
	Alter setting of a Conservation Area														
	Effect on visual amenity experience														
Built Heritage	Visual and aural disruption to the setting of the listed building and the appreciation of its heritage significance caused by demolition and construction activity														
Potential for Effect Interaction and so Combined Cumulative Effect?		**None**	**None**	**None**	**None**	**None**	**None**	**None**	**None**	**None**	**None**	**None**	**None**	**None**	**None**

Major Beneficial
Moderate Beneficial
Minor Beneficial
Minor Adverse
Moderate Adverse
Major Adverse

Table 11.1: Demolition and Construction Intra-Project Cumulative Effects

Demolition and Construction

11.15 As shown in Table 11.1, the proposed development would not result in intra-project cumulative effect interactions during the demolition and construction stage.

Likely Residual Effects		Relevant Receptor Groups														
		Existing commercial uses	Future on-site commercial occupants	Existing off-site residential occupants	Future on-site residential occupants	Existing off-site human health	Existing and future pedestrians	Existing social infrastructure	Users of exisiting off-site amenity space	Users of future on-site amenity space	Users of roof top amenity	Existing surrounding townscape character and views	Existing transport infrastructure	Off-site Bus Stop users	Local Economy	Listed Building
Socio-Economics	Provision of new housing															
	Increased spending from new employees	Major Beneficial													Major Beneficial	
	Net loss of employment on-site	Moderate Adverse														
	Additional spending by employees and residents	Major Beneficial													Major Beneficial	
	Increased demand for GP provision															
	Increased demand for dentist provision							Minor Adverse								
	Increased demand on early years school places															
	Increased demand on primary school places															
	Increased demand on secondary school places															
	Provision of open space															
	Impact on levels of deprivation															
	Impact on crime levels															
Air Quality	NO2, PM10 and PM2.5 effects due to vehicle emissions															
	NO2, PM10 and PM2.5 effects due to local air quality					Minor Adverse										
Noise and Vibration	Changes in traffic noise															
	Noise from fixed plant installations															
	Noise from servicing vehicle movements															
	Noise from servicing vehicle idling															
Wind Microclimate	Unsuitable wind conditions		Minor Adverse / Major Adverse		Minor Adverse / Major Adverse		Minor Adverse / Moderate Adverse			Minor Adverse / Major Adverse	Major Adverse			Minor Adverse		
	Suitable wind conditions		Minor Beneficial		Minor Beneficial		Minor Beneficial			Minor Beneficial	Minor Beneficial					
Daylight, Sunlight and Overshadowing	Reduction in access to daylight and sunlight			Minor Adverse / Moderate Adverse												
	Sunlight availability within amenity space															
	Creation of solar glare			Minor Adverse / Moderate Adverse									Minor Adverse / Moderate Adverse			
Townscape and Visual	Direct and indirect changes to Conservation Area											Minor Beneficial / Moderate Beneficial				
	Effect on visual amenity experience															
Built Heritage	Alteration in the setting of the locally listed building															Minor Adverse
	Alteration in the setting of the listed building															Minor Adverse / Moderate Adverse
Potential for Effect Interaction and so Combined Cumulative Effect?		**None**	**None**	**None**	**None**	**None**	**None**	**None**	**None**	**None**	**None**	**None**	**None**	**None**	**None**	**None**

Major Beneficial
Moderate Beneficial
Minor Beneficial
Minor Adverse
Moderate Adverse
Major Adverse

Table 11.2: Completed Development Intra-Project Cumulative Effects

Completed Development

11.16 As shown in Table 11.2, the proposed development would not result in intra-project cumulative effect interactions during the completed development stage.

Conclusions

11.17 Based on the assessments presented in Table 11.1 and Table 11.2, the proposed development would not have the potential to create to intra-project cumulative effect interaction during either the demolition and construction stage, or the completed development stage.

12 RESIDUAL EFFECTS AND MITIGATION

Introduction

12.1 This chapter summarises the additional mitigation and enhancement measures identified in the technical assessments of ES Volume 1 Chapters 6-10 and ES Volume 2 Chapter 1 and 2 and provides a summary of the residual effects and the likely significant environmental effects attributed to the proposed development.

Additional Mitigation and Enhancement

12.2 As set out in Chapter 2: EIA Process and Methodology, the aim of an EIA is to develop measures to prevent, reduce and mitigate the significant adverse environmental effects of a project and to enhance any beneficial effects.

12.3 Within each of the technical assessments, the need for additional mitigation measures has been considered to prevent, reduce or mitigate likely significant adverse effects as far as reasonably possible. In addition, opportunities for environmental enhancement have been explored where practicable. The proposed additional mitigation and enhancement measures are in addition to the embedded design and operational mitigation measures (as described in ES Chapter 4: Proposed Development Description), and standard construction mitigation measures (as described in ES Chapter 5: Demolition and Construction Environmental Management), which have been considered within the technical assessments.

12.4 Table 12.1 presents a summary of the additional mitigation and enhancement measures categorised under the following stages:

- Demolition and Construction; and
- Completed Development.

12.5 Reference should be made to individual technical chapters for more detail.

Table 12.1: Summary of Proposed Additional Mitigation and Enhancement Measures

Topic	Proposed Additional Mitigation and Enhancement Measures
Demolition and Construction	
Socio-Economics	None
Air Quality	None
Noise and Vibration	None
Wind	None
Daylight, Sunlight, Overshadowing and Solar Glare	None
Townscape and Visual	None
Built Heritage	None
Completed Development	
Socio-Economics	CIL payment to be used towards the extension of an existing, or provision of a new school(s) in the local area to be advised by Reading Local Education Authority (LEA)

Table 12.1: Summary of Proposed Additional Mitigation and Enhancement Measures

Topic	Proposed Additional Mitigation and Enhancement Measures
Air Quality	None
Noise and Vibration	• Commitment to undertake further detailed design to avoid potential for noise effects from plant and entertainment uses. • Implementation of signage to minimise the idling of delivery vehicles close to surrounding residential receptors
Wind	Mitigation would be explored at the detailed design stage. This would include: • articulation of the building scale, footprint and mass of the proposed development; • elevational treatments including fins, canopies, balustrades, arcades and screens to slow and redirect wind flow; • recessed building entrances to provide an area of shelter; • screening in the form of sculptures and porous screens to reduce the energy the wind contains; and • landscaping and planting to provide shelter and reduce exposure and break up air flow.
Daylight, Sunlight and Overshadowing and Solar Glare	Non-reflective materials to reduce impacts of solar glare
Townscape and Visual	Adherence to commitments in the Design Code in regards to high-quality design and the delivery of a landmark development
Built Heritage	None

Residual Effects

12.6 Reference should be made to ES Volume 1 Chapters 6-10 and ES Volume 2 Chapter 1 and 2 for a detailed description of residual and likely significant environmental effects.

Demolition and Construction Residual Effects

12.7 Table 12.2 summarises the likely residual effects which have been identified by the individual technical assessments as a result of the construction of the proposed development. Significant effects are shown in **bold**.

Table 12.2: Residual Effects during Proposed Development Demolition and Construction Stage

Topic Area	Description of Residual Effect	Scale of Effect	Adverse/ Beneficial	Duration of Effect
Socio-economics	Generation of construction employment	**Major**	**Beneficial**	Short Term
	Local expenditure	**Major**	**Beneficial**	Short Term
Air Quality	Dust Soiling and PM_{10} due to demolition and construction works	Negligible	Neutral	Medium Term
	NO_2, PM_{10} and $PM_{2.5}$ due to vehicle	Negligible	Neutral	Medium Term

Table 12.2: Residual Effects during Proposed Development Demolition and Construction Stage

Topic Area	Description of Residual Effect		Scale of Effect	Adverse/ Beneficial	Duration of Effect
	emissions				
Noise and Vibration	Demolition and Construction noise	Receptor 9 (31-51 Vastern Road)	**Moderate**	**Adverse**	**Medium Term**
		Receptor 10 (SSE)	Minor	Adverse	Medium Term
		All other receptors	Negligible	Adverse	Medium Term
	Demolition and Construction Traffic Noise at all receptors		Negligible	Adverse	Medium Term
	Demolition and Construction Vibration at all receptors		Negligible	Adverse	Medium Term
Wind	Wind conditions suitable for strolling and walking		Negligible	N/A	Short Term
Daylight, Sunlight, Overshadowing and Solar Glare	Temporary change in daylight and sunlight levels at surrounding residential receptors		Negligible – Moderate	Neutral	Short Term
	Change in solar glare levels		Negligible - Moderate	Neutral	Short Term
Townscape and Visual	*Townscape Receptors*				
	Detraction from the application site character		**Moderate**	**Adverse**	**Short Term**
	Detracting from the character of the Conservation Area - CA 22: Vastern Road		**Moderate**	**Adverse**	**Short Term**
	Slight deterioration in the setting of the Conservation Area	CA 12: Caversham Road, CA 23: King's Meadow	Minor	Adverse	Short Term
		CA 11: Napier Road	Negligible	Adverse	Short Term
	No alteration to any of the key characteristics of the CA 1: Station Hill		Minor	Adverse	Short Term
	Views and Visual Receptors				
	Limited deterioration to the existing view: Site Context Photograph 01		**Moderate**	**Adverse**	**Short Term**
	Limited deterioration to the existing view: Site Context Photograph 02		**Minor - Moderate**	**Adverse**	**Short Term**
	Occupation of a greater area of the skyline in views: Site Context Photograph 03		**Moderate**	**Adverse**	**Short Term**
	Interruption of views of recognisable townscape elements: Site Context Photograph 04		**Moderate**	**Adverse**	**Short Term**
	Detraction from the visual amenity: Site Context Photograph 05		**Moderate**	**Adverse**	**Short Term**
	Introduction of additional element of clutter into views: Site Context Photograph 25		Minor	Adverse	Short Term
Built Heritage	Visual and aural disruption to the setting of the locally listed building and the appreciation of its heritage significance caused by demolition and construction activity		Negligible	Adverse	Short Term
	Visual and aural disruption to the setting of the listed building and the appreciation of its heritage significance caused by demolition and construction activity – All Receptors		Negligible	Adverse	Short Term

12.8 During the demolition and construction stage, significant beneficial effects would be likely in respect of generation of construction employment and local expenditure.

12.9 During the demolition and construction stage, significant adverse effects would be likely in respect of the following:

- **Noise and Vibration** - Demolition and construction noise on receptor 9 (31-51 Vastern Road – residential); and
- **Townscape and Visual** - Change to the character of the application site, the conservation area (CA 22: Vastern Road), and change to views (Site Context Photographs 1-5 and 25).

Completed Development Residual Effects

12.10 Table 12.3 summarises the likely residual effects which have been identified by the individual technical assessments as a result of the operation of the proposed development. Significant effects are shown in bold.

Table 12.3: Residual Effects of the Completed Proposed Development

Topic Area	Residual Effect	Scale of Effect	Adverse/ Beneficial	Duration of Effect
Socio-economics	No residential dwellings delivered	Negligible	Beneficial	Long Term
	Local expenditure	**Major**	**Beneficial**	**Long Term**
	Net loss of employment on-site	Minor	Adverse	Long Term
	Economic output	**Moderate**	**Beneficial**	**Long Term**
	Demand for GP provision	Negligible (following mitigation in form of CIL payment)	Adverse	Long Term
	Demand for dentist provision	Minor	Adverse	Long Term
	Demand on early years school places	Negligible	Beneficial	Long Term
	Demand on primary school places	Negligible	Beneficial	Long Term
	Demand on secondary school places	Negligible	Beneficial	Long Term
	Demand for open space	Negligible	Beneficial	Long Term

Table 12.3: Residual Effects of the Completed Proposed Development

Topic Area	Residual Effect		Scale of Effect	Adverse/ Beneficial	Duration of Effect
	Impact on levels of deprivation		Negligible	Beneficial	Long Term
	Impact on crime		Negligible	Beneficial	Long Term
Air Quality	NO_2, PM_{10} and $PM_{2.5}$ effects due to vehicle emissions		Slight	Adverse	Long Term
	NO_2, PM_{10} and $PM_{2.5}$ effects due to local air quality		Negligible	Neutral	Long Term
Noise and Vibration	Changes in traffic noise		None	N/A	Long Term
	Noise from fixed plant installations		Negligible	Adverse	Long Term
	Noise from servicing vehicle movements		Negligible	Adverse	Long Term
	Noise from servicing vehicle idling		Negligible	Adverse	Long Term
Wind	Off-Site Thoroughfares (target conditions suitable for walking/strolling).	Vastern Road	**Negligible to Minor**	**Adverse**	**Long Term**
		Caversham Road	**Negligible to Minor**	**Adverse**	**Long Term**
		Troopers Port Way	**Negligible to Minor**	**Adverse**	**Long Term**
		Brighams Mead	**Minor**	**Adverse**	**Long Term**
	Proposed Development Thoroughfares (target conditions suitable for walking/strolling)	Thoroughfare 1, 2 and 3	**Negligible to Moderate**	**Adverse**	**Long Term**
		Thoroughfare 4	**Minor**	**Beneficial/ Adverse**	**Long Term**
	Pedestrian Crossings		**Negligible to Minor**	**N/A Beneficial**	**Long Term**
	Proposed Development on-site building entrances		**Negligible to Major**	**N/A Major**	**Long Term**
	Off-Site Entrances (target conditions suitable for standing)	Entrance to a neighbouring property measurement location 38 (across Caversham Road)	**Minor**	**Adverse**	**Long Term**
		Entrance to the railway station	Negligible	Adverse	Long Term
		Entrance to a neighbouring property measurement location 45 (across Vastern Road)	**Minor to Moderate**	**Beneficial**	**Long Term**
		Off-site Bus Stops (target conditions suitable for standing)	**Minor**	**Adverse**	**Long Term**
		Off-Site Amenity Area (target conditions suitable for sitting to standing)	**Minor to Moderate**	**Adverse**	**Long Term**
		Proposed Development Amenity (target condition range of sitting to standing) — Ground Floor	**Minor to Major**	**Beneficial / Adverse**	**Long Term**
		Proposed Development Amenity (target condition range of sitting to standing) — Roof top	**Minor to Major**	**Beneficial / Adverse**	**Long Term**
	Strong winds at ground level and roof level		**Major**	**Adverse**	**Long term**
Daylight, Sunlight, Overshadowing and Solar Glare	Reduction in access to daylight and sunlight - 17-49 Vastern Road (when assessed based on BRE criteria)		**Moderate**	**Adverse**	**Long Term**
	Reduction in access to daylight and sunlight - 17-49 Vastern Road (when assessed based on alternative targets)		Minor-Moderate	Adverse	Long Term
	Reduction in access to daylight and sunlight - 87-89 Caversham Road, 91 Caversham Road and 93-97 Caversham Road		Negligible	Adverse	Long Term
	Sunlight availability within amenity space		Negligible	N/A	N/A
	Creation of Solar Glare		Minor	Adverse	Long Term
Townscape and Visual	**Townscape Receptors**				
	Detraction of the application site character		**Moderate**	**Beneficial**	**Permanent**
	Change to CA 22: Vastern Road		**Moderate**	**Beneficial**	**Permanent**
	Change to CA 12: Caversham Road		Negligible	Beneficial	Permanent
	Change to the setting of the Conservation Area	CA 23: King's Meadow, CA 1: Station Hill	Minor	Beneficial	Permanent
		CA 11: Napier Road	Negligible	Beneficial	Permanent
	Views and Visual Receptors				

Table 12.3: Residual Effects of the Completed Proposed Development

Topic Area	Residual Effect		Scale of Effect	Adverse/ Beneficial	Duration of Effect
	Change to view	Site Context Photograph 01 - 05: View south from Vastern Road/Lynmouth Road, Site Context Photograph 02	Negligible	Beneficial	Permanent
		Site Context Photograph 25: View North from Station Square	Minor	Adverse	Permanent
Built Heritage	Alteration in the setting of no 55 Vastern Road (locally listed building)		Minor	Adverse	Permanent
	Alteration in the setting of the listed building – Great Western House		Minor	Adverse	Permanent
	Alteration in the setting of the listed building – Main building of Reading General Station		**Moderate**	**Adverse**	**Permanent**
	Alteration in the setting of the listed building – Remaining Receptors		Negligible	Adverse	Permanent

12.11 The completed development would give rise to significant beneficial effects in respect of economic output and local expenditure. The completed development would also give rise to moderate beneficial effects in respect of the application site character and change to Consercation Area 22.

12.12 The completed development would give rise to the following significant adverse effects:

- **Wind Microclimate -** Where the pedestrian comfort assessment identified minor to major adverse effects, these are considered to be significant. In addition, all instances of strong winds exceeding the 15m/s threshold are considered to be major adverse and significant.
- **Daylight, Sunlight, Overshadowing and Solar Glare -** The effects of the proposed development on daylight to 17-49 Vastern Road would be significant when assessed against the BRE Targets. When assessed against the alternative targets, the effects are not considered to be significant.
- **Built Heritage –** The effects on the alteration of the setting of the listed building – Great Western House are considered to be moderate adverse and permanent.