

Table 11.16: Assessment of Residential Amenity

Plot / Facade	Period	WHO Guideline Value	External Noise Level (dB(A))	Difference with WHO Guideline Value	Significance
Telecom House/Plot E / North	Daytime	55dB $L_{Aeq,16h}$	66	11	Substantial Adverse
	Night-time	45dB $L_{Aeq,8h}$	61	16	Substantial Adverse
Telecom House/Plot E / East	Daytime	55dB $L_{Aeq,16h}$	66	11	Substantial Adverse
	Night-time	45dB $L_{Aeq,8h}$	61	16	Substantial Adverse
Telecom House/Plot E / South	Daytime	55dB $L_{Aeq,16h}$	67	12	Substantial Adverse
	Night-time	45dB $L_{Aeq,8h}$	64	19	Substantial Adverse
Telecom House/Plot E / West	Daytime	55dB $L_{Aeq,16h}$	66	11	Substantial Adverse
	Night-time	45dB $L_{Aeq,8h}$	61	16	Substantial Adverse
Plot F / North	Daytime	55dB $L_{Aeq,16h}$	66	11	Substantial Adverse
	Night-time	45dB $L_{Aeq,8h}$	61	16	Substantial Adverse
Plot F / East	Daytime	55dB $L_{Aeq,16h}$	66	11	Substantial Adverse
	Night-time	45dB $L_{Aeq,8h}$	61	16	Substantial Adverse
Plot F / South ^[1]	Daytime	55dB $L_{Aeq,16h}$	61	6	Moderate Adverse
	Night-time	45dB $L_{Aeq,8h}$	58	13	Moderate Adverse
Plot F / West	Daytime	55dB $L_{Aeq,16h}$	66	11	Substantial Adverse
	Night-time	45dB $L_{Aeq,8h}$	61	16	Substantial Adverse

Note: Derived from LT1, Friar Street Noise Survey.

- 11.114 The assessment of residential amenity presented as Table 11.16 represents 'worst-case' based on the measured long-term noise levels and assumes that the façades have an unobstructed view of the surrounding road network, which will be the case of façades facing directly onto the roads and the upper floors which are higher than the surrounding intervening buildings. At the lower floors of both Telecom House / Plot E and Plot F which face away from the roads, the actual noise levels are likely to be lower than those indicated by approximately 10-15dB(A) due to screening effects from the intervening buildings. The level of significance at these lower, screened locations is likely to be negligible during the daytime period increasing to minor to moderate adverse during the night-time period. Full details of the assessment of residential amenity are presented in Appendix 11.4.
- 11.115 Given substantial adverse noise effects are predicted with regard to residential amenity, mitigation would be required in the form of glazing combined with a suitable ventilation strategy to allow the internal ambient noise level criteria of BS8233:2014 and WHO criteria to be satisfied.

Public Realm

- 11.116 The Zone for Central Square is likely to be exposed to traffic noise levels which satisfy the WHO guideline value of 55dB $L_{Aeq,16h}$ due to the attenuation afforded by the intervening buildings and is therefore of **negligible** significance. The Zone for Station Square, however, is likely to be exposed to noise levels which exceed 55dB $L_{Aeq,16h}$ due to its un-obscured view of Station Hill and Station Road and is therefore of **moderate adverse** significance. Noise levels in excess of

60dB(A) for an urban public realm space is not however considered unusual. In this respect specific mitigation is not proposed.

Fixed Plant and Mechanical Services Noise

- 11.117 Any items of fixed plant installed as part of the proposed Development have the potential to generate noise. At this stage, details of the proposed nature, type and number of such plant are unavailable. It is appropriate therefore, to specify suitable limits to which any such plant should conform. These limits would include any corrections for acoustic characteristics and account for the location of receptors.
- 11.118 Plant specification is sufficiently flexible to ensure that suitably quiet, non-tonal plant can be procured and / or mitigation options such as screening (e.g. acoustic louvers) can be installed as necessary to ensure that guideline noise criteria are met.
- 11.119 Plant located within basements would have the potential to give rise to **negligible** effects on nearby NSRs, including future residents within the Development. This assumes that appropriate design measures are integral to the design, such as isolation of plant from the building structure, enclosure of plant, sufficient sound reduction afforded by wall / floors / doors and acoustic louvers.
- 11.120 However, where roof mounted plant is adopted and in the absence of mitigation there may be the potential for at worst **moderate adverse** effects to arise and mitigation measures would be required. Potential mitigation measures are discussed in the relevant Section of this Chapter.

Service and Delivery Noise

- 11.121 Service vehicles accessing the Site have the potential to generate noise and should be a consideration where there are noise sensitive rooms (e.g. bedrooms and living rooms) directly above the access point (ie within Telecom House / Plot E and Plot F only). As illustrated by Parameter Plan 5 'Vehicle and Pedestrian Access Routes' (Drawings 698_E_PP_07_005 and 698_PP_07_005) service vehicles would access the Telecom House / Plot E and Plot F via a dedicated access point at lower ground level from Garrard Street. At this stage in the design process it is not possible to accurately quantify the number of delivery vehicles that may be associated with the retail units within these Plots as they are likely to vary in accordance with the 'end user'. However, it is the intention of the Applicant to liaise with RBC during the detailed design and reserved matters stage to ensure that new and existing NSRs are protected from such activities to ensure the effect of service vehicles and servicing activities is **negligible**.

Proposed Uses

- 11.122 There are a number of proposed uses associated with the completed, occupied Development which may generate noise, namely:
- Retail uses (A1, A2, A3, A4 and A5);
 - Leisure (D2); and
 - Office (B1).
- 11.123 The exact nature of the retail uses is not yet known because this is dependent on occupiers being secured. However, it is assumed that consideration would be given to noise prior to occupation and operation of the above elements to ensure that the amenity of surrounding uses is protected. Noise break-out from any of the proposed buildings, which may include retail uses (bars/cafes/restaurants) and the proposed leisure use, would, however, be **negligible** provided adequate sound insulation is afforded by the building façade. The expectation is that insulation

provided by the new construction would be more than adequate to attenuate internally generated noise to below the existing ambient noise levels in the vicinity of the Site.

- 11.124 Further consideration to the above would be required at the detailed design stage. Standard controls, which could be secured through planning conditions or obligations relating to opening hours and use of outside space, would also minimise the potential noise effects on sensitive receptors.

Car Park Noise

- 11.125 A maximum of 1,000 car parking spaces would be provided within the Development. The existing multi-storey car park building, which currently provides 952 car park spaces, would be retained, reconfigured and refurbished and would provide between 550 and 900 car parking spaces. The proposed reduction in car parking spaces in the multi-storey car park building equates to an overall noise level reduction of less than 3dB(A) and is therefore of **negligible** significance. It is recommended, however, that the refurbishment of the multi-storey car park where possible should introduce design measures that would reduce reverberant noise levels and break-out from the multi-storey car park. This may include increase of parapet height, inclusion of absorptive internal surfaces and 'quiet' internal road surface.
- 11.126 There is also potential for a separate car park to be introduced in Telecom House/Plot E, providing up to 200 additional car parking spaces. This is 100 more than Plot E in the SH3 scheme. Access to the commercial and residential uses would be direct from all levels of the car park, via lifts and staircases. Within residential plots, if car parking is located at lower ground level, it is considered that noise breakout would be minimal and therefore of **negligible** significance provided noise sensitive rooms such as bedrooms and living rooms are not above the car park entrance.

Road Traffic Noise

- 11.127 The noise effects for road links forecast to have a change in traffic flow and/or % HGVs of greater than or equal to 10 percent have been assessed. As shown in Appendix 11.5 all of the predicted changes in road traffic noise as a result of the Development for a future year of 2018 (the assumed completion year for the purposes of this assessment) are 1dB or less and therefore of **negligible** significance, with the exception of Station Hill. A noise level decrease of 3dB(A) is predicted for Station Hill (road links 1602-1601 in Appendix 11.5) which is of permanent **minor beneficial significance**. However, this should be treated with caution due to the low flows involved, a reduction of 4 vehicles to 2 vehicles over an 18 hour period. In this respect a change of this magnitude is unlikely to be perceptible.
- 11.128 It is understood that the forecast road traffic volumes and composition for the proposed Development are unchanged from the SH3 scheme.

Road Traffic Vibration

- 11.129 Observations made during the noise surveys indicate that existing traffic movements do not present a significant source of vibration, even where roads and traffic movements pass close to existing buildings. Traffic noise changes can be used as a surrogate measure of traffic generated vibrations. If the existing road conditions and traffic flows give rise to perceptible vibrations at any receptor, a significant increase in noise due to traffic growth is also likely to increase instances of vibration. Compared to the baseline, any increases in traffic noise levels which do occur as a result of the proposed Development are negligible. Any vibration effect due to changes in traffic flows would, therefore, have a **negligible** effect upon existing conditions.

Mitigation

Demolition and Construction

- 11.130 In accordance with Planning Condition 35 (Environmental Management Plan) on the SH3 Scheme Planning Consent, measures to control the construction noise and vibration effects would be incorporated into a Site-specific Construction Environment Management Plan (CEMP). The times and routes of access and delivery vehicles would also be controlled through Planning Conditions 32 (Demolition Method Statement) and 33 (Construction Method Statement).
- 11.131 The content of the CEMP would be finalised prior to the commencement of the works, through liaison with RBC, but is likely to include the following measures:
- Restricted working hours, normally between 08:00 to 18:00 hours weekdays and 08:00 to 13:00 hours Saturdays and no working on Sundays or Bank Holidays;
 - Adopting quiet periods during the day to enable the occupants of surrounding commercial premises to carry out their work normally;
 - Noise and vibration monitoring on Site, where necessary, which would assist in controlling levels at sensitive receptors;
 - Liaising with the occupants of adjacent commercial and residential properties potentially most affected by noise or vibration from on-site activities. The occupants would be informed of the nature of the works, proposed hours of work and anticipated duration prior to the commencement of activities. They would also be given contact details of a neighbour liaison manager who would be responsible for ensuring complaints and enquiries are dealt with fairly and expeditiously;
 - Using screens around any static plant located adjacent to NSRs;
 - Establishing noise Action Levels in consultation with the local authority, above which consideration would be given to the use of alternative techniques and/or other means of reducing noise;
 - Establishing vibration Action Levels on the basis of guidance contained in BS 5228:2009;
 - Reviewing construction techniques, especially in response to exceedances of the Action Level and/or complaints;
 - Regularly liaison, meetings or communications held between the contractors and RBC officers to advise of progress; and
 - Implementing specific mitigation measures such as:
 - Using modern, well maintained plant and equipment;
 - Off-site prefabrication where appropriate;
 - Using non-vibratory or percussive piling techniques, to minimise noise and vibration; and
 - Switching-off plant and equipment when not in use.

Vibration

- 11.132 Contractors would be required to use best practicable means (BPM) throughout the duration of the Site works and are to register with the National Considerate Constructors Scheme.
- 11.133 On-site monitoring of noise and/or vibration would also be undertaken if necessary, which would assist in controlling levels at specific sensitive receptors. The option would also exist for an application for 'Prior Consent' to be made to RBC's Environmental Health Department (EHD)

under Section 61 of the Control of Pollution Act. Such an application would provide the EHD with the necessary details relating to construction method statements and construction noise and/or vibration effects, thereby enabling them to check that best practicable means are being used and that the noise and vibration controls are acceptable. In authorising an application for prior consent, the EHD can apply reasonable conditions where these are considered necessary.

Demolition and Construction Traffic

- 11.134 As described in Chapter 6: Development Programme Demolition and Construction, the CEMP and Demolition and Construction Management Statements (required by Planning Conditions 35, 32 & 33 on the SH3 Scheme Planning Consent respectively) would include measures to minimise the potential effects from construction traffic. Key controls would include:
- Provision would be made to ensure that the unloading is carried out on-site rather than on the adjacent roads;
 - Construction vehicles would travel via designated routes, which would be agreed with RBC and other relevant authorities; and
 - Materials deliveries would be phased and controlled on a 'just-in-time' basis, wherever possible, minimising travel time and traffic congestion around the Site.
- 11.135 The above range of controls represent the measures that are regularly and successfully applied to large scale construction projects in order to minimise noise and vibration effects on local communities. The application of similar control measures during the construction of the proposed Development would likewise ensure that the works proceed with the minimum disturbance to businesses, pedestrians and local residents.
- 11.136 Peak levels of noise or vibration arising from construction vehicles should not be any greater than can presently arise from existing heavy duty vehicle movements on the existing roads.

Interim Condition: Temporary Flexible Event Space

Event Noise

- 11.137 Given the distance to the nearest NSR, the likely effects are considered to be negligible. However, the following noise control measures are proposed so as to ensure the potential for disturbance to nearby residents is minimised:
- Noise limits to be set for live music events in agreement with the Local Authority's licencing department;
 - External PA systems would utilise small directional speakers where possible so as to minimise potential for noise transmission to sensitive receptors; and
 - Use of stewards to control crowd noise.

Plant Noise

- 11.138 Given the distance to the nearest NSRs, the likely effects are considered to be negligible. Nevertheless, it is proposed that plant noise limits are set relative to the existing background noise levels in the area of the Site. The baseline noise survey result in terms of L_{A90} and the maximum allowable plant noise limits as agreed with environmental health of RBC are presented as Table 11.17.

Table 11.17: Temporary Flexible Event Space Plant Noise Limiting Criteria

Receptor	Monitored Baseline Noise Levels (L_{A90})		Maximum Permissible Plant Noise Limit Level at Sensitive Receptor	
	Daytime (0700 to 2300)	Night-time (2300 to 0700)	Daytime (0700 to 2300)	Night-time (2300 to 0700)
Projection East and West at Merchants Place	55	46	55	46
Garrard House	55	46	55	46

Traffic Noise

- 11.139 The effects from traffic noise are considered to be negligible, and no mitigation is therefore required.

Completed Development

Assessment of Residential Amenity

- 11.140 Given that moderate to substantial adverse effects are predicted with regard to residential amenity, mitigation measures would be required in the form of a suitable glazing and ventilation strategy. Table 11.18 presents the required sound insulation to achieve BS8233:2014 and WHO together with indicative glazing specification. Essentially, it is the night-time L_{Amax} noise events that are the limiting criteria with regard to the indicative glazing specification.

Table 11.18: Indicative Required Sound Insulation & Glazing Performance

Plot / façade	Period	BS8233 and WHO Criteria	External Noise Level (dB(A))	Sound Insulation $R_{w,Ctr}$	Indicative Glazing Specification
Telecom House/Plot E / North	Daytime	35dB $L_{Aeq,16h}$	66	36	8.8 [#] /12/12.8 [#]
	Night-time	30dB $L_{Aeq,8h}$	61	31	
	Night-time	45dB L_{Amax}	84	39	
Telecom House/Plot E / East	Daytime	35dB $L_{Aeq,16h}$	66	36	8.8 [#] /12/12.8 [#]
	Night-time	30dB $L_{Aeq,8h}$	61	31	
	Night-time	45dB L_{Amax}	84	39	
Telecom House/Plot E / South	Daytime	35dB $L_{Aeq,16h}$	67	37	16.8 [#] /12/16.8 [#]
	Night-time	30dB $L_{Aeq,8h}$	64	34	
	Night-time	45dB L_{Amax}	88	43	
Telecom House/Plot E / West	Daytime	35dB $L_{Aeq,16h}$	66	36	8.8 [#] /12/12.8 [#]
	Night-time	30dB $L_{Aeq,8h}$	61	31	
	Night-time	45dB L_{Amax}	84	39	
Plot F / North	Daytime	35dB $L_{Aeq,16h}$	66	36	8.8 [#] /12/12.8 [#]
	Night-time	30dB $L_{Aeq,8h}$	61	31	
	Night-time	45dB L_{Amax}	84	39	
Plot F / East	Daytime	35dB $L_{Aeq,16h}$	66	36	8.8 [#] /12/12.8 [#]

Plot / façade	Period	BS8233 and WHO Criteria	External Noise Level (dB(A))	Sound Insulation Rw ,Ctr	Indicative Glazing Specification
Plot F / South ^[1]	Night-time	30dB LAeq,8h	61	31	8.8#/12/12.8#
	Night-time	45dB LAmax	84	39	
	Daytime	35dB LAeq,16h	61	31	
	Night-time	30dB LAeq,8h	58	28	
	Night-time	45dB LAmax	82	37	
	Daytime	35dB LAeq,16h	66	36	
Plot F / West	Night-time	30dB LAeq,8h	61	31	8.8#/12/12.8#
	Night-time	45dB LAmax	84	39	

Note: Derived from LT1, Friar Street Noise Survey.

- 11.141 Table 11.18 indicates that high specification glazing would be required in order to achieve BS8233:2014 and WHO criteria. This is likely to be required in conjunction with an appropriate ventilation strategy such as through wall passive ventilation strategy and possibly mechanical ventilation thereby removing the requirement for residents to open their windows.
- 11.142 Document IP4/99:1999: Ventilators: Ventilation and Acoustic Effectiveness²³ details a study into the sound reduction performance of fourteen different window mounted trickle ventilators and seven different through-wall passive ventilators. The measured sound reduction performance after taking into account flanking sound paths (i.e. sound paths that do not travel directly through vents) and the effective area of the ventilator were 14 to 46 dB(A) for 'passive through-wall ventilators'.
- 11.143 It can be seen from these figures that passive through-wall ventilators are available that meet the requirements of the Building Regulations Approved Document F²⁴ for background ventilation and also provide sound reduction performance that meets or exceeds that required from the glazing elements.
- 11.144 The above indicative mitigation is for façade areas of residential Building Plots E and F that are directly exposed to road traffic noise from the surrounding road network. Eastern and western façade areas that are below the level of the intervening buildings are likely to be exposed to noise levels 10 to 15 dB(A) lower due to screening effects. Based on a noise level reduction of 10dB(A) external noise levels would range from 51 to 57dB LAeq,16h during the daytime period and 48 to 51dB LAeq,8h during the night-time period estimated LAmax values from road traffic of 72 to 78dB LAmax. At these façade locations, internal noise levels with windows open are still likely to exceed the BS8233:2014 and WHO criteria. A mitigation strategy would be required comprising standard thermal glazing in combination with trickle or through wall passive ventilation, thereby removing the requirement for residents to open their windows.

Public Realm

- 11.145 The Zone for Central Square is likely to satisfy the WHO guideline value of 55dB LAeq,16h due to screening afforded by the intervening buildings, therefore no specific mitigation is required. Although the Zone for Station Square is likely to be exposed to noise levels in excess of 55dB LAeq, hence above the WHO's guideline value, given the urban setting this is not considered unreasonable and therefore no mitigation is proposed.

Fixed Mechanical & Building Services Plant

11.146 Mitigation for building services and fixed plant typically includes but is not limited to the following:

- Procurement of 'quiet' non-tonal plant;
- Locate plant and air vents away from NSRs;
- Acoustic enclosures;
- In-duct attenuators;
- Acoustic louvres; and
- Isolation of plant from building structure.

11.147 At this outline stage, it is considered that it would be reasonable to expect a condition, based on the requirements of RBC, requiring that the rating noise generated by the plant should not cause an increase in the prevailing background noise level.

11.148 Table 11.19 Presents provisional day and night plant noise limits at the identified NSRs.

Table 11.19: Provisional Plant Limit Noise Levels

NSR (Figure 11.1)	Period	Noise Levels dB			Provisional Noise Limit ^[1]
		L _{Aeq}	L _{A90}	L _{A90 min}	
A. Three Guineas PH ^[2]	Daytime	64	61	58	45
	Night-time	59	52	49	39
B. Bridewell House / Samuel House	Daytime	64	61	58	45
	Night-time	59	52	49	39
C. The Gateway Public House	Daytime	66	59	54	44
	Night-time	60	61	49	39
D. Stanshawe Road ^[3]	Daytime	61	54	49	39
	Night-time	55	56	44	34
E. Vachel Road ^[3]	Daytime	62	55	50	40
	Night-time	56	57	45	35
F. Malthouse PH	Daytime	66	59	54	44
	Night-time	60	61	49	39
G. Novotel & Ibis, Friar Street	Daytime	67	58	56	45
	Night-time	64	52	42	35
H. 39 Friar Street	Daytime	67	58	56	45
	Night-time	64	52	42	35
I. Projection East and West at Merchants Place ^[4]	Daytime	64	55	54	45
	Night-time	58	46	36	36
J 5-21 Tudor Road ^[2]	Daytime	64	61	58	45
	Night-time	59	52	49	39

	Daytime	64	55	54	45
L.Garrard House	Night-time	58	46	36	36

Note: [1] Minimum Noise Limit of 35dB L_{Aeq} where minimum noise level is lower than 45dB L_{A90} and Maximum Noise Limit of 45dB L_{Aeq} where minimum background noise level exceeds 55dB L_{Aeq}. Plant Noise Limit to be reduced by 5dB if plant has an acoustic character. [2] Derived from LT2. [3] Derived from LT3. [4] Derived from LT1.

- 11.149 Further analysis of noise from fixed plant would need to be undertaken at the detailed design stage.

Service and Delivery Noise

- 11.150 Service and delivery vehicles have been predicted to have a negligible effect on both existing and proposed noise sensitive receptors. This is on the assumption that a Servicing and Delivery Plan is implemented in accordance with the requirements of Planning Conditions 43 and 44 on the SH3 Planning Consent and following detailed design discussion with RBC. Therefore, no mitigation measures are required.

Proposed Uses

- 11.151 Negligible effects have been predicted from proposed uses on the basis that adequate noise attenuation measures are inherent in the building design. Further consideration to this would be required at the detailed design stage. Standard controls, which could be secured through planning conditions or obligations relating to opening hours and use of outside space, would also minimise the potential noise effects on sensitive receptors. On this basis no further mitigation measures are required.

Car Park Noise

- 11.152 Noise associated with the operation of the proposed car park has been predicted to have a negligible effect on both existing and proposed noise sensitive receptors. Therefore, no mitigation measures are required. However, the refurbishment of the multi-storey car park where possible should introduce design measures that would reduce reverberant noise levels and break-out from the multi-storey car park. This may include increase of parapet height, inclusion of absorptive internal surfaces and 'quiet' internal road surface.

Operational Road Traffic Noise

- 11.153 As no adverse potential effects have been predicted due to operational road traffic once the Development is operational, therefore no mitigation measures are required.

Operational Road Traffic Vibration

- 11.154 As no adverse potential effects have been predicted due to vibration from road traffic once the Development is in operational, therefore no mitigation measures are required.

Residual Effects

Demolition and Construction

Demolition and Construction Noise

- 11.155 Appropriate measures to mitigate and control noise from construction works are available and would be implemented in accordance with relevant planning conditions or obligations. As a consequence, it is envisaged that the construction works would proceed with the minimum disturbance to local residents and businesses. Nevertheless, some short term disturbance for premises immediately adjacent to the Site is likely during the construction works, resulting in **temporary, negligible to minor adverse** effect with up to **moderate adverse** for demolition.
- 11.156 There is a slight variation in predicted residual effects to those presented within the 2013 ES. The reason for this is due to changes to the BS5228 ABC assessment methodology and the assessment of some additional NSRs. There is no change however in the overall range of residual effects to that of the SH3 Scheme.

Demolition and Construction Traffic

- 11.157 With the implementation of a CEMP and a construction traffic routing plan to be agreed with RBC in order to minimise the temporary and intermittent effects that construction traffic can cause, it is considered that there would be a **negligible** effect on nearby potentially sensitive receptors as a result of construction traffic noise and vibration.
- 11.158 The predicted residual effects are unchanged from the SH3 scheme. This reason for this is that there are no changes to the forecast demolition and construction traffic to that of the SH3 scheme.

Demolition and Construction Vibration

- 11.159 With regards to the potential effects of construction generated vibration upon nearby existing and proposed potentially sensitive receptors, vibration limits would be set to ensure compliance with national standards and hence, minimise the risk of complaints or building damage. These limits would be controlled through the implementation of a CEMP. Following the implementation of appropriate mitigation measures construction generated vibration would have a **negligible** effect upon existing and proposed noise sensitive receptors.
- 11.160 The predicted residual effects are unchanged from the SH3 scheme. The additional NSRs are located at greater distance than some of the nearest NSRs therefore the overall range of residual effects remain unchanged.

Interim Condition: Temporary Flexible Event Space

Event Noise

- 11.161 Given the distance to the nearest NSR, together with the noise control measures for the proposed events, the residual effects would be **negligible**. This is unchanged from the SH3 scheme.

Plant Noise

- 11.162 Given the distance to the nearest NSR, together with the proposed plant limits the likely residual effects would be **negligible**. This is unchanged from the SH3 scheme.

Traffic Noise

- 11.163 The levels of traffic generated by the Temporary Flexible Event Space would generate a **negligible** effect on traffic noise. This is unchanged from the SH3 scheme.

Completed Development

Suitability for Noise Sensitive Development

- 11.164 With appropriate detailed design of the façade of the residential elements of the Development the adopted guideline internal noise levels would be met for all proposed noise sensitive receptors and as such **negligible** effects would arise. It is envisaged that all such detailed design matters would be enforced by way of appropriately worded planning conditions.
- 11.165 The results are unchanged from the SH3 scheme. Although the noise criteria of BS8233 has altered, namely the daytime noise level within living rooms and bedroom being less onerous than previously, it was the L_{Amax} value that was the determining factor when recommending appropriate sound insulation. The required criteria for the L_{Amax} value has not changed, although it has been taken from WHO rather than BS8233:2014 which no longer specifies an absolute value for bedrooms.

Public Realm

- 11.166 Mitigation for public realm is not proposed therefore residual effects range from **negligible** at the Central Square central location to **moderate adverse** at Station Square which is adjacent to the existing local road network. This is unchanged from the SH3 scheme.

Fixed Mechanical and Service Plant

- 11.167 The effect of fixed mechanical and service plant noise generated as a result of the proposed Development is considered to be of **negligible** significance. This is unchanged from the SH3 scheme.

Delivery and Service Noise

- 11.168 The effect of delivery and service noise generated as a result of the proposed Development is considered to be of negligible significance. . This is unchanged from the SH3 scheme.

Proposed Uses

- 11.169 The effect of noise generated from proposed uses of the Development is considered to be of negligible significance, assuming noise attenuating measures are inherent in the building design. The residual effects would remain **negligible**. This is unchanged from the SH3 scheme.

Car Park Noise

- 11.170 The effect of car park noise generated as a result of the proposed Development is considered to be of negligible significance and the residual effects would remain **negligible**. This is unchanged from the SH3 scheme.

Road Traffic Noise

- 11.171 The effect of road traffic noise as a result of the proposed Development is predicted to be of negligible significance with minor beneficial predicted at Station Hill, although this should be treated with caution due to the low flows involved. In this respect, no mitigation measures are

considered necessary, so the residual effects would remain **negligible** to **minor beneficial**. This is unchanged from the SH3 scheme.

Road Traffic Vibration

- 11.172 The effect of road traffic vibration as a result of the proposed Development is considered to be of negligible significance. In this respect no mitigation measures are considered necessary and residual effects are **negligible**. This is unchanged from the SH3 scheme.

Summary and Conclusions

Comparison of Effects between this ES and the Consented SH3 Scheme ES

- 11.173 An assessment of the effects of the demolition and construction works, together with the completed Development, was undertaken. Essentially the predicted range of effects of the proposed Development are unchanged from the 2013 SH3 Scheme ES.
- 11.174 There is, however, a slight variation in predicted residual demolition and construction effects to those presented within the SH3 scheme ES when considered on an individual NSR basis. The reason for this is due to changes to the BS5228 ABC assessment methodology and the inclusion of some additional NSRs.
- 11.175 With regard to the completed development, although the noise criteria of BS8233:2014 is less onerous for the daytime period within living rooms, 35dB L_{Aeq,16h} compared with the previous 30-40dB L_{Aeq,16h} design range, the determining factor on the required sound insulation was the L_{Amax} parameter. Although BS8233:2014 no longer specifies a L_{Amax} criteria value for bedrooms the assessment is in-line with WHO recommendations and therefore remains unchanged.

Summary of Potential Effects, Mitigation and Residual Effects

- 11.176 The potential effects, mitigation measures and resulting residual effects (accounting for mitigation) are summarised in Table 11.20 below.

Table 11.20: Summary of Potential and Residual Noise and Vibration Effects

Issue	Potential Effect	Mitigation	Residual Effect
Demolition and Construction of Wider Development			
Demolition and Construction noise	Negligible to Temporary Minor to Major Adverse	Implementation of Site Specific CEMP	Negligible to Temporary Moderate Adverse at NSRs H and K
Demolition and Construction vibration	Negligible to Temporary Moderate Adverse	Implementation of Site Specific CEMP, Adherence to Vibration Limits.	Negligible
Demolition and Traffic	Negligible	CEMP and traffic management plan.	Negligible
Interim Condition: Temporary Flexible Event Space			
Refer to planning permission 130440/FUL for further details of mitigation			
Event Noise	Negligible	Noise limits to be set for live music events in agreement with the Local Authorities licencing department;	Negligible

Issue	Potential Effect	Mitigation	Residual Effect
		- External PA systems would utilise small directional speakers where possible so as to minimise potential for noise transmission to sensitive receptors; and - Use of stewards to control crowd noise.	
Plant Noise	Negligible	Plant noise limited to 55dBA during daytime and 46dBA at night at nearest NSR (Merchants House)	Negligible
Traffic Noise	Negligible	None Required	Negligible
Completed Development			
Suitability of Site for noise-sensitive development	Moderate to Substantial Adverse	Selection of suitable glazing combined with appropriate ventilation strategy. Most exposed facades, high specification glazing in combination with through wall passive acoustic vent.	Negligible
Public Realm	Negligible to Moderate Adverse	None as noise levels typical for urban environment.	Negligible to Moderate Adverse
Fixed plant and mechanical service noise	Negligible to Temporary Moderate Adverse	Planning condition to ensure that plant noise is below background.	Negligible
Servicing and Delivery Noise	Negligible	None required. Discussion to be held with RBC regarding servicing and delivery management once retail end users are known.	Negligible
Proposed Uses	Negligible	Planning condition and appropriate façade construction.	Negligible
Car parking noise	Negligible	None required. Car park refurbishment to consider design measures to reduce reverberant noise and break-out.	Negligible
Road Traffic noise	Negligible to Minor Beneficial	None required.	Negligible to Minor Beneficial
Road Traffic Vibration	Negligible	None required.	Negligible

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12. Ground Conditions and Contamination

Introduction

- 12.1 This Chapter, written by Waterman Infrastructure & Environment Limited (Waterman IE), considers the implications of the proposed Development upon, and from, the prevailing ground conditions at the Site. In particular, it considers the likely significant effects of ground contamination on human health and the quality of surface waters and groundwater.
- 12.2 A summary of relevant legislation and planning policy is given, together with the assessment methodologies employed. The relevant baseline conditions at the Site and its surrounds are explained and then the potential direct and indirect likely significant effects of the Development arising from existing ground conditions, hazardous materials and potential future sources of contamination are considered during both demolition and construction works and following completion and operation of the Development. The mitigation measures required to prevent, reduce or offset the identified likely significant effects and the associated likely significant residual effects are also presented.
- 12.3 The assessment draws upon, and summarises the results of a Preliminary Environmental Risk Assessment (PERA) undertaken by Waterman IE in order to develop a Preliminary Conceptual Ground Model for the Site. The PERA is presented within Appendix 12.1.
- 12.4 A Geo-Environmental Site Investigation has also been undertaken by Waterman Energy, Environment & Design Ltd (now Waterman IE) for the northern area of the Site, located between Garrard Street and Station Hill. This is presented in Appendix 12.2 and has been used to inform this Chapter. The area to the south of Garrard Street including the Telecom House / Plot E Scheme is yet to undergo investigation. A Ground Investigation Specification is presented in Appendix 12.3 and encompasses both the area of the Site to the north of Garrard Street and the area south of the Site which has not previously undergone investigation .

Legislation, Planning Policy Context

Legislation

- 12.5 Land contamination is regulated under several regimes, including environmental protection, environmental permitting, waste management, planning and development control, and health and safety legislation.

Environmental Protection Act 1990

- 12.6 Specific UK legislation on contaminated land is principally contained within Part IIA of the Environmental Protection Act (EPA) 1990¹. The legislation endorses the principle of a 'suitable for use' approach to contaminated land, where remedial action is only required if there are unacceptable risks to human health or the environment, taking into account the use of the land and its environmental setting.

The Water Resources Act 1991 (Amendment) (England and Wales) Regulations 2009

- 12.7 In England and Wales, under The Water Resources Act 1991 Amendment (England and Wales) Regulations 2009² a works notice may be served by the regulator requiring appropriate investigation and clean-up.

Environmental Permitting (England and Wales) Regulations 2010

- 12.8 The Environmental Permitting (England and Wales) Regulations 2010³ make it a criminal offence to cause or knowingly permit a water discharge of any poisonous, noxious or polluting matter to controlled waters.

Building Regulations 2010

- 12.9 The Building Regulations 2010⁴ and specifically Approved Document C, Site Preparation and Resistance to Contaminants and Moisture⁵, outline an approach for the assessment of contamination and preparation of sites prior to redevelopment.

National Planning Policy and Guidance

National Planning Policy Framework, 2012

- 12.10 The National Planning Policy Framework (NPPF)⁶ sets out Government planning policy for England and how this is expected to be applied to development. Paragraphs 120 to 122 of Section 11 – ‘Conserving and enhancing the natural environment’ of the NPPF relate to contaminated land matters and state the following:

"To prevent unacceptable risks from pollution and land instability, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be taken into account. Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner.

Planning policies and decisions should ensure that:

- *... the site is suitable for its new use taking account of ground conditions and land instability, including from natural hazards or former activities such as mining, pollution arising from previous uses and any proposals for mitigation including land remediation or impacts on the natural environment arising from that remediation;*
- *after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990; and*
- *adequate site investigation information, prepared by a competent person, is presented.*

In doing so, local planning authorities should focus on whether the development itself is an acceptable use of the land and the impact of the use, rather than the control of processes or emissions themselves where these are subject to approval under pollution control regimes. Local planning authorities should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities."

Contaminated Land Statutory Guidance, 2012

- 12.11 The Contaminated Land Statutory Guidance 2012⁷ describes a risk assessment methodology in terms of 'significant pollutants' and 'significant pollutant linkages' within a 'source-pathway-receptor' conceptual model. The model comprises:
- The principal pollutant hazards (sources) associated with a site;
 - The principal receptor(s) at risk from the identified hazards (for example, people, environmental assets, surface water and/or groundwater); and

- The existence, or absence, of plausible pathways which may exist between the identified hazards and receptor(s).
- 12.12 For land to be determined as 'contaminated' in a regulatory sense, and therefore requiring remediation (or a change to less sensitive use), all three elements (source-pathway-receptor) of a significant pollutant linkage must be present. The legislation places a responsibility on the Local Planning Authority (LPA) to determine whether the land in its area is in such a condition, by reason of substances in, on or under the land that:
- *"significant harm is being caused or there is a significant possibility of such harm being caused; or*
 - *significant pollution of controlled waters is being caused, or there is a significant possibility of such pollution being caused"*.
- 12.13 LPAs rely heavily on the advice of the Environment Agency (EA) in relation to their approach to the analysis of pollution of 'Controlled Waters'.

Local Planning Policy

Reading Borough Local Development Framework, Adopted Core Strategy, 2008 (Updated 2015)

- 12.14 Policy CS34 of the adopted Reading Borough Local Development Framework (LDF)⁸ states that:
- "Development will only be permitted where it would not be damaging to the environment through air, land, noise or light pollution; where it would preserve or ideally enhance ground and surface water quality....Development will be permitted on land affected by contamination where it can be demonstrated, to the satisfaction of the LPA, that the contamination can be satisfactorily remediated so that it is suitable for the proposed end use."*
- 12.15 The LDF goes on to say that land affected by contamination does exist within the Borough of Reading as a result of previous land uses and in order to make the most effective use of previously developed land it will be important to ensure that, where possible, such land is remediated so that it is suitable for redevelopment.

Reading Borough Local Development Framework, Sites and Detailed Policies Document, Adopted 2012 (Updated 2015)

- 12.16 The LDF Sites and Detailed Policies Document⁹, adopted in 2012, includes no relevant policies in relation to contamination.

Reading Borough Local Development Framework, Reading Central Area Action Plan, 2009

- 12.17 The Reading Central Area Action Plan (RCAAP)¹⁰ does not make any specific reference to ground conditions, soil pollution or related matters.

Station Hill South Planning and Urban Design Brief, 2007

- 12.18 The Station Hill South Planning and Urban Design Brief¹¹ does not contain any specific policies relating to ground contamination. However, Principle 8 which encourages high standards of sustainable design, refers to minimising the generation of waste through all stages of a development.

Station Area Framework, 2010

- 12.19 There are no specific policies in the Station Area Framework¹² relevant to ground conditions or pollution.

Assessment Methodology and Significance Criteria

Assessment Methodology

Collection of Baseline Data and Information Sources

- 12.20 The baseline conditions of the Site, in respect of the potential for contamination, were established through:
- Site walkovers undertaken in November 2006, May 2009 and March 2012;
 - An update Site walkover to include the Telecom House Site undertaken on 13 June 2014;
 - Review of Landmark Group Envirocheck Data (refer to Appendix C of Appendix 12.1);
 - Review of British Geological Survey (BGS) 1:50,000 Geological Map, Sheet 256 Reading¹³;
 - Review of Environment Agency Groundwater Vulnerability Map Sheet 39 (West London)¹⁴;
 - Review of BGS borehole logs; and
 - Review of relevant reports.
- 12.21 The reports reviewed were:
- Waterman, Station Hill, Reading Geo-Environmental Assessment, September 2014, Ref. EED12350-110-R-3.1.2-RM¹⁵ (included as Appendix 12.2);
 - Waterman, Station Hill Reading Preliminary Environmental Risk Assessment, June 2014, Ref. EED12350-111-R-4.1.5- NS¹⁶ (included as Appendix 12.1);
 - Waterman, Station Hill, Reading Phase 1 Land Quality Assessment, November 2006, ref EN4903¹⁷;
 - Waterman, Station Hill, Reading Phase 1 Land Quality Assessment, May 2009, ref E30601¹⁸;
 - Redhills, Former Mecca Bingo Hall, Station Hill Reading, December 2011, Revised Asbestos Register Following Remedial Works ref S-58266¹⁹;
 - Redhills, Friars Walk Shopping Centre, Station Hill Reading, October 2011, Revised Asbestos Register Following Remedial Works ref S-56448²⁰; and
 - Ross Udall, March 2012, Review of Asbestos Surveys and Remediation Works²¹.

Assessment Approach

- 12.22 The assessment presented in this Chapter was undertaken in accordance with current best practice guidance on the assessment of contaminated land, including relevant British Standards, and the DEFRA Contaminated Land Reports (CLR) series. CLR 11 'Model Procedures for the Management of Contaminated Land'²² advocates the use of a tiered approach to the assessment of contaminated land, whereby initial conceptual models are formulated and where necessary further refined through successive phases of site investigation, risk assessment and where appropriate remediation.
- 12.23 A PERA (desk-based) was carried out for the Site. This study included a site walkover, review of historical maps and plans, review of borehole records from the BGS and a review of previous reports for the Site. This information was used to develop a preliminary contaminated land conceptual model for the Site. For the purposes of ground conditions assessment, the 'risk' presented by the

Site is determined using a source-pathway-receptor model, in line with regulatory requirements and best practice.

- 12.24 A Geo-Environmental Assessment was carried out for the Site. This included an intrusive investigation of the northern part of the Site, between Garrard Street and Station Hill. The scope of the works included 5No. shell and auger boreholes to a maximum depth of 25m below ground level (bgl), one continuous flight auger borehole to 12m bgl, 22No. window sample boreholes to a maximum depth of 5.45m bgl, and 7No trial pits up to 4.2m bgl. Four monitoring wells were installed at the Site.

Approach to Outline Assessment

- 12.25 The assessment of the proposed Development was based on the 'maximum extent' of landscape areas, maximum depth and extent of excavation, and maximum foundation depths. As such, it is considered that the assessment represents the 'worst case'. Owing to the small differences between the maximum and minimum parameters for building footprints, it is considered that there would be no material change in the predicted effects between the maximum and minimum parameters of the Development.

Approach to Future Baseline

- 12.26 It is assumed that the construction works associated with the future baseline schemes would be carried out in accordance with legislation and best practice and therefore the potential for contamination of the ground or groundwater at the Site is low. The future baseline schemes are for commercial and residential uses and therefore have limited potentially contaminative uses associated with them. It is assumed that potential contamination sources, such as fuel for backup generators, would be appropriately stored in accordance with current legislation and therefore the potential for them to result in a contamination of the ground or groundwater at the Site is low. It is therefore considered that the 'future baseline' conditions would remain consistent with those of the current baseline conditions on the Site and therefore the future baseline schemes have not been considered further within this Chapter.

Significance Criteria

- 12.27 The significance of the environmental effect that could result from a contamination risk is considered to be dependent on the value of the resource, the sensitivity of the receptor and the ways in which the Development could provide a contamination pathway to the receptor. The significance of the effect is also governed by the timescales involved and the extent of the area affected. The significance criteria used in this assessment are set out in Table 12.1.

Table 12.1 Significance Criteria for Ground Conditions Assessment

Significance Criteria	Description
Substantial adverse	High risk site classification – acute or severe chronic effects to human health and/or animal/plant populations predicted. Effect on a <i>potable groundwater</i> or surface water resource of regional importance e.g. principal aquifer, public water reservoir or inner protection zone of a public water supply borehole.
Moderate adverse	Medium risk site classification and proven (or likely significant) pollutant linkages with human health and/or animal/plant populations, with harm from long-term exposure. Effect on a potable groundwater or surface water resource at a local level e.g. effect on an outer groundwater source protection zone. Temporary alteration to the regional hydrological or hydrogeological regime or permanent alteration to the local regime.
Minor adverse	Medium risk site classification and potential pollutant linkages with human health and/or animal/plant populations identified. Reversible, localised reduction in the quality of groundwater or surface water resources used for commercial or industrial abstractions, minor aquifer, etc.
Negligible	Low risk site classification – No appreciable effect on human, animal or plant health, potable groundwater or surface water resources.
Minor beneficial	Risks to human, animal or plant health are reduced. Local scale improvement to the quality of groundwater or surface water resources used for commercial or industrial abstraction.
Moderate beneficial	Significant reduction in risks to human, animal or plant health, to acceptable levels. Significant local improvement to the quality of potable groundwater or surface water resources. Significant improvement to the quality of groundwater or surface water resources used for public water supply.
Substantial beneficial	Major reduction in risks to human, animal or plant health. Significant regional scale improvement to the quality of potable groundwater or surface water resources.

Consultations

- 12.28 Waterman EED (now Waterman IE) consulted the planning and contaminated land departments of Reading Borough Council (RBC) in support of the Preliminary Environmental Risk Assessment, which was prepared in February 2013.
- 12.29 In addition, a Scoping Report was prepared by Waterman EED (now Waterman IE) and submitted to RBC, together with a request for a formal Scoping Opinion, in February 2012. In preparing their Scoping Opinion, RBC consulted the EA.
- 12.30 The EA suggested further environmental investigation would be required of soils and groundwater on the basis of historical potentially contaminative land uses. These would be secured by planning condition.
- 12.31 An EIA Scoping Letter was prepared by Waterman EED (now Waterman IE) in relation to the application for the Telecom House / Plot E Scheme and submitted to RBC in June 2014. In their scoping response of October 2014, RBC requested that further consideration be given to undertaking a Site Investigation to support the Environmental Impact Assessment. However, following subsequent correspondence with the Environmental Protection Officer at RBC, it was agreed that, due to the extent of the building present on the Site, the site investigation should be

delayed until after demolition but that a scope of works for the post demolition site investigation should be included as part of the ES. This is included in Appendix 12.3.

Limitations and Assumptions

- 12.32 Intrusive investigation of the northern part of the SH3 Site between Garrard Street and Station Hill has been undertaken. The information from this site investigation has been used to inform this Chapter. Further site investigation of the remainder of the SH3 Site to include the Telecom House / Plot E Scheme will be undertaken post demolition as detailed in the Waterman Post Demolition Ground Investigation Specification Report which is presented in Appendix 12.3. .
- 12.33 As stated in Chapter 2: EIA Methodology, the assessment of demolition and construction effects is based upon the indicative demolition and construction timetable, phasing and methodologies as provided by the project team and agreed by the Applicant (refer to Chapter 6: Development Programme, Demolition and Construction).

Baseline Conditions

Site Walkover Observations

- 12.34 As described in Chapter 3: Land Uses and Activities, the existing Site occupies an area of approximately 2.47 hectares. Garrard Street and Station Hill fall in a westerly direction from 44.0m AOD to 38.4m AOD and from 43.5m AOD to 39.3m AOD, respectively. Levels in the south of the Site rise from 38.4m AOD at Garrard Street to 45.8m AOD along Friar Street.
- 12.35 The Site comprises a variety of land uses and is almost entirely covered by built form, roads or areas of hard standing. Land uses within the Site broadly comprise:
- The Western Tower and associated low rise block (units 20-58 Station Hill) - a disused multi-storey office block, with predominantly vacant retail units at ground floor;
 - Friars Walk Shopping Centre, now disused;
 - An operational NCP multi-storey car park;
 - Disused bingo hall above the former bus station;
 - Xafinity House, a six storey office block in the north-western part of the Site;
 - Telecom House, an interconnected office block between 4 and 7 storeys.

Geology and Ground Conditions

Geology

- 12.36 The BGS Geological Map for Reading shows that the Site is underlain by Made Ground overlying Alluvium, over Taplow Gravel Formation and the Seafood Chalk Formation. The exploratory holes from the intrusive investigation of the northern part of the Site undertaken in 2014 revealed that the Site is underlain by up to 5.0m of Made Ground over up to 2.8m of alluvium. Sands and gravels of the Taplow Gravel Formation up to 5.7m in thickness were encountered underlying the alluvium. The Upper Chalk bedrock was encountered at depths from 3.60m bgl to 9.50m, the thickness was not proven.
- 12.37 A summary of the Site's geology is provided in Table 12.2:

Table 12.2: Site Geology

Stratum	Area Covered	Depth (m bgl)	Thickness (m)	Typical Description
Made Ground	Whole Site	0 – 1.80	Up to 5.0	Made Ground including reinforced concrete slab, tarmac over concrete, concrete paving slab, or topsoil, blacktop, cemented sand, sub-base, sandy clayey gravel, sandy / gravelly / silty clay with either brick cobbles, flint gravel, concrete cobbles, ashy material, occasional organic material, slate, rare metal, charcoal, porcelain, clay pipe, or weathered chalk fragments.
Alluvium	Whole Site	1.50 - 3.10	0.70 to 2.80	Soft to firm, low to medium strength orange brown mottled greenish grey to black organic silty or sandy gravelly CLAY. Gravel is fine to medium of subrounded flint.
Taplow Gravel Formation	Whole Site	3.55 – 4.30	1.50 to 5.70	Medium dense becoming loose, yellowish brown gravelly sometimes clayey or silty fine to coarse SAND. Medium dense fine to coarse sandy GRAVEL. Medium dense orange brown to dark grey fine to coarse SAND and GRAVEL. Gravel is fine to coarse subrounded flint and fine to medium rounded quartz.
Upper Chalk	Whole Site	3.60 – 9.50	Unproven	Recovered as fine to coarse, weak to moderately strong subangular CHALK gravel with abundant coarse to cobble sized flint gravel.

Hydrology and Hydrogeology

Surface Water

- 12.38 There are no surface water sources or bodies on the Site. The River Thames, at its closest point, flows about 420m north-east of the Site in an easterly direction. The River Kennet is located approximately 500m south-east of the Site and also flows in an easterly direction.
- 12.39 The Environment Agency has classified both the River Thames and River Kennet surface water bodies in accordance with the General Quality Assessment (GQA) scheme as River Quality B.
- 12.40 The Envirocheck Report (refer to Appendix C of Appendix 12.1) identifies that there are three surface water abstractions within 1km of the Site. The permits are held by The Oracle Shopping Centre and RBC, the nearest of which is located 483m south of the Site at the St Giles Street at Oracle Shopping Centre and is understood to be utilised to support lake and pond through flow within the shopping centre. The other surface water abstraction licences are registered to RBC and involve the abstraction of surface water for non-remedial river / wetland support approximately 660m north of the Site.
- 12.41 Further details regarding surface water drainage and flood risk are presented within Chapter 13: Surface Water Drainage and Flood Risk.

Groundwater

- 12.42 According to the EA Groundwater Vulnerability Map, Sheet 39 (West London) the Alluvium and Taplow Gravel Formation are classed as a Secondary A Aquifer and the Seaford Chalk Formation is a Principal Aquifer. An assessment of the hydrogeological properties of main geological units underlying the Site is shown in Table 12.3.

Table 12.3: Summary of Hydrogeological Properties of the Main Geological Strata

Stratum	Environment Agency Classification	Hydrogeological significance
Made Ground	Not classified	May contain small quantities of perched water.
Alluvium	Secondary A Aquifer	Small quantities of water of importance for baseflow to Rivers and local abstraction.
Taplow Gravel Formation	Secondary A Aquifer	Small quantities of water of importance for baseflow to Rivers and local abstraction.
Seaford Chalk Formation	Principal Aquifer	Highly permeable strata, contains large quantities of groundwater for abstraction.

- 12.43 The Environment Agency online database²³ indicates that the Site is not located within a groundwater Source Protection Zone (SPZ). However, the Envirocheck Report (refer to Appendix C in Appendix 12.1) identifies that there are 12 groundwater abstractions recorded within 1km of the Site. The closest is located 0.16km to the south-west of the Site and relates to an abstraction from a single point licensed to Primark Stores that utilises the water for drinking, cooking, sanitary and washing (small garden) purposes. The abstraction stratum is not specified.

Potential Contamination Sources

Historical Land Uses

- 12.44 A review of historical maps since 1802 obtained from the Envirocheck Report (refer to Appendix C in Appendix 12.1) has been undertaken in order to identify the presence of former potentially contaminative land uses at or near to the Site. This has assisted in determining the potential for ground contamination at the Site. Further details of the Site's early historical development are provided within Chapter 8: Archaeology.
- 12.45 Table 12.4 summarises the historical land uses. Potential sources of contamination are indicated in bold.

Table 12.4: Summary of Historical Land Uses

Source	Site ^a	Surroundings ^a
OS Map		
1802	Gardens and undeveloped land with drainage ditch.	Residential buildings on Friar Street to the south and open fields to the north.
1879 1899	By 1879, the southwest corner and southern boundary of the Site were occupied by terraced houses, with some larger houses and a timber yard located along the western boundary. A few additional houses were also situated on the east side and to the south of the Site. Livery stables were noted to be present in the northeast corner of the Site. A malt house and a coal yard were located in the central portion, with the remainder of the Site consisting of open fields and an area of woodland. A veterinary infirmary and stables are present in the southwest of the Site. The 1899 Ordnance Survey map indicates the presence of an irregular oval feature in the centre of the Site.	The Great Western railway, situated approximately 60m north, ran parallel to the Site's northern boundary. A gasworks company was located approximately 100m southeast and east of the Site and was no longer operational by 1879. By 1879 the Royal Horse and Carriageway Depository was constructed approximately 60m southeast of the Site. To the west of the Site, a cattle market is shown. A rifle factory was located approximately 12m northwest. A timber yard is present approximately 20m to the west. Two coal yards are located approximately 80m to the northwest and 20m to the southwest. Roughly 60m to the east of the Site, near to the station, a railway terminus had been erected. A brewery is marked approximately 80m west. Garrard Street was constructed by 1879. 1899 maps indicate a public house approximately 50m to the west. In addition, a further timber yard had been established approximately 170m to the northwest.
1912 1931	The oval feature is no longer present by 1912. Additional buildings are located towards the centre of the Site. In 1931 a large building had been established in the centre of the Site. A separate building of unknown use was constructed on the east of the Site.	Further residential units, commercial facilities and trade units were constructed around the Site. Ordnance Survey maps indicate that by 1912 an iron works and iron foundry had been established approximately 280m northeast of the Site. The 1931 historical map indicates that a timber yard was operational on the Site of the former iron works. A paint works is situated adjacent the timber yard. A smithy is located adjacent to the southeastern boundary.
1957 -1961 1962 -1972 1968 -1984 1980 -1988 1979 -1989 1986 -1991 1993 1994	In 1957 a factory is shown in the northwest corner of the Site. The large building in the central part of the Site is shown to be a garage. A smithy is present in the area of the former Veterinary Infirmary in the southwest. Two depositories are also marked to the south which had turned into warehouses by the early 1960s. By the early 1960s the central, unused area of the Site was made into a car park.	By 1957 a garage resided on the Site of the former paint works to the northeast. Garages are also situated approximately 173m, 210m and 234m southwest and 50m southeast of the Site. Warehouse complexes had established approximately 20m and 100m northwest of the Site. An engineering works was situated 115m northwest. An extensive works Site is marked roughly 150m north, whilst a smaller works unit was located approximately 220m east.

Source	Site ^a	Surroundings ^a
1957 -1961 1962 -1972 1968 -1984 1980 -1988 1979 -1989 1986 -1991 1993 1994 (Cont.)	By the late 1960s a ballroom had been constructed on the western portion of the car park along with a bus station. A coal yard was present to the south of the Site. The Western Tower and its adjoining office block had been built along the northern boundary of the Site and a tank was located in the centre. The numerous structures in the southwest of the Site are now denoted as one large structure of unknown use, denoted as government offices by 1974. The garage, houses and factory were eventually demolished sometime before 1980 to make way for a multi-storey car park in the centre, an office building in the west and Friar's Walk Shopping Centre to the south of the Site, including a roof top car park. By 1986, the former ballroom was marked as a club.	An engineering works occupied the Site of the aforementioned paint works and a railway works occupied a portion extensive works Site to the north. By the late 1960s a builders yard had established approximately 60m west and by 1984 electrical substations were evident 75m east, 25m south east, 50m southwest and 5m west.
1996, 2011	No changes to the Site were noted.	

Recorded Contamination Events

- 12.46 Since 2001 there have been pollution incidents within the vicinity (up to 500m) of the Site, but none within the Site. These include:
- An entry into the Substantiated Pollution Incident Register located 467m to the southeast of the Site. This comprised the release of oils to water on 22 April 2006 and is considered a Category 2 (significant) effect. However, the entry records that there was no effect to the land or air environment; and
 - 48 pollution incidents to controlled waters. The closest to the Site, located 12m to the north, occurred in 1993 and was associated with the release of unknown oils. The receiving water was not stated. The incident was classed as category 3 (minor).

Current Land Uses

- 12.47 As identified earlier within this Chapter, there are a number of potentially contaminative uses operating at the Site, principally relating to car parking, electricity substations, building fabrics and tanks and associated fuel lines.
- 12.48 There are two records of historical landfill sites located within 1km of the Site. These entries relate to Richfield Avenue and Cow Lane located about 728m to the northwest and 970m to the west of the Site, respectively.
- 12.49 The Site does not lie in an area where radon protection measures would be required. There are also no radioactive substance authorisations to keep, use and dispose of radioactive materials within 1km of the Site.
- 12.50 No Environmental Permits are operated within 1km of the Site.

Type of Potential Ground Contamination

- 12.51 The information obtained through the desk-based study of the Site regarding the type and quantity of ground contamination, and potentially contaminative activities (historical and existing) are summarised in Table 12.5.

Table 12.5: Summary of Potential Sources of Contamination

Type of Contamination	Comment
Soil Contamination.	Made Ground, localised spillages in car parking, tanks and electrical substation areas, contamination associated with nearby railway tracks and Station.
Shallow Groundwater Contamination.	Contaminants present in Made Ground, leakages from drainage pipes and sewerage network.

- 12.52 Table 12.5 indicates that local hotspots of contamination are likely to exist within the Site. However, chemical analysis of environmental samples (soils and groundwater) collected as part of the intrusive Site Investigation (SI) undertaken on the northern part of the Site, between Garrard Street and Station Hill did not identify widespread contamination of soils and groundwater within this area.
- 12.53 However, the presence of additional contamination hotspots on other parts of the Site cannot be discounted. Based upon the above information and professional experience, the types of contamination that may be present across the Site, include:
- Fuels and oils;
 - Metals and heavy metals (including leachate); and
 - Organic solvents.
- 12.54 Further detail regarding potential contamination sources is provided in Appendix 12.1.

Conceptual Risk Assessment Model

- 12.55 The following section describes the current contamination risk posed to identified receptors on, or within the vicinity of the Site. On this basis, a framework is also set out to subsequently assess the contamination risks (and likely significant effects) of the Development, and to inform an appropriate mitigation strategy as necessary.

Current Site Occupiers and Users

- 12.56 As previously identified, the Site is almost entirely covered with buildings, structures and hardstanding. As such, potential contamination beneath the Site is contained beneath hardstanding. However, as there are a number of existing potentially contaminative land uses on the Site and a small area of landscaping, as a worst case, these present a low to medium risk to current occupiers and users.

Water Resources and Drainage

- 12.57 As previously noted the Site is almost entirely covered in hardstanding and the River Thames is located approximately 420m north of the Site, and the River Kennet approximately 500m southeast of the Site. As such, there is a low risk of potential contaminants present beneath the Site migrating laterally through groundwater to the Rivers.

- 12.58 Given the potential age of parts of the existing drainage network and sewerage system, leaks could be expected. As a result there is likely to be a low to medium risk associated with leaks from the drainage network into the underlying soils and groundwater at the Site.
- 12.59 The geology beneath the Site comprises Alluvium and the Taplow Gravel Formation (classed as Secondary A Aquifers) overlying the Seaford Chalk Formation (classed as Principal Aquifer). Vertical migration of potential contaminants is therefore considered possible. However the presence of hardstanding offers some protection to the underlying aquifers. There is therefore considered to be a low to medium risk for the contamination of groundwater.

Flora and Fauna

- 12.60 As noted previously buildings and hard-standing cover the majority of the Site, although there is a lawn area associated with the office building in the north-western part of the Site. As the Site is largely hardstanding, it would help to form a barrier between contaminants in the soil and fauna. Flora identified at the Site in areas of soft landscaping are widespread and were noted to appear unaffected by potential contamination in the underlying soils. On this basis and given the limited value of the Site to wildlife, the potential contamination risk to wildlife is considered to be low.

Buildings and Other Structures

- 12.61 Existing contamination beneath the Site has the potential to affect below ground infrastructure through chemical attack, particularly in the case of buried water pipes. However, given the age of the structures present and the significant areas of hardstanding with no evidence of subsidence or other disturbance it is considered unlikely that significant damage has been made to existing structures. Given that the existing structures remain in place and that no reports of drinking water contamination have been recorded there is considered to be a low risk to buildings and other structures at the Site.

Summary of the Conceptual Risk Assessment Model

- 12.62 Overall, significantly elevated concentrations of contaminants are not expected to be present on the Site. However, some near surface contamination may be present as a result of historic and current Site activities.
- 12.63 On the basis of the above, the results of the Site investigation, and taking a worst-case precautionary approach with regard to the area of the Site which is yet to undergo intrusive investigation, it is considered that the Site currently poses a **low to medium** risk with respect to ground contamination and contaminative liabilities, as defined under Part IIA of the Environmental Protection Act, 1990.

Potential Effects

Demolition and Construction

- 12.64 The main issues relating to the assessment of contamination risks and effects during the demolition and construction works include:
- Implications for the proposed Development in respect of soil to be removed from the Site; soil may require treatment prior to disposal;
 - Potential exposure of the general public and workers at the Site to contamination which has been isolated within buildings, structures, or beneath the ground, including contaminants within the soil and in groundwater;

- Potential for the mobilisation of contamination from soil to groundwater that is currently not adversely affected by contaminants, through the creation of new migration pathways;
- Potential for demolition and construction activities to cause soil, surface water or groundwater contamination, for example, as a result of accidental spillages of fuel or poor construction site housekeeping; and
- Exposure of existing limited ecosystems to contamination during construction.

12.65 A preliminary conceptual site model illustrating the relationship of the proposed Development to the ground conditions is included at Appendix 12.1. An updated conceptual site model for the Site is included in the Geo-Environmental Assessment Report at Appendix 12.2.

Disposal of Spoil and Demolition Material

12.66 Material will be generated as a result of the demolition of existing buildings on the Site, and as part of construction processes such as piling, excavation for services and attenuation tanks and the potential removal of contaminated soil hotspots.

12.67 The opportunities for reusing demolition and construction derived material on the Site are likely to be minimal. As such, the majority of the demolition, excavation and piling arisings would require removal from the Site.

12.68 Owing to the current and historic use of the Site, some material excavated from the Site, and requiring off-site disposal, would likely be classified as hazardous waste. Such waste would be disposed of at a licensed landfill site and would be transported and disposed of in accordance with the Environmental Protection (Duty of Care) Regulations, 1991²⁴.

12.69 In order to determine whether the Site arisings are hazardous or not, the soils chemical data for the samples taken during the site investigation of the northern part of the Site (detailed in the Geo-Environmental Assessment Report presented in Appendix 12.2) would be assessed using HazWasteOnline. HazWasteOnline is a web-based tool for classifying hazardous waste. The tool follows the latest Environment Agency guidance and European regulations.

12.70 Waste Acceptance Criteria (WAC) testing would be required to confirm the disposal classification prior to disposal. The Made Ground would likely be classified as either 'hazardous' or 'non-hazardous'. The natural soils (e.g. pile arisings) would be expected to be classified as inert.

12.71 Following the classification of excavation wastes, the options available for the waste would be considered in the context of the waste hierarchy:

- On site reuse (with or without prior treatment);
- Off-site reuse (with or without prior treatment) e.g. use of waste in construction at a site exempt from the requirement to hold an environmental permit such as a golf course development;
- Off-site processing for recycling or recovery e.g. screening; and
- Off-site disposal (with or without prior treatment) i.e. landfill.

12.72 Assuming that legislative requirements are adhered to, the disposal of this material would result in a **negligible** effect in relation to contamination.

Effects to Site Workers and Public Safety

12.73 In the absence of appropriate mitigation and the use of Personal Protective Equipment (PPE), contamination present in the soil represents a potential risk to construction workers. However, worker safety is the subject of the mandatory requirements of the Control of Substances Hazardous to Health (COSHH) Regulations 2003²⁵ and the Construction (Design and Management)

Regulations 2007 (CDM)²⁶. These regulations set out the extensive requirements for the protection of the workforce and stress the importance of appropriate procedures in the event of the workforce encountering pockets of unknown contamination.

- 12.74 Adherence to the legislative requirements described above would significantly reduce the health and safety risk posed to construction site workers by minimising the risk of direct and/or indirect inhalation, ingestion or contact with contaminated soil, dust, groundwater or contaminated surface water run-off. Furthermore, the dust control measures, described in Chapter 10: Air Quality would reduce the potential for exposure to contaminants associated with dust. The potential contamination risks and effects of the demolition and construction works on site workers would therefore be **negligible**.
- 12.75 In respect of public safety, as indicated within Chapter 6: Development Programme, Demolition and Construction, the Site would be surrounded by hoarding and secured. The risk to individual members of the public during all demolition and construction works would therefore be **negligible**.

Effects to Water Resources

Groundwater – Introduction of New Pathways

- 12.76 Below ground structures and tanks would be removed prior to piling, removing a potential source of contamination.
- 12.77 Pile depths are expected to terminate in the Seaford Chalk Formation. As such, they would have the potential to create new pathways for contamination to be introduced into the regionally important Chalk aquifer. Whilst there would be the potential for the creation of a temporary pathway, typical pile installation times would be in the order of a few minutes and concreting would close this pathway very soon after it forms. It is therefore considered that, in the absence of a head of contaminated liquid, which has not been encountered to date, seepage of contamination is unlikely.
- 12.78 Nevertheless, taking a precautionary approach to the assessment, in the absence of mitigation, the likely effect would be **temporary, short-term, local and of minor adverse** significance.

Groundwater – Accidental Spillages

- 12.79 During the construction works there would be a risk related to material or fuel spillages. Measures to protect the quality of the surface and groundwater as part of a Construction Environmental Management Plan (CEMP) are described in the mitigation measures section below. Adoption of these measures would protect soil and water quality during the demolition and construction works. However, in the absence of the adoption of these methods, the risk to groundwater occurring as a result of unforeseen accidental spillages would be **temporary, short-term, local** in effect and of **moderate adverse** significance.

Surface Waters

- 12.80 There are no surface water receptors on the Site and the nearest surface water resource to the Site is the River Thames which is located 420m northeast of the Site. The effect of lateral migration of contamination or from accidental spillages would therefore be **negligible**. It is considered unlikely that leaking sewerage network and drainage systems would provide preferential pathways to such a degree that these water receptors would be significantly impacted by migration of on site contamination.

Effects to Soils

- 12.81 As previously described, the Site currently comprises predominantly of hardstanding and built form. This limits infiltration to the underlying soils following rainfall events. Removing the existing hardstanding and stock-piling potentially contaminated material, could result in leaching of contaminants to the Site soils following rainfall. The risks and effects associated with this are considered to be **temporary, short-term, local** and of **minor adverse** significance.
- 12.82 Measures to protect the quality of the surface and groundwater would be set out in a CEMP. Adoption of these measures would protect soil quality during the demolition and construction works. However, in the absence of the adoption of these methods, the risk of additional contamination occurring as a result of unforeseen accidental spillages would be temporary, short-term, local in effect and of **moderate adverse** significance.

Effects to Flora and Fauna

- 12.83 Exposure of existing flora and fauna on the Site to potential contamination sources during the demolition and construction works is not considered to pose significant risks or effects as the Site is, in general, of low ecological value (refer to Chapter 14: Ecology). Nevertheless, as a precautionary worst-case approach, given the Site supports protected species, potential demolition and construction related accidental spillages could result in **temporary, short-term, local** effects of **minor adverse** significance.

Interim Condition: Temporary Flexible Event Space

- 12.84 The Temporary Flexible Event Space is proposed to be covered with resin bound gravel and used for multiple end-uses. The resin bound gravel would form a barrier between people and direct contact with any contaminated soil beneath. Limited soft landscaped areas are proposed in raised planters, within a clean growth medium to prevent exposure to soil contaminants. The effects on Site users, flora and fauna would therefore be **negligible**.
- 12.85 The proposed uses of the Temporary Flexible Event Space are not considered to give rise to additional sources of contamination. The effect on groundwater and surface water would therefore be **negligible**.

Completed Development

Effects to Future Site Occupiers and Users

- 12.86 As described in Chapter 5: Description of Development, the Development would comprise residential, commercial and community uses. The potential risk posed to future Site users and occupants from exposure to contaminated soils would be very limited for the following reasons:
- The majority of the Site would be hard-surfaced, forming a barrier between people and contaminated soil, thus breaking the potential contaminant pathway between source and receptor;
 - The proposed buildings would be designed to incorporate appropriate ground gas protection measures, if required;
 - Services would be installed in clean material;
 - Fuel storage tanks provided for backup generators would be installed in accordance with best practice;

- The drainage network at the Site would be improved where failures are detected and oil water interceptors would be installed in car parks to reduce environmental impact;
- Substations would be managed and maintained in accordance with best practice; and
- Landscaped areas would be provided with a clean growth medium to reduce risks of exposure to soil contaminants.

12.87 Soft landscaped areas would be effectively capped from residual contamination risk due to their location at roof and podium level, located above the proposed ground floor level. It is therefore considered that future occupants and Site users would not come into contact with contaminated soil, ground gas and groundwater. The effect on future occupants and Site users is therefore, considered to be **negligible**.

Effects to Water Resources

Groundwater

12.88 The majority of the completed and operational development would be hard-surfaced, thereby limiting rainfall infiltration. The completed and operational Development would not give rise to new sources of significant contamination. The contamination risks and effects of the completed Development upon groundwater would therefore be **negligible**.

Surface Water

12.89 As noted above, the completed and operational Development is not considered to give rise to new sources of significant contamination. The risk of potentially contaminated run-off from the completed and operational Development is therefore low. In addition, improvements are proposed to the surface water drainage system such as installation of oil water interceptors on car parking areas to minimise the risk of accidental spillages and leaks from entering the drainage system. The contamination effects of the completed Development upon surface water would therefore be **negligible**.

12.90 Given the geographical distance of the River Thames and the River Kennet from the Site, the potential risks associated with lateral migration of groundwater contamination to these surface waters are considered to be low. The overall effects on water resources would, therefore, be **negligible**.

Risks and Effects to Flora and Fauna

12.91 As noted above, all proposed landscaped areas would be effectively capped from underlying soils. In addition, soil and material utilised within soft landscaped areas would be certified as clean and inert. As such, the potential contamination effects to flora and fauna associated with the Development would be **negligible**.

Contamination by the Completed Development

12.92 The Development does not include land uses that are likely to give rise to the contamination of soil, groundwater or surface waters. Spillages of oil-based fuels associated with the car parking areas, tanks and substations cannot be discounted. However, the hardstanding would protect the underlying soils from potential risks.

12.93 In addition, improvements are proposed to the surface water drainage system such as installation of oil water interceptors on car parking areas to minimise the risk of accidental spillages and leaks from entering the drainage system. The effects are therefore considered to be **negligible**.

- 12.94 The Development would also include the diversion of the existing sewer along Garrard Street. The diversion of the existing foul public sewer would replace a brick sewer with a new concrete conduit. The existing risk of sewage contamination, accidental spillages and leaks would therefore be reduced giving rise to a likely **long-term, local** effect of a **minor beneficial** significance.

Mitigation

Environmental Intrusive Investigation

- 12.95 This Chapter has highlighted that the Site and its surrounds have the potential to contain areas of contamination. Whilst it is recognised that this is unlikely to mean that the Site is contaminated in terms of the Environmental Protection Act, a lack of intrusive site investigation across the southern half of the Site to the south of Garrard Street means that there is some uncertainty regarding the nature, location, quantum and concentrations of potential contamination hot spots in this area.
- 12.96 Consultation with RBC's Environmental Health Department confirmed that there would be a need for an intrusive site investigation following demolition and prior to construction of the Development on the Site. This would determine the presence, location and levels of any existing soil and/or groundwater contamination. Planning Condition 27 on the SH3 Scheme Planning Consent, sets out the requirement for a Site Investigation to be undertaken and Planning Condition 28 sets out the requirement for gas monitoring and protection as required.
- 12.97 The intrusive investigation undertaken to date included the accessible parts of the Site to the north of Garrard Street. Limited exceedances were identified within the soil samples analysed from the Site and included lead, benzo(a)pyrene, benzo(b)fluoranthene, Di-benz(a,h)anthracene, and indeno(1,2,3-cd)pyrene at concentrations marginally above the generic assessment criteria based on a commercial end-use. Asbestos was identified within eight samples. Following quantification it was determined that only four of these samples contained asbestos with a percentage by weight of the total dried sample that was above the generic assessment criteria of 0.001%.
- 12.98 It was determined that, in view of the proposed Development, potential pollutant pathways between contaminants in the Made Ground and the end-user would be broken by the presence of hardstanding and/or building footprints, and therefore the levels of contaminants within the soils in the area of the Site to the north of Garrard Street would not pose a risk to human health.
- 12.99 Gas monitoring undertaken within the area of the Site to the north of Garrard Street highlighted that the concentrations of methane and volatile organic compounds were low whilst those of carbon dioxide were slightly elevated. Ground gas monitoring categorised this area of the Site as Characteristic Situation 2, and consequently low level protective measures are required.
- 12.100 Groundwater monitoring undertaken identified only marginal exceedances of ammoniacal nitrogen, benzo(a)pyrene and benzo(ghi)perylene within the shallow groundwater in the area of the Site to the north of Garrard Street. Given this, the risk to groundwater was considered to be low.

Post Demolition Site Investigation

- 12.101 Due to the heavy density of buildings which are in place across a significant area of the Site, a post demolition Site Investigation would be undertaken.
- 12.102 A specification for a post demolition site investigation has been produced and is presented in Appendix 12.3 along with a proposed site investigation plan (Fig Ref. EED12350-100-ES-A1A). The exploratory investigation has been designed to target potentially contaminative historical site uses including a smithy, a coal yard and a malthouse in the south of the Site in addition to adding coverage across the wider Site including the area to the north of Garrard Street. The exploratory

Site Investigation has been designed in accordance BS 10175:2011 and is based on an approximate 50m square grid to ensure that all samples and logs are representative of the Site. The following has been recommended:

- 16 trial pits (TP101 to TP116) to provide samples for chemical analysis from shallow depths within the northern half of the Site up to a maximum of 4.5m bgl;
- 18 trial pits (TP117 to TP135) to provide samples for chemical analysis from shallow depths within the southern half of the Site including Telecom House up to a maximum of 4.5m bgl;
- 4 cable percussive boreholes (BH101 to BH105) to a depth of approximately 15m;
- Gas and groundwater monitoring installations in selected boreholes;
- 6 return visits for gas and groundwater sampling/monitoring; and,
- Geo-environmental analysis to be scheduled by Waterman IE.

Demolition and Construction

Pre-Treatment of Spoil and Demolition Material

- 12.103 All material to be excavated and removed off the Site would be subject to waste classification sampling and analysis and necessary treatment would be undertaken, in accordance with the requirements of the Hazardous Waste Regulations²⁷ and the List of Wastes Regulations²⁸.
- 12.104 Groundwater encountered within excavations would be pumped out and either treated prior to disposal to sewer under a Trade Effluent Consent from Thames Water Utilities Ltd (TWUL) or disposed of to a suitable licensed treatment facility.
- 12.105 Spoil containing 'leachable' (i.e. soluble or mobile) contaminants would be identified and suitably contained by bunding or other containment measures, including segregation and sheeting of contaminated spoil and storage on areas of hardstanding or other impermeable surface as set out in the CEMP. This would prevent the release of contaminated run-off and thus protect groundwater and surface water resources.
- 12.106 The adoption of appropriate measures to remove asbestos would be required prior to demolition work.

Protection of Site Workers and the Public

- 12.107 During all demolition and construction works, precautions would be taken to minimise the exposure of workers and the general public to potentially harmful substances. Attention would be paid to restricting potential off-Site nuisances, such as dust and odour emissions. Such precautions would be included within working method statements and the CEMP (as required by Planning Conditions 32, 33 and 35 on the SH3 Scheme Planning Consent) and comprise:
- Personal hygiene, washing and changing procedures;
 - Personal Protective Equipment (PPE), including use of disposable overalls, gloves, respiratory personal protection and particulate filter masks;
 - Adopting dust suppression methods, e.g. water spraying, wheel-washing facility for vehicles leaving the Site; and
 - Regularly cleaning all on Site roads, access roads and the public highway.
- 12.108 The contractor would, prior to construction, provide a Safety Method Statement, which would show how the safety of the work force and the public would be addressed.

Protection of Water Resources

Groundwater

- 12.109 The Environment Agency guidance document on piling on contaminated land²⁹ describes various methods and scenarios for piling through contaminated land. The report recommends that a Foundation Works Risk Assessment (FWRA) is carried out in such cases. It is considered that with the application of an appropriate piling methodology, the risks to the deep aquifer from piling works penetrating through potentially contaminated land would be low. The piling method to be used at the Site would be confirmed following implementation of an intrusive SI and through further consultation with the EA.
- 12.110 Excavated materials would be stockpiled on hardstanding, sheeted and if considered necessary bunded to minimise generation of contaminated run-off and subsequent infiltration and migration to groundwater.
- 12.111 Measures to protect the quality of the surface and groundwater as part of a CEMP would include the following:
- Surface drainage to pass via settlement and oil interception facilities, where required, and discharge arrangements to be agreed with the Environment Agency or, in the case of discharges to sewer, Thames Water;
 - Water which may have come into contact with contaminated materials to be disposed of in accordance with the Water Resources Act 1991 and other legislation, and to the satisfaction of the Environment Agency and/or Thames Water;
 - The piling systems would be designed and constructed to minimise effects on the aquifer;
 - The handling and storage of potentially hazardous liquids on-site, e.g. fuels and chemicals, to be controlled. Storage tank/container facilities to be appropriately bunded within designated areas and sited as far as possible from surface water drains; and
 - Spill kits to be available.
- 12.112 Adoption of these measures would protect water quality during the demolition and construction works.

Surface Water

- 12.113 As previously identified, the only potentially significant contamination risk posed to surface waters is via the release of contaminated surface water runoff from the Site. This would be mitigated by ensuring that surface water drainage is appropriately managed, including passing sediment laden run off through a settlement trap and water potentially contaminated with fuels and oils through an oil water interceptor. Surface water runoff that is contaminated or potentially contaminated would not be discharged to surface water sewers.

The UK Water Industry Research (UKWIR) project steering group consider that barrier pipes provide sufficient protection for the supply of drinking water in all Brownfield site conditions³⁰. However, this approach would be agreed with Thames Water. In any event water supply pipelines would be laid in appropriate clean medium.

Protection of Soils

- 12.114 The measures to protect the quality of the surface and groundwater as part of a CEMP would also protect contamination of soils during the demolition and construction works.

Completed Development

- 12.115 If required, gas protection would be incorporated at detailed design stage to protect occupants of the Development in accordance with the requirements of Planning Condition 28 on the SH3 Scheme Planning Consent. The gas protection measures will be validated with site inspections and cross referenced with design plans. A verification report will then be produced in order to confirm that the installation is suitable and meets the required standards. Assuming this is implemented, the effects of the proposed Development once completed would be **negligible** and no further mitigation measures are required.
- 12.116 All chemicals or fuels would be stored in appropriate containers on hardstanding. In the unlikely event that fuels are stored outside the buildings, the fuel tanks would be appropriately bunded in accordance with current legislation (SI 2001/2954)³¹. Oil-water interceptors would be installed on the drains from car parking areas to minimise the potential for oils to enter the surface water drainage system.
- 12.117 Post construction all electrical substations should be subject to suitable management to ensure that the opportunity for failure and subsequent contamination is kept to a minimum.
- 12.118 An appropriate thickness of clean cover should be installed in all landscaping areas to ensure that a suitable barrier is provided between potentially contaminated site soils and the end-user.

Residual Effects

Demolition and Construction

Disposal of Spoil and Demolition Material

- 12.119 The disposal of contaminated spoil and demolition material would be subject to legislative and regulatory control. The likely residual effects would remain the same as the potential effects, that is, **negligible**.

Effects to Site Workers and Public Safety

- 12.120 As above, the legislative and regulatory framework set out to protect construction Site workers and the public would be implemented as part of the proposed Development. The potential **negligible** contamination effects would therefore be maintained as the likely residual effect of the Development.

Effects to Water Resources (Groundwater and Surface Water)

- 12.121 Contamination with the groundwater underlying the Site has been identified in very low concentrations which are considered to pose a low risk and a **negligible** effect.
- 12.122 A FWRA would be undertaken based on the results of the full site investigation once the Site has been cleared. Piling would be carried out in accordance with best practice.
- 12.123 In view of the above, the potential contamination effect on groundwater resources, including the secondary and principal aquifers associated with the Taplow Gravel Formation and Seaford Chalk Formation would be **negligible**.
- 12.124 The implementation of the CEMP would reduce the potential for contamination of water resources during construction. However, due to unforeseen accidental spillages, some residual risk to groundwater resources would remain. The likely worst case residual effect would be **temporary**,

short-term, local and of **minor adverse** significance. The effect to surface water resources would remain **negligible**.

Effects to Soils

- 12.125 The implementation of protective measures to reduce the potential for contamination of the ground during construction would limit the risk of contamination. However, owing to unforeseen accidental spillages, some residual risk would remain. The likely worst-case residual effect would therefore be **temporary, short-term, local** and of **minor adverse** significance.

Flora and Fauna

- 12.126 On the basis that the Site is currently of limited ecological value and given the implementation of the CEMP, the residual risk to ecological resources is considered to be **negligible**.

Interim Condition: Temporary Flexible Event Space

- 12.127 The residual effects of the Temporary Flexible Event Space would remain the same as the potential effects, the resultant risk is **negligible**.

Completed Development

Risks and Effects to Future Site Users

- 12.128 Assuming remedial works, as required, are carried out in agreement with the EA and RBC combined with the inherent concrete capping layer formed by the Development, use of inert materials within landscaped areas, and use of gas protection measures, if required, the residual risk to future Site users would remain **negligible**.

Risks and Effects to Water Resources (Groundwater and Surface Water)

- 12.129 Assuming the correct and appropriate installation of piles and correct drainage connections/hardstanding/oil water interceptors/ appropriate storage of fuels and chemicals that may be present, the residual risk of the Development to ground and surface water resources would be **negligible**.

Risks and Effects to Flora and Fauna

- 12.130 The inherent capping of all landscaped areas from the prevailing ground conditions through the various structures of the Development mean that the residual effect on flora and fauna would remain **negligible**.

Contamination by the Completed Development

- 12.131 The proposed Development is considered to pose a low risk with regard to contaminative sources. Given this the Residual effect on the Site would be **negligible**. The diversion of the public sewer which is currently in a poor state of repair would represent a **minor beneficial** effect.

Summary and Conclusions

Comparison of Effects between this ES and the Consented SH3 Scheme ES

12.132 The effects remain unchanged from those of the 2013 ES.

Summary of Potential Effects, Mitigation and Residual Effects

12.133 A summary of potential effects, mitigation measures and likely residual effects in relation to ground conditions is summarised below within Table 12.6.

Table 12.6: Summary of Potential and Residual Effects

Issue	Potential Effect / Significance	Mitigation Measures	Residual Effect / Significance
Demolition and Construction (including demolition to create Temporary Event Space)			
Disposal of contaminated spoil and demolition material.	Negligible.	On-site treatment, if required, to ensure reduction in potential contamination levels prior to disposal. Disposal in accordance with legislation.	Negligible.
Contamination risks to Site workers and public safety.	Negligible	Compliance with legislative requirements and implementation of a CEMP which would stipulate the use of protective equipment, standard dust control and other construction site management measures.	Negligible.
Contamination risks and effects to soils.	Accidental Spillages - Temporary, short-term, local and of moderate adverse significance. Effects to soils - Temporary, short-term, local and of minor adverse significance.	Implementation of a CEMP to minimise the risks of contamination spillages to soils.	Accidental Spillages - Temporary, short-term, local and of minor adverse significance. Effects to soils: Temporary, short-term, local and of minor adverse significance.
Contamination risks and effects to groundwater.	New pathways: Temporary, short-term, local and of minor adverse significance Accidental spillage: Temporary, short-term, local and of moderate adverse significance.	Preparation of a FWRA in consultation with the Environment Agency and RBC. Implementation of best practice and a CEMP	New Pathways - Negligible Accidental Spillage - Temporary, short-term, local and of minor adverse significance.
Contamination risks and effects to surface water.	Negligible.	Implementation of a CEMP to minimise the risks of generating contaminated runoff.	Negligible.

Issue	Potential Effect / Significance	Mitigation Measures	Residual Effect / Significance
Contamination risks and effects to flora and fauna.	Temporary, short-term, district and of minor adverse significance.	Implementation of a CEMP to minimise the risks of generating contaminated runoff.	Negligible.
Interim Condition: Completed Temporary Events Space			
Effects to future users of the Temporary Event Space	Negligible.	None Required	Negligible.
Effects to water resources	Negligible.	None Required	Negligible.
Completed Development			
Contamination risks and effects to future occupants and users of the Development.	Negligible.	Remediation of the Site as necessary, undertaken in consultation with the Environment Agency and RBC.	Negligible.
Contamination risks and effects to water resources (groundwater and surface water).	Negligible.	Storage of fuel tanks for backup generators and cleaning chemicals etc on hardstanding or within appropriately bunded areas. Provision of interceptors on the drainage system as required.	Negligible.
Contamination risks and effects to flora and fauna.	Negligible.	None required.	Negligible.
Contamination by the completed Development.	Negligible to Long-term, local effect and of minor beneficial significance.	Storage of fuel tanks for backup generators and cleaning chemicals etc on hardstanding or within appropriately bunded areas. Provision of interceptors on the drainage system as required.	Negligible to Long-term, local effect and of minor beneficial significance.

References

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- ² HMSO, The Water Resources Act 1991 (Amendment) (England and Wales) Regulations (2009)
- ³ The Environmental Permitting (England and Wales) Regulations (2010)
- ⁴ HMSO The Building Regulations (2010)
- ⁵ HMSO, Building Regulations, 2010: Approved Document C, Site Preparation and Resistance to Contaminants and Moisture (2010)
- ⁶ The National Planning and Policy Framework (2012)
- ⁷ DEFRA, Contaminated Land Statutory Guidance (2012)
- ⁸ Reading Borough Council, Reading Borough Local Development Framework, Core Strategy (2008)
- ⁹ Reading Borough Council, Local Development Framework, Sites and Detailed Policies Document (2012)
- ¹⁰ The Reading Central Area Action Plan (2009)
- ¹¹ The Station Hill South Planning and Urban Design Brief (2007)
- ¹² The Station Area Framework (2010)
- ¹³ British Geological Survey (BGS) 1:50,000 Geological Map, Sheet 256, Reading
- ¹⁴ Environment Agency Groundwater Vulnerability Map Sheet 39 (West London)
- ¹⁵ Waterman, Station Hill, Reading Geo-Environmental Assessment, September 2014, Ref. EED12350-110-R-3.1.2-RM
- ¹⁶ Waterman, Station Hill Reading Preliminary Environmental Risk Assessment, June 2014, Ref. EED12350-110-R-4.1.5 – NS
- ¹⁷ Waterman, Station Hill, Reading Phase 1 Land Quality Assessment, November 2006, ref EN4903
- ¹⁸ Waterman, Station Hill, Reading Phase 1 Land Quality Assessment, May 2009, ref E30601
- ¹⁹ Redhills, Former Mecca Bingo Hall, Station Hill Reading, December 2011, Revised Asbestos Register Following Remedial Works ref S-58266
- ²⁰ Redhills, Friars Walk Shopping Centre, Station Hill Reading, October 2011, Revised Asbestos Register Following Remedial Works ref S-56448
- ²¹ Ross Udall, March 2012, Review of Asbestos Surveys and Remediation Works
- ²² DEFRA, The Model Procedures for the Management of Contaminated Land (Contaminated Land Report 11)
- ²³ Environment Agency (EA), Groundwater Source Protection Zones. Accessed August 2014. <http://apps.environment-agency.gov.uk/wiyby/37833.aspx>
- ²⁴ HMSO (1991). Environmental Protection (Duty of Care) Regulations, 1991
- ²⁵ Health and Safety Executive Publication (HSEP) (2003). Control of Substances Hazardous to Health (COSHH) Regulations 2003
- ²⁶ HSEP (2007). Construction (Design and Management) Regulations 2007 (CDM)
- ²⁷ HMSO (2005) Hazardous Waste Regulations 2005
- ²⁸ HMSO (2005) The List of Wastes (England) Regulations 2005
- ²⁹ EA (2001). Environment Agency guidance document on piling on contaminated land
- ³⁰ UK Water Industry Research (2011) Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites. Ref. 10/WM/03/21
- ³¹ Control of Pollution (Oil Storage) (England) Regulations 2001. No. 2954. Crown Copyright 2001.

13. Surface Water Drainage and Flood Risk

Introduction

- 13.1 This Chapter, prepared by Waterman Infrastructure & Environment Ltd, considers the effect of the Development on surface water drainage and flooding. Potential pollution effects have been dealt with in Chapter 12: Ground Conditions and Contamination.
- 13.2 This Chapter provides an overview of the prevailing surface water drainage and flood risk characteristics of the Site. It then identifies the potential flooding risks associated with the demolition and construction works, and once the Development is completed and operational. Appropriate mitigation measures are outlined in order to prevent, reduce or offset the identified potential risks and the resulting likely significant residual effects are summarised.
- 13.3 The assessment has been informed by the Preliminary Environmental Risk Assessment (refer to Technical Appendix 12.1), a Site Investigation (Appendix 12.2), Flood Risk Assessment (FRA) and Outline Drainage Strategy for the Development. The FRA incorporating the Outline Drainage Strategy is presented in Appendix 13.1, and the drainage strategy for the Temporary Flexible Event Space is presented in Appendix 13.2.

Legislation and Planning Policy Context

European Legislation

Water Framework Directive, 2000/60/EC

- 13.4 The Water Framework Directive¹ applies to all European Union water bodies and aims to make sure they are protected from further deterioration, and that improvements in water quality can be made. Although the Water Framework Directive discusses ways to mitigate the effects of flooding, it does not contain any specific flood risk management objectives. In general terms there is an onus on developers to protect and, if possible, enhance water bodies close to proposed developments.

National Legislation

Land Drainage Act 1991

- 13.5 The Land Drainage Act² sets out the responsibilities given to the Environment Agency (EA), local authorities and internal drainage boards in relation to the drainage of land.

Water Resources Act 1991

- 13.6 The Water Resources Act³ (as amended) relates to the control of the water environment. The main aspects of the Act which are relevant to the Development include provisions concerning land drainage, flood mitigation and controlling discharges to watercourses to prevent water pollution.

Flood and Water Management Act 2010

- 13.7 The Flood and Water Management Act⁴ removes the automatic right of connection into public water sewers and places the onus on the Local Planning Authorities (LPA) to adopt Sustainable Drainage Systems (SuDS).

National Planning Policy

National Planning Policy Framework, March 2012

- 13.8 The adopted National Planning Policy Framework⁵ (NPPF), sets out that:
- “inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere”.*
- 13.9 The NPPF states that when determining planning applications, LPAs should ensure flood risk is not increased elsewhere and only consider development appropriate in areas at risk of flooding where it can be demonstrated that:
- Within the site, the most vulnerable development is located in areas of lowest flood risk unless there are overriding reasons to prefer a different location; and
 - Development is appropriately flood resilient and resistant, including safe access and escape routes where required, and that any residual risk can be safely managed, including by emergency planning; and it gives priority to the use of sustainable drainage systems.

The National Planning Practice Guidance, 2014

- 13.10 To accompany the NPPF, additional Planning Practice Guidance⁶ on flood risk and coastal change has been prepared and replaces NPPF Technical Guidance (2012). The Planning Practice Guidance aims to advise LPAs on how planning can take account of the risks associated with flooding and coastal change in plan-making and the application process.
- 13.11 The Planning Practice Guidance stipulates that developers and LPAs should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development, and the appropriate application of SuDS.

Local Planning Policy

Reading Borough Local Development Framework Adopted Core Strategy, 2008 (Updated 2015)

- 13.12 The Reading Borough Council Core Strategy⁷ which broadly states that the risk of flooding needs to be managed without causing detrimental impacts upon drainage. Specifically under Policy CS1, it is stated that new developments should:
- “incorporate sustainable urban drainage facilities and techniques as part of the layout of a development as appropriate and as advised by the Environment Agency, including minimising the size of impermeable areas so that peak run-off and annual water run-off is reduced where possible and in any case is no greater than the original conditions of the site. Particular care will be needed in areas of flood risk where different solutions may be required.”*

Reading Borough Local Development Framework, Sites and Detailed Policies Document, 2012 (Updated 2015)

- 13.13 Policy DM1 ‘Adaptation to Climate Change’ of the Sites and Detailed Policies Document⁸ requires that all development should minimise the impact of surface water runoff from the development in the design of the drainage system.

Reading Borough Local Development Framework Central Area Action Plan, 2009

- 13.14 The Reading Central Area Action Plan (RCAAP) which makes up part of the Local Development Framework⁹, identifies that the Site falls into the Station/River major opportunity area and part of this area particularly north of the railway line, is identified as within both Flood Zones 2 and 3a. The sequential and exceptions test in line with PPS25 (applicable at the time of RCAAPs publication) have been carried out in identifying these sites for development. However, the Site is located entirely in Flood Zone 1 and on this basis no sequential test is required.

Station Hill South Planning and Urban Design Brief, 2007

- 13.15 The Station Hill South Planning and Urban Design Brief¹⁰, states that:
- “Applicants should investigate and adopt where appropriate, techniques of sustainable urban drainage (SuDS) to reduce grey water run-off”.*

Reading Station Area Framework, 2010

- 13.16 The Station Area Framework¹¹ encourages the incorporation of SuDS into the design of a scheme to ensure that runoff from a development site does not exceed, and, where possible, improves on existing runoff rates.
- 13.17 Policy 10: Sustainability states that any proposed drainage scheme should apply the SuDS ‘Management Train’ approach by using a range of sustainable techniques to ensure the maximum benefits of using these methods can be achieved.

Assessment Methodology and Significance Criteria

Assessment Methodology

Baseline Collection

- 13.18 Baseline conditions at the Site and surroundings, surface water run-off rates and potential sources of flood risk were established using the following sources of information:
- A Site visit to examine the water features and topography of the area and the surrounding locality;
 - Flood maps published by the Environment Agency (EA);
 - Review of Ordnance Survey maps; topographical surveys; British Geological Survey (BGS) maps and borehole data, historical maps, and groundwater vulnerability maps;
 - Flood level data obtained from the EA;
 - A Landmark Envirocheck report for the Site (refer to Chapter 12: Ground Conditions and Contamination for further details); and
 - Review of previous Site investigation data (refer to Chapter 12: Ground Conditions and Contamination for further details).

Flood Risk and Surface Water Drainage

- 13.19 A Flood Risk Assessment (FRA) was undertaken in accordance with the requirements of the NPPF and associated Planning Practice Guidance. The FRA considers all sources of potential flooding including fluvial, artificial sources, groundwater and pluvial sources. The full FRA is presented in Appendix 13.1.
- 13.20 The NPPF requires that the rate of surface water discharge from any developed site should be no greater than the existing rate, taking into account climate change, for the lifetime of the

development. The EA aims for discharge to be restricted to a minimum of 50% of the existing rate, and preferably to the greenfield rate.

- 13.21 Surface water runoff was therefore also investigated in the FRA to determine the likely effect of the Development on surface water resources and the potential risk of flooding elsewhere. As part of the Drainage Strategy, a feasibility assessment of possible SuDS options to reduce the runoff from the Site was undertaken (appended to the FRA provided in Appendix 13.1).

Groundwater and Hydrology

- 13.22 The assessment of likely significant effects on groundwater flows during the demolition and construction phase was based on an understanding of existing ground conditions identified from geological and hydrogeological data from intrusive investigations and monitoring, and professional judgement based on experience at similar developments.

Foul Drainage

- 13.23 Estimates of demand for foul drainage have been calculated by Hoare Lea. Thames Water would be consulted at the detailed design stage to determine how this increased demand would be met.

Approach to Future Baseline

- 13.24 Each of the future baseline schemes would be required to consider the potential flood risk and drainage issues relevant to their site and ensure that they do not increase the risk of flooding to others. The future baseline schemes are therefore not considered to affect the baseline conditions relevant to this assessment and have therefore not been considered further within this Chapter.

Approach to Outline Assessment

- 13.25 The assessment of the Development has been based on the maximum parameters of the Development as this has the most potential for significant adverse effects on surface water flow.

Limitations and Assumptions

- 13.26 The design life of the Development is assumed to be 100 years.
- 13.27 The attenuation requirements assume that little or no soft landscaping is proposed within the Development. The commitment to green and brown roofs (refer to Chapter 5: Description of Development) has not been considered in the attenuation requirements. Again, this represents a worst-case scenario for the purposes of this assessment.

Consultation

- 13.28 The EA, Thames Water and Reading Borough Council (RBC) were consulted in relation to the scope of the FRA and to gain information on records of flooding in the vicinity of the Site.
- 13.29 The EA stated that they were satisfied with the proposed scope of the FRA. Their response encouraged the use of innovative SuDS techniques within the drainage network and the reduction of runoff rates to below that of brownfield conditions.
- 13.30 An EIA Scoping Report was prepared and submitted together with a formal request for a Scoping Opinion to RBC on 17th February 2012. RBC provided a formal Scoping Opinion dated 17th April 2012 which is included at Appendix 2.1, together with consultation responses received. No further comments were raised in the scoping opinion in relation to water resources and flood risk. A further Scoping Letter was issued in June 2014 to set out how the Telecom House/Plot E

Application would be assessed. No comment were raised in relation to flood risk in the Scoping Opinion received in October 2014.

Significance Criteria

- 13.31 In accordance with Chapter 2: EIA Methodology, this assessment determines the relative significance of surface water drainage and flood risk effects. The assessment of potential and residual effects has used the scale of significance set out in Table 13.1 which has been based upon professional judgement and experience.

Table 13.1: Significance Criteria for Surface Water Effects and Flood Risk Assessment

Significance Criteria	Description
Substantial adverse	Moderate to severe increase in flood risk. Permanent flooding or change to flow characteristics of watercourses. Moderate to severe local scale change in flow of groundwater underneath the Site and / or modest changes in off-Site groundwater flow. Substantial increase in demand for drainage above capacity of services.
Moderate adverse	Minor to moderate local scale increase in flood risk. Severe temporary flooding or change to flow characteristics of watercourses. Minor to moderate local scale change in flow of groundwater. Moderate increase in demand for drainage above capacity of services.
Minor adverse	A slightly increased risk of flooding and minor local scale change in groundwater flow. Minor increase in demand for drainage above capacity of services.
Negligible	Development would result in no appreciable effect on flood risk. Demand for drainage can be met within existing capacity.
Minor beneficial	Minor local scale reduction in localised flood risk. Minor increase in capacity of drainage.
Moderate beneficial	Moderate local scale reduction in flood risk. Moderate increase in capacity of drainage.
Substantial beneficial	Significant local scale / moderate to significant regional scale reduction in flood risk. Major increase in capacity of drainage.

Baseline Conditions

Topography

- 13.32 Topographic surveys of the Site (refer to Appendix 13.1) carried out in 2003 and 2008 indicate that the Site falls towards the north-west. Land in the south of the Site along Friar Street lies at a maximum of approximately 45.8m Above Ordnance Datum (AOD), falling to a minimum of approximately 38.3m AOD in the north-west of the Site at the junction of Greyfriars Road and Stanshawe Road.

- 13.33 Garrard Street and Station Hill fall in a westerly direction from 44.0m AOD to 38.7m AOD and from 43.7m AOD to 39.3m AOD, respectively.

Geology and Ground Water

- 13.34 As discussed within Chapter 12: Ground Conditions and Contamination, the Site's Made Ground is estimated to extend to a maximum depth of 5m below ground level (bgl). This overlays approximately 1-3m of Alluvium which in turn overlays approximately 1.5-6.5m of Taplow Gravel. Seaford Chalk lies beneath.
- 13.35 The Site Investigation undertaken within the northern part of the Site (refer to Appendix 12.2) encountered groundwater at depths of between 2.7m below ground level (bgl) and 5.3m bgl. Subsequent groundwater monitoring found resting levels to be at between 2.15 and 2.75m bgl (36.07 to 36.44m AOD).

Surface Water Drainage

- 13.36 In terms of drainage, the existing Site is effectively hard landscaped, and is positively drained to the surrounding sewer network. Due to the above ground Site characteristics, there are likely to be very limited opportunities for the natural infiltration of precipitation to the underlying soils.
- 13.37 The closest watercourse to the Site is that of the River Thames. This is located approximately 420m to the north of the Site. The River Kennet (a tributary of the Thames) is located approximately 500m to the south-east of the Site.
- 13.38 Discharge consents have been identified within 500m of the Site. Details are provided in Chapter 12: Ground Conditions and Contamination.
- 13.39 Surface water infrastructure serving the immediate vicinity of the Site flows towards the north east within the existing highway. A 225mm diameter surface water sewer flows along Friar Street to the south of the Site. A 300mm diameter surface water sewer in Greyfriars Road, picks up a 375mm diameter sewer that runs beneath Garrard Street, and enlarges to a 600mm pipe. This 600mm pipe joins the 375mm pipeline that runs along Station Hill, and connects to a 525mm and a 375mm diameter surface water sewer in Tudor Road.

Foul Drainage

- 13.40 Thames Water Sewer records show that there are a number of foul sewers that currently cross the Site. A primary foul sewer runs west-east beneath the centre of the Site. The sewer is made of brick and approximately 525mm in diameter. Thames Water has confirmed that the sewer is in reasonable condition. A second 225mm diameter Sewer runs east west along Garrard Street and then north to the primary sewer beneath the proposed Plot D. This is in a poor state of repair.

Flood Risk

Risk from Tidal and Fluvial Flooding

- 13.41 The EA flood map shows the Site to be located within Flood Zone 1 (refer to Appendix 13.1). This means that the Site has an annual probability of flooding from tidal or fluvial sources of less than 0.1%, indicating that the risk of flooding from rivers and the sea is low. The nearest watercourse to the Site is the River Thames, approximately 420m northeast. The EA has confirmed that the peak 1 in 1000 year fluvial flood level nearest to the Site is 38.45m AOD. Minimum ground levels at the Site are 38.5m AOD confirming the Site lies within Flood Zone 1.

- 13.42 Maps of historical flooding provided by the EA (refer to Appendix 13.1) confirm that there have been no historic incidents of tidal or fluvial flooding at the Site and the Development is therefore considered to be at a low risk of flooding.

Risk from Surface Water Drainage Flooding

- 13.43 Pluvial (surface water) flooding occurs when natural and engineered drainage systems have insufficient capacity to deal with the volume of rainfall. Pluvial flooding can sometimes occur in urban areas during an extreme, high intensity, short duration rainfall event which overwhelms the local surface water drainage systems. This flood water would then be conveyed via overland flow routes dictated by the local topography.
- 13.44 The EA's Risk of Flooding from Surface Water map, indicates that the Site is generally at a very low risk of surface water flooding. However, there are some potential areas of surface water flooding indicated within the highways in and around the Site. Correspondence received from Thames Water (refer to Appendix 13.1) confirms that they have no records of sewer flooding occurring at the Site. It is therefore considered that although some highways in the vicinity of the Site may be at risk of surface water ponding, the risk of flooding from overland surface water run off or surcharged sewers is currently low.

Risk from Groundwater Flooding

- 13.45 The Site Investigation undertaken at the Site (refer to Appendix 12.2) monitored ground water levels at between 2.15 and 2.75m below ground level. The Strategic Flood Risk Assessment undertaken on behalf of Reading Borough Council indicates that no groundwater flooding has been recorded within the Site boundary. The lack of existing basements at the Site mean that the risk of on-Site groundwater flooding is currently low.

Risk from Foul Drainage Flooding

- 13.46 As previously noted, Thames Water has confirmed that they have no records of sewer flooding at the Site. The risk of foul sewer flooding is therefore considered to be low.

Potential Effects

Demolition and Construction - Wider Development

Flood Risk to Construction Workers

- 13.47 As set out above, there is a low risk on the Site of flooding from pluvial and groundwater sources. There may be some ponding / surface water flooding within the local highways in and around the Site however, this is considered unlikely to represent a significant risk to Construction Workers. As such, the effect is considered to be **negligible**.

Surface Water Drainage

- 13.48 The Site currently comprises primarily hard standing and buildings. Construction earthworks, temporary Site drainage, temporary car parks and dewatering all have the potential to give rise to changes in the surface water run-off regime, including peak flows and low flows.
- 13.49 In the absence of mitigation, the above effects could increase the risk of surface water flooding giving rise to, at worst, a **temporary** and **local** effect of **minor adverse significance**.

Foul Drainage

- 13.50 It is currently proposed to build over the existing primary foul water sewer running beneath the Site which is in a good condition, and divert a smaller sewer running under Plot D, which is currently in a poor condition. A 3m easement would be provided either side of the sewers to facilitate future maintenance access. A build over agreement would be sought from Thames Water for the primary sewer and Thames Water would repair and relocate the foul sewer running under the proposed Plot D. As such, the effect on foul drainage flooding during construction would be **negligible**.

Interim Condition: Temporary Flexible Event Space

- 13.51 The surface water drainage strategy for the Temporary Events Space prepared by Waterman states that surface water currently discharges into the Thames Water surface water sewers located immediately to the north and east of the Temporary Flexible Event Space site along Station Hill and Station Approach. The drainage for the Temporary Flexible Event Space is proposed to mimic the existing situation and to restrict surface water runoff to the existing rate.
- 13.52 The existing site is wholly hard landscaped and the proportion of hard standing post development would decrease by approximately 13.5%. As such, the volume of surface water run-off entering the sewer would decrease proportionally. This increase in soft landscaping would account for any minimal increase in rainfall intensity for the duration of lifetime in this temporary proposal (estimated to be approximately 5 years). On this basis, the effect on flood risk is considered to be **negligible**.

Completed Development

Flood Risk to Occupants of the Development

- 13.53 As set out previously, the Site is at low risk of tidal and fluvial flooding. The effect on the Development would therefore be **negligible**.
- 13.54 The EA's Risk of Flooding from Surface Water map indicates that there are some potential areas of surface water flooding indicated within the highways in and around the Site. There is therefore potential for a permanent, **minor adverse** effect from surface water flooding.

Surface Water Drainage

- 13.55 The EA has confirmed that the rate of surface water discharge from the completed development should be no greater than existing and account for the effects of climate change. The preferred method of reducing surface water run-off lies with the implementation of a range of SuDS which aim to reduce and attenuate the amount of run-off as close to the source as possible. Due to the constraints of the Site, only living roofs and underground storage combined with hydrobrakes to restrict the rate of discharge are considered viable for the Site, as set out in the Hoare Lea Stormwater Drainage Strategy provided in Appendix 13.1.
- 13.56 The Stormwater Drainage Strategy demonstrates that the volume of surface water attenuation required for the Site to attenuate runoff from a 100 year storm event accounting for 30% climate change would be in the order of 900m³ (an increase of 100m³ compared to the SH3 Scheme where 800m³ was required).
- 13.57 The Development would reduce the existing areas of impermeable land surfaces through the provision of green / brown roofs on a minimum of 25% of the total roof area of the Development (in accordance with Planning Condition 22 on the SH3 Planning Consent), together with soft landscaping provided at ground level within Central Square, Station Square and other areas of

public realm (refer to Parameter Plans 698_PP_07_004 and 698_E_PP_07_004). It is also proposed that a green wall be created on the southern elevation of the refurbished multi-storey car park. Although these areas would capture rainwater, taking a precautionary approach, the surface water attenuation benefits of these roofs have currently been discounted and the outline drainage strategy allows for the full 900m³ of attenuation required to be provided by attenuation tanks.

13.58 The locations of the attenuation tanks would be determined at the detailed design stage.

13.59 The overall effect of the Development on surface water flood risk would therefore be **negligible**.

Groundwater Flow

13.60 No significant substructure works are proposed and piled foundations would not be of sufficient mass to adversely affect groundwater flows or levels. The Development would therefore not cause an obstruction to groundwater flows and hence would not cause any increase in the level of the water table. Therefore the Development would have a **negligible** effect on groundwater flow and would not increase the risk of groundwater flooding at the Site or elsewhere.

Foul Drainage Flooding

13.61 Should the receiving foul drainage network be close to capacity, the additional effluent generated by the new population of the Development has the potential to overload the existing drainage system outside of the Site. In the absence of mitigation the effect could be **minor adverse**.

Mitigation Measures

Demolition and Construction of the Wider Station Hill Site

General Protection of Construction Workers

13.62 The effects on construction workers are anticipated to be negligible. As such, no mitigation measures are required.

Maintenance of Surface Water and Foul Drainage Capacity

13.63 All drainage flow routes and connections would be appropriately maintained throughout the demolition and construction works. Should dewatering be required, this would be carried out using standard techniques such as sumps and pump. Any increase in discharges to the foul or surface water sewer, including from dewatering, would be subject to prior agreement with Thames Water.

Interim Condition: Temporary Flexible Event Space

13.64 The increase in soft landscaping would account for any increase in rainfall intensity as a result of climate change for the duration of this temporary proposal. As such, no mitigation measures are required.

Completed Development

Flood Risk to Occupants of the Development

13.65 The finished floor levels of the Development should be reviewed against those of the surrounding highway network at the detailed design stage to confirm that no new low points are created. If potential surface water flows / ponding cannot be ruled out, the drainage strategy should be

designed to ensure that this can be appropriately accommodated and in line with best practice, internal finished floor levels should be set nominally above the level of the adjacent highways. This could be achieved by gently ramping up from the external areas/highways to the building entrances.

Surface Water Drainage

- 13.66 The outline drainage strategy proposes approximately 900m³ of attenuation tanks to be provided within the Site together with hydrobrakes to limit discharge rates. The detailed drainage strategy would be determined at the reserved matters stage in accordance with the requirements of Planning Condition 21 on the SH3 Scheme Planning Consent; it is intended that an equivalent condition would be included in the Telecom House / Plot E permission. Provided that attenuation is provided across the whole Development, no further mitigation would be required.

Groundwater Flooding

- 13.67 Given the Development is anticipated to have a negligible effect on groundwater flow, no mitigation would be required.

Foul Drainage

- 13.68 Consultation would be undertaken with Thames Water at the detailed design stage, and if required foul water infrastructure would be upgraded.

Residual Effects

Demolition and Construction - Wider Station Hill Site

Risk to Construction Workers

- 13.69 Given, the Site is at low risk of flooding, the residual effect on construction workers from flooding would be **negligible**.

Risk from Surface Water Drainage Flooding

- 13.70 Provided all drainage flow routes and connections are maintained and any increased discharge from dewatering, is agreed, the effects from surface water drainage would be **negligible**.

Risk from Foul Drainage Flooding

- 13.71 Provided the 3m easement zone either side of the existing primary foul sewer is provided and access to the sewer is maintained, the effect on foul drainage flooding during construction would be **negligible**.

Interim Condition: Temporary Flexible Events Space

- 13.72 The residual effect of the temporary flexible events space on water resources and flood risk would be **negligible**.

Completed Development

Risk to Occupants of Completed Development

- 13.73 The Site is at low risk of flooding from fluvial and tidal sources. With regard to surface water flooding, the detailed designs would be reviewed to ensure that no new low points are created or that the drainage design is suitable to accommodate potential surface water flows, and that finished floor levels are set above the surrounding highway network to minimise the potential for

surface water flooding. On this basis, the residual flood risk to occupants of the completed Development would be **negligible**.

Surface Water Drainage Flooding

- 13.74 The surface water strategy would ensure that there is no increase in run-off during the lifetime of the Development, accounting for the effects of climate change resulting in a **negligible** effect.

Groundwater Flooding

- 13.75 Given no significant substructure works are proposed the effect of the Development on groundwater flooding would be **negligible**.

Foul Drainage Flooding

- 13.76 Provided any necessary upgrade works are implemented the residual effect of the Development on foul drainage would be **negligible**.

Summary and Conclusions

- 13.77 In line with the relevant guidance, a FRA and Storm Water Drainage Strategy has been undertaken to determine the potential risk posed by the Development in terms of tidal, fluvial, groundwater, artificial sources and foul and surface water (i.e. sewers and overland run off) flooding. An appropriate drainage strategy has also been developed.

Comparison of Effects between this ES and the Consented SH3 Scheme ES

- 13.78 The residual effects remain the same as presented in the 2013 ES. However, the potential effect (without mitigation) from Surface Water Flooding has increased from a negligible effect to a minor adverse effect. This is because the EA's more recent Risk of Surface Water Flooding maps show that there is some potential for surface water ponding / flooding in the highways within and surrounding the Site. However, this can be appropriately mitigated through consideration of Site levels and finished floor levels at the detailed design stage.

Summary of Potential Effects, Mitigation and Residual Effects

- 13.79 The potential and residual effects are summarised within Table 13.2.

Table 13.2: Summary of potential and residual effects

Issue	Potential Effect	Mitigation	Residual Effect
Demolition and Construction of Wider Development			
Flood risk to construction workers.	Negligible	None required.	Negligible
Surface water drainage	Temporary and local risk of minor adverse significance	Drainage routes to be maintained. Discharge rates to be agreed.	Negligible
Foul drainage	Negligible	None Required	Negligible
Completed Temporary Events Space			
Risk from surface water drainage flooding.	Negligible	None required.	Negligible

Issue	Potential Effect	Mitigation	Residual Effect
Completed Wider Development			
Flood risk to occupants of the Development.	Negligible	None required.	Negligible
Surface Water Flooding	On the Development: Minor adverse	Review of designs to ensure no new low points are created and finished floor levels are above the level of the surrounding highway network.	Negligible
	From the Development: Negligible	Implementation of appropriate drainage strategy incorporating attenuation tanks and hydrobrakes.	Negligible
Risk of groundwater flooding.	Negligible	None required.	Negligible
Risk of foul drainage flooding.	Minor Adverse	Foul drainage Infrastructure upgrades if required.	Negligible

References

- ¹ European Commission, 2000. Water Framework Directive (2000/60/EC). OOPCE.
- ² Her Majesty's Stationary Office (HMSO) Land Drainage Act 1991 (as amended).
- ³ Her Majesty's Stationary Office (HMSO) The Water Resources Act 1991 (as amended)
- ⁴ Her Majesty's Stationary Office (HMSO) The Flood and Water Management Act 2010 (as amended).
- ⁵ Department for Communities and Local Government, 2012: National Planning Policy Framework.
- ⁶ Department for Communities and Local Government, March 2014: National Planning Policy Framework, Planning Practice Guidance.
- ⁷ Reading Borough Council, 2008. Reading Borough Local Development Framework: Core Strategy Adopted January 2008.
- ⁸ Reading Borough Council, 2012. Local Development Framework: Sites and Detailed Policies Document, Adopted October 2012.
- ⁹ Reading Borough Council, 2009. Local Development Framework: Reading Central Area Action Plan to 2026.
- ¹⁰ Reading Borough Council, 2007. Station Hill South Planning and Urban Design Brief.
- ¹¹ Reading Borough Council, 2010. Station Area Framework.

14. Ecology

Introduction

- 14.1. This Chapter, written by Waterman Infrastructure & Environment Ltd (Waterman IE) is an updated assessment of the 2013 ES submitted as part of the planning application for the SH3 Scheme (Planning Application Reference: 130436/OUT). The Chapter considers the potential effects of the SH3 Scheme minus the consented Plot E plus the newly proposed Telecom House / Plot E Scheme (hereafter collectively referred to as the 'proposed Development') on ecological and nature conservation resources.
- 14.2. A description of relevant legislation and planning policies is provided, together with the methodology used and a description of the baseline conditions on, and adjacent to, the Site. The Chapter then identifies any likely significant effects that the proposed Development may have during the demolition and construction works and also once operational. Appropriate mitigation and enhancement measures are outlined and any likely significant residual effects identified.
- 14.3. The findings of the most recent ecological baseline assessments are either provided as Appendices to this Chapter or sufficient details of the assessments are provided within the Chapter itself. An updated desk top study undertaken in 2014 is provided in Appendix 14.1 and a black redstart (*Phoenicurus ochruros*) survey undertaken in 2012 is provided in Appendix 14.2.

Legislation and Planning Policy Context and Guidance

Legislation

The Conservation of Habitats and Species Regulations 2010 (as amended)

- 14.4. The Conservation of Habitats and Species Regulations 2010 (as amended)¹ (the Habitats and Species Regulations) implement the Natural Habitats and Wild Fauna and Flora Directive (92/43/EC) (the 'Habitats Directive')² in England and Wales. The Habitats and Species Regulations mainly deal with the protection of sites that are important for nature conservation in a European context, such as Special Areas for Conservation (SACs) and Special Protection Areas (SPAs) for birds.
- 14.5. However, the Habitats and Species Regulations also give protection to certain species of flora and fauna including bats (*Chiroptera*). It is an offence to deliberately pick, collect, cut, uproot or destroy a wild plant of a species that is protected by Regulation 45 of the Habitat and Species Regulations. In addition, wild animals which are listed in Schedule 2 of the Regulations are subject to the provisions in Regulation 41, which makes it an offence to:
- deliberately capture, injure or kill a wild animal as listed in Schedule 2;
 - deliberately disturb any such animal in such a way as to be likely to significantly affect:
 - The ability of any significant group of animals of that species to survive, breed, or rear or nurture their young; or
 - The local distribution or abundance of that species;
 - deliberately take or destroy the eggs of such an animal; or
 - damage or destroy a breeding site or resting place of such an animal.

The Wildlife and Countryside Act, 1981 (as amended)

- 14.6. The Wildlife and Countryside Act 1981³ (as amended) (WCA) protects the most important habitats such as Sites of Special Scientific Interest (SSSI). The WCA also requires that the Secretary of State (SoS) takes special measures to protect certain rare or vulnerable bird species, as defined in Annex I of the EC Birds Directive⁴, through the designation and protection of SPAs.
- 14.7. Wild animals listed in Schedule 5 of the WCA are subject to specific protection under Section 9, which make the following an offence:
- Intentional killing, injuring and taking;
 - Possession or control;
 - Intentional or reckless damage to, destruction of, obstruction of access to any structure or place used by a scheduled animal for shelter or protection;
 - Intentional or reckless disturbance of an animal occupying such a structure or place;
 - Selling, offering for sale, possessing or transporting for the purposes of sale; and
 - Advertising for buying or selling.
- 14.8. It also provides a level of protection to plants listed on Schedule 8 and makes it an offence to plant or otherwise cause to grow in the wild any plant that is included in Schedule 9 of the WCA, which includes Japanese knotweed (*Fallopia japonica*).

The Countryside and Rights of Way Act, 2000

- 14.9. Part III of the Countryside and Rights of Way Act 2000⁵ (CRoW Act) addresses wildlife protection and nature conservation. It stipulates that the SoS must publish a list of living organisms and habitat types that are considered to be of principal importance in conserving biodiversity. These species and habitats are listed under Section 74 of the CRoW Act and are also found within the UK Biodiversity Action Plan (UK BAP)⁶.
- 14.10. The CRoW Act amends the WCA by strengthening the protection of designated SSSIs. In addition, the CRoW Act increases the legal protection of threatened species, by also making it an offence to 'recklessly' destroy, damage or obstruct access to a sheltering place used by an animal listed in Schedule 5 of the CRoW Act or 'recklessly' disturb an animal occupying such a structure or place.

Natural Environment and Rural Communities Act, 2006

- 14.11. The Natural Environment and Rural Communities Act 2006⁷ (NERC) amends the CRoW Act 2000, by including a duty on all public authorities to have regard to biodiversity and conservation.

National Planning Policy

National Planning Policy Framework (NPPF), 2012

- 14.12. The National Planning Policy Framework¹ (NPPF) was published in March 2012. Section 11 (outlined below) of the NPPF, 'Conserving and Enhancing the Natural Environment', effectively replaces former Planning Policy Statement 9: Biodiversity and Geological Conservation. However, Government Circular 06/20052 - Biodiversity and Geological Conservation: Statutory Obligations and Their Impact within the Planning System, remains valid and is referenced within the NPPF.

¹ Department of Communities and Local Government. (2012). *National Planning Policy Framework*.

² Department of Communities and Local Government. (2005). *Circular 06/05: Biodiversity and Geological Conservation – Statutory Obligations and their Impact within the Planning System*.

- 14.13. The NPPF encourages the planning system to contribute to and enhance the natural and local environment. This should be achieved by:
- *“Protecting and enhancing valued landscapes, geological conservation interests and soils;*
 - *Recognising the wider benefits of ecosystem services;*
 - *Minimising impacts on biodiversity and providing net gains in biodiversity where possible, contributing to the government’s commitment to halt the overall decline in biodiversity, including by establishing ecological networks that are more resilient to current and future pressures;*
 - *Preventing both new and existing development from contributing to or being put at an unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability; and*
 - *Remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate”.*
- 14.14. The NPPF also stipulates that Local Planning Authorities (LPAs), when determining planning applications, should seek to conserve and enhance biodiversity, by applying the following principles:
- *“Development proposals where the primary objective is to conserve or enhance biodiversity should be permitted; and*
 - *Opportunities to incorporate biodiversity in and around developments should be encouraged”.*
- 14.1. If significant harm resulting from a development cannot be avoided (through locating on an alternative site with less harmful effects) adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused.

[National Planning Practice Guidance, 2014](#)

- 14.2. The Government’s National Planning Practice Guidance³ (NPPG) is intended to provide guidance to local planning authorities and developers on the implementation of the planning policies set out within the NPPF. The guidance of most relevance to ecology and biodiversity is the Natural Environment Chapter, which explains key issues in implementing policy to protect biodiversity, including local requirements.

[Local Planning Policy](#)

[Reading Borough Local Development Framework, Adopted Core Strategy, 2008 \(Updated 2015\)](#)

- 14.3. Policies within the Reading Core Strategy⁸ relevant to ecology include Policy CS36 on ‘Biodiversity and Geology’. This states that:

“Development should retain, protect and incorporate features of biodiversity or geological interest (including protected species and their habitats) found within the application site into their schemes”.

[Reading Borough Local Development Framework, Sites and Detailed Policies Document, Adopted 2012 \(Updated 2015\)](#)

- 14.4. Policy DM3 of the Sites and Detailed Policies Document⁹ relates to infrastructure Planning. The policy states that in determining planning applications the highest priority will be given to *“open space, green infrastructure and other measures to improve or enhance biodiversity”*.

³ Department for Communities and Local Government. (2014). *National Planning Practice Guidance*. DCLG, London.

- 14.5. Policy DM18 encourages tree planting within application sites or off-site where appropriate.

[Reading Borough Local Development Framework, Reading Central Area Action Plan, 2009](#)

- 14.6. The Reading Central Area Action Plan (RCAAP) adopted in 2009¹⁰, stresses that the design and construction of new developments in the centre of Reading should be sustainable in nature. The Plan draws attention to the use of green and brown roofs which *“may enhance the biodiversity value of developments in the centre. Brown roofs in particular are of benefit to species such as black redstarts, one of the priority species in the [Reading] Biodiversity Action Plan, which have been sighted in the central area”*.

[Station Hill South Planning and Urban Design Brief, 2007](#)

- 14.7. The Station Hill Planning and Urban Design Brief¹¹ acknowledges that the ecology of the area is mainly limited to black redstarts, which are known to nest in the area. Design principle 8 states:

“Developments should demonstrate positive yield in terms of environmental and ecological benefits...”

- 14.8. It continues:

“Development should meet the requirements of the local Biodiversity Action Plan (BAP)”.

- 14.9. The design brief also states that:

“Building tall buildings can also yield potential ecological and environmental benefits by integrating vertical landscaping, roof gardens or vegetation within the architecture. Further consideration will be expected as part of any application for taller buildings.”

[Station Area Framework, 2010](#)

- 14.10. The Reading Station Area Framework¹² encourages brown and green roofs on Developments with flat roofs within the station area to provide habitat for species including the black redstart. In addition living walls and artificial nesting sites are encouraged.

[Biodiversity Action Plans](#)

- 14.11. Published on 17 July 2012, the 'UK Post-2010 Biodiversity Framework' covers the period from 2011 to 2020. This now supersedes the UK Biodiversity Action Plan (UK BAP). However many of the tools developed under UK BAP remain of use, for example, background information about the lists of priority habitats and species. The lists of priority species and habitats agreed under UK BAP still form the basis of much biodiversity work in the countries. For the purpose of this report, habitats and species listed under Section 41 of the NERC Act are referred to as having superseded the UK BAP.
- 14.12. As part of the action plan process, Local Biodiversity Action Plans (LBAPs) have been produced for most local authorities in the UK. The Site is covered by the Reading BAP.
- 14.13. The Section 41 NERC and Reading BAP habitats and priority species, listed below, are considered relevant to the Site:
- Bats: all species (LBAP and NERC – some species);
 - Black redstart *Phoenicurus ochruros* (LBAP); and

- House sparrow *Passer domesticus* (LBAP and NERC).

Assessment Methodology and Significance Criteria

Assessment Methodology

Delineation of the Study Area

- 14.14. The first stage of the assessment necessitated the delineation of an appropriate study area. This was defined as the Site and all land within 2km of the perimeter of the Site, as the scale of the proposed Development is such that no significant effects are considered likely to arise beyond this area.

Surveys and Data Sources

- 14.15. Nature conservation organisations with interests in the study area were initially approached in 2005 (as part of the SH1 planning application in 2007) in order to provide information and records on:
- Sites designated for their nature conservation value;
 - Protected species;
 - Other species of conservation concern; and
 - Any other information that they considered relevant.
- 14.16. The organisations contacted were as follows:
- Berkshire, Buckinghamshire and Oxfordshire Wildlife Trust;
 - Berkshire and South Buckinghamshire Bat Group;
 - Buckinghamshire and Milton Keynes Environmental Records Centre;
 - English Nature (Thames and Chilterns Team);
 - Reading Bat Group;
 - Reading Ornithological Club; and
 - Thames Valley Environmental Records Centre.
- 14.17. The above desk study was updated in 2009 (in association with the SH2 Scheme planning application), in 2011 (in association with the SH3 Scheme planning application) and most recently in 2014 (in association with the Telecom House / Plot E Scheme Application). On all occasions, the Thames Valley Environmental Records Centre was contacted, which is the main repository for biological data in Berkshire, along with Berkshire Ornithological Society (formerly the Reading Ornithological Club).
- 14.18. In addition, records from the Multi-Agency Geographic Information for the Countryside (MAGIC)¹³ and an assessment of habitats and species listed on Section 41 of the NERC Act 2006 (previously the UK BAP) and the BAP was undertaken to assign an ecological context to the Site.
- 14.19. Relevant information obtained in the desk-study undertaken in 2014 is provided in Appendix 14.1.

Field Surveys

14.20. Field surveys were undertaken between 2005 and 2015 to determine the baseline conditions for the Site. These were carried out in accordance with accepted methodologies at the time of survey including the 'Handbook for Phase 1 Habitat Survey' (JNCC, 2010)¹⁴, 'Bird Monitoring Methods' (Gilbert et al, 1998)¹⁵ and 'Good Practice Guidelines' (Bat Conservation Trust, 2007¹⁶, and most recently 2012 (Hundt 2012¹⁷)). The surveys comprised:

- 'Extended' Phase 1 Habitat surveys;
- Bird surveys predominantly for black redstarts (LBAP species); and
- Potential bat roost surveys.

14.21. Table 14.1 summarises the ecological surveys undertaken on the Site and surrounding areas.

Table 14.1: Summary of ecological surveys

Survey	Date(s)	Area	Description
'Extended' Phase 1 Habitat Survey and Bat Roost Potential Survey	26 May 2005	SH1 site	Walkover survey to classify and map all habitats on the Site in accordance with standard Phase 1 habitat survey methodology. In addition, trees and structures on the Site were examined to determine if they had the potential to provide bat roosting sites. These were classified on a scale of negligible, low, medium or high potential.
Black Redstart Survey	Visit 1: 26 May 2005 Visit 2: 1 June 2005 Visit 3: 8 June 2005 Visit 4: 15 June 2005 Visit 5: 22 June 2005	SH1 site and the immediate surrounding area (including the Site)	Surveys to detect the presence or absence of black redstarts together with any observations to indicate breeding (e.g. singing males, nesting behaviour or the presence of juveniles).
Updated 'Extended' Phase 1 Habitat Survey and Bat Roost Potential Survey	20 April 2009	SH2 site	Walkover as described above.
Updated 'Extended' Phase 1 Habitat and Bat Roost Potential Survey	12 August 2011	SH3 site	Walkover as described above.
Updated black redstart Survey	Visit 1: 21 May 2012 Visit 2: 28 May 2012 Visit 3: 14 June 2012 Visit 4: 25 June 2012 Visit 5: 12 July 2012	SH3 site and immediate surrounding area	Survey as described above
Updated 'Extended' Phase 1 Habitat and Bat Roost Potential Survey	13 June 2014	Telecom House site + SH3 site	Walkover as described above.
Updated black redstart Survey	Visit 1: 10 June 2014 Visit 2: 24 June 2014	SH3 site + Telecom House site	Reduced Surveys to update the presence or absence of black redstarts together with any observations to

Survey	Date(s)	Area	Description
			indicate breeding (e.g. singing males, nesting behaviour or the presence of juveniles).
Bird Survey followed by Inspection of Western Tower	Visit 1: 7 March 2014	Western Tower	Bird survey at dawn followed by a building inspection prior to the erection of specific netting to deter peregrine falcons nesting on the tower prior to demolition works.
Updated Black Redstart Survey	Visit 1: 6 March 2015 Visit 2: 14 May 2015	SH3 site + Telecom House site	Reduced Surveys to update the presence or absence of black redstarts together with any observations to indicate breeding (e.g. singing males, nesting behaviour or the presence of juveniles).

Evaluation of Ecological Features

- 14.22. The evaluation of ecological features was undertaken in accordance with the Institute of Ecology and Environmental Management (IEEM, now Chartered) '*Guidelines for Ecological Impact Assessment*' (EcIA)¹⁸. These guidelines aim to provide consistency in the approach to evaluating the importance of ecological features and any effect that a new development would have upon them.
- 14.23. In accordance with the IEEM EcIA guidelines, the ecological features identified were assigned a value and the likely significant effects of the proposed Development were predicted, taking into account the different stages and activities within the development process. These identified effects were then assessed for their significance. The significance of the effect is a function of the value of the ecological feature, and the type, magnitude and nature of the effect.
- 14.24. The value of ecological features is defined according to the following geographical scales:
- International value;
 - UK value;
 - National value (i.e. England/Northern Ireland/Scotland/Wales);
 - Regional value;
 - County / Metropolitan value;
 - District / Borough value;
 - Local or Parish value;
 - Of value within the Site only; and
 - Negligible.
- 14.25. IEEM's criteria are broadly similar to those set out in Chapter 2: EIA Methodology with the terms 'Local/Parish' and 'District/Borough' equivalent to the 'local' scale and 'County/Metropolitan' equivalent to the 'district' scale. The remaining geographical scales are consistent with both methodologies.

Approach to Outline Assessment

- 14.26. The assessment of the proposed Development has been based on the minimum and maximum extent parameters set out in Chapter 5: Description of Development, to identify the likely significant effects. Where the deviation between the maximum and minimum extent parameters would not lead to significantly different effects on ecological resources the assessment has been based upon the maximum extent of the proposed Development due to the fact that this would represent a precautionary 'worst-case' assessment. Where the maximum and minimum extent parameters would lead to a significantly different effect on ecological resources this has been assessed and stated.

Approach to Future Baseline

- 14.27. The future baseline schemes (Chatham Place, 21 Caversham Road, Energis House, Thames Tower and Aldwych House) would retain the predominantly urban context to the Site. On this basis, it is not considered that the future baseline schemes would affect the ecological baseline relevant to this assessment and the schemes have therefore not been considered further in this Chapter.

Consultations

- 14.28. RBC has been consulted on the approach and methodology of the ecology assessments undertaken as part of SH1, SH2 and SH3 as part of the EIA Scoping Requests. Most recently, a scoping letter was prepared by Waterman EED in relation to the Telecom House / Plot E Scheme and submitted to RBC, together with a request for a formal Scoping Opinion, in June 2014.
- 14.29. A scoping opinion was received from Reading Borough Council in October 2014 (Appendix 2.4). Given the findings of the previous assessments undertaken at the Site it was deemed reasonable to undertake an updated 'Extended' Phase 1 Habitat and Bat Roost Potential Survey and a 'reduced' black redstart survey to determine if any changes had occurred to the ecological baseline and if black redstarts are still nesting on Site.

Significance Criteria

- 14.30. The potential and residual effects of the proposed Development on identified ecological features are expressed as follows:
- **Adverse:** Detrimental or negative effect on a valued ecological receptor;
 - **Negligible:** No significant effect on a valued ecological receptor; and
 - **Beneficial:** Advantageous or positive effect on a valued ecological receptor.
- 14.31. Where adverse or beneficial effects were identified, these were assessed according to the following scale:
- **Minor significance:** Slight, very short or highly localised effect of no significant consequence;
 - **Moderate significance:** Limited effect (by extent, duration or magnitude) which may be considered significant; and
 - **Substantial significance:** Considerable effect (by extent, duration or magnitude) of more than local significance or in breach of recognised acceptability, legislation, policy or standards.
- 14.32. The following factors are considered in assessing the significance of ecological effects:

- The extent and magnitude of the effect;
- The duration of the effect (short, medium or long term);
- The nature of the effect (direct or indirect, reversible or irreversible);
- The timing and frequency of the effect;
- Whether the effect occurs in isolation, is cumulative or interactive; and
- The sensitivity of the ecological receptor.

Baseline Conditions

Site Context

- 14.33. The Site is located south of Reading Mainline Station in the northern part of Reading town centre and is surrounded on all sides by roads and buildings, beyond which lies predominately commercial, retail and leisure uses.

Designated Sites

Statutory Designated Sites

- 14.34. No statutory designated sites are located within the Site boundary or within 2km of the Site boundary.

Non-statutory Sites

- 14.35. No non-statutory sites are located within the Site boundary. However, there are 10 non-statutory designated sites within 2km of the Site. All of these are Local Wildlife Sites (LWSs) which are of County importance and are protected through local planning policy. Those closest to the Site are given in Table 14.2 and presented in Figure 14.1.

Table 14.2: Desk Study Records of Note (Designated Sites)

Site Name	Designation	Distance from centre of Site (km)	Description/Citation
Kennet and Avon Canal and River Kennet	LWS	0.8km South	The River Kennet is one of the best national examples of a chalk river which is a UKBAP priority habitat. The Kennet and Avon canal section is fed by the river and is accordingly, calcareous in nature. This provides rich and varied riparian vegetation together with adjacent habitats.
Holy Brook (south of Berkley Avenue and Berkley Avenue to Inner Distribution Road)	LWS	0.8km South	The Holy Brook stream carries water to and from the River Kennet. It provides a green area between housing, commercial and industrial areas.
Cow Lane Depot	LWS	0.9km West	This small, triangular site bounded by a railway track towards the centre of Reading comprises a mosaic of habitats including

Site Name	Designation	Distance from centre of Site (km)	Description/Citation
			willow scrub, standing water, swamp and ruderal grassland. Cow Lane Depot provides an important wildlife corridor in an urban landscape.
The Coal, Kennetmouth and Kings Meadow East	LWS	1.2km East	The Kennetmouth site comprises a short length of towpath at the confluence of the River Kennet and River Thames, including the western bank of the Kennet and southern bank of the Thames. The site is important for the presence of the nationally scarce Loddon lily (<i>Leucojum aestivum</i>). It has been combined with the Coal, an area of woodland, and Kings Meadow East.

Habitats and Flora

- 14.36. As described within Chapter 3: Land Uses and Activities, the Site is typically urban in nature comprising six buildings, road infrastructure and other areas of hard-standing. A small area of vegetation exists within the north-western corner of the Site between Xafinity House and Station Hill, comprising amenity grassland and a few ornamental shrubs and trees.
- 14.37. The following habitat descriptions should be read in conjunction with Figure 14.2.

Buildings and Hard standing

- 14.38. Buildings and hard standing cover the majority of the Site. Six buildings are present; these comprise of:
- B1 - Xafinity House: A six-storey brick built office building in good repair;
 - B2 - Former Bus station and Mecca Bingo hall with adjacent toilet block: A pitched corrugated roof concrete structure with underground parking and adjacent brick built disused toilet block;
 - B3 - NCP car park: An eight storey rectangular concrete structure;
 - B4 - Western tower with connecting low-rise block and public house: Western Tower is a 15 storey rectangular tower block currently in a state of disrepair. This block is connected to a three-storey low rise block, occupied by small retail units (land use classes A1 & A3). A public house occupies the north-east corner of the three-storey low rise block;
 - B5 - Friars Walk Shopping Centre: A five storey 1970s concrete and glass construction. All units in the shopping centre and the offices located over the units are now disused. The NCP car park extends over Garrard Street and occupies the roof level of the north-eastern portion of the shopping centre; and
 - B6 – Telecom House: A building split into different connecting units. A six storey flat roofed unit is located adjacent to Friar Street, of a 1960s construction. The building unit then runs north to Garrard Street. The building unit in this location is four storeys and is flat roofed with external roof plant units present.
- 14.39. Additional details of the buildings present on Site are provided in Table 3.1 in Chapter 3: Land Uses and Activities.

- 14.40. Hard standing areas are mainly associated with the buildings and include covered walkways, car parks and paved areas.
- 14.41. Areas of hard standing on Site offer no opportunities to notable and/or protected species although the buildings on Site offer nesting habitat for breeding birds. The 2005, 2012, 2014 and 2015 black redstart surveys confirmed that black redstarts are utilising the Site, having bred on the Site in 2012 and holding territory in 2015. No direct evidence of nesting or breeding black redstarts was recorded during the two surveys in 2015. During the 2012 black redstart survey, the Site was specifically found to contain a pair of black redstarts which attempted to breed twice on-Site, both times in B3 - the NCP car park (further details are provided later in this Chapter). Black redstarts were seen and heard holding territory within the same location in 2015 and so it is considered likely that this species is still breeding within the NCP car park or immediately adjacent area.
- 14.42. None of the buildings on-site were assessed to have any obvious access points suitable for roosting bats and the few trees present on Site were too young in age to contain suitable roosting features such as rot and woodpecker holes.
- 14.43. Therefore, the buildings on Site are considered to be of value **within the boundary of the Site** only to black redstarts and **negligible** to bats.

Amenity Grassland

- 14.44. A small area of amenity grassland is situated in the north-western corner of the Site, dominated by annual meadow-grass (*Poa annua*) with other species including red fescue (*Festuca rubra*), daisy (*Bellis perennis*) and dandelion (*Taraxacum* agg). All species recorded are widespread and common. The habitat is therefore considered to be of **negligible** value.

Ornamental Shrubs and Scattered Trees

- 14.45. Four ornamental planted beds are present along the western Site boundary adjacent to Xafinity House and along the southern and eastern margin of the amenity grassland. These beds contain a variety of cultivated and introduced shrub species such as Oregon grape (*Mahonia aquifolium*), butterfly bush (*Buddleja davidii*), barberry (*Berberis* sp), cultivated holly (*Ilex* sp) and young birch Trees (*Betula* sp), as well as Spanish bluebell (*Hyacinthoides hispanica*).
- 14.46. All species found within the amenity grassland and ornamental planted beds are common and widespread. As such, these habitats are considered to be of **negligible** value.

Protected Species

Black Redstarts

- 14.47. The 2005 black redstart survey revealed a pair of black redstarts together with dependent young on the roof of a building adjacent to the east of the Site. The roof being utilised by the species comprises a small informal 'living' roof consisting of a flat, gravel covered substrate colonised with ephemeral plant species. Updated desk-studies undertaken in 2009 and 2011 provided further records for black redstarts in the immediate vicinity of the Site from 2009, 2010 and 2011 (specifically Friar Street, Garrard Street (refer to Figure 14.2) and Merchants Place), with breeding records held for 2009 and 2010.

- 14.48. The 2012 black redstart survey revealed that the Site was found to contain a pair of black redstarts which attempted to breed twice, both times in the NCP Car Park on Garrard Street. (refer to Appendix 14.2). Two nests were found; the first is thought to have been partially successful, as chicks were heard calling from it. On inspection under licence on 29 June 2012, the nest was found to contain three cold eggs, but any surviving chicks would have left the nest by then. The second nest contained four well grown feathered young at the time of the survey visit on 12 July 2012. Although black redstarts have been recently recorded nesting and breeding on Site, the foraging habitat across the Site is considered to be sub-optimal for this species, with no areas of wasteland and stony ground normally required to support a breeding population.
- 14.49. The 2014 black redstart survey revealed that the Site still provides nesting habitat for black redstarts (Figure 14.3). During the first of the two survey visits, two singing males were recorded, the first singing from the buildings to the south of Garrard Street and the second on buildings outside the Site to the south east of Friar Street. The male in the red-line boundary area was seen to use a number of song-perches around and just outside the Site. A female black redstart was also seen briefly on Telecom House. The second survey visit recorded a male black redstart that was seen and heard singing briefly from two song-perches to the south of Garrard Street. The other singing male located outside the Site during the first survey was not located and no females were observed. No direct evidence of nesting or breeding black redstarts was recorded during the two surveys.
- 14.50. The 2015 black redstart surveys revealed that the Site still provides nesting habitat for black redstarts. Although no direct evidence of nesting or breeding black redstarts were identified during the survey, a singing male was recorded on the NCP carpark. It is considered likely due to previous survey results and previous records provided for the desk study, that black redstarts are still breeding within or immediately adjacent to the Site.
- 14.51. The natural habitat of black redstarts is ravines in mountainous regions in Europe. However this species has also adapted to live in town centres where tall buildings mimic the ravine habitats. Black redstarts are therefore attracted to the Reading town centre area by the presence of tall buildings, of which there are several on the Site and many more adjacent to the Site.
- 14.52. Black redstarts are a rare breeding bird in the UK with around 100 pairs nesting in city centres. The main populations are in London and Birmingham. However, they also occur in other towns such as Reading. The population of black redstarts within Reading, which may comprise one or two breeding pairs, are of importance due to the rarity of this species.
- 14.53. Black redstarts are afforded National protection under Schedule 1 of the WCA. It is an offence to intentionally take, injure or kill a black redstart or to take damage or destroy its nest, eggs or young. It is also an offence to intentionally or recklessly disturb the birds close to their nest during the breeding season.
- 14.54. The 2005 - 2015, black redstart surveys confirmed that black redstarts are using the Site, having bred on the Site in 2012 and still holding territory in 2015. No direct evidence of nesting or breeding black redstarts was recorded during the surveys in 2014 or 2015 however it is considered likely that black redstarts breed within the Site. The Site is therefore currently considered to be of **District to County** value for black redstarts.

Other Birds

- 14.55. The Berkshire Ornithological Club and Buckinghamshire and Milton Keynes Environmental Records Centre were contacted with regard to records held within a 2km radius of the Site. Records

were returned for several notable/protected species including species protected at all times under Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) such as red kite (*Milvus milvus*), peregrine falcon, fieldfare (*Turdus pilaris*) and redwing (*Turdus iliacus*). Red listed species of conservation concern such as song thrush (*Turdus philomelos*) LBAP, starling, house sparrow LBAP and hawfinch (*Coccothraustes coccothraustes*) LBAP were also returned from the data search. Several Amber list species of conservation concern were also returned from the data search including stock dove (*Columba oenas*), swift LBAP, house martin (*Delichon urbica*) LBAP, grey wagtail and reed bunting (*Emberiza schoeniclus*). Peregrine falcon and starling were recorded within the immediate vicinity of the Site (specifically within Garrard Street and Reading Station). Peregrine falcon, swift, grey wagtail and house sparrow have been recorded breeding within 2km of the Site.

- 14.56. The following bird species were recorded during all walkover and black redstart surveys to date, both on and adjacent to the Site:
- Blackbird (*Turdus merula*) in 2005 and 2012;
 - Starling (*Sturnus vulgaris*) in 2005, 2012 and 2014;
 - Magpie (*Pica pica*) in 2014;
 - Jackdaw (*Corvus monedula*) in 2014;
 - Red kite (*Milvus milvus*) in 2014;
 - Wren (*Troglodytes aedon*) in 2014;
 - Wood pigeon (*Columba palumbus*) in 2005 and 2014;
 - Feral pigeon (*Columba livia*) in 2005, 2009, 2011, 2012, 2014 and 2015;
 - Swift (*Apus apus*) in 2005 and 2014;
 - Sparrowhawk (*Accipiter nisus*) in 2009 and 2014;
 - Carrion crow (*Corvus corone*) in 2009;
 - Robin (*Erithacus rubecula*) in 2012 and 2014;
 - Pied wagtail (*Motacilla alba*) in 2012 and 2014;
 - Grey wagtail (*Motacilla cinerea*) in 2012 and 2014;
 - Blue tit (*Cyanistes caeruleus*) in 2012 and 2014;
 - House sparrow (*Passer domesticus*) in 2012 and 2014;
 - Black-headed gull (*Chroicocephalus ridibundus*) in 2014;
 - Herring gull (*Larus argentatus*) in 2012 and 2014;
 - Peregrine falcon (*Falco peregrinus*) in 2005, 2012, 2014 and 2015; and
 - Dunnock (*Prunella modularis*) in 2014.
- 14.57. Given the most recent records of birds on Site during the black redstart survey undertaken in 2015, it is possible that some of the species listed above including robin, blackbird, pied wagtail, feral pigeon and blue tit have recently bred on the Site.
- 14.58. Three species (herring gull, house sparrow and starling), which appear on the red list of birds of conservation concern were recorded in 2014. They are not thought to have bred on-Site, and as

all these species are still common and widespread in the region, the Site is not considered to be of particular importance to them.

- 14.59. Four species (grey wagtail, red kite, black-headed gull and dunnoek) that appear on the amber list of birds of conservation concern were recorded in 2014. With regard to the grey wagtail, one pair was recorded on Site in 2014 though this species is unlikely to be breeding on Site as it usually nests near running or standing water. The remaining species are not thought to have bred on-Site and as black-headed gull and dunnoek are still common and widespread in the region, the Site is not considered to be of particular importance to them. The habitat on Site is not suitable for breeding or feeding red kite (which was observed as flyover species only).
- 14.60. Robin, sparrowhawk, blackbird, pied wagtail, feral pigeon, wood pigeon, carrion crow, magpie, jackdaw and blue tit are not of special conservation concern. However, they are subject to the blanket protection given to all birds under the Wildlife and Countryside Act. All active bird's nests are protected from damage and destruction under the Wildlife and Countryside Act 1981 (as amended). Several feral pigeons, approximately 4 nests, were recorded underneath B2.
- 14.61. In addition to the above, a single male peregrine falcon was recorded on and around the Site on two occasions in 2005 (1 June and 8 June). This individual was observed to be wearing jesses, and is therefore considered to be an escaped falconer's bird. As an escaped bird, it does not have the same conservation status as a wild-bred peregrine.
- 14.62. In 2012, a pair of peregrines was seen on the Western Tower on Site on several occasions during the black redstart survey visits. A search was made for a nesting scrape on the Western Tower on 29th June 2012. However, no sign of any breeding activity was found. It is therefore considered to be a perch site only.
- 14.63. A pair of peregrines was again recorded to be using the Western Tower in 2014. They were using it as a lookout and for loafing and feeding. No evidence of nesting was found during all of the bird surveys in 2014. In 2014, following a bird survey building inspection at the Western Tower on Site, netting was erected to deter peregrine falcons nesting on the tower prior to demolition works.
- 14.64. In 2015 a single peregrine falcon was observed flying over the Site but did not land on any buildings within the Site boundary. It is considered that the netting erected in 2014 has been successful in deterring peregrine falcons from using the Western Tower for perching and so the Site is suitable for foraging peregrines only.
- 14.65. The Peregrine is afforded National protection under Schedule 1 of the WCA.
- 14.66. Overall, the populations of current breeding birds on the Site (excluding black redstart) are considered to be of value **within the boundary of the Site** only.

Bats

- 14.67. All buildings on-site have no obvious access points suitable for roosting bats and the few trees present on Site were too young in age to contain suitable roosting features such as rot and woodpecker holes. Furthermore, the Site, and immediate environs are in a densely urbanised area, with associated levels of disturbance and lighting and lack suitable foraging and commuting resources. The Site is therefore considered to be of **negligible** value for bats.

Potential Effects

Demolition and Construction of Wider Site

- 14.68. The demolition and construction stage of the proposed Development has the potential to result in a number of ecological effects. Those relevant to the Site include:
- Land take and associated habitat fragmentation and/or loss;
 - Disturbance due to construction operations, including noise and vibration; and
 - Creation of additional temporary habitat for species favouring the urban environment.

Designated Sites

- 14.69. There are no statutory designated sites within the 2km radius study area and the nearest non-statutory designated site is Kennet and Avon Canal and River Kennet; located approximately 700m to the south of the Site (or about 800m from the centre of the Site). Given that the Site currently exists within an already busy urban context and there are distances of 700m and greater between the Site and the designated sites, it is considered that disturbance from noise, vibration, light and dust during the demolition and construction works would have a **negligible** effect on designated sites.

Direct Mortality and Disturbance of Protected Species

- 14.70. The buildings and shrubs on the Site offer suitable habitat for breeding common species of birds such as robin, blackbird, pied wagtail, grey wagtail, feral pigeon and blue tit. All active bird's nests are protected from damage and destruction under the Wildlife and Countryside Act 1981, as amended.
- 14.71. The 2005, 2012, 2014 and 2015 black redstart surveys confirm that black redstarts are using the Site, having bred on the Site in 2012 and currently holding territory in 2015. No direct evidence of nesting or breeding black redstarts was recorded during the two latest surveys in 2015 but it is considered likely that black redstarts are still breeding within the Site due to a male holding territory in a location previously used for breeding. Black redstarts receive special protection under the WCA, which, in addition to the protection set out above, means that they are also protected from disturbance while at the nest or with dependant young.
- 14.72. The NCP car park is to be retained within the proposed Development and reconfigured and refurbished. Commencing demolition or construction works on Site during the bird breeding season could disturb black redstarts if they were nesting on Site at that time and therefore could lead to an offence under the WCA.
- 14.73. Due to the adaptability of starling, herring gull and house sparrow and their prevalence in the urban environment, they are not expected to be affected by potential noise, vibration and dust generated by the demolition and construction activities. Grey wagtail usually breed alongside running or standing water and is therefore unlikely to be breeding on site. The other bird species recorded on the Site are not of conservation concern and so have not been included in the impact assessment.
- 14.74. Peregrines previously recorded on Site on Western Tower are no longer using the Site for perching due to the erection of bird netting in 2014. The demolition and construction phase would therefore have only limited disturbance to foraging peregrines due to the displacement of their prey.

- 14.75. The potential effect of the demolition and construction phase on disturbance to protected species is considered to be **temporary, adverse** and of **minor significance**, if undertaken outside of the breeding bird season. However, if demolition and construction works are undertaken during the breeding bird season, a **permanent, adverse** effect of **moderate significance** could occur in the absence of mitigation.

Habitat Loss and Creation

- 14.76. The proposed Development would result in the loss of a small area of amenity grassland and ornamental planting. These habitats are of negligible ecological value and as such, the potential effect is considered to be **negligible**.
- 14.77. Demolition of buildings would result in a **temporary minor adverse effect** on nesting birds (including black redstarts). The removal of buildings on Site has the potential to create temporary open habitats colonised by opportunistic plants. Although other tall buildings are present adjacent to the Site and the NCP car park in which nesting black redstarts have previously been recorded would be retained, the temporary loss of tall buildings within the Site could reduce the attractiveness of the area to nesting black redstarts. However open and sparsely vegetated areas of the construction Site would provide temporary foraging benefits for birds (including black redstart) and so would result in a **temporary minor beneficial** effect for foraging birds.
- 14.78. The loss of the peregrine perch on Western Tower due to netting being installed in 2014 to facilitate demolition for the proposed Development has reduced the attractiveness of the area to this species, resulting in a **temporary minor adverse** effect.

Interim Condition: Temporary Flexible Event Space

- 14.79. The proposed Temporary Flexible Event Space would create a multipurpose events platform for temporary uses, with associated hard and soft landscaping. The Temporary Event Space site is typically urban in nature with buildings and hard standing covering the majority of the area.

Temporary Habitat Creation

- 14.80. On completion of the temporary event space, some additional foraging habitat would be available through provision of small areas of soft landscaping/trees. However, this is considered to be of value to the Site only and, the effect is therefore considered **negligible**.

Completed Development

- 14.81. Whilst most of the proposed Development's effects would occur during the demolition and construction phase, there exists the potential for the following effects to result from the completed development:
- Provision of additional landscape planting and associated habitat;
 - Provision of black redstart habitat;
 - Disturbance to bird sightlines and flyways resulting from the construction of new buildings.

Designated Sites

- 14.82. For the reasons noted previously, the completed development would have a **negligible** effect upon statutory and non-statutory designated sites.

Direct Mortality and Disturbance of Protected Species

- 14.83. The bird species recorded within the Site are adapted to the urban environment and the presence of large numbers of people. The activities on the completed and operational Development would therefore have a **negligible** effect upon the species within and surrounding the Site.

Habitat Creation

- 14.84. Green or brown roofs would be provided as part of the proposed Development and would cover a minimum of 25% of the total roof area of the proposed Development which equates to approximately 1,235m² and a maximum roof area of approximately 6,005m². Landscape planting would also be included within public spaces throughout the proposed Development.
- 14.85. The total area of proposed vegetative habitats would represent an increase compared to the existing Site which currently supports only slightly over 400m² of vegetation, all of which is of negligible value for nature conservation.
- 14.86. Furthermore, the brown roofs would be designed specifically to benefit black redstarts, by providing good foraging habitat for this species. Following the implementation of these enhancement measures, the effect on birds during the operational phase of the completed development is considered to be **long-term, beneficial** and of **minor significance** but would be dependent on the quantum and quality of brown and green roofs, which would be determined at the reserved matters stage.

Effect of Tall Buildings on Bird Sightlines and Flyways

- 14.87. The proposed Development would replace the buildings present on the Site (one of which is 17 storeys in height, the rest being low and medium rise) with a complex of seven building elements. The proposed minimum building heights would range from 63m Above Ordnance Datum (AOD) to 109m AOD and the proposed maximum building heights would range from 73m AOD to 128m AOD, representing a significant increase in building massing when compared to the existing situation.
- 14.88. Despite the above, birds species that live in urban environments are quick to adapt to environmental change. As such, it is envisaged that birds would quickly habituate to new routes through and/or over the proposed Development, or would adapt their flight path around the Development. Birds do sometimes fly into glass windows in situations where vegetation is reflected in the glass or visible through the building. However, providing trees and shrubs are not planted next to reflective glass windows, the potential effects of the proposed tall buildings on birds would be expected to be **negligible**.
- 14.89. Peregrine falcons favour tall buildings and therefore the proposed Development would assist in ensuring this species remains in the local area. This effect is likely to be **long-term, beneficial** and of **minor significance**.

Mitigation Measures

Demolition and Construction

- 14.90. Netting has now been placed on Western Tower to discourage peregrine falcons from nesting on this structure prior to its demolition.

- 14.91. In line with best practice and Planning Condition 31 on the SH3 Scheme Planning Consent, demolition and Site clearance works would be undertaken outside the main bird breeding season where practicable (i.e. within the months September to February inclusive). If these works cannot be restricted to within this period, an Ecological Watching Brief would be maintained during the main bird breeding season to ensure that no nesting birds are adversely affected. This would include a pre demolition check to see if any birds including black redstarts and peregrines are breeding on Site.
- 14.92. If during the Ecological Watching Brief including the pre-demolition check, black redstarts, peregrine falcons or other birds are found to be breeding on or near the Site, an appropriate Method Statement would be agreed in consultation with Natural England. This would include measures to prevent disturbance to breeding black redstarts and/or peregrines, including the cessation of demolition, site clearance or construction works in areas close to breeding sites until the birds have completed breeding, and monitoring the species during the active construction period. If any other birds are found to be breeding on the Site, appropriate measures would be undertaken to protect the nest sites until after the young have fledged.
- 14.93. Contractors would comply with the Construction Environmental Management Plan (CEMP) (refer to Chapter 6: Development Programme Demolition and Construction) which would ensure that appropriate environmental controls would be implemented during the demolition and construction works. The CEMP would include the ecological mitigation measures described above. The CEMP would accord with the requirements of Planning Condition 35 on the SH3 Scheme Planning Consent.

Interim Condition: Temporary Events Space

- 14.94. Negligible effects were identified for the Temporary Events Space and therefore no mitigation is required.

Completed Development

- 14.95. In accordance with Planning Condition 22 on the SH3 Scheme Planning Consent, green or brown roofs would be installed comprising of at least 25% of the roof area of each plot of the proposed Development, the design of which would be determined at reserved matters stage. However, the brown roofs would be designed to be suitable for the black redstart.
- 14.96. A single Open fronted peregrine falcon nest boxes would be erected at a high elevation on the vertical sides of a tall building or on the brown roof in undisturbed areas within the proposed Development to encourage peregrines to nest. Alternatively, a specially designed high elevation ledge or recess would be included within the design of the proposed Development to provide a safe perching or nesting platform. Any artificial nest site should be sited facing north-east or east to prevent possible overheating of the eggs and newly hatched young (Ratcliffe, 1995)¹⁹. This would replace and/or enhance the potential peregrine perching opportunity lost on Site.
- 14.97. To provide additional enhancements for black redstarts, starling and house sparrows (urban bird species undergoing rapid decline), it is proposed to attach nest boxes suitable for these species in appropriate locations around the Site. A minimum of 5 nest boxes per species would be installed.

Residual Effects

Demolition and Construction of the Wider Development

Designated Sites

- 14.98. As previously stated, no statutory or non-statutory designated sites for nature conservation would be affected by the Development. The residual effect would therefore remain **negligible**.

Direct Mortality and Disturbance of Protected Species

- 14.99. The avoidance of demolition and construction activities within the bird breeding season and/or the undertaking of an Ecological Watching Brief would ensure that demolition and construction effects upon breeding birds would be appropriately managed and their nests would not be damaged or destroyed. As such, the residual effect following the implementation of these mitigation measures is considered to be **negligible**.

Habitat Loss and Creation

- 14.100. The small areas of amenity grassland and ornamental planting lost during construction are of negligible value and their loss would therefore result in a **negligible** effect. .
- 14.101. The demolition of Western Tower could reduce the attractiveness of the Site to the peregrine falcon. This would be mitigated in the long-term by provision of appropriate nesting and perching sites within the completed Development. However, a **temporary minor adverse** effect would remain.
- 14.102. The demolition works would provide temporary additional foraging habitat for the black redstart, a **minor beneficial effect**.

Interim Condition: Temporary Flexible Events Space

- 14.103. The temporary event space would provide some additional foraging habitat for birds, but due to the size and amount of additional foraging habitat being created, it would have a **negligible** effect.

Completed Development

Designated Sites

- 14.104. The completed Development would have a **negligible** effect upon statutory and non-statutory designated sites. As such, the residual effect would remain **negligible**.

Direct Mortality and Disturbance of Protected Species

- 14.105. The **negligible** potential effect of disturbance to protected species would be maintained as the residual effect.

Habitat Loss and Creation

- 14.106. The creation of new habitats, and especially the brown roofs, would provide new habitat for black redstart, a nationally rare species, as well as other common bird species. Very little suitable foraging habitat is present on the Site currently, and so the provision of this habitat, coupled with

the provision of nest sites, would have a **long-term, beneficial** effect of **minor to moderate significance** for all local birds, dependant on the quantum and specification of brown roof.

Effect of Tall Buildings on Bird Sightlines and Flyways

- 14.107. The potential effect of the proposed tall buildings on birds due to reflective glass is addressed above. The effect on flight paths would be negligible as birds would habituate quickly to the new development. The presence of tall buildings should also ensure the continued attraction of peregrines to the town centre. Therefore the residual effect is likely to remain **long-term, beneficial** and of **minor significance**.

Summary and Conclusions

- 14.108. The assessment has concluded that the Site is currently of between negligible and District/County value (the latter for black redstart). The 2005, 2012, 2014 and 2015 black redstart surveys confirm that black redstarts are using the Site, having bred on the Site in 2012 and still holding territory in 2015. No direct evidence of nesting black redstarts was recorded during the two surveys in 2015 however it is considered likely that black redstarts are breeding within the NCP carpark due to previous and current activity by this species on Site. A pair of Peregrine falcon was previously recorded perching on Site, but the installation of bird netting to deter breeding peregrines prior to demolition was erected in 2014. The Site also has potential to be utilised by some ecologically valuable breeding birds including starling, although the Site in its current form does not provide optimal habitat for this species.

Comparison of Effects of the Proposed Development with the SH3 Scheme

- 14.109. The value of the Site and the assessment of effects has not changed since the 2013 ES of the SH3 Scheme.

Summary of Potential Effects, Mitigation and Residual Effects

- 14.110. The potential effects, mitigation and residual effects are summarised below in Table 14.3.

Table 14.3: Summary of Potential Effects, Mitigation and Residual Effects

Issue	Potential Effect	Mitigation	Residual Effect
Demolition and Construction			
Designated sites for nature conservation	Negligible.	None required.	Negligible.
Damage/destruction of active bird's nests and disturbance of nesting black redstart and/or Peregrine are offences under the Wildlife and Countryside Act.	Permanent Moderate Adverse if undertaken during the breeding season. Temporary Minor Adverse if undertaken outside the breeding season.	Implementation of ecological watching brief and on-going monitoring during the demolition and construction works via an appropriate Method Statement agreed with Natural England, if required. Implementation of a CEMP.	Negligible.

Issue	Potential Effect	Mitigation	Residual Effect
Bird (Including Black redstart) foraging habitat	Temporary minor beneficial	None required	Temporary minor beneficial
Loss of small areas of amenity grassland and ornamental planting.	Negligible	None required	Negligible
Loss of peregrine perch	Temporary minor adverse	None required due to installation of bird netting in 2014	Temporary minor adverse
Temporary Events Space			
Creation of Foraging Habitat	Negligible.	None required.	Negligible.
Completed Development			
The Site is adequately geographically removed from all statutory and non-statutory designated sites for nature conservation.	Negligible.	None required.	Negligible.
The activities on the Site following completion of the proposed Development should not result in mortality or significant disturbance of the protected species present on the Site or the immediate surrounds	Negligible.	None required, provided trees and shrubs are not planted close to reflective glass.	Negligible.
Provision of habitat via landscape planting of the public spaces and proposed green and brown roofs	Permanent, local minor beneficial	Provision of nest boxes for starling and house sparrow. Creation of nesting opportunities for peregrine. Provision of brown roofs and nest boxes for black redstarts, providing new black redstart habitat.	Permanent, local Minor to Moderate Beneficial
Birds are anticipated to quickly adapt their flight paths to avoid any physical obstructions created by the massing of the proposed Development. Proposed tall buildings favoured by peregrine.	Permanent Minor Beneficial.	None required.	Permanent Minor Beneficial.

References

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- ¹ HMSO (2012), The Conservation of Habitats and Species Regulations 2010 (as amended)
 - ² European Union (1992), Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora
 - ³ HMSO (1981), The Wildlife and Countryside Act 1981 (as amended)
 - ⁴ European Union (2009), Council Directive 2009/147/EC on the conservation of wild birds
 - ⁵ HMSO (2000), The Countryside and Rights of Way Act, HMSO
 - ⁶ UK Biodiversity Partnership (1992), UK Biodiversity Action Plan
 - ⁷ ODPM (2006), Natural Environment and Rural Communities Act
 - ⁸ Reading Borough Council (2008), 'Reading Borough Local Development Framework: Core Strategy Adopted January 2008'
 - ⁹ Reading Borough Council (2012), Reading Borough Local Development Framework, Sites and Detailed Policies Document, Adopted 2012
 - ¹⁰ Reading Borough Council (2009), 'Reading Borough Local Development Framework: Reading Central Area Action Plan To 2026'
 - ¹¹ Reading Borough Council (2007), 'Station Hill South Planning and Urban Design Brief'
 - ¹² Reading Borough Council (2010), Station Area Framework
 - ¹³ www.magic.gov.uk
 - ¹⁴ Joint Nature Conservation Committee (2010), 'Handbook for Phase 1 Habitat Survey: A technique for environmental audit'.
 - ¹⁵ Gilbert, G, Gibbons, DW and Evans, J (1998), 'Bird Monitoring Methods'
 - ¹⁶ Bat Conservation Trust (2007), 'Good Practice Guidelines'
 - ¹⁷ Bat Conservation Trust (2012), 'Good Practice Guidelines'
 - ¹⁸ Institution of Ecology and Environmental Management (IEEM) (2003), 'Guidelines for Baseline Ecological Assessment'
 - ¹⁹ Ratcliffe, D A (1995), The Peregrine Falcon. Second Edition. T and A D Poyser, London.

15. Wind

Introduction

- 15.1. This Chapter has been written by RWDI. It assesses the likely significant effects of the Development on the local wind microclimate within and around the Development. In particular it considers the likely significant effects of wind upon pedestrian comfort and safety and summarises the findings of a full wind tunnel testing exercise undertaken by RWDI. The full results of this testing study are presented within Technical Appendix 15.1.
- 15.2. The Chapter describes the methods used to assess the effects, the relevant baseline conditions at the Site and around its immediate surrounds. The potentially significant effects of the Development are presented together with mitigation measures required to prevent, reduce and offset them. The resulting likely significant residual effects are also identified.

Planning Policy Context

National Planning Policy and Guidance

National Planning Policy Framework, 2012

- 15.3. The UK wide National Planning Policy Framework (NPPF)¹ contains no national planning policies directly relating to wind microclimate issues; however, the benefits of a high quality built environment are emphasized in the NPPF. For example, paragraph 58: “... *using streetscapes and buildings to create attractive and comfortable places to live, work and visit...*”

National Planning Practice Guidance, 2014

- 15.4. The Planning Practice Guidance (PPG)² identifies the potential for a building's size and shape (particularly in the case of tall and large buildings) to affect the wind microclimate. Under the section addressing 'Design: How should buildings and the spaces between them be considered?', the PPG states in Paragraph 25 and 26 ('Consider Form' and 'Consider Scale' respectively) that: “*Some forms pose specific design challenges, for example how taller buildings meet the ground and how they affect local wind and sunlight patterns should be carefully considered.*” And that: “*Account should be taken of local climatic conditions, including daylight and sunlight, wind, temperature and frost pockets.*”

Local Planning Policy

Reading Borough Local Development Framework Adopted Core Strategy, 2008 (Updated 2015)

- 15.5. The Core Strategy³ makes no reference to the wind microclimate.

Reading Borough Local Development Framework, Sites and Detailed Policies Document, Adopted 2012 (Updated 2015)

- 15.6. The Sites and Detailed Policies Document⁴ makes no reference to the wind microclimate.

Reading Borough Local Development Framework, Reading Central Area Action Plan, 2009

- 15.7. The Reading Central Area Action Plan (RCAAP)⁵ defines ‘tall buildings’ as buildings with 10 storeys of commercial floorspace or 12 storeys of residential (equating to 36 metres tall) or above. Policy RC13 specifies that *“tall building proposals should be of excellent design and architectural quality, and should: [...] Create safe, pleasant and attractive spaces around them, and avoid detrimental impacts on the existing public realm. [and] Mitigate any wind speed or turbulence or overshadowing effects through design and siting”*.
- 15.8. The RCAAP includes the following paragraphs discussing wind microclimate effects:
- 8.59 *Tall buildings can adversely affect the environmental quality of surrounding areas, particularly through the diversion of high speed winds to ground level and through overshadowing of other areas. However, good design and siting can successfully mitigate these impacts. A building, or grouping of buildings, should be modelled and simulated within its surrounding context, to examine environmental performance at an early design stage to highlight any potential issues that need to be addressed.*
- 8.60 *In terms of wind effects, the use of architectural devices such as screens, terraces and awnings as well as façade set backs can be used to minimise the effects of high wind speed at the base of a tall building.*

Station Hill South Planning and Urban Design Brief, 2007

- 15.9. The Station Hill South Planning and Urban Design Brief⁶ does not contain any policies or guidance directly related to wind.

Station Area Framework, 2010

- 15.10. Chapter 6 of the Station Area Framework⁷ states that tall buildings should:
- “Contribute to the creation of a coherent, attractive and sustainable cluster of buildings with a high quality of public realm”*.
- 15.11. The Station Area Framework also emphasises that new development should:
- “Mitigate any wind speed or turbulence effects through design and siting”*.

Assessment Methodology and Significance Criteria

Assessment Methodology

- 15.12. The assessment of the likely significant effects of the construction of the Development on the wind microclimate of the Site and the immediate surrounding area was undertaken qualitatively using professional judgement and experience.
- 15.13. The interim Temporary Events Space and completed Development were tested using wind tunnel testing. Wind tunnel testing is the most well established and robust means of assessing the pedestrian wind environment. Wind tunnel testing enables the pedestrian level wind microclimate at the Site and immediate surrounds to be quantified and classified in accordance with the widely accepted Lawson Comfort Criteria⁸. Wind tunnel testing delivers a detailed assessment of the mean and gust wind conditions around the Site and the Development for all wind directions in terms of pedestrian comfort and strong winds.

- 15.14. The methodology for quantifying the pedestrian level wind environment is outlined below. The full details of the assessment methodology are given in Appendix 15.1.
- 15.15. In summary, the wind tunnel tests included the following steps:
- Step 1: Measure the building-induced wind speeds at pedestrian level in the wind tunnel;
 - Step 2: Adjust standard meteorological data to account for conditions at the Site;
 - Step 3: Combine these to obtain the expected frequency and magnitude of wind speed at pedestrian level; and
 - Step 4: Compare the results with the Lawson Comfort Criteria to 'grade' conditions around the Site.
- 15.16. The wind tunnel model included the buildings surrounding the Site and relevant features with regards to wind flow up to a radial distance of 360m from the Site's centre.

Simulation of Atmospheric Winds

- 15.17. Wind is unsteady, or gusty, and this 'gustiness' or turbulence, varies depending upon the site. Modelling the effects of gustiness was achieved by the use of a series of grid, barrier and floor roughness elements in the wind tunnel model to create a boundary layer that is representative of urban or open country conditions, as is appropriate.

Measurement Technique

- 15.18. Wind speed measurements were made using Irwin probes. These measure the wind speed at a scaled 1.5m in height above the ground. For pedestrian comfort studies, both the mean wind speed and the peak wind speed were determined at each measurement location.
- 15.19. The wind speed was measured at 143 locations around the Site, and for all wind directions in equal increments, with 0° representing the wind blowing from the north and 90° for wind from the east. Probes were placed in pedestrian thoroughfares along the building facades and corners, within open amenity spaces, and on pedestrian routes within and around the Development. Measurements were also taken on roofs.

Scenarios Tested

- 15.20. The baseline conditions were taken to be those of the Site prior to demolition with surrounding land uses including the upgraded Reading Mainline Station and in-construction buildings comprising Chatham Place, 21 Caversham Road, Energis House, Thames Tower and Aldwych House (Configuration 1 – Future Baseline). Wind tunnel testing of this configuration therefore established the wind microclimate that would likely exist immediately surrounding the Site.
- 15.21. An interim construction phase was tested (Configuration 2) comprising a demolished northern site (except Xafinity House and the NCP car park), plus the future baseline schemes plus the Temporary Events Space.
- 15.22. Wind tunnel testing of the completed proposed Development (comprising the SH3 Scheme as amended and extended by the Telecom House / Plot E Scheme, in the context of future baseline surrounding schemes) was undertaken using the maximum parameters of the Development (Configuration 3), modified at ground level to include the set-back at ground level around Plots B,

C, D and G. This configuration was selected as it would be expected to create the windiest conditions within and around the Site and was also tested as part of the 2013 ES.

- 15.23. A fourth configuration (Configuration 4) was tested with cumulative schemes in place. The results of this configuration are presented in Chapter 17: Cumulative Effects.
- 15.24. To ensure a robust and worst-case assessment of the Development to be undertaken, the scenarios described above were tested without landscaping. Photographs of the wind tunnel model are shown in Figure 15.1.
- 15.25. Three of these configurations (1, 3 and 4) were previously tested as part of the consented SH3 scheme (tested in 2013). Where any changes in wind microclimate are measured in comparison to the SH3 scheme, they are discussed in the following sections.

Lawson Comfort Criteria

- 15.26. Lawson devised a scale for assessing the suitability of wind conditions in the urban environment based upon threshold values of wind speed and frequency of occurrence (refer to Table 15.1). The Lawson Comfort Criteria define a range of pedestrian activities including sitting, standing (at bus-stops/taxi ranks), standing (outside an entrance), leisure walking (strolling), business walking and more transient activity such as crossing the road. For each activity, a wind speed (in Beaufort Force – Table 15.2) and the frequency of occurrence is defined. If the wind conditions exceed the threshold then they are considered unacceptable for the stated activity. If the wind conditions are below the threshold then they are considered as tolerable (or suitable) for the stated activity. For example in Table 15.1, if the wind speed exceeds Beaufort Force 4 (B4) for more than 4% of the time then the conditions are unacceptable for leisure walking.

Table 15.1: Lawson Comfort Criteria

Description	Level	Threshold
Roads and Car Parks	A	6% > B5
Business Walking	B	2% > B5
Pedestrian Walk-through (leisure walking)	C	4% > B4
Pedestrian Standing	D	6% > B3
Entrance Doors	E	6% > B3
Sitting	F	1% > B3

Strong Winds

- 15.27. Lawson also promotes the reporting of occasional strong wind events defined by wind speeds which exceed Beaufort Force 6 (B6) for more than one hour per year. In this assessment if the wind speed exceeds Beaufort Force 6, 7 or 8 then mitigation may be necessary or more detailed consideration of the likely pedestrian use of an area on the windiest days of the year may be required. If the wind speed exceeds Beaufort Force 6 on a pedestrian thoroughfare this is unlikely to cause disturbance whereas wind speeds that exceed Beaufort Force 7 or Force 8 would impede walking.

- 15.28. Occasional strong winds in the UK are associated with the business walking and roadway classifications defined in the Lawson Comfort Criteria. Consequently, mitigation to enhance pedestrian comfort would also reduce the strength and frequency of strong winds at these locations.

Table 15.2: Beaufort Force

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

Target / Desired Wind Conditions

- 15.29. For an urban development, the typical range of wind conditions would include sitting, standing/entrance use and leisure walking, covering the amenity spaces, taxi pick-up/drop-off/entrances and thoroughfares respectively. This range of conditions is common to many other developments. Business walking may be acceptable on a route where there would be limited pedestrian traffic or where alternative routes are available because this classification would be associated with occasional strong winds during the windiest season.
- 15.30. The desire for sitting conditions in amenity spaces, terraces and balconies is weighted towards achieving this in the summertime when people are more likely to more frequently use such areas. It is worth noting that achieving sitting conditions in the summer usually means that same location would become suitable for standing in the winter, when winds are stronger, unless there was some additional physical shelter provided during the windier season to counteract the stronger winds.
- 15.31. The assessment of significance is based on summertime conditions in amenity areas, terraces, balconies and the windiest season at all other locations.

- 15.32. The Temporary Flexible Event Space located in Plot C will require a mix of leisure walking and standing conditions during the windiest season and a mix of standing and sitting conditions during the summer season.

Significance Criteria

- 15.33. When assessing the significance of the wind microclimate, consideration is given to the pedestrian activity at a receptor location. With this in mind amenity spaces are assessed in terms of the summertime wind microclimate, as this is when these are most frequently used. However, standing areas, entrances and thoroughfares are assessed for the windiest season because these need to 'usable' throughout the year.
- 15.34. Within the Site, where the use of the area is changing in relation to the relevant future baseline conditions, the significance criteria used in the assessment of the likely significant potential and residual effects is based on the relationship between the desired pedestrian uses (as defined by the Lawson Comfort Criteria) and the wind conditions predicted at a particular location with the Development in place. Accordingly, the following seven-point scale was used within this assessment:
- **Substantial beneficial effect:** Wind conditions are 3-steps calmer than desired;
 - **Moderate beneficial effect:** Wind conditions are 2-steps calmer than desired;
 - **Minor beneficial effect:** Wind conditions are 1-step calmer than desired;
 - **Negligible:** Wind conditions are similar to those desired;
 - **Minor adverse effect:** Wind conditions are 1-step windier than desired;
 - **Moderate adverse effect:** Wind conditions are 2-steps windier than desired; and
 - **Substantial adverse effect:** Wind conditions are 3-steps windier than desired.
- 15.35. For example, if the desired wind conditions at a particular location are required to be suitable for standing, but the expected wind conditions are identified as being suitable for leisure walking, the difference between the desired and expected wind condition is 1-step windier than desired. In this case the effect would be identified as being adverse, and of minor significance.
- 15.36. An adverse effect implies that the wind microclimate would be windier than desired for the intended pedestrian activity whereas a beneficial effect implies that the wind conditions are calmer than required. This is a simple logical means of relating the measured wind microclimate to the desired pedestrian use of an area using the Lawson Comfort Criteria. As originally proposed by Lawson, strong winds are reported separately and are not incorporated into the significance criteria.
- 15.37. On surrounding streets, where the use remains the same following the Development a comparison is provided against the future baseline conditions.

Approach to Outline Assessment

- 15.38. In respect of the proposed built development, the scale model used in the wind tunnel was constructed using the maximum footprint and heights defined by the Parameter Plans as this is considered to give rise to the worst-case likely wind conditions particularly around the perimeter of the Site. The maximum parameters were modified for the purposes of the wind microclimate assessment to include the proposed set-back at ground level around Plots B, C, D and G, as these have the potential to channel wind at ground level and generate the worst case wind conditions.

- 15.39. In accordance with Planning Condition 18 on the Planning Consent for the SH3 Scheme, further testing would be carried out as part of reserved matters detailed applications to confirm the effects of the detailed design, the acceptability of the proposed landscaping strategy and the final detail of any proposed mitigation.
- 15.40. Assumptions applied to the assessment with regard to building entrances and areas of public realm and private amenity space are provided below.

Limitations and Assumptions

- 15.41. Due to the outline nature of the planning application, building entrances have not been fixed. However, the assessment would inform the location of entrances at detailed design.
- 15.42. Whilst the key locations of public realm and private amenity space are defined by the Parameter Plans, the detailed layout and landscaping of these areas is currently unknown including the proposed location of seating areas.
- 15.43. The maximum parameter plans do not include balustrades or any other detail at roof level. Because of this, the results presented for the 'roof terrace' are expected to be substantially windier than they would be in the final detailed design (in which balustrades, plant rooms and any other screening or landscaping on the terraces would all provide shelter to occupants). To provide some guidance for types of mitigation that would be effective, the 'Mitigation' section of this chapter draws on results from the illustrative scheme tested as part of Plot B Reserved Matters Wind Tunnel Test. This scheme creates a more realistic wind climate at roof level, which includes the effect of illustrative balustrades and screening around the terraces. Further details of this configuration are included in Technical Appendix 15.1.

Baseline Conditions

General Meteorological Conditions

- 15.44. Meteorological data derived from the Heathrow Airport meteorological station was reviewed to develop a statistical model of wind speed and direction, representative of wind conditions in Reading. Figure 15.2 demonstrates meteorological standard conditions at 10m above open, flat, level countryside terrain.
- 15.45. The meteorological data indicate that the prevailing wind direction at the Site and throughout the year is from the south-west. This is typical for many areas of southern England. There is a secondary peak from the north-easterly winds, especially during the spring, and these tend to be cold winds. Winds from the prevailing south westerly sector account for around 45% of all wind for Heathrow.

Terrain Roughness

- 15.46. The meteorological station data was corrected to standard conditions of 10m above open flat level country terrain. The meteorological model was then adjusted to the Site conditions taking account of the terrain roughness using the BREVe3 software package which models the wind characteristics caused by changes in the terrain roughness at the stated reference height of 100m above the surface. The results are shown in Table 15.3.

Table 15.3: BREVe3 Mean Factors for the Site at 100m

	Direction(Degree °)											
Height	0	30	60	90	120	150	180	210	240	270	300	330
120m	1.34	1.38	1.40	1.35	1.32	1.37	1.38	1.43	1.38	1.34	1.36	1.34

Future Baseline Scenario

- 15.47. Figure 15.3 and Figure 15.4 show the worst-case (windiest season) and summer season results respectively for the future baseline scenario (Configuration 1). The Site and surrounding area have relatively calm wind conditions; most of the 93 measured locations are suitable for sitting or standing, with the exception of locations 14 and 28 which are suitable for leisure walking during the windiest season. During the summer season (Figure 15.4), when winds are lighter, the wind microclimate for Configuration 1 is calmer and conditions at all measured locations are suitable for sitting or standing.
- 15.48. The future baseline was one of the configurations re-tested on the 11th June 2015, to include the upgraded Reading Mainline Station and in-construction buildings comprising Chatham Place, 21 Caversham Road, Energis House, Thames Tower and Aldwych House. Minor differences can be noted in the results compared to the 2013 SH3 assessment. Notably there are a larger proportion of leisure walking conditions measured towards the north and east of the proposed Development and around the updated Thames Tower, in areas that were previously suitable for standing/entrance use. These localised differences are attributed to minor differences in the surrounding building configurations, which has caused these areas where wind conditions were close to the upper threshold of the standing/entrance use in the 2013 assessment, to exceed the threshold into leisure walking. Notably, these locations include the station entrance represented by receptor 8, which marginally exceeds the threshold into 'leisure walking', whereas it had previously been within the upper range of standing/entrance use. This change is sufficiently minor that it is not expected to be significant (and furthermore, it can be noted in the later configurations that conditions at this location become significantly calmer in the presence of the proposed Development).
- 15.49. Wind conditions throughout other parts of the Site continue to be acceptable for the current uses of the area, which is consistent with the results of the 2013 assessment.

Strong Winds

- 15.50. There were 6 receptors which had wind speeds exceeding Beaufort 6 for more than one hour per year (namely receptors 33, 37, 39, 43 and 55).

Potential Effects

Demolition and Construction – Wider Development

- 15.51. Once the Site is cleared, the wind would blow across the open Site. The predominance of the south-westerly winds would imply that the existing Reading Mainline Station on the north-east side of Station Hill would be most affected by the reduction in shelter created by the removal of the existing buildings on the Site. However, this would be a temporary effect mitigated to some degree by the temporary construction buildings and hoarding. Therefore, wind conditions during the

demolition phase are expected to be similar to those for the existing Site. This would give rise to at worst a likely **negligible** effect.

- 15.52. Once construction of the Development begins and progresses, the local wind conditions on the Site would adjust to those reported in the latter sections of this Chapter. However, it is anticipated that the likely effect of the construction works on the wind microclimate of the Site and immediate surrounding area would be **negligible**.

Interim Condition: Temporary Event Space

- 15.53. A temporary scenario was tested in the wind tunnel (refer to Figures 15.5 and 15.6 for the windiest and summer seasons respectively) which consisted of demolished buildings within the northern part of the Site, with the exception of Xafinity House and the NCP Car Park and completion of the Temporary Event Space at Plot C together with the future baseline schemes.
- 15.54. The Temporary Flexible Event Space has potential to be used for a range of events including markets, ice rink, and outside concert venue, where sitting or standing conditions are desired. Designated walkways are proposed around the perimeter of the Site, where leisure walking conditions are desired during winter months.

Thoroughfares

- 15.55. As shown on Figure 15.5 the majority of the Site would be suitable for standing or sitting during the winter months, with leisure walking conditions in the north eastern part of the Site in the vicinity of Thames Tower. This is largely consistent with the results of the Future Baseline configuration, albeit with minor differences due to the changes throughout the rest of the Site. The wind conditions within the proposed temporary thoroughfares would therefore be suitable or better than desired resulting in a **negligible to local, temporary, short-term moderate beneficial** significance effect on thoroughfares along the perimeter of the Site.

Event Space

- 15.56. As shown in Figures 15.5 and 15.6 (windiest and summer season respectively), the Temporary Event Space observes a mix of standing and sitting conditions throughout the year and is therefore suitable or better than required. This is classified as a **negligible to moderate** beneficial effect.

Strong Winds

- 15.57. There were three occurrences of strong winds in excess of Beaufort 6 for up to 3.7 hours per year. These strong winds were measured at receptors 37, 39 and 43; however these conditions are not materially worse than in the future baseline scenario.

Completed Development

- 15.58. Figure 15.7 shows the modelled conditions during the worst-case season for the maximum parameters of the Development.

Existing Streets

- 15.59. As shown in Figure 15.7, with the proposed Development (maximum parameters) in place, the conditions along Station Road would be similar to those for the future baseline situation, with

conditions ranging from sitting to leisure walking during the windiest season (and at worst suitable for standing/entrance use at entrance locations), corresponding with a **negligible** effect. .

- 15.60. Along Station Hill, to the north of Building Plot A, the conditions during the windiest season would be windier than the future baseline, due to prevailing winds accelerating around the northwest corner of Building Plot A. The leisure walking conditions observed along the north side of Station Hill are appropriate for thoroughfare use; however, the conditions at the corner of Building Plot A itself (receptor 69) would be suitable for business walking, which is one category windier than required. The conditions at receptor 69 are windier than those recorded in the SH3 Scheme Proposed Development Configuration but the same as those recorded in the SH3 Scheme Cumulative Scheme Assessment. This would suggest that these conditions are due to the future baseline schemes surrounding the Site (previously considered as cumulative schemes). , At all other locations, conditions would remain suitable for standing and sitting similar to the existing condition. Notably the conditions outside the station entrance represented by receptor 8 become calmer in the presence of the proposed Development. Conditions overall would be suitable for the desired use except at receptor 69, resulting in **negligible** to a **local, long-term minor** adverse effect.
- 15.61. Conditions along Greyfriars Road, during the windier season would be suitable for sitting to leisure walking, with a slight increase in wind to the south of Building Plot A. The wind conditions would however, remain suitable for the desired use and the likely effect is considered to be **negligible**.
- 15.62. During the windiest season, the conditions along Friar Street would be similar to those for the future baseline situation, with conditions ranging from sitting to standing. This would correspond with a likely **negligible** effect.
- 15.63. Along Garrard Street conditions within the Development (maximum parameters) would be suitable for sitting to leisure walking during the windiest season compared to sitting to standing conditions in the future baseline scenario. However, conditions would remain suitable for use and the effect is therefore considered to be **negligible**.

Proposed Thoroughfares

- 15.64. As shown in Figure 15.7, conditions along all proposed thoroughfares within the Site would be suitable for leisure walking, or better. This would give rise to a range of effects from **negligible** to **local, long-term moderate** beneficial effects.
- 15.65. Conditions along Friars Walk, the key north-south route and the Arcade along the east-west route would be predominantly suitable for standing or sitting conditions during the winter months. This would give rise to **local, long-term minor** to **moderate** beneficial effects.

Entrances

- 15.66. As this is an outline planning application, the location of entrances is currently undecided. The conditions along all maximum Building Plot façades range from sitting to leisure walking. Without mitigation, the likely effect for building entrances ranges from **local, long-term minor beneficial** effects to **local, long-term minor adverse** effects.

Ground Level Amenity Spaces

- 15.67. Sitting conditions should be targeted within amenity spaces during the summer season, however in areas where greater levels of activity are expected, such as parks, then standing conditions may be acceptable. The wind microclimate during the summer season is shown in Figure 15.8.

Station Square

- 15.68. The summer season wind environment within Station Square on the north side of Thames Tower is one category windier than desired at locations 43, 44 and 50 (refer to Figure 15.8). Without mitigation the likely effect is considered to be **local, long-term** and of **minor adverse significance**.

Central Square

- 15.69. As shown in Figure 15.8, within the proposed Central Square, conditions would be suitable for sitting and standing. Without mitigation, this would correspond to **negligible** to **local, long-term minor** adverse effects.

Roof Terraces

- 15.70. Roof terrace areas throughout the proposed Development are generally windier than desired, which is mainly due to the absence of balustrades or other beneficial shelter in the maximum parameter scheme. As shown in Figure 15.8, the conditions during the summer are suitable for leisure walking on the roofs of Plots B and C (i.e. two categories windier than the target conditions), a mixture of leisure walking and standing/entrance use on the roofs of Plots A, D and E (two and one categories windier respectively), and standing/entrance use on the roofs of Plots F and G. These conditions represent **adverse effects** of **moderate** and **minor significance** respectively for leisure walking and standing/entrance conditions. As described in the assessment methodology, the significance of effects on terraces and other amenity spaces is based on summer season conditions. Conditions during the windiest season, as shown in Figure 15.7, would be windier with a wind environment suitable for business walking and carpark/roadway use on the roof areas of Plots A, B and C.
- 15.71. As noted in the methodology section of this chapter, the conditions on these terraces will change as a result of the detailed design of the respective plots (particularly the design of the balustrade), and so these areas should be reassessed at detailed design stage. The suggested mitigation described later in this chapter draws on the results of wind tunnel tests conducted for the Plot B Reserved Matters application, which included illustrative parameters for the wider Site.
- 15.72. Conditions on the roof terraces are windier than in the SH3 assessment, because that assessment included the effects of illustrative 2m high balustrades around the roof terraces of the maximum parameter plots. Balustrades have not been included in the current assessment, as they do not form part of the maximum parameter scheme, and this assessment aims to demonstrate a 'worst case' scenario prior to mitigation (which is discussed later in this chapter).

Strong Winds

- 15.73. For the completed Development in Configuration 3, there are 40 locations where the wind speed exceeds Beaufort Force 6 (B6), 7 (B7) or 8 (B8) on occasion (shown in Table 3 in Appendix 15.1).
- 15.74. Beaufort Force 6 is exceeded at locations 13, 20, 39, 43-46, 51, 61, 62 and 84, which are situated at building corners or along a thoroughfare at ground level; these are considered marginal exceedances and unlikely to cause a nuisance to pedestrians; however locations 55 and 69 would

require mitigation as they observed strong winds exceeding B7. It should be noted however that strong winds in these areas will be sensitive to the final detailed design of the plots, and so the requirement for mitigation should be reassessed at detailed design stage.

- 15.75. The remaining locations where strong winds are measured are on rooftop amenity spaces. However, these areas have already been identified as areas that would require mitigation to address pedestrian comfort. The conditions on these terraces will change as a result of the detailed design of the respective plots (particularly the design of the balustrades), and so the requirement for mitigation should be reassessed at detailed design stage.
- 15.76. It is noted that more locations observed strong winds in the current assessment than in the consented SH3 scheme. This is due to changes in the future baseline surrounds and the design of Plot E affecting those receptors that were either sensitive due to their location (close to building corners, for example) or were close to the strong wind threshold such that a minor increase would result in a shift in classification. For most affected locations, the change is not significant (specifically, the thoroughfare receptors noted above where wind speeds occasionally exceed B6 are still suitable for their intended use). The significant changes are those where mitigation may now be required (dependent upon the detailed design) as a result of the minor increase in wind speed (i.e. receptors 69 and 55, as described above).

Mitigation

Demolition and Construction

- 15.77. As conditions during the demolition and construction of the proposed Development were reported as negligible, mitigation measures are not required.

Interim Condition: Temporary Flexible Event Space

- 15.78. The wind microclimate across the Temporary Flexible Event Space is expected to be suitable for a mix of standing and sitting during the windiest season, with calmer conditions suitable for sitting likely in the summer. No mitigation is therefore considered to be necessary.

Completed Development

Existing Streets and Proposed Thoroughfares

- 15.79. As shown in Figure 15.7, and previously discussed, most of the existing and proposed thoroughfares have conditions suitable for the desired leisure walking use or better, with the exception of receptor 69 at the northwest corner of Building Plot A. It is anticipated that conditions in this area would improve as a result of the detailed design of Plot A (i.e. the windy conditions in this area are a result of assessing the worst-case maximum parameter plans), and no additional mitigation is expected to be required. This would be reviewed at the detailed design stage and should windier than desired conditions remain, additional mitigation measures would be implemented.
- 15.80. As noted previously in this chapter, the conditions at receptor 69 are windier consistent with those recorded in the SH3 cumulative assessment. It is therefore considered that these wind conditions are due to the fact that future baseline surrounding buildings have been included in the Proposed Development Configuration rather than the Cumulative Configuration as for the SH3 Scheme.

Entrances

- 15.81. With the Development (maximum parameters in place) conditions along the Development Plot façades would range from sitting to leisure walking. The wind tunnel testing would inform detailed design and entrances would be located in more benign conditions where possible. Where entrances are proposed in locations where conditions are suitable for leisure walking mitigation would be required in the form of localised screening or recessed entrances. Further wind tunnel testing would be conducted, if necessary, at detailed design when entrance locations are known to determine the form that any such mitigation should take.

Ground Level Amenity Spaces

Station Square

- 15.82. Figure 15.8 shows that during the summer season, the wind environment within Station Square is one category windier than desired at locations 43, 44 and 50. Mitigation measures that are expected to be effective (based on professional judgement and the results of previous mitigation tests conducted on the SH3 scheme) are localised screening and soft landscaping within the square. The conditions in the square will be sensitive to the detailed design of Plots C and G, and so the requirements for mitigation should be reassessed during the detailed design of these plots.

Central Square

- 15.83. Within the proposed Central Square, conditions would be suitable for sitting and standing conditions. The square has not been designed in detail and seating areas could be located in areas with more benign conditions. Should seating be proposed in areas suitable for standing, localised screening would be required. The final mitigation measures would be determined at detailed design and further wind testing would be conducted, if necessary, to support the reserved matters application and validate and demonstrate the effectiveness of such mitigation

Roof Terraces

- 15.84. Wind conditions on the roof terrace areas of the maximum parameter scheme were found to be up to two categories windier than desired during the summer. As noted previously this is due partly to the absence of balustrades or any other shelter on the maximum parameter roof areas, and as such it represents a conservative, worst-case scenario.
- 15.85. As part of the Reserved Matters Application for Plot B, wind tunnel testing has been conducted by RWDI on the detailed Plot B scheme with an indicative wider Site, which presents a more realistic wind climate at roof level, incorporating the effects of balustrades and other roof level features. Wind conditions improved by up to two categories during the summer in the rooftop areas of Plots A, B, C and D that were sheltered by perforated or solid screening around the building crowns. Other parts of the terraces improved by one category where 1.1m high balustrades and the indicative massing of the building combined provided a small amount of shelter from windy conditions.
- 15.86. Overall, in the indicative scheme, conditions on the rooftop terraces were found to be predominantly suitable for standing or sitting use during the summer, with only one area (at the northwest corner of Plot C) remaining suitable for leisure walking use. These results indicate the type of mitigation

that can be effective, and should be developed further at the detailed design stage of each plot to ensure that conditions are comfortable for their intended use.

- 15.87. Technical Appendix 15.1 provides more information on the illustrative assessment, including model photographs and test results.

Residual Effects

Demolition and Construction – Wider Development

- 15.88. No mitigation is required. As such, the effects during demolition would be as set out under potential effects, that is **negligible**.

Interim Condition: Temporary Flexible Event Space

- 15.89. All thoroughfares would be expected to be suitable for their desired use even in the absence of mitigation. The residual effect would therefore be **negligible to moderate beneficial**.
- 15.90. Wind Conditions in the event space would be suitable for sitting during summer months and sitting and standing during winter. This correlates with the likely desired conditions for events taking place during these seasons and the residual effect is therefore **negligible to moderate beneficial**.

Completed Development

Existing Streets

- 15.91. The detailed design of Building Plot A is anticipated to improve conditions at receptor 69 at the northwest corner of the Site; however, this would need to be confirmed at detailed design stage and additional mitigation measures explored if necessary to ensure that the wind conditions are suitable for the intended use of this area. Until this is confirmed, the residual effect at this receptor location would be **minor adverse**. This effect is consistent with that of the consented SH3 Scheme with surrounding Cumulative Schemes but without mitigation in place. All other locations tested on the existing streets would be suitable for their intended use equating to a **negligible** effect.

Proposed Thoroughfares

- 15.92. All proposed thoroughfares would be suitable or better for the desired leisure walking use. The likely residual effect would therefore range from **negligible to long-term, local and of moderate beneficial significance**.

Entrances

- 15.93. Further wind tunnel testing at the reserved matters approval stage would inform the detailed design. Provided entrances are located in areas with more benign wind conditions and localised screening and/or recessing is used where necessary, the wind conditions would be suitable for entrance use. However, until entrance locations are confirmed at detailed design stage, the residual effect would remain **minor beneficial to minor adverse**. These effects remain consistent with those of the consented SH3 Scheme based on maximum parameters and without mitigation in place. For the SH3 Scheme some mitigation testing was undertaken to demonstrate that mitigation could be effective in reducing wind speeds where necessary. This mitigation testing has not been repeated

for the Telecom House / Plot E Application but further testing would be undertaken at the detailed design stage because at this stage the wind conditions can be more accurately quantified based on the detailed massing of the buildings. Therefore, prior to detailed design and in the absence of mitigation, if considered necessary at the detailed design stage, the residual effects have been reported to be the same as the potential effects.

Ground Level Amenity Spaces

Station Square

- 15.94. Based on professional judgement, informed by the mitigation tests conducted on the SH3 scheme (which had similar effects in the Station Square area), mitigation measures localised screening and additional tree planting within the Square are expected to prove effective mitigation. However, until the mitigation measures implemented at the detailed design stage are confirmed to be effective through further wind tunnel tests, the likely residual effect within Station Square would remain **minor adverse**. As with the residual effects of the entrances, these effects remain consistent with those of the consented SH3 Scheme at maximum parameters and without mitigation in place.

Central Square

- 15.95. Within the proposed Central Square, conditions would be suitable for sitting and standing conditions. Providing seating is located in areas with more benign conditions or localised screening is incorporated at detailed design, the wind conditions are likely to be suitable for their intended use. However, until this is confirmed at the detailed design stage, the residual effect would remain **negligible to minor adverse**. As with the residual effects of the entrances, these effects remain consistent with those of the consented SH3 Scheme at maximum parameters and without mitigation in place.

Roof Terraces

- 15.96. Mitigation measures tested with the illustrative scheme (as part of the Plot B Reserved Matters application) demonstrate that a significant improvement in wind conditions by up to two categories during the summer can be achieved with appropriate screening and balustrades. This mitigation would need to be developed at detailed design stage and additional mitigation measures explored if necessary. Until this is confirmed, the residual effect would be **moderate to minor adverse**.

Summary and Conclusions

- 15.97. A wind tunnel assessment was conducted to determine the likely significant effects of the Development on the local wind environment. The assessment used the Lawson Comfort Criteria to benchmark the wind microclimate and focused on the results for the winter and summer seasons. The Maximum Parameter plans were assessed because these present the largest facades around the perimeter of the Site and so represent a worst-case result.
- 15.98. Meteorological data acquired for Heathrow indicates prevailing winds blow from the south west throughout the year with secondary springtime winds from the north east.
- 15.99. Baseline conditions across the existing Site are suitable for leisure walking, standing and sitting during the windiest season. During the summer season, when winds are lighter, conditions are suitable for sitting at the majority of receptors across the Site.

- 15.100. For the completed Development – Max Parameter wind conditions were suitable for business walking, leisure walking, standing or sitting and much of the wind environment on the Site is in-line with the intended use of the Development. During the summer season, there are outdoor amenity spaces where seating areas are proposed, which would benefit from localised mitigation in the form of landscaping/tree planting to provide shelter from prevailing winds.
- 15.101. The wind environment on the rooftop terraces is primarily suitable for standing or leisure walking during the summer. The terraces are windier than desired for outdoor amenity spaces in the summertime but the wind tunnel tests were conducted without any landscape or screen details on the terraces. During detailed design, effective use of soft landscaping, including tree planting and vertical screening/balustrades, is expected to shelter the garden space and terraces whereas, tall balustrades in conjunction with trees and soft landscaping would shelter the penthouse terraces.

Comparison of Effects between this ES and the Consented SH3 Scheme ES

- 15.102. Localised minor differences were noted in the results of the 2015 assessment compared to the 2013 SH3 assessment, which are attributed to differences in the modelled configurations of Plot E and the future baseline surroundings. Local wind speeds at areas to the northeast and northwest of the Site increased by a small amount, causing a change of one category in locations that were either close to their respective comfort category thresholds or were located in areas that were particularly sensitive to minor changes in the surrounding massing (such as exposed building corners). However with regard to the intended uses of the area, the assessment and conclusions are largely consistent with the 2013 assessment.
- 15.103. The receptor located on the existing thoroughfare at the northwest corner of the site (receptor 69) changed from being marginally within the upper threshold of the leisure walking category, to suitable for business walking during the windiest season (i.e. one category too windy for its intended use). This is consistent with the cumulative assessment presented in the 2013 ES and it is therefore likely that these wind conditions are caused by the surrounding future baseline schemes which were originally considered as Cumulative Schemes. It is anticipated, however, that the detailed design of Building Plot A would return this area to suitable conditions for thoroughfare use. However, this would be confirmed in wind tunnel testing at the detailed design stage and additional mitigation measures would be provided in this area, if necessary to ensure that the wind conditions are suitable for their intended use.

Summary of Potential Effects, Mitigation and Residual Effects

- 15.104. The potential and residual wind effects of the Development are summarised within Table 15.4. Within this table, unlike in the 2013 ES, the residual effects have been reported to be the same as the potential effects. This is because at this outline stage, the mitigation measures are not known and have therefore not been tested. However, in all cases, there are known suitable mitigation measures which could be incorporated and these would be tested at the detailed design stage to render wind conditions suitable for their intended use.

Table 15:4 Summary of Potential Effects, Mitigation Measures and Residual Wind Effects

Issue	Potential Effect	Mitigation	Residual Effect
Demolition and Construction			
Wind conditions on streets surrounding the Site	Negligible	None required	Negligible
Interim Condition: Temporary Flexible Event Space			
Wind conditions at proposed thoroughfares	Negligible	None required	Negligible
Wind conditions at the proposed Event Space	Negligible to Moderate Beneficial	None required	Negligible to Moderate Beneficial
Completed Development			
Wind conditions on streets surrounding the Site	Negligible to Minor Adverse	Conditions at the northwest corner of Plot A are expected to be sensitive to the detailed design of plot A. Requirement for mitigation should be reassessed at detailed design of Plot A.	Negligible to Minor Adverse
Wind conditions at thoroughfares	Negligible to Moderate Beneficial	None Required	Negligible to Moderate Beneficial
Wind conditions at entrances	Minor Adverse to Minor Beneficial	During detailed design, the results of this assessment should be considered; entrances could be located away from windy zones or localized shelter provided. Further testing would be required at detailed design to confirm the effectiveness of mitigation measures.	Minor Adverse to Minor Beneficial
Wind conditions at Station Square	Negligible to Minor Adverse	Mitigation incorporated into detailed design such as localised screening and additional tree planting. This mitigation is expected to be effective, but should be confirmed through further testing at detailed design.	Negligible to Minor Adverse
Wind conditions at Central Square	Negligible to Minor Adverse	Seating should be located in areas with more benign conditions, or localised screening provided where	Negligible to Minor Adverse

Issue	Potential Effect	Mitigation	Residual Effect
		required. Further testing would be required at detailed design to confirm the effectiveness of the mitigation measures.	
Wind conditions at Roof Terraces	Minor to Moderate Adverse	The detailed design of the buildings together with balustrades and localised screening are expected to mitigate the wind conditions on the roof terraces. However, further testing would be required at detailed design to confirm the effectiveness of the mitigation measures.	Minor to Moderate Adverse

References

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- ¹ National Planning Policy Framework, 2012
 - ² National Planning Practice Guidance, 2014
 - ³ Reading Borough Council Core Strategy, 2008
 - ⁴ Reading Borough Council, 2012, Local Development Framework, Sites and Detailed Policy Document
 - ⁵ Reading Central Area Action Plan, 2009
 - ⁶ Station Hill South Planning and Urban Design Brief, adopted 2007
 - ⁷ Station Area Framework, 2010
 - ⁸ Lawson T.V, 2001,, Building Aerodynamics.' Imperial College Press,

16. Daylight, Sunlight and Overshadowing

Introduction

- 16.1. This Chapter of the Environmental Statement (ES) assesses the potential effects of the proposed Development upon daylight, sunlight and overshadowing within neighbouring residential receptors and amenity areas.
- 16.2. The technical analysis has been undertaken in accordance with the Building Research Establishment (BRE) 2011 Guidelines¹.
- 16.3. This Chapter outlines the relevant policy context, describes the methodologies applied, the baseline conditions at the Site and its surrounds and identifies potential effects associated with the proposed Development. Where appropriate, mitigation is set out as necessary and the resulting likely residual impacts are identified.
- 16.4. The planning application is outline in nature and therefore details of any large expanses of office use where extensive artificial lighting is used and details of façade materials including large areas of glazing are not available for full detailed light pollution and solar glare analyses to be undertaken. Therefore light pollution and solar glare are not considered further in this chapter.
- 16.5. This Chapter has been prepared by Gordon Ingram Associates (GIA) and is supported by the following documents which can be found in the technical appendices 16.1 to 16.5:
- Technical Appendix 16.1 - Drawings of the Future Baseline, Proposed Development, Consented Scheme and Cumulative Scenario;
 - Technical Appendix 16.2 - Daylight and Sunlight Results for all scenarios;
 - Technical Appendix 16.3 - Daylight Potential Assessment;
 - Technical Appendix 16.4 - Overshadowing Assessment; and
 - Technical Appendix 16.5 – Impact Assessment on 29-35 Station Road.

Planning Policy Context

National Planning Policy

National Planning Policy Framework, 2012

- 16.6. The National Planning Policy Framework², adopted on the 27th March 2012, replaces the Planning Policy Statements and Planning Policy Guidance and stipulates that:
- “... planning policies and decisions should always seek to secure a good standard of amenity for existing and future occupants of land and buildings.”*

Local Planning Policy

Reading Borough Local Development Framework, Core Strategy, Altered 2015

- 16.7. Policy DM4³ seeks to safe guard amenity, requiring development to not cause a significant detrimental impact to the living environment or existing or new residential properties in terms of access to sunlight/daylight.

Reading Borough Local Development Framework, Sites and Detailed Policies Document, Altered 2015

- 16.8. Policy DM4⁴ requires new development not to cause significant detrimental impact to the living environment of existing or new residential properties in terms of, inter alia, access to sunlight and daylight and artificial lighting.

Reading Borough Local Development Framework, Reading Central Area Action Plan, 2009

- 16.9. Policy RC13⁵ concerns tall buildings, which are defined as 10 storeys of commercial floor space or 12 storeys of residential (equating to 36 metres tall) or above and states that all proposals should:

“Ensure adequate levels of daylight and sunlight are able to reach buildings and spaces within the development;

Avoid significant negative impacts on existing residential properties and the public realm in terms of outlook, privacy, daylight, sunlight, noise, light glare and night-time lighting.”

Station Hill South Planning and Urban Design Brief, 2007

- 16.10. Principle 8⁶ Incorporating high standards of sustainable design states that a new development should have *“acceptable levels of daylight and views available to residents and office workers (avoiding overshadowing).”*

Guidance

Building Research Establishment (BRE) Guidelines ‘Site Layout Planning for Daylight and Sunlight 2011: A Guide to Good Practice’, Second Edition

- 16.11. The 2011 BRE Guidelines provide advice on site layout planning to achieve good sunlighting and daylighting within buildings, and in the open spaces between them. It is intended for building designers, developers, consultants and Local Planning Authorities (LPAs). The advice it gives is not mandatory and should not be used as an instrument of planning policy. Of particular relevance it states:

“This guide is a comprehensive revision of the 1991 edition of Site Layout Planning for Daylight and Sunlight: A Guide to Good Practice. It is purely advisory and the numerical target values within it may be varied to meet the needs of the development and its location.”

- 16.12. It also states:

“The advice given here is not mandatory and the guide should not be seen as an instrument of planning policy; its aim is to help rather than constrain the designer. In special circumstances the developer or planning authority may wish to use different target values... in an area with modern high rise buildings, a higher degree of obstruction may be unavoidable if new developments are to match the height and proportions of existing building” (para.1.6).”

- 16.13. In addition, the BRE Guidelines state (para. 1.3) that *“it is intended to be read in conjunction with the interior daylighting recommendations in the British Standard 8206-2 Code of practice for daylighting, and in the CIBSE publication Lighting guide; daylighting and window design.”*

British Standard (BS) 8206 Part 2: (2008)

- 16.14. The British Standard⁷ provides recommendations regarding the design for daylight in buildings and sets out various methods for assessing daylight. The document states:

“Daylighting gives to a building a unique variety and interest. An interior which looks gloomy, or which does not have a view to the outside when this could reasonably be expected, will be considered unsatisfactory by its users.”

Applications Manual Window Design of the Chartered Institute of Building Services Engineers (CIBSE)

- 16.15. This guide⁸ replaces the CIBSE Applications Manual Window Design (1987) and provides a daylight design guide. It states:

“When daylighting decisions are made, however, they will have implications for other, interrelated aspects of window performance such as solar heat gain, winter heat loss, provision of view, acoustic performance, privacy, security and protection from fire.”

Assessment Methodology and Significance Criteria

Assessment Methodology

- 16.16. The daylight, sunlight and overshadowing analysis used to prepare this report is based upon the 2011 BRE Guidelines. All relevant standards within the BRE Guidelines are set out in the following paragraphs.
- 16.17. This Chapter assesses the effect of the proposed Development against the Future Baseline conditions of the site. A three-dimensional model of the Future Baseline scenario has been created and assessed in order to ascertain the Future Baseline levels of daylight and sunlight amenity within the surrounding residential receptors.
- 16.18. The technical assessments have been undertaken using specialist computer software applied to three-dimensional AutoCAD models for the Site and surroundings, based on measured survey data. Actual room layouts of the surrounding properties have been obtained where possible. Where room layout information was unavailable, reasonable assumptions have been made in regards to the likely use and internal configuration of rooms behind the fenestration observed.
- 16.19. In such cases, it has also been assumed that a standard 4.2m deep room exists, unless the building form dictates otherwise. This is common practice when room layouts are not available and it is not possible to access the property for surveying. This enables evaluation of the diffuse levels of daylight within each of the rooms via the NSL methodologies, which are discussed in more detail below.
- 16.20. All models have been correctly orientated north by the use of Ordnance Survey (OS) information so as to enable the path of the sun to be tracked throughout the year, where relevant.
- 16.21. For the purposes of this assessment, effects are determined based on levels suggested by the BRE Guidelines and have been defined as **negligible**, **adverse** or **beneficial** depending upon whether the property would be more or less favourable in terms of daylight and sunlight amenity and overshadowing than in the baseline situation. The effects have also been described as **minor**, **moderate** or **substantial significance** using professional judgement considering the levels of daylight, sunlight and overshadowing lost and retained.

Daylight

- 16.22. It should be noted that this Chapter's assessment deals only with effects to residential properties (both existing residential properties which surround the site and future proposed residential units of the Development itself). This is due to the fact that the BRE Guidelines clearly notes that residential receptors/properties are most sensitive to daylight availability.
- 16.23. As stated in the BRE Guidance "*guidelines may be used for houses and any non-domestic buildings, where daylight is required*". Commercial properties are generally deemed to have a greater reliance upon supplementary electric lighting and have therefore not been included within the assessment.

Vertical Sky Component (VSC) Method

- 16.24. VSC is a quantified measurement of the amount of skylight falling on a vertical wall or window. This is the ratio of the direct sky luminance falling on a vertical wall at the reference point for the simultaneous horizontal luminance under an unobstructed sky. The Commission International de l'Eclairage (CIE) 'standard' overcast sky is used, the ratio is then expressed as a percentage. The maximum value achievable is approximately 40% for a completely unobstructed vertical wall. The VSC of a window can then be related to the ADF in a room, which is a standard test for the British Standard (BS 8206: Part 2) recommendations on interior day-lighting.
- 16.25. VSC may be calculated by using the sky light indicator or Waldram Diagram; all obstructing buildings would have an effect, not just those on the same site. For calculation purposes, trees may be ignored unless they form dense continuous belts.
- 16.26. The VSC method of analysis takes no account of the room behind the window being assessed; it relies purely upon the external obstructions. Where levels of VSC are low in the baseline, any reduction would lead to a large percentage change which may be misleading given the small quantum of light loss.

No Sky Line (NSL) Method

- 16.27. The NSL divides those areas of the working plane which can receive direct sky light from those which cannot.
- 16.28. If a significant area of the working plane lies beyond the NSL (i.e. it receives no direct sky light), then the distribution of daylight in the room would be poor and supplementary electric lighting may be required.
- 16.29. The effect of daylighting distribution in an existing building can be found by plotting the NSL in each of the main rooms. For houses, this would include living rooms, dining rooms and kitchens. Bedrooms should also be analysed, although they are less important.
- 16.30. The BRE Guidelines state that if the area of a room that does receive direct sky light is reduced to less than 0.8 times its former value, then this would be noticeable to its occupants.
- 16.31. The analysis and results for NSL are stated in square foot.

Sunlight

- 16.32. The 2011 BRE Handbook provides two methods for assessing sunlight, depending on whether the assessment is for an existing neighbouring property or a proposed building. However, the methods are similar and relate to methods of assessing the Annual Probable Sunlight Hours (APSH) at a reference point. Similar to the assessment of daylight, this assessment considers

only sunlight effects to existing residential properties surrounding the site and the levels of sunlight received by the proposed residential units within the proposed Development.

- 16.33. Sunlight is deemed less important in bedrooms and in kitchens, where people prefer sunlight in the morning, rather than in afternoon. Section 3.1.2 of the 2011 BRE states that:

"In housing, the main requirement for sunlight is in living rooms, where it is valued at any time of day, but especially in the afternoon."

- 16.34. With regard to sunlighting, the same skylight indicator is used for the VSC test at the same reference point to calculate the APSH, which are expressed as a percentage.

- 16.35. The 2011 BRE Handbook notes:

"...a south facing window will, in general, receive most sunlight, while a north facing one will receive it only on a handful of occasions. East and west facing windows will receive sunlight only at certain times of day".

Sunlight Assessment - New Proposed Developments

- 16.36. For a new proposed building, the 2011 BRE Handbook states that the centre of each proposed main living room window can be assessed for sunlight.

- 16.37. Section 3.1.12 of the 2011 BRE Handbook states:

"If a room has multiple windows on the same or adjacent walls, the highest value of APSH should be taken." This is an approach which seeks to simplify the calculation of sunlight for multi-glazed rooms.

Sunlight Assessment - Existing Buildings

- 16.38. For existing properties, the 2011 BRE Handbook suggests;

"that all main living rooms of dwellings...should be checked if they have a window facing within 90° of due south. Kitchens and bedrooms are less important, although care should be taken not to block too much sun."

and

"If the main living room to a dwelling has a main window facing within 90° of due north, but a secondary window facing within 90° of due south, sunlight to the secondary window should be checked."

- 16.39. The 2011 BRE Handbook suggests that when assessing sunlight for existing neighbouring buildings, the point at the centre of the window on the outside window face can be used.

"If this window point can receive at least one quarter of APSH, including at least 5% of APSH in the winter months between 21st September and 21st March, then the room should still receive enough sunlight."

- 16.40. The 2011 BRE Handbook goes on to summarise that if these guidelines are not met and a window receives less than 0.8 times its former value of annual APSH or winter APSH, and has a reduction in annual APSH of more than 4%, *"then the sunlighting of the existing dwelling may be adversely affected."*

Overshadowing

Sun-on-Ground

- 16.41. The methodology for the assessment of permanent overshadowing, sun-on ground hours, is set out in the 2011 BRE Guidance and is summarised below. The 2011 BRE Handbook acknowledges that:

“Good site layout planning for daylight and sunlight should not limit itself to providing good natural light inside buildings. Sunlight in the space between buildings has an important effect on the overall appearance and ambience of a development.”

- 16.42. The method for assessing permanent shadow on the ground is the sun-on-ground indicator. The sun-on-ground assessment applies both to new gardens and amenity areas, including existing spaces, which are affected by new developments.
- 16.43. The 2011 BRE Handbook suggests that the Spring Equinox (21st March) is a good date for assessment. Using specialist software, the path of the sun is tracked. This maps obstructions and compares them to the known sun paths to determine where the sun would reach the ground and where it would not.
- 16.44. The BRE Handbook suggests that for a garden or amenity area to appear adequately sunlit throughout the year, no more than half (50%) of the area should be prevented by buildings from receiving two hours of sunlight on the 21st March.
- 16.45. The 2011 BRE Handbook then goes on to suggest that if, as a result of new development, an existing garden or amenity area does not meet the Guidance, or the area which can receive some sun on the 21st March is less than 0.8 times its former value then the loss of sunlight is likely to be noticeable. The results of each assessment are analysed against these criteria. In addition, the results are compared with the BRE Handbook in general. The BRE Handbook must be used flexibly and should not be used as an instrument of planning policy because it is not mandatory. Rather, the Guidance aim to help the designer and planning authority, and should be viewed in the context of other site constraints.
- 16.46. There are no surrounding amenity areas that are relevant for analysis, only internal amenity areas within the proposed Development.

Transient Overshadowing

- 16.47. The 2011 BRE Handbook suggests that where large buildings are proposed which may affect a number of gardens or open spaces, it is useful to plot a shadow plan to illustrate the location of shadows at different times of the day and year. For the purpose of this assessment the overshadowing was mapped for the following three key dates in the year:
- 21st March (Spring Equinox);
 - 21st June (Summer Solstice); and
 - 21st December (Winter Solstice).
- 16.48. September 21st (Autumn Equinox) provides the same overshadowing images as March 21st (Spring Equinox) as the sun follows the same path at these corresponding times of year.
- 16.49. For each of these dates, the overshadowing is calculated at hourly intervals throughout the day from 08:00 to 19:00. Some images are not included within Appendix 16.4 because the sun would

not be present during these times (e.g. from approximately 16:00 onwards on 21st December) and thus no shadow can be cast.

- 16.50. The indicators are calculated for different latitudes, London being at 51.5° north and Reading being at 51.45° north. Southern orientation is critically important, as are the heights of the existing and proposed buildings.

Significance Criteria

Daylight and Sunlight

- 16.51. The results of the daylight and sunlight assessment are compared against the criteria set out in the 2011 BRE Guidelines as summarised in Table 16.1 below.
- 16.52. When reviewing the daylight results for each property, they should be read sequentially; VSC and then NSL. In the first instance, the VSC results should be considered. If all the windows in a building meet the VSC criteria, it can be concluded that there will be adequate daylight potential to the windows in question.
- 16.53. If the windows in a building do not meet the VSC criteria, the NSL analysis for the room served by that window needs to be considered. If the NSL criteria for the room in question are met, then there will be adequate daylight to that room.

Table 16.1: BRE Criteria for Daylight and Sunlight

Issue	BRE Criteria
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.
NSL	A room may be adversely affected if the daylight distribution (NSL) is reduced beyond 0.8 times its existing area.
APSH	A window may be adversely affected if a point at the centre of the window received for the whole year is less than 25% of the APSH including at least 5% of the APSH during the winter months (21 st September to 21 st March) and less than 0.8 times its former sunlight hours during either period, and for existing neighbouring buildings, if there is a reduction in annual APSH which is greater than 4%.

- 16.54. Appendix I of the 2011 BRE Guidelines addresses Environmental Impact Assessments with regard to daylight and sunlight. Section 3 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.”

- 16.55. Paragraph 5 of Appendix I goes on to say that:

“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 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.”

16.56. Paragraph 6 of Appendix I continues:

*“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; and*
- *The affected building or open space only has a low level of requirement for skylight or sunlight.”*

16.57. Paragraph 7 of the Appendix I: states

“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 particular strong requirement for skylight or sunlight, eg. A living room in a dwelling or a children’s playground”.*

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

16.59. Professional judgement and reference to the criteria summarised within Table 16.1 (above) have been used to provide a significance criteria for all potential impacts and residual effects to each of the neighbouring buildings assessed and are referred to as **beneficial** or **adverse**, and of either **negligible, minor, moderate or substantial** significance.

16.60. Where the results show compliance with the 2011 BRE Handbook criteria, the impact is considered **negligible** since the BRE Handbook indicates that the occupants are unlikely to experience any noticeable change to their amenity levels. Effects considered **minor** are those which are slight and are not considered significant. In regards to the impacts to each of the neighbouring buildings, where approximately 90% or more of the windows or rooms within a property comply with the BRE Guidelines the impact to the property is considered to be **negligible**. Where approximately 80% or more of the windows/rooms comply with the guidelines within a building, the impact is considered to be **minor adverse**.

16.61. Impacts considered **moderate** or **substantial (adverse or beneficial)** in significance are those which are considerable and of more than local significance or in breach of recognised acceptability, legislation, policy or standards. These are considered significant. Where less than 80% of the rooms/windows comply with the BRE Guidelines, consideration is given to the proportion of rooms/windows which experience **moderate** and **substantial** effects. Where the majority of the rooms/windows experience **moderate adverse** effects, the overall effect to the property is considered to be **moderate adverse**.

16.62. In view of the above, the interpretation of the daylight and sunlight results should be considered in terms of the quantum of light lost and retained, not purely upon the percentage of change. The percentage value may well be misleading, particularly where the baseline values are small. In

these situations, a small change in the quantum of light could represent a high percentage change in the overall figure, implying that there would be a significant change in daylight and sunlight whereas in reality the difference would be negligible. In addition, the BRE criterion does not specifically relate to city centre locations (such as that which surrounds the Site), thus a degree of flexibility needs to be applied when assessing the significance of daylight and sunlight effects in urban locations.

Overshadowing

Sun-on-Ground

- 16.63. The 2011 BRE Handbook acknowledges that sunlight in the space between buildings has an important influence on the overall appearance and ambience of a development. The worst situation would be to have significant areas (of the defined amenity space) in which the sun does not shine.
- 16.64. The 2011 BRE Handbook acknowledges that sunlight in the space between buildings has an important influence on the overall appearance and ambience of a development. The worst situation would be to have significant areas (of the defined amenity space) in which the sun does not shine.
- 16.65. The 2011 BRE Guidelines suggest that for a garden or amenity area to appear adequately sunlit throughout the year, no more than half (50%) of the area should be prevented by buildings from receiving 2 hours of sunlight on the 21st March. The 2011 BRE Guidelines go on to suggest that if, as a result of a new development, an existing garden or amenity area does not meet the guidance, or the area which can receive some sun on the 21st March is less than 0.8 times its former value, then the loss of sunlight is likely to be noticeable.
- 16.66. Where an amenity area does not meet the criteria suggested within the BRE guidelines (2011), the effects are identified as **adverse** and of **minor**, **moderate** or **substantial** significance. Where there is compliance with the 2011 BRE guidelines the effect is considered to be **negligible**.
- 16.67. Where an area experiences an increase in the area which receives 2 hours of direct sunlight, (compared to the baseline conditions) this is considered to be **beneficial**.

Transient Overshadowing

- 16.68. The BRE Handbook gives no criteria for the significance of transitory overshadowing, other than to suggest that by establishing the different times of day and year when shadow would be cast over adjacent areas, an indication is given as to the significance of the effect of the proposed Development. The assessment of transient overshadowing effects is therefore based on professional judgement, taking into consideration the effect of the baseline Site and comparing it with the likely transient overshadowing effect of the proposed Development.
- 16.69. The results in Appendix 16.4 illustrate the shadow cast by the existing buildings adjacent to the site in grey, the shadows cast by the existing buildings in green, and the shadows cast by the proposed Development in blue. The transient overshadowing is defined as being of **negligible**, **minor adverse**, **moderate adverse** or **substantial adverse** using professional judgement.

Scenarios Assessed

- 16.70. The following scenarios have been assessed and are reported within this Chapter of the ES:
- Future Baseline;

- Proposed Development; and
- Consented vs Proposed Development.

16.71. The Cumulative Scenario has also been assessed and the results are presented in Chapter 17: Cumulative Effects.

Future Baseline

16.72. This scenario considers the existing Site prior to commencement of demolition and also considers the following schemes that are under construction: Chatham Place, 21 Caversham Road, Energis House, Thames Tower and Aldwych House.

16.73. This scenario is depicted on drawing numbers 5847/518-520 (Appendix 16.1).

Proposed Development

16.74. This scenario considers the proposed Development comprising the consented SH3 Scheme, minus Plot E, plus the Telecom House/Plot E scheme, assuming completion of the surrounding Future Baseline schemes.

16.75. The Maximum Parameter scheme for the entire development has been used in this scenario.

16.76. This scenario is depicted on drawings numbers 5847/515-517 (Appendix 16.1).

Consented vs Proposed Development

16.77. This scenario considers the consented SH3 Scheme against the proposed Development (i.e. a comparison of the effects of the consented SH3 Scheme versus the effects of the SH3 Scheme minus Plot E plus Telecom House/Plot E).

16.78. The Maximum Parameter scheme for the entire development has been used in this scenario.

16.79. This scenario is depicted on drawings numbers 5847/512-514 (Appendix 16.1).

Cumulative Scenario

16.80. This scenario considers the proposed Development plus cumulative schemes, which includes applications for planning permission in the surrounding area that have been submitted or proposed but are not yet under construction so as to have the potential of causing cumulative impacts to the daylight, sunlight and overshadowing amenity to existing neighbouring buildings.

16.81. The Reserved Matters Application scheme for Plot B has been used in the cumulative scenario only.

16.82. The list of cumulative schemes is as follows: Former Sorting Office Caversham Road/Vestern Road, Building B Station Hill 3 (Reserved Matters Application), Garrard House 30 Garrard Street (2 storey extension) and 29-35 Station Road (22 storey tower).

16.83. This scenario is depicted on drawings numbers 5847/521-523 (Appendix 16.1).

Future Baseline Conditions

Daylight and Sunlight

16.84. This section assesses the Future Baseline conditions which considers the existing site prior to commencement of demolition and will also consider the following schemes that are under

construction: Chatham Place, 21 Caversham Road, Energis House, Thames Tower and Aldwych House.

- 16.85. A three-dimensional model of the baseline scenario has been created and assessed in order to ascertain the Future Baseline levels of daylight and sunlight amenity within the surrounding residential receptors. The Future Baseline is depicted on drawings numbers 5847/518-520 (Appendix 16.1).
- 16.86. The BRE Guidelines suggest that residential properties have the highest requirement for daylight and sunlight. Therefore this chapter focuses on those residential buildings surrounding the Site which would have the potential to be affected by the Proposed Development. Residential occupation of adjoining properties was established using external observation and Valuation Office Agency (VOA) checks.
- 16.87. 25a-25b Friar Street has not been considered as a receptor in our analysis as is it a hotel and has a transitory population, therefore it is not considered to be sensitive.
- 16.88. There are a total of 24 properties, as listed below, which we understand to be residential in use. These properties have been assessed for daylight and sunlight.
- 32 Friar Street
 - 33 Friar Street
 - 34 Friar Street
 - 1-45 Projection West
 - 1-29 Projection East
 - 1-41 Icon House
 - 5 Vachel Road
 - The Gateway Public House, 31 Greyfriars Road
 - 53 Greyfriars Road
 - 144 Friar Street
 - 127 Friar Street
 - 125 Friar Street
 - Bridewell and Samuel House, 60-61 Friar Street
 - 9-11 Stanshawe Road
 - 13 Stanshawe Road
 - 15 Stanshawe Road
 - 17 Stanshawe Road
 - 19 Stanshawe Road
 - Summit House 49-51 Greyfriars Road
 - 30-31 Friar Street
 - 136-137 Friar Street
 - 7-11 Station Road
 - Garrard House, 30 Garrard Street
 - 29-35 Station Road
- 16.89. These properties have been modelled using site survey information and site photography. Where detailed drawings have not been available, floor heights and room layouts have been approximated externally from window locations and other survey information.
- 16.90. Only those properties which have windows facing the development have been included within this assessment. If a nearby property has no windows which face the site, these properties are thought to be not be affected by the proposed Development. These properties are: 3-5 Station Road, 23 Friar Street and 5-21 Tudor Road.

Amenity Areas

- 16.91. Due to the southerly rotation of the sun only amenity areas located to the north of the Site have been considered.
- 16.92. There are no surrounding amenity areas that are relevant for analysis, only internal amenity areas within the proposed Development.

Future Baseline

- 16.93. A total of 846 windows serving 447 rooms within the 24 surrounding residential properties have been assessed for daylight. 846 windows have been assessed in regards to sunlight.
- 16.94. Table 16.2 below sets out a summary of the results of the Future Baseline daylight and sunlight assessment. Full details of the Future Baseline daylight and sunlight assessment results are provided in Appendix 16.2.
- 16.95. The results of the baseline assessment indicate that out of the 846 windows assessed, 183 (22%) have an existing VSC of 27% or more.
- 16.96. In regards to NSL, 222 (50%) out of the 447 rooms assessed have a daylight distribution of at least 80% of the total room area.
- 16.97. The results of the sunlight assessment indicate 165 (20%) out of the 846 windows assessed, have a baseline annual APSH of at least 25% with at least 5% in the winter period.

Table 16.2: Future Baseline Daylight and Sunlight Results

Address	Total No. Windows that meet VSC criteria (>27%)		Total No. of Rooms that receive NSL in excess of 80%		Total no. of windows that meet APSH criteria	
	Pass	Total	Pass	Total	Pass	Total
30-31 Friar Street	5	40	10	10	16	40
32 Friar Street	0	7	0	5	0	7
33 Friar Street	0	7	0	5	0	7
34 Friar Street	0	5	0	4	0	5
1-45 Projection West	51	138	71	110	64	138
1-29 Projection East	24	94	26	66	1	94
1-41 Icon House	10	54	13	38	0	54
30 Garrard Street	19	194	19	32	26	194
29-35 Station Road	2	40	12	30	5	40
5 Vachel Road	0	5	0	5	0	5
9-11 Stanshawe Road	5	11	4	9	4	11
13 Stanshawe Road	2	6	3	3	0	6
15 Stanshawe Road	2	5	2	3	0	5
17 Stanshawe Road	2	5	2	3	0	5
19 Stanshawe Road	3	3	2	3	0	3
The Gateway Public House - 31 Greyfriars Road (PH)	1	8	3	5	1	8

Address	Total No. Windows that meet VSC criteria (>27%)		Total No. of Rooms that receive NSL in excess of 80%		Total no. of windows that meet APSH criteria	
	Pass	Total	Pass	Total	Pass	Total
49-51 Greyfriars Road	18	38	4	6	27	38
53 Greyfriars Road (Consented)	6	14	6	10	6	14
144 Friar Street	0	2	0	2	0	2
136-137 Friar Street	0	11	2	6	0	11
127 Friar Street	3	7	5	6	0	7
125 Friar Street	8	32	4	4	0	32
60-62 Friar Street	22	63	34	58	15	63
7-11 Station Road	0	57	0	24	0	57
Totals	183	846	222	447	165	846

- 16.98. The baseline conditions which capture the existing daylight and sunlight levels for the surrounding residential properties are considered low in relation to VSC (the test at the window face), NSL (the distribution of light around rooms) and APSH (sunlight). In dense urban environments such as this and where there are balconies above windows and overhangs from eaves, the daylight and sunlight values are reduced and, in a number of cases, the BRE criteria is not met. The Site and surroundings are a dense mass of tightly packed buildings which restricts visibility of the sky dome. This plays a significant part in influencing the poor light levels. Other contributory factors include the inherent architectural features of the surrounding buildings, such as balconies and overhangs.
- 16.99. Judging from the Future Baseline results, it is evident that even modest alterations in new massing will have an effect upon future daylight and sunlight levels within the surrounding properties.

Transient Overshadowing

- 16.100. The results of the baseline transient overshadowing assessment are shown on the drawings at Appendix 16.4.
- 16.101. On 21st March it can be seen that the baseline shadows cast mainly cover the roadways and pavements within the Site and beyond along Station Hill and Station Road, which continues for most of the day, with intermittent periods of direct sunlight.
- 16.102. On 21st June, Station Hill receives a greater quantum of direct sunlight due to the high angle of the sun for most of the day. Shadow is cast on Station Road by the existing buildings on the Site from midday to 5pm however this is only cast by a small proportion of the existing buildings and the majority of the area in front of the station receives direct sunlight.
- 16.103. On 31st December when the shadows become longer on the ground due to the lower angle of the sun, no neighbouring streets receive any noticeable direct sun due to the shadow cast by surrounding properties as well as the existing buildings on the Site throughout most of the day.

Potential Effects

Demolition and Construction - Wider Development

- 16.104. The level of effect in relation to daylight and sunlight to the surrounding properties would vary throughout the demolition and construction phase, depending on the level of obstruction caused.
- 16.105. Demolition of the existing buildings and structures on site would lead to an improvement in daylight and sunlight at the closest sensitive receptors.
- 16.106. Any temporary accommodation or equipment such as cranes would only have a minimal and temporary effect on the daylight and sunlight levels to the surrounding properties, and would not cause as great an effect as the proposed Development.
- 16.107. The potential effects of the demolition of the existing buildings and other structures on the Site would lead to a temporary improvement in the daylight, sunlight and overshadowing to nearby adjacent properties and amenity areas.
- 16.108. These effects would likely be short to medium term, local and of **minor beneficial** significance. Sensitive receptors at a greater distance from the Site would experience a **negligible** effect.
- 16.109. Construction of the proposed Development would have a gradually increasing effect on the levels of daylight, sunlight and overshadowing, as the massing of the proposed Development steadily increases.
- 16.110. No technical analysis of the potential effects on the surrounding properties and amenity areas during the demolition and construction phases has been undertaken due to the constantly changing nature of the demolition and construction works. The potential effects would increase in magnitude as the buildings are constructed, however the effect would be less than the effect of the proposed Development. The effect of the proposed Development therefore provides a worst case scenario.

Interim Condition: Temporary Flexible Event Space

- 16.111. This considers the demolished northern site (except Xafinity House and the NCP car park), plus the Future Baseline schemes plus the Temporary Events Space.
- 16.112. Given that the Temporary Flexible Event Space would not propose any new significant built development or standing structures, the likely potential effects upon daylight, sunlight and overshadowing to surrounding receptors would likely be **negligible**.

Proposed Development

- 16.113. This scenario considers the proposed Development comprising the consented SH3 scheme, minus Plot E, plus the Telecom House/Plot E scheme, assuming completion of the surrounding Future Baseline schemes.

Daylight to Surrounding Properties

- 16.114. The potential daylight impacts on surrounding residential properties arising from the proposed Development have been assessed against the Future Baseline conditions in regards to VSC and NSL conditions in accordance with the BRE guidelines. Full details of the results can be found in Appendix 16.2 and are summarised in Table 16.3 below.

16.115. A total of 846 windows serving 447 rooms have been assessed within the 24 surrounding residential properties in terms of daylight.

Table 16.3: Proposed Development – Summary of Daylight Results (VSC, NSL)

Address	VSC						NSL					
	Total No. of Windows	No. Windows that meet BRE criteria	Below BRE Guidelines			Total	Total No. of Rooms	No. Rooms that meet the 0.8 times former value criteria	Below BRE Guidelines			Total
			20-30% Reduction	30-40% Reduction	>40% Reduction				20-30% Reduction	30-40% Reduction	>40% Reduction	
30-31 Friar Street	40	28	8	3	1	12	10	6	1	0	3	4
32 Friar Street	7	5	1	1	0	2	5	3	2	0	0	2
33 Friar Street	7	2	3	1	1	5	5	0	1	0	4	5
34 Friar Street	5	5	0	0	0	0	4	0	0	1	3	4
1-45 Projection West	138	59	15	17	47	79	110	67	15	12	16	43
1-29 Projection East	94	24	31	15	24	70	66	38	13	6	9	28
1-41 Icon House	54	41	6	4	3	13	38	23	6	8	1	15
30 Garrard Street	194	19	16	12	147	175	32	18	1	1	12	14
29-35 Station Road	40	39	0	0	1	1	30	6	5	2	17	24
5 Vachel Road	5	5	0	0	0	0	5	3	2	0	0	2
9-11 Stanshawe Road	11	5	4	1	1	6	9	5	2	1	1	4
13 Stanshawe Road	6	6	0	0	0	0	3	3	0	0	0	0
15 Stanshawe Road	5	5	0	0	0	0	3	3	0	0	0	0

Address	VSC						NSL					
	Total No. of Windows	No. Windows that meet BRE criteria	Below BRE Guidelines				Total No. of Rooms	No. Rooms that meet the 0.8 times former value criteria	Below BRE Guidelines			
			20-30% Reduction	30-40% Reduction	>40% Reduction	Total			20-30% Reduction	30-40% Reduction	>40% Reduction	Total
17 Stanshawe Road	5	5	0	0	0	0	3	3	0	0	0	0
19 Stanshawe Road	3	3	0	0	0	0	3	3	0	0	0	0
The Gateway Public House - 31 Greyfriars Road (PH)	8	1	0	1	6	7	5	1	0	1	3	4
49-51 Greyfriars Road	38	0	0	2	36	38	6	0	0	1	5	6
53 Greyfriars Road (Consented)	14	7	1	0	6	7	10	5	1	1	3	5
144 Friar Street	2	2	0	0	0	0	2	2	0	0	0	0
136-137 Friar Street	11	11	0	0	0	0	6	6	0	0	0	0
127 Friar Street	7	7	0	0	0	0	6	5	1	0	0	1
125 Friar Street	32	32	0	0	0	0	4	4	0	0	0	0
60-62 Friar Street	63	12	10	17	24	51	58	24	4	8	22	34
7-11 Station Road	57	57	0	0	0	0	24	24	0	0	0	0
Totals	846	380	95	74	297	466	447	252	54	42	99	195

- 16.116. A total of 380 (45%) windows out of the 846 assessed will meet the BRE Guidelines for VSC. A total of 252 (56%) out of the 447 rooms assessed will meet the BRE Guidelines for NSL.
- 16.117. A total of eight (33%) out of the 24 properties assessed will therefore meet the BRE Guidelines and are considered **negligible**. All daylight results are presented in Table 16.3.
- 16.118. The remaining properties for which there are potential impacts are discussed below.

30-31 Friar Street

- 16.119. A total of 28 (70%) out of the 40 windows assessed will meet the BRE guidelines for VSC.
- 16.120. Eight windows will experience an alteration of 20-30%. All of these windows currently serve corridors and WC's which are not considered sensitive in terms of daylight. Two windows will retain a VSC over 15.5% in the proposed Development Scenario, which in a dense urban environment is a level of VSC that is capable of delivering a well lit room behind the fenestration. A further four windows have low existing levels of VSC of below 12% which is below the BRE Guidelines (recommended 27%), whereby any alteration could result in a disproportionate percentage change. In addition all of these four windows experience an absolute loss of VSC of less than 3% which is unlikely to be perceptible to the occupant.
- 16.121. Three windows will experience an alteration of 30-40%. All three windows will experience an absolute loss of VSC of less than 2.5% which is unlikely to be perceptible to the occupant. In addition all three windows have low existing levels of VSC below 7% which is below the BRE Guidelines (recommended 27%), whereby any alteration could result in a disproportionate percentage change.
- 16.122. One window will experience an alteration of over 40%. This window experiences an absolute loss of VSC of 2.5% which is unlikely to be perceptible to the occupant. In addition this window has a low existing level of VSC at 6% which is below the BRE Guidelines (recommended 27%), whereby any alteration could result in a disproportionate percentage change.
- 16.123. A total of six (60%) out of the ten rooms assessed within this property will meet the criteria for NSL.
- 16.124. One room will experience an alteration of 20-30%. This room experiences an alteration of 23.51% which is just above the BRE criteria of 20%. This room will retain a daylight distribution of 75.4% in the proposed Development Scenario, compared to the British Standard recommended 80%.
- 16.125. Three rooms will experience an alteration of over 40%. All three rooms are large in size at 183.9 sq.ft and therefore it would be unreasonable to expect light to reach the full depth of the room. In addition all of these rooms are currently WC's which are not considered sensitive in terms of daylight.
- 16.126. In consideration of the above, the overall effect to daylight enjoyment upon this property as a result of the proposed Development would be **moderate adverse**.

32 Friar Street

- 16.127. 32 Friar Street is a mixed use building, with commercial usage at ground and first floor, and residential above. The property is located on the north side of Friar St and has residential accommodation at second and third floor level, with a number of rooms served by windows at the rear of the property that face north towards the proposed Development. The rear of this property faces into an already dense urban environment with many of the rooms experiencing poor levels of existing daylight, whereby any alteration could result in a disproportionate percentage change.

- 16.128. A total of five (71%) out of the seven windows assessed will meet the BRE guidelines for VSC.
- 16.129. One window experiences an alteration of 20-30%. This window serves a bedroom and is therefore considered less sensitive in terms of daylight compared to living rooms. In addition this window only experiences a reduction of 22.2% which is just above the BRE criteria of 20%.
- 16.130. One window experiences an alteration of 30-40%. This window has a low existing level of VSC of 13% which is below the BRE Guidelines (recommended 27%), whereby any alteration could result in a disproportionate percentage change. In addition this window only experiences a small absolute loss of 4% VSC and therefore the transgression is attributable to the disproportionate percentage change.
- 16.131. A total of three (60%) out of the five rooms assessed within this property will meet the criteria for NSL.
- 16.132. Two rooms will experience an alteration of 20-30%. One of these rooms is poorly lit at 15.57% of the total room area in the baseline, whereby any alteration could result in a disproportionate percentage change. In addition this room only experiences a small absolute loss of 5.27 sq.ft which is proportionately small in comparison to the size of the room (142.25 sq.ft) and is therefore unlikely to be noticeable. The remaining room is a bedroom and is therefore considered less sensitive in terms of daylight compared to living rooms. In addition this remaining room only experiences a reduction of 22.43%, which is just above the BRE criteria of 20%.
- 16.133. In consideration of the above, the overall effect to daylight enjoyment upon this property as a result of the proposed Development would be **moderate adverse**.

33 Friar Street

- 16.134. 33 Friar Street is a mixed use building and adjoins 32 Friar Street, with commercial usage at ground and first floor, and residential spaces above. The rear, Site facing elevation of this property is orientated into an already dense urban environment.
- 16.135. A total of two (29%) out of the seven windows assessed will meet the BRE guidelines for VSC.
- 16.136. Three windows experience an alteration of 20-30%, however, all of these windows have low existing levels of VSC of less than 9% which is below the BRE Guidelines (recommended 27%), whereby any alteration could result in a disproportionate percentage change. All windows experience absolute losses of 1-2% VSC which is unlikely to be perceptible to the occupant. In addition, one window experiences a reduction of 22.2% which is only just above the BRE criteria of 20%.
- 16.137. One window experiences an alteration of 30-40%, this window has a low existing level of VSC of 4% which is below the BRE Guidelines (recommended 27%), whereby any alteration could result in a disproportionate percentage change. In addition, this window experiences an absolute loss of less than 1.5% VSC which is unlikely to be perceptible to the occupant.
- 16.138. The remaining window experiences an alteration of over 40%, however, this window has a low existing level of VSC of 5.5% which is below the BRE Guidelines (recommended 27%), whereby any alteration could result in a disproportionate percentage change. In addition it only experiences a small absolute loss of 4.5% VSC and therefore the transgression is attributable to the disproportionate percentage change.
- 16.139. Five rooms were assessed for NSL, all of which will not meet the BRE guidelines.
- 16.140. One room will experience an alteration of 20-30%, this room is poorly lit at 5.83% of the total room area in the baseline. In addition this room only experiences an absolute loss of 2.34 sq ft which is

proportionately small in comparison to the size of the room (196.88 sq.ft) and is therefore unlikely to be noticeable.

- 16.141. Four rooms will experience an alteration of over 40%. Using a strict interpretation of the BRE guidance these losses could be considered substantial adverse in nature, however, a closer inspection of the results finds that three of these rooms are poorly lit in the baseline with an NSL of less than 43% of the total room area, whereby any alteration could result in a disproportionate percentage change. These three rooms are also relatively large in size 180.61-262.28 sq ft and therefore it would be unreasonable to expect light to reach the full depth of the room. In addition, one of these rooms is a bedroom and is therefore considered less sensitive in terms of daylight compared to living rooms.
- 16.142. In consideration of the above and the existing and retained values of both VSC and NSL, the overall effect to daylight enjoyment upon this property as a result of the proposed Development would be **moderate adverse**.

34 Friar Street

- 16.143. 34 Friar Street is a mixed use building and adjoins 33 Friar Street, with commercial usage at ground and first floor level, with residential above. The rear of this property faces into an already dense urban environment, with many of the rooms experiencing poor levels of existing daylight, whereby any alteration could result in a disproportionate percentage change.
- 16.144. All of the five windows assessed will meet the BRE guidelines for VSC.
- 16.145. Four rooms were assessed for NSL all of which will not meet the BRE.
- 16.146. One room will experience an alteration of 30-40%, however, this room will retain a view of the sky dome of at least 52% of the room area in the proposed, which could be considered commensurate with an urban location.
- 16.147. Three rooms will experience an alteration of over 40%. Using a strict interpretation of the BRE guidance these losses could be considered substantial adverse in nature, however, a closer inspection of the results finds that, all three rooms have a low daylight distribution of below 38% in the baseline, whereby any alteration could result in a disproportionate percentage change. As all three rooms are large in size 182.63-259.97 sq ft, therefore it would be unreasonable to expect light to reach the full depth of the room. In addition, one of these rooms is a bedroom and is therefore considered less sensitive in terms of daylight compared to living rooms.
- 16.148. In consideration of the above and with the inherent flexibility of the BRE Guidelines in mind, the overall effect to daylight enjoyment upon this property as a result of the proposed Development would be **moderate adverse**.

1-45 Projection West

- 16.149. 1-45 Projection West is a primarily residential building, located on Merchants Place. The property is located on the south and east of the proposed Development, with all elevations facing into an already dense urban environment. 87 (63%) of the 138 windows relevant for analysis, are already below the recommended BRE guidelines for VSC in the baseline scenario.
- 16.150. A total of 59 (43%) out of the 138 windows assessed will meet the BRE guidelines for VSC. Many of the windows that are below the guidance have projecting balconies above and below. This severely restricts visibility of the sky dome meaning even modest increases in massing can result in a disproportionate percentage change. This is acknowledged by the BRE in paragraph 2.1.17.

- 16.151. 15 windows experience an alteration of 20-30%. Nine windows experience a reduction of 20.3%-22.4% which is just above the BRE criteria of 20%. In addition four of these windows retain over 16.5% VSC with the proposed Development in place, which in a dense urban environment is a level of VSC that is capable of delivering a well lit room behind the fenestration.
- 16.152. 17 windows experience an alteration of 30-40%. Ten windows will retain over 16.5% VSC in the proposed Development Scenario which may be considered commensurate with an urban environment. Two windows have low existing levels of VSC below 12.5% which is below the BRE Guidelines (recommended 27%), whereby any alteration could result in a disproportionate percentage change.
- 16.153. 47 windows experience an alteration of over 40%. 13 of these windows have low existing levels of VSC below 12.5% which is below the BRE Guidelines (recommended 27%), whereby any alteration could result in a disproportionate percentage change. In addition four of these windows experience an absolute loss of less than 2.5% VSC which is unlikely to be perceptible to the occupant. A further ten windows retain above 15% VSC in the proposed which may be considered commensurate with an urban environment.
- 16.154. A total of 67 (61%) out of the 110 rooms assessed within this property will meet the criteria for NSL. A number of these rooms have balconies located above and below the window apertures. This severely restricts visibility of the sky dome meaning even modest increases in massing can result in a disproportionate percentage change.
- 16.155. 15 rooms experience an alteration of 20-30%. 11 rooms will retain a daylight distribution above 53.7% in the proposed Development Scenario, which could be considered commensurate with an urban location. A further three rooms have a low daylight distribution of less than 42.46% in the Baseline Scenario whereby any alteration could result in a disproportionate percentage change. In addition two of these rooms only experience a reduction of 20.43% and 20.88% which is just above the BRE criteria of 20%. The final room is large in size at 189.47 sq.ft and therefore it would be unreasonable to expect light to reach the full depth of the room.
- 16.156. 12 rooms experience an alteration of 30-40%. Three of these rooms are large in size 185.23-252.33 sq.ft and therefore it would be unreasonable to expect light to reach the full depth of the room. Nine rooms retain a daylight distribution above 58% in the proposed Development Scenario.
- 16.157. 16 rooms experience an alteration over 40%. Four rooms are large in size 190.37-239.61 sq.ft and therefore it would be unreasonable to expect light to reach the full depth of the room. Three rooms will retain a daylight distribution above 51.33% in the proposed Development Scenario, which could be considered commensurate with an urban location. In addition, one room has a low daylight distribution below 30.57% in the baseline.
- 16.158. In consideration of the above, the overall effect to this building is assessed as **moderate adverse**, with a number of **substantial** reductions in daylight.

1-29 Projection East

- 16.159. 1-29 Projection West is a primarily residential building, located to the south/east of the proposed Development. The rooms within this building are poorly lit in the Baseline Scenario, with 70 (75%) of the 94 windows relevant for analysis, failing the BRE VSC criteria.
- 16.160. A total of 24 (26%) out of the 94 windows assessed will meet the BRE guidelines for VSC. A number of windows that are below guidance in the proposed scenario have projecting balconies

above and below which severely restricts visibility of the sky dome, meaning even modest increases in massing can result in a disproportionate percentage change.

- 16.161. 31 windows experience an alteration of 20-30%. 25 windows will retain a VSC of over 15% in the proposed Development Scenario, which in a dense urban environment is a level of VSC that is capable of delivering a well lit room behind the fenestration. Two windows experience absolute losses of 1-2.5% VSC which is unlikely to be perceptible to the occupant. In addition these two windows only experience a reduction of 21.7-22.2% which is just above the BRE criteria of 20%.
- 16.162. 15 windows experience an alteration of 30-40%. Seven windows will retain a VSC of over 15% in the proposed Development Scenario, which in a dense urban environment is a level of VSC that is capable of delivering a well lit room behind the fenestration. A further four windows have low existing levels of VSC below 13% which is below the BRE Guidelines (recommended 27%), whereby any alteration could result in a disproportionate percentage change.
- 16.163. 24 windows experience an alteration of over 40%. 12 of these windows have low existing levels of VSC below 13% which is below the BRE Guidelines (recommended 27%), whereby any alteration could result in a disproportionate percentage change. Of these, four windows will experience an absolute loss of less than 2.5% VSC which is unlikely to be perceptible to the occupant.
- 16.164. A total of 38 (58%) out of the 66 rooms assessed within this property will meet the criteria for NSL. Many of the rooms that are below the guidance in the proposed scenario have balconies located above and below the window apertures which severely restricts visibility of the sky dome, meaning even modest increases in massing can result in a disproportionate percentage change.
- 16.165. 13 rooms experience an alteration of 20-30%. Eight of these rooms will retain a daylight distribution of over 52% in the proposed Development Scenario, which could be considered commensurate with an urban location. Three of these rooms only experience a reduction of 20.35%-22.76% which is just above the BRE criteria of 20%. In addition, three rooms have a low daylight distribution of 17.84-35.92% in the baseline, whereby any alteration could result in a disproportionate percentage change.
- 16.166. Six rooms experience an alteration of 30-40%. Two of these rooms will retain a daylight distribution of over 55% in the proposed Development Scenario, which could be considered commensurate with an urban location. One further room is poorly lit in the baseline below 43.54% of the total room area and in addition this room is large in size at 200.79 sq.ft, therefore it would be unreasonable to expect light to reach the full depth of the room.
- 16.167. Nine rooms experience an alteration of over 40%. Three rooms are large in size 200.79 sq.ft, therefore it would be unreasonable to expect light to reach the full depth of the room. One room has a low daylight distribution of below 47.67% in the Baseline Scenario, whereby any alteration could result in a disproportionate percentage change.
- 16.168. In consideration of the above, the overall effect of the proposed Development upon this building is assessed as **moderate adverse**.

1-41 Icon House

- 16.169. 1-41 Icon House is a primarily residential building, located to the south/east of the proposed Development. The rooms within this building are poorly lit in the Baseline Scenario, with 44 (81%) of the 54 windows relevant for analysis, falling below the recommended BRE VSC guidelines.
- 16.170. A total of 41 (76%) out of the 54 windows assessed will meet the BRE guidelines for VSC. Many of the windows that are below guidance in the proposed Development Scenario have projecting

balconies above and which severely restricts visibility of the sky dome, meaning even modest increases in massing can result in a disproportionate percentage change.

- 16.171. Six windows experience an alteration of 20-30%. All six windows retain above 15% VSC in the proposed Development Scenario which may be considered commensurate with an urban environment. In addition two of these windows only experience a reduction of 21.2-22% which is just above the BRE criteria of 20%.
- 16.172. Four windows experience an alteration of 30-40%. Three windows will retain above 17% VSC in the proposed Development Scenario which could be considered commensurate with an urban environment. The remaining one window has a low existing level of VSC of 10.5% which is below the BRE Guidelines (recommended 27%), whereby any alteration could result in a disproportionate percentage change.
- 16.173. Three windows experience an alteration of over 40%. One of these windows has low existing levels of VSC of 14% which is below the BRE Guidelines (recommended 27%), whereby any alteration could result in a disproportionate percentage change.
- 16.174. A total of 23 (61%) out of the 38 rooms assessed within this property will meet the criteria for NSL. A number of rooms that are below the guidance in the proposed Development Scenario have balconies located above and below the window apertures. This severely restricts visibility of the sky dome meaning even modest increases in massing can result in a disproportionate percentage change.
- 16.175. Six rooms experience an alteration of 20-30%. Three rooms will retain a daylight distribution of above 74% in the proposed, compared to the British Standard recommended 80%. In addition two of these rooms are large in size 198.73-205.29 sq.ft, therefore it would be unreasonable to expect light to reach the full depth of the room.
- 16.176. Eight rooms experience an alteration of 30-40%. Five rooms will retain a daylight distribution of above 50% in the proposed Development Scenario, which could be considered commensurate with an urban location. One of these rooms is large in size 205.3 sq.ft, therefore it would be unreasonable to expect light to reach the full depth of the room. A further one room has a low daylight distribution of 17.44% in the baseline, whereby any alteration could result in a disproportionate percentage change.
- 16.177. One room experiences an alteration over 40%. The room has experienced a loss of 30.03 sq.ft, which in proportion with the total room size of 131.82 sq.ft could be considered a moderate loss.
- 16.178. In consideration all of the above, the overall effect of the proposed Development on this building is assessed as **moderate adverse**.

30 Garrard Street

- 16.179. The Proposed summary tables compiled for this assessment, do not consider the location of the site nor the inherent built environment. The BRE criteria is based upon a low density suburban environment rather than a dense urban location such as this. The BRE clearly states in its introduction that different target values may be necessary in such environments, and that the results should be interpreted flexibly and not on face value.
- 16.180. Mindful of this, our summary sheets, which are based upon a strict interpretation of the guidelines, find that a total of 19 (10%) out of the 194 windows assessed will meet the BRE guidelines for VSC.

- 16.181. 16 windows will experience an alteration of 20-30%. 11 of these windows experience an absolute loss of less than 1.5% VSC which is unlikely to be perceptible to the occupant. All of these 11 windows also have low existing levels of VSC of less than 5.5% which is below the BRE Guidelines (recommended 27%), whereby any alteration could result in a disproportionate percentage change.
- 16.182. 12 windows will experience an alteration of 30-40%. Nine of these windows experience an absolute loss of less than 2.5% VSC which is unlikely to be perceptible to the occupant. In addition, these nine windows have low existing levels of VSC of less than 7% which is below the BRE Guidelines (recommended 27%), whereby any alteration could result in a disproportionate percentage change.
- 16.183. 147 windows will experience an alteration of over 40%. 87 windows have low existing levels of VSC of less than 14% which is below the BRE Guidelines (recommended 27%), whereby any alteration could result in a disproportionate percentage change. 16 of these windows experience an absolute loss of less than 3% VSC which is unlikely to be perceptible to the occupant. A further six windows will retain a VSC above 15% which could be considered commensurate with an urban environment.
- 16.184. A total of 18 (56%) out of the 32 rooms assessed within this property will meet the criteria for NSL.
- 16.185. One room will experience an alteration of 20-30%. This room is large in size at 799.37 sq.ft and therefore it would be unreasonable to expect light to reach the full depth of the room. In addition this room will retain a daylight distribution of 76.93% in the proposed Development Scenario, compared to the British Standard recommended 80%.
- 16.186. One room will experience an alteration of 30-40%. This room is large in size at 1190.26 sq.ft and therefore it would be unreasonable to expect light to reach the full depth of the room. In addition this room will retain a daylight distribution of 61.39% in the proposed Development Scenario, which could be considered commensurate with an urban location.
- 16.187. 12 rooms will experience an alteration of over 40%. All of these rooms are large in size with two rooms 1190.26 sq.ft and the other 10 rooms 431.95-433.39 sq.ft and therefore it would be unreasonable to expect light to reach the full depth of the room. In addition one of these rooms will retain a daylight distribution of 57.82% in the proposed Development Scenario, which could be considered commensurate with an urban location. Two further rooms have a low daylight distribution of less than 43% in the baseline, whereby any alteration could result in a disproportionate percentage change.
- 16.188. The BRE guide acknowledges the flexibility that is required to assess the impact of proposals in dense urban locations. The results must thus be interpreted flexibility. Furthermore the guidelines recognise that existing architectural features such as balconies can heavily influence both the VSC and NSL target values. In consideration of the above, the summary table should not be taken at face value, and the existing built environment and conditions must be considered.
- 16.189. In consideration of the above, the overall effect to this building is assessed as **moderate adverse**, with a number of **substantial** reductions in daylight.

29-35 Station Road

- 16.190. A total of 39 (98%) out of the 40 windows assessed will meet the BRE guidelines for VSC.
- 16.191. One window will experience an alteration of over 40%. This window has a low existing level of VSC of 0.5% which is below the BRE Guidelines (recommended 27%), whereby any alteration

could result in a disproportionate percentage change. In addition, this window experiences an absolute loss of 0.5% VSC which is unlikely to be perceptible to the occupant.

- 16.192. A total of six (20%) out of the 30 rooms assessed within this property will meet the criteria for NSL.
- 16.193. Five rooms will experience an alteration of 20-30%. One room experiences a loss of 0.11 sq.ft which in comparison with the size of the room 102.69 sq.ft, could be considered a small loss and is therefore unlikely to be noticeable. Two rooms retain a daylight distribution of over 52% in the proposed Development Scenario, which could be considered commensurate with an urban location. The remaining two rooms are large in size at 291.15-297.02 sq.ft and therefore it would be unreasonable to expect light to reach the full depth of the room. In addition one of these rooms had a low daylight distribution of 42.67% in the baseline, whereby any alteration could result in a disproportionate percentage change.
- 16.194. Two rooms will experience an alteration of 30-40%. Both of these rooms have a low daylight distribution of less than 36.72% in the baseline, whereby any alteration could result in a disproportionate percentage change. In addition, both of these rooms are large in size at 280.31-297.02 sq.ft and therefore it would be unreasonable to expect light to reach the full depth of the room.
- 16.195. 17 rooms will experience an alteration of over 40%. Five of these rooms have a low daylight distribution of less than 42.10% in the baseline, whereby any alteration could result in a disproportionate percentage change. The remaining 12 rooms are large in size at 290.31-297.02 sq.ft and therefore it would be unreasonable to expect light to reach the full depth of the room.
- 16.196. In consideration of the above and the existing and retained values of both VSC and NSL, the overall effect to daylight enjoyment upon this property as a result of the proposed Development would be **moderate adverse**.

5 Vachel Road

- 16.197. 5 Vachel Road is a residential property located to the west of the proposed Development, just off Greyfriars Road.
- 16.198. All of the five windows assessed will meet the BRE guidelines for VSC.
- 16.199. A total of three (60%) out of the five rooms assessed within this property will meet the criteria for NSL.
- 16.200. Two rooms experience an alteration of 20-30% and fall below the BRE criteria for NSL with reductions of 26.62% and 29.39%, however, these rooms are served by windows that comply with the BRE criteria for VSC.
- 16.201. In consideration of the above and the existing and retained values of both VSC and NSL, the overall effect to daylight enjoyment upon this property as a result of the proposed Development would be **minor adverse**.

9-11 Stanshawe Road

- 16.202. 9-11 Stanshawe Road is a residential property located to the West of the Proposed Development.
- 16.203. A total of five (45%) out of the 11 windows assessed will meet the BRE guidelines for VSC.
- 16.204. Four windows will experience an alteration of 20-30%. All four windows retain a VSC above 18.5% VSC in the proposed Development Scenario which may be considered commensurate with an urban environment.

- 16.205. One window will experience an alteration of 30-40%. This window has a low existing VSC of 7.5% which is below the BRE Guidelines (recommended 27%), whereby any alteration could result in a disproportionate percentage change. In addition this window will only experiences an absolute loss of 2.5% VSC which is unlikely to be perceptible to the occupant.
- 16.206. One window will experience an alteration of over 40%. This window has a low existing VSC of 6.5% which is below the BRE Guidelines (recommended 27%), whereby any alteration could result in a disproportionate percentage change.
- 16.207. In consideration of the above and the existing and retained values of both VSC and NSL, the overall effect to daylight enjoyment upon this property as a result of the proposed development would be **minor adverse**.

[The Gateway Public House, 31 Greyfriars Road](#)

- 16.208. A total of one (13%) out of the eight windows assessed will meet the BRE guidelines for VSC.
- 16.209. One window experiences an alteration of 30-40%.
- 16.210. Six windows experience an alteration of over 40%. Three of these windows serve bedrooms and are therefore considered less sensitive in terms of daylight compared to living rooms.
- 16.211. A total of one (20%) out of the five rooms assessed within this property will meet the criteria for NSL.
- 16.212. One room experiences an alteration of 30-40%. This room retains a daylight distribution of 59.06% in the proposed, which could be considered commensurate with an urban location.
- 16.213. Three rooms experience an alteration over 40%. One of these rooms is a bedroom and is therefore considered less sensitive in terms of daylight compared to living rooms.
- 16.214. The likely effect of the proposed Development is therefore considered to be **moderate adverse**.

[49-51 Greyfriars Road](#)

- 16.215. The Proposed summary sheets compiled for this assessment do not consider the location of the site nor its inherent built environment, and are based upon a low density suburban environment. They find that 38 windows were assessed for VSC all of which will not meet the BRE guidelines. However these results cannot be taken at face value, and a more detailed examination is necessary to fully understand the reductions in daylight.
- 16.216. Two windows will experience an alteration of 30-40%.
- 16.217. 36 windows will experience an alteration of over 40%. Two rooms have an existing VSC of less than 15% which is below the BRE guidelines (recommended 27%), whereby any alteration could result in a disproportionate percentage change.
- 16.218. Six rooms were assessed for NSL all of which will not meet the BRE.
- 16.219. One room experiences an alteration of 30-40%. This room is large in size at 400.47 sq.ft and therefore it would be unreasonable to expect light to reach the full depth of the room.
- 16.220. Five rooms experience an alteration of over 40%. All of these rooms are large in size 223.26-1538.54 sq.ft and therefore it would be unreasonable to expect light to reach the full depth of the room. In addition one of these rooms retains a daylight distribution of 55% in the proposed Development Scenario, which could be considered commensurate with an urban location.

16.221. As previously stated, the BRE guide acknowledges the flexibility that is required to assess the impact of proposals in dense urban locations such as this. The results must thus be interpreted flexibility. Furthermore the guidelines recognise that existing architectural features such as balconies can heavily influence both the VSC and NSL target values. In consideration of the above, the summary table should not be taken at face value, and the existing built environment and conditions must be considered

16.222. The likely effect of the proposed Development is therefore considered to be **moderate adverse**.

53 Greyfriars Road

16.223. A total of seven (50%) out of the 14 windows assessed will meet the BRE guidelines for VSC.

16.224. One window experiences an alteration of 20-30%. This window retains 18.5% VSC in the proposed Development Scenario which may be considered commensurate with an urban environment and in addition only experiences a reduction of 21.3% which is just above the BRE criteria of 20%.

16.225. Six windows experience an alteration of over 40%. One of these windows retains a VSC of 15.5% which could be considered commensurate with an urban environment.

16.226. A total of five (50%) out of the ten rooms assessed within this property will meet the criteria for NSL.

16.227. One room experiences an alteration of 20-30%. This room retains a daylight distribution of 68.82% in the proposed which could be considered well-lit. In addition this room is large in size at 208.20 sq.ft and therefore it would be unreasonable to expect light to reach the full depth of the room.

16.228. One room experiences an alteration of 30-40%. This room retains a daylight distribution of 60.31% in the proposed which could be considered well-lit. In addition this room is large in size at 206.74 sq.ft and therefore it would be unreasonable to expect light to reach the full depth of the room.

16.229. Three rooms experience an alteration over 40%. All of these rooms are large in size 226.88-229.07 sq ft, therefore it would be unreasonable to expect light to reach the full depth of the room.

16.230. The likely effect of the proposed Development is therefore considered to be **moderate adverse**.

127 Friar Street

16.231. All of the seven windows assessed will meet the BRE guidelines for VSC.

16.232. A total of five (83%) out of the six rooms assessed within this property will meet the criteria for NSL.

16.233. One room experiences an alteration of 20-30%; this room will retain a daylight distribution of 59.50% in the proposed Development Scenario, which could be considered commensurate with an urban location.

16.234. Given the isolated nature of the room discussed above, the likely effect of the proposed Development is considered to be **minor adverse**.

60-62 Friar Street

16.235. A total of 12 (5%) out of the 63 windows assessed will meet the BRE guidelines for VSC.

- 16.236. Ten windows will experience an alteration of 20-30%. One window will only experience an absolute loss of 1.5% VSC which is unlikely to be perceptible to the occupant. In addition this window has an existing VSC of 5.5% which is below the BRE guidelines (recommended 27%), whereby any alteration could result in a disproportionate percentage change. One window experiences an alteration of 20.6% which is just above the BRE criteria of 20%.
- 16.237. 17 windows will experience an alteration of 30-40%. One window will only experience an absolute loss of 2.5% VSC which is unlikely to be perceptible to the occupant. In addition this window has an existing VSC of 8% which is below the BRE guidelines (recommended 27%), whereby any alteration could result in a disproportionate percentage change. A further three windows have an existing VSC of less than 12% which is below the BRE guidelines (recommended 27%), whereby any alteration could result in a disproportionate percentage change. A further eight windows will retain a VSC above 16.5% which could be considered commensurate with an urban environment.
- 16.238. 24 windows will experience an alteration of over 40%. Seven windows will retain a VSC above 15.5% which could be considered commensurate with an urban environment. A further seven windows have an existing VSC of less than 13.5% which is below the BRE guidelines (recommended 27%), whereby any alteration could result in a disproportionate percentage change.
- 16.239. A total of 24 (41%) out of the 58 rooms assessed within this property will meet the criteria for NSL.
- 16.240. Four rooms will experience an alteration of 20-30%. All four rooms retain a daylight distribution above 62% in the proposed which could be considered well-lit. In addition all four rooms are large in size at 152.15-163.46 sq.ft and therefore it would be unreasonable to expect light to reach the full depth of the room.
- 16.241. Eight rooms will experience an alteration of 30-40%. Four rooms will retain a daylight distribution above 62% in the proposed which could be considered well-lit. In addition all four rooms are large in size at 151.81-152.43 sq.ft and therefore it would be unreasonable to expect light to reach the full depth of the room. Two further rooms have a low daylight distribution of less than 41.08% in the baseline, whereby any alterations could result in a disproportionate percentage change.
- 16.242. 22 rooms will experience an alteration of over 40%. All 22 rooms are large in size at 151.81-202.44 sq.ft and therefore it would be unreasonable to expect light to reach the full depth of the room. Eight rooms have a low daylight distribution of less than 45% in the baseline, whereby any alterations could result in a disproportionate percentage change massing. Four further rooms will retain a daylight distribution above 50% in the proposed which could be considered well-lit.
- 16.243. Many of the windows and rooms assessed serve student accommodation which has a transient population and thus may be considered less sensitive from a daylight perspective.
- 16.244. In consideration of the above, the overall effect to this building is assessed as **moderate adverse**.

[Sunlight to Surrounding Properties](#)

- 16.245. The potential sunlight impacts of the proposed Development have been assessed against the Future Baseline Scenario. Full details of the results can be found in Appendix 16.2 and are summarised in Table 16.4 below.

Table 16.4: Proposed Development – Summary of the Sunlight Results

Address	Total No. Windows	Meet BRE Guidelines Annual & Winter	Window which do not meet the BRE criteria						Total Fail Winter or Annual Sunlight
			Below threshold for Winter APSH			Below threshold for Annual APSH			
			20-30% Reduction	30-40% Reduction	>40% Reduction	20-30% Reduction	30-40% Reduction	>40% Reduction	
30-31 Friar Street	40	40	0	0	0	0	0	0	0
32 Friar Street	7	7	0	0	0	0	0	0	0
33 Friar Street	7	7	0	0	0	0	0	0	0
34 Friar Street	5	5	0	0	0	0	0	0	0
1-45 Projection West	138	99	1	2	1	0	8	31	39
1-29 Projection East	94	49	0	1	1	2	0	43	45
1-41 Icon House	54	37	0	1	11	2	3	10	17
30 Garrard Street	194	149	0	2	22	5	1	39	45
29-35 Station Road	40	39	0	0	1	0	0	0	1
5 Vachel Road	5	5	0	0	0	0	0	0	0
9-11 Stanshawe Road	11	5	0	0	0	0	0	6	6
13 Stanshawe Road	6	0	0	0	0	0	0	6	6
15 Stanshawe Road	5	0	0	0	0	0	0	5	5
17 Stanshawe Road	5	0	0	0	0	0	0	5	5
19 Stanshawe Road	3	0	0	0	0	0	0	3	3
The Gateway Public House - 31 Greyfriars Road (PH)	8	3	1	0	4	0	3	2	5
49-51 Greyfriars Road	38	1	0	0	35	0	0	37	37

Address	Total No. Windows	Meet BRE Guidelines Annual & Winter	Window which do not meet the BRE criteria						Total Fail Winter or Annual Sunligh
			Below threshold for Winter APSH			Below threshold for Annual APSH			
			20-30% Reduction	30-40% Reduction	>40% Reduction	20-30% Reduction	30-40% Reduction	>40% Reduction	
53 Greyfriars Road (Consented)	14	7	0	0	7	0	0	7	7
144 Friar Street	2	2	0	0	0	0	0	0	0
136-137 Friar Street	11	11	0	0	0	0	0	0	0
127 Friar Street	7	7	0	0	0	0	0	0	0
125 Friar Street	32	32	0	0	0	0	0	0	0
60-62 Friar Street	63	54	0	1	1	5	3	0	9
7-11 Station Road	57	57	0	0	0	0	0	0	0
Totals	846	616	2	7	83	14	18	194	230

- 16.246. A total of 846 windows have been assessed in regards to sunlight, of which 616 (73%) windows will meet the BRE guidelines.
- 16.247. Where all of the windows within a property meet the BRE guidelines, the likely effect of the proposed Development is considered to be **negligible** to that property. Ten (42%) properties out of the 24 assessed will meet the BRE Guidelines and the effects to these properties are considered **negligible**. All sunlight results are presented in Table 16.4.
- 16.248. The remaining properties for which there are potential impacts are discussed below.

1-45 Projection West

- 16.249. 138 windows have been assessed in regards to sunlight of which 99 (72%) windows will meet the BRE guidelines in regards to both annual and winter sunlight. Many of the windows that fall below the annual BRE criteria have balconies located above and below, which substantially reduces the ability of the sun to reach the windows. Many of the windows that have been assessed do not fall within 90° of due South and therefore due to their orientation there is a restriction in the amount of sunlight received. Therefore, as discussed in the BRE the ability of these windows to receive high levels of APSH and be compliant with the criteria is lower.
- 16.250. Eight windows will experience an alteration of 30-40% in regards to annual sunlight, however seven of these windows do not experience an alteration in regards to winter sunlight beyond the BRE criteria. Four of these windows retain an annual APSH over 21% which is just below the BRE criteria of 25%.
- 16.251. 31 windows will experience an alteration beyond 40% in regards to annual sunlight, however 28 of these windows do not experience an alteration in regards to winter sunlight beyond the BRE criteria. 23 of these windows have low existing annual APSH of below 15%, which is below the 25% recommended in the BRE guidelines. The BRE guidelines acknowledge that in certain circumstances care needs to be taken in applying the guidelines (BRE paragraph 3.2.8). It is clear that these windows achieve very poor existing levels of APSH due to the existing dense built environment.
- 16.252. Considering the dense urban context of the site, the inherent architectural design of this building, the overall level of compliance with the BRE Guidelines and the retained levels of APSH, the effect of the proposed Development on this property in sunlight terms is assessed as **moderate adverse**.

1-29 Projection East

- 16.253. 94 windows have been assessed in regards to sunlight of which 49 (52%) windows will meet the BRE guidelines in regards to both annual and winter sunlight. Many of the windows that have been assessed do not fall within 90° of due south and therefore due to their orientation there is a restriction in the amount of sunlight received. Therefore, as discussed in the BRE the ability of these windows to receive high levels of APSH and be compliant with the criteria is lower.
- 16.254. Two windows will experience an alteration of 20-30% in regards to annual sunlight. One of these windows retains an annual APSH of 24% which is just below the BRE criteria of 25%. In addition this window only experiences an alteration of 20% in regards to annual sunlight which is in line with the BRE criteria of 20%.
- 16.255. 43 windows will experience an alteration beyond 40% in regards to annual sunlight, however none of these windows experience an alteration in regards to winter sunlight beyond the BRE criteria. All of these windows have low existing annual APSH below 12%, which is below the 25%

recommended in the BRE guidelines, whereby any alterations could result in a disproportionate percentage change.

- 16.256. Considering the dense urban context of the site and the poor existing levels of sunlight they achieve, the effect of the proposed Development on this property in sunlight terms is assessed as **moderate adverse**.

1-41 Icon House

- 16.257. 54 windows have been assessed in regards to sunlight of which 37 (69%) windows will meet the BRE guidelines in regards to both annual and winter sunlight. A number of windows that fall below the annual BRE criteria are restricted by the fact they have balconies located above and below which substantially reduces the ability of the sun to reach the windows. Many of the windows that have been assessed do not fall within 90° of due south and therefore due to their orientation there is a restriction in the amount of sunlight received. Therefore, as discussed in the BRE the ability of these windows to receive high levels of APSH and be compliant with the criteria is lower.
- 16.258. Two windows experience an alteration of 20-30% in regards to annual sunlight. One of these windows retains an annual APSH of 22% which is just below the BRE criteria of 25%. The other window experiences an alteration of 21.74% which is just above the BRE criteria of 20%.
- 16.259. Three windows experience an alteration of 30-40% in regards to annual sunlight. One window has a low existing annual APSH of 13%, which is below the 25% recommended in the BRE guidelines, whereby any alterations could result in a disproportionate percentage change. In addition this window does not experience an alteration in regards to winter sunlight beyond the BRE criteria.
- 16.260. Ten windows experience an alteration beyond 40% in regards to annual sunlight. All of these windows have low existing annual APSH of 9-17%, which is below the 25% recommended in the BRE guidelines, whereby any alterations could result in a disproportionate percentage change. In addition, four of these windows do not experience an alteration in regards to winter sunlight beyond the BRE criteria.
- 16.261. Considering the dense urban context of the site, the inherent architectural design of this building, the overall level of compliance with the BRE and the retained levels of APSH, the effect of the proposed Development on this property in sunlight terms is assessed as **moderate adverse**.

30 Garrard Street

- 16.262. 194 windows have been assessed in regards to sunlight of which 149 (77%) windows will meet the BRE guidelines in regards to both annual and winter sunlight.
- 16.263. Five windows experience an alteration of 20-30%. None of these windows experience an alteration in regards to winter sunlight beyond the BRE criteria. In addition two windows retain an annual APSH above 20% which is just below the BRE criteria of 25%.
- 16.264. One window experiences an alteration of 30-40%. This window does not experience an alteration in regards to winter sunlight beyond the BRE criteria.
- 16.265. 39 windows experience an alteration over 40% in regards to annual sunlight. Seven windows do not experience an alteration in regards to winter sunlight beyond the BRE criteria. Six windows retain an annual APSH above 20% which is just below the BRE criteria of 25%. Three further windows had low existing annual APSH of 7-15% which is below the 25% recommended in the BRE guidelines, whereby any alterations could result in a disproportionate percentage change.
- 16.266. The likely effect of the proposed Development is therefore considered to be **moderate adverse**.

29-35 Station Road

- 16.267. 40 windows have been assessed in regards to sunlight of which 39 (98%) windows will meet the BRE guidelines in regards to both annual and winter sunlight.
- 16.268. One window will experience an alteration over 40% in regards to winter sunlight, however this window will not experience an alteration in regards to annual sunlight beyond the BRE criteria.
- 16.269. The likely effect of the proposed Development is therefore considered to be **minor adverse**.

9-11 Stanshawe Road

- 16.270. 11 windows have been assessed in regards to sunlight of which five (45%) windows will meet the BRE guidelines in regards to both annual and winter sunlight. Many of the windows that have been assessed do not fall within 90° of due south and therefore due to their orientation there is a restriction in the amount of sunlight received. Therefore, as discussed in the BRE the ability of these windows to receive high levels of APSH and be compliant with the criteria is lower.
- 16.271. Six windows experience an alteration beyond 40% in regards to annual sunlight. None of these windows experience an alteration in regards to winter sunlight beyond the BRE criteria. In addition all six windows have low existing annual APSH of below 10%, which is below the 25% recommended in the BRE guidelines, whereby any alterations could result in a disproportionate percentage change.
- 16.272. The likely effect of the proposed Development is therefore considered to be **moderate adverse**.

13 Stanshawe Road

- 16.273. The windows that have been assessed face north; due to their orientation there is a restriction in the amount of sunlight received. Therefore, as discussed in the BRE the ability of these windows to receive high levels of APSH and be compliant with the criteria is lower. Therefore no further discussion is required as these windows are considered **negligible** in terms of sunlight analysis.

15 Stanshawe Road

- 16.274. The windows that have been assessed face north; due to their orientation there is a restriction in the amount of sunlight received. Therefore, as discussed in the BRE the ability of these windows to receive high levels of APSH and be compliant with the criteria is lower. Therefore no further discussion is required as these windows are considered **negligible** in terms of sunlight analysis.

17 Stanshawe Road

- 16.275. The windows that have been assessed face north; due to their orientation there is a restriction in the amount of sunlight received. Therefore, as discussed in the BRE the ability of these windows to receive high levels of APSH and be compliant with the criteria is lower. Therefore no further discussion is required as these windows are considered **negligible** in terms of sunlight analysis.

19 Stanshawe Road

- 16.276. The windows that have been assessed face north; due to their orientation there is a restriction in the amount of sunlight received. Therefore, as discussed in the BRE the ability of these windows to receive high levels of APSH and be compliant with the criteria is lower. Therefore no further discussion is required as these windows are considered **negligible** in terms of sunlight analysis.

The Gateway Public House, 31 Greyfriars Road

- 16.277. Eight windows have been assessed in regards to sunlight of which three (38%) windows will meet the BRE guidelines in regards to both annual and winter sunlight.
- 16.278. Three windows experience an alteration of 30-40% in regards to annual sunlight. One of these windows serves a bedroom and is therefore less sensitive in terms of sunlight compared to living rooms.
- 16.279. Two windows experience an alteration beyond 40% in regards to annual sunlight. One of these windows serves a bedroom and is therefore less sensitive in terms of sunlight compared to living rooms.
- 16.280. Many of the windows that have been assessed face North and West; due to their orientation there is a restriction in the amount of sunlight received. Therefore, as discussed in the BRE the ability of these windows to receive high levels of APSH and be compliant with the criteria is lower.
- 16.281. The likely effect of the proposed Development is therefore considered to be **moderate adverse**.

49-51 Greyfriars Road

- 16.282. 38 windows have been assessed in regards to sunlight of which one (3%) window will meet the BRE guidelines in regards to both annual and winter sunlight.
- 16.283. 37 windows will experience an alteration beyond 40% in regards to annual sunlight. Three windows have low existing annual APSH of below 14%, which is below the 25% recommended in the BRE guidelines, whereby any alterations could result in a disproportionate percentage change. Of these, two windows will not experience an alteration in regards to winter sunlight beyond the BRE criteria.
- 16.284. The likely effect of the proposed Development is therefore considered to be **moderate adverse**.

53 Greyfriars Road

- 16.285. 14 windows have been assessed in regards to sunlight of which seven (50%) windows will meet the BRE guidelines in regards to both annual and winter sunlight.
- 16.286. Seven windows experience an alteration beyond 40% in regards to annual and winter sunlight.
- 16.287. Many of these windows that have been assessed face North and West; due to their orientation there is a restriction in the amount of sunlight received. Therefore, as discussed in the BRE the ability of these windows to receive high levels of APSH and be compliant with the criteria is lower.
- 16.288. The likely effect of the proposed Development is therefore considered to be **moderate adverse**.

60-62 Friar Street

- 16.289. 63 windows have been assessed in regards to sunlight of which 54 (86%) windows will meet the BRE guidelines in regards to both annual and winter sunlight.
- 16.290. Five windows experience an alteration of 20-30% in regards to annual sunlight. Four windows do not experience an alteration in regards to winter sunlight beyond the BRE criteria. The remaining two windows retain an annual APSH above 22% which is just below the BRE criteria of 25%.
- 16.291. Three windows experience an alteration of 30-40% in regards to annual sunlight. None of these windows experience an alteration in regards to winter sunlight beyond the BRE criteria.

- 16.292. Many of the windows that have been assessed serve student accommodation which has a transient population and thus may be considered less sensitive from a sunlight perspective.
- 16.293. The likely effect of the proposed Development is therefore considered to be **moderate adverse**.

Sun-on-Ground – Proposed Amenity Areas Within and Surrounding the Site

- 16.294. The BRE Handbook suggests that for a garden or amenity area to appear adequately sunlit throughout the year, no more than half (50%) of the area should be prevented by buildings from receiving two hours of sunlight on the 21st March.
- 16.295. A Sun-Hours on Ground, has been undertaken on two amenity areas (Areas 1 and 2) in the Proposed and Cumulative scenarios.
- 16.296. This assessment illustrates that the proposed Area 1 will fall below the BRE's recommendations in the Proposed Development scenario. This is primarily due to the proximity and density of the proposed massing. Judging from the transient overshadowing assessment (See Appendix 16.5), the existing streets in this location experience similar levels of overshadowing in the existing scenario, so this level of overshadowing is not without precedent in this location.
- 16.297. Area 2 which is a proposed amenity space located to the north of the proposed site and south of the train station, on Station Hill. This space will achieve direct sunlight for 2 hours or more to over 62.8% of its area, meaning it will be in excess of the BRE guidelines.
- 16.298. Judging from the transient overshadowing assessment (See Appendix 16.4), the existing streets in this location experience similar levels of overshadowing in the baseline scenario, so this level of overshadowing is not without precedent in this location. It is also worth noting that the assessment is based upon the worst-case maximum parameters of the Development and that further detailed design at the reserved matters stage would allow an opportunity to enhance these results.

Transient Overshadowing

- 16.299. The transient overshadowing analysis, attached within Appendix 16.4, shows the paths of the shadows cast by the proposed Development in the context of the existing surrounding buildings.
- 16.300. The 21st March images show that the shadows from the proposed Development are cast in a north-westerly direction from 07:00am moving eastwards (in a clockwise direction) across the surrounding area through the day. There is some additional shadow to the western side of Station Hill where it adjoins Tudor Road throughout the day, however in contrast with the existing Station Hill condition which is already overshadowed for much of the day in the future Baseline Scenario, the additional overshadowing will not be substantial. While the length of the shadows cast may be longer, as the sun transits in a westerly direction through the course of the day, they move relatively quickly across the ground. The additional overshadowing is almost exclusively cast over commercial properties, with 1-45 Projection West, 1-29 Projection East and 1-41 Icon House seeing some additional overshadowing from 18:00 as the sun sets behind the horizon.
- 16.301. On June 21st there is additional shadow to Station Hill throughout the day; however, the shadows cast by the proposed Development are shorter on the ground. The shadow cast does not reach the residential properties at 1-45 Projection West, 1-29 Projection East and 1-41 Icon House until 18:00, before the sun set after 19:00, thus limiting the impact to just over 1 hour.
- 16.302. On December 21st the shadows cast by the proposal are much longer on the ground because of the low altitude of the sun, however no neighbouring residential properties will experience additional overshadowing.

- 16.303. Whilst this overshadowing assessment provides a snap shot of the effects compared with the Baseline Scenario, they do so against a baseline that may be unrealistic for this urban location because of the current low rise and underdeveloped Site. Therefore, it is inevitable that additional overshadowing will occur with regeneration schemes of this size.
- 16.304. Overall there will be a small increase in the amount of shadow cast by the proposed Development with regards to the surrounding residential properties and open spaces, limited to the later part of the day. The effect to overshadowing on the surrounding environment is likely to be **minor adverse** considering the existing overshadowing, and the fact the additional overshadowing will be limited to commercial buildings, Station Hill to the north and the railway beyond. Furthermore the additional overshadowing will not affect areas of amenity space in the surrounding area.

Daylight (VSC) within the Proposed Development

- 16.305. The assessments for the daylight and sunlight potential for the residential facades have been undertaken using the cumulative model in order to consider the maximum levels of obstruction and thus the worst case in terms of potential for daylight and sunlight. Due to the distance separation between the Site and cumulative schemes which involve alterations in the massing, there will likely be no difference in the daylight and sunlight potential between each of the scenarios.

Building E

- 16.306. The results show that 50% of all residential facades achieve levels of VSC in excess of 27%. In these areas conventional window design will usually give reasonable results in terms of internal daylight as suggested in the BRE guidance.
- 16.307. A total of 67% will achieve levels of VSC above 15%, of which 17% are in the range between 15% and 26%. As expressed in the BRE Guidance, special measures such as large windows and shallow rooms will be needed to provide adequate internal daylight levels.
- 16.308. A total of 93% of all residential facades of Building E will achieve levels of VSC in excess of and equal to 5%, of which 26% are in a range between 5% and 14%. According to the BRE, it will be difficult to provide adequate daylight to the rooms behind these areas, unless very large windows are used.
- 16.309. The remaining 8% will achieve a VSC level between 0% and 4%, where it is often impossible to achieve reasonable daylight, even if the whole wall is glazed.

Building F

- 16.310. The results show that 25% of all residential facades achieve levels of VSC in excess of 27%. In these areas conventional window design will usually give reasonable results in terms of internal daylight as suggested in the BRE guidance.
- 16.311. A total of 55% will achieve levels of VSC above 15%, of which 30% in the range between 15% and 26%. As expressed in the BRE Guidance, special measures such as large windows and shallow rooms will be needed to provide adequate internal daylight levels.
- 16.312. A total of 83% of all residential facades of Building F will achieve levels of VSC in excess of and equal to 5%, of which 28% are in a range between 5% and 14%. According to the BRE, it will be difficult to provide adequate daylight to the rooms behind these areas, unless very large windows are used.

- 16.313. The remaining 17% will achieve a VSC level between 0% and 4%, where it is often impossible to achieve reasonable daylight, even if the whole wall is glazed.

Sunlight (APSH) within the Proposed Development

- 16.314. The facades facing within 90 degrees of due south have been assessed for Annual Probable Sunlight Hours (APSH) as suggested by the BRE guidance.

Building E

- 16.315. The results of the assessment have shown that 89.5% of the facades fully comply with the BRE guidance for winter and annual APSH. Less than a quarter of the façade will fall short of the recommendation for annual and winter APSH, respectively 10.1% and 10.4%.

Building F

- 16.316. The results of the assessment have shown that 52.4% of the facades fully comply with the BRE guidance for winter and annual APSH. Less than a third of the façade will fall short of the recommendation for annual and winter APSH, respectively 46.3% and 43.6%.

Mitigation Measures

Demolition and Construction - Wider Development

- 16.317. Demolition and construction of the wider Development would not give rise to any significant adverse potential effects. Therefore, no mitigation is required.

Interim Condition: Temporary Flexible Event Space

- 16.318. The likely potential effects of the proposed Temporary Flexible Event Space upon daylight, sunlight and overshadowing would likely be negligible. As such, no mitigation would be required.

Proposed Development

Daylight and Sunlight

- 16.319. The proposed Development has been designed to respond to its urban context, whilst being mindful of the existing residential receptors. Consideration has therefore been given to the location of massing blocks to minimise adverse effects, particularly to the areas identified as being most sensitive to daylight and sunlight loss to the east of the Site. Consequently, the main areas of massing are concentrated on the north of the Site and away from neighbouring residential properties, and as such, the resultant overall retained daylight and sunlight values are generally consistent with an urban location of this type.
- 16.320. It should also be noted that during the future detailed design stage, the future proposals will be below the maximum parameter massing assessed, and thus the effects are likely to be reduced. Furthermore future detailed designs can benefit from the analysis undertaken as part of this assessment as a means to mitigating the reductions in daylight and sunlight.

Transient Overshadowing

- 16.321. In order to minimise the effects of the proposed Development, the design has taken into account the fact that the areas most sensitive to additional overshadowing lie to the south of the Site. Therefore, the taller areas of massing are concentrated on the north of the development Site.

- 16.322. Larger buildings will inevitably result in some adverse effects, particularly when they are being compared to a relatively low rise existing Site. The effects upon surrounding sensitive receptors are generally minimal, with most of the additional overshadowing limited to Station Hill, and commercial buildings to the north.

Sun Hours on Ground

- 16.323. The master plan provides two communal open spaces, one of which, located to the northeast of the development, has been designed to accommodate amenity areas in the form of green spaces and seating areas. This achieves levels of Sun Hours on Ground in excess of the BRE's recommendation. The smaller open space located in between Blocks B, C, D and G, appears to be designed as a transitory space with the main aim of serving as access point to the buildings mentioned above. The latter is located only a few metres away from the former, which we believe will provide sufficient sunlight amenity. As a result no mitigation measures are necessary.

Residual Effects

Demolition and Construction - Wider Development

- 16.324. No mitigation is required for the demolition and construction of the proposed Development in relation to daylight, sunlight and overshadowing. Accordingly, the likely residual effects would remain as the potential effects, that is, **negligible** to **temporary, short-term** and of **minor beneficial** significance.

Interim Condition: Temporary Flexible Event Space

- 16.325. Given that the likely potential effects of the operational Temporary Flexible Event Space would be negligible and that no mitigation would be required to ameliorate any significant adverse effects associated with the temporary flexible event space, the likely residual effect would remain **negligible**.

Proposed Development

- 16.326. The proposed Development is located in a dense urban area where some reduction in daylight and sunlight as a result of a Development of this scale is inevitable. The BRE Guidelines criteria were written with a suburban environment in mind and therefore, as stated by the Guidelines themselves, lower levels in urban situations may be more acceptable. In addition many of the existing residential building experience very poor existing levels of light making them particularly sensitive to alternations in massing within the surrounding buildings. Furthermore inherent architectural features such as recessed windows and overhanging balconies can heavily influence the retained levels of daylight and sunlight where proposed buildings are constructed in close proximity.

Daylight - Surrounding Properties

- 16.327. Overall, in the proposed Development scenario, 45% (380 of 846) residential windows around the Site meet the BRE criteria in terms of VSC. Of the remaining 55% (466) of the windows that breach the BRE Guideline criteria, there are many instances where it is not possible to assume room uses with any level of confidence. In these instances, some windows which currently fail to meet the BRE Guideline criteria could comply in relation to their actual room use. Furthermore, some rooms that fail to meet the BRE criteria are those with low existing levels of VSC or NSL for which some reduction beyond the Guidelines is inevitable. Many others are located below

overhanging balconies, which greatly restricts visibility of the sky dome meaning even modest increases in massing can result in a disproportionate percentage change.

- 16.328. The overall effect of the proposed Development on daylight to the surrounding residential properties is considered to be **long term, local** and of **minor to moderate adverse**.

Sunlight - Surrounding Properties

- 16.329. In relation to sunlight, in the proposed Development scenario 73% (616 out of 846) of the residential windows around the Site meet the BRE criteria. The majority of the 230 windows that fail to meet the BRE criteria have existing levels of sunlight below the recommended levels or are influenced by the presence of balconies, so some reduction beyond the guidelines is likely to be inevitable for any new massing on the Site beyond the existing profiles.
- 16.330. The overall effect of the proposed Development on sunlight to the surrounding residential properties is considered to be **long term, local** and of **moderate adverse**.

Transient Overshadowing

- 16.331. The transient overshadowing assessment for the proposed Development indicates that the effect to overshadowing on the surrounding environment is likely to be **minor adverse**. The majority of the overshadowing will be restricted to the north of the Site along Station Hill, and the train track to the north. Minor additional overshadowing beyond that experienced in the Baseline Scenario will occur towards the latter part of the day and will be limited to commercial buildings. The additional shadowing will not affect surrounding amenity spaces.

Sun-on-Ground

- 16.332. Of the two proposed amenity areas assessed (Area 1 and Area 2 – see Appendix 16.4), the proposed Area 1 is located in between Blocks B, C, D and G and appears to be designed as a transitory space with the main aim of serving as access point to the buildings mentioned above. This space will fall below the BRE guidelines. Area 2 will meet the BRE criteria in both the Proposed Development and Cumulative scenarios with over 50% of the amenity area achieving over 2 hours of direct sunlight. The effect of the Proposed Development and the Consented schemes is therefore negligible.

Summary and Conclusion

Comparison of Effects between this ES and Consented SH3 Scheme ES

- 16.333. The levels of daylight and sunlight in the proposed Development Scenario are largely in line with those in the Consented SH3 scheme, as discussed in the 2013 ES chapter. There is an insignificant difference between the scale and magnitude of the impacts for the Proposed Scheme compared with the Consented SH3 Scheme. Given that the degree of alteration is unlikely to be noticeable, the likely additional effect of extending Plot E to cover the Telecom House Site is considered to be negligible. In addition, the levels of shadow as a result of the proposed Development are similar to those from the Consented SH3 scheme and as there are only slight differences the effect is considered unlikely to be noticeable.

Daylight to Surrounding Properties

- 16.334. The following additional receptors have been assessed in this ES compared with the 2013 ES:
- The Gateway Public House, 31 Greyfriars Road

- 53 Greyfriars Road
- 127 Friar Street
- Bridewell and Samuel House, 60-61 Friar Street
- Summit House 49-51 Greyfriars Road
- 30-31 Friar Street
- 136-137 Friar Street
- 7-11 Station Road
- Garrard House, 30 Garrard Street
- 29-35 Station Road

- 16.335. Because of changes to the Future Baseline we have re-assessed the Consented SH3 Scheme and compared the retained levels against the Proposed Scheme to see if they are in line with each other.
- 16.336. The potential daylight impacts on surrounding residential properties arising from the proposed Development have been assessed against the Consented SH3 Scheme in regards to VSC and NSL conditions in accordance with the BRE Guidelines. Full details of the results can be found in Appendix 16.2.
- 16.337. Out of the 846 windows assessed, 788 (93%) have a VSC which is either the same or within 1% VSC of the Consented SH3 Scheme in absolute terms. Of the remaining 58 windows, 13 windows have a VSC which is within 1-2% VSC of the Consented SH3 Scheme in absolute terms, which could be considered unlikely to be noticeable to the occupant. The remaining windows all serve student accommodation which has a transient population and thus may be considered less sensitive compared to a dwelling house and the differences are likely a direct result of the proximity to the site and the expansion of the Proposed to include Telecom House.
- 16.338. For the majority of the windows the retained levels of VSC are in line with the Consented SH3 scheme; there are no additional significant impacts beyond those reported for the Consented SH3 Scheme. Given that the degree of alteration is unlikely to be noticeable, in terms of the BRE Guidelines for VSC to the occupant, the likely effect is considered to be negligible.
- 16.339. Out of the 447 rooms that have been assessed for NSL, 384 (86%) have the same NSL as the Consented SH3 scheme. Of the remaining rooms, the majority are student accommodation and therefore likely to be bedrooms which are considered less sensitive in regards to daylight.
- 16.340. The levels of daylight distribution are in line with those in the Consented SH3 Scheme. Given that the degree of alteration is unlikely to be noticeable, in terms of the criteria for NSL to the occupant, the likely effect is considered to be **negligible**.

Sunlight to Surrounding Properties

- 16.341. The potential sunlight impacts of the proposed Development have been assessed against the Consented SH3 Scheme. Full details of the results can be found in Appendix 16.2.
- 16.342. Out of the 846 windows assessed, 778 (92%) have the same annual APSH as the Consented SH3 Scheme. Of the remaining windows 21 will retain BRE compliant levels of annual APSH and a further seven will retain levels which may be considered commensurate with an urban environment.
- 16.343. Out of the 846 windows assessed, 826 (98%) have the same Winter APSH as the Consented SH3 Scheme. Of the remaining windows 14 will meet the BRE criteria for winter sunlight.
- 16.344. The levels of sunlight are in line with those in the Consented SH3 Scheme. Given that the degree of alteration is unlikely to be noticeable, the likely effect is considered to be **negligible**.

Sun Hours on Ground

- 16.345. A comparative sun on ground assessment has been undertaken for both areas 1 and 2 (Appendix 16.4) and the results indicate that the proportion of the amenity areas receiving two hours of direct sunlight on March 21st is the same as the Consented SH3 Scheme. Therefore the proposed development will not result in any additional impacts in regards to overshadowing on these two proposed areas.

Transient Overshadowing

- 16.346. In comparison to the Consented SH3 Scheme the levels of shadow as a result of the proposed Development are very similar. The only difference occurs first thing in the morning on March 21st where there is a slight increase in the levels of shadow compared to the Consented SH3 scheme as the massing has increased in regards to Plot E, however, this doesn't affect any areas of amenity space and is unlikely to be noticeable. There is an insignificant change in terms of the magnitude of impacts for the Proposed Scheme, as these are in line with those for the Consented SH3 Scheme.

Summary of Potential Effects, Mitigation and Residual Effects

- 16.347. A summary of potential effects, mitigation measures and residual effects in relation to daylight, sunlight and overshadowing are summarised within Table 16.5 below.

Table 16.5: Summary of Potential Effects, Mitigation and Residual Effects

Issue	Potential Effects	Mitigation	Residual Effect
Demolition and Construction - Wider Development			
Increase in daylight levels in neighbouring properties	Short term, local, negligible to minor beneficial	None required	Negligible to temporary, short-term effect of minor beneficial significance
Increase in sunlight levels in neighbouring properties	Short term, local, negligible to minor beneficial	None required	Negligible to temporary, short term effect of minor beneficial significance
Interim Condition - Flexible Event Space			
Increase in daylight levels in neighbouring properties	Negligible	None required	Negligible
Increase in sunlight levels in neighbouring properties	Negligible	None required	Negligible
Proposed Development			
Daylight availability to neighbouring properties	8 properties experience a negligible impact, 3 properties experience a minor adverse impact, 11 properties experience a moderate adverse impact and 2 properties experience a moderate adverse impact with a number of substantial reductions in daylight.	Mitigation inherent in design.	Long term, local, adverse effect of minor to moderate significance
Sunlight to existing neighbouring properties	14 properties experience a negligible impact, 1 property experiences a minor adverse impact and 9 properties experience a moderate adverse impact.	Mitigation inherent in design.	Long term, local adverse effect of moderate significance
Permanent overshadowing within proposed amenity spaces and existing amenity spaces surrounding the Site	Area 1 will fall below the BRE recommendations, however Area 2 will be in excess of the BRE guidelines.	Mitigation inherent in design.	Negligible - Considered acceptable
Transient overshadowing of surrounding area	Minor adverse	Mitigation inherent in design.	Long term, local, adverse effects of minor significance.

References

- ¹ Buildings Research Establishment (BRE) (2011); BRE Handbook 'Site Layout Planning for Daylight and Sunlight' a guide for good practice
- ² National Planning Policy Framework, 2012
- ³ Reading Borough Local Development Framework; Core Strategy, Altered 2015
- ⁴ Reading Borough Local Development Framework; Sites and Detailed Policies Document, Altered 2015
- ⁵ Reading Borough Local Development Framework; Reading Central Area Action Plan, 2009
- ⁶ Station Hill South Planning and Urban Design Brief, 2007
- ⁷ British Standards Institution (BSI) (2008); BS8206-2: 2008 Lighting for buildings; Code of Practice for Daylighting. BSI
- ⁸ Chartered Institution of Building Services Engineers (CIBSE) (1999); Applications Manual: Window Design of the Chartered Institute of Building Services Engineers

17. Cumulative Effects

Introduction

- 17.1. This Chapter assesses the likely significant cumulative effects of the Development in relation to effect interactions of the proposed Development in isolation, and the combined effects of the proposed Development with other consented or reasonably foreseeable schemes.
- 17.2. The Chapter has been prepared by Waterman Infrastructure and Environment Ltd (Waterman IE) with input from each of the technical specialists who have contributed to the Environmental Impact Assessment (EIA) and this Environmental Statement (ES).

Assessment Methodology

- 17.3. The EIA Regulations¹ require ‘cumulative’ effects to be considered within an ES. There is no prescribed guidance relating to the assessment of cumulative effects, however, reference has been made however to the ‘Guidelines for the Assessment of Indirect and Cumulative Effects as well as Impact Interactions’ published in 1999 by the European Commission (EC)². The EC Guidelines give advice on how to approach cumulative assessments during the EIA process and how to adapt the approach to different circumstances. They also suggest tools for identifying and assessing indirect and cumulative effects as well as impact interactions.
- 17.4. There are no agreed and accepted definitions, although the EC Guidelines mentioned above define cumulative effects as:
- ...“those that result from incremental changes to an environment caused by past, present or reasonably foreseeable actions together with the project”.
- 17.5. Impact interactions are defined as:
- “...the reactions between impacts whether between the impacts of just one project or between the impacts of other projects in the area”.
- 17.6. In view of the above, this Chapter considers two types of cumulative effects:
- **Type 1 Cumulative Effects:** Combined effects of a number of individual effects (for example noise, dust and visual intrusion) from the construction of the Development (in isolation) on a particular receptor; and
 - **Type 2 Cumulative Effects:** Combined effects of the proposed Development with other schemes, which individually might be insignificant, but when considered together could cause a significant cumulative effect.
- 17.7. The approach to the assessment of Type 1 and Type 2 cumulative effects is detailed below.

Type 1 Cumulative Effects

- 17.8. The combined effect of the Development on particular receptors have only been considered during the demolition and construction works, since it is considered that this is when there would be the greatest potential for likely significant effect interactions to arise. The interaction between effects associated with the completed and operational Development has been considered, as necessary, within the relevant technical chapters of this ES. For example, the combined effects of road traffic and operational heating and ventilation plant have been considered in the air quality assessment (refer to Chapter 10: Air Quality).

- 17.9. The type 1 cumulative effects identified in this Chapter are based on the likely residual effects reported in the preceding technical Chapters of this ES (Chapters 7 - 16 inclusive) and therefore take account of mitigation measures that would be in place, such as the Construction Environmental Management Plan (CEMP) discussed within Chapter 6: Development Programme Demolition and Construction.
- 17.10. In determining those receptors which have potential to be affected by more than one type of effect from the Development, consideration has been given to the type of receptor, proximity to the demolition and construction works and likely extent of exposure to effect interactions. On this basis, the receptors likely to be affected by more than one type of effect are primarily surrounding residents, and to a lesser extent employees and pedestrians, who are likely to be affected by noise and vibration, dust, visual effects and increased traffic movements.
- 17.11. The socio-economic effects of construction have not been included within this assessment of type 1 cumulative effects. This is because effects of additional employment and local spending during the construction works would be beneficial (refer to Chapter 7: Socio-Economics) and highly unlikely to interact with any other identified environmental effects associated with the demolition and construction of the Development.

Type 2 Cumulative Effects

- 17.12. A review of schemes which have planning permission was undertaken to determine those which would be likely give rise to significant type 2 cumulative effects. In determining the schemes to be considered as part of the cumulative assessment due regard was given to the following:
- The likelihood of the scheme being implemented;
 - The scheme's distance from the Site;
 - The scheme's proposed use; and
 - The scheme's proposed floor area, or uplift in floor area.
- 17.13. The schemes considered within the Type 2 Cumulative Assessment (collectively referred to as Cumulative Schemes) are set out in Table 17.1 below and are shown on Figure 17.1.

Table 17.1 Schemes considered within the Type 2 Cumulative Assessment

Site	Application Reference	Proposal	Decision / Date	Distance and direction from the Site (at its closest point)
Former Sorting Office Caversham Road/Vastern Road Reading RG1 1AA	11/00276/OUT	Outline planning application with all matters reserved with the exception of means of access, for the demolition of existing buildings; site preparation; and redevelopment of the application site for a mix of uses from amongst employment and business uses (use class B1) and residential accommodation (C3); Hotel (C1), retail floor space (A1), food and drink uses (A3, A4 and A5), leisure uses (D2), car parking, public and private open space, landscaping works, highways, access and associated works.	Approved 26/03/2012	150m north
Building B, Station Hill 3	Application to be submitted shortly	Reserved Matters application for Building B of Station Hill 3	N/A	Within the Site

Site	Application Reference	Proposal	Decision / Date	Distance and direction from the Site (at its closest point)
29-35 Station Road, Reading, RG1 1LG	Application to be submitted shortly	Demolition of existing building and the erection of an approximately 22 storey building. As advised by Reading Borough Council, model information has been taken from previous application for a similar scheme (Application ref: 04/01395/FUL)	N/A	45m south-east
Garrard House 30 Garrard Street Reading RG1 1NR	150556	Extension to include part new fourth floor and new fifth and sixth floors to provide 23 residential units.	Pending Decision	Immediately adjacent to the east of the Site.

- 17.14. In the absence of detailed information regarding construction programmes, all assessments of effects of type 2 cumulative demolition and construction have assumed that there would be overlap in the implementation of the Development with the relevant cumulative schemes.

Type 1 Cumulative Effect Assessment

- 17.15. Relevant surrounding land uses and sensitive receptors are identified in Chapter 3: Land Use and Activities. The likely significant type 1 cumulative effects for various sensitive receptors during the demolition and construction works are listed in Table 17.2. This also distinguishes the anticipated interactions during the main phases of the demolition and construction works, such as enabling works, site preparation, and piling, etc.
- 17.16. To avoid repetition, sensitive receptors have been grouped together according to land use. It is anticipated that the proximity of the majority of receptors to the Site is such that effect interactions would be similar for most sensitive receptors according to land use type. The criteria for identifying those receptors which are considered to be the most potentially sensitive has included the land use / activity, proximity to the Site and likely extent of exposure to effect interactions.
- 17.17. A description of the construction works is provided in Chapter 6: Development Programme Demolition and Construction.

Table 17.2: Likely Type 1 Cumulative Effects during Demolition and Construction

Sensitive Receptor / Land Use	Works			
	Demolition	Substructure Construction	Superstructure Construction	Fit out and Landscaping
Existing and future surrounding residents present at the time of demolition and construction	D, N, V, Vis, T	D, N, V, (Vis), T	D, N, Vis, T	(N), (Vis), (T)
Future occupants (residents and employees) of the Site	D, N, V, Vis, T	D, N, V, (Vis), T	D, N, Vis, T	(N), (Vis), (T)
Surrounding commercial, retail, and leisure uses	D, N, V (Vis), T	D, N, V, (Vis), T	D, N, Vis, (T)	(N), (Vis), (T)
Pedestrians and cyclists	D, N, V, (Vis), T	D, N, V, (Vis), T	D, N, Vis, (T)	(N), (Vis), (T)
Other road users	(D), (N), (Vis), (T)	(D), (N), (Vis), T	(N), Vis, (T)	(N), (Vis), (T)
Local views and townscape	Vis	(Vis)	Vis	(Vis)
Ecology	(N), (D)	(N), (D)	(N), (D)	×

Key: D = Dust
N = Noise
V = Vibration
Vis = Visual
T = Traffic
× = no adverse effects likely
() = very minor effects anticipated

- 17.18. Table 17.2 indicates that whilst there is the potential for some type 1 cumulative effect interactions to take place during the demolition and construction works, these would generally be restricted to relatively short periods, and would primarily relate to temporary noise and vibration, dust, visual and transport effects to adjacent occupants, with less significant effects to pedestrians and road users in the surrounding area.

Type 2 Cumulative Effect Assessment.

Townscape and Visual Assessment

Demolition and Construction

- 17.19. In the worst case scenario that the cumulative schemes are constructed at the same time, it is considered that there would be some temporary **moderate adverse** effects in the surrounding area, as a result of the visual effects of construction activities such as presence of cranes, deliveries and loss of trees. This assessment is consistent with that of the SH3 Scheme presented in the 2013 ES.

Completed Development

- 17.20. The full assessment of the proposed Development alongside cumulative schemes is set out in Volume 3: Townscape, Conservation and Visual Assessment. In summary, the cumulative effects would be **negligible or beneficial and of minor to substantial** significance from all viewpoints assessment. This assessment is consistent with that of the SH3 Scheme presented in the 2013 ES.

Socio - Economics

Demolition and Construction

- 17.21. The implementation of the Development along with the three cumulative schemes (Building B has been excluded as it lies within the Site and has therefore already been assessed) would bring about additional construction-related employment. The scale of the construction employment generated cannot be readily quantified on the basis of the information available for each scheme as this information is commercially sensitive.
- 17.22. Despite the above, due to the nature of the construction industry, construction-related employment is relatively mobile and therefore it is not considered appropriate to assess construction employment at the local level. It is therefore expected that the Development and would have **negligible** effect on construction-related employment. This assessment is consistent with that of the SH3 Scheme presented in the 2013 ES.

Completed Development

- 17.23. The three cumulative schemes included in this assessment (Building B has been excluded as it lies within the Site and has therefore already been assessed) would bring forward a range of land uses including residential, commercial and leisure floorspace.
- 17.24. The Former Sorting Office proposal includes the delivery of 401 new homes, along with commercial uses including hotel, office space, retail and leisure uses with associated parking and open space. The Garrard Street extension will deliver 23 new residential units, and 29 – 35 Station Road would deliver 103 new residential units and some ground floor commercial floorspace.
- 17.25. The likely type 2 cumulative effect on employment has been assessed by either using the same methodology and employment densities used to assess the Development (refer to Chapter 7: Socio-Economics) or by reference to the assessments made in relation to the planning applications associated with the cumulative schemes (where available). On this basis, it has been estimated that the cumulative schemes would generate up to approximately 500 jobs. Considered alongside the Development, the likely type 2 cumulative effect on employment is assessed to be **long-term, district** and of **minor beneficial** significance. This is less than the beneficial effects reported in the 2013 ES as the majority of the cumulative schemes considered at that time now form part of the future baseline.
- 17.26. The cumulative schemes would deliver in the region of 527 residential units. Accordingly, the cumulative schemes and the Development would contribute towards housing delivery and meeting RBC's housing targets. The overall likely type 2 cumulative effect on housing is therefore considered to be **long-term, district** and of **moderate beneficial** significance. This is less than the beneficial effects reported in the 2013 ES as the majority of the cumulative schemes considered at that time now form part of the future baseline.
- 17.27. The cumulative provision of homes can be reasonably expected to bring more people to the area. This could increase demand for community facilities such as education and healthcare facilities. The extent of additional demand expected to be generated by the cumulative schemes for social infrastructure depends on the number of additional residents. Population assumptions have been made for this assessment of cumulative effects using the same methodology used to assess the Development (refer to Chapter 7: Socio-Economics). This estimates that the cumulative schemes would accommodate approximately 950 residents. The cumulative schemes would give rise to an additional 125 children requiring school places.

- 17.28. It is expected that the applicant of each of the cumulative schemes would have undertaken the required assessment on demand for social infrastructure and should any mitigation have been required, this would have been agreed with RBC for each application and delivered through Section 106 or Community Infrastructure Levy. It is therefore assumed the likely type 2 cumulative effect upon community facilities would be **negligible**. This assessment is consistent with that of the SH3 Scheme presented in the 2013 ES.

Archaeology

- 17.29. Although it is recognised that any direct effects of the development and each of the cumulative schemes on below ground archaeological assets would be site-specific, intrusive ground works associated with the Development and the cumulative schemes could lead to the fragmentation of below ground archaeological assets, thus not allowing for the preferred method of 'in-situ' archaeological preservation.
- 17.30. Despite the above, it is considered reasonable to assume that (as per the Development) all relevant cumulative schemes would accord with the principles of relevant national, regional and local planning policies so that significant archaeological assets would be preserved and / or recorded as appropriate. Accordingly, the Type 2 cumulative archaeological effect is considered to be permanent, **adverse** and of **moderate significance**, and reduced to **adverse** and of **minor significance** through the implementation of suitable mitigation measures.

Transportation and Access

Demolition and Construction

- 17.31. The proposed construction traffic route is likely to be from Caversham Road, via a small stretch of Friar Street, Greyfriars Road, and Tudor Road.
- 17.32. The main potential for type 2 cumulative effects is on a small stretch of Friar Street between Caversham Road and Greyfriars Road and Tudor Road should the Station Road application be constructed at the same time as the proposed Development.
- 17.33. For the remaining cumulative schemes the potential for likely significant type 2 cumulative traffic effects would be limited to Caversham Road should the construction of the Former Sorting Office site overlap with the proposed Development.
- 17.34. Given the level of existing traffic using Caversham Road the cumulative effect of the proposed Development construction traffic alongside the anticipated level of construction traffic generated by these other consented schemes, would be, at worse, **temporary, short-term, local** and of **minor adverse** significance.

Completed Development:

- 17.35. The TA has been undertaken using RBC's Development Control Forecast Model. This model includes the estimated traffic flow of all major consented developments. Accordingly, the estimated traffic generation of these consented schemes has been included within the assessed scenario. The assessment in relation to traffic within the TA and therefore Chapter 9: Transportation and Access has therefore considered the effect of the proposed Development together with the cumulative schemes.

Air Quality

Demolition and Construction

Dust

- 17.36. The main air quality effects during demolition and construction activities are in relation to dust. As set out in Chapter 10: Air Quality, in the absence of mitigation, dust from construction activities is not likely to arise at distances beyond approximately 200m from the works. The majority of any deposition tends to occur within 50 to 100m³. Accordingly, it is considered that the potential for dust to create a significant type 2 cumulative effect on a potentially sensitive receptor, after the implementation of mitigation measures, is only likely to be an issue for the closest cumulative schemes i.e. those within 50 to 100m of the Site and the receptor.
- 17.37. In view of the above, should any of the cumulative schemes be constructed concurrently with the Development there would likely be type 2 cumulative dust effects upon surrounding sensitive receptors.
- 17.38. The implementation of a CEMP at each construction Site, or best working practices, would mitigate the effects of dust such that the likely type 2 cumulative effect on surrounding residents and workers would be negligible to at worst, temporary, short-term and local effects of **moderate adverse** significance. This assessment is consistent with that of the SH3 Scheme presented in the 2013 ES.

Demolition and Construction Traffic

- 17.39. The combined construction and demolition traffic of all the neighbouring consented schemes could also give rise to type 2 cumulative local air quality effects. As shown in Figure 6.3 the proposed construction traffic route is likely to be from Caversham Road, via a small stretch of Friar Street, Greyfriars Road, and Tudor Road.
- 17.40. The potential for likely type 2 cumulative air quality effects would be limited to Caversham Road and Greyfriars Road. Given the level of existing traffic the likely type 2 cumulative effects are considered to be, at worst, temporary, short-term, local and of **minor adverse** significance. This assessment is consistent with that of the SH3 Scheme presented in the 2013 ES.

Completed Development

- 17.41. The road traffic data provided by the Development's transport consultants used in the air quality assessment (Chapter 10: Air Quality) included all projected background traffic growth to 2015 plus all traffic associated with the cumulative and future baseline schemes. This shows that at all existing receptors negligible effects are expected. Assuming that legislative requirements are met in terms of heating plant the cumulative effects from the completed cumulative schemes would therefore be as reported in Chapter 10: Air Quality.

Noise and Vibration

Demolition and Construction

- 17.42. In the event that the cumulative schemes located within 500m of the Site boundary were to be constructed concurrently with the proposed Development, type 2 cumulative noise and vibration effects could occur during the combined demolition and construction activities. The closest cumulative schemes to the Site boundary are Garrard House and 29-35 Station Road. Accordingly,

the likelihood of type 2 cumulative noise and vibration effects occurring during the demolition and construction works would be greatest for these cumulative schemes and the Development.

- 17.43. Should the implementation of one or more of the above cumulative schemes take place concurrently with the implementation of the Development, there would be the potential for some limited type 2 cumulative noise and vibration effects from the works, predominantly to occupants of surrounding properties. In particular, residential occupants of Projection East and West at Merchants Place and occupants of the Novotel and Ibis hotels on Friar Street would be likely to be affected during the concurrent construction of Garrard House and 29-35 Station Road.
- 17.44. The effects described above could be minimised through standard CEMPs, ensuring no more than **temporary, short-term, local** effects of **minor to moderate adverse** significance would be experienced.
- 17.45. In addition to construction noise generated on the Site, there would be the potential for cumulative effects to arise from an increased number of construction vehicles on the local road network. However, as set out above the main potential for cumulative effects would be limited to Greyfriars Road and Caversham Road. Given the existing high noise levels in the area and existing traffic levels, the potential increase in noise levels from construction vehicles from the cumulative schemes would be at worst **minor adverse** to receptors on Greyfriars Road, with **negligible** effects on the remaining roads.
- 17.46. The cumulative effects remain unchanged from the SH3 scheme ES.

Completed Development

- 17.47. The road traffic data provided by the Development's transport consultants used in the noise assessment would not have a significant cumulative effect on traffic flows alongside the Development. As such, the **negligible to long-term, local** and **minor beneficial** effects reported in Chapter 11: Noise and Vibration in relation to road traffic noise are applicable to the predicted cumulative effects.
- 17.48. With the proposed mitigation in place in relation to plant noise, the likely residual effects of the Development on surrounding receptors from noise and vibration would be **negligible**. Given that noise from building plant is controlled through planning policy, it is considered reasonable to assume that similar mitigation measures would be implemented for all cumulative schemes so that they would not in isolation, or together, give rise to unacceptable noise effects. Consequently, the likely type 2 cumulative effects of noise from the operation of building plant on surrounding receptors would be **negligible**.
- 17.49. The cumulative effects from the completed developments remains unchanged from the SH3 scheme.

Ground Conditions and Contamination

Demolition and Construction

- 17.50. All the cumulative schemes would be accompanied by some form of assessment of ground conditions in line with planning policy requirements. The potential for contamination on each site would be identified, and further action taken as necessary to ensure the sites are 'suitable for use' in accordance with Part IIA of the Environmental Protection Act 1990⁴. This would likely result in **negligible to long-term, local** type 2 cumulative effects of **minor beneficial** significance to ground conditions and groundwater quality, through a general overall improvement in ground conditions. This assessment is consistent with that of the SH3 Scheme presented in the 2013 ES.

Completed Development

- 17.51. All cumulative schemes are commercial or residential in nature, with no uses considered likely to give rise to contamination. Consequently, no cumulative effects would be associated with the completed cumulative schemes. This assessment is consistent with that of the SH3 Scheme presented in the 2013 ES.

Surface Water Drainage and Flood Risk

Demolition and Construction

- 17.52. Given all the cumulative schemes are on brownfield land, the demolition may lead to a potential decrease in hardstanding and associated increase in permeability and reduction in runoff. However, the likely type 2 cumulative effect should some or all of the cumulative schemes be constructed simultaneously with the Development, would be **negligible**. This assessment is consistent with that of the SH3 Scheme presented in the 2013 ES.

Completed Development

- 17.53. With regards to flood risk, it is reasonable to assume that the drainage strategy for each cumulative scheme has been (or would be) approved by the Environment Agency and RBC. By definition, this would mean that each scheme in isolation and therefore together, should not result in an increase in flood-risk at each site or elsewhere. Similarly, in line with planning policy, it has been assumed that each cumulative scheme would make adequate provision for surface water attenuation and run-off rates which are an improvement on the existing situation and acceptable to the Environment Agency or Lead Local Flood Authority. The overall type 2 cumulative effect on surface water runoff, the capacity of surface water sewers and resulting flood risk can therefore be assumed as **negligible**. This assessment is consistent with that of the SH3 Scheme presented in the 2013 ES.
- 17.54. The cumulative schemes would increase the demand for potable water, foul drainage and sewerage treatment as a result in the increased resident population and occupants of commercial uses. Upgrades to infrastructure would be subject to site-specific discussions with Thames Water to ensure adequate supply and capacity is available for each cumulative scheme. Assuming upgrades to service infrastructure are undertaken as necessary, it can be assumed that the likely type 2 cumulative effect would be **negligible**. This assessment is consistent with that of the SH3 Scheme presented in the 2013 ES.

Ecology

Demolition and Construction

- 17.55. In line with legislation and planning policy, relevant surveys and assessments would need to be undertaken for each cumulative scheme, with mitigation proposed should any harm to protected species be identified. Assuming that appropriate surveys are undertaken where necessary, including steps to avoid the displacement of nesting birds including the black redstart *Phoenicurus ochruros* during the demolition and construction works of all cumulative schemes, the type 2 cumulative effect to nesting birds is likely to be **negligible**. This is consistent with the assessment of effects set out within the 2013 ES.

Completed Development

Designated Sites

- 17.56. There are a number of non-statutory sites designated for nature conservation in the vicinity of Reading town centre. An increase in the local population has the potential to adversely affect such sites through increased recreational pressure. However, the number of new homes proposed is small compared to the existing population. Where access is permitted, recreational pressure is already likely to be high and the wildlife would already be tolerant to the presence of a human population. Accordingly, the type 2 cumulative effect of increased recreational pressure is likely to have a **negligible** effect upon the nature conservation value of these sites. This is consistent with the assessment of effects set out within the 2013 ES.

Disturbance of Protected Species

- 17.57. Assuming that all the consented schemes are required to replace or add to potential nest sites or foraging habitat for protected species including the black redstarts, there should be no net loss of nesting sites for this species once the cumulative schemes are completed. The bird species recorded on-site are adapted to the urban environment and the presence of a large human population. Given that all the cumulative schemes are located on brownfield land in a highly disturbed urban environment, the likely type 2 cumulative effect upon protected species disturbance would be **negligible**. This is consistent with the assessment of effects set out within the 2013 ES.

Habitats and Flora

- 17.58. Information on habitat creation and landscaping is not available for each of the cumulative schemes. However, in accordance with legislative requirements and planning policy, all the cumulative schemes would be required to mitigate adverse ecological effects and should be providing biodiversity enhancements. Accordingly, the likely type 2 cumulative type effect upon habitats and flora is considered to range from negligible to long-term and of minor beneficial effect at the district level. As described within Chapter 14: Ecology, the proposed Development in isolation provides for a net increase in the habitats and flora when compared to the baseline conditions and would therefore contribute to the type 2 cumulative **beneficial** effect. This is consistent with the assessment of effects set out within the 2013 ES.

Effect of Tall Buildings on Bird Sightlines and Flyways

- 17.59. All bird species within the area are likely to be highly adapted to the urban environment. In addition, they would be able to quickly adapt their behaviour to negotiate potential new structures within their existing sightlines and flyways. Furthermore, peregrines, which are known to utilise the area, favour

tall buildings. Consequently, the cumulative effects would be at worst **negligible**. This is consistent with the assessment of effects set out within the 2013 ES.

Wind

Demolition and Construction

- 17.60. The likely type 2 cumulative wind effects during demolition and construction have not been directly assessed by the wind tunnel tests. However, professional judgement has been used to consider these effects.
- 17.61. During demolition and construction, the presence of surrounding off-site cumulative schemes (namely 29-35 Station Road; the Former Sorting Office at Caversham Road and a two storey extension to Garrard House, Garrard Street) would potentially provide a small amount of additional shelter to the Site and nearby area; however, in the worst case it is expected that conditions would be the same as described in the demolition and construction with future baseline surrounds. Effects are therefore expected to be **negligible** at worst.
- 17.62. If the nearby cumulative schemes were demolished concurrently with the proposed Development, this potentially creates a more 'open' scenario where wind speeds at street level (particularly in vicinity of Thames Tower) could be higher than at present. Site hoarding around the cleared sites (2 – 3m in height) would be expected to provide sufficient localised shelter to pedestrians using the thoroughfares around the sites in this scenario.
- 17.63. Once construction of the Development begins and progresses, the local wind conditions on the Site would adjust to those reported in the latter sections of this Chapter. However, it is anticipated that the likely effect of the construction works on the wind microclimate of the Site and immediate surrounding area would be **negligible**. The demolition and construction assessment is consistent with that of the SH3 Scheme presented in the 2013 ES.

Completed Development

- 17.64. Following the same methodology as outlined within Chapter 15: Wind, a wind tunnel test was carried out for the maximum parameters of the Development (except for Plot B which was modelled in detail) and all cumulative schemes within an area where it might be expected that wind flow interactions of buildings may occur, which is 360m of the site in this instance. The cumulative schemes therefore included in the wind tunnel are as follows:
- A. 29-35 Station Road;
 - B. The Former Sorting Office, Caversham Road; and
 - C. A two storey extension to Garrard House, Garrard Street.
- 17.65. For the windiest and summer seasons, the ground level and rooftop terrace level results for the cumulative scenario are shown within Figures 17.2 and 17.3. There are 31 locations where there is a change in the local wind conditions during the windiest season when compared with the results from Configuration 3 (Proposed Development) as presented in Chapter 15. All of the locations that are affected at ground level show a one category change, according to the Comfort Criteria. However, the wind conditions in the Cumulative Scenario remain suitable for sitting, standing, leisure walking or business walking as per the Proposed Development Scenario. There are no increases in the number of receptors experiencing business walking conditions. Changes of up to three categories can be noted in the conditions at the roof level of Plot B, due to the change from the maximum parameters of Plot B to the detailed design (which provides significant shelter to its roof terraces).

- 17.66. During the summer season, there are 16 locations where there is a change in the local wind microclimate. The wind environment across the Development in the presence of the cumulative schemes is suitable for leisure walking, standing or sitting in the summertime.
- 17.67. The majority of thoroughfare locations remained acceptable or better than required for their intended use, classified as **negligible to moderate beneficial** effect, except at receptor 69 which still observed business walking conditions ie a **minor adverse** effect. Wind conditions at this location are, however, expected to become calmer with the detailed design of Plot A. However, as set out in Chapter 15, this will need to be confirmed through wind tunnel testing at the detailed design stage and additional mitigation provided if necessary.
- 17.68. During the summer season the seating area to the north of Thames Tower (Station Square) observed a mix of standing and sitting conditions, equating to a **negligible to minor adverse** effect. As set out in Chapter 15, mitigation will be required locally around seating areas to create an acceptable sitting wind condition.
- 17.69. Roof top terraces remained windier than desired, however with the implementation of appropriate screening and balustrades within the terrace, it is expected that wind conditions could be reduced to acceptable conditions (based on results from the tests conducted on the illustrative scheme for Plot B Reserved Matters). Mitigation measures should be developed through further wind tunnel testing at detailed design stage for each Plot.

Strong Winds

- 17.70. For the completed development with cumulative surrounding buildings, there were 28 occurrences of strong winds exceeding B6 or B7. Most of these locations are on thoroughfares at ground level where infrequent winds exceeding B6 are unlikely to cause a nuisance.
- 17.71. The exception at ground level is receptor 43 (located in the Station Square) which is an amenity space and observes strong winds exceeding Beaufort 6; however this location has been identified to require mitigation to achieve comfort conditions and such mitigation, including screens and planting, will reduce the occurrences of strong winds. This shall be addressed at reserved matters.
- 17.72. Receptors on the rooftop terrace areas of Plots A, C, D, E, F and G observe winds exceeding B6 or B7 on occasion. As noted previously, these represent worst-case conditions without the beneficial shelter provided by balustrades or other screening (which was not part of the maximum parameter scheme in these tests). With the implementation of appropriate screening and balustrades on the terraces, it is expected that wind conditions could be reduced to acceptable conditions (based on results from the tests conducted on the illustrative scheme for Plot B Reserved Matters). Mitigation measures should be developed through further wind tunnel testing at detailed design stage for each Plot.

Daylight, Sunlight and Overshadowing

- 17.73. This scenario considers the combined impacts of the proposed Development and cumulative schemes being built at the same time and compares this against the Future Baseline scenario. The cumulative schemes include applications for planning permission in the surrounding area that have been submitted or are proposed to be submitted but are not yet under construction so as to have the potential of causing cumulative impacts to the daylight, sunlight and overshadowing amenity to existing neighbouring buildings.
- 17.74. The cumulative scenario is depicted in drawings 5847/521-523 within Appendix 16.1. The analysis has included both an assessment of the cumulative effects on existing receptors and on future

receptors within the following residential consented scheme within the proximity of the Proposed Development: Garrard House, 30 Garrard Street.

- 17.75. The total numbers of windows and rooms assessed within the Cumulative Scenario differs from the Baseline. This is due to some of the existing surrounding receptors forming part of the cumulative schemes. In regards to 29-35 Station Road, an assessment has been undertaken to establish the effect of the proposed development on the potential for daylight within the residential units in this property.

Demolition and Construction

- 17.76. The demolition of the cumulative schemes would lead to some temporary improvements in daylight availability at surrounding properties, and reduced overshadowing. However, given the short-term, temporary nature of the effect which would rapidly change as construction of the relevant cumulative schemes progresses, the likely type 2 cumulative effect is considered to be **negligible**.

Completed Development

Daylight and Sunlight

- 17.77. Full details of the results can be found in Appendix 16.2 and are summarised in Table 17.3 below.
- 17.78. A total of 865 windows serving 452 rooms have been assessed within the 23 surrounding residential properties in terms of daylight.
- 17.79. In comparison to the assessment of the proposed Development in the absence of the relevant cumulative schemes, the cumulative VSC, NSL and APSH results indicate that there would be either no, or only marginal, changes in the daylight and sunlight received by the majority of surrounding residential properties, which are not considered to be perceptible to the occupant. The results of these marginal changes can be seen in Tables 17.3 and 17.4. The detailed results can be found in Appendix 16.2
- 17.80. The results in Tables 17.3 and 17.4 demonstrate that the majority of properties assessed would see no change in VSC, NSL or APSH when compared to the results for the assessment of the proposed Development in isolation as a result of the implementation of relevant cumulative schemes. Furthermore, where there are alterations, they are for the most part minor in nature when compared against results for the Development in isolation, with only a number of small alterations to a very limited number of windows/rooms and the significance of the cumulative effects therefore remain as set out in Chapter 16: Daylight, Sunlight and Overshadowing.
- 17.81. For those properties highlighted in green in Table 17.3 and Table 17.4, the levels of BRE compliance for daylight and sunlight are unchanged from those of the proposed Development in isolation, therefore these properties do not experience any cumulative daylight impacts.
- 17.82. The where there are changes to the BRE compliance for daylight and sunlight are discussed in the following paragraphs.

Table 17.3: Summary of Cumulative Daylight Results Compared Against Proposed Development

Address	Proposed Development Scenario				Cumulative Development Scenario			
	Total No. of Windows	No. Windows that meet VSC	Total No. of Rooms	No. Rooms that meet the NSL	Total No. of Windows	No. Windows that meet VSC	Total No. of Rooms	No. Rooms that meet the NSL
30-31 Friar Street	40	28	10	6	40	28	10	6
32 Friar Street	7	5	5	3	7	5	5	3
33 Friar Street	7	2	5	0	7	2	5	0
34 Friar Street	5	5	4	0	5	5	4	0
1-45 Projection West	138	59	110	67	138	59	110	67
1-29 Projection East	94	24	66	38	94	20	66	31
1-41 Icon House	54	41	38	23	54	3	38	6
30 Garrard Street	194	19	32	18	252	16	66	21
29-35 Station Road	40	39	30	6				
5 Vachel Road	5	5	5	3	5	5	5	3
9-11 Stanshawe Road	11	5	9	5	11	5	9	5
13 Stanshawe Road	6	6	3	3	6	6	3	3
15 Stanshawe Road	5	5	3	3	5	5	3	3
17 Stanshawe Road	5	5	3	3	5	5	3	3
19 Stanshawe Road	3	3	3	3	3	3	3	3
The Gateway Public House - 31 Greyfriars Road (PH)	8	1	5	1	8	1	5	1
49-51 Greyfriars Road	38	0	6	0	38	0	6	0
53 Greyfriars Road (Consented)	14	7	10	5	14	7	10	5
144 Friar Street	2	2	2	2	2	2	2	2

Address	Proposed Development Scenario				Cumulative Development Scenario			
	Total No. of Windows	No. Windows that meet VSC	Total No. of Rooms	No. Rooms that meet the NSL	Total No. of Windows	No. Windows that meet VSC	Total No. of Rooms	No. Rooms that meet the NSL
136-137 Friar Street	11	11	6	6	11	11	6	6
127 Friar Street	7	7	6	5	7	7	6	5
125 Friar Street	32	32	4	4	32	31	4	4
60-62 Friar Street	63	12	58	24	63	12	58	24
7-11 Station Road	57	57	24	24	57	57	24	22
Totals	846	380	447	252	865	296	452	224

1-29 Projection East

- 17.1. In the cumulative scenario 20 out of the 94 windows will meet the BRE guidelines in terms of VSC. This is slightly lower than that for the proposed Development Scenario in isolation. The level of BRE compliance will also be slightly lower in regards to NSL and this is likely a result of the additional massing on 30 Garrard Street and 29-35 Station Road in conjunction with the proposed development. Whilst the levels of compliance are reduced the effect is considered unchanged from that of the proposed scenario and remains **moderate adverse**.

1-41 Icon House

- 17.2. In the cumulative scenario 3 out of 54 windows will meet the BRE guidelines in terms of VSC. This is significantly different to the results of the proposed Development Scenario in isolation and we can therefore conclude that the impacts of the cumulative schemes are causing the compliance to drop. It is likely that the additional massing at 30 Garrard Street and 29-35 Station Road have contributed to the lower levels of both VSC and NSL compliance in the cumulative scenario. Due to the reduced compliant the effect is considered to be **moderate adverse**, with a number of **substantial** reductions in daylight. It should be noted that, the BRE criterion does not specifically relate to city centre locations (such as that which surrounds the Site), thus a degree of flexibility needs to be applied when assessing and considering the significance of daylight and sunlight effects in urban locations.

30 Garrard Street

- 17.3. Additional windows have been considered in 30 Garrard Street as the planning application for a two storey extension to this building has been assessed. Therefore it is unfair to compare these figures as the total number of windows and rooms differs. The results are discussed below.
- 17.4. A total of 16 (6%) out of the 252 windows assessed will meet the BRE guidelines in terms of VSC.
- 17.5. 17 windows experience an alteration of 20-30%. 12 of these windows will experience an absolute loss of less than 1.5% VSC which is unlikely to be perceptible to the occupant. In addition all of these 12 windows have low existing levels of VSC below 5.5% which is below the BRE Guidelines (recommended 27%), whereby any alteration could result in a disproportionate percentage change.
- 17.6. 13 windows experience an alteration of 30-40%. Seven of these windows will experience an absolute loss of less than 2% VSC which is unlikely to be perceptible to the occupant. In addition all of these seven windows have low existing levels of VSC below 6% which is below the BRE Guidelines (recommended 27%), whereby any alteration could result in a disproportionate percentage change.
- 17.7. 206 windows will experience an alteration of over 40%. 120 windows have low existing levels of VSC below 13% which is below the BRE Guidelines (recommended 27%), whereby any alteration could result in a disproportionate percentage change. 11 of these windows experience an absolute loss of less than 2% VSC which is unlikely to be perceptible to the occupant.
- 17.8. A total of 21 (32%) out of the 66 rooms assessed within this property will meet the criteria for NSL.
- 17.9. Four rooms will experience an alteration of 20-30%. One of these rooms is a bedroom and is therefore considered less sensitive in terms of daylight compared to living rooms. Two of the rooms will retain a daylight distribution above 76%, compared to the British Standard recommended 80%. The remaining room only experiences a 20.29% alteration which is just above the BRE criteria of 20%.
- 17.10. Seven rooms will experience an alteration of 30-40%. Three rooms will retain a daylight distribution above 58%, which could be considered commensurate with an urban location. The remaining rooms

are large in size at 210.05-250.15 sq.ft and therefore it would be unreasonable to expect light to reach the full depth of the room.

- 17.11. 34 rooms will experience an alteration of over 40%. 11 rooms have a low daylight distribution below 43% in the baseline, whereby any alterations could result in a disproportionate percentage change. 15 rooms are large in size at 250.15-1190.26 sq.ft and therefore it would be unreasonable to expect light to reach the full depth of the room.
- 17.12. It is likely that the 22 storey tower massing at 29-35 Station Road has heavily impacted the results for both VSC and Daylight in the Cumulative Scenario and the additional two storey extension to this property could also be having an impact.
- 17.13. In consideration of the above, the overall effect to this building is assessed as **moderate adverse**, with a number of substantial reductions in daylight.

125 Friar Street

- 17.14. In the cumulative scenario 31 out of the 32 windows will meet the BRE guidelines in terms of VSC. This is only one less than for the proposed development in isolation. All 4 rooms will meet the BRE guidelines in terms of NSL. In the proposed Development Scenario there were no effects to this property so it was considered negligible, as there is only one window affected in the Cumulative Scenario and the property as whole still has high levels of compliance the effect is therefore considered to be **minor adverse**.

7-11 Station Road

- 17.15. In the cumulative scenario all 57 windows will meet the BRE guidelines in terms of VSC. 22 rooms out of 24 assessed will meet the BRE guidelines in terms of NSL. In the proposed Development Scenario there were no effects to this property so it was considered negligible, as there are only two rooms affected in the Cumulative Scenario and the property as whole still has high levels of compliance the effect is therefore considered to be **minor adverse**.

Impact Assessment on 29-35 Station Road

- 17.16. As the 29-35 Station Road Cumulative Scheme is located in proximity to the site and includes residential accommodation an assessment has been undertaken through VSC facade studies to understand the effect that the proposal will have on the potential for daylight. The results can be found in Appendix 16.5 and are summarised below.
- 17.17. The results indicate that the daylight potential for the majority of the facades will be unaffected by the proposed development with the exception of the Western façade (View 2) at the lowest levels where there will be a marginal reduction in the proportion of the facade which receives 27% VSC. However as the reduction is located close to the corner, it is likely that these rooms will have mitigating windows to the North which will be unaffected by the proposed development.
- 17.18. Therefore it can be concluded that the effect of the proposed development will be negligible for the majority if this property with one instance of **minor adverse** on the Western facade.

Sunlight to Surrounding Properties

The potential sunlight impacts of the Cumulative Scenario have been assessed against the Future Baseline Scenario. Full details of the results can be found in Appendix 16.2 and are summarised in Table 17.4 below.

Table 17.4: Summary of Cumulative Sunlight Results Compared Against Proposed Development

Address	Proposed Development Scenario			Cumulative Development Scenario		
	Total No. of Windows	Meet BRE Guidelines Annual & Winter		Total No. of Windows	Meet BRE Guidelines Annual & Winter	
30-31 Friar Street	40	40		40	40	
32 Friar Street	7	7		7	7	
33 Friar Street	7	7		7	7	
34 Friar Street	5	5		5	5	
1-45 Projection West	138	99		138	99	
1-29 Projection East	94	49		94	47	
1-41 Icon House	54	37		54	32	
30 Garrard Street	194	149		252	183	
29-35 Station Road	40	39				
5 Vachel Road	5	5		5	5	
9-11 Stanshawe Road	11	5		11	5	
13 Stanshawe Road	6	0		6	0	
15 Stanshawe Road	5	0		5	0	
17 Stanshawe Road	5	0		5	0	
19 Stanshawe Road	3	0		3	0	
The Gateway Public House - 31 Greyfriars Road (PH)	8	3		8	3	
49-51 Greyfriars Road	38	1		38	1	
53 Greyfriars Road (Consented)	14	7		14	7	
144 Friar Street	2	2		2	2	
136-137 Friar Street	11	11		11	11	

Address	Proposed Development Scenario			Cumulative Development Scenario		
	Total No. of Windows	Meet BRE Guidelines Annual & Winter		Total No. of Windows	Meet BRE Guidelines Annual & Winter	
127 Friar Street	7	7		7	7	
125 Friar Street	32	32		32	32	
60-62 Friar Street	63	54		63	54	
7-11 Station Road	57	57		57	57	
Totals	846	616		865	605	

1-29 Projection East

- 17.19. In the cumulative scenario 47 out of the 94 windows will meet the BRE guidelines in terms of annual and winter sunlight. This is only two less than for the proposed Development Scenario in isolation and this is likely a result of the additional massing on 30 Garrard Street and 29-35 Station Road in conjunction with the proposed development. Whilst the levels of compliance are reduced the effect is considered unchanged from that of the proposed scenario and remains **moderate adverse**.

1-41 Icon House

- 17.20. In the cumulative scenario 32 out of the 54 windows will meet the BRE guidelines in terms of annual and winter sunlight. This is only five less than for the proposed Development Scenario in isolation and this is likely a result of the additional massing on 30 Garrard Street and 29-35 Station Road in conjunction with the proposed development. Whilst the levels of compliance are reduced the effect is considered unchanged from that of the proposed scenario and remains **moderate adverse**.

30 Garrard Street

- 17.21. Additional windows have been considered in 30 Garrard Street as the planning application for a 2 storey extension to this building has been assessed. Therefore it is unfair to compare these figures as the total number of windows and rooms differs. The results are discussed below.
- 17.22. 252 windows have been assessed in regards to sunlight of which 183 (73%) windows will meet the BRE guidelines in regards to both annual and winter sunlight.
- 17.23. Four windows experience an alteration of 20-30%. None of these windows experience an alteration in regards to winter sunlight beyond the BRE criteria. In addition one window retains an annual APSH of 20% which is just below the BRE criteria of 25%.
- 17.24. One window experiences an alteration of 30-40%. This window does not experience an alteration in regards to winter sunlight beyond the BRE criteria.
- 17.25. 64 windows experience an alteration over 40% in regards to annual sunlight. 13 of these windows do not experience an alteration in regards to winter sunlight beyond the BRE criteria. 11 windows have low existing annual APSH of 6-15% which is below the 25% recommended in the BRE guidelines, whereby any alterations could result in a disproportionate percentage change. Two further windows retain an annual APSH above 20% which is just below the BRE criteria of 25%.

The likely effect of the proposed Development is therefore considered to be **moderate adverse**.

Sun on Ground - Amenity Areas

- 17.26. Due to the distance separation of the cumulative schemes the results of the Sun Hours assessment are almost identical in the cumulative scenario to that of the proposed development in isolation. Area 2 will experience a marginal reduction to 62.4% of the area receiving 2 hours of direct sunlight. It can therefore be considered that there will be no cumulative effects in regards to this assessment.

Transient Overshadowing

- 17.27. A cumulative transient overshadowing assessment has been undertaken and can be found in Appendix 16.4. Whilst both 30 Garrard Street and 29-35 Station Hill involve an increase in massing, the levels of transient overshadowing on the surrounding area will be unchanged from the proposed development in isolation.

17.28. The effects in terms of overshadowing remain as reported for the proposed Development and there will be no likely cumulative impacts.

References

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- ¹ HMSO (2011) The Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 2011, 2011 No.1824.
 - ² European Commission. Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions. 1999.
 - ³ Arup Environmental/Ove Arup and Partners, The Environmental Effects of Dust from Surface Mineral Workings (HMSO, 1995)
 - ⁴ Department of Communities and Local Government (DCLG) (2009); 'Part IIA of the Environmental Protection Act (EPA) 1990.

18. Summary of Mitigation and Residual Effects

Introduction

- 18.1. The likely significant residual effects of the Development are described in the preceding technical Chapters of this ES, following the implementation of mitigation measures. For ease of reference, **Table 18.1** presents a summary of the likely significant effects, proposed mitigation measures and residual effects as reported by each technical Chapter (Chapters 7 to 16 and Volume 2: Townscape and Visual Assessment).
- 18.2. This EIA was undertaken in parallel with the design process. As a consequence, many measures to mitigate likely significant adverse environmental effects are incorporated into the scheme design in order to avoid, reduce or offset such effects. Further mitigation measures would be implemented during the detailed design of the Development. These are specified in Chapters 7 to 16 where appropriate.
- 18.3. With respect to the management of the demolition and construction process, it is intended that a Construction Environmental Management Plan (CEMP), as outlined in Chapter 6: Development Programme Demolition and Construction, would be prepared and implemented. This is an established method of controlling and minimising environmental effects arising from demolition and construction activities, and would serve to reduce likely significant adverse environmental effects such as noise and vibration, dust and the risk of surface and groundwater pollution. The CEMP would also control and manage hours of work, traffic routing and access, the protection of archaeological resources and nesting birds, and the generation and disposal of waste. In addition, the CEMP would include monitoring and reporting requirements. It is anticipated that the CEMP and other mitigation measures identified have already been secured by appropriate planning obligations or conditions with regard to SH3. Similar obligation and conditions are anticipated to be applied to the Telecom House/Plot E Application.
- 18.4. The effects of the proposed Development remain largely consistent with those of the consented SH3 Scheme. Where changes have occurred, these are due to either alterations in reporting or as a result of changes to guidance. One receptor would experience stronger wind conditions than identified in the 2013 ES although in the cumulative scenario, similar conditions were reported at this location. It is therefore considered that wind conditions at this location result from inclusion of the cumulative schemes (now in the future baseline). The wind conditions in this area are expected to reduce as a result of the detailed design but further testing would be undertaken at that time to confirm this and additional mitigation implemented where necessary.

Table 18.1: Summary of Potential Effects, Mitigation Measures and Residual Effects

Effect Types	Stage of Development	Issue	Potential Effect	Mitigation Measures	Residual Effect
Socio-Economics	Demolition and Construction	Loss of employment	Short Term Minor Adverse , Long Term Negligible : Approximately 42 jobs are estimated to be present on Site. These would be displaced by the proposed Development.	None Required	Short term Minor Adverse , Long Term Negligible
		Employment	Negligible : Approximately 370 permanent Full-Time Equivalent construction jobs at the local level would be created. However, the effects are considered to be negligible in comparison with the scale of the broader regional construction workforce.	None Required. Consider implementation of job brokerage schemes, apprenticeships and training schemes	Negligible
		Construction Workforce Spending	Minor Beneficial : Spending on food and drink.	None Required	Minor Beneficial
	Operational Temporary Flexible Events Space	Creation of temporary Employment and Community and Cultural use	Minor Beneficial : The implementation of temporary uses would provide temporary employment and community and cultural benefits for the town centre.	None Required	Minor Beneficial
	Completed Development	Employment	Substantial Beneficial : The Development would create a minimum of 4,900 FTE jobs and a maximum of 8,845 FTE jobs through the commercial end uses.	None Required	Substantial Beneficial
		Demand for Housing	Moderate Beneficial : The Development would deliver a minimum of 300 and a maximum of 475 residential units. These units would make a significant contribution towards Reading's annual housing targets, equating to between 6% and	None Required	Moderate Beneficial

Effect Types	Stage of Development	Issue	Potential Effect	Mitigation Measures	Residual Effect
			9% of the annual targets for the period 2016 to 2026.		
		Primary School Capacity	Minor Adverse: There are 5 primary schools within 1km of the Site with 235 surplus places. However, surplus capacity at reception level is low.	Financial contributions	Negligible
		Secondary School provision	Negligible: Across Reading Borough, there are 7 secondary schools, which have 559 surplus places amongst them. It is estimated that a maximum of 17 secondary school children would yield from the Development under the maximum scenarios and would not place significant pressure on secondary schools.	None Required	Negligible
		Healthcare	Minor Adverse: the Development would increase the resident base by 540-855 residents and there is limited surplus capacity locally for GPs.	Financial contributions	Negligible
		Additional Spending	Minor to Moderate Beneficial: The additional 300-475 residential units are estimated to generate spending of £4.2 - £6.7 million per year. The Development local spending by employees could range from £11.4-£20.6 million per year. Given the location of the Site, it would be expected that a significant proportion of this spending would be captured locally.	None Required	Minor to Moderate Beneficial
		Open Space	Minor Beneficial: The Development would provide amenity space across	None Required	Minor Beneficial

Effect Types	Stage of Development	Issue	Potential Effect	Mitigation Measures	Residual Effect
			Central Square, Station Square and additional public realm.		
		Crime and Safety	Minor Beneficial: The proposed mix of uses would animate the currently vacant Site and the introduction of residential units would create a 24 hour presence. CCTV and PAC entry phone systems for residential entrances would be employed throughout the Development.	None Required	Minor Beneficial
Archaeology	Demolition and Construction	Loss, disturbance and/or truncation of locally, regionally, nationally important archaeological deposits	Moderate Adverse to Substantial Adverse: In the absence of mitigation, the removal of existing substructures, excavation, piling and foundations could have moderate adverse effects, and in the event Viking remains are present in this part of the Site, substantial adverse effects.	Archaeological evaluation post-demolition; archaeological watching brief during embankment reduction and/or strip, map and sample works during/after site clearance, localised archaeological excavation, archaeological watching brief during construction on areas as appropriate. Preservation <i>in situ</i> is unlikely to be required unless nationally important features are identified. The precise methodologies would be agreed in consultation with the archaeological advisors to RBC. All measures could be implemented by way of suitable planning conditions or obligations.	Negligible to Minor Adverse
	Temporary Flexible Events Space	Loss, disturbance and/or truncation of locally, regionally, nationally important archaeological deposits	Moderate Adverse to Substantial Adverse: In the absence of mitigation, the removal of existing substructures, excavation, piling and foundations could have moderate adverse effects, and in the event Viking remains are present in this part of the Site, substantial adverse effects.	In line with the planning conditions for the consented Station Hill 3 scheme, archaeological evaluation post demolition of former Station Hill retail parade (including 26 to 58 Station Hill).	Negligible to Minor Adverse

Effect Types	Stage of Development	Issue	Potential Effect	Mitigation Measures	Residual Effect
	None: Effects would occur during the intrusive demolition and construction works.	No significant issues.	Negligible: On completion, the Development would not give rise to any further intrusive ground works or activities.	None Required	Negligible
Transport	Demolition and Construction	Local highway networks and traffic flows	Negligible: The average volume of HGVs movements associated with demolition and construction works is approximately 35 vehicles per day. This is considered insignificant in relation to the volume of existing HGV traffic.	None Required	Negligible
		Driver Delay	Minor Adverse: Any road closures and traffic diversions would not be unusual given the scale and nature of the works. Road closures and traffic diversions would be well planned and agreed with RBC and any other affected parties.	Disruptions to the local transport network would be managed and any changes required being would be agreed with RBC. Implementation of a construction traffic management plan and adherence to a construction method statement to be prepared with RBC. No further major mitigation measures have been identified as being necessary at this stage.	Minor Adverse
		Severance	Negligible: It is considered that the increase in traffic on severance is negligible during the demolition and construction phases.	None Required	Negligible
		Pedestrian Delay and Amenity	Moderate Adverse: Any demolition and construction works may result in the need to introduce temporary footpath closures or diversions.	Disruptions to the local transport network would be managed and any changes required being agreed with RBC. Implementation of a construction traffic management plan and adherence to a construction method statement to be prepared with RBC.	Minor Adverse

Effect Types	Stage of Development	Issue	Potential Effect	Mitigation Measures	Residual Effect
				No further major mitigation measures have been identified as being necessary at this stage.	
		Fear and Intimidation	Negligible: There will be a higher proportion of HGVs during the works. However, given the extended phasing programme, the level of impact on fear and intimidation is below the IEA guidelines threshold.	None Required	Negligible
		Accidents and Safety	Minor Adverse: The increase in HGV traffic could lead to increased conflict with pedestrians and cyclists within the vicinity of the Site.	Implementation of a construction traffic management plan and adherence to a construction method statement to be prepared with RBC. The defined HGV routes set out within the Construction Traffic Management Plan will ensure vehicles are driven slowly and cautiously, and that drivers will be familiar with the routes and any potential risks associated with them. The routes which HGVs will be travelling along will already have pedestrians and cyclist facilities, such as footways, cycle routes and crossings. This will mitigate the risk of conflict between vehicles and pedestrians and cyclists.	Negligible
	Temporary Flexible Events Space	Change in traffic flows	Minor Adverse: The potential effect of the Flexible Space relates to the potential conflict between people and vehicles accessing the site to set up or remove the uses being undertaken.	In line with the planning conditions for the consented Station Hill 3 scheme, a Service Management Plan would be developed to ensure conflicts are suitably managed.	Negligible
	Completed Development	Local highway network and traffic flows	Negligible: The changes in traffic levels associated with the completed Development would result in indiscernible changes in the environmental effects of traffic according to the IEMA. There are not any increases in traffic flows greater	A Site-Wide Framework Travel Plan (SWFTP) has been prepared.	Negligible

Effect Types	Stage of Development	Issue	Potential Effect	Mitigation Measures	Residual Effect
			than 10% on more sensitive residential roads.		
		Bus Access	Minor adverse: The analysis of trip modes has shown that buses would be one of the dominant means of travel to the Site. This could impact on the existing capacity of the bus network.	Bus operators are likely to respond to this increased demand through provision of additional services if needed, mitigating any impacts. Therefore no mitigation is proposed as part of the Development.	Negligible
		Rail Network	Negligible: The Reading Station upgrades would accommodate a doubling of passenger numbers from today's figures.	None Required	Negligible
		Driver Delay	Minor Beneficial: Comparing the driver delay between the baseline and completed Development scenarios the key links have all remained the same, excluding Greyfriars Road which has reduced from a 'high' driver delay to a 'medium' driver delay during the PM Peak hour.	None Required	Minor Beneficial
		Severance	Negligible: None of the links were predicted to result in an AADT (Annual Average Daily Traffic) change greater than 30%. According to the IEMA Guidelines, the changes to traffic flows across the network are all classified as having a low level of severance.	None Required	Negligible
		Pedestrian Delay and Amenity	Minor Beneficial: The Development proposals are based upon the principle of creating a new primary pedestrian street that connects Reading Station and Friar Street. The benefit of the new link to the town centre outweighs the slight delay associated with crossing	A wide raised crossing facility is proposed at Garrard Street. No further mitigation required.	Minor Beneficial

Effect Types	Stage of Development	Issue	Potential Effect	Mitigation Measures	Residual Effect
Air Quality			Garrard Street in the centre of the Site.		
		Fear and Intimidation	Negligible: Changes in traffic flows are not considered to result in any change to the degree of hazard and have a negligible effect on fear and intimidation.	None Required	Negligible
		Accidents and Safety	Negligible: The highway impact assessment shows that the Development will not result in any significant increases in traffic movements.	None Required	Negligible
	Demolition and Construction	Nuisance Dust	Moderate Adverse: In the absence of mitigation, given that residential properties would be located between 10 – 100m from an active construction Site, there would be the potential for moderate adverse effects.	Implementation of a CEMP.	Minor Adverse
		Emissions from construction vehicles	Negligible to Minor adverse: Given that the town centre is an AQMA, during the peak construction period there would be potential for a minor adverse effect from construction traffic on air quality. Outside the peak construction period, the effect would be negligible.	Detailed mitigation measures to control construction traffic will be discussed and agreed with RBC. The most effective mitigation would be achieved by ensuring that construction traffic does not pass along sensitive roads where possible.	Negligible to Minor Adverse
		Emissions from construction plant	Negligible: Any emissions from plant operating on the Site would be small in comparison to the emissions from the traffic movements on the roads adjacent to the Site.	None Required	Negligible
	Temporary Flexible Event Space	Emissions from traffic	Negligible: Given the effects of traffic are considered to be negligible, the resultant effect from	None Required	Negligible

Effect Types	Stage of Development	Issue	Potential Effect	Mitigation Measures	Residual Effect
Noise and Vibration	Completed Development		traffic emissions on air quality is also considered to be negligible.		
		Emissions from traffic associated with the completed Development and emissions from the operation of the heating plant	Negligible: The Development is predicted to result in a negligible effect at all receptors considered.	None Required	Negligible
		Introduction of residential uses to the Site	Negligible: annual and hourly mean NO ₂ concentrations are all below the objectives when assume no improvements (reduction) in NO _x and NO ₂ emission rates.	None Required	Negligible
	Demolition and Construction	Noise	Negligible to Major Adverse: Potential for temporary noise effects to occur during demolition and construction works at the closest noise sensitive receptors and at on-Site receptors should the residential building be occupied before completion of the construction phrase.	Implementation of Site Specific CEMP	Negligible to Moderate Adverse
		Traffic	Negligible: It is anticipated that noise and vibration arising from construction vehicles should not be any greater than can presently arise from existing local heavy duty vehicle movements.	Implementation of Site Specific CEMP and traffic management plan	Negligible
		Vibration	Negligible to Moderate Adverse: There is the potential for vibration generated during construction to potentially affect properties surrounding the Site, including 39 Friar Street Grade II listed building.	Contractors would be required to use best practicable means (BPM) throughout the duration of the Site works and are to register with the National Considerate Constructors Scheme.	Negligible

Effect Types	Stage of Development	Issue	Potential Effect	Mitigation Measures	Residual Effect
	Temporary Flexible Event Space			On-site monitoring of noise and/or vibration would also be undertaken if necessary, which would assist in controlling levels at specific sensitive receptors	
		Event Noise	Negligible: Predicted noise levels fall below the monitored background noise levels. As such, adverse comment or complaint by local residents is unlikely to arise.	In line with the planning conditions for the consented Station Hill 3 scheme it is anticipated that a condition will set noise limits to be set for live music events. External PA systems would utilise small directional speakers to minimise noise transmission. Use of stewards to control crowd noise.	Negligible
		Plant Noise	Negligible: Given the distance to the nearest noise sensitive receptor Garrard House, approximately 80m away) it is considered that effects from plant noise would be negligible.	None required. It is proposed that plant noise limits are set relative to the existing background noise levels in the area of the Site.	Negligible
	Completed Development	Traffic Noise	Negligible: The proposed uses of the Temporary Flexible Events are not considered likely to attract primary trips into Reading. On this basis traffic generated would be limited to low levels of servicing.	None Required	Negligible
		Assessment of Residential Amenity – Noise Levels	Moderate to Substantial Adverse: Sources of noise that may affect residential amenity areas include road traffic noise and noise from the railway line.	Selection of suitable glazing combined with appropriate ventilation strategy. Most exposed facades, high specification glazing in combination with through wall passive acoustic vent.	Negligible
		Assessment of Public Realm – Noise Levels	Negligible to Moderate Adverse: Noise levels in Central Square will be attenuated to negligible levels by the intervening buildings. Station Square will be subject to moderate adverse noise levels due to un-obscured	None Required	Negligible to Moderate Adverse

Effect Types	Stage of Development	Issue	Potential Effect	Mitigation Measures	Residual Effect
			views of Station Hill and Station Road.		
		Fixed Plant and Mechanical Services Noise	Negligible to Moderate Adverse: Plant located within basements would give rise to negligible effects given the enclosure of plant and sound reduction design measures. Where roof mounted plant is adopted there is the potential for at worst moderate adverse effects.	Planning condition to ensure that plant noise is below background.	Negligible
		Service and Delivery Noise	Negligible: it is the intention of the Applicant to liaise with RBC during the detailed design stage and reserved matters stage to ensure the effect of service vehicles and activities is negligible.	None Required beyond a servicing and delivery plan.	Negligible
		Noise Breakout out from Proposed Uses	Negligible: Adequate sound insulation afforded by the building façade would be inherent in the detailed design.	Planning condition and appropriate façade construction.	Negligible
		Car Park Noise	Negligible: the potential effects of cars arriving and departing from the Development are expected to be negligible.	Use of design measures to reduce reverberant noise levels and breakout.	Negligible
		Road Traffic Noise	Negligible to Minor Beneficial: Changes in road traffic noise are 1dB or less, with the exception of Station Hill. A noise level decrease of 3dB is predicted for Station Hill.	None Required	Negligible to Minor Beneficial
		Road Traffic Vibration	Negligible: Vibration effects due to changes in traffic flows would have a negligible effect upon existing conditions.	None Required	Negligible
Ground Conditions	Demolition and Construction	Disposal of Spoil and Demolition Material	Negligible: Assuming that legislative requirements are adhered to.	All waste to be removed off Site would be subject to waste classification and any	Negligible

Effect Types	Stage of Development	Issue	Potential Effect	Mitigation Measures	Residual Effect
				necessary treatment in accordance with legislation. Additional methods of pre-treatment of spoil and demolition material set out in the CEMP. Adoption of appropriate mitigation measures to remove asbestos prior to demolition work.	
		Risks and Effects to Site Workers and Public Safety	Negligible: Adherence to legislative requirements of COSHH Regulations (2003) and CDM Regulations (2007) and the use of hoarding around the secured Site would significantly reduce health and safety risks.	Undertaking a Site Investigation and remedial work where necessary. Compliance with legislative requirements and implementation of a CEMP which would stipulate the use to standard dust control and other construction site management measures.	Negligible
		Risk and Effects to Soils	Minor to Moderate Adverse: In the absence of soil quality protection measures.	Implementation of a CEMP to minimise the risks of contamination spillages to soils.	Minor Adverse
		Groundwater – Introduction of New Pathways	Minor Adverse: Potential for the creation of a temporary pathway in the regionally important Chalk aquifer.	A Foundation Works Risk Assessment (FWRA) will be conducted to consider appropriate piling methodologies. Implementation of best practice and a CEMP.	Negligible
		Groundwater – Accidental Spillages	Moderate Adverse: Risk to groundwater related to unforeseen accidental material or fuel spillages.	Implementation of a CEMP to minimise the risks of contamination spillages to groundwater.	Minor Adverse
		Surface Waters	Negligible: There are no surface waters on the Site and the nearest surface water resource is located 400m from the Site.	Implementation of a CEMP. Identify and suitably contain leachate containing spoil.	Negligible
		Risk and Effects to Flora and Fauna	Minor Adverse: Given that the Site supports protected species, accidental spillages could result in temporary and local risk of minor adverse significance.	Implementation of a CEMP to minimise risks of generating contaminated runoff.	Negligible

Effect Types	Stage of Development	Issue	Potential Effect	Mitigation Measures	Residual Effect
	Temporary Flexible Events Space	Risk and Effects to Future Site Users and Occupants	Negligible: The effect to Site users from any sources of contamination is negligible.	None Required	Negligible
		Contamination by the Completed Development	Negligible: The proposed uses of the Site are not considered to give rise to additional sources of contamination.	None Required	Negligible
	Completed Development	Risks and Effects to Future Site Occupiers and Users	Negligible: All soft landscaped areas would be capped from any residual contamination risk due to their location at roof and podium level, therefore future occupants and Site users would not come into contact with contaminated soil, ground gas and groundwater.	Remediation of the Site and implementation of gas protection measures as necessary, undertaken in consultation with the Environment Agency and RBC. Use of clean cover material in landscaped areas.	Negligible
		Risks and Effects to Groundwater	Negligible: The majority of the completed Development would be hard-surfaced, limiting infiltration.	Storage of fuel tanks for backup generators and cleaning chemicals etc on hardstanding or within appropriately bunded areas. Provision of interceptors on the drainage system as required.	Negligible
		Risks and Effects to Surface Water	Negligible: The risk of potentially contaminated run-off from the completed Development is low.	None Required	Negligible
		Risks and Effects to Flora and Fauna	Negligible: All proposed landscaped areas would be capped from underlying soils.	None Required	Negligible
		Contamination by the Completed Development	Negligible to Minor Beneficial: The Development does not include land uses that are likely to give rise to the contamination of soil, groundwater or surface waters. Improvements to the existing foul public sewer are proposed.	Storage of fuel tanks for backup generators and cleaning chemicals etc on hardstanding or within appropriately bunded areas. Provision of interceptors on the drainage system as required.	Negligible to Minor Beneficial

Effect Types	Stage of Development	Issue	Potential Effect	Mitigation Measures	Residual Effect
Flood Risk and Drainage	Demolition and Construction	Flood Risk to Construction Workers	Negligible: There is a low risk on Site of flooding from all potential sources, including fluvial, pluvial and groundwater.	None Required	Negligible
		Surface Water Drainage	Minor Adverse: In the absence of mitigation, construction earthworks, temporary Site drainage and potential dewatering all have the potential to give rise to changes in surface water runoff regimes and potentially increase the risk of flooding.	All drainage flow routes and connections to be maintained. Any increase in discharges would be subject to prior agreement with the Thames Water.	Negligible
		Foul Drainage	Negligible: It is proposed that the existing primary foul water sewer would be retained and a smaller sewer running under the proposed Plot D would be dewatered. Access to the sewer would be maintained.	None Required	Negligible
	Temporary Flexible Events Space	Surface Water Drainage	Negligible: The proportion of hard-standing would decrease by 13.5% post development and the increase in soft landscaping would account for any increase in rainfall intensity. The effect on flood risk is therefore considered to be negligible.	None Required	Negligible
	Completed Development	Flood Risk to Occupants of the Development from tidal and fluvial flooding	Negligible: The Site is at low risk of flooding.	None Required	Negligible
		Flood Risk to Occupants of the Development from Surface water flooding	Minor Adverse: The Environment Agency's Surface Water map indicates that there are some potential areas of surface water flooding indicated within the highways in and around the Site.	If potential surface water flows / ponding cannot be ruled out, the drainage strategy should be designed to ensure that this can be appropriately accommodated in line with best practice	Negligible

Effect Types	Stage of Development	Issue	Potential Effect	Mitigation Measures	Residual Effect
		Surface Water Drainage	Negligible: The Drainage Strategy demonstrates that the Development would provide approximately 900m ³ of surface water attenuation. The location of attenuation tanks would be determined at detailed design.	None Required	Negligible
		Groundwater Flow	Negligible: No significant substructure works are proposed and piled foundations would not be of sufficient mass to adversely affect groundwater flows or levels.	None Required	Negligible
		Foul Drainage	Minor Adverse: Should the receiving foul drainage network be close to capacity, in the absence of mitigation, the additional effluent has the potential to overload the existing drainage system.	Consultation with Thames Water at detailed design, and if required foul water infrastructure would be upgraded.	Negligible
	Ecology	Designated Sites	Negligible: There are no statutory designated sites within 2km of the Site. The nearest non-statutory designated site is located approximately 700m south of the Site.	None Required	Negligible
		Direct Mortality and Disturbance of Protected Species	Temporary and Minor Adverse: If works undertaken outside of the breeding bird season. Permanent and Moderate Adverse: If works are undertaken during the breeding bird season, in the absence of mitigation.	Netting has been placed on Western Tower to discourage Peregrine Falcons from nesting prior to demolition works commencing. Demolition and Site clearance works would be undertaken outside the main breeding season where practicable. Where this is not practicable, an Ecological Watching Brief would be maintained including a pre-demolition check. Implementation of a CEMP.	Negligible

Effect Types	Stage of Development	Issue	Potential Effect	Mitigation Measures	Residual Effect
		Habitat Loss and Creation	Negligible: Loss of a small area of amenity grassland and ornamental planting of negligible ecological value. Minor Adverse: Loss of the potential Peregrine perch on Western Tower. Minor Beneficial: Open and sparsely vegetated areas of the construction Site may provide temporary foraging benefits for Black Redstarts.	None Available.	Temporary Minor Adverse (prior to replacement habitats being introduced as part of the completed Development) Minor Beneficial for Black Redstarts.
	Temporary Flexible Event Space	Temporary Habitat Creation	Negligible: Some additional foraging habitat would be available; however, it would be of value to the Site only.	None Required	Negligible
	Completed Development	Effect on Designated Sites	Negligible: The completed and operational Development would likely result in a negligible effect on designated sites for nature conservation given their distance from the Site.	None Required	Negligible
		Direct Mortality and Disturbance of Protected Species	Negligible: On completion of construction works, there would be no further risk of mortality directly through human activity. The bird species recorded on-Site are adapted to the urban environment and the proposed uses of the Development would therefore have a negligible effect.	None Required	Negligible
		Habitat Creation	Minor Beneficial: Green or brown roofs would cover a minimum of 25% of the total roof area of each plot. The area of proposed would represent an increase compared to the existing Site.	A Peregrine Falcon nest box would be erected at a high elevations on the vertical sides of a tall building or on one of the brown roof to encourage Peregrines to nest. Nest boxes suitable for Black Redstarts, Starlings, Grey Wagtails and House	Minor to Moderate Beneficial

Effect Types	Stage of Development	Issue	Potential Effect	Mitigation Measures	Residual Effect
Wind				Sparrows would be provided in appropriate locations around the Site.	
		Effect of Tall Buildings on Bird Sightlines and Flyways	Negligible: The proposed Development represents a significant increase in building massing. However, bird species living in urban environments are quick to adapt to change, provided vegetation is not planted next to reflective glass windows. Minor Beneficial: Peregrine Falcons favour tall buildings.	None Required	Minor Beneficial
	Demolition and Construction	Existing Streets	Negligible: Wind conditions during the demolition phase are expected to be similar to those for the existing Site. During construction, the wind conditions would start to become similar to those of the completed Development	None Required	Negligible
	Temporary Flexible Event Space	Thoroughfares	Negligible: The majority of the Site would be suitable for standing or sitting during the winter months. The effect on thoroughfares along the perimeter of the Site would be of negligible significance.	None Required	Negligible
		Event Space	Negligible to Moderate Beneficial: the Temporary Event Space observes a mix of standing and sitting conditions throughout the year and is therefore suitable or better than required.	None Required	Negligible to Moderate Beneficial
	Completed Development	Existing Streets	Negligible to Minor Adverse: Wind conditions would range from sitting to business walking during the windiest season. However, conditions would	Conditions at the northwest corner of Plot A are expected to be sensitive to the detailed design of plot A. Requirement for mitigation	Negligible to Minor Adverse (on the basis that detailed design

Effect Types	Stage of Development	Issue	Potential Effect	Mitigation Measures	Residual Effect
			remain suitable for the desired use except at receptor 69.	should be reassessed at detailed design of Plot A.	mitigation measures are not currently known)
		Proposed Thoroughfares	Negligible to Moderate Beneficial: Conditions along all proposed thoroughfares would be suitable for leisure walking, or better. Conditions along Friars Walk and the Arcade would be suitable for standing or sitting during winter months, giving rise minor to moderate beneficial effects.	None Required	Negligible to Moderate Beneficial
		Entrances	Minor Beneficial to Minor Adverse: Without mitigation, the likely effect for building entrances ranges from minor beneficial to minor adverse. However, the location of entrances is currently unknown due to the outline nature of the planning application.	Wind tunnel testing would inform detailed design and entrances would be located in benign conditions where possible. Mitigation measures would include localised screening or recessed entrances.	Minor Beneficial to Minor Adverse (on the basis that detailed design mitigation measures are not currently known)
		Amenity Areas – Station Square	Negligible to Minor Adverse: The wind microclimate in Station Square is one category windier than desired at certain locations. Without mitigation, the likely effect is considered to be minor adverse.	Final mitigation measures would be determined at detailed design but may include localised screening and/or landscaping.	Negligible to Minor Adverse (on the basis that detailed design mitigation measures are not currently known)
		Amenity Areas – Central Square	Negligible to Minor Adverse: Without mitigation, conditions would be suitable for sitting and standing.	Detailed design to ensure seating areas are set in areas with more benign wind conditions. Should seating be proposed in areas suitable for standing, localised screening from prevailing winds would be provided.	Negligible to Minor Adverse (on the basis that detailed design mitigation measures are not currently known)
		Roof Terraces or other beneficial shelter	Minor to Moderate Adverse: Roof terrace areas throughout the Development are generally windier than desired mainly due to the absence of balustrades in the maximum parameter scheme.	Further wind tunnel testing at the detailed designed stage would be required and additional mitigation included as necessary.	Minor to Moderate Adverse (on the basis that detailed design mitigation measures are not currently known)

Effect Types	Stage of Development	Issue	Potential Effect	Mitigation Measures	Residual Effect
Daylight, Sunlight and Overshadowing	Demolition and construction	Increase in daylight and sunlight availability to surrounding properties following demolition	Minor Beneficial: Demolition of the existing buildings and structures on Site would improve daylight and sunlight at the closest sensitive receptors. Those further away would experience negligible effects.	None Required	Negligible to Minor Beneficial
	Temporary Flexible Events Space	Increase in daylight and sunlight availability to surrounding properties	Negligible: No built development is proposed and the effect is therefore negligible as set out for demolition	None Required	Negligible
	Completed Development	Daylight availability to surrounding properties	Negligible to Moderate Adverse: In consideration of the VSC (Vertical Sky Component) and NSL (No Sky Line) criteria, the overall impact to residential buildings surrounding the completed Development is considered to range predominately from minor to moderate adverse.	None Required	Negligible to Moderate Adverse
		Sunlight to existing surrounding residential properties	Negligible to Moderate Adverse Adverse: 1 property experiences a negligible impact and 5 properties experience a moderate adverse impact. Considering the proposed Development, the poor levels of existing daylight to many of the rooms, the dense urban location and inherent architectural features of buildings.	None Required	Negligible to Moderate Adverse
		Permanent overshadowing (<i>sun-hours on ground</i>) – proposed amenity areas within and surrounding the Site	Negligible: Amenity Area 1 (Central Square) falls below the BRE's recommendations for <i>sun-hours on ground</i> . However, amenity Area 2 (Station Square) will achieve direct sunlight for 2 hours or more to over 65.7% of its area, in excess of the BRE guidelines.	None Required	Negligible

Effect Types	Stage of Development	Issue	Potential Effect	Mitigation Measures	Residual Effect
		Transient overshadowing – surrounding area	Minor Adverse: Overall there will be a small increase in the amount of shadow cast by the Development with regards to the surrounding residential properties and open spaces, limited to the later part of the day.	None Required	Minor Adverse
Townscape, Conservation and Visual Assessment	Demolition and Construction	Townscape, Heritage and Visual Effects	Minor to Moderate Adverse: Temporary moderate adverse local townscape and visual effects with Minor adverse effects from more distant views.	Hoarding and good practice measures	Minor to Moderate Adverse
	Temporary Flexible Events Space	Townscape, Heritage and Visual Effects	Minor beneficial: The temporary events space would have a beneficial effect on the setting of the listed station and the character of the surrounding townscape.	None Required	Minor Beneficial
	Completed Development	Townscape	Substantial Beneficial: The high quality architecture and public realm would have substantial beneficial effect on local townscape.	None Required	Substantial Beneficial
		Heritage	Negligible to Moderate Beneficial: The effect on the setting of surrounding listed buildings and Conservation Areas would be negligible to moderate beneficial.	None Required	Negligible to Moderate Beneficial
		Local Views	Moderate to Substantial Beneficial: From the south and east of the Site, views of the Development will be very restricted. The streets to the west of the Site have a fragmented appearance and are characterised by varied housing and light industrial buildings, the setting of which will be positively transformed by the Development. Views from the north	None Required	Moderate to Substantial Beneficial

Effect Types	Stage of Development	Issue	Potential Effect	Mitigation Measures	Residual Effect
			of the Site would be positively transformed by the creation of Station Square and routes through the Site.		
		Distant Views	Negligible to Substantial Beneficial: The Development will have a positive impact on the setting and perception of Reading.	None Required	Negligible to Substantial Beneficial



PLOT E AND TELECOM HOUSE

Outline Application
Environmental Statement (ES)

Volume 2: Townscape, Conservation and Visual Assessment

Waterman
August 2015

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Chapter 1

INTRODUCTION

- 1.1 This document provides an assessment of the likely townscape and visual impacts in relation to the Proposed Development at Station Hill in Reading designed by architects Allies and Morrison for Sackville Developments (Reading) Limited (SDRL). It forms Volume 2 of the Environmental Statement (the ES) prepared by Waterman Infrastructure & Environment Ltd as part of this application for outline planning permission.
- 1.2 This report is based on Volume 2 of the ES (March 2013) and the Erratum to Volume 2 (July 2013) prepared in relation to the SH3 Scheme. As part of the Proposed Development assessed in this report, the parameters of Plots A, B, C, D and F are the same as those assessed in March and July 2013. The parameters for Plot E have been altered as part of the Proposed Development due to the inclusion of the Telecom House Site, immediately west of Plot E in the SH3 Scheme. All other aspects of the 2013 reports – the baseline assessment, the cumulative assessment and planning policy and methodology – have also been updated to reflect the current situation.
- 1.3 The ‘SH3 Scheme’ refers to the scheme consented for the SH3 Site in 2013. The ‘Telecom House/ Plot E Scheme’ refers to the current planning application and relates to the enlarged Plot E only. The ‘Proposed Development’ refers to the SH3 Scheme on all plots incorporating the proposed amendments to Plot E: this is because the enlarged Plot E proposals would only be built out in conjunction with the consented plans for the remainder of the SH3 Site. The Proposed Development is the assessment subject of this report and the rest of the ES.
- 1.4 This report provides an assessment of the likely impact that the Proposed Development will have on the surrounding townscape character of Reading in local and wider views. The assessment has been undertaken by the Professor Robert Tavernor Consultancy (‘Tavernor Consultancy’) and is based on parameter plans by Allies and Morrison, which are being submitted as part of the planning application, and verified images by Cityscape, which are included within this report. This document should be read in conjunction with the Design and Access Statement (DAS) produced by Allies and Morrison.
- 1.5 In particular, this assessment considers potential changes to:
 - The character of the townscape surrounding the Site;
 - The significance of designated heritage assets in the surrounding area and their settings; and
 - The composition of selected representative views as a result of the Proposed Development.
- 1.6 The potential environmental effects of the Proposed Development are considered through the Views Assessment in section 6. It contains

a comprehensive selection of views, agreed with Reading Borough Council, through which an assessment is made of the visual impacts of the minimum and maximum parameters of the scheme in the round. Photographs of the views have been overlaid by Cityscape with accurately surveyed, verified wireline representations of the Proposed Development, with the maximum parameter shown in solid line and the height of the minimum parameter shown in a dotted line. A cumulative impact assessment has also been undertaken which considers all relevant consented schemes in the area.

- 1.7 Additional illustrations of the Proposed Development are included in the architects’ DAS which assist in interpreting the outline parameter forms assessed in this report.
- 1.8 The following sections 2-5 set out the assessment methodology, relevant planning policy and guidance, the existing townscape and heritage assets on and around the Site and relevant visual characteristics of the Proposed Development, all of which form the basis for the Views Assessment in section 6. The conclusions and residual effects are set out in section 7.

Chapter 2

METHODOLOGY

- 2.1 This assessment takes into account the skyline of Reading, existing tall buildings and consented applications for other tall buildings in Reading, the physical fabric of the area, the appropriateness of the Site for the proposals and the character of the design for Station Hill.
- 2.2 The available guidance for assessing the townscape, heritage and visual effects of a development is as follows:
- Guidelines for Landscape and Visual Impact Assessment (GLVIA) Third Edition (2013) (Ref 1-1) produced jointly by the Landscape Institute and the Institute of Environmental Management and Assessment;
 - Seeing the History in the View (May 2011) (Ref 1-2), which was prepared by Historic England (formerly English Heritage) as a methodology for assessing the heritage significance of views.
- 2.3 The IEMA and Landscape Institute Guidelines (Ref 1-1) were developed in relation to rural and urban landscapes and are applicable to all assessments submitted under the Town and Country Planning (Environmental Impact Assessment) Regulations 2011 (as amended). The methodology employed for this TCVIA is based on approaches recommended in the IEMA and Landscape Institute Guidelines. The EH guidance was developed in line with the policies set out in Planning Policy Statement 5: Planning for the Historic Environment (PPS5), which inform the relevant policies of the National Planning Policy Framework (NPPF) (Ref 1-3) published in March 2012 to supersede PPS5 and other Planning Policy Statements. The Historic England publication Seeing the History in the View uses examples in London but it is intended to be applicable in all parts of the country and to both urban and rural environments.
- 2.4 Visual impacts have been assessed in terms of the magnitude of the impact or change and also the sensitivity of the resource affected. Where present, listed buildings and conservation areas are considered to be elements of high sensitivity in the townscape. The Site contains no listed buildings and is not designated as a conservation area. However there are listed buildings and conservation areas in the vicinity; these will be identified in section 4 below. In considering the impact of the proposals for the Site, the NPPF (Ref 1-3) requires assessment of potential impacts on the setting of these designated heritage assets.
- 2.5 Thirty viewpoints have been selected for assessment in consultation with Reading Borough Council. Where visible, the Proposed Development has been outlined to show its massing and position.
- 2.6 In order to assess the impact of the Proposed Development, three separate images have been prepared from each viewing location selected:
- Future Baseline – the existing view, prior to the demolition of buildings on the northern part of the Site and with consented schemes presently under construction outlined in relevant views (as black wirelines) (see Table 2-1);
 - Proposed – the Future Baseline view with the consented minimum and maximum parameters for Plots A, B, C, D, F and G of the SH3 Scheme and the proposed minimum and maximum parameters for Plot E of the Telecom House/ Plot E Scheme inserted (as coloured wirelines); and
 - Cumulative - the Proposed View but with maximum parameters only represented for the Proposed Development and significant consented schemes inserted (as black wirelines) (see Table 2-2).

Table 2-1: Future Baseline schemes under construction

Scheme name/ address	Application Ref. and status	Details of consented works
Phase 2, Land at Chatham Place	12/00798/FUL approved	Detailed planning application for Phase 2 of the Chatham Place redevelopment comprising one nine storey and one nineteen storey building to accommodate a total of 184 residential units and ground floor retail uses (Use Classes A1, A2 or A3), together with basement car parking, public and private amenity space, public realm works and landscaping and alterations to existing vehicular access.
21 Caversham Road	110628 approved	Demolition of existing building and erection of 11 x 1-bed flats.
Energis House, Forbury Road	12/01856/FUL approved	Demolition of existing building and construction of two new office buildings (Use Class B1) with associated access, car parking, servicing, landscaping and engineering works.
Thames Tower	141043 approved	Refurbishment and recladding of the existing building, construction of four additional storeys of offices (use class B1), change of use of the ground floor to flexible office and retail uses (classes A1, A2, A3 and B1), rooftop plant and associated works.
Aldwych House, 2 Blagrove Street	101300 approved	Demolition of existing office building and construction of new 6-storey office building (total approximately 13,500 sqm) with associated basement car park and external works.

Table 2-2: Schemes considered in the Cumulative Assessment

Scheme name/ address	Application Ref.	Details of works
Former Sorting Office, Caversham Road / Vastern Road	11/00276/OUT approved	Outline planning application for business uses (Use Class B1), residential accommodation (Use Class C3), hotel (Use Class C1), retail floor space (Use Class A1), food and drink uses (Use Class A3, A4 and A5), leisure uses (Use Class D2), and associated car parking, open space and landscaping, highways, access and associated works.
Garrard House, 30 Garrard Street	150556 approved	Extension to include part new fourth floor and new fifth and sixth floors to provide 23 residential units.
29-35 Station Road	Not yet submitted.	Demolition of existing building and the erection of a 22 storey building. Model information has been taken from previous application for a similar scheme (Application ref: 04/01395/FUL).
Building B, Station Hill 3	Not yet submitted.	Reserved matters application for Building B of Station Hill 3.

2.7 To aid legibility, the plots on Site are represented with the following different coloured wirelines in the Proposed Views and Cumulative Views:

- Plot A = Green
- Plot B = Yellow
- Plot C = Blue
- Plot D = Pink
- Plot E = Red
- Plot F = Orange
- Plot G = Purple

The minimum parameters are indicated with a dashed line and the maximum parameters are indicated with a solid line. Each Plot is also colour shaded to aid clarity.

2.8 The Cumulative Views include the Proposed Development and schemes which are in the pre-application phase, submitted for planning or consented or ‘reasonably foreseeable’ schemes, in accordance with EIA Regulations, and which are likely to have a significant effect in conjunction with the Proposed Development. These schemes are listed in Table 2-2 above and are represented in the Cumulative Views with a black wireline. They include the outline for the Reserved Matters Application for Plot B which is due to be submitted shortly. The Cumulative Views include only the maximum parameters of the Proposed Development for clarity, however both the minimum and maximum parameters of the Proposed Development have been assessed and this is reported in the text that accompanies the Cumulative Views where relevant. The Proposed Views should be referred to for the relevant minimum parameters. The likely significance of cumulative impact refers to the likely impact of the Proposed Development in conjunction with the other cumulative schemes, rather than a combined impact overall.

2.9 It should be noted that the Royal Mail Group development is represented in the views at maximum parameters and that there is therefore a very small deviation in form from the scheme as it was shown in the cumulative views in the 2013 ES, in which an illustrative version of the scheme was considered. The difference between the two versions of the consented Royal Mail Group scheme are very minimal and the effects considered would be the same.

2.10 An assessment of existing townscape conditions and the significance of relevant heritage assets and their settings are set out in section 4 of this report. This overall assessment informs consideration of the existing conditions of each Future Baseline View in section 6. The sensitivity of each Future Baseline View and their scope for change is considered within that assessment. The sensitivity of a view is determined by a range of factors identified in detail in Historic England’s guidance Seeing the History in the View (Ref 1-2) and summarised here:

- the degree of heritage significance of the structures and spaces in view (both how important they are and how much they contribute to the view);

Table 2-3: Significance evaluation methodology

Effect	Magnitude
Major, adverse	Where the proposed changes to the Site would form a major and immediately apparent part of the scene that adversely effects and changes its overall character.
Moderate, adverse	Where the proposed changes to the Site would form a visible and recognisable new element within the scene and may be readily noticed by the viewer as adverse.
Minor, adverse	Where the proposed changes to the Site would be a minor component of the wider view and may be missed by the casual observer.
Negligible	Where the proposed changes to the Site would be imperceptible or would be in keeping with and would maintain the overall character of the existing view. The balance of the proposals with proposed mitigation would maintain the quality of the views.
Neutral	Where the proposed changes to the Site would not be discernible.
Minor, beneficial	Where the proposed changes to the Site would not only be in keeping with, but would also slightly improve the quality of the existing view.
Moderate, beneficial	Where the proposed changes to the Site would be in keeping with, and would improve, the quality of the existing view.
Major, beneficial	Where the proposed changes to the Site would be in keeping with, and would greatly improve the quality of the scene through the removal of visually distracting features.

Source: Modification of criteria contained in the Guidelines for Landscape and Visual Impact Assessment (2013) (Ref 1-1)

- the nature of the significance of the structures and spaces in view (for example the robustness of their character, their degree of visibility and/or the importance of retaining a clear sky backdrop in order to enable their recognition and appreciation);
 - the degree of importance attached to the view (whether of local or strategic importance or within the setting of a designated heritage asset and/or whether potential for enhancement has been identified); and
 - the nature of the view (whether it is glimpsed, kinetic, formally composed).
- 2.11 Existing buildings within the Site which are to be demolished as part of the Proposed Development (e.g. Western Tower) have been included in the Proposed Views and Cumulative Views in order to give context to the minimum and maximum massing of the Proposed Development. Some of the buildings on the northern part of the Site have already been demolished, although it should be noted that the ‘baseline’ of this assessment includes all the buildings on site prior to the recent demolitions, and this ‘baseline’ situation is represented in the photography used for the assessment.
- 2.12 Potential impacts are considered within the assessment which appears beside each Proposed View in section 6 of this report. It assesses the degree of change – neutral, negligible, minor or major - and the nature of that change - whether beneficial or adverse - as a result of the nature and sensitivity of existing conditions and of the design of the Proposed Development. The criteria which inform the assessment of potential impacts are drawn from relevant national and local policy and guidance set out in section 3.
- 2.13 A night view has not been prepared as part of this assessment due to the outline form of the planning application. Only the height and massing of the Proposed Development are assessed.
- 2.14 The significance of potential impacts overall is categorised for each view using a standardised scale adapted from the Guidelines for Landscape and Visual Impact Assessment (Ref 1-1). Where neutral in impact, the Proposed Development would not be seen, and where deemed negligible, the Proposed Development is likely to have little or no impact on the overall character of the scene in the view. For impacts judged to be minor to major in magnitude, the nature of that magnitude is further categorised as either beneficial or adverse. The scale of significance is defined as follows:

Chapter 3

PLANNING POLICY CONTEXT

National Planning Policy and Guidance

National Planning Policy Framework (March 2012) (Ref 1-3)

- 3.1 A National Planning Policy Framework (NPPF) was introduced in March 2012 to set out the Government's overarching planning policies on the delivery of sustainable development through the planning system. It replaces almost all Planning Policy Statements and Guidance.
- 3.2 In Chapter 7 Requiring Good Design the NPPF considers that *"Good design is a key aspect of sustainable development, is indivisible from good planning, and should contribute positively to making places better for people."* (para 56). Paragraph 58 states that Local Planning Authorities (LPAs) should ensure that developments:
- *"will function well and add to the overall quality of the area, not just for the short term but over the lifetime of the development;*
 - *establish a strong sense of place, using streetscapes and buildings to create attractive and comfortable places to live, work and visit;*
 - *optimise the potential of the site to accommodate development, create and sustain an appropriate mix of uses (including incorporation of green and other public space as part of developments) and support local facilities and transport networks;*
 - *respond to local character and history, and reflect the identity of local surroundings and materials, while not preventing or discouraging appropriate innovation;*
 - *create safe and accessible environments where crime and disorder, and the fear of crime, do not undermine quality of life or community cohesion; and*
 - *are visually attractive as a result of good architecture and appropriate landscaping"*
- 3.3 Chapter 12 Conserving and Enhancing the Historic Environment sets out the Government's overarching planning policies put in place to conserve the historic environment and its heritage assets so that they may be enjoyed by future generations. It replaces PPS5 - Planning and the Historic Environment (2010) and outlines a balanced approach to the conservation of the historic environment and gives guidance relating to designated heritage assets - listed buildings, conservation areas, World Heritage Sites and Registered Parks and Gardens - and undesignated heritage assets, buildings positively identified as having a degree of heritage significance meriting consideration during the planning process. In paragraph 131 it states that local planning authorities should take account of:
- *"the desirability of sustaining and enhancing the significance of heritage assets and putting them to viable uses consistent with their conservation;*

- *the positive contribution that conservation of heritage assets can make to sustainable communities including their economic viability; and*
- *the desirability of new development making a positive contribution to local character and distinctiveness."*

- 3.4 In determining applications, LPAs should require an applicant to describe the significance of any heritage assets affected, including any contribution made by their setting. "The level of detail should be proportionate to the assets' importance and no more than is sufficient to understand the potential impact of the proposal on their significance" (para 128). Paragraph 132 states that "when considering the impact of a proposed development on the significance of a designated heritage asset, great weight should be given to the asset's conservation. The more important the asset, the greater the weight should be." Significance can be harmed or lost through alteration or destruction of the heritage asset or development within its setting. Any harm or loss of significance should require clear and convincing justification.

- 3.5 Paragraph 134 states that where a proposed development will lead to less than substantial harm to the significance of a designated heritage asset, this harm should be weighed against the public benefits of the proposal. Where proposals lead to substantial harm, it must be shown that the harm is necessary in order to achieve substantial benefits which outweigh it, or that a number of criteria regarding the use and ownership of the site are met (para.133). In considering applications that affect non designated heritage assets, a balanced judgment will be required having regard to the scale of any harm or loss and the significance of the heritage asset (para.135).

- 3.6 The following assessment has been formed to accord with these policies. The relevant records have been consulted as part of the design process and the significance of potentially affected heritage assets has been assessed in proportion to the potential impacts of the proposals. The Site is not within a conservation area and there are no listed buildings on Site. However there are conservation areas and listed buildings in the close and wider surrounding area. Opportunities to enhance or preserve positive aspects of the setting of heritage assets has informed the design process and any potential harm has been weighed against other heritage and public benefits brought by the scheme. An assessment of the potential impacts of the Proposed Development on the setting of relevant heritage assets is undertaken within the Views Assessment in section 6 below.

Planning Practice Guidance (PPG) (March 2014) (Ref 1-4)

- 3.7 The PPG, recently launched by the Department for Communities and Local Government (DCLG), is an online resource providing guidance

	on implementing the policies of the NPPF (Ref 1-3). The web resource replaces various guidance documents, including By Design (2000). There are two sections of the NPPG that are of particular relevance to this assessment: • Design; and • Conserving and enhancing the historic environment.		<i>destruction is obvious, partial destruction is likely to have a considerable impact but, depending on the circumstances, it may still be less than substantial harm or conceivably not harmful at all, for example, when removing later inappropriate additions to historic buildings which harm their significance. Similarly, works that are moderate or minor in scale are likely to cause less than substantial harm or no harm at all. However, even minor works have the potential to cause substantial harm."</i>		3.16 The Guidance notes that <i>"Each of the stages may involve detailed assessment procedures and complex forms of analysis such as viewshed analyses, sensitivity matrices and scoring systems. Whilst these may assist analysis to some degree, as setting is a matter of qualitative and expert judgement, they cannot provide a systematic answer. English Heritage [sic] recommends that [...] technical analyses of this type should be seen primarily as material supporting a clearly expressed and non-technical narrative argument that sets out 'what matters and why' in terms of the heritage significance and setting of the assets affected, together with the effects of the development upon them."</i> This narrative is provided in relation to the heritage assets in the views in section 6 and in relation to each relevant heritage asset in section 6.
3.8	The PPG on Design, which supports section 7 of the NPPF, states that local planning authorities are required to take design into consideration and should give great weight to outstanding or innovative designs which help to raise the standard of design more generally in the area: <i>"Planning permission should not be refused for buildings and infrastructure that promote high levels of sustainability because of concerns about incompatibility with an existing townscape, if those concerns have been mitigated by good design (unless the concern relates to a designated heritage asset and the impact would cause material harm to the asset or its setting which is not outweighed by the proposal's economic, social and environmental benefits"</i> (Ref 1-3, para 004).	3.12	Considering potential harm in relation to conservation areas, Paragraph 18 of the guidance states: <i>"An unlisted building that makes a positive contribution to a conservation area is individually of lesser importance than a listed building (paragraph 132 of the National Planning Policy Framework). If the building is important or integral to the character or appearance of the conservation area then its demolition is more likely to amount to substantial harm to the conservation area, engaging the tests in paragraph 133 of the National Planning Policy Framework. However, the justification for its demolition will still be proportionate to the relative significance of the building and its contribution to the significance of the conservation area as a whole."</i>		Guidance on Tall Buildings (July 2007) (Ref 1-6)
3.9	The PPG states (Ref 1-3, para 015) that new or changing places should have the following qualities commonly exhibited by successful, well-designed places: • be functional; • support mixed uses and tenures; • include successful public spaces; • be adaptable and resilient; • have a distinctive character; • be attractive; and • encourage ease of movement.		The Setting of Heritage Assets: Historic Environment Good Practice Advice in Planning Note 3 (March 2015) (Ref 1-5)	3.17	Guidance on Tall Buildings was published by CABI and Historic England to provide advice and guidance on good design practice in relation to tall buildings in the planning process and to highlight other related issues that need to be taken into account. It sets out how CABI and Historic England will evaluate proposals for tall buildings. CABI and Historic England recommend that local authorities use it as a basis for their own consideration of such projects.
		3.13	The Setting of Heritage Assets is a guidance document published by Historic England in March 2015. It supersedes the previous Historic England Guidance publication The Setting of Heritage Assets published in October 2011. It condenses that document and updates it to relate to the terminology and objectives of the NPPF. It identifies the ways in which the setting of a heritage asset can contribute to its significance and sets out means of assessing the impacts of a development on the setting of a heritage asset.	3.18	It is stated at paragraph 3.4 of the Guidance that <i>"All proposals for tall buildings should be accompanied by accurate and realistic representations of the appearance of the building. These representations should show the proposals in all significant views affected, near, middle and distant, including the public realm and the streets around the base of the building. This will require methodical, verifiable 360 degree view analysis."</i> This is provided in section 6 of this report.
3.10	The PPG on Conserving and Enhancing the Historic Environment supports section 12 of the NPPF. Heritage assets may be affected by direct physical change or by change in their setting. Being able to properly assess the nature, extent and importance of the significance of a heritage asset, and the contribution of its setting, is very important to understanding the potential impact and acceptability of development proposals. Significance derives not only from a heritage asset's physical presence, but also from its setting, therefore a thorough assessment of the impact on setting needs to take into account, and be proportionate to, the significance of the heritage asset under consideration and the degree to which proposed changes enhance or detract from that significance and the ability to appreciate it.	3.14	The Guidance notes that <i>"The contribution of setting to the significance of a heritage asset is often expressed by reference to views, a purely visual impression of an asset or place which can be static or dynamic, including a variety of views of, across, or including that asset, and views of the surroundings from or through the asset, and may intersect with, and incorporate the settings of numerous heritage assets."</i> (Ref 1-5, paragraph 5).	3.19	Criteria for the evaluation of tall buildings are set out at paragraph 4.1 of the guidance: • The relationship to context; • The effect on the historic context; • The effect on world heritage Sites; • The relationship to transport infrastructure; • The architectural quality of the building including its scale, form, massing, proportion and silhouette, facing materials and relationship to other structures; • The sustainable design and construction of the proposal; • The credibility of the design, both technically and financially; • The contribution to public space and facilities, both internal and external; • The effect on the local environment, including microclimate, overshadowing, night-time appearance; • The contribution made to the permeability of a Site and the wider area; and • The provision of a well-designed environment, both internal and external.
3.11	In considering assessment of substantial harm, Paragraph 017 of the guidance states: <i>"In general terms, substantial harm is a high test, so it may not arise in many cases. For example, in determining whether works to a listed building constitute substantial harm, an important consideration would be whether the adverse impact seriously affects a key element of its special architectural or historic interest. It is the degree of harm to the asset's significance rather than the scale of the development that is to be assessed. The harm may arise from works to the asset or from development within its setting. While the impact of total</i>	3.15	Paragraph 12 sets out a number of key steps which form a broad approach to assessment of potential impacts on settings: • <i>"Step 1: identify which heritage assets and their settings are affected;</i> • <i>Step 2: assess whether, how and to what degree these settings make a contribution to the significance of the heritage asset(s);</i> • <i>Step 3: assess the effects of the proposed development, whether beneficial or harmful, on that significance;</i> • <i>Step 4: explore the way to maximise enhancement and avoid or minimise harm;</i> • <i>Step 5: make and document the decision and monitor outcomes."</i>		

3.20 A draft revision of the Guidance was issued on 15 October 2014 for consultation which has not yet been adopted. It is broadly the same as the 2007 document with parts and terminology updated to reflect minor changes in the wider planning policy context, such as the adoption of the NPPF and publication of the PPG.

Local Planning Policy

Reading Borough Council Core Strategy (Adopted January 2008 and Revised January 2015) (Ref 1-7)

3.21 The Reading Borough Council Core Strategy (CS) sets out its vision up to the year 2023. The policy framework is designed to work towards the following core objectives:

- “1. Strengthen the role of Reading, including the Central Reading Area, as the regional hub for the Thames Valley, providing an accessible focus for the development of employment, housing, services and facilities, meeting the needs of residents, workers, visitors, those who study in Reading Borough, and the wider area, in accordance with the South East Plan;*
- 2. Improve the quality of life for those living, working, studying in and visiting the Borough, creating inclusive, sustainable communities with good access to decent and affordable housing, employment, open space and waterspace, transport, education, services and facilities (such as sustainable water supplies and wastewater treatment, healthcare services, sport and recreation, etc.) to meet identified needs;*
- 3. Ensure new development is accessible and sustainable, in accordance with the LDF sustainability appraisal objectives;*
- 4. Maintain and enhance the historic, built and natural environment of the Borough through investment and high quality design;*
- 5. Improve and develop excellent transport systems to improve accessibility within Reading and for the wider area by sustainable modes of transport;*
- 6. Offer outstanding cultural opportunities, which are based on multiculturalism, local heritage and high quality, modern arts and leisure facilities; and*
- 7. Ensure that Reading is a multi-cultural city where significant social inclusion exists and where the needs of all its citizens are met by high quality, cost effective services and outstanding levels of community involvement.” (Ref 1-7, pp. 19-20)*

3.22 There are four distinct areas in Reading that are considered sustainable locations for future development:

- The Reading Central Area;
- South West Reading including the development of Green Park 3;
- District/ Local Centres; and
- Redevelopment of parts of existing employment areas.

The Site is located in the Reading Central Area, and more specifically in the ‘Station/River Project Area’. This area is dominated by Reading Station. The rail interchange at Reading Station is of national significance; it has recently been upgraded with significant improvement works, including a new bridge over the rail line which is visible in nearby views in section 6. Much of the surrounding area is isolated, underutilised and of a very poor architectural and environmental quality.

3.23 Policies CS1, CS7 and CS33 in the Core Strategy are of relevance to the site of the Proposed Development and are outlined in greater detail below.

3.24 Policy CS1: Sustainable Construction and Design ensures that all proposals for new development, as well as the redevelopment and refurbishment of existing buildings, will only be acceptable where their design uses “energy, water, minerals, materials and other natural resources appropriately, efficiently and with care and take account of the effects of climate change.” (Ref 1-7, p.28)

3.25 Policy CS7: Design and the Public Realm will ensure that all new development in Reading is of the highest design quality, “one that maintains and enhances the character and appearance of the area of Reading in which it is located.” (Ref 1-7, p.37). The components for consideration are:

- *“Layout: urban structure and urban grain;*
- *Landscape;*
- *Density and mix;*
- *Scale: height and massing; and*
- *Architectural detail and materials.” (Ref 1-7, p.37)*

These components will be assessed to ensure that proposals make a positive contribution to the following urban design objectives:

- *“Character - a place with its own identity and sense of place*
- *Continuity and enclosure*
- *Quality of the public realm*
- *Ease of movement and permeability*
- *Legibility - clear image and easy to understand*
- *Adaptability – capable of adaptation over time*
- *Diversity – meets a wide range of needs.” (Ref 1-7, p.37)*

3.26 Policy CS33: Protection and Enhancement of the Historic Environment make sure that the historic environment of Reading, including conservation areas, listed buildings and other features of local or national designation, such as sites of archaeological importance and historic parks and gardens, will be protected and, where appropriate, enhanced. The Council will only grant planning permission where development has “*no adverse impact on historic assets and their settings. All proposals will be expected to protect and where appropriate enhance the character and appearance of the area in which they are located.*” (Ref 1-7, p.79).

3.27 The alterations made to Policy CS16 in January 2015 are not relevant to this assessment.

Reading Borough Council Sites and Detailed Policies Document (SDPD) (Adopted October 2012, altered 27 January 2015) (Ref 1-8)

3.28 The SDPD was adopted following the Core Strategy and provides detailed policies to necessary for delivering the objectives of the Core Strategy. It is one of the documents which make up Reading’s Local Development Framework.

3.29 The SDPD provides further detail relating to Heritage Assets on pages 58-62, including listed buildings, conservation areas and other designated and undesignated assets. It refers to National planning policy for principles and guidance relating to development affecting the setting of heritage assets (9.1.8). It notes that “*The setting of a building or place can make a significant contribution to and form an integral part of the character of all heritage assets. [...] National planning policy confirms that the setting of all heritage assets is a material consideration and the alteration or destruction of any part of its setting should require clear and convincing justification*” (9.1.12).

3.30 It is noted at paragraph 11.1.1 that design issues are not addressed in the SDPD and that the most important design principles applicable to all types of development are set out in Core Strategy Policy CS7. The Station Hill Site is not included in the Site Policies part of the SDPD.

Reading Central Area Action Plan to 2026 (January 2009) (Ref 1-9)

3.31 The Reading Central Area Action Plan (RCAAP) is one part of the Local Development Framework for the Reading and is a Development Plan Document (DPD). It should be read alongside the Core Strategy, which is the most important of the DPDs. The role of the RCAAP is to establish specific planning policies for central Reading, an area where significant intervention.

3.32 The RCAAP sets out three Major Opportunity Areas (MOA) in Reading. The Site is located within the Station/River Major Opportunity Area, the vision for this area is as follows:

“The station/river area will be a flagship scheme, extending the centre and providing a mixed use destination in itself and centred on a redeveloped station and new public transport interchange. It will integrate the transport links and areas northwards towards the river and into the heart of the centre.” (Ref 1-9, p.21)

3.33 Policy RC1: Development in the Station/River Major Opportunity Area will ensure that development in the MOA will:

- “i) Contribute towards providing a high density mix of uses to create a destination in itself – the areas that also make up part of the primary shopping area and central core will have a particular emphasis on delivering much of the identified retail and leisure need;*
- ii) Help facilitate greater pedestrian and cycle permeability, particularly on*

- the key movement corridors. North-south links through the centre and across the railway line, IDR and River Thames centred on the new station are of particular importance;*
- iii) *Provide developments that front onto and provide visual interest to existing and future pedestrian routes and open spaces;*
- iv) *Safeguard land which is needed for:*
- *Improvements to Reading station;*
 - *Reading station interchange;*
 - *Mass rapid transit routes and stops;*
- v) *Provide additional areas of open space where possible, including a direct green link between the station and the River Thames;*
- vi) *Give careful consideration to the areas of transition to low and medium density residential and protect and, where appropriate, enhance the setting of listed buildings;*
- vii) *Be laid out in a way that allows the area to come forward in parcels – for instance, single developments should not be solely inwards-facing, ignoring the links with other potential future development areas.” (Ref 1-9, p.22)*
- 3.34 The MOA is divided into sub-areas, each of which has its own character and development provisions. The Site has frontages in three of the sub-areas defined in the policy:
- “RC1a, FRIAR STREET & STATION ROAD: There will be active retail and leisure uses on the ground floor along Friar Street and Station Road, with a mix of uses on higher floors. Development should enhance linkages in a north-south direction to link to the Station Hill area. The setting of listed buildings in the area will be preserved, and opportunities to improve the environment of Merchants Place will be sought.*
- RC1b, FRIARS WALK & GREYFRIARS ROAD: Development in this area will be of a mixed use with a significant leisure element. Active retail and leisure uses will be on the ground floor, particularly along Friar Street, with a mix of uses on higher floors. Development should enhance linkages in a north-south direction at a single level into the Station Hill area and through to the station. The edge of the site nearest to the areas of traditional terracing west of Greyfriars Road will require careful design treatment.*
- RC1c, STATION HILL: This area will be developed for a mix of uses at a high density, including retail and leisure on the ground and lower floors and residential and offices on higher floors. There will be enhanced links through the sites, and a network of streets and spaces. Frontages on key routes through the site should have active uses. The edge of the site nearest to the areas of traditional terracing west of Greyfriars Road will require careful design treatment.”*
- 3.35 Policy RC5: Design in the Centre aims to ensure high-quality urban design in the centre by expecting development proposals to demonstrate the following attributes:

- “a. Development will build on and respect the existing grid layout structure of the central area, providing continuity and enclosure through appropriate relationships between buildings and spaces, and frontages that engage with the street at lower levels, and contributing towards enhanced ease of movement through and around the central area;
- b. Development will provide appropriate, well designed public spaces and other public realm, including squares, open spaces, streetscape, utilising high quality and well-maintained hard and soft landscape, public art, that provide suitable functions and interest, sense of place and safe and convenient linkages to adjoining areas;
- c. The architectural details and materials used in the central area should be high quality and respect the form and quality of the detailing and materials in areas local to the development site;
- d. Development and any associated public realm should contribute to the diversity of the central area, be capable of easy adaptation over time to meet changing circumstances, and be designed to enhance community safety.” (Ref 1-9, p.38)
- 3.36 Policy RC13: Tall Buildings defines tall buildings in Reading as “10 storeys of commercial floorspace or 12 storeys of residential (equating to 36 metres tall) or above.” (Ref 1-9, p.49). In general all tall building proposals “should be of excellent design and architectural quality” (Ref 1-9, p.50) and meet the following criteria:
- *“Enhance Reading’s skyline, through a distinctive profile and careful design of the upper and middle sections of the building;*
 - *Contribute to a human scale street environment, through paying careful attention to the lower section or base of the building, providing rich architectural detailing and reflecting their surroundings through the definition of any upper storey setback and reinforcing the articulation of the streetscape;*
 - *Contribute to high-quality views from distance, views from middle-distance and local views;*
 - *Take account of the context within which they sit, including the existing urban grain, streetscape and built form and local architectural style;*
 - *Avoid bulky, over-dominant massing;*
 - *Preserve and, where appropriate, enhance the setting of conservation areas and listed buildings;*
 - *Use high quality materials and finishes;*
 - *Create safe, pleasant and attractive spaces around them, and avoid detrimental impacts on the existing public realm...” (Ref 1-9, p.50)*
- 3.37 The Site lies in one of the sub-areas defined in the Policy RC13 as being appropriate for tall buildings, specifically in the ‘Station Area Cluster’. RC13a Station Area Cluster relates to this sub-area:
- “A new cluster of tall buildings with the station at its heart will signify the status of the station area as a major mixed-use destination and the main gateway to, and most accessible part of, Reading. Tall buildings in this area should:*

- *Be located at the centre of the cluster, close to the station, and step down in height from that point towards the lower buildings at the fringes;*
 - *Contribute to the creation of a coherent, attractive and sustainable cluster of buildings with a high quality of public realm;*
 - *Ensure that adequate space is provided between the buildings to avoid the creation of an overly dense townscape and to allow buildings to be viewed as individual forms;*
 - *Be designed to fit within a wider planning framework or master plan for the area, which allows separate parcels of land to come forward at different times in a co-ordinated manner.” (Ref 1-9, p.49)*
- 3.38 The elements of a tall building’s design will be viewed differently from different distances. From longer distances the overall massing and proportions are most significant; from mid-distances the composition and detail of the building becomes more important as well as the articulation of elevations. For local views the building’s base and its relationship to its immediate setting is important. The Council expects all of these aspects to be taken into account when designing such a building.
- “There are some key panoramic views of the central area that tall buildings should make a positive contribution to. These include the views of the central area from Balmore Park, Caversham Park, Kings Meadow, Reading Bridge, and from Oxford Road to the west of the centre, and Wokingham Road to the east.” (Ref 1-9, p.52)*
- Reading Station Area Framework (December 2010) (Ref 1-10)*
- 3.39 The Reading Station Area Framework (RSAF) is a Supplementary Planning Document (SPD) which sets out principles and guidelines for development around the station, focusing particularly on the northern area. It supplements the RCAAP, the relevant parts of which are summarised above, which allocated this area for development.
- 3.40 Chapter 6 of the RSAF set out principles for the density, mass and height of buildings in the area. Building height and massing in the wider central Reading area are addressed in the RCAAP, particularly policies RC1-3 and RC13 (RC1 and RC13 are relevant to the Site and are summarised above). The guidance set out in the RSAF interprets and applies the policies of the RCAAP.
- 3.41 The majority of the Station Area has been defined as an area suitable for tall buildings. In order to come to this conclusion a series of height, massing and sectional studies were undertaken by the Council. These studies form the basis of the RSAF’s guidance on density, mass and scale. The RSAF requires development in the Station Area to be characterised by “high density development with an intense, fine grained urban fabric framing flexible development plots capable of adaptation to many land uses, combinations of land uses (vertical and horizontal) and many building types and forms.” (Ref 1-10, p. 34)