Former Royal Mail Sorting Office, Twickenham

Environmental Statement
Volume 1: Main Report

November 2012

pba peterbrett

St James
Designed for life

St James Group

Former Royal Mail Sorting Office, Twickenham

Environmental Statement

Volume 1 - Main Report

Project Ref: 26503

November 2012

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Document Control Sheet

Project Name: **Former Royal Mail Sorting Office, Twickenham**
Project Ref: **26503**
Report Title: **Environmental Statement Volume 1 – Main Report**
Date: **November 2012**

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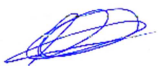
Approved by:	Greg Callaghan	Partner		4 September 2012
For and on behalf of Peter Brett Associates LLP				

Revision	Date	Description	Prepared	Reviewed	Approved
00	04/09/12	Planning Application	SB	SB	GC
01	27/09/12	Planning Application	SB	DW	GC
02	15/11/12	Planning Application	SB	SB	GC

Contents

1 Introduction

1.1 The Proposed Development

1.1.1 This Environmental Statement (ES) has been prepared in respect of a full planning application by St James Group (St James) for the redevelopment of the Former Royal Mail Sorting Office, London Road, Twickenham, south west London. St James is part of the Berkeley Group, a leading housing developer based in London and the South East.

1.1.2 The proposed development comprises the comprehensive redevelopment of the vacant former sorting office to provide residential accommodation (within houses and flats), a community building and two restaurants.

1.2 The Site

1.2.1 The site comprises approximately 1.15 hectares, located approximately on National Grid Reference 515958,173623.

1.2.2 The site comprises the former Royal Mail Sorting Office, which entails a series of disused buildings and service yards and car parks. The very western extent of the site, currently occupied by car parking associated with the former sorting office is designated as Metropolitan Open Land (MOL). The site does not include the wider MOL to the west of the site, which is currently overgrown and to which there is no public access.

1.2.3 The site is bound to the north by sports pitches and outdoor bounds facilities and a canalised section of the River Crane. To the south lies Brewery Lane and four railway cottages, beyond which is the railway line that connects London Waterloo to Staines.

1.2.4 The site is accessed from London Road (A310), which also forms the site's eastern boundary, while the western end of the site is delimited by the extent of the former Sorting Office car park.

1.2.5 A Site Location Plan is provided in **Appendix A.1.**

1.3 Terms and Definitions

1.3.1 For ease of reference the following terms have been used in the ES:

- Former Royal Mail Sorting Office – the name of the development, for which planning consent is sought;
- The site – the area within the planning application boundary;
- The wider MOL – the wider area of Metropolitan Open Land to the west of the site, not including the small area of MOL at the western end of the site that is currently occupied by a car park associated with the former sorting office; and

- Proposed development – the development for which planning permission is sought as described in **Chapter 3**.

1.4 The EIA, ES and Related Documents

1.4.1 This Environmental Statement presents the findings of an Environmental Impact Assessment (EIA) undertaken in accordance with The Town and Country Planning (Environmental Impact Assessment) Regulations 2011, referred to as the 'EIA Regulations'.

1.4.2 Running concurrently with the design process, the EIA has sought to identify appropriate design and construction measures and good practice to mitigate potential adverse environmental effects and maximise environmental opportunities which might arise as a consequence of the construction and operation of the proposed development as well as determining the residual environmental effects remaining after mitigation has been incorporated.

1.4.3 The ES comprises the following separate volumes:

- **Volume 1: Main Report**;
- **Volume 2: Appendices**; and
- **Non-Technical Summary**.

1.4.4 The other principal documents to be submitted as part of the planning application are:

- Design and Access Statement;
- Planning Statement;
- Transport Statement;
- Statement of Community Involvement;
- Sustainability Statement (including Energy Strategy); and
- Employment & Economic Case.

1.5 Stakeholder Consultation

1.5.1 An extensive programme of stakeholder consultation was undertaken to inform the design of the proposed development and the EIA.

1.5.2 An extensive stakeholder database was established by John Thompson and Partners, who managed the consultation process, which included: community groups, special interest and residents' groups, local schools and churches, local Councillors and politicians. Stakeholders, along with approximately 2,000 local households, were then invited to a Community Planning Weekend.

1.5.3 Prior to running the Community Planning Weekend, a series of animation events and discussions took place with a number of key local stakeholders (Age UK, Friends of the River Crane Environment (FORCE), and various youth groups at Heatham House) to understand their hopes and aspirations for the site, as well as the local town centre. At the time, LBRuT was running a consultation regarding the future of Heatham House, with the proposal being to relocate the facilities of Heatham House to a new purpose built community facility, located on the Sorting Office Site.

1.5.4 Nearly 100 people attended the Community Planning Weekend on Friday 23rd and Saturday 24th March 2012 at the Richmond Adult Community College, Twickenham. Participants included local residents, representatives from The Twickenham Society, FORCE, Richmond Environment Trust, Twickenham Residents Action Group, and local councillors. The aim of the event was to bring together everyone with an interest in the development and the surrounding neighbourhood to produce a practical vision for its future. Over the two days, 'Hands on Planning' workshops, walkarounds of the site and local area and wider discussions about Twickenham took place.

1.5.5 The outcomes of the Community Planning Weekend were analysed to develop an illustrated vision and indicative masterplan which was reported back to the local community on Wednesday 25th April 2012 at Richmond Adult Community College. Around 40 people from the local community attended the session.

1.5.6 Following the report back, in response to the community desire to continue to participate and engage in the design process, two forums were held, one in May and one in July, to continue to provide the opportunity for the community to engage with the design team in the development of the site's proposals.

1.5.7 In addition to the above consultations, there has been on-going consultation with various statutory and non-statutory bodies to inform the design and the EIA process. This topic-specification consultation is identified as appropriate in each of the topic chapters of this ES.

1.5.8 The input of everyone who contributed to the consultation process is gratefully acknowledged.

1.6 Project Team

1.6.1 The project team is as follows:

- CgMs: Archaeology;
- Anstey Horne: Daylight & Sunlight;
- The Ecology Consultancy: Ecology & Nature Conservation;
- John Thompson & Partners: Architects, Townscape & Visual, Public Consultation;
- JWG & Associates: Built Heritage;

- Peter Brett Associates: EIA Coordination, Transport, Noise, Air Quality, Flood Risk, Socio-Economics, Waste;
- RSK: Land & Water Quality, Drainage; and
- Whitecode Design Associates: Energy, Code for Sustainable Homes and BREEAM pre-assessments.

1.7 Structure of the Environmental Statement

1.7.1 The ES is structured as follows:

- **Chapter 2**: description of the site and the surrounding area;
- **Chapter 3**: summarises the proposed development, including sustainability, utilities and the consideration of alternatives;
- **Chapter 4**: outlines the construction works;
- **Chapter 5**: provides the methodology adopted to undertake the EIA;
- **Chapter 6**: summarises the planning and policy context to the proposed development;
- **Chapters 7 to 17**: comprise the technical assessment chapters;
- **Chapter 18**: provides a summary and assesses impact interactions; and
- **Chapter 19**: provides a glossary of terms.

2 Site and Surrounding Area

2.1 The Site & Surroundings

2.1.1 The following description of the site and surroundings should be read in conjunction with the Site & Surrounding Area Plan and Site Photographs Plan provided in **Appendix A.1**.

2.1.2 The site entails the former Royal Mail Sorting Office, and is approximately 1.15 hectares, and is located approximately on National Grid Reference 515958,173623.

2.1.3 Much of the site comprises the derelict former sorting office buildings. These are relatively dilapidated structures of one to two storeys, of a variety of construction forms with flat and pitched roofs. The remainder of the site comprises hardstanding, principally a former car park at the western end of the site and service yard towards to the eastern end.

2.1.4 A topographical survey identified that ground levels at the site are typically 8-8.5m above ordnance datum (AOD). The site slopes down towards the River Crane to the north of the site and along the northern border to the east of the site, following the natural gradient of the River Crane corridor. This results in the lowest levels being measured in the north east corner of the site, where the site is beneath the level of London Road which at that location is on a bridge of the River Crane.

2.1.5 A small part of the western end of the site is designated as MOL, although this land has previously been developed and is currently occupied by a car park associated with the previous sorting office. The wider MOL extends to the west, between the railway line and the River Crane, and comprises overgrown bushes and trees, to which there is no public access.

2.1.6 The site is accessed from London Road (A310) immediately to the east of the site and which is elevated at this point due to the road continuing south on a bridge over the railway. From a single junction with London Road, there are two ramps that provide vehicular access into the site. One provides access to the service yard at the eastern end of the site. The second ramp is immediately adjacent to London Road Bridge and provides access to the Brewery Lane which provides the southern boundary of the site.

2.1.7 London Road provides the site's eastern boundary, with Brewery Lane the southern boundary. To the south of Brewery Lane are four railway cottages (nos. 1-4 Brewery Lane), a Network Rail substation and the London Waterloo to Windsor and Reading railway line. To the north of the site is the River Crane, which is confined to a concrete channel and, in a meander of the River Crane, an Astro Turf sports pitch, basketball pitch, skate/BMX park and outward bound facilities. The western end of the site is delimited by the extent of the former Sorting Office car park.

2.1.8 Beyond London Road and the wider MOL the site is surrounded by predominantly residential areas. Dwellings are located immediately to the north of the River Crane and to the south of the railway. The area is mainly characterised by semi-detached and terraced housing, dating from the late nineteenth century to the south of the site and early twentieth century to the north. The Richmond Adult Community College (Twickenham campus) is located approximately 300m to the south west of the site and Richmond upon Thames College is located approximately 500m to the west of the site.

2.1.9 Twickenham Railway Station is located to the east of London Road, adjacent to the site. London Road provides access to Twickenham town centre, which is approximately 500m to the south of the site.

2.2 History of the Site

2.2.1 A review of historical maps has identified that the site was occupied by a brewery, owned by the Cole family, from the early 17th century until the last 19th century. The brewery ceased operating by 1927, shortly before the council bought the site and built a Council Depot. The site continued to be operated as a depot until the early 1960s.

2.2.2 From the 1960s until the present day, the site has been occupied by the existing, albeit dilapidated, sorting office facilities.

2.2.3 In addition to the uses noted above a railway station building was also located on the site during the second half of the 19th century. The railway provides a long term southern boundary of the site, and the wider MOL has previously been used as railway sidings.

2.3 Environmental Setting

2.3.1 The geology of the site comprises a mantle of made ground extending to depths of between 0.5m and 2.5m, underlain by organic-rich alluvial deposits, with the Kempton Park Gravel beneath. These superficial deposits are underlain by the London Clay Formation, which was encountered at depths of between 2.8m and 5.85m and proven to a depth of 25m.

2.3.2 The hydrogeology of the site is characterised by the presence of a shallow aquifer within the Kempton Park Gravels (and anticipated to be present with the identified Alluvial Deposits), perched upon the underlying London Clay Formation.

2.3.3 There are no watercourses within the site. The site is located immediately adjacent to the River Crane, which flows in a north easterly direction along the northern boundary of the site to its confluence with the River Thames just upstream of Isleworth Ait. Adjacent to the site, the banks of the watercourse are heavily modified and constructed of reinforced concrete, which in certain places has fallen into a state of disrepair. The channel of the River Crane is relatively shallow throughout the reach and is confined in near vertical banks. The River Crane enters a culvert underneath the London Road adjacent to the north eastern corner of the site.

2.3.4 The site is located within Flood Zone 1 as 'land assessed as having a less than 1 in 1,000 year annual probability of river or sea flooding'. It is therefore deemed to be at a low risk of flooding. Historical records confirm that there are no known reports of fluvial flooding in the immediate vicinity of the site.

2.3.5 The habitats within the site are dominated by buildings and hardstanding, with scattered trees around the boundary of the site and scattered scrub and tall ruderal growing through cracks in the hardstanding. The River Crane at St Margarets (Richmond side) a Site of Borough Grade II Importance for Nature Conservation (SINC) is adjacent to the north eastern boundary of the site. The Twickenham Junction Rough Site of Local Importance for Nature Conservation (SLINC) is located directly adjacent to the site, along the entire western boundary.

2.3.6 The noise environment at the site is dominated by local vehicular traffic, especially associated with London Road, and the railway to the south of the site. The entire Borough of LBRuT is located within an Air Quality Management Area (AQMA) due to elevated concentrations of nitrogen dioxide.

2.3.7 There is one statutorily Listed Building, Heatham House, located to the north of the site in Whitton Road. It is Grade II listed and was first listed on 2nd September 1952. Whilst being a designated heritage asset, the house, walls, entrance gates and piers do not form part of an Asset Grouping, as defined by English Heritage. Other buildings of more local heritage interest in the vicinity of the site as identified in **Chapter 15** Built Heritage.

3 The Proposed Development

3.1 Description of Proposed Development

Introduction

3.1.1 The proposed development entails a full planning for the comprehensive redevelopment of the sorting office site for a residential-led mixed use development.

3.1.2 The quantum of development proposed is set out below:

- 110 residential units (28 houses and 82 apartments);
- Two restaurants each of approximately 300m^2 each; and
- Community building of approximately 1,265m^2.

3.1.3 It is anticipated that 10% of the proposed dwellings will be for affordable housing, however this will be subject to consideration by LBRuT of the viability appraisal submitted with the planning application.

Development Drawings

3.1.4 A full set of drawings has been included with the planning application. In addition, to support the description of the proposed development set out below and to allow the environmental effects of the development to be fully understood, the following figures are provided in **Appendix A.2**:

- Site Plan;
- Apartment Block Lower Ground Floor Plan;
- Apartment Block Ground Floor Plan;
- Apartment Block First Floor Plan;
- Apartment Block Second Floor Plan;
- Apartment Block Third Floor Plan;
- Apartment Block Fourth Floor Plan;
- Apartment Block Roof Plan;
- Apartment Block External Elevations;
- Community Building Basement and Ground Floor Plans;
- Community Building First and Second Floor Plans;

- Community Building Third and Fourth Floor Plans;
- Community Building East and West Elevations
- Community Building North and South Elevations; and
- Landscape Masterplan.

Apartment Block

3.1.5 The apartment block comprises a horseshoe-shaped building of three to five stories around a central landscaped courtyard. The ground floor will provide two restaurants, including one overlooking the River Crane, along with residential apartments. The upper floors are entirely residential. The block will accommodate 22 one bedroom apartments and 60 two bedroom apartments. A basement will be provided beneath the block providing 68 car parking spaces, cycle parking, refuse areas and plant space.

3.1.6 The apartment block has been designed such that London Road frontage is lower than the proposed railway station redevelopment and Regal House and Bridge House, further to the south on London Road. Heights are also lower towards Heatham House and the River Crane to minimise overshadowing, with taller elements being towards the south.

3.1.7 All apartments will have private balconies/terraces.

3.1.8 The landscaped courtyard connects to a public piazza in the north east corner of the site, overlooking the River Crane. The piazza is to be used for informal recreation as well as outdoor dining associated with the two restaurants. The piazza connects to a river walkway between the apartment building and the River Crane.

3.1.9 An Energy Centre will be located within the basement. This will comprise a 70 kilowatt electric gas-fired combined heat and power (CHP) unit, providing space heating to the proposed apartments, along with boilers to 'top up' where required. The CHP unit will also be connected to the community building to provide heating and power.

3.1.10 The basement will be accessed from a ramp on the southern façade, which then connects to the existing junction on London Road.

Community Building

3.1.11 The community building will be five storeys fronting onto London Road, albeit that the building will sit lower than London Road. To the rear will be a single storey community hall, under part of which there will be a small basement. The design and use of the building has been subject to extensive discussion with LBRuT as it is intended that the community building will be an LBRuT facility. It is proposed that the community building will provide the following:

- 350-400 seat community hall area, café and reception area on the ground floor;

- Flexible floor space on the first, second, third and fourth floors;
- Small basement providing dressing rooms and storage space; and
- A first floor roof terrace above the community hall.

3.1.12 The final uses of the community building will depend on the requirements of the LBRuT and the local community, but are anticipated to entail live music performances, theatre, rehearsals, music studios and sporting activities.

Houses

3.1.13 The central and western part of the site will provide 28 houses; 6 three bedroom houses and 22 four bedroom houses.

3.1.14 These will be located in five short terraces orientated north to south. The houses will be three storeys, with rooms also provided in roof space. Each house will have a private garden and two car parking spaces.

3.1.15 The proposed houses will have individual boilers, along with photovoltaic panels located on the roof.

3.1.16 It is proposed to provide a boundary fence along the northern boundary of the site to screen the houses from noise associated with the sports pitches to the north.

3.1.17 The houses will be accessed from Brewery Lane, which then connects to the existing junction with London Road.

Sustainability

3.1.18 An Energy Strategy, prepared by Whitecode Design Associates, has been submitted with the planning application outlining the sustainability credentials of the proposed development and how it is proposed to minimise the development's carbon dioxide emissions.

3.1.19 Sustainability has been an important consideration in the design of the proposed development as evidenced by the residential units achieving level 4 of the Code for Sustainable Homes (CfSH) and the commercial units achieving a 'Very Good' rating under BREEAM.

3.1.20 The energy strategy for the site is based around the London Plan approach of being lean, clean and green. As noted above the proposed development includes a combined heat and power unit that will serve the apartment building and community building, while the houses will be fitted with photovoltaic panels.

Landscaping

3.1.21 The landscape strategy for the development is based around the following six character areas:

- The Piazza: At the front of the site, adjacent to the London Road and opposite the station, it is proposed to create a new contemporary public piazza space. This area will be set at the same level as London Road and will feature a curved seating amphitheatre overlooking the river. Three large specimen trees will be planted to provide a sense of vertical enclosure and the active frontage from the adjacent restaurants will further animate the area encouraging an 'Al Fresco'. The space will be paved with high quality masonry materials set in a simple pattern which will provide great flexibility of public uses and civic functions.

- The riverside promenade: Adjacent to the river it is proposed to provide a ramped pedestrian link from the sports pitches area up to the piazza level. A level linear terrace overlooking the river is proposed, along with a tiered landscaped terrace.

- The landscape curtilage to the new community building: Along the curved ramped access road it is proposed to plant a line of semi-mature street trees in front of the new community building. Two further breakout landscape spaces are provided to cater for outdoor seating and general relaxation.

- The communal courtyard garden to the apartment block: At the centre to the apartment block it is proposed to provide a high quality landscaped communal garden. This space will include raised planters planted with specimen multi-stem trees and shrubs. A central water feature will provide a quiet focal seating space.

- The mews style entrance courts to the townhouses: A series of three mews styled courtyard spaces will be created to provide feature entrances to the town houses. The mews will also cater for private car parking and be laid out in a formal manner, framed with mature tree planting. The ends adjacent to the sports pitches will be finished with 3m high masonry walls. These walls will be planted with climbers and pleached trees.

- Brewery Lane: It is proposed to plant an evergreen hedge and line of trees along the boundary adjacent to the railway line. This will provide visual screening and provide attractive trees to line the road. Access will also be provided on major match days for the underpass under London Road to be used by pedestrians to enhance access to the station.

3.2 Incorporated Mitigation

3.2.1 The iterative nature of the EIA process has resulted in the incorporation of a number of mitigation and enhancement measures during the design phase. These are explained in detail in the topic chapters of this ES. The following summarises some of the key mitigation measures incorporated into the proposed development to ameliorate potentially significant environmental effects and provide environmental enhancements:

- Provision of a new community building following extensive consultation with LBRuT to provide a range of flexible community space for the benefit of the local community and future residents of the development.

- The height and massing of the development, especially the apartment and community buildings, have been designed to minimise adverse effects (relating to wind, daylight and sunlight, built heritage) on adjacent properties. The design has considered these potential effects in the context of the proposed redevelopment of Twickenham Railway Station.

- Provision of a noise barrier between the proposed houses and the sports pitches to the north of the site. The acoustic specification for facades around the development has been identified to ensure that the proposed dwellings achieve the 'good' internal noise standard (see **Chapter 11**).

- A drainage strategy to attenuate surface water has been prepared to reduce the rate of surface water discharge from the site and therefore reduce the local flood risk.

- Implementation of Travel Plans to minimise private car use and encourage public transport and walking/cycling.

- Provision of a centralised CHP unit for the apartment building and community building to reduce carbon dioxide emissions, in relation to traditional boilers.

- Separate from the proposed development, the transfer of land in the ownership of the applicant to LBRuT for the wider benefit of the community,

3.3 Consideration of Alternatives

Introduction

3.3.1 The EIA Regulations require an ES to include an outline of the main alternatives considered by the applicant, indicating the main reasons for the choice made, taking into account the environmental effects.

3.3.2 This legal requirement is expressed in very general and high-level terms, requiring only the inclusion of an "outline" of "main" alternatives and an "indication" of "main" reasons. Although a full description of alternatives and a full assessment of their likely environmental effects are not required, sufficient detail should be provided to allow for a meaningful comparison between the alternatives and the proposed development.

3.3.3 It is a matter for the applicant to decide which alternatives it intends to consider. The EIA Regulations do not expressly require that an applicant considers alternatives, although it is widely encouraged at the policy level, both European and domestic, and is a feature of EIA best practice.

3.3.4 The consideration of alternatives in this ES goes beyond what is required, helping to explain how alternatives were identified and why the proposed development was chosen in preference to them.

3.3.5 Paragraph 83 of Circular 02/99 provides the following national policy guidance on the consideration of alternatives in EIA: *"...consideration of alternatives (including alternative sites, choice of process, and the phasing of construction) is widely regarded as good practice, and resulting in a more robust application for planning permission. Ideally, EIA should start at the stage of site and process selection, so that the environmental merits of practicable alternatives can be properly considered*." This policy guidance has been taken into account when preparing this ES.

3.3.6 Alternatives should only be considered where they are feasible, realistic and genuine. This may depend on various factors, including planning policy, land ownership, financial viability, technical feasibility and design quality. Options which are unlikely to be acceptable or deliverable are not realistic alternatives and so do not need to be considered.

3.3.7 Whilst environmental effects are relevant when choosing between alternatives, other factors are also relevant. The main selection criteria which the applicant has used when choosing between the alternatives which it has considered include: planning policy, viability, design quality, market requirements, site constraints and opportunities and environmental effects.

3.3.8 The following provides an outline of the main alternatives considered in relation to the Former Royal Mail Sorting Office Twickenham and the main reasons for choosing the proposed development in preference to them.

No Development & Alternative Sites

3.3.9 The site was vacated by the Royal Mail Group in October 2011. Since the site was acquired by St James in December 2011 the site has been used by a small scale local distribution company. However, the full potential of the site will remain unfulfilled in its present state as it fails to contribute to the local economy, provides no opportunity to deliver community facilities and due to its condition it detracts from the local townscape and the River Crane environment. The adjoining land owned by Network Rail has also deteriorated in its appearance and suffers from a lack of maintenance. This has resulted in a decline in the living environment of the four railway cottages lying adjacent to the site. On-going site security also remains an issue.

3.3.10 LBRuT's adopted Core Strategy (2009; see Chapter 6) identifies the site within the Key Diagram as a *"site with potential for change"* although the Core Strategy is silent on any specific use. However, it is clear that there is an expectation to maximise the benefits from redevelopment opportunities. The site has been promoted for redevelopment by LBRuT in the current allocation from the UDP and more recently in the emerging Twickenham Area Action Plan (again see Chapter 6).

3.3.11 Therefore, St James has not considered no development of the site, or the development of an alternative site rather than this site, as one of the main alternatives to the proposed development, for the reasons stated above (i.e. planning policy) and because no development would only lead to the further deterioration of buildings on the site and a worsening of the local townscape (i.e. adverse environmental effects).

Extent of the Site

3.3.12 Consideration has been given to including the MOL to the west of the site within the site for the purposes of the planning application. This option entailed providing a public footpath, running east to west, through the MOL to provide public access to this area into which there is currently no public access.

3.3.13 It was decided that the MOL should be excluded from the site for the purposes of the planning application. The land will instead be transferred to the LBRuT to allow future public access as part of a wider set of proposals for a footpath link alongside the River Crane incorporating other LBRuT land in the local area. As a result, the EIA has considered the potential cumulative effect of the proposed development and the footpath route set out within the emerging Twickenham Area Action Plan and associated information available from LBRuT at the time of preparing the ES.

Proposed Uses

3.3.14 St James is an established developer of residential accommodation and therefore it was not realistic or necessary for it to consider development other than a residential-led scheme. However, the proposed development includes other uses which are considered beneficial to the vitality and viability of the town centre and which will provide community benefit.

3.3.15 A key consideration in the initial stages of the design process was the potential for the local youth facility to be relocated from Heatham House to a new building within the site. This was the subject of public consultation held by LBRuT in the first half of 2012 regarding the future provision of youth facilities in the area. A number of potential locations for a youth centre within the site were therefore explored (locating the facility in the western, north eastern and south eastern corners of the site).

3.3.16 Following LBRuT's decision to retain the youth facility at Heatham House, LBRuT and St James considered alternative opportunities for the provision of local community/leisure uses and it was agreed that a community building and two restaurants should be included within the scheme.

3.3.17 Alternative uses at the site, in preference to the community building or restaurants included: a cinema (which was considered to have fewer community benefits than the community building), and office and retail space (both of which were discounted due to the availability of vacant comparable space elsewhere in the town centre).

3.3.18 It was decided through the design process that the community building should be located in the south eastern corner of the site as this provides good access from London Road and makes the centre more prominent from London Road and the railway station, which should increase its use by the public. The proposed uses within the community building have been subject to iteration through the design process and are based around the requirements of LBRuT and the public consultation, while providing flexibility in future use.

3.3.19 An earlier design of the community building comprised a building of 2-4 storeys, stepping down in height away from London Road. This design was subject of detailed testing by the EIA team to understand its environmental effects prior to being superseded by the proposed design which was preferred on the basis of better meeting the requirements of LBRuT. The layouts of the previous design are included in **Appendix A.3**. As explained in the relevant topic chapters these layouts were used as the basis of the noise and quality modelling reported in this ES as the subsequent changes to the community building to better meet the requirements of LBRuT should not cause any material changes to the noise and air quality effects that have been identified or the requirements for mitigation.

3.3.20 The proposed quantum and mix of residential accommodation has been identified by St James to reflect market demand and in accordance with relevant planning policy. This ensures that the proposed development remains viable and allows for the redevelopment of this previously developed site.

3.3.21 Therefore, St James has chosen the preferred development in preference to alternative uses of the site for the reasons stated above (i.e. planning policy, market demand), along with maximising the social benefits of the community building and minimising daylight and sunlight effects.

Site Layout

3.3.22 The proposed development layout is the result of a process of community consultation and pre-application discussions with LBRuT and to reflect relevant design policies from the Development Plan. Through this design process a number of potential layouts and ideas for the redevelopment of the site have been investigated. Photographs 1, 2 & 3 (included in **Appendix A.3**) are of alternative plans that were formed during the community planning weekend with input from local residents who attended the event. Sketch options 1-4 (included in **Appendix A.3**) show early design ideas of the layout which illustrates how the initial site layout evolved. However, consideration has also been given to the need to maintain existing rights of way for both Network Rail and the residents of the four railway cottages.

3.3.23 It was quickly established that a north-south layout of finger blocks was the best option for the western part of the site, as shown on photograph 3 and sketch options 1, 3 & 4, which allows light and views through the site with courtyards to the front of properties and gardens to the rear, and which also provides an animated frontage facing the railway line to the south.

3.3.24 Alternative options therefore generally focused on the eastern part of the site facing London Road, in particular the massing and layout of these buildings. Key issues to be addressed included the change in ground levels between the site and the London Road, enhancement of the River Crane environment, delivery of appropriate town centre uses, relationship between public and private realm and the scale and massing of proposed buildings. The proposed development is considered to appropriately address all of the above and to positively contribute to the townscape of this part of Twickenham.

3.3.25 Careful consideration has also been given to the location of open space within the development. The focus for public open space has concentrated on the north eastern corner of the site as this offers views over the River Crane, easy access from London Road, an improved environment for London Road and the opportunity to provide outdoor eating space associated with the restaurants.

3.3.26 No realistic and feasible alternatives have been identified in relation to providing access into the development due to the suitability of the junction with London Road. The main access to the front of the site provides access to the basement car park under the apartment block and wider development. The ramp which lies to the front of the site (outside of the application boundary) is owned by Network Rail. However, St James benefits from a right of way over this ramp and it will be used to access the houses in the western half of the site and continue to provide access to the four railway cottages and the Network Rail electricity sub-station.

3.3.27 Therefore, St James has chosen the preferred development in preference to alternative layouts of the site for the reasons stated above (i.e. accessibility) and reasons relating to townscape & visual, daylight & sunlight effects (i.e. environmental reasons).

Scale & Massing

3.3.28 In terms of scale and massing of the proposed development, the heights of the buildings in the eastern half of the site was considered carefully, taking account of the change in levels between London Road and the site, the sensitivity of the setting of Heatham House and the River Crane, and relevant planning policy.

3.3.29 Following consultation with the Environment Agency and Friends of the River Crane Environment, consideration has been given to how the scheme could improve the condition of the River Crane. This has been achieved by avoiding locating tall buildings on the site that significantly overshadow the river, removing significant sources of contamination that may be present at the site and could be affecting water quality prior to development, preparation of a drainage strategy and creation of a riverside walk and piazza overlooking the river. Given the limited extent of the river channel adjacent to the site it was not considered practicable or to achieve sufficient environmental benefits to undertake any works to the river channel itself.

3.3.30 Therefore, St James has chosen the preferred development in preference to alternative scale and massing for the reasons stated above (i.e. setting, planning policy) and reasons relating to daylight & sunlight effects (i.e. environmental reasons).

Construction Phasing

3.3.31 It is proposed that the construction of the apartment building, community building and houses will be undertaken in three phases which will run concurrently. This approach to construction has been adopted as it provides the most efficient approach to delivering a development of this size, utilising the inherent efficiencies of a large construction project. The development is not of the size where separate phases are required due to too many dwellings needing to be marketed at the same time, resulting in properties remaining vacant for an extended period awaiting sale. Further, undertaking the construction phases concurrently minimises the duration of construction and therefore the duration of adverse environmental effects (noise, dust, construction traffic, etc.) associated with construction.

Conclusion

3.3.32 As set out above, alternatives have been considered as part of the design of the proposed development. Some options were discounted at a relatively early stage because they are not feasible, realistic and genuine. The remaining options formed the "main alternatives" which St James considered. These options performed less well than the proposed development when considered in accordance with St James' selection criteria, including environmental effects. These alternatives have been considered in the context of local planning policy and the opportunities and constraints of the site and surrounding area. It is considered however that the proposed development best achieves the requirements of local planning policy, bringing the site back into beneficial use while also provides new facilities and amenities for the local community.

4 Construction and Site Management

4.1 Introduction

4.1.1 This chapter provides information on the construction of the proposed development and the management of the construction site.

4.1.2 St James is registered with the Considerate Contractor's Scheme and will implement a Construction Management Plan (CMP) for the construction works. This will outline the arrangements and management practices adopted to minimise the environmental effects of construction and which will be agreed with LBRuT prior to the commencement of construction.

4.1.3 The likely scope of the CMP is outlined in **Section 4.3** below.

4.2 Construction Works & Programme

4.2.1 It is anticipated, subject to receipt of planning permission, that construction is expected to start in 2013 and be completed by 2015. The key construction phases are anticipated to be:

- Demolition & Enabling Works: July to May 2013;
- Groundworks: May 2013 to February 2014;
- Construction of the houses: August 2013 to November 2014;
- Construction of the community building: October 2013 to June 2015; and
- Construction of the apartment building: February 2014 to June 2015.

4.2.2 For the purposes of this assessment it has been assumed that first occupation of the scheme could be in 2014.

4.2.3 The key construction activities are likely to include:

- Demolition and site clearance, including the crushing of demolition materials for re-use on site where appropriate;
- Earthworks and soil preparation to prepare the development area;
- Installation of foundations including use of piling (which is anticipated to be continuous flight auger piling and vibro piling);
- Construction of building structure, cladding and glazing and internal walls and partitions;
- Installation of fixtures, fitting and building services;

- Utility diversions, upgrades and connections; and
- External landscaping, highway and drainage works.

4.3 Construction Management

4.3.1 All of the construction operations carry with them a range of issues to be dealt with in their design, preparation and execution. Due to the urban location of the site, best practice in construction management will be required to minimise the environmental effects and disruption that could be caused by the construction works. This will minimise disruption to affected communities, businesses and services.

4.3.2 It is proposed to utilise a Construction Management Plan (CMP) to manage the impacts of construction. The CMP will be a comprehensive document for the management of the construction works, including environmental and transport related aspects.

4.3.3 Based on the CMPs utilised by St James to manage construction on other developments and the construction works required for the development it is anticipated the CMP will cover the following:

- Roles and responsibilities;
- Construction traffic routing;
- Site access;
- Deliveries;
- Road washing;
- Road Cleansing;
- Parking;
- Arrangements for the management of contractors;
- Dust and noise suppression;
- Considerate Contractors Scheme;
- Residents' Liaison Officer;
- Crane usage;
- Protection of water resources;
- Contamination; and
- Archaeology.

4.3.4 The exact format of the CMP will need to be reviewed once the construction techniques and methodologies to be employed in the various stages of the project are confirmed. It is proposed that the requirement for such a CMP be secured through an appropriate planning condition.

4.4 Construction Waste

4.4.1 A Waste Management Strategy (see **Appendix A.4**) has been prepared to guide waste management during the construction and operation of the proposed development. This will be taken forward for the construction phase through the preparation of a detailed Site Waste Management Plan (SWMP; in accordance with the requirements of the Site Waste Management Plan Regulations 2008) to minimise and control the waste. The main aims of the SWMP will be to ensure compliance with waste legislation and to move waste up the hierarchy, diverting as much waste as possible from final disposal to more sustainable waste management option, i.e.:

- Reduction;
- Re-use;
- Recovery (i.e. recycling); and
- Disposal (i.e. landfill/incineration).

4.4.2 The SWMP will be consistent with the CMP.

5 Assessment Method

5.1 Introduction

5.1.1 This chapter describes the process by which the EIA was carried out. It includes a discussion of the relevant Regulations, the EIA process, consultations, and the assessment method.

5.2 EIA Regulations

5.2.1 Procedures relating to the assessment of the environmental effects of development are described in The Town and Country Planning (Environmental Impact Assessment) Regulations 2011. These implement EC Directive 85/337/EEC, as amended, into domestic legislation. The initial Directive and its three amendments have been codified by Directive 2011/92/EU. The Regulations set out the procedures for undertaking an EIA and the information which is required in an Environmental Statement (ES). Formal guidance on procedures under the EIA Regulations was issued in Circular 02/99 and the Government has also published a booklet entitled "Environmental Impact Assessment: A Guide to Procedures" (November 2000).

5.3 The EIA Process

5.3.1 In general terms the main stages in the EIA are as follows:

- Screening – determining the need for EIA;
- Scoping – identify significant issues, determining the scope of the EIA;
- Data Review – draw together and review available data;
- Baseline Surveys – undertake baseline surveys and monitoring;
- Assessment & iteration – assess likely significant effects of development, evaluate alternatives, provide feedback to design team on potential adverse impacts, modify development or impose parameters, incorporate mitigation (including monitoring and long-term management), assess effects of mitigated development; and
- Preparation of the ES.

5.3.2 It should also be noted that, as summarised in **Section 5.5**, consultation with relevant stakeholders has been undertaken throughout the EIA process.

5.4 Screening and Scoping

5.4.1 Early in the planning of the proposed development St James identified that the development would constitute EIA development in the context of the EIA Regulations. Through pre-application discussions with LBRuT St James confirmed that they would undertake a voluntary EIA. A formal EIA Screening Opinion was not therefore sought.

5.4.2 On the basis that an EIA would be required for the proposed development, a scoping exercise was undertaken to identify the potentially significant environmental issues relating to the proposed development to ensure that they are subject to an appropriate level of assessment, thereby providing a focus for the EIA.

5.4.3 The scoping exercise involved reviewing the proposed development in relation to existing site conditions, the team's experience of other projects of a similar nature, potentially significant issues, perceived by the team and consultees, and the means by which they would be assessed.

5.4.4 The findings of the scoping exercises were documented in an EIA Scoping Report (prepared by Peter Brett Associates LLP, dated May 2012), which was submitted to LBRuT in support of an EIA Scoping Opinion Request. The Scoping Report is provided in **Appendix A.5**

5.4.5 Following further pre-application discussions, an addendum to the EIA Scoping Report, was issued in August 2012 (a copy is provided in **Appendix A.5**). This addendum explained that the extent of the site proposed for development had been reduced since the EIA Scoping Opinion was submitted, clarified the quantum of development proposed and updated the proposed scope of the EIA.

5.4.6 LBRuT's EIA Scoping Opinion (dated 22nd August 2012) is provided in **Appendix A.6**).

5.4.7 This ES has been prepared to document the assessment undertaken in accordance with the Scoping Report, addendum and Scoping Opinion.

5.5 Consultations

5.5.1 A comprehensive programme of consultations has been undertaken with statutory and non-statutory organisations as well as community engagement events and workshops with the local community. Such consultations have been to undertaken to inform the emerging design and EIA.

5.5.2 As part of the EIA process the following consultees have been consulted to agree the scope of the assessment, to provide information, to discuss assessment methods and findings, and agree mitigation measures and design responses:

- London Borough of Richmond upon Thames (LBRuT);
- Environment Agency;
- Transport for London (TfL);

- Thames Water;
- Network Rail; and
- Friends of the River Crane Environment (FORCE).

5.5.3 The EIA has been undertaken to fulfil the requirements of the consultees and the assistance of these consultees is gratefully acknowledged.

5.5.4 In addition a comprehensive programme of public consultation has been undertaken. This is summarised in **Section 1.5** drawing upon the Statement of Community Involvement submitted with the planning application.

5.6 Cumulative Developments

5.6.1 The EIA Regulations require the assessment to consider the potential effects of the proposed development in the context of other major local developments as well as the cumulative effects that may result from the proposed development and these other developments.

5.6.2 A review has therefore been undertaken of major local developments which either have planning permission or are currently within the planning system. This has identified that the only major local development that is sufficient scale and proximity to the site to potentially lead to significant cumulative effects is the redevelopment of Twickenham Railway Station.

5.6.3 Planning permission was granted on 30th March 2012 for the redevelopment of Twickenham Railway Station. This will entail a new ticket office and concourse, 115 residential units, 734m^2 of commercial space, car and cycle parking and a pedestrian route along the River Crane. The development will be in three blocks of two to seven storeys.

5.6.4 The redeveloped station has therefore been considered in the future environmental baseline against which effects have been considered and the potential for cumulative effects from the two schemes have also been assessed.

5.6.5 As noted in section 3.3, the wider MOL to the west of the site is to be transferred to LBRuT. It is understood that LBRuT will be promoting development proposals to provide public access and a footpath link through the wider MOL which includes its own land. At the time of preparing this ES further specific information on LBRuT's proposals was not available.

5.6.6 To consider the likely cumulative effects of the proposed development and LBRuT's footpath proposals each topic chapter of this ES includes an 'Assessment of Cumulative Effects of MOL Proposals' section which assesses the cumulative effects of the proposed redevelopment of the former Royal Mail Sorting Office and the intention to provide a footpath through the wider MOL. In the absence of further information on LBRuT's proposals it has been assumed for the purposes of this ES that the proposed footpath would run from the site adjacent to the north west corner of the apartments building, to the north of the sports pitches and then through the length of the wider MOL. The connection at the western end of the MOL is not known but it is assumed that the footpath would extend to the full length of the wider MOL. To provide a conservative assessment it has been assumed that the footpath will be at least partially lit and will be open 24 hours per day.

5.6.7 The assessment of such cumulative effects has been based on information collected in relation to the site and the proposed development. Some surveys have been undertaken in the wider MOL, however, wider surveys of the MOL have been precluded as the area cannot be accessed. Where the absence of data causes uncertainty to the assessment of cumulative effects is identified as appropriate in each of the topic chapters. Environmental aspects that LBRuT should consider in the design of the footpath are identified as appropriate.

5.7 List of Assumptions

5.7.1 The following assumptions have been used to ensure that the EIA has undertaken an assessment of reasonable worst case effects (unless otherwise specified in each of the technical chapters) has been undertaken:

- Construction will commence in 2013 and will continue until 2015, in accordance with the key construction phases identified in chapter 4. It has been assumed that the first occupation of the development could be in 2014 and that construction may still be underway when first occupation commences.
- Baseline conditions are generally considered to be current conditions at the site and surrounding area, however the redeveloped Twickenham Railway Station has also been considered as part of a future baseline where appropriate. Where significant changes are likely to occur in a 'no development' scenario such changes are identified as appropriate within each topic chapter. The potential for cumulative effects as a result of the construction and operation of the two developments has been considered.
- It is proposed that 10% of the dwellings to be provided will be affordable, however this is subject to viability testing. It has been assumed for the EIA that the affordable provision will be 10%.

- It is understood that LBRuT will be promoting proposals to provide public access and a footpath link through the wider MOL. In the absence of further information on LBRuT's proposals it has been assumed for the purposes of this ES that the proposed footpath would run from the site adjacent to the north west corner of the apartment building, to the north of the sports pitches and then through the length of the wider MOL. The connection at the western end of the MOL is not known but it is assumed that the footpath would extend to the full length of the wider MOL. To provide a conservative assessment it has been assumed that the footpath will be at least partially lit.

5.7.2 Following the substantial completion of the assessments reported in the ES further consultation has been undertaken with LBRuT regarding the community building. In response to the requirements of LBRuT the design of the community building has been amended, slightly altering the external appearance and internal configuration of the building.

5.7.3 The townscape and visual impact assessment has been updated to identify the impacts resulting from this change to the visual appearance of the building. The other topic assessments reported in this ES are not materially affected by these very limited design changes. The assessments have not therefore been updated and the assessment of effects and mitigation requirements remain valid. For completeness drawings identifying the previous layout/appearance of the community building, and upon which the assessments have been based, are provided in **Appendix A.7**.

5.8 Assessing Effects

Introduction

5.8.1 The assessment of potential environmental effects assesses the likely effects of the proposed development against baseline conditions in the same year (i.e. providing an assessment of 'do something' and 'do nothing').

Establishing Baseline Condition

5.8.2 A range of site surveys and data collection exercises have been used to identify environmental conditions at the site. Surveys have been undertaken over several years as the planning of the proposed development and where surveys are considered to have become dated these have superseded or corroborated by up-to-date surveys. The surveys undertaken are reported in each of the topic chapters.

5.8.3 The assessment has been based on technical surveys and assessments, the reporting of which is frequently too detailed and lengthy for incorporation into Volume 1 of this ES (e.g. ecology surveys and daylight and sunlight assessments). In such instances the technical survey and assessment reports are provided in full as an appendix to this ES (Volume 2), with a relevant summary and the reference for the full survey or assessment provided in the ES. The geographical scope of these appended surveys and assessments has been based on the likelihood for significant effects in accordance with the scoping exercise summarised above.

5.8.4 Due to the limited potential for conditions at the site to alter, without development proceeding, between now and the proposed completion year for the development (2015) current conditions have been used to define baseline conditions, although the redeveloped Twickenham Railway Station has been included in the future baseline where appropriate. The exception to this is where there potentially significant changes are anticipated (e.g. in background air quality or traffic levels), in which case future conditions are explained in the relevant topic chapter.

Assessing Operational Effects

5.8.5 To provide a robust assessment and one that is generally consistent between topic chapters, the EIA has focused on assessing the environmental effects of the full, completed development. Therefore, the EIA has generally assessed the likely effects in 2015, the year the development is proposed to be completed and fully occupied/operational. This approach ensures that maximum exposure is considered as well the full environmental effects of development itself. Where worst case effects could occur during an earlier year (e.g. air quality effects need to be considered during the year of first occupation as background air quality can be improving) then such an assessment has been undertaken and this is reported in the relevant topic chapter.

5.8.6 As noted in **Section 3.3**, the noise and air quality assessments documented in this ES were based on a design of the community building which was subject to iteration following consultation with LBRuT on their requirements for the building. The iterations included the introduction of an additional floor and basement, along with a rounding of the building profile. As a result these iterations should not lead to any material changes to the assessment and requirement for mitigation reported in this ES.

5.8.7 A Transport Statement has been prepared in relation to the proposed development and submitted as a standalone document with the planning application. Traffic data calculated to inform the Transport Statement has been used to inform the noise and air quality assessments documented in this ES. It should be noted however that the proposed development is anticipated to generate less traffic than the previous use of the site as a sorting office and therefore there is limited potential for transport related effects.

5.8.8 The Townscape and Visual Assessment and Waste Strategy have been considered through standalone reports, best fitting the reporting requirements of these environmental topics. These reports are therefore included as appendices, with summaries included this Volume 1.

Assessing Construction Effects

5.8.9 The EIA has also assessed the potentially significant environmental effects that could occur during the construction phase. These effects will vary substantially during the construction process therefore judgements have been made to ensure that reasonable worst case effects are tested through consideration of the processes most likely to lead to significant effects.

5.8.10 Construction effects should be temporary, although due to the extent of the construction works required could occur over a number of years. Construction effects could also be intermittent, i.e. they will not occur at one place throughout the duration of the construction works. The potential duration and intermittency of effects is identified as appropriate in the relevant topic chapters.

5.8.11 Consideration has also been given to the potential for the occupiers of the first element of the development to be affected by the construction of the later phases. In addition the assessment has considered the potential for cumulative effects as a result of the construction of the proposed development and the redevelopment of the railway station.

5.8.12 In judging the significance of construction effects it has been assumed that the construction mitigation measures identified and the proposed CMP are fully implemented (as it is expected would be required by a suitable planning condition).

5.9 Uncertainty

5.9.1 The prediction of future effects inevitably involves a degree of uncertainty. Where necessary, the topic chapters describe the principal factors giving rise to uncertainty in the prediction of environmental effects and the degree of the uncertainty.

5.9.2 Confidence in predictions has been engendered by employing accepted assessment methodologies, e.g. Design Manual for Roads and Bridges and the Guidelines for Ecological Impact Assessment in the UK. Uncertainty inherent within the prediction has been described. As a general principle the ES has described credible, worst case foreseeable events and their effects.

5.9.3 Uncertainty also applies to the success or otherwise of measures to mitigate adverse environmental effects. Where the success of a mitigation measure is uncertain, the extent of the uncertainty has been identified in the ES and a suitable response identified.

5.10 Mitigation of Adverse Effects

5.10.1 The incorporation of mitigation measures; that is measures to avoid minimise or compensate for adverse effects, is an integral part of the design and related EIA process. A description and the significance of any potential residual effect, namely that which remains after mitigation has been incorporated, is presented in each topic chapter.

5.10.2 Key mitigation measures that have been incorporated into the proposals as a result of the EIA are identified in **Section 3.3**.

5.11 Residual Effects

5.11.1 Residual effects are the environmental effects that will remain after the incorporation of mitigation measures.

5.11.2 It is these residual effects which should be considered when assessing the significance of the proposed development impact, rather than the unmitigated effects as unmitigated effects will not occur. For example, the development may exceed relevant noise standards given its geographical location; however, following the incorporation of appropriate mitigation into the design, such as high specification glazing, this effect can be minimised and rendered insignificant. Thus there would be no residual effect.

5.11.3 To provide an objective assessment of residual effects the significance of residual effects has been determined and is identified in the ES. This allows for comparison of effects between topics and also strengthens the assessment of impact interactions.

5.12 Significance Criteria

5.12.1 The two principal criteria for determining significance of an environmental effect are the magnitude of the effect and the sensitivity of the receptor; in addition the likelihood of the effect occurring is also considered as appropriate. The approach to assessing and assigning significance to an environmental effect will rely upon such factors as; consideration of the EIA Regulations, guidelines, standards or codes of practice, the advice and views of statutory consultees and other interested parties, and expert judgement. The following questions are relevant in evaluating the significance of potential environmental effects:

- Which risk groups are affected and in what way?
- Is the effect reversible or irreversible?
- Does the effect occur over the short, medium or long term?
- Is the effect permanent or temporary?
- Does the effect increase or decrease with time?
- Is the effect of local, regional, national or international importance?
- Is it a positive, neutral or adverse effect?
- Are health standards or environmental objectives threatened?
- Are mitigating measures available and is it reasonable to require these?

5.12.2 Specific significance criteria will be prepared for each specialist topic, based on the generic criteria, for adverse and beneficial effects, set out in **Table 5.1**.

Table 5.1: Generic Significance Criteria

Significance Level	Criteria
Severe	Only adverse effects are assigned this level of importance as they represent key factors in the decision-making process. These effects are generally, but not exclusively, associated with sites and features of international, national or regional importance. A change at a regional or Borough scale site or feature may also enter this category.
Major	These effects are likely to be important considerations at a local or Borough scale but, if adverse, are potential concerns to the project and may become key factors in the decision-making process.
Moderate	These effects, if adverse, while important at a local scale, are not likely to be key decision-making issues. Nevertheless, the cumulative effect of such issues may lead to an increase in the overall effects on a particular area or on a particular resource.
Minor	These effects may be raised as local issues but are unlikely to be of importance in the decision-making process.
Not Significant	No effect or effect which is beneath the level of perception, within normal bounds of variation or within the margin of forecasting error.

5.13 Cumulative Effects

5.13.1 **Section 5.6** above identifies that the redevelopment of Twickenham Railway Station has been considered in the EIA as appropriate within the future baseline conditions identified in each topic chapter, while the potential for synergistic effects as a result of the proposed Former Royal Mail Sorting Office development has also been considered.

5.13.2 As a result the EIA has considered the potential cumulative effect of the proposed development with major development proposed in the local area.

5.13.3 In addition, and also as noted in **Section 5.6**, the EIA has also considered the potential for cumulative effects as a result of the proposed development and LBRuT's intention to promote proposals to create public access and a footpath link through the wider MOL. For clarity, this is cumulative assessment is reported through an 'Assessment of Cumulative Effects of MOL Footpath Proposals' section at the end of each chapter.

5.14 Impact Interactions

5.14.1 **Chapter 18** of the ES provides the assessment of impact interactions, i.e. receptors being affected by more than one environmental effect and therefore potentially being subject to a more significant combined effect than the individual effects reported in each of the topic chapters.

5.14.2 The approach adopted to the assessment is in accordance with the methodology set out above, with further details provided in **Chapter 18**.

5.14.3 **Chapter 18** therefore provides an overall summary of the effects of the proposed development during construction and operation, and provides an overall judgement on the beneficial or adverse environmental effect of the development.

6 Planning and Policy Context

6.1 Introduction

6.1.1 Section 38(6) of the Planning and Compulsory Purchase Act 2004 requires that where the development plan contains relevant policies, applications for development which are in accordance with the plans should be allowed unless material considerations indicate otherwise.

6.1.2 The current Development Plan material to the proposed redevelopment of the Sorting Office comprises:

- London Plan 2011;
- LB Richmond upon Thames Unitary Development Plan (adopted March 2005) – Saved Policies (March 2008);
- LB Richmond upon Thames Core Strategy (adopted April 2009); and
- LB Richmond Development Management Plan (adopted November 2011).

6.1.3 In addition to the above, the National Planning Policy Framework (NPPF) (published March 2012), the Twickenham Rail Station and Surroundings Design SPD (adopted October 2010), Crane Valley Planning Guidelines (adopted April 2005) and the emerging Twickenham Area Action Plan (TAAP) (Publication Version July 2012) represent material considerations in the determination of the planning application.

6.1.4 The Planning Statement that accompanies the planning application provides a detailed assessment of the proposed development against relevant policies. This chapter of the ES provides a summary of the key planning issues from national policy, the Development Plan and other supplementary documents that are material to the proposed development. Policies relevant to specific EIA topic are identified in the relevant topic chapters of this ES.

6.2 National Policy

6.2.1 The National Planning Policy Framework (NPPF) was published on 27th March 2012. Paragraph 13 confirms that it constitutes guidance for local planning authorities (LPAs) and decision-takers and a material consideration in the determination of planning applications. The following makes reference to the relevant sections in respect of the proposed development.

6.2.2 The NPPF replaces a raft of previous national guidance, including planning policy guidance (PPGs), planning policy statements (PPSs) and circulars, with one consolidated statement of national planning policy. A small number of earlier national guidance documents remain in force and these are referred to below where relevant.

6.2.3 For a period of 12 months from the date of publication of the NPPF, policies within development plan documents written since 2004 can continue to be given weight by decision makers even if there is a small degree of conflict with policies of the NPPF.

Achieving Sustainable Development

6.2.4 Paragraph 7 of the NPPF states that there are three dimensions to sustainable development - economic, social and environmental and these give rise to the need for the planning system to perform a number of roles:

- An economic role – contributing to building a strong, responsive and competitive economy, by ensuring that sufficient land of the right type is available in the right places and at the right time, to support growth and innovation; and by identifying and co-ordinating development requirements, including the provision of infrastructure;

- A social role – supporting strong, vibrant and healthy communities by providing the supply of housing required to meet the needs of present and future generations; and by creating a high quality built environment with accessible local services that reflect the community's needs and support, its health, social and cultural wellbeing; and

- An environmental role – contributing to protecting and enhancing our natural, built and historic environment; and, as part of this helping to improve biodiversity, using natural resources prudently, minimise waste and pollution, and mitigate and adapt to climate change including moving to a low carbon economy.

6.2.5 Paragraph 8 confirms that these roles should not be undertaken in isolation because they are mutually dependant and to achieve sustainable development, economic, social and environmental gains should be sought jointly and simultaneously through the planning system. The planning system should play an active role in guiding development to sustainable solutions.

6.2.6 Paragraph 14 confirms that at the heart of the NPPF is a presumption in favour of sustainable development, which should be seen as a golden thread running through both plan-making and decision-taking. For decision-taking, this means:

- Approving development proposals that accord with the Development Plan without delay; and

- Where the Development Plan is absent, silent or relevant policies are out-of-date, granting permission unless:

  - Any adverse impacts of doing so would significantly and demonstrably outweigh the benefits, when assessed against the policies in this framework taken as a whole; or

  - Specific policies in this Framework indicate development should be restricted.

6.2.7 Paragraph 17 confirms that, within the overarching roles that the planning system ought to play, a set of core land-use planning principles should underpin both plan-making and decision-taking. Relevant extracts from these principles in respect of the proposed development include:

- Proactively drive and support sustainable economic development to deliver homes, business and industrial units, infrastructure and thriving local places the country needs.
- To take account of market signals, such as land prices and housing affordability, and setting out a clear strategy for allocating sufficient land which is suitable for development, taking account of the residential and business communities.
- Encouraging the effective use of land by reusing land that has been previously developed (brownfield land), provided that it is not of high environmental value.
- Actively manage patterns of growth to make the fullest possible use of public transport, walking and cycling, and focus significant development in locations which are or can be made sustainable.
- Support local strategies to improve health, social and cultural wellbeing for all, and deliver sufficient community and cultural facilities and services to meet local needs.

6.2.8 Paragraph 22 states that planning policies should avoid the long term protection of sites allocated for employment use where there is no reasonable prospect of a site being used for that purpose. Where there is no reasonable prospect of a site being used for the allocated employment use, applications for alternative uses of land or buildings should be treated on their merits having regarded to market signals and the relative need for different land uses to support sustainable local communities.

Ensuring the Vitality of Town Centres

6.2.9 Paragraph 23 expects planning policies to promote competitive town centres and in doing so that LPAs should:

- Recognise town centres as the heart of their communities and pursue policies to support their viability and vitality.
- Recognise that residential development can play an important role in ensuring the vitality of centres and set out policies to encourage residential development on appropriate sites.
- Where town centres are in decline, local planning authorities should plan positively for their future to encourage economic activity.

Promoting Sustainable Transport

6.2.10 Paragraph 29 confirms that transport policies have an important role to play in facilitating sustainable development but also in contributing to wider sustainability and health objectives. Paragraph 32 confirms that all developments which generate significant amounts of movement should be supported by a Transport Statement/Assessment and that planning decisions should take account of whether:

- The opportunities for sustainable transport modes have been taken up depending on the nature and location of the site, to reduce the need for major transport infrastructure;
- Safe and suitable access to the site can be achieved for all people; and
- Improvements can be undertaken within the transport network that cost effectively limits the significant impacts of the development. Development should only be prevented or refused on transport grounds where the residual cumulative impacts of development are severe.

6.2.11 Paragraph 34 states that planning decisions should ensure developments that generate significant movement are located where the need to travel will be minimised and the use of sustainable transport modes can be maximised.

Requiring Good Design

6.2.12 Paragraph 56 states that the Government attaches great importance to the design of the built environment and that good design is a key aspect of sustainable development.

Promoting Healthy Communities

6.2.13 Paragraph 69 confirms that the planning system can play an important role in facilitating social interaction and creating healthy, inclusive communities. Paragraph 70 goes on to state that planning policies should plan positively for the provision of community facilities including cultural buildings.

Meeting the Challenge of Climate Change, Flooding and Costal Change

6.2.14 Paragraph 93 confirms that planning plays a key role in helping shape places to secure radical reductions in greenhouse gas emissions, minimising vulnerability and providing resilience to the impacts of climate change, and supporting the delivery of renewable and low carbon energy and associated infrastructure. This is central to the economic, social and environmental dimensions of sustainable development.

6.2.15 Paragraph 96 states that when determining planning applications, LPAs should expect new development to:

- Comply with adopted Local Plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and

- Take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.

6.2.16 Paragraph 99 states that Local Plans should take account of climate change over the longer term, including factors such as flood risk, coastal change, water supply and changes to biodiversity and landscape. New development should be planned to avoid increased vulnerability to the range of impacts arising from climate change.

6.2.17 Paragraph 100 confirms 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. Paragraph 103 goes on to state 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, informed by a site-specific flood risk assessment.

Conserving and Enhancing the Natural Environment

6.2.18 Paragraph 109 confirms that the planning system should contribute to and enhance the natural and local environment 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 coherent ecological networks that are more resilient to current and future pressures;

- Preventing both new and existing development from contributing to or being put at 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.

6.2.19 Paragraph 118 states that when determining planning applications, LPAs should aim to conserve and enhance biodiversity by applying the following principles (summarised as relevant to the proposed development):

- Opportunities to incorporate biodiversity in and around developments should be encouraged; and

- Planning permission should be refused for development resulting in the loss or deterioration of irreplaceable habitats, including ancient woodland and the loss of aged or veteran trees found outside ancient woodland, unless the need for, and benefits of, the development in that location clearly outweigh the loss.

6.2.20 Paragraph 121 confirms that when making planning decisions it should be ensured 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.
- Paragraph 123 states that planning decisions should aim to:
- Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development; and
- Mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions.

Conserving and Enhancing the Historic Environment

6.2.21 Paragraph 128 confirms that when 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. As a minimum the relevant historic environment record should have been consulted and the heritage assets assessed using appropriate expertise where necessary. Where a site on which development is proposed includes or has the potential to include heritage assets with archaeological interest, local planning authorities should require developers to submit an appropriate desk-based assessment and, where necessary, a field evaluation.

6.2.22 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.

6.2.23 Paragraph 139 confirms that non-designated heritage assets of archaeological interest that are demonstrably of equivalent significance to scheduled monuments, should be considered subject to policies for designated heritage assets.

6.3 London Policy

The Development Plan

6.3.1 There are number of policies within the London Plan (2011) which relate to the site and the development proposals and these are covered in details in the Planning Statement, with a summary of most relevant policies provided below.

6.3.2 Policy 2.7 Outer London: Economy sets out a framework for economic matters. In the related "Table 1.1 Employment projections 2007-2031 by Borough", employment in Richmond is only forecast to grow by 2.6% up to 2031, with growth only in the last 5 years of the Plan period.

6.3.3 Policy 3.4 Optimising Housing Potential confirms that new development should optimise housing output in accordance with the density matrix in Table 3.2 and Policy 3.11 Affordable Housing Targets seeks the maximum amount of affordable housing subject to viability and a 60:40 social rent/intermediate tenure split.

6.3.4 Policy 5.2 Minimising Carbon Dioxide Emissions confirms that development proposals should make the fullest contribution to minimising CO_2 emissions in accordance with the energy hierarchy of Be Lean (use less energy), Be Clean (supply energy efficiently) and Be Green (use renewable energy). It also expects all new development from 2010 to achieve Code for Sustainable Homes (CfSH) Level 4 based on a 25% reduction in CO_2 emissions over 2010 Building Regulations.

6.3.5 Policy 7.7 Location and Design of Tall and Large Buildings states that such buildings should be part of a plan-led approach to changing or developing an area by the identification of appropriate, sensitive and inappropriate locations. Tall and large buildings should not have an unacceptably harmful impact on their surroundings. The policy continues by advising that applications for tall or large buildings should include an urban design analysis that demonstrates the proposal is part of a strategy that will meet the criteria set out in the policy.

6.3.6 Policy 7.17 Metropolitan Open Land advises that the Mayor strongly supports the current extent of Metropolitan Open Land (MOL), its extension in appropriate circumstances and its protection from development having an adverse impact on the openness of MOL.

Unitary Development Plan (adopted March 2005) – Saved Policies (March 2008 incorporating updated Proposals Map April 2009)

6.3.7 The site is the subject of a single site specific policy in the form of 'saved' UDP policy T3. It indicates that the site is suitable for a mix of uses, including residential, commercial, leisure and hotel and to a lesser extent retail (provided it would not detract from the main town centre retail frontage) and states:

"To provide either education use (post 16) or a mix of uses to take advantage of public transport accessibility and to maximise benefits to the town centre. The established use of the site is for public service, including substantial employment, this means that priority should be given to public service/ employment uses particularly the need for facilities for post 16 education needs in the Borough or any uses that could be serviced by rail. The site has potential for a mixture of town centre uses and consideration could also be given to the potential for hotel, leisure and residential uses. Forty per cent of any residential element should be affordable housing; other housing should be developed at a high density with small units and without on-site parking. The site is not appropriate for retail uses which would draw trade from the designated frontages and lead to the elongation of the centre. Only where fairly and reasonably related to the proposed development, the proposals will allow for the provision of a riverside walk along the River Crane, to link to the existing River Crane Walk, and a link along the railway to the rugby stadia (see Proposal T17). Features of nature conservation importance should be preserved and enhanced. Proposals should take a comprehensive approach, taking into account related town centre sites particularly Twickenham Railway Station (T17) and the Station Yard (T23), and the contribution of the proposal towards the area as a whole".

LB Richmond upon Thames Core Strategy (adopted April 2009)

6.3.8 The site is identified within the Key Diagram as a *"site for potential for change"* although the Core Strategy is silent on any specific use. However, it is clear that there is an expectation to maximise the benefits from redevelopment opportunities.

6.3.9 In Chapter 6 – The Spatial Strategy, paragraph 6.1.5 sets out that Richmond and Twickenham centres with their accessible locations and established range of services provide the most sustainable options for development in the Borough, especially office and retail provision and increased densities of housing. Paragraph 6.1.7 focuses on Twickenham and sets out policy objectives to maximise the benefits from redevelopment opportunities, including the Post Office Sorting Office site.

6.3.10 In Chapter 7 Making it Happen paragraph 7.2.6 accepts that exceptions to Core Strategy policies will be allowed if a scheme can be shown to be unviable provided that the open market value of an individual parcel of land is used as the basis for assessment in accordance with normal land valuation principles and no allowance is made if a developer has paid in excess of that.

6.3.11 Policy CP1 confirms that residential development should achieve a CfSH Level 3 rating and commercial development should seek to achieve BREEAM excellent rating.

6.3.12 Policy CP4 encourages the enhancement of existing biodiversity sites (includes Other Site of Nature Importance).

6.3.13 Policy CP7 states that all new development should recognise distinctive local character and contribute to creating places of a high architectural and urban design quality that are well used and valued. Proposals will have to illustrate that they:

- Are based on an analysis and understanding of the Borough's development patterns, features and views, public transport accessibility and maintaining appropriate levels of amenity; and

- Connect positively with their surroundings to create safe and inclusive places through the use of good design principles including layout, form, scale, materials, natural surveillance and orientation, and sustainable construction.

6.3.14 Policy CP9 Twickenham Town Centre is the key policy for the site. It promotes highly sustainable and accessible design of the built environment through redevelopment proposals. It encourages higher density residential development including affordable and small units and car free development, in the town centre and tall buildings in the station area only.

6.3.15 Policy CP8 confirms that there is a need for 4,305sqft (400sqm) of convenience floorspace in Twickenham by 2017/18 and confirms that Twickenham is suitable for major office development and net increase in jobs of 2,500 to 2021.

6.3.16 Policy CP10 encourages the provision of new open space in areas of deficiency which includes South Twickenham in close proximity to the site. It also confirms that Metropolitan Open Land will be safeguarded.

6.3.17 Policy CP12 states that the Council will seek to improve the River Crane strategic corridor to provide an attractive open space with improvements to the biodiversity. Developments in and adjacent to the River Crane Corridor will be expected to contribute to improving the environment and access, in line with planning guidance.

6.3.18 Policy CP14 requires all new housing to be 'Lifetime Homes' complaint with 10% designed to wheelchair standards. It also expects a minimum of 25% of market housing to be small (1-bed) units but this should rise to 75% in town centre locations.

6.3.19 Policy CP15 sets a baseline affordable housing target of 50% of all new units, with a tenure mix of 40% housing for social rent and 10% immediate housing, on sites capable of ten or more units gross.

6.3.20 Policy CP19 (A) states a diverse and strong local economy will be supported by retaining land in employment uses for business, industrial and storage. Furthermore, CP19 (D) sets out mixed use schemes will be required to retain the level of existing employment floorspace. However the inclusion of residential use within mixed use schemes will not be appropriate where it would be incompatible with established employment uses on neighbouring sites.

LB Richmond Development Management Plan (adopted November 2011)

6.3.21 Policy TC1 confirms that proposals within the town centre which contribute to a suitable mix of uses will be approved. Acceptable uses include retail, business, leisure, tourism, community, health and residential. It also confirms that proposals within the town centre will be acceptable if they contribute to the vibrancy and vitality and won't erode core function of existing centre.

6.3.22 Policy TC5 promotes uses which support the evening economy such as cinemas, leisure, restaurant, bars etc. Support will be given to uses which specifically add diversity to the evening economy of Twickenham providing there is not an adverse impact upon residential amenity.

6.3.23 Policy EM2 requires a marketing campaign or other evidence to support loss of employment floorspace. Mixed use proposals must maintain or improve the amount of employment floorspace, subject to site specific considerations. Other evidence may include the provision of new community facilities (crèche, medical, education etc.). The policy confirms that when developing employment sites for residential use the maximum amount of affordable housing should be delivered, justified by a viability appraisal.

6.3.24 Policy HO4 expects a mix of housing appropriate to location and encourages family sized accommodation outside of town centres and to comply with Policy CP14. It also confirms that appropriate external private and/or communal amenity space is provided to meet the needs of the development.

6.3.25 Policy HO6 confirms that the Council will expect the maximum amount of affordable housing on mixed use schemes having regard to Policy CP15 and site specific circumstances.

6.3.26 Policy DC1 confirms new development must be of high architectural and urban design quality. It must respect local character and be compatible in terms of scale, height, massing, proportions and form.

6.3.27 Policy DC2 confirms that mixed use schemes should include a suitable and compatible mix of uses which add to the vitality and convenience of the area. This should include active ground floor frontages.

6.3.28 Policy DC3 confirms the proposed height restrictions for the Sorting Office site as set out in the Twickenham Station and Surroundings Design Standards SPD. It expects tall buildings to include a mix of uses particularly at ground level (such as restaurants) in order to ensure successful integration into the surrounding area and to include amenity/opens spaces. Proposals which exceed the prescribed heights must address two criteria - 1) to justify the proposals through a detailed townscape appraisal (including consideration of the impact upon Heatham House); 2) to demonstrate significant local community support for the public benefits of the overall scheme.

6.3.29 Policy OS2 confirms that Metropolitan Open Land will be protected and retained in predominantly open use. Appropriate uses include public and private open spaces, playing fields and recreation and sport. Policy OS5 seeks to preserve and enhance existing habitats including river corridors and Policy OS6 confirms that for large developments, provision of open space will be expected with a balance between private, semi-private and public open space provision.

6.3.30 Policy OS7 confirms that new developments should provide appropriate play provision on-site where there would be child occupancy of 10 or more. Where this cannot be met on-site the Council will seek an equivalent off-site contribution.

6.3.31 Policy TP8 confirms that all new developments should meet proposed maximum car parking standards unless the applicant can demonstrate there would be adverse impact upon the area as a result of on-street car parking. Supporting text also suggests car free development in town centres to be appropriate.

6.3.32 Policy SD1 confirms that new development should meet or exceed the requirements of CfSH Level 3 but this will be based on achieving 25% reduction in CO_2 emissions over 2010 Building Regulations. All commercial developments should seek to achieve BREEAM excellent.

6.3.33 Policy SD2 expects development to maximise opportunities for securing some form of renewable/low carbon decentralised energy network in new development and Policy SD4 requires new development to take into and account higher temperatures and the need for cooling, through layout, energy efficient design and reduced reliance on comfort cooling.

6.3.34 Policy SD5 expects that living roofs should be incorporated into new developments where technically feasible (expectation that 70% of roof plat would be used).

6.3.35 Policy HD2 confirms that new development should protect the setting of listed buildings.

Other Material Considerations

Twickenham Station and Surroundings Supplementary Planning Document (adopted October 2010)

6.3.36 The Twickenham Station and Surroundings Design Guidance SPD provide specific design guidance in respect to both the Royal Mail and Twickenham Railway Station sites. In Section 4 General Principles it lists six key considerations against which new development should be assessed which are:

- Impact of upon the skyline and views from Richmond Hill;
- Impact upon nearby residential areas;
- Impact of development upon Listed Buildings, Buildings of Townscape Merit, Conservation Areas and MOL;
- The potential of the development to create a gateway or feature between the sites;
- To avoid monotonous building form; and
- Not adversely Impact upon the natural environment.

6.3.37 In respect of the site (and the wider MOL to the west) the SPD sets out site specific requirements which are as follows:

- Riverside walk and open space should be retained alongside River Crane. Should include ecological enhancement;

- Provision of underpass to rail station;
- Retain tree appearance around site;
- Built development – scale should increase towards East of site and from North to South;
- Buildings should incorporate lower section fronting London Road to avoid 'tunnel' effect;
- Maximum height should not exceed 4-5 storeys and include a variety of roof forms; and
- Redevelopment should take account of the area designated as 'other site of nature importance'.

6.3.38 Of particular relevance to the eastern portion of the site, the SPD states:

- Building not to step further forward towards London Road than Bridge House to avoid 'canyon' effect;
- Buildings beside River Crane should not exceed 2-3 storeys to relate well to the River Crane and avoid adverse impact on Heatham House; and
- Buildings to the South should be no higher than Bridge House (4-5 storeys from ground level).

6.3.39 Of particular relevance to the western portion of the site, the SPD states:

- Up to 3 storeys, more domestic scale to relate to existing cottages, Buildings of Townscape Merit in Station Road and Metropolitan Open Land;
- Allow views through/between buildings; and
- Consider reuse/retention of railway/warehouse building.

6.3.40 The development has been designed to accord with the specific design principles of the SPD in consultation with Planning and Design Officers and the local community.

Crane Valley Planning Guidelines (adopted April 2005)

6.3.41 This document provides the planning guidelines for the Crane Valley in Twickenham and includes specific guidance for the Sorting Office site. It sets out a series of development principles to ensure development in the area achieves the highest level of environmental standards including an improved riverside and improved open space.

6.3.42 In respect of the Sorting Office site (both the site for the purposes of the planning application and the wider MOL), it confirms the following:

- Access arrangements:
  - The traffic implications of the access/egress should be carefully assessed by future developers to ensure that the operational capacity of Whitton Road / London Road is maintained at satisfactory levels.
- Design:
  - A significant part of the site is protected by Metropolitan Open Land designation and within the River Crane floodplain. The Environment Agency also requires and 8m buffer zone between building and the river bank. This restricts the area available for development. That remaining is a long strip along the Crane and south to the railway. The form of development will be largely dictated by the need to screen the railway from noise, to develop river fronting development and a riverside walkway and a road access between will largely dictate the form of development.

6.3.43 On the London Road frontage development provision of active frontage uses of an appropriate scale onto a widened footway onto London Road will be encouraged, complementing the opposite public space next to Twickenham Station.

- Heatham House Setting:
  - On the Post Office site development must protect the setting of Heatham House, a listed building which must be retained, with development reducing in height closest to Heatham House There is a section of Council owned land, in Metropolitan Open land designation, straddling the River Crane to the rear of Heatham House. This is where the proposed River Path will link through the development site to the Craneford Way open spaces to the west. There is a significant group of outstanding mature Oaks and other trees to the side and rear of Heatham House which must be retained. The combination of trees, river and River Crane path at this location could be developed as a riverside amenity area with public access in part. The path, river improvements and possible open space will be secured as part of the planning obligation covering the site which will also secure the maintenance regime.
- Retail:
  - The site is on the edge of the Twickenham Town Centre, but outside the primary area. The site is suitable for a modest A1 retail development, primarily serving those on foot such as commuters (larger developments are more suitable within the town centre itself).

- Flooding:

  - The River Crane flows through the site. The site is partly within the floodplain and will require a detailed flood risk assessment to accompany any application. Development proposals should include an appropriate scheme for restoration of the river through the site. This would remodel or replace the concrete vertical sided channel to establish marginal vegetation and to improve its nature conservation value, as well as increasing water quality. This would have to be subject to a flood appraisal.

6.4 Local Policy

Twickenham Area Action Plan (Publication Version July 2012)

6.4.1 The Twickenham Area Action Plan (TAAP) will form part of the Local Development Framework and sets out an overall strategy for the future of Twickenham town centre. The plan will cover the period up to 2027 and will be vital to the promotion of a prosperous local economy and investment.

6.4.2 It provides policies covering retail and economic development, employment provision and also area specific proposals including the 'Northern Approach' to the town centre which comprises the Sorting Office along with Heatham House and Station Yard.

6.4.3 It also contains site specific proposals. The Sorting Office, wider MOL and Council owned land to the north west forms Site TW1. The TAAP confirms that the redevelopment of the empty site is to be encouraged and that new uses should bring benefits to the town and assist with its regeneration. The key objectives for the site are:

- Achieve the comprehensive approach to the area;
- Provide a mix of uses including employment, residential, leisure (possibly a cinema), a substantial level of community use, retention of space for sports/outdoor activities, retain and use the link under London road bridge;
- Ensure that the improved and extended open space and riverside walk/cycle route maximises amenity and nature conservation value;
- Maintain a similar amount of land for outdoor sports and activities;
- The creation of a piazza in front of the station and sorting office which opens up views to Heatham House and provides an attractive urban gathering space, at the entrance to the riverside walk; and
- Achieve high quality design which generally reflects the traditional character of Twickenham.

6.4.4 Uses considered acceptable for the site are listed as being employment, residential including family housing, leisure (possibly a cinema), and a substantial level of community use.

6.4.5 The TAAP also provides specific design guidelines for the site covering building form, transport and environment.

7 Socio-Economics

7.1 Introduction

7.1.1 This chapter assesses the potential impacts of the proposed development in respect to socio economics.

7.1.2 The socio economic impact assessment comprises:

- A review of the legislative context and national, regional and local planning policy consideration pertaining to socioeconomics;
- The number of construction related jobs generated throughout the construction programme;
- Supporting on-going jobs in retail and in the community building;
- Increasing retail spending in the local economy; and
- The impacts associated with increased demand on social infrastructure, including education places, health care, and community / leisure facilities.

7.1.3 The site forms part of the emerging Twickenham Area Action Plan. In summary the AAP seeks to improve the quality of the retail and employment offer of the centre while supporting new residential development which can make a positive contribution to the vitality and viability of the centre. It is this simple objective that the redevelopment scheme proposed of the former Post Office site seeks to address.

7.1.4 This chapter has been prepared by Roger Tym and Partners, part of Peter Brett Associates LLP.

7.2 Policy Context

National Planning Policy Framework (Ref 7-1)

7.2.1 In March 2012 almost all previous national planning policy (PPS/PPG) was replaced and revoked by a new National Planning Policy Framework.

7.2.2 The NPPF states at paragraph 6 that the purpose of the planning system is to contribute to the achievement of sustainable development. The NPPF states (paragraph 19) that '*planning should operate to encourage and not act as an impediment to sustainable growth'*.

7.2.3 The NPPF urges planners to listen to market signals and where possible deliver what the market demands. The NPPF (para 17, bullet 3) obliges local planning authorities (LPAs) to proactively drive and support sustainable economic development to deliver (amongst others) the homes, business and industrial units, infrastructure and thriving local places people need. It goes on to state that, "*Every effort should be made to objectively identify and then meet …the housing, business and other development needs of an area, and respond positively to wider opportunities for growth"*. It also states that account should be taken of market signals, such as land prices, in ensuring that sufficient land is allocated to meet these objectively assessed needs.

7.2.4 To meet this objective and meet the demand for new homes the NPPF supports conversion of former employment sites for new homes where other planning policies, for example the emerging Twickenham Area Action Plan, support this. Para 51 states that local authorities should

"Normally approve planning applications for change to residential use and any associated development from commercial buildings (currently in the B use classes) where there is an identified need for housing in that area, provided that there are not strong economic reasons why such development would be inappropriate".

Regional Planning Policy

7.2.5 London is the only English Region to retain a regional planning function. The Mayor's London Plan (2011) (Ref 7 -2) is the Spatial Development Strategy for Greater London and sets out objectives for London.

7.2.6 The plan sets out six objectives. The first two, and potentially the main objectives are to meet the challenges of population growth and secondly to secure an internationally competitive and successful city.

7.2.7 The plan notes the extreme pressure London experiences for new homes, caused both by natural population growth and also inward migration and aims to meet this demand where possible. The objectives of the Plan's housing policies are:

- Help deliver more high quality homes for Londoners that meet a range of needs;
- Assist with reducing health inequalities;
- Support social infrastructure provision such as health, education and sports facilities; and
- Promote genuinely sustainable neighbourhoods and higher density housing.

7.2.8 New homes, and new population, can also contribute towards the second London Plan objective to support an economically competitive city.

7.2.9 The Plan notes that with a with population set to increase by 1.3 million in the 25 years to 2031, and average household size declining from 2.34 persons/household to 2.19, the number of households in London could rise by 0.9 million. This may need 34,000 additional households a year. The GLA's 2008 Strategic Housing Market Assessment provides more detail and includes a commitment to address the existing backlog of housing need.

7.2.10 To meet this need the Boroughs are urged to identify new capacity and particularly brownfield capacity through:

- Intensification (Policies 2.13, 3.4);
- Town centre renewal (Policy 2.15);
- Opportunity and Intensification Areas and Growth Corridors (Policies 2.13 and 2.3);
- Mixed use redevelopment, especially of surplus commercial capacity (Policies 2.7, 2.11, 4.2-4.4); and
- Sensitive renewal of existing residential areas (Policies 3.4, 3.5, 3.15).

7.2.11 For Outer London, which includes the London Borough of Richmond upon Thames (LBRuT), the aim is to: realise its potential, enhance and promote its distinct existing and emerging strategic and local economic opportunities, and transport requirements. The plan also stresses the role of Outer London as a place to live and therefore the importance of enhancing the quality of life for present and future residents as one of its key contributions to London as a whole.

7.2.12 Key features of the strategy for the Outer London economy include:

- Enabling existing sources of growth to perform more effectively, and increasing the competitive attractiveness of outer London for new sectors or those with the potential for step changes in output;
- Improving accessibility to competitive business locations (especially town centres) and enabling the labour market to function more efficiently in opening up wider opportunities to Londoners;
- Consolidating and developing the strengths of outer London's office market through mixed use redevelopment and encouraging new provision in competitive locations, including through the use of land use 'swaps';
- Identifying and bringing forward capacity in and around town centres with good public transport accessibility to accommodate leisure, retail and civic needs and higher density housing, and providing recognition and support for specialist as well as wider town centre functions;

- Managing and improving the stock of industrial capacity to meet both strategic and local needs, including those of small and medium sized enterprises (SMEs), start-ups and businesses requiring more affordable workspace;
- Support strategic and local marketing of outer London's visitor attractions; and
- Identifying and addressing local pockets of deprivation, and especially the strategic priorities identified as Regeneration Areas (Policy 2.14).

Local Development Plan Policies

7.2.13 The local policies for LBRuT predate both the NPPF and also the latest version of the London Plan. For Twickenham they are also being supplemented by the emerging Twickenham Area Action Plan.

7.2.14 LBRuT's Core Strategy was adopted in April 2009 (Ref 7-3) and is one of the key constituents of the Local Development Framework. The Strategy has three inter-related themes; a 'Sustainable Future', 'Protecting Local Character' and 'Meeting People's Needs'.

7.2.15 The Core Strategy plans for a net increase of 700-1,100 residential units, 2,500 jobs (to 2021) and 400sq m of retail space in Twickenham by 2017/18.

7.2.16 Focusing on the spatial distribution of development in the Borough, the strategy highlights the fact that Richmond (town centre) and Twickenham provide the most sustainable options for development in the Borough. In Twickenham, emphasis is placed on revitalising the town centre, making environmental improvements to the shopping areas and civic space and maximising benefits from redevelopment opportunities such as the area around Twickenham Railway Station.

7.2.17 Specifically when looking to guide new development the Core Strategy states:

"Higher density and larger commercial schemes will as far as possible be concentrated in the 5 town centres, enabling people to walk to shops and services or use public transport. There will continue to be opportunities outside these centres and the area of most change is likely to be to the north and west of Twickenham, where there will be opportunities to put sustainability principles into practice".

7.2.18 In May 2010 a new administration led by the Conservatives came to power in the Borough. This will alter the strategic context and will inform a review of the existing Community Plan and policies within the Local Development Framework.

7.2.19 It is still early days but the Conservatives' manifesto sets their broad objectives for the Borough. At the heart of this is the commitment to consult each and every household in the Borough on their local priorities and to express these through 'village plans' (of which Twickenham maybe one of the first).

7.2.20 With regards to business activity, the focus remains on reviving high streets across the Borough and Twickenham centre in particular. The Borough recognises that Twickenham is one of its most challenging centres. The emerging Twickenham Area Action plan summaries the centre as a leisure and convenience retail destination as opposed to meeting higher order retail needs. It notes that the centre is dominated by cafes and specialist retailers and lacks the main brand retailers, for example a main M&S clothes store. However the centre is acknowledged to serve its catchment well with no significant quantitative need for new space identified in the Borough's retail study (2006 and updated 2009).

7.2.21 The main perceived drawbacks identified by the emerging Twickenham Area Action Plan (Ref 7-4) are largely qualitative. It notes that the urban environment is poor compared to nearby centres, shop and office floorspace vacancies higher. There is a lack of high quality housing and particularly family housing.

The Local Housing Market Assessment

7.2.22 The South West London Strategic Housing Market Assessment (January 2012) (Ref 7-5) presents a detailed evidence base regarding the current supply and characteristics of housing in the Borough.

7.2.23 The research identifies an acute shortage of affordable homes in the Borough. It found that:

"There are 6,858 households on the Council's waiting list as at 31 March 2009, which is the fourth highest in south west London. Of these 5,157 are in need (the fourth highest figure in the sub-region). As at 31 March 2009, the Council was providing temporary accommodation for 203 households which it had accepted as unintentionally homeless and in priority need, which is the second lowest figure in south west London. There are also 333 approved shared ownership applicants on the waiting list for a property in Richmond upon Thames".

7.2.24 It found that the Borough was one of the least affordable in London with Lower Quartile house price in Richmond upon Thames of £275,000, the highest amongst the south west London authorities. It also estimated that the number of households in the Borough is projected to increase by 24,000 in the period between 2006 and 2031. This represents a 30.4% increase, which is the third highest amongst south west London authorities.

Policy Summary & Key Points

7.2.25 All levels of policy recognise a pressing demand for new homes nationally, across London and in LBRuT.

7.2.26 Recent evidence and particularly the Housing Market Assessment clearly demonstrates this in a local context. The Borough is one of the least affordable London boroughs and has one of the higher projected population increases.

7.2.27 At the Twickenham scale the emerging local policies together with the adopted development plan highlights Twickenham centre as an area in need of investment and new housing.

7.3 Methodology

7.3.1 The baseline research has included several pre-planning discussions, meetings and communications with LBRuT as well as the local NHS Trust (Hounslow & Richmond). As the LBRuT will be aware the author of this chapter completed the Local Economic Assessment (October 2010) for the Borough and are currently preparing an update of the Employment Land Review. Much of the baseline analysis is drawn from this work.

7.3.2 The socio economic impact assessment considers the potential impacts arising during the construction phases, and once the proposed development is completed, occupied and operational. The assessment considers methods of mitigating the impacts and residual impacts.

7.3.3 The socio-economic impact method approach is guided by HM Treasury's 'Green Book', which sets out the standard approach to economic impact assessments and informed the EIA Regulations.

Baseline Data Collection

7.3.4 The area's socio-economic baseline is derived from the analysis of a range of statistical sources such as the Annual Business Inquiry, Annual Population Survey and VAT registrations. This is combined with research undertaken by the Borough such as the Local Economic Assessment and the Borough Retail Study. The sectorial structure and performance of the local economy was examined; the local labour market in terms of unemployment, economic activity, skills and commuting patterns; deprivation indices and the provision of community infrastructure.

7.3.5 The geography for the analysis varies dependent on the availability of the data. It is however guided by that used for the recent station redevelopment so that the cumulative impacts can be examined.

Assessing Employment Impacts

7.3.6 The economic impacts of the project can be split into two broad categories: those generated by the construction phase which will tend to be temporary; those generated by the operation phase which will tend to be permanent.

7.3.7 For both phases, the net direct, indirect and induced employment impacts of the proposed development are estimated in line with English Partnership's best practice.

7.3.8 The direct employment impacts from the construction phase are based on the estimated construction value provided by the client. A standard approach of applying a ratio of turnover per employee in the construction industry in order to derive the number of construction jobs associated with a given investment level has been utilised.

7.3.9 A similar process is undertaken in order to estimate the jobs generated during the operation phase. In this case the number of direct jobs has been estimated based on the floorspace schedule and the application of job to square metre (sqm) ratios drawn from the latest guidance from the Homes & Communities Agency (2010). Once the gross direct jobs supported by the new employment space have been calculated it is important to subtract the jobs that will be lost from the site as businesses move from their existing premises.

7.3.10 Indirect employment is the employment created amongst suppliers as a result of purchases from the new activity generated by the project. Induced impacts occur as construction and operation workers and suppliers' employees create further turnover and employment in the local economy via their spending on local goods and services.

7.3.11 In order to calculate these indirect and induced effects, a composite local multiplier was applied based on guidance from English Partnerships and more recent research undertaken for the Department for Business, Innovation and Skills (BIS). This is the usual approach which is taken when detailed information on the value of supplies purchased from the local supply chain and detailed information on the salaries of employees is not available. The BIS evidence suggests overall, for all types of project, a mean (average) multiplier of 1.25 and a median multiplier of 1.21 should be applied, while the mean and median local multipliers for capital projects are 1.46 and 1.38. Taking this evidence in the round, a composite local multiplier of 1.3 has been applied. Therefore, the direct employment impacts associated with the construction and operation phases are increased by 30% to allow for these indirect and induced effects in the local economy.

7.3.12 In order to calculate net impacts a method aligning with recommendations set out in HM Treasury Guidance and English Partnership's Additionality Guidance is employed. The method consists of assessing the net additional effects, i.e. after accounting for deadweight, displacement and leakage. These concepts are understood as follows:

- Deadweight is the proportion of total outputs/outcomes that would have been secured without the investment in question. It is the counterfactual case of what development could have been expected to go ahead on the proposed site in the absence of the proposed development.

- Displacement: Refers to reduction in activity elsewhere within the target area due to increase in activity caused by the Proposed Development. This may occur both when the project uses scarce resources, such as labour, land, and/or capital pushing their prices up, or when the project takes market share from existing firms in the study area producing a similar good or service. Product market displacement is not relevant to the construction phase as during this phase no goods or services are being produced which could compete with existing provision elsewhere in the local economy.

- Leakage: Refers to the proportion of the project's benefits that accrue outside the study area.

7.3.13 The English Partnerships guidance suggests deadweight for housing of 24% to 26% on average. The more extensive BIS evidence suggests overall, for all types of project, mean (average) deadweight of 39.5% and median deadweight of 38.5% while mean and median deadweight for capital projects was 10.3% and 0% respectively. Taking this evidence in the round, deadweight is assumed to be 25% for housing and 20% for commercial and other development in the construction phase. A breakdown of construction costs into housing and other development has not been provided. Therefore, as the development is mainly housing a deadweight in the construction phase of 24% and the total gross employment impacts associated with the construction phase are reduced by 24% for housing to allow for this deadweight have been assumed. For the operational phase a 20% deadweight in line with the above estimates for non-housing development has been assumed.

7.3.14 The English Partnerships guidance suggests rather different estimates of displacement for housing of 38% taken from the evaluation of the City Challenge programme to 15% taken from the evaluation of the Neighbourhood Renewal Fund. In addition, the English Partnerships guidance suggests assuming 25% displacement where displacement is expected to be low. This is likely to be the case for the construction phase as only labour market displacement and not product market displacement is relevant to this phase. Hence considering all this evidence a displacement of 25% for the construction phase has been assumed. The BIS evidence covers product market displacement but not labour market displacement and so is not relevant to the construction phase.

7.3.15 Displacement is expected to be higher in the operational phase than in the construction phase given both product and labour market displacement will be relevant to this phase. The evidence from the BIS research suggests overall, for all types of project, mean displacement of 21.5% and median displacement of 12.0%, and mean and median displacement for capital projects of 43.1% and 48.8% respectively. Taking this evidence in the round product market displacement of around 30% has been assumed. This is then combined with an assumption for labour market displacement of 25% as in the construction phase to give an estimate of overall displacement for the operational phase of 47.5%.

7.3.16 According to data from the 2001 Census of Population, 49.6% of workers in Richmond also live in the Borough and 50.4% live elsewhere. Hence it has been assumed that 50.4% of jobs generated by both the construction and operational phases leak out of the Borough to non-residents, however this will ultimately be determined by construction and operation employees operating at the site.

7.4 Baseline Conditions

7.4.1 The following description of baseline conditions considers firstly the local economy, drawing on the Local Economic Assessment (LEA) (Ref 7-6) and Retail Studies (Ref 7-7), and secondly the social and demographic baseline.

The LBRuT Economy

7.4.2 The economy of LBRuT has a fairly diversified economic structure. The largest sectors locally include business services, creative industries and the visitor economy. They have all experienced job growth over the last 10 years. The Borough's economy has been fairly dynamic with growth in both jobs and business at above the national average rate.

7.4.3 Much of this growth has taken place amongst self-employed and micro-businesses and hence the growth has not been expressed to the same degree either in terms of gross value added (GVA) or of commercial premises demand.

7.4.4 Businesses are concentrated in the main centres of Richmond, Twickenham and Teddington. But as noted in the LEA they are also spread throughout the Borough, even in residential areas in part as a result of the presence of small shops, studios and home-based businesses.

7.4.5 In terms of competitiveness the LEA stated that LBRuT ranked 13th out of 379 authorities in the 2010 UK Competitiveness Index, same as the previous year. It was preceded by 9 London boroughs1, Mole Valley, Windsor & Maidenhead and South Bucks. Although detailed data is not available it is most likely that Richmond, the centre of the Borough's private sector employment will be driving this competitiveness.

7.4.6 Until the new Employment Land Review is complete an accurate view cannot be obtained of future demand, nor the impact of the recession. However given that some of the deepest cuts in employment nationally have been in the public services it would be expected that this would have disproportionately harmed Twickenham because of its greater share of public sector employment.

7.4.7 More empirical evidence would suggest that currently demand for new commercial (B Class) space in Twickenham is comparably weak. From the early stages of the updated Employment Land Review it has been identified that there is a significant amount of vacant office space in Twickenham town centre, mostly located on upper floors. Looking to the future research for the London Office Policy Review highlights the limited demand for new major office development in the outer London boroughs and particularly the smaller centres such as Twickenham.

The Retail & Leisure Economy

7.4.8 Twickenham is the Borough's second largest retail centre. According to the Retail Study, it has experienced a good deal of investment from retailers in recent years, including a Marks & Spencer Simply Food format and has a Waitrose foodstore within the key shopping frontage.

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[1] City of London, Westminster, Camden, Islington, Hammersmith & Fulham, Tower Hamlets, Kensington & Chelsea, Wandsworth and Southwark

7.4.9 However it lacks major comparison retailers, for example a main brand M&S. Main comparison shops are undertaken either in Richmond or nearby Kingston on Thames. Hounslow centre is another major centre nearby although this is mainly driven by discount retailing.

7.4.10 For leisure uses the centre is well represented. The retail study notes healthy demand for restaurants and cafes. The nearby rugby clubs are a near unique visitor attraction (although their impact is mostly limited to match days). There is demand for new hotel spaces, including the new Travelodge. According to the Council there are 3,500 square metres of café and restaurant uses in the centre.

7.4.11 However, Twickenham town centre presents a contrasted picture. To the east of the town centre is the attractive cobbled Church Street and riverside. Yet, the busy thoroughfare of London Road/King Street/Heath Road detracts from the environmental quality of the centre. As a result, Twickenham has been identified as a centre in need of revitalisation. The Retail Study recommended stringent planning control to maintain a good balance of uses in the centre.

7.4.12 The prospects for the future growth in Twickenham are dependent on securing investment in the town centre to improve the urban fabric whilst respecting the town's built environment.

Population and Labour Market Baseline

7.4.13 In July 2012 the first results from the 2011 Census were published (Ref 7-8). This has confirmed the Borough's population as approximately 190,000; similar to previous estimates. However much published analysis uses older datasets and population estimates.

7.4.14 The population continues to grow by around 1,000 people per year; from 183,000 in 2005 to 187,000 in 2011. The population of LBRuT is made up of 48.7% men and 51.3% women – a slightly more pronounced reflection of the higher proportion of women in England and Wales.

7.4.15 The population profile of the Borough is older than the average for England and also London. When compared with London, LBRuT has a significantly lower percentage of people aged 20- 24 (4.9% in LBRuT and 7.7% in London) and 25-29 (6.5% in Richmond compared with 10% in London). Overall, LBRuT has a smaller percentage of the population in all the age quintiles between age 10 and age 34 compared with London but a higher percentage of the population in age quintiles 49 and over.

7.4.16 This enforces the common view that LBRuT as an attractive place to live for families with children and older people. However young people, at the start of their careers find it difficult to move into the Borough.

7.4.17 Data on the labour force is not yet available from the Census. But the LEA suggested that in 2009, approximately 71,200 people worked in the Borough and, of these 16,600 (23%) were self-employed workers. This is a much higher proportion than in London (15%) and England (13%) and as such, a defining features of the local labour market, one that is explored in more depth below.

7.4.18 The geographical distribution of workers are largely concentrated in the main town centres but also scattered across the Borough in residential areas and on isolated employment sites.

7.4.19 Modes of employment and work are changing however, with greater levels of flexibility in status, contract terms and location of work. This particularly applies to the workforce in LBRuT not only because of the high levels of self-employment but also because of the rise in home-based working.

Health & Education

7.4.20 A compressive baseline assessment of both healthcare and education capacity was undertaken last year to inform the Twickenham Station ES. This been checked with both the LBRuT and Richmond NHS that this baseline information remains valid although some updated information has been provided which is discussed below.

Health Surgeries

7.4.21 There are eight GP surgeries listed on NHS Choices within 1 mile of the site (1.6km). Of these six are within LBRuT:

- The York Medical Practice;
- Oak Lane Medical Centre;
- Rowlands & Partners Practice (Acorn Practice);
- Robertson And Partners;
- The Green Surgery; and
- Johal & Partners.

7.4.22 All the GP surgeries are currently accepting new patients (July 2012) however the PCT (formally Richmond but now merged with Hounslow) maintain their assessment given in 2011 that capacity to take new patents is limited.

7.4.23 It has been queried whether there is any updated information from that used to inform the Station ES (i.e. the 2008 assessment of the GP estate and the 2010 physical survey). The PCT has confirmed that no updated information exists and these assessments remain valid.

7.4.24 The 2008 and 2010 assessments suggested that there was a shortage of space in local GP surgeries and five of the six local LBRuT surgeries were operating below NHS Gross Internal space guidelines.

Table 7.1: NHS Gross Internal Space Guidelines

	GP Practice Current GIA (m2)	Target GIA (m2)	% Below Target
The York Medical Practice	736	832	12
Oak Lane Medical Centre	202	239	15
Robertson & Partners	263	728	64
The Green Surgery	142	354	60
Johal & Partners	239	465	49

Source: Richmond PCT 2008 (Now merged)

7.4.25 The physical conditions survey (2010) found that of the six local surgeries two are below the benchmark for functional suitability, two had very good utilisation of space and therefore no scope for increased activity, three were below the benchmark for quality. All six had significant problems with regards to statutory compliance. The cost of dealing with the backlog of maintenance and future maintenance issues for the six surgeries totalled an estimated £270,000.

Hospitals

7.4.26 The nearest major acute hospital to the site is at Isleworth in the Borough of Hounslow. The West Middlesex provides the full range of services including an accident and emergency centre together with 400 beds. In common with other major London hospitals some services are shared with other nearby hospitals.

7.4.27 The buildings were extensity modernised around 2003 with the opening of a new main hospital building.

7.4.28 In the National Performance Standards & Targets 2011/12 the West Middlesex hospital exceeded its targets in all bar two of its measures.

7.4.29 The site is also within the catchment of the Teddington Memorial Hospital. Although this is further away (approximately 2 miles, rather than 1.5 miles to the West Middlesex) it operates a NHS walk in centre for minor treatment. This allows local residents to avoid the larger A&E department at West Middlesex. It also offers some diagnostics and wards.

Dentists

7.4.30 There are six dentist surgeries within 1 mile of the site listed on NHS Choices (Ref 7-10). In ascending distance these are:

- Richmond & Twickenham PCT dental unit;
- Eden, Jane;
- Claremont Dental Practice;
- Mr P S Panesar;
- Brightsmile Dental Care (Hounslow Borough); and

- Bridge Dental Centre Limited.

7.4.31 Three of the six are currently accepting new NHS patents (adults and children) and a fourth, also accepting NHS patents is only 1.1 miles from the site (Perfect Smile Surgery, Ham). Note that the PCT unit operates as a walk in centre only.

Education

Childcare

7.4.32 The government funds pre-school nursery education for up to 15 hours a week via LBRuT. This funding is known as the Nursery Education Grant.

7.4.33 If parents choose a private nursery school, sessional play group or independent school, the Nursery Education Grant will act as a contribution to any fees due. For care offered through local schools there is no charge for the standard 15 hours.

7.4.34 There are eight full care nurseries within one mile of the site and a further eight pre-school nurseries. Most of these are eligible for Nursery Education Grant and have immediate vacancies (as reported on the Borough's web site). In ascending distance they are:

Table 7.2: Nursery Provision

Name	Address	Distance from Site	Vacancy
St Mary's Day Nursery (Asquith Nursery)	Arragon Road, Twickenham	0.3 miles	Has immediate vacancies Eligible for Nursery Education Grant
Bright Beginnings Day Nurseries	Grosvenor Road, Twickenham	0.3 miles	Eligible for Nursery Education Grant
Little Bugs Montessori Nursery	Strafford Road, Twickenham	0.3 miles	Has immediate vacancies
			Eligible for Nursery Education Grant
Brook House Nursery	Cole Park Road, Twickenham	0.5 miles	Eligible for Nursery Education Grant
Tenderlinks Daycare	Langhorn Drive, Twickenham	0.5 miles	Has immediate vacancies
Chestnuts Pre-School	May Road, Twickenham	0.6 miles	Has immediate vacancies
			Eligible for Nursery Education Grant
Trafalgar Day Nursery	Meadway, Twickenham	0.9 miles	Has immediate vacancies
			Eligible for Nursery Education Grant
Milkshake Montessori Nursery School	Warren Road, Twickenham	1.0 miles	Has immediate vacancies

Source: LBRuT

7.4.35 There are also eight pre-school nurseries within one mile and as with the full care nurseries the Borough report that most have immediate vacancies.

Table 7.3: Pre-school Provision

Name	Address	Distance from Site	Vacancy
Peaches Nursery School	Chertsey Road, Twickenham	0.2 miles	Has immediate vacancies Eligible for Nursery Education Grant
Sunflower Montessori School	Victoria Road, Twickenham	0.4 miles	Has immediate vacancies Eligible for Nursery Education Grant
Windsor Kindergarten	Church Street, Twickenham	0.4 miles	Has immediate vacancies Eligible for Nursery Education Grant
The Riverside Playgroup	Richmond Road, Twickenham	0.4 miles	Eligible for Nursery Education Grant
Strawberry Hill Pre-School	Radnor Road, Twickenham	0.6 miles	Has immediate vacancies Eligible for Nursery Education Grant
Pebbles Pre-School	Northcote Road, Twickenham	0.7 miles	Has immediate vacancies Eligible for Nursery Education Grant
Marble Hill Nursery School	Richmond Road, Twickenham	0.8 miles	Has immediate vacancies Eligible for Nursery Education Grant
Windsor Kindergarten at St.Margaret's	Rosslyn Road, Twickenham	0.9 miles	Eligible for Nursery Education Grant

Source: LBRuT

7.4.36 In addition to the above there are three public sector providers of childcare (Archdeacon, Orleans, Ivy Bridge schools). Combined these accommodate 140 children. These are currently at capacity although the Borough is working to provide more spaces because while private spaces are available many parents choose spaces at local schools.

7.4.37 In 2011 the Borough produced a gap analysis of childcare provision in the Borough. This found that overall the evidence suggests that the number of places across age-groups is well-matched to demand. Very few people reported that the lack of childcare in an area was a barrier to them choosing not to use childcare (1%).

Primary Education

7.4.38 There are 34 state primary schools within two miles of the site (reported by DirectGov), see **Table 7.4**. Only 23 of these schools are in LBRuT with the rest, including the second closest (Ivybridge) in Hounslow Borough.

Table 7.4: Primary Schools within 2 Miles:

Name	Distance	Comments
St Mary's Church of England Primary School	0.25 miles	Ofsted: 1 – Excellent 453 pupils, 4-11 years, State funded, Mixed gender
Ivybridge Primary School	0.35 miles	Ofsted: 2 – Good 295 pupils, 3-11 years, State funded, Mixed gender
Orleans Infant School	0.46 miles	Ofsted: 1 – Excellent 371 pupils, 3-7 years, State funded, Mixed gender
St Stephen's Church of England Junior School	0.54 miles	Ofsted: 2 – Good 349 pupils, 7-11 years, State funded, Mixed gender
Chase Bridge Primary School	0.59 miles	Ofsted: 2 – Good 443 pupils, 3-11 years, State funded, Mixed gender
Archdeacon Cambridge's Church of England Primary School	0.75 miles	Ofsted: 2 – Good 466 pupils, 4-11 years, State funded, Mixed gender
Trafalgar Infant School	0.90 miles	Ofsted: 1 – Excellent 267 pupils, 5-7 years, State funded, Mixed gender
Trafalgar Junior School	0.91 miles	Ofsted: 3 – Satisfactory 350 pupils, 7-11 years, State funded, Mixed gender
Worple Primary School	1.05 miles	Ofsted: 3 – Satisfactory 223 pupils, 3-11 years, State funded, Mixed gender
St James's Roman Catholic Primary School	1.13 miles	Ofsted: 1 – Excellent 679 pupils, 3-11 years, State funded, Mixed gender
St Richard's Church of England Primary School	1.15 miles	Ofsted: 2 – Good 183 pupils, 5-11 years, State funded, Mixed gender
St Edmund's Catholic Primary School	1.20 miles	Ofsted: 2 – Good 414 pupils, 4-11 years, State funded, Mixed gender
Nelson Primary School	1.25 miles	Ofsted: 2 – Good 407 pupils, 4-11 years, State funded, Mixed gender
St Mary's RC Primary School, Isleworth	1.27 miles	Ofsted: 2 – Good 273 pupils, 3-11 years, State funded, Mixed gender
The Blue School of CoE Primary	1.30 miles	Ofsted: 1 – Excellent 247 pupils, 3-11 years, State funded, Mixed gender
The Russell Primary School	1.30 miles	Ofsted: 2 – Good 288 pupils, 3-11 years, State funded, Mixed gender
Stanley Primary School	1.32 miles	Ofsted: 2 – Good 699 pupils, 3-11 years, State funded, Mixed gender
Chatsworth Primary School	1.34 miles	Ofsted: 2 – Good 577 pupils, 3-11 years, State funded, Mixed gender
Meadlands Primary School	1.37 miles	Ofsted: 2 – Good 255 pupils, 3-11 years, State funded, Mixed gender
Bishop Perrin Church of England Primary School	1.46 miles	Ofsted: 1 – Excellent 206 pupils, 4-11 years, State funded, Mixed gender
The Vineyard School	1.52 miles	Ofsted: 1 – Excellent 436 pupils, 4-11 years, State funded, Mixed gender
Isleworth Town Primary School	1.55 miles	Ofsted: 2 – Good 514 pupils, 3-11 years, State funded, Mixed gender
St Mary's and St Peter's Church of England Primary School	1.56 miles	Ofsted: 1 – Excellent 461 pupils, 4 pupils, 4-11 years, State funded, Mixed gender
Hounslow Town Primary School	1.58 miles	Ofsted: 2 – Good 555 pupils, 3-11 years, State funded, Mixed gender
Heathfield Junior School	1.63 miles	Ofsted: 2 – Good 265 pupils, 7-11 years, State funded, Mixed gender
Heathfield Infant School	1.63 miles	Ofsted: 2 – Good 399 pupils, 3-7 years, State funded, Mixed gender
Spring Grove Primary School	1.69 miles	Ofsted: 2 – Good 235 pupils, 3-11 years, State funded, Mixed gender
The Smallberry Green Primary School	1.70 miles	Ofsted: 3 – Satisfactory 314 pupils, 3-11 years, State funded, Mixed gender

Name	Distance	Comments
St Elizabeth's Catholic Primary School	1.76 miles	Ofsted: 1 – Excellent 241 pupils, 4-11 years, State funded, Mixed gender
The Woodbridge Park Education Service	1.85 miles	Ofsted: 3 – Satisfactory 84 pupils, 5-18 years, State funded, Mixed gender
Marlborough Primary School	1.92 miles	Ofsted: 2 – Good 709 pupils, 3-11 years, State funded, Mixed gender
Marshgate Primary School	1.96 miles	Ofsted: 1 – Excellent 414 pupils, 4-11 years, State funded, Mixed gender
Orchard Primary School	1.96 miles	Ofsted: 3 – Satisfactory 655 pupils, 3-11 years, State funded, Mixed gender
Grove Road Primary School	1.98 miles	Ofsted: 2 – Good 269 pupils, 3-11 years, State funded, Mixed gender

Source: DirectGov

7.4.39 A two mile catchment is used by the Department of Education as a benchmark catchment for primary schools but in practice this is much reduced. This is because walking distances can be much further than a 'as the crow flies' measurement, so a school two miles away not be a practical solution. Also in practice many schools operate much reduced catchments because they are heavily oversubscribed.

7.4.40 In the Borough's 10 year strategy for primary places the Council has identified an existing shortage of primary places. This has been caused by a number of factors including:

- Significantly increased birth rates;
- Increase in parents opting for state sector education; and
- High levels of new housing growth.

7.4.41 A large number of the schools, including two closest Richmond schools (St Marys & Orleans) are classed as 'excellent' by Ofsted. This is a contributing reason for their popularity. In the 2010/11 year they were oversubscribed by a factor of 4:1 and 5.5:1 and by the start of term 50 reception children were without a place in the TW1 area. However, more recently, in 2012 (June) officers reported to the Councils' Admissions Forum that all 'on time' applications for spaces should be met in September 2013 partly thanks to the increased capacity discussed below.

7.4.42 The Primary Expansions Strategy (December 2010) identifies that should demand continue to rise (for example, as a result of new developments) the shortfall could be as high as 541 a year from 2015/16 onwards. This is an acknowledged problem and a number of solutions are identified in the 10 year strategy including bulge classes and some permanent expansion of facilities.

7.4.43 In response to oversubscribed primary provision the Council has successfully been awarded Basic Need Safety Value Funding along with Targeted Capital Funds. This has helped secure an additional 11 Form Entry's (FE) at reception level for 2011/12 across the Borough. This includes at the two closest schools to the site (St Mary's & Orleans Infant) and there is an additional 3 FE at reception level in St Margaret's area in 2011/12.

7.4.44 From September 2012 St Mary's will be expanded from 2 to 3 FE, enabling it to place an additional 210 children by 2018/19 when all years will be 3 FE. To further increase local capacity it has also been agreed with Archdeacon Cambridge's Church of England Primary that it will accommodate an extra Reception class in 2012/2013.

7.4.45 A number of new schools are also being planned to meet the growing shortage of primary spaces. This includes a new Catholic VA primary school in Twickenham, very close to the site. This will be single form and 10 of the 30 places will be 'community places' awarded on the basis of proximity. The remaining 20 will be selective places although it may be expected that these will reduce pressure on other nearby schools, including the heavily oversubscribed St Marys & Orleans. One justification for the new school is that there is a growing demand for catholic schools and at the moment little supply, so parents are forced to send their children to other schools in the area.

7.4.46 Also two new free schools are also being proposed to open in the Borough. In Hampton the Church of England is due to open St Mary's Church of England Primary school from September 2013, with an initial intake of 30 pupils but eventually growing to 210 overall places. Thomson House School (Barnes) has also been given approval and the Board of Governors have already started working on their plans to open in September 2013 with an initial intake of 48 pupils, eventually growing to 336 additional places. The schools are unlikely to directly befit new residents of the site but may help reduce the Borough's overall shortage and allow a re-focusing of resources on other parts of the Borough.

7.4.47 In neighbouring Hounslow a number of schools are also being expanded because of similar pressures to Richmond on school places. Ivybridge School (the second nearest to the site, although in Hounslow) is expending from 1FE to 2FE so will take an additional 30 children a year.

7.4.48 Officers at the Borough stress that although they are actively working on plans increase capacity this remains challenging. The latest projections supplied by the Borough a shortage of reception places as the table below shows:

Table 7.5: Reception Forecasts for Twickenham North of the River.

	2013/2014	2014/2015	2015/2016	2016/2017
Capacity	1590	1560	1560	1560
Forecast pupils	1559	1600	1627	1628
Surplus / shortfall	+31	-40	-67	-68

Source: LBRuT

Secondary Education

7.4.49 There are 17 secondary schools reported by EduBase (Ref 7-11) within three miles of the site. Three miles is the suggested secondary school area catchment, however similar caveats apply as discussed above. This count includes the academies and church/faith schools.

7.4.50 Eight of these schools are in LBRuT with the remainder in Hounslow. Combined EduBase reports a total capacity of 18,431 with 17,504 on roll (July 2012).

Table 7.6: Secondary Schools within 3 miles

	Borough	Capacity	Number on Roll
Brentford School for Girls	Hounslow	949	948
Christ's Church of England Comprehensive Secondary School	Richmond	623	589
The Green School	Hounslow	867	877
Grey Court School	Richmond	1066	931
Gumley House RC Convent School, FCJ	Hounslow	1292	1129
Hampton Academy	Richmond	1050	744
The Heathland School	Hounslow	1679	1828
Heston Community School	Hounslow	1265	1281
Hounslow Manor School	Hounslow	1006	842
Isleworth and Syon School for Boys	Hounslow	979	978
Lampton Academy	Hounslow	1438	1395
Orleans Park School	Richmond	1017	1008
St Mark's Catholic School	Hounslow	1127	1222
Teddington School	Richmond	1125	1124
The Tiffin Girls' School	Richmond	883	893
Twickenham Academy	Richmond	1050	709
Waldegrave School for Girls	Richmond	1015	1004
Total		18431	17502

Source: EduBase

7.4.51 Across the Borough the Council reports a shortage of secondary school places with only the academy schools (three) having any surplus capacity at the moment. Over time the pressures now being faced by the primary schools will move up to the secondary level. With this in mind the Borough is planning two new secondary schools, including a new Catholic school in Twickenham discussed below.

7.4.52 The most recent pupil projections show that with new the new schools there will be some limited capacity in the Borough in the future (Ref 7-12)[2].

7.4.53 The projections show that by 2016 there will be 145 spare places in the Borough, 65 of which will be at the Twickenham academy with rest at Richmond Academy (35) and the new Community School (50).

7.4.54 In early 2012 the Borough agreed to lease the Clifden Road site to the Catholic Church for a new school (along with the Primary discussed above). For the secondary school the proposals are for a five form school or 150 pupils per year.

7.4.55 This is a very major uplift in local secondary school capacity and although, as with the primary school, only a minority of the places will be 'community' with the rest selective. The selective places will however release capacity elsewhere in the local school system and increase choice in Twickenham. At the moment Twickenham area schools are heavily oversubscribed.

Further Education

7.4.56 Richmond Schools do not offer post 16 (sixth form) education. This is proposed to change. In December 2010, the Council published a report, Choice and Diversity: a policy paper for Education and Children's Services 2010, (Ref 7-13) which set out the intention to create high-quality sixth forms within the Borough's schools and academies.

7.4.57 Today those children wishing to continue their education post year 11 have to change school/college. The 2011 year 11 destination survey (Ref 7-14) (showed that around 75% of school levers continued education but almost all had to move to one of the local colleges.

7.4.58 To widen education opportunities within the schools the Council has (on 2 March 2012) issued statutory proposals to establish sixth forms at Christ's, Grey Court, Orleans Park, Teddington and Waldegrave. This is in addition to providing sixth forms at the Borough's academies. The Borough's 'sixth form forum' has agreed that the sixth forms would be established under the umbrella of 'Richmond upon Thames Post-16 Partnership', with a degree of commonality in various matters, such as marketing (with a combined offer matrix), the application process, daily and weekly curriculum structure, and enrichment. Work is ongoing to develop the curriculum offer and other aspects of the proposed sixth forms.

7.4.59 In addition to the new school offer Further Education will be provided at the two local colleges at Richmond.

7.5 Assessment of Effects

Economic Impacts

7.5.1 The cost of constructing the development is estimated to be around £32 million (St James estimate). The latest data from the 2010 Annual Business Survey (ABS) produced by the Office for National Statistics (ONS) is that the ratio of annual turnover to the average yearly employment level in the construction of residential and non-residential buildings sector was just under £178,000 per job. Dividing the estimated construction costs by this figure gives an estimated number of construction jobs in person years of 180. With a two year construction period this gives an average number of construction jobs of 90 per annum assuming each job is full-time and lasts for a year.

7.5.2 The cost of constructing the development is estimated to be around £30.5 million (St James estimate). The latest data from the 2010 Annual Business Survey (ABS) produced by the Office for National Statistics (ONS) is that the ratio of annual turnover to the average yearly employment level in the construction of residential and non-residential buildings sector was just under £178,000 per job. Dividing the estimated construction costs by this figure gives an estimated number of construction jobs in person years of 171. With a two year construction period this gives an average number of construction jobs of 86 per annum assuming each job is full-time and lasts for a year.

7.5.3 In addition, to the above gross direct construction jobs as detailed in the methodology section it is necessary to take account of the induced and indirect jobs generated. Using the composite local multiplier of 1.3 this produces an estimate of the total gross jobs of 111. However not all these jobs are net or additional and taking accounts of deadweight, displacement and leakage gives an estimate of a net increase in jobs taken by Richmond residents of 32.

7.5.4 As detailed elsewhere St James will commit to delivering local jobs and training to ensure these benefits accrue in the area.

Restaurant and Community Building Jobs

7.5.5 While the above construction jobs will be temporary and will end when construction of the proposed development ends, although the affected workers are likely to stay in employment by moving onto their next building project, there are likely to be some on-going jobs generated by the development in the two restaurants and the community building.

7.5.6 The development involves 593 sqm of restaurant floorspace in two units. The latest employment densities guidance from the Office of Project and Programme Advice and Training (OffPAT) and the Homes and Communities Agency (HCA) (Ref 7-15)[3] suggests an employment density for restaurants and cafes of 18 sqm per full time equivalent (FTE) job. Applying this employment density to the above restaurant floorspace figure gives an estimate of around 33 restaurant jobs in the two units.

7.5.7 A similar calculation can be undertaken for the jobs in the proposed community building. It has a floorspace of 1,265sqm. Direct estimates of employment densities for community buildings are not available. However the above latest OffPAT / HCA guidance gives figures for similar uses of amusement and entertainment centres, and sports centres and private clubs of 70 sqm per FTE job and 65 sqm per FTE job respectively. Using either of these densities suggests around 19 jobs in the community building. This gives us an indicative estimate of the number jobs that the community building could accommodate.

7.5.8 In summary, the proposed restaurants and community building are expected to accommodate around 52 on-going jobs, which is considered to be a minor beneficial effect.

7.5.9 The St James Group's commitment to a local jobs and training strategy should assist with maximising the chances of local people benefitting from these construction and on-going employment opportunities.

Increased Retail Spending in the Local Economy

7.5.10 The first step in estimating the additional retail spend that the proposed development could support is to estimate the number of people who are expected to live in the development once it is fully occupied. This is done by combining the number of dwellings of the different sizes that are proposed with occupancy factors[4] (the number of people who are expected to live in dwellings of different sizes). **Table 7.7** below shows the results. These indicate that it is expected that the 110 dwellings at the proposed development to contain 207 residents.

Table 7.7: Population Estimates

	One Bed	Two Bed	Three Bed	Four Bed
Units	22	60	6	22
Residents per unit	1.39	1.66	2.14	2.93
New Residents	30.58	99.6	12.84	64.46

Sources: LBRuT 106 Calculator & PBA

[4] GVA Grimley (2009), "London Borough of Richmond upon Thames Retail Study Update"

7.5.11 It is then necessary to estimate how much spending these 207 people would be expected to undertake. The 2009 Update to the Richmond Retail Study[5] provides per capita spend on convenience and comparison goods in different parts or zones of LBRuT over time. The proposed development lies within Zone 6 of the retail study. **Table 7.8** below shows the 2011 figures for per capita spend in 2007 prices as taken from the 2009 Retail Update study and these figures adjusted to 2012 prices, which are derived by applying the increase in the Consumer Price Index (CPI) between June 2007 and June 2012, 16.5%, to the 2007 price based figures.

Table 7.8: Per Capita Retail Spending, 2011

Goods type	In 2007 prices	In 2012 price
Convenience	£1931	£2249
Comparison	£3108	£3620

Sources: GVA Grimley, RTP calculations
Note: Figures for Zone 6 as defined by the 2009 GVA study.

7.5.12 These per capita spending figures in 2012 prices have then been multiplied by the expected number of residents in the proposed development to derive the total expected level of retail spending from the development and our results are shown in **Table 7.9**. Clearly a part of this spending will leak out of the Borough. The 2009 Retail Update study suggests that residents of Zone 6 undertake 57% of their convenience good spending and 26% of their comparison good spending in the Borough. Hence these figures have been used to estimate the total amount of retail spending from the residents of the proposed development that will flow into the economy in LBRuT. These are shown in **Table 7.9**. It is estimated that overall the residents of the proposed development would generate around £1.2 million of retail spending per annum and that around £460,000 of this would be expected to be spent in LB Richmond.

Table 7.9: Retail Spend Generated by the Residents of the Proposed Development

Goods Type	In all Locations	In LBRuT
Convenience	£465,543	£265,360
Comparison	£749,340	£194,828
Total	£1,1,214,883	£460,188

Sources: RTP calculations

More People, More Jobs

7.5.13 The estimate of local retail spend has then been used to estimate the number of additional local retail jobs that this spending might support. The latest figures from the 2010 ABS indicate that the ratio of turnover to employment in retail is £108,747. Applying this figure to the estimated retail spend in LBRuT gives an estimate of 4 additional retail jobs.

[5] GVA Grimley (2009), "London Borough of Richmond upon Thames Retail Study Update",

7.5.14 This is a very small number of jobs. However, retail jobs are not the only type of jobs that can be generated by the presence of more people in a local area. Other activities where local demand may be expected to be stimulated by more local residents include leisure, educational service, health services and local transport. Research by GLA Economics concluded that on average an increase of 1,000 in local residents would lead to an increase in local jobs of 230. This suggests that the 207 residents at the proposed development could lead to an increase in local jobs of around 50.

Overall Local Jobs Impact

7.5.15 It has been estimated that the restaurants and community building in the proposed development could accommodate 52 jobs, and that the presence of 207 residents in the development could generate almost 50 jobs. However, these two job estimates cannot be simply added together as this could involve a degree of double counting. For example, some of local jobs supported by the spending of local residents from the development could be situated in the restaurants in the development.

7.5.16 it can however be established that a range for the overall local jobs impact by assuming for the worst case complete double counting and for the best case no double counting. For the worst case all the jobs estimated to be generated by the spending of the residents at the proposed development are assumed to be located either in the two restaurants or the community building on the site. Hence in this case the local jobs impact would be 52. In the best case scenario none of the jobs generated by the spending of the residents at the proposed development are assumed to be located in either the two restaurants or the community building on the site. In this case the two estimates can be added together and so in this case the estimated number of local jobs generated by proposed development is 98. Consequently the local jobs impact of the development is expected to lie somewhere in between 52 and 100 jobs, which is a minor beneficial effect.

7.5.17 As for the construction phase it is necessary to add on to this estimate of gross direct jobs to allow for induced and indirect jobs in order to produce an estimate of total gross jobs. Using the composite local multiplier of 1.3 gives a range for total gross jobs of 65 to 127 jobs per annum. Again this is likely to only have a minor beneficial effect.

7.5.18 Again not all of these jobs will be net or additional and taking account of deadweight, displacement and leakage gives a range for net additional jobs filled by Richmond residents of 10 to 20 per annum.

Other Fiscal Benefits

7.5.19 Any new development within the Borough will increase the local tax base and may also trigger other payments for example the New Homes Bonus. Total payments to LBRuT under the New Homes Bonus are expected to be £1.1m for 2012/13.

7.5.20 The CLG New homes bonus calculator (ref 7-16)suggests the 110 new units may provide nearly £1m of 'Bonus' for the Borough over six years assuming 50% of the properties are band D with around 25% in bands C and E.

7.5.21 This is in addition to the increase in Council tax receipts of around £150,000 per year using the same assumption as above.

7.5.22 It is the Governments stated intention that fiscal rewards for delivering new homes should be a major consideration in planning. This underpins the rationale behind the New Homes Bonus scheme. Therefore this effect is considered to be a minor beneficial effect.

Population Impacts

7.5.23 The proposed development scheme includes 110 dwellings. Based occupancy data used in the Borough's S106 calculator the population arising from the mix of units is estimated as 207.

7.5.24 This is 0.125% increase on the existing LBRuT population as recorded in the 2011 Census (187,000.)

Housing

7.5.25 The sector mix of new homes is yet to be agreed but as identified in the baseline the Borough has a large demand for new homes and the NPPF states that planners should do all they can to meet the demand for new homes.

7.5.26 The development scheme will add 110 new dwellings to the council stock of 82,000 dwellings. For the Borough this is an insignificant addition but it is significant in the context of the Core Strategy housing target for Twickenham town centre. The type of dwellings has been designed to meet the Council's objective to meet the demand for family homes (especially affordable) as expressed in the Housing Strategy (Richmond upon Thames Housing Strategy 2008-2012). The smaller units will meet the growing demand for small households identified by the ONS and CLG in their household projections as one of the key drivers of household growth. It is therefore considered that the provision of a new housing is a minor beneficial effect.

Education

7.5.27 The number of children requiring new school places is also calculated from the Borough's S106 calculator. However at the moment the mix of tenures is not yet finalised but it is assumed that 10% of the new units are affordable.

7.5.28 The S106 calculator makes a different assumption depending on whether the development is north or south of the river. The development site is south of the river.

Table 7.10: Indicative Housing Mix

Beds	Houses				Flats			
	1	2	3	4	1	2	3	4
Private			6	22	12	59		
Social					10	1		
Total			6	22	22	60		

Source: PBA

Childcare

7.5.29 In the baseline it was that identified that there is no capacity at local schools nursery provision although the Borough is planning to expand this provision.

7.5.30 There is provision available in the private sector. The Borough has previously estimated that private provision is at around 70% occupancy and the 2011 gap analysis finds no gaps in provision. Also our analysis has shown that most of the providers in proximity to the site currently have vacancies (as recorded by the Borough).

7.5.31 Assuming 10% of the new homes will be affordable the S106 calculator suggests the development will yield 28 nursery age children although the demand for places maybe less as not all children may take up a place. Given the availability of places at the moment the impact on childcare is not significant.

7.5.32 When combined with the nearby station site, where 28 new nursery age children are expected the cumulative impact is identified as minor and adverse.

Primary

7.5.33 The new development is likely to generate pupil take-up of 18 primary places. As identified in the baseline all the Boroughs primary provision is oversubscribed and the Council is working to identify additional capacity to accommodate forecast demand.

7.5.34 As noted in the baseline the Council is working on expanding provision to accommodate demand and secure choice in the Borough. Most relevant to this site is the new single FE Catholic Primary school which will take 10 community places each year and release some (20) capacity elsewhere. Also a number of the local schools are in the process of being expanded in line the Councils Primary Expansion Strategy including nearby St Marys.

7.5.35 The 18 new places arising from the development is very small compared to the overall shortage of spaces across the Borough. However it is still locally significant so is considered to be moderate and adverse. Notwithstanding this education requires mitigation.

7.5.36 The Station site is also expected to provide additional demand for places (15). The combined impact is moderate and adverse for the reasons discussed above.

7.5.37 The Council suggests that combined the two schemes may generate a need for a new FE in one of the local schools. This is a factor to be considered in the mitigation.

Secondary

7.5.38 The new development is expected to generate a pupil take-up of 9 pupils. The baseline assessment has identified stress in the supply if secondary spaces in the Borough although this is less severe than primary places.

7.5.39 The pupils arising from the development scheme is very small in the context of the Boroughs demand for places and the plans being put into place to expand the Boroughs provision overall.

7.5.40 At the very local level the recently approved Catholic School will increase the supply of spaces in close proximity to the site by opening community places but also accommodating faith pupils who otherwise would be placed in other local schools. In addition to this the Council is also seeking to provide a further community school to release capacity across the Borough.

7.5.41 Even with the new schools demand for places at the immediate schools to the site will remain high. But the additional 9 pupils from this scheme and the 7 from the Station site are not significant. As such the impact is considered to be minor and adverse for the scheme individually and also combined. Notwithstanding this also requires mitigation.

Further Education

7.5.42 The S106 calculator does not estimate demand for FE provision. However demand can be estimated by looking at the most recent year 11 destination data discussed in the baseline. Around 70% of leavers currently continue in education, most in the local FE colleges. So the development may increase demand by up to 10 places across the whole sector. This is a higher proportion than assumed in the Station ES, which estimated only 50% (5). However neither figure is likely to be significant, individually or cumulatively because, as discussed in the baseline the Council is planning a very large expansion of sixth form provision in its schools and also the academies.

7.5.43 The impact on Further Education is considered to be Not Significant for both the site and cumulatively with the Station redevelopment.

Health

GPs and Health Centres

7.5.44 Evidence supplied by the Hounslow and Richmond Community Healthcare trust to inform the recent Station ES suggests a lack of local GP capacity around the site (the trust has confirmed there is no more recent data available). A number of the local health centres are operating below the target GIA to meet demand and also a number require investment to improve their physical condition.

7.5.45 The Councils S106 calculator suggests 207 new residents will require access to healthcare. With this in mind any additional new residents will create an adverse impact although compared to the total 1.5km catchment of 41,000 people the impact will be small.

7.5.46 This is considered to be a moderate and adverse impact. When combined with the station site (269 new residents) the combined number of new residents requiring healthcare will be just over 1% of the 1.5km catchment and which is considered will remain moderate and adverse.

Hospitals

7.5.47 The site is well located to access major hospitals with both the West Middlesex (acute) hospital and the more local Teddington Memorial Hospital being around 2 miles away. The small additional burden the 207 additional residents will place on these facilities is not significant.

7.5.48 Combined with other nearby schemes the impact may have some significance. The 476 new residents from both the Station site and this may create a very minor adverse impact. Although given the very large catchments of the hospitals, this will be very minor.

Dentist

7.5.49 Six dentist surgeries have been identified in close to the development site. All of which are currently accepting new patents (except the PCT walk in centre which does not have a list). Three surgeries are accepting NHS patients. There is therefore capacity to accommodate additional local residents in the area. For the 207 new residents from the scheme the impact is likely to be not significant and the combined (with the Station redevelopment) minor adverse.

Other Community, Including Community Buildings and Leisure

7.5.50 The development includes provision for a new community building which may include new indoor sports space.

7.5.51 The community building will be five storeys. The use of the building has been subject to discussion with LBRuT and will provide the following:

- Performance hall area (with basement changing rooms), bar/café and reception area on the ground floor; and
- Flexible floor spaces on the first, second, third and fourth floors.

7.5.52 The final uses of the community building will depend on the requirements of the LBRuT and the local community, but are anticipated to entail live music performances, theatre, rehearsals, music studios and sporting activities. As such it will make a positive contribution to the boroughs leisure provision and community space provision.

7.5.53 The impact of the new facility is considered to be a moderate beneficial effect on leisure and community facilities.

7.5.54 The development will generate some demand for increased local play provision although all of the new houses on site will include private gardens and informal play space will be provided in the plaza area for those without gardens. In addition the new community facility described above may contribute additional space dependent on its end use. The development is therefore expected to have only a minor adverse impact on local place space provision.

7.5.55 **Table 7.11** provides a summary of the socio-economic effects of the proposed development.

Table 7.11: Summary

	Summary	Classification	Significance	Term	Mitigation
Economic Impacts					
Construction Jobs	180 (90 per year).	Beneficial	Minor	Short	Commitment to provide local employment and training.
Other Jobs	52 from the restaurant and community use	Beneficial	Minor	Permanent	
GVA					
Retail Spend	£1.2m pa of which £450,000 in Richmond	Beneficial	Minor	Permanent	
Fiscal	New Homes bonus and tax receipts	Beneficial	Minor	Permanent	
Population Impacts					
New Homes	110 new homes; including social and family housing.	Beneficial	Minor	Permanent	Social Mix to be determined.
GP Surgeries	207 new residents. Limited capacity.	Adverse	Moderate	Permanent	Contributions to be determined.
Dentists	207 new residents. Some local capacity.	Adverse	Minor	Permanent	
Hospitals	Number of residents unlikely to be significant.	Not Significant	Not Significant	Permanent	
Childcare	No capacity in state schools but there is private capacity identified.	Not Significant	Not Significant	Permanent	
Primary Education	18 new places. Very limited capacity across Borough. However this is a known Borough wide problem and strategies are being implemented.	Adverse	Moderate	Permanent	Contributions to be determined. Dependent on social mix.
Secondary	9 places. Limited capacity across Borough. However this is a known Borough wide problem and strategies are being implemented.	Adverse	Minor	Long Permanent	Contributions to be determined. . Dependent on social mix.
Play Space	No new formal place space is proposed. However all homes have gardens and informal play space will be provided in the new plaza.	Adverse	Minor	Permanent	Potential in the community building to provide increased play opportunities.
Wider Community	New Community Space.	Beneficial	Moderate	Permanent	

7.6 Mitigation

7.6.1 The main adverse socio-economic effect associated with the redevelopment relate to the potential demand placed on education and health services in the area; especially primary education and GP provision. It is expected these will be mitigated through contributions to be determined when the mix of development (social/private) is confirmed.

7.6.2 The new community building being provided may also contribute to on site leisure and play provision depending on the final scope of the proposal.

7.7 Assessment of Cumulative Effects of MOL Footpath Proposals

7.7.1 It is understand that LBRuT intends to provide a footpath through the wider MOL, which potentially opens up the wider MOL as a park. This will provide a new recreational space for the existing local community and residents of the proposed development. In addition the footpath will improve connectivity in the local area for pedestrians and cyclists. The cumulative effect of LBRuT's proposals is therefore considered to be minor and beneficial.

7.8 Summary

7.8.1 An assessment has been made of the social and economic effects of the proposed development. This has considered the extent to which the proposed development is expected to deliver local economic development policy and its potential impacts on employment, population, the local community and social and community infrastructure. Consideration has been given the effects of the proposed development in isolation and in combination with the redevelopment of the railway station.

7.8.2 Key policies considered include the London Plan, the Core Strategy and the emerging Twickenham Area Action Plan. These documents show that there is a need to improve the overall economic performance of Twickenham. As part of this, and to meet the social objectives of the plans new housing is proposed to meet identified needs and also provide additional people in the local area.

7.8.3 The economy of the Borough remains relatively strong, although as with everywhere will have been dampened by the recession. There is however no need or demand for new high density employment space in the area.

7.8.4 The proposed development will make a significant contribution towards the aspirations of LBRuT to improve Twickenham. It will deliver benefits in terms of jobs, linked both to the construction and operation phases of the development. Alongside this, new development will result in increased population, which will in turn lead to more expenditure becoming available to local businesses, both on the site and in the town centre generally. These economic effects of the proposed development are generally considered to be a minor beneficial effect.

7.8.5 The increased population however will place more demand on existing local service provision. LBRuT will need to plan future social and community infrastructure provision, particularly education facilities, to allow for this growth which will also need to be considered in the context of other developments proposed in the local area. Primary education and to a more limited extent healthcare (GP surgery capacity) are key issues to be addressed. The increased demand on local services is generally considered to be a minor adverse effect of the proposed development.

7.8.6 The provision of new services and amenities, along with the regeneration of the area and opening of the waterside, are considered to provide a moderate beneficial effect for the local community and future residents of the development.

7.9 References

Ref 7-1 National Planning Policy Framework (July 2012)

Ref 7-2 The London Plan 2011

Ref 7-3 London Borough of Richmond upon Thames (2009) 'Richmond Local Development Framework Core Strategy'

Ref 7-4 Twickenham Area Action Plan, Publication version 2012.

Ref 7-5 South West London Strategic Housing Market Assessment, January 2012

Ref 7-6 LB Richmond Local Economic Assessment (LEA), Roger Tym & Partners, 2010

Ref 7-7 'Richmond Retail Study Update, GVA Grimley, 2009

Ref 7-8 2011 Census Briefing Paper, Analysts Group of LBRuT and Richmond & Twickenham PCT, July 2012

Ref 7 – 9 http://www.nhs.uk accessed July 2012

Ref 7 – 10 http://www.direct.gov.uk/en/index.htm accessed July 2012

Ref 7–11 http://www.education.gov.uk/edubase accessed August 2012

Ref 7 -12 Appendix 1 projections presented to the Education and Children's Overview and Scrutiny Committee, 21 November 2011. Appendix 1 projections were considered by officers to the 'most likely'.

Ref 7-13 Choice and Diversity: a policy paper for Education and Children's Services, LBRuT 2010,

Ref 7-14 http://www.richmond.gov.uk/richmond_destination_survey_2011.pdf

Ref 7-15 "Employment Densities Guide, 2nd Edition". OffPAT and HCA, (2010),

Ref 7-16 http://www.communities.gov.uk/housing/housingsupply/newhomesbonus/ . Accessed August 2012.

8 Hydrology & Flood Risk

8.1 Introduction

8.1.1 This chapter documents the assessment of the effect of the proposed development in relation to hydrology and flood risk.

8.1.2 The chapter describes the assessment methodology; the baseline conditions at the site and surroundings; the likely significant environmental effects; the mitigation measures required to prevent, reduce or offset any significant adverse effects; and the likely residual effects after these measures have been employed. This chapter has been prepared by Peter Brett Associates LLP (PBA).

8.1.3 This chapter should be read in conjunction with the Flood Risk Assessment (FRA), which has also been prepared by PBA and which is enclosed in **Appendix C**. A surface water management strategy forms part of the FRA.

8.2 Policy Context

Water Resources Act, 1991

8.2.1 The Water Resources Act relates to the control of the water environment. Aspects of the Act which are relevant to the proposed development include provisions concerning land drainage and pollution.

Flood and Water Management Act, 2010

8.2.2 The Flood and Water Management Act received royal assent in April 2010 and, of relevance to this application, it both removes the right of connection to a public sewer and sets a framework for new national standards for Sustainable Drainage Systems (SuDS).

8.2.3 All planning applications for new development will have to be accompanied by a SuDS application which will be independently assessed by a SuDS Approval Body (SAB) which will either approve or refuse the application irrespective of the outcome of the planning application.

Water Framework Directive, 2000

8.2.4 The aim of the Water Framework Directive (WFD) is to establish "*good ecological and chemical status in all surface waters and groundwaters*." It also promotes the importance of sustainable water use.

8.2.5 During the implementation process, Local Planning Authorities (LPAs) must not act in a way to compromise the WFD's aims. As part of the planning process, powers to control diffuse pollution at the source should be introduced to meet the obligations under the WFD. The development proposals therefore must have no adverse effect on the water quality of any receiving waterbodies.

National Planning Policy Framework, 2012

8.2.6 Section 10 of the NPPF sets out Government policy on development and flood risk – its aims are to ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas of highest risk. In circumstances where new development is necessary in flood risk areas the policy also aims to make it safe, without increasing flood risk elsewhere, and, where possible, reducing flood risk overall.

8.2.7 The NPPF and accompanying Technical Guidance were published in March 2012 and replaced Planning Policy Statement 25 (PPS25). The NPPF reinforces the previous guidance in respect of placing greater emphasis on the information and recommendations specified in the Strategic Flood Risk Assessments of Lead Local Flood Authorities and made some modifications to the Exception Test. The guidance aims to locate development proposals in less vulnerable Flood Zones. NPPF defines risk and the source-pathway-receptor model, it then goes on to advocate the use of the risk-based sequential test, in which new development is steered towards the areas at lowest probability of flooding, which are identified by Flood Zones, as follows:

- **Flood Zone 1**: Low probability of flooding - less than 0.1% (1 in 1000) annual probability of river or sea flooding in any year;
- **Flood Zone 2**: Medium probability of flooding - between 1% and 0.1% (1 in 100 and 1 in 1000) annual probability of river flooding and between 0.5% and 0.1% (1 in 200 and 1 in 1000) annual probability of sea flooding in any year;
- **Flood Zone 3a**: High probability - 1% (1 in 100) or greater annual probability of river flooding or 0.5% (1 in 200) or greater annual probability of sea flooding in any year, and;
- **Flood Zone 3b**: The functional floodplain - where water has to flow or be stored in times of flood, including flood conveyance routes. As a starting point, it is land which would flood with an annual probability of 5% (1 in 20) or greater in any given year or designed to flood in an extreme 0.1% (1 in 1,000) flood.

8.2.8 It should be noted that the above Flood Zones 1, 2 and 3a ignore the presence of flood defences.

8.2.9 NPPF also provides further definition of functional floodplain and the accommodation of the potential effects of climate change on development. Accordingly, NPPF recommends precautionary sensitivity ranges for peak flood flows of +10% to 2025 and +20% from 2025 to 2115 in rivers, with rainfall intensities gradually increasing by 5% to 30% from now until 2115.

CIRIA C697, 2007

8.2.10 Sustainable Drainage System (SuDS) techniques as set up in CIRIA C697 (CIRIA 2007) guidance aim to deal with surface water as close to the source as possible and reproduce natural drainage patterns to prevent an increase in the volume and peak discharge from development sites.

Sewers for Adoption, 6th Edition, 2006

8.2.11 Sewers for Adoption 6th Edition, provides guidance on the design, construction and maintenance of drains and sewers outside buildings which are to be adopted by a relevant public authority.

BS EN 752:2008 – Drain and Sewer Systems Outside Buildings, 2008

8.2.12 BS EN 752:2008 – Drain and Sewer Systems Outside Buildings (2008), provides a framework for the design, construction, rehabilitation, maintenance and operation of drain and sewer systems outside buildings.

Regional Policy

Draft Thames Water, Water Resource Management Plan, 2012

8.2.13 A review of the Draft Thames Water, Water Resource Management Plan (January 2012) found the following:

- The proposed development site is located within London Water Resource Zone (WRZ).
- Their document identifies a number of strategic resource developments proposed for the WRZ, and it is anticipated that the water demand from all future development within the WRZ will be met through a combination of universal metering, leakage reduction, water efficiency measures and resource developments.
- Thames Water has considered scenarios of universal water metering in their Water Resource Plan.

Environment Agency, Thames Catchment Flood Management Plan (CFMP), 2009

8.2.14 The site is located within Sub-Area 9 (London Catchments). The CFMP states that the principle flooding issues in this locality are concerned with blockage risk from artificial river systems, the overflow from surface drains, inundation of sewers and large areas of impermeable surfacing.

8.2.15 The Environment Agency has applied 'Policy Option 4' for the management of flood risk within the Sub-Area, which is defined as *"…areas of low, moderate or high flood risk where we are already managing the flood risk effectively but where we may need to take further actions to keep pace with climate change".* In effect, this means that the Environment Agency already has appropriate procedures in place to manage flood risk but further works may be necessary to combat the impacts of climate change.

8.2.16 The proposed management actions by the Environment Agency include:

- *"We will continue to make sure the recommendations in Strategic Flood Risk Assessments and Local Development Framework policies create the potential to reduce flood risk through regeneration.*
- *We will play our part in adopting a strategic approach to planning so that wider community objectives as well as flood risk objectives can be met.*
- *We will develop our emergency response planning to deal with extreme floods, including raising public awareness and working with key partners to identify critical infrastructure at flood risk.*
- *We want to continue to maintain the existing flood defences and when redevelopment takes place, replace and improve them so that they are more effective against the impacts of climate change. We will be looking to remove culverts and other structures that cause significant conveyance problems. An example of this is our work in the Ravensbourne catchment.*
- *With our partners, we will look for opportunities to reduce flood risk by recreating river corridors in urban areas. We will influence people who shape the urban environment and harness these opportunities, allowing space for water, habitat, wildlife and recreation."*

Thames River Basin Management Plan, Environment Agency (Thames Region), 2009

8.2.17 The River Basin Management Plan focuses on achieving protection, improvement and sustainable use of water and is a requirement of the Water Framework Directive (WFD). The plan identifies the management of future development as one of the key aspects which can influence achievement of the WFD requirements.

8.2.18 The River Crane falls within the London Catchment, which is described in the plan to be heavily modified and to have a significant water quality problem.

8.2.19 The River Basin Management Plan outlines some key actions for the London Catchment. The only item relevant to the site is that *"the Environment Agency and Natural England will work together to continue to develop and implement the London Rivers Action Plan to improve ecology through habitat creation and enhancement."*

Environment Agency, London Catchment Abstraction Management Strategy (CAMS), 2006

8.2.20 The CAMS specifies that the Water Resource Management Unit for the River Crane is classified as 'Water Available'. This status allows for some water abstraction practices as the environment is not being compromised. However, this unit does not include groundwater.

The London Plan, Mayor of London, 2011

8.2.21 Section 5.12 and 5.13 of the London Plan focuses on flood risk management and sustainable drainage systems and supports PPS25 as overarching policy to manage flood risk in the built environment. In line with PPS25, the London Plan identifies the need for local planning authorities to carry out Strategic Flood Risk Assessments (SFRAs) to inform their Local Development Documents and manage flood risk taking climate change into account. The overarching policies of PPS25 have now been superseded by the NPPF, but the core principles remain the same.

Local Policy

London Borough Richmond upon Thames (LBRuT) Core Strategy (2009)

8.2.22 The Core Strategy was adopted by LBRuT in 2009 and sets out the objectives, strategy and vision for the Borough in terms of housing provision and economic development up to 2026.

8.2.23 The Core Strategy has a number of development policies which are directly relevant to consideration of flood risk and surface water management for the new development. Policy CP3 provides guidance on the design of developments to account for the effects of climate change and CP12, guidance on development within the River Crane corridor:

- **Policy 3A** - Development will need to be designed to take account of the impacts of climate change over its lifetime, including:
    - Water conservation and drainage;
    - The need for Summer cooling;
    - Risk of subsidence; and
    - Flood risk from the River Thames and its tributaries.
- **Policy 3B** - Development in areas of high flood risk will be restricted, in accordance with PPS25, and using the Environment Agency's Catchment Flood Management Plan, Borough's Strategic Flood Risk Assessment and site level assessments to determine risk.
- **Policy 12A -** The Council will improve the strategic [River Crane] corridor to provide an attractive open space with improvements to the biodiversity. Developments in and adjacent to the River Crane Corridor will be expected to contribute to improving the environment and access, in line with planning guidance.

LBRuT Development Management Plan (2011)

8.2.24 The local authority's Development Management Plan, which was adopted in November 2011, has been produced to address in more depth the policies outlined in the Core Strategy. Its focus lies with ensuring that development is conducted in a sustainable manner.

8.2.25 Policy DM SD6 focuses on flood risk and highlights the need for developments to be assessed in line with PPS25 to determine their suitability of the development's location; dependent on the vulnerability of the development and the Flood Zone in which it is located. The document instructs that attenuation areas should be considered as a method for reducing the risk of fluvial and surface water flooding. For proposals of more than 10 dwellings it is necessary to provide justification, where attenuation has not been provided. On sites of more than 10 dwellings or more than 1,000m^2, it is necessary to produce a Flood Warning and Evacuation Plan.

8.2.26 Policy DM SD7 states that in the design of surface water drainage strategies a hierarchical approach should be taken when considering an appropriate strategy, in accordance with the London Plan:

- Store rainwater for later use;
- Use infiltration techniques, such as porous surfaces in non-clay areas;
- Attenuate rainwater in ponds or open water features for gradual release to a watercourse;
- Attenuate rainwater by storing in tanks or sealed water features for gradual release to a watercourse;
- Discharge rainwater direct to a watercourse;
- Discharge rainwater to a surface water drain; and
- Discharge rainwater to the combined sewer.

8.2.27 It is also stated in Policy DM SD7 that wherever possible SUDS should be incorporated into drainage strategies and that surface water runoff rates should be reduced to the Greenfield runoff rate for the site, wherever this is achievable. Evidence must be provided when discharging surface water to the existing sewer network, which shows that there is adequate capacity within the system for the additional volume of water.

8.2.28 Policy DM SD8 relates to developments next to river banks and flood defences. It is stated that an 8m buffer zone should be provided between any development and the bank-top of a river, in order to ensure ease of maintenance and upgrading.

LBRuT Preliminary Flood Risk Assessment (2011)

8.2.29 The Preliminary Flood Risk Assessment (PFRA) was published in May 2011 to provide an overview of flooding within the Borough. Data was collected from a number of sources to provide information regarding historical flooding in the Borough. The purpose of the report is to provide evidence in determining areas at risk of flooding, in order to instruct in planning within the area.

8.2.30 The PFRA records a number of flood events within the Twickenham area, though none are in the immediate vicinity of the site. All are incidents of surface water flooding in July 2007. The development site is included in a list of major development sites that are considered to have a potential to increase the local flood risk. However, the flood risk caused by the redevelopment of the site has been investigated in detail in the FRA and it has been found that the redevelopment of the site will in fact reduce the risk of flooding to the site and the areas in the immediate vicinity of the site.

8.2.31 Figure 3 of the PFRA, maps the number of sewer flood events in certain areas, within the Borough. The site lies on the border between two such areas, for which records have shown that there are only between 1 and 5 historic sewer flood occurrences. Figure 5 of the PFRA shows that part of the site lies within an area of moderate flood hazard. There may, therefore, be capacity issues within the sewer network in the vicinity of the site, which is considered in **Section 8.5**.

LBRuT Level 1 Strategic Flood Risk Assessment (2010)

8.2.32 The Strategic Flood Risk Assessment (SFRA) comprises a study that sets out the nature of flood risk constraints to enable LBRuT to apply the Sequential Test as part of the Local Development Framework (LDF) process. The study categorises all areas within the Borough in accordance with the Flood Zones set out in PPS25, which has since been superseded by the NPPF. The SFRA flood maps are based upon a combination of the EA's Flood Map, historical flood event data and the results of hydraulic modelling studies and also includes mapping from the EA surface water flood risk mapping.

8.2.33 The SFRA guidance on surface water drainage is in line with national guidance on the sustainable management of surface water runoff from development sites, as detailed in PPS25 and the most recent EA Standing Advice.

8.2.34 Guidance for developers for the completion of site specific FRAs generally falls in line with national guidance on flood risk and surface water management contained in PPS25 and EA Standing Advice on Development and Flood Risk.

8.2.35 However, the SFRA sets out the following requirements for developers in addition to the requirements set out in national guidance and policy:

- *"The developer must provide a clear and concise statement summarising how the proposed (re)development has contributed to a positive reduction in flood risk within the Borough.*

- *The raising of floor levels within the highest risk areas of the Borough will ensure that the risk to life, and damage to property, is minimised. Floor levels should be situated a minimum of 300mm above the 1% AEP (100 year) fluvial or 0.5% (200 year) tidal (whichever is greater) plus climate change flood level, determined as an outcome of the site based FRA. A minimum of 600mm above the 1% AEP (100 year) flood level should be adopted if no climate change data is available.*

- *It is recommended that developers demonstrate that the Local Plan drainage hierarchy has been considered in the design of their surface water management system."*

LBRuT Flood Risk and Development Sequential Test (2008)

8.2.36 The LBRuT Sequential Test report assesses the site in terms of flood risk. The document states that there are no reasonably available alternative sites in areas of lower flood risk or the same flood risk zone and that the site therefore passes the Sequential Test.

8.2.37 The document also demonstrates that all three components of the Exception Test can be passed as the development provides wider sustainability benefits for the community that outweigh flood risk, is located on previously developed land and, users of the development can remain safe without increasing flood risk elsewhere.

LBRuT Crane Valley Planning Guidelines (2005)

8.2.38 This document sets out development planning guidelines for developers bringing forward sites within the Crane valley and specifically the River Crane corridor.

8.2.39 The focus of the guidelines is to create a positive policy of environmental improvement and sympathetic development. There is also a push to provide a through pedestrian/cycle route along the River Crane.

8.2.40 The planning guidelines provide the following advice:

- *"Permission is required from the EA for development in, under, over or within 8m of the River Crane.*

- The EA are *"likely to object to development within the 8m corridor as well as securing access to the riverside for flood risk and maintenance purposes. As there is existing development within this 8m corridor there may be scope for variation from a uniform 8m set back, in agreement with the Environment Agency, where access to the river and the river environment, is improved overall.*

- *The proposed development building ground floor levels be set at an appropriate height (freeboard):*

  - *Above the flood level of the 1 in 100 year +20% flood flow allowing for climate change; and*

- *To meet the requirements of the Association of British Insurers, (currently 0.5% annual probability (1 in 200 year return period) up to the year 2050), after taking climate change into account.*

- *New buildings constructed within the floodplain must not be on stilts and must not have storage voids beneath.*

- *Development in the floodplain should ensure that floodplain storage is not reduced, floodplain conveyance is not interrupted and not lead to increase flood risk elsewhere.*

- *Developers must incorporate SUDS to prevent the water environment being adversely affected by:*

  a) *Increasing surface water runoff;*

  b) *Increasing the risk of pollution, in particular diffuse pollution; and*

  c) *Reducing the recharge of groundwater and d) causing physical damage to the beds and banks of watercourses.*

- *SUDS implemented must have adequate provision for future maintenance.*

- *Applications for planning permission for the Post Office Sorting office site which has a significant area within the flood risk area will need to be accompanied by a more detailed and robust Flood Risk Assessment.*

- *The kind of concrete canalised trench along the River Crane adjacent to the Royal Mail Sorting Office "has now fallen out of favour and more naturalised measures of flood prevention are now preferred which give more opportunities for wildlife along the water edge.*

- *Development proposals must contribute to a scheme for restoration of more naturalised river banks through the framework area. It is acknowledged that this might not be practical where the channel runs along the back of domestic gardens and other measures might be needed."*

LBRuT Twickenham Station and Surroundings Design Standards Supplementary Planning Document (2010)

8.2.41 The SPD provides a comprehensive approach to ensure the best overall development for the Twickenham area. It states that permeable surfacing should be incorporated into future developments, to reduce surface water runoff rates.

Surface Water Management Plan for the London Borough of Richmond upon Thames (2011)

8.2.42 The Surface Water Management Plan was produced in 2011 as part of the Drain London initiative. The document outlines the preferred surface water strategy for the Borough, taking into consideration flooding from a number of different sources. Surface water data has been collected and reviewed in the development of the plan. Following this a risk assessment was undertaken, which used modelling to analyse surface water, allowing areas at risk from fluvial flooding to be identified. This data was then used to inform the assessment of various surface water management options for the area and to determine a long-term management plan.

8.3 Methodology

8.3.1 The approach for the assessment has been guided by the EIA Scoping Opinion.

8.3.2 Assessing the significance of the potential impacts of the development on the hydrology, drainage and flood risk of the site has involved defining the existing flood risk to the site and understanding how the development will change that risk. This has been carried out through the production of a Flood Risk Assessment (FRA) in accordance with national, regional and local planning policy, which is provided in **Appendix C**. The FRA first assesses the existing risk of flooding to the site through analysis of flood maps provided by the EA and checking records of flooding at the site through consultation with a number of key stakeholders.

8.3.3 The FRA is prepared in line with the Sequential Test, which determines the suitability of a development of a certain land use for a site and analyses it in relation to the flood risk at the site. The Sequential Test ensures that sites with a lower probability of flooding are prioritised for development ahead of those with a higher risk of flooding. All available information regarding flood risk is assessed against the development proposals in order to quantify the risk of flooding to the site and areas in the vicinity of the site.

8.3.4 The methodology adopted for technical assessment of hydrology and flood risk has involved the following:

- Review development flood risk and drainage works in accordance with applicable national, regional and local level planning policy requirements.
- Consideration of the risk to life and property posed by all potential sources of flooding including the River Crane in accordance with NPPF and the latest accepted climate change guidance.
- Mitigation of the potential detrimental impacts of surface water runoff from the development upon receiving receptors including watercourses, groundwater and drainage systems.

- Identification of risks to sensitive receptors from the proposed development and the likely impacts, magnitude of change and significance of impact during both the construction and operational phases.

Baseline Data Collection

8.3.5 The collection of data for determination of the baseline conditions of the site has involved reviewing data from a number of different sources in order that the most comprehensive understanding of the existing risk of flooding at the site and in the vicinity of the site can be gained. National and local legislation in relation to hydrology and flood risk has also been reviewed.

8.3.6 Consultation with the relevant organisations and authorities has provided information regarding potential sources of flooding (fluvial, surface water, and groundwater), expected water levels, flow monitoring data and historical flooding. Consultation has been carried out with the following authorities:

- EA;
- LBRuT; and
- Thames Water.

8.3.7 Data collected during the consultation process can be found in the Flood Risk Assessment (FRA), which is provided in **Appendix C**.

Environment Agency

8.3.8 The EA produce a series of flood maps, which can be used to determine the risk of flooding at the site. These maps plot the extent of fluvial and tidal flooding for certain rainfall event return periods. The EA has also produced a hydraulic model for the River Crane. Modelled water levels for the River Crane have been reviewed with detailed site survey data to confirm the extent of flooding at and in the vicinity of the site in various return period events. Historical flood records have also been provided by the EA and were considered in determining the flood risk to the site.

8.3.9 Mapping indicating the depth of groundwater beneath the ground surface has also been provided by the EA.

8.3.10 Various correspondences with the EA has provided information regarding their requirements for the development such as the inclusion of SuDS; consideration of the ecology of the site and the location of the site relating to positions of areas expected to flood and source protection zones.

London Borough of Richmond upon Thames

8.3.11 The SFRA produced for the Borough sets out the requirements that a developer is expected to adhere to. This is described fully in Paragraph 8.2.35 and states that *"the developer must describe how the development decreases flood risk; the requirements for the floor levels of the buildings proposed for the development and the need to consider the drainage hierarchy set out in the Local Plan within the surface water management strategy".*

8.3.12 E-mail correspondence with the council highlighted the council's requirements for the site to control discharges into the River Crane and consider the effects of pollutants on the quality of the River Crane.

Thames Water

8.3.13 No information from Thames Water was provided relating to flooding at or in the vicinity of the site resulting from the poor condition or inadequate capacity of local sewers.

8.3.14 Thames Water provided asset plans, which were reviewed alongside site observations in order to determine the location and nature of the existing drainage infrastructure present on the site.

Other Information

8.3.15 Work undertaken by RSK and MK Surveys has also informed in the preparation of the FRA and ES Chapter.

8.3.16 Observations were made, by RSK, during site walkovers, which confirmed the presence of existing services and provided information regarding the condition of existing infrastructure and the River Crane.

8.3.17 RSK undertook a Wall Condition Survey in May 2012 to determine the condition of the concrete walls and river bed of the River Crane channel. The survey recorded the dimensions of the wall, evidence of movement, the condition of the concrete, deterioration and notable defects. The channel was generally found to be in good condition.

8.3.18 A topographical survey of the site was undertaken by MK Surveys in 2011 to identify levels across the site. Further information regarding the findings of the survey is outlined in the FRA. This information has allowed an understanding of how the existing site drains and to determine the extent of flooding in relation to the flood levels predicted by the EA River Crane hydraulic model.

8.3.19 The following plans have been used in the preparation of the FRA and ES Chapter:

- Topographical Survey (MK Surveys, 2011);
- Site Masterplan (St James, 2012);
- Thames Water Asset Plan (Thames Water, 2012);

- Proposed Surface Water Drainage Strategy Plans (RSK, 2012); and
- Flood Maps, Groundwater Mapping and Locations of Modelling Nodes Plan (EA, 2012).

Assessment

8.3.20 The impacts of the development have been assessed in relation to the baseline flood risk to the site and the existing surface water regime.

8.3.21 EA model data has been used to inform the FRA to determine the effects that the proposed development is expected to have on the site and on areas downstream. An appropriate strategy for the drainage of surface water runoff from the development has been outlines to ensure there is no increase in the risk of flooding to the site or an adverse impact to the overall drainage of the site.

8.3.22 It was also necessary to consider how the baseline conditions would be expected to change due to the impacts of climate change. The Technical Guidance to the NPPF provides guidance on the potential increases in peak rainfall that should be accounted for as a result of climate change over various timescales. This is provided in Table 5 of the Technical Guidance document. These have been included within the modelling undertaken to inform in the drainage design for the site. It has been assumed that the peak rainfall will increase by 30% as a result of climate change in accordance with the guidance for a residential development with a lifetime of 100 years.

Significance Criteria

8.3.23 The significance of residual effects, following the implementation of mitigation measures, has been assessed based on the generic significance criteria. This has been based on a qualitative appraisal of the magnitude of the effect and the sensitivity of the affected receptor.

8.3.24 The magnitude of flood risk and severity of the impact to people and property for the baseline and with development scenarios has been considered as part of the Flood Risk Assessment.

8.3.25 The criteria used in the assessment of the effects are those as defined in **Table 5.1** of this report.

8.3.26 With respect to hydrology and flood risk, adverse impacts will be those where the risk of flooding at the site or downstream of the site is increased as a result of the development. Beneficial impacts will be apparent where there is a decrease in flood risk as a result of the development of the site.

8.4 Baseline Conditions

8.4.1 This section describes the existing condition of the site and the local area. It also describes how the current condition would be expected to change, should the proposed development not proceed. The extent of the assessment covers land within the site boundary and any surrounding land that may be impacted or be susceptible to impact by the proposed development and vice versa.

Watercourses

8.4.2 There are no watercourses within the site. The site is located immediately adjacent to the River Crane, which flows in a north easterly direction along the northern boundary of the site to its confluence with the River Thames just upstream of Isleworth Ait. Adjacent to the site, the banks of the watercourse are heavily modified and constructed of reinforced concrete, which in certain places has fallen into a state of disrepair. The channel of the River Crane is relatively shallow throughout the reach and is confined in near vertical banks. The River Crane enters a culvert underneath the London Road adjacent to the north eastern corner of the site.

8.4.3 The RSK Wall Condition Survey considers a reach of the River Crane from the wider MOL to the west of the site to the London Road culvert, adjacent to the north east corner of the site. However, only a reach of approximately 75m extending upstream from the London Road culvert, is immediately adjacent to the site's red line boundary.

8.4.4 The Wall Condition Survey demonstrates that the River Crane flows within a concrete channel for the entirety of the surveyed extent. In some places the concrete walls have become heavily vegetated but there are no natural river banks in the vicinity of the site. The wall is generally in good condition, though some wall movement and vertical cracks were noted.

8.4.5 The survey also recorded all structures in the channel. The River Crane flows under the London Road in a large culvert immediately to the north east of the site. There were two bridges recorded during the survey. A footbridge was located approximately 84-86m upstream of the London Road culvert and a bridge of temporary scaffolding construction was located at a distance of approximately 86-89m upstream of the culvert. There are no obstructions recorded in the channel.

8.4.6 **Section 8.4.10** confirms that EA model data demonstrates that the channel capacity is adequate for extreme events, although the water levels provided by the EA for the River Crane suggest that there may be some limited overtopping of the river banks during extreme events.

Existing Surface Water Drainage Regime

8.4.7 Surface water runoff from the site currently discharges into the River Crane at two locations and into the existing sewer network to the south east of the site.

8.4.8 Review of a topographical survey and utility survey undertaken in 2011, determined that there are three separate drainage sub-catchments currently serving the site:

- **Sub-catchment A** - Brewery Lane which is drained to a Thames Water public sewer, located to the south east of the site.
- **Sub-catchment B** - comprises the eastern area of the site, which drains via a 225mm diameter outfall into the River Crane to the north located at NGR 505980, 173692 to the north. The sub-catchment currently comprises various sorting office buildings.
- **Sub-catchment C** - comprises the western portion of the site, which is currently occupied by sorting office buildings and the associated parking areas and service yards. This area drains toward the west into a densely vegetated area via a 300mm diameter pipe. It is understood that this pipe outfalls into the River Crane.

8.4.9 The existing discharge rates, obtained through hydraulic modelling of the existing system, are provided in **Table 8.1**. Sub-catchment A has not been included in the modelling review as it will be unchanged by the development.

Table 8.1: Existing Site Discharge Rates

Return Period	Sub-catchment B	Sub-catchment C
1 in 2 year	49.9 l/s	78.6 l/s
1 in 30 year	70.9 l/s	131.4 l/s
1 in 100 year	78.5 l/s	158.0 l/s

Fluvial Flood Risk

8.4.10 The EA Flood Maps indicate that the site lies within an area with a less than 1 in 1,000 year risk of flooding. The technical guidance of the NPPF defines Flood Zone 1 as 'land assessed as having a less than 1 in 1,000 year annual probability of river or sea flooding'. Therefore the site lies within Flood Zone 1 and is deemed to be at a low risk of flooding. Historical records confirm that there are no known reports of fluvial flooding in the immediate vicinity of the site.

8.4.11 The risk of flooding to the site is not expected to increase significantly in the future if the development of the site does not proceed, although the risk of flooding in wider areas is expected to increase due to the impact of climate change.

Surface Water Flood Risk

8.4.12 The site is brownfield and comprises 100% impermeable surfacing. A review of local development documents has confirmed that there the site may be at a moderate adverse risk to surface water flooding since there have been historical surface water flood events in the Twickenham area.

Groundwater Flood Risk

8.4.13 There are no known reports of groundwater flooding at the site. EA data suggests that groundwater is located at a depth of 6m below ground level. However, this does not correlate with detailed site investigation data collected by RSK in 2011, which found the depth of groundwater to be approximately 2.5 to 3.9m below ground level.

Future Conditions

8.4.14 Planning permission has been granted for the redevelopment of Twickenham Railway Station, located immediately to the east of the site and thus it is necessary to consider the affect that this would have on current baseline conditions.

8.4.15 Although the redevelopment of the station will change the surface water strategy for the site, the Environmental Statement produced in 2011 by Maddox Associates, states that the runoff rate from the site will be limited to the existing rate or a reduced rate and hence the redevelopment will have no adverse impact on local flood risk. The site currently comprises predominantly hard standing and will continue to do so under the proposed plans. It is unlikely that the development will have any impact on the River Crane at the location of the Former Royal Mail Sorting Office, since the railway station is downstream of this location.

8.5 Potential Effects

8.5.1 This section identifies the impact that the development would have in both the construction and operational phases, should no mitigation measures be undertaken. The construction process considered is outlined in **Chapter 4** while the operational phase includes occupation of the proposed buildings and ongoing operation and maintenance of the whole site.

Construction

8.5.2 The impact of construction of the development on floodplain storage capacity is negligible since the site is located within Flood Zone 1, which is defined as 'land assessed as having a less than 1 in 1,000 year probability of river or sea flooding'. The site is therefore considered to be located outside of any known floodplains and any development will have no impact on floodplain flows or storage.

8.5.3 Due to the proposed improvements to the surface water drainage strategy it is possible that during the construction phase there will be periods where the surface water drainage system serving the site is interrupted. In the worst case, this may result in localised pooling of surface water runoff on the site and has the potential to increase the risk of surface water flooding in certain areas, which will need to be managed through appropriate measures in the Construction Management Plan (CMP).

Operation

8.5.4 As the site is located within Flood Zone 1 the proposed development, including its occupiers, should not be at a significant risk of flooding.

8.5.5 The site currently comprises hard standing that discharges to the River Crane without attenuation. As a result the development should not increase the volume or rate of surface drainage from the site, while the inclusion of attenuation within the surface water drainage strategy offers the potential for a reduction in surface water drainage rates.

8.5.6 The site bounds only a short reach of the River Crane and there are limited opportunities to modify the channel or the fluvial environment. As such the River Crane channel itself is not affected by the scheme. However, access to the River Crane would be improved, since an area of public realm, incorporating steps down to the river is proposed. Furthermore, new buildings will be set further back than existing, providing potential improvements to the overall river bank environment.

Cumulative

8.5.7 The effect of the proposed development has been considered cumulatively with the redevelopment of Twickenham Railway Station. The redevelopment of the station will limit discharge rates to pre development levels or lower. As a result there should not be a significant cumulative effect.

8.6 Proposed Mitigation & Enhancement

8.6.1 The following mitigation and enhancement measures are proposed.

Construction

8.6.2 Since it has been determined that the site is at a very low risk of fluvial flooding and the construction of the development will not increase this risk, no mitigation measures are required in relation to flood risk during construction.

8.6.3 A suitable drainage scheme will be required during construction of the development to ensure that surface water runoff is not increased as a result of construction. This should be specified in the CMP.

Operation

8.6.4 The proposed drainage strategy uses the existing drainage infrastructure, improved through the addition of a number of SuDS features, to improve the overall drainage of the site and reduce the surface water discharge rate by 50%. A hierarchy has been considered in the selection of appropriate SuDS measures. A detailed account of the proposed surface water strategy for the site and details of the SuDS measures considered are included in the FRA, provided in **Appendix C**.

8.6.5 The proposed drainage strategy is based on three separate drainage sub-catchments covering the site.

8.6.6 Sub-catchment A is outside the area of development and as such will continue to discharge into the existing drainage network.

8.6.7 Sub-catchment B comprises the eastern portion of the site which is proposed for residential, commercial and community development and associated car parking areas. Open green space with SuDS features are intended to be located in this area in order to reduce the discharge rate from the site. The features proposed for inclusion within the drainage strategy are:

- Bio-retention: comprising landscaped depressions, which provide storage for water whilst also encouraging deposition of sediments to improve quality;
- Rain garden: similar to bio-retention and includes vegetation within the depression, which is suited to growing in water-logged areas;
- Cellular storage: comprising underground plastic box structures, which provide water storage; and
- Storage within the podium: located at the east of the site.

8.6.8 The area will be drained via the existing 225mm diameter pipe outfall to the River Crane. The discharge rate from sub-catchment B will be limited to the existing 1 in 30 year rainfall event since draining sub-catchment B to the open area to the west of the site has been found to be unachievable and there is not sufficient space within the sub-catchment to provide the attenuation capacity necessary to reduce the discharge rate further in this area. Since the drainage strategy and thus the discharge rate in sub-catchment A will also remain unaltered, sub-catchment C will provide adequate attenuation facilities to reduce the surface water runoff rate for the whole development area to a discharge rate of 50% of the existing discharge rate.

8.6.9 Sub-catchment C comprises the western portion of the site, proposed for housing, gardens and associated car parking areas. It is proposed that the sub-catchment will outfall to the River Crane via the existing 300mm diameter pipe. Cellular storage is proposed in this area to provide storage to ensure that the overall discharge rate from the site is reduced to 50% of the existing rate. Sub-catchment C also incorporates permeable areas throughout the parking areas to improve the drainage of the sub-catchment. Above ground storage has been provided in the form of minimal flooding of the permeable paving, for events more extreme than the 1 in 100 year event and it is proposed that the levels of the site will be designed to ensure that in an exceedence event, water will be routed to the green area to the west of the site.

8.6.10 With the proposed development, the impermeable area in both sub-catchments C and B will be reduced and SuDS will provide surface water attenuation to accommodate the 1 in 100 year event with a 30% increase in peak rainfall to account for the effects of climate change for the whole site.

8.6.11 The proposed drainage strategy adheres to more recent policies, which encourage betterment in the performance of such systems. The SFRA requires that wherever possible Greenfield runoff rates are achieved or the runoff rates from the site are reduced by at least 50%. Due to the existing drainage infrastructure on the site and the topography of the land, it is not deemed possible for Greenfield runoff rates to be achieved. However, the proposed drainage system will limit the runoff rate from the site to 50% of the current rate, whilst also improving the overall drainage from the site.

Water and Environmental Quality

8.6.12 The provision of SuDS should also improve the quality of the surface water runoff that is discharged into the River Crane. This is because features such as the rain garden and bio-retention provide storage of surface water and also encourage sedimentation. The result of this is that the water entering the River Crane would be of an improved quality since a proportion of the sediments in the water will have been removed.

8.7 Residual Effects

Construction

8.7.1 With the implementation of an appropriate temporary surface water management strategy for the construction phase conveying surface water runoff at appropriate discharge rates into the River Crane, the construction of the proposed development is expected to have a not significant effect on hydrology and flood risk.

Operation

8.7.2 Hydraulic modelling completed as part of the FRA identifies that the risk of surface water and fluvial flooding due to the development will be reduced, since proposed measures will decrease the rate of surface water runoff from the site. The development therefore has a moderate beneficial impact on the risk of flooding both at and in the vicinity of the site. The provision of SuDS should also improve surface water quality through encouraging sedimentation, this is considered to be a minor beneficial effect.

8.7.3 The site is located within Flood Zone 1 and therefore there is not considered to be a significant risk of flooding affecting the proposed development and future occupiers.

8.8 Assessment of Cumulative Effects of MOL Footpath Proposals

8.8.1 At this stage it is understood that the proposed footpath through the wider MOL will run from the north west corner of the apartment building, to the north of the sports pitches and then through the length of the wider MOL. It is not clear yet how close the footpath will be to the River Crane, although it is likely that in some sections it will be within the 8m buffer zone of the watercourse and potentially within the 1 in 1,000 year floodplain of the River Crane (which is shown in the FRA as extending out of bank to the north west and west of the Former Royal Mail Sorting Office site).

8.8.2 Due to its proximity to the River Crane and potentially its location within the floodplain, the proposals for the footpath will be subject to approval from the EA. Accordingly, it is understood that the footpath will be designed such that it has no adverse impact on flood risk in the areas adjacent to the River Crane or elsewhere. As such, there would be negligible impact on the flood risk at the site or in the surrounding area.

8.8.3 As part of the development of the Former Royal Mail Sorting Office site, a surface water drainage scheme will be provided as outlined in the FRA. This includes a connection to the existing surface water sewer that runs through the wider MOL and discharges into the River Crane to the north west of the site. As part of any work in the wider MOL, the surface water sewer would be retained and, at this stage, it is assumed that the footpath construction would not result in significant changes to the ground levels across the wider MOL. On this basis, the proposed works for the footpath are assumed to be shallow and would have no impact on the existing sewer. It is, however, recommended that LBRuT give consideration to the position of the sewer as part of their proposals for the new footpath and ensure that suitable cover over the sewer is provided.

8.8.4 Although it will be dependent on the final proposals including the width and material for the footpath, it is unlikely that there would be a significant increase in the impermeable area across the wider MOL. Assuming that there are no significant changes in ground levels across the MOL, any changes to the surface water runoff regime resulting from the footpath construction would have a negligible impact on the drainage at the site.

8.8.5 Based on the current understanding of the proposals for the footpath through the MOL, there would be a negligible effect on flood risk or management of surface water at the site and the flood risk mitigation and surface water management strategies for the site would have no impact on the flood risk to the footpath through the wider MOL.

8.9 Summary

8.9.1 An assessment has been undertaken of the hydrology and flood risk effects of the proposed development, drawing upon a Flood Risk Assessment prepared in accordance with relevant guidance.

8.9.2 Data has been collected for the site and the local area in order to determine the existing flood risk to the site and to identify and assess the existing surface water drainage strategy on the site. This has included analysis of flood maps, model data, records and consultation with key stakeholders.

8.9.3 Modelling of the surface water drainage strategy has been undertaken which has defined the existing condition, determined the impact of the proposed development without mitigation measures and the expected residual impact of the proposed development if all mitigation measures are implemented.

8.9.4 The site lies with Flood Zone 1, the lowest possible risk of flooding, which is supported by the absence of any records of flooding at the site.

8.9.5 During the construction phase the drainage strategy for the site may be interrupted which may result in temporary pooling of the water on the site. However, this can be effectively controlled through consideration within the Construction Management Plan and the resultant effect is therefore considered to be not significant.

8.9.6 Since the existing drainage strategy does not include attenuation and the site comprises predominantly hard standing, the development of the site is not likely to increase the risk of flooding either on or in the vicinity of the site in the operational phase of the development.

8.9.7 The proposed mitigation measures for the site have been designed to reduce the surface water discharge rates into the River Crane to 50% of the existing rates of runoff, resulting in a moderate beneficial effect.

8.9.8 The measures proposed as part of the surface water drainage strategy have additional benefits, in that they are expected to have a permanent minor beneficial impact on both the water and environmental quality of the site through preventing sediments entering the drainage network.

8.10 References

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9 Land & Water Quality

9.1 Introduction

9.1.1 This chapter provides an assessment of the potentially significant land and water quality effects of the proposed development. Where potentially significant effects have been identified the mitigation measures have been identified and the significance of residual effects identified. This chapter has been prepared by RSK.

9.2 Policy Context

9.2.1 Relevant legislation and EU, national, regional and local policies are summarised in **Tables 9.1 to 9.3**. Relevant Pollution Prevention Guidelines issued by the Environment Agency are outlined in **Table 9.4**.

Table 9.1: National and EU Legislation and Policy Context

Policy/Legislation	Key Provisions
National Planning Policy Framework (2012)	Planning policies and decisions should also 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 Act 1990; and • Adequate site investigation information, prepared by a competent person, is presented.
The Water Framework Directive 2000/60/EC	• The 1980 Groundwater Directive 80/68/EEC and the 2006 Groundwater Daughter Directive 2006/118/EC of the WFD are the main European legislation in place to protect groundwater. • The policies set out provisions for protecting and enhancing the quality or surface waters and groundwaters by assessing all ground and surface waters against a number of criteria including environmental quality standards for river basin specific pollutants. These standards specify maximum permissible concentrations for specific pollutants in controlled waters.
Environmental Protection Act:1990 Part IIA	• Requires all Local Authorities to inspect their areas for contaminated land, and produce a strategy outlining how they approach this task. Under s.78B(1) the Council is required to maintain a Public Register of Contaminated Land.

Table 9.2: Regional Legislation and Policy Context

Policy/Legislation	Key Provisions
The London Plan (2011) Spatial Development Strategy for Greater London	It is essential that wherever practicable, brownfield sites, including those affected by contamination, should be recycled into new uses. This also provides an opportunity to deal with any threats to health and the environment posed by contamination. Any land that is affected by contamination, whether or not identified under the regulations, may require measures to prevent contamination being activated or spread when building takes.

Table 9.3: Local Planning Policy

Policy/Legislation	Key Provisions
London Borough of Richmond upon Thames (2003) - Supplementary Planning Guidance on redevelopment of potentially contaminated sites	It is the developer's responsibility to ensure that the development is safe and that the Local Planning Authority is satisfied that any risks from potential contamination have been adequately addressed. To this end, the developer should carry out a satisfactory assessment of the site, considering the potential for contamination, including a ground investigation, where necessary, to confirm the level and extent of any contamination.
London Borough of Richmond upon Thames (2001) - Contaminated Land Strategy	Where development of contaminated land, or land suspected of being contaminated, is proposed the Council will require the submission of details of site investigations and proposed remedial action. Planning permission will be refused unless an appropriate and acceptable level of remedial action can be achieved.
London Borough of Richmond upon Thames (2009) Core Strategy	Local environmental impacts of development with respect to factors such as noise, air quality and contamination should be minimized.

Table 9.4: Pollution Prevention Guidelines

Policy/Legislation	Key Provisions
Control of Water Pollution from Construction Sites (2001)	Provides practical help and guidance for consultants and contractors on how to plan and manage construction projects to control water pollution.
PPG1: General Guidance to the Prevention of Pollution (2001)	Provides an introduction to a series of Pollution Prevention Guidance notes (PPGs), which provide practical advice to help developers and contractors avoid causing pollution, minimise waste and comply with the law.
PPG6: Working at Construction and Demolition Sites (2010)	Provides detailed guidance on construction and demolition activities, including requirements for discharges of water from dewatering operations to controlled waters and foul sewers, and the safe discharge of silt-laden water.
PPG21: Pollution Incident Response Planning (2009)	Provides guidance on the development of a pollution incident response plan and includes a template plan.

9.3 Methodology

9.3.1 Information on the ground conditions beneath the site has been compiled in a Contamination Assessment Report prepared by RSK (RSK, 2012) as contained in Appendix D. The report contains relevant information and data obtained during previous phases of investigation and assessment including a preliminary risk assessment (PRA).

9.3.2 The contamination assessment was carried out generally in accordance with:

- BS 10175:2001 - Code of Practice for the Investigation of Potentially Contaminated Sites;
- BS 5930:1999: - Code of Practice for Site Investigations;
- CLR 11: Model Procedures for the Management of Land Contamination, Environment Agency (2004);
- BS 1377:1990 - Method of Tests for Soils for Civil Engineering Purposes; and
- Guidance on Requirements for Land Contamination Reports, Environment Agency (2005).

9.3.3 In addition, the assessments contained in RSK's Contamination Assessment Report were carried out with reference to:

- Contaminated Land Exposure Assessment Framework (CLEA), Environment Agency;
- CIRIA C665 – Assessing Risks Posed by Hazardous Ground Gases to Buildings, CIRIA, (2007);
- The Soil Code, MAFF (1998);
- Thames Water - Trigger Levels for Pipe Material Selection;
- The Water Supply (Water Quality) Regulations (2000);
- The Private Water Supplies Regulations (1991); and
- The UK Approach for Evaluating Human Health Risks from Petroleum Hydrocarbons in Soils, Environment Agency (2005).

General Approach

9.3.4 The identification and assessment of impacts has been made with reference to the information obtained within the combined PRA and Contamination Assessment Report (as contained in Appendix D) and the particular issues identified within them. The information has been interpreted using professional judgement and experience based on previous developments on sites of a similar environmental sensitivity.

9.3.5 The PRA makes reference to a commercially available environmental database report, an assessment of the site's history of development and an inspection of the site. In addition, the report contains a summary of the underlying ground conditions obtained from a preceding site investigation undertaken by Geotechnical and Environmental Associates Ltd (GEA).

9.3.6 RSK's intrusive investigation involved the drilling of eight drive-in sampler boreholes to supplement intrusive information from the GEA investigation, together with a programme of geotechnical and chemical testing and subsequent groundwater monitoring.

9.3.7 Assessment of chemical testing results were undertaken against human health Generic Assessment Criteria (GAC's), applicable to a 'residential with garden' land use scenario, and also against target concentrations for a Principal Aquifer with respect to the protection of controlled waters.

Assessment of Significance

9.3.8 A judgement, based on relevant guidance and professional experience, has been made on the importance and/or sensitivity of the receptors involved, as indicated in **Table 9.5**.

Table 9.5: Method for determining Sensitivity/Importance of the Environment

Receptor sensitivity	Description
High	• Areas of critical topography, including steep slopes • Inner groundwater source protection zones (SPZ 1) • Areas of high groundwater vulnerability • Principal aquifers • Areas of known/confirmed contaminated land/groundwater • Rivers with a Grade A water classification • Areas of flood risk (Flood Zones 2 and 3) • End users of the site • Neighbouring properties and residents
Medium	• Outer groundwater source protection zones and total catchment areas (SPZ 2 and SPZ 3) • Secondary aquifers • Areas with intermediate groundwater vulnerability • Rivers with a Grade B water classification
Low	• Industrial site topography • Rivers with a Grade C or D water classification • Unproductive strata • Areas with low groundwater vulnerability

Magnitude of Change

9.3.9 **Table 9.6** gives generic criteria for determining levels of magnitude of change on the physical environment.

Table 9.6: Magnitude of Effect

Magnitude	Definition
Major	Total loss or substantial alteration to key elements or features of the baseline (pre-development) conditions such that the post-development character, composition or attributes will be fundamentally changed.
Moderate	Loss or alteration to one or more key elements/ features of the baseline conditions such that post development character, composition or attributes of the baseline will be materially changed.
Minor	A minor shift away from baseline conditions. Change arising from the loss or alteration will be discernible but not material. The underlying character, composition or attributes of the baseline condition will be similar to the pre-development circumstances or situation.
Negligible	Very little change from baseline conditions. Change barely distinguishable, approximating to a 'no change' situation.

Assessment of Significance of Impacts

9.3.10 The categories used when classifying the overall significance of potential impacts by considering the sensitivity of receptor and the magnitude of effect, are shown in **Table 9.7**.

Table 9.7: Effect Significance Matrix

Magnitude	Sensitivity of Receptor		
	High	Medium	Low
Major	Major	Moderate	Minor
Moderate	Moderate	Minor	Not significant
Minor	Minor	Not significant	Not significant
Negligible	Not significant	Not significant	Not significant

9.3.11 The categories identified in the above table are defined within **Table 5.1**.

9.3.12 The assessment has considered the potential for cumulative effects.

9.3.13 The nature of an effect and timescales are detailed within **Chapter 5** (Methodology).

Uncertainty and Technical Difficulties Encountered

9.3.14 The opinions and recommendations expressed in this assessment are based on the ground conditions encountered during site work conducted in August 2011 and during an earlier investigation in September 2010, the results of field and laboratory testing and interpretation between exploratory holes. The materials encountered and samples obtained represent only a small proportion of the materials present on-site and therefore other conditions may prevail at the site which have not been revealed by the investigations.

9.4 Baseline Conditions

Site Description

9.4.1 The site, which covers an area of approximately 2.3 hectares, is located on the Former Royal Mail Sorting Office, Twickenham. The London Road (A310) forms the site's eastern boundary with the railway and the River Crane forming the southern and northern boundaries, respectively.

9.4.2 The site is currently occupied by vacant sorting office buildings, which are one to two storey and generally in a dilapidated condition, and yards/car parks covered in hard standing. Two underground fuel storage tanks are present in the east of the site beneath the hardstanding.

9.4.3 A small area of recreational land, which includes an Astro Turf sports pitch and outward-bound facilities, is present between the central and western areas of the site and the River Crane. The site excludes this area of wider MOL and four terraced railway cottages (and adjacent disused railway substation) between the southern boundary and the railway line.

9.4.4 Existing residential properties are present to the north and northeast of the site beyond the River Crane and to the south of the site beyond the railway line.

Geology

9.4.5 The published geological map of the area (British Geological Survey, 1998) and previous investigations have identified that the geology of the site comprises a mantle of made ground extending to depths of between 0.5m and 2.5m, underlain by organic-rich alluvial deposits, with the Kempton Park Gravel beneath. Along the western edge of the site, alluvial deposits are absent with Made Ground deposits overlying the Kempton Park Gravel.

9.4.6 These superficial deposits are underlain by the London Clay Formation, which was encountered at depths of between 2.8m and 5.85m and proven to a depth of 25m.

9.4.7 Through the proposed development area, the made ground generally comprised a dark brown, silty clayey gravel or gravelly clayey silt with inclusions of brick ash, concrete and clinker.

Previous Land Use

9.4.8 An assessment of the site's previous land use has revealed a number of potentially contaminative activities across the proposed development area. These include:

- The presence of a brewery, in the eastern half of the development area from the late 1800's to the early 1930's;
- The presence of a nursery, including numerous glasshouses, across the western half of the development area from the 1890's through to the 1960's; and
- The presence of a corporation depot across the eastern half of the development area from the 1930's until the 1960's.

9.4.9 From the 1960's until the present day, the proposed development area has been occupied by the existing, albeit dilapidated sorting office facilities. At the eastern edge of the sorting office a yard is present containing a brick built building which previously housed an above ground diesel storage tank. In the same area, two underground diesel tanks are present together with fill points, a former dispensing pump and vent pipes. The underground tanks, which have capacities of 5,000 litres and 6,000 litres, were subject to integrity testing in 2005 with no reported leakages. Interceptors are also located in this area.

Hydrogeology

9.4.10 The hydrogeology of the site is characterised by the presence of a shallow aquifer within the Kempton Park Gravels (and anticipated to be present with the identified Alluvial Deposits), perched upon the underlying London Clay Formation.

9.4.11 The Kempton Park Gravels underlying the site are classified as a Principal Aquifer. Principal Aquifers are those that comprise layers of rock or drift deposits that have high intergranular and/or fracture permeability, meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.

9.4.12 The underlying London Clay Formation is designated as Unproductive Strata, reflecting the predominantly cohesive nature of the geological unit, which acts as an aquiclude and is expected to limit the vertical migration of any contamination to depth.

9.4.13 Information available on the Environment Agency (EA) website indicates that the full extent of the application site does not lie within a groundwater source protection zone. There are no licensed groundwater abstractions within a 1km radius of the site.

9.4.14 The monitoring of groundwater levels beneath the site has revealed a shallow groundwater table within the Kempton Park Gravels at depths ranging between 2.52m and 3.85m.

Surface Waters

9.4.15 The River Crane is located to the immediate north of the site running through a canalised concrete channel. The canalised nature of the channel would suggest that the watercourse is unlikely to be in hydraulic continuity with groundwater beneath the site.

9.4.16 The River Thames is located 500m south of the site. The confluence of the River Crane and River Thames is located at Isleworth, approximately 2km to the north northeast of the site

9.4.17 The site is located within Flood Zone 1 with less than 1 in 1000 annual probability of fluvial flooding. There are no records of flooding within the immediate area.

Soil Contamination

9.4.18 In the east of the site, the analysis of targeted made ground samples in the proximity of the above/below ground fuel tanks has identified the presence of Total Petroleum Hydrocarbons (TPH) in excess of the derived Generic Assessment Criteria (GAC's) for a 'residential with garden' land use. This has confirmed the visual /olfactory evidence of contamination observed in this area of the site. The results appear to indicate that the contamination is only present within the made ground (potentially resulting from the underlying low permeability Alluvium limiting vertical migration) with the testing of the underlying Kempton Park Gravels indicating no gross impact at depth.

9.4.19 Across the remainder of the site, the analysis of sixteen non-targeted samples has identified the presence of lead together with various Polycyclic Aromatic Hydrocarbon (PAH) compounds at concentrations which are elevated when assessed against a 'residential with plant uptake' end land use.

Groundwater Contamination

9.4.20 Groundwater testing has been undertaken within the proposed development area, revealing the presence of a marginally elevated concentration of selenium. This exceedence was so marginal that it was not considered to pose a risk to controlled waters.

Ground Gases and Vapours

9.4.21 During the previous investigations ground gas and vapour monitoring was conducted across the site. The monitoring has found no detectable methane and only slightly elevated concentrations of carbon dioxide. Gas flow rates remained consistently low indicating low gas generation and emission rates.

9.4.22 The assessment to date has revealed low risks from volatile vapours, with the exception of the area of identified hydrocarbon contamination in the east of the site, in the vicinity of the below/above ground fuel tanks.

Assumptions and Uncertainties

9.4.23 Where hydrocarbon contamination has been encountered within made ground in the east of the development area, the potential exists for the underlying natural soils and groundwater to have been impacted. RSK's Contamination Assessment Report made recommendations for more detailed investigation works, including the assessment of groundwater quality through the immediate surroundings following demolition and removal of the surface cover.

9.4.24 Whilst a programme of gas monitoring has been undertaken across the site the events are considered to be relatively limited and, as such, additional monitoring will be required to further inform the assessment and detail specific gas protection measures.

9.4.25 Although the investigations to date have targeted the principal potential sources of contamination, the long history of industrial use should be noted and the potential for further contamination to be identified during the demolition and construction recognised.

9.5 Potential Effects

Demolition Phase

9.5.1 Works that could potentially affect land or water quality effects during the demolition phase include:

- Fuel storage and refuelling activities;
- Demolition of existing buildings and structures, especially where asbestos containing materials may be present; and
- Excavation and removal of below ground storage tanks and any associated impacted soils.

9.5.2 Effects relating to demolition personnel have not been included as it is assumed that these will be mitigated via the preparation of detailed risk assessments and implementation of appropriate control measures, including the use of personal protective equipment.

9.5.3 With respect to the underlying Principal Aquifer within the Kempton Park Gravels, the following effects could potentially occur from construction activities:

- The creation of preferential pathways for the migration of contaminants; and
- The pollution of groundwater from fuel, oil and chemical spills.

9.5.4 With respect to the surface water quality of the River Crane, the following effects could occur from demolition activities:

- The creation of preferential pathways for the migration of contaminants;

- The pollution of surface water from spills of fuels, oils, chemicals and silt-contaminated water; and
- The discharge of silt-contaminated water, from surface water run-off and dewatering activities.

9.5.5 With respect to neighbouring properties and residents, the following effects could potentially arise as a result of construction activities:

- The release of contaminated dust (including possible asbestos containing materials) during demolition of structures and movement of construction vehicles; and
- The release of odours during excavation activities.

Construction Phase

9.5.6 Works that could potentially affect land or water quality during the construction phase of the development include:

- Fuel storage and refuelling activities;
- Creation of temporary access roads and construction compounds;
- Deep excavations and earthworks to create a new formation level and excavate a basement car park beneath the proposed blocks of flats;
- Excavation of contaminated soils through eastern areas of the site in the vicinity of the below/above ground fuel tanks;
- Installation of piled foundations resulting in the potential for contaminated soils to be driven into the aquifer or for the creation of preferential migration pathways; and
- The importation of potentially contaminated materials from off-site.

9.5.7 Effects relating to construction personnel have not been included as it is assumed that these will be mitigated via the preparation of detailed risk assessments and implementation of appropriate control measures, including the use of personal protective equipment.

9.5.8 With respect to the underlying Principal Aquifer within the Kempton Park Gravels, the following effects could potentially occur from construction activities:

- The creation of preferential pathways for the migration of contaminants;
- The leaching of contamination from mobile contaminants associated with imported materials such as crushed stone for construction compounds, sub-base materials placed beneath hardstanding and general aggregates; and
- The pollution of groundwater from fuel, oil and chemical spills.

9.5.9 With respect to the surface water quality of the River Crane, the following effects could potentially occur from construction activities:

- The creation of preferential pathways for the migration of contaminants;
- The leaching of pollution to surface water from spills of fuels, oils, chemicals and silt-contaminated water; and
- The discharge of silt-contaminated water, from surface water run-off and dewatering activities.

9.5.10 With respect to neighbouring properties and residents, the following effects could arise as a result of construction activities:

- The release of contaminated dust during the movement of construction vehicles; and
- The release of odours during excavations and construction activities.

Operational Phase

9.5.11 The following effects are potentially associated with the operation of the Proposed Development, with respect to the underlying Principal Aquifer and adjacent River Crane:

- The leaching of contaminants from the soils as a result of the infiltration of surface water drainage discharge into the ground.

9.5.12 The following effects are potentially associated with the operation of the Proposed Development, with respect to human health:

- The health effects on site users and maintenance workers coming into contact with contaminated ground;
- The ingestion of contaminants from home-grown produce resulting from plant uptake;
- Health effects on flora or fauna coming into contact with contaminated ground;
- Harmful or explosive ground gases and vapours, entering and accumulating within structures and confined spaces; and
- The permeation of contaminants into potable water supply pipes or the potential degradation of construction materials in contact with contaminated ground.

9.6 Mitigation Measures

9.6.1 Prior to construction works commencing, supplementary investigation works will be undertaken in agreement with the London Borough of Richmond upon Thames (LBRuT) Scientific Officer to fully determine the existing baseline conditions. These works will include an assessment of potential groundwater contamination in the vicinity of the underground storage tanks, investigation of western areas of the wider MOL where access was previously unavailable and the completion of additional ground-gas monitoring.

9.6.2 Upon completion of these works, an Options Appraisal and detailed Remediation Method Statement (RMS) will be compiled specifying the mitigation measures designed to break the identified pollutant linkages. Prior to construction works commencing on site the RMS will be submitted to the LBRuT Scientific Officer and the Environment Agency for approval.

9.6.3 Prior to demolition works a Type 3 asbestos survey will be undertaken to confirm the presence of absence of asbestos containing materials. Where asbestos containing materials are identified these will be removed by a suitably qualified contractor prior to demolition.

9.6.4 During the excavation and removal of underground storages tanks a watching brief will be implemented to ensure that all impacted soils are effectively removed from the site. Procedures to be implemented during the removal process, including details of the validation process, will be outlined within the RMS.

9.6.5 Fuels, lubricants, and chemicals required during demolition and construction operations will be stored in secure bunded areas at appropriate distances from the River Crane, with refuelling restricted to these areas. Spill kits will be available on site in case of emergency.

9.6.6 A Construction Environmental Management Plan (CEMP) will be prepared which will set out methods which contractors will be required to adopt as a minimum.

9.6.7 The CEMP will include quality control procedures to be employed by contractors for the import and export of materials to and from site. Methods for controlling surface water run-off and dust and measures to remove contaminated materials off site to licensed treatment or disposal sites, will also be detailed.

9.6.8 Should the presence of previously unidentified contaminated material be suspected during excavation works, work will cease until the material has been characterised and appropriate measures to treat or dispose of contaminated materials have been identified.

9.6.9 Measures will be undertaken to reduce the amount of water entering excavations so as to minimise dewatering activities. Should de-watering be required, the Environment Agency will be consulted and appropriate abstraction and discharge licences will be obtained if necessary. Prior to disposal to surface water bodies, water will be treated to ensure it meets appropriate water quality standards. Further details on water management techniques are discussed within **Chapter 8** (Hydrology and Flood Risk).

9.7 Residual Effects

Demolition Phase

9.7.1 The proposals to excavate and remove below ground storage tanks and associated impacted soils will result in a minor beneficial residual effect with respect to groundwater quality.

9.7.2 With the full implementation of the outlined mitigation measures there will be no other significant residual effects during the demolition phase.

Construction Phase

9.7.3 With the full implementation of the outlined mitigation measures there will be no significant residual effects during the construction phase.

Operational Phase

9.7.4 With the full implementation of the outlined mitigation measures there will be no significant residual effects during the operational phase.

9.8 Cumulative Effects

9.8.1 There is little scope for cumulative effects related to ground conditions and contaminated land arising from the Project in combination with the proposed redevelopment of Twickenham Railway Station to the east of the site. The latter development is also expected to result in a minor beneficial effect with respect to land and water quality.

9.8.2 In addition the provision of a public footpath through the wider MOL should not lead to significant cumulative effects in relation to ground conditions and contaminated land. LBRuT as part of implementing the footpath and opening the wider MOL to public access will need to consider any potential issues in relation to contamination however these are separate and not affected by the mitigation measures proposed as part of the former Royal Mail Sorting Office development.

9.9 Summary

9.9.1 The existing baseline conditions have been identified from a Contamination Assessment Report produced by RSK in April 2012. The report included a Preliminary Risk Assessment and makes reference to the results of a preceding investigation.

9.9.2 Ground conditions beneath the site comprise a mantle of made ground of varying thickness and composition underlain by organic-rich alluvial deposits with the Kempton Park Gravels beneath. These strata are in turn underlain by the London Clay Formation. Groundwater is present beneath the site at a depth of between 2.52m and 3.85m and is designated as a Principal Aquifer.

9.9.3 Localised hydrocarbon contamination has been identified beneath the eastern area of the site, associated with the presence of underground fuel tanks, whilst diffuse low-level contamination has been identified within the shallow made ground.

9.9.4 Potential effects have been identified during the site's demolition, construction and operational phases relating to a number of potentially sensitive receptors. These include groundwater within the underlying Principal Aquifer, the adjacent River Crane, neighbouring properties and residents and end users of the site.

9.9.5 In order to mitigate the identified potential effects, a number of measures have been outlined, including requirement for supplementary intrusive investigation works prior to the commencement of construction, preparation of a detailed remediation method statement and completion of an asbestos survey. Additional measures will also be required during the demolition and construction phases, including the supervision of specific remedial works, provision of dedicated areas for the refuelling of plant on-site and a CEMP to outline working methods and quality control procedures.

9.9.6 With the implementation of these mitigation measures, the excavation of below ground storage tanks and any associated hydrocarbon impacted soils will result in a minor beneficial effect in relation to groundwater quality. All other effects in relation to land and water quality, including cumulative effects with the redevelopment of the station, should be not significant.

9.10 References

BS 10175:2001 - Code of Practice for the Investigation of Potentially Contaminated Sites: British Standards Institution.

BS 1377:1990 - Method of Tests for Soils for Civil Engineering Purposes: British Standards Institution.

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Trigger Levels for Pipe Material Selection (2010): Thames Water.

10 Transport & Access

10.1 Introduction

10.1.1 This chapter assesses likely significant effects of the proposed development in relation to transport access and should be read in conjunction with the Peter Brett Associates LLP (PBA) 'Royal Mail Sorting Office Site' Transport Statement (TS). The TS contains a more detailed analysis on the determination and assessment of travel characteristics associated with the site.

10.1.2 The purpose of this chapter is to examine the potential transport related environmental effects at and in the vicinity of the site. In particular, assessing the change in environmental conditions which could arise on the local transport networks and which are attributable to changes in predicted traffic volumes associated with the proposed development.

10.1.3 The process of predicting development traffic volumes has been undertaken and is presented in the TS. These traffic figures form the basis for this environmental assessment. Whilst traffic related impacts are the main impacts arising out of a development, this chapter also considers other environmental impacts that might arise as a result of increased demand upon the pedestrian, cycle and public transport networks.

10.2 Planning Policy Context

National Policies

National Planning Policy Framework (NPPF)

10.2.1 The National Planning Policy Framework (NPPF) was published in March 2012 replacing and revoking existing Planning Policy Statements and Planning Policy Guidelines, including PPG13, Transport. The new Framework seeks to facilitate sustainable development. In respect of Transport, the NPPF advocates that planning policies and decisions should consider whether:

- The opportunities for sustainable transport modes have been taken up depending upon the nature and location of the site to reduce the need for substantial transport infrastructure;
- Safe and suitable access to the site can be achieved for all people; and
- Improvements can be undertaken within the transport network that cost effectively limits the significant impacts of the development. Development should only be prevented or refused on transport grounds where the residual impacts of development are severe.

10.2.2 At a more detailed level, the NPPF states that developments should be located and designed in order to:

- Give priority to pedestrian and cycle movements and have access to high quality public transport facilities;
- Create safe and secure layouts which minimise conflicts between traffic and cyclists or pedestrians;
- Consider the needs of people with disabilities by all modes of transport; and
- Incorporate facilities for charging plug-in and other low emission vehicles.

Regional Policies

The London Plan (July 2011)

10.2.3 The London Plan was revised and published in July 2011.

10.2.4 Chapter 6 identifies polices to support the delivery of an efficient and effective transport system and places emphasis on encouraging sustainable travel through:

- Enhancing walking polices;
- Promoting electric car use; and
- Improving public transport capacity.

Policy 6.1 Strategic Approach

10.2.5 The Mayor will work with key parties to encourage integrated transport systems through:

- Encouraging development that reduces the need to travel, in particular by car;
- Encouraging boroughs to use parking standards as maximum parking standards; and
- Supporting measures that encourage sustainable travel.

Policy 6.3 Assessing Transport Capacity

10.2.6 Development proposals should ensure that the impacts of the transport capacity and the transport network are considered and that Transport Assessments will be required in accordance with TfL's Transport Assessment Best Practice guidelines.

Policy 6.9 and Policy 6.10 Cycling and Walking

10.2.7 The Mayor will work to increase cycling and walking in London. Developments should:

- Provide secure, integrated and accessible cycle parking facilities in line with London Plan standards; and

- Ensure pedestrian environments in and around new developments give emphasis to quality and street space.

Policy 6.13 Parking

10.2.8 New developments should ensure a balance is met between promoting new development and avoiding excessive car parking that can reduce the use of sustainable travel.

10.2.9 When the car parking provision for new developments are being considered, maximum car parking standards with the provision of parking spaces for disabled users (in line with London Plan policy) should be applied.

10.2.10 New developments must ensure that 20% of all parking spaces, both active and passive, provide electrical charging points to encourage the use of electric vehicles.

Local Policies

London Borough of Richmond upon Thames Local Development Framework

10.2.11 The UDP was adopted in March 2005. It is gradually being replaced by the Local Development Framework (LDF) and policies in the UDP have already been superseded by the adopted Core Strategy (2009) and the Development Management Plan (DMP; 2011).

Core Strategy

10.2.12 In relation to Transport, Policy CP5 relates to sustainable travel and states:

*"**5.A** The need for travel will be reduced by the provision of employment, shops and services at the most appropriate level locally, within the network of town centres identified in CP 8. To implement this policy the Council will:*

- *Protect and enhance local facilities and employment to reduce the need to travel.*
- *Require developments which would generate significant amounts of travel to be located on sites well served by public transport.*
- *In promoting safe, sustainable and accessible transport modes such as walking, cycling and public transport, in association with its partners the Council will seek to:*

5.C Cycling and Walking

- *Give priority to pedestrians, including those with disabilities, particularly in Richmond town centre and the district and local shopping centres.*
- *Provide and promote a well-designed bicycle and walking network across the Borough (the Strategic Walks network, Richmond Borough Cycle Network and London Cycle Network Plus), and improve conditions for cyclists and pedestrians elsewhere.*

- *Prioritise the needs of pedestrians and cyclists in the design of new developments including links to existing networks and requiring the provision of adequate cycle parking.*

- *Investigate the possibility of a footbridge across the Thames between Ham and Twickenham for pedestrians and cyclists.*

5.D Public Transport

- *Improve provision for buses particularly in Richmond and Twickenham town centres, and seek to improve bus services within River Crane Corridor through the implementation of development proposals.*

- *Achieve integration and convenient interchange facilities at all the borough's stations.*

5.E Congestion and Pollution

- *Undertake traffic management measures to reduce the impact of traffic particularly in Richmond town centre, the district and local centres, residential areas and streets unsuitable for through traffic.*

5.F Car Parking and Travel

- *Require new car free housing in Richmond and Twickenham town centres and in other areas where there is good public transport and elsewhere have regard to maximum parking standards.*

- *Require car share facilities and car clubs in appropriate new developments and encourage the use of low emission motor vehicles in order to reduce congestion and pollution.*

- *Discourage commuter parking particularly by giving priority to residents' needs.*

- *Limit any further expansion of parking in town and local centres and manage parking controls to help maintain the vitality and viability of the centres, including the evening economy.*

5.G Sustainable Travel

- *Encourage major employers and schools to develop Green Travel Plans and require these where appropriate with planning applications.*

- *Require all major developments to submit a Transport Assessment based on TfL's Best Practice Guidance.*

- *Encourage efficient, safe and sustainable freight transport.*

- *Encourage river transport through the retention and support for new transport infrastructure."*

Development Management Plan

10.2.13 The Development Management Plan (DMP) builds on the Core Strategy and includes more detailed policies for the management of development. Section 5.4 which relates to Transport and Parking contains several policies that are relevant with the proposed development:

Policy DM TP1: Matching Development to Transport Capacity

10.2.14 Higher trip generating development will only be permitted in areas which are, or at the time of implementation are, easily accessible by transport other than the private car, and well located with respect to local services

Policy DM TP2: Transport and New Development

10.2.15 The impact of new development on the transport network will be assessed against other plan policies and transport standards. All planning applications for major developments should be accompanied by a Transport Assessment and for smaller developments should be accompanied by a Transport Statement. Matters to be included are set out in DofT/TfL guidance.

Policy DM TP3: Enhancing Transport Links

10.2.16 New developments will be expected to create or improve links with the local and wider transport networks, including links to the cycle and pedestrian networks. All new developments must be designed to improve accessibility including:

- Maximise permeability, with safe, convenient, accessible and appropriate road, cycle and pedestrian routes within and in the immediate vicinity of the scheme, as well as accessible walking and cycling links to the wider transport network including to public transport nodes and key land uses, taking account of the need to connect people to jobs, to town centres and to schools.
- Gated developments will not be permitted.
- Developments adjoining the River Thames must provide a public riverside walk.

Policy DM TP6: Walking and the Pedestrian Environment

10.2.17 To protect, maintain and improve the pedestrian environment, the Council will ensure that:

- New development and schemes protect, maintain and, where appropriate, improve the existing pedestrian infrastructure, including the Rights of Way network.
- New development does not adversely impact on the pedestrian environment and provides appropriate pedestrian access.
- New development and schemes improve the safety and security of the pedestrian environment where appropriate.

Policy DM TP7: Cycling

10.2.18 To maintain and improve conditions for cyclists, the Council will ensure that new development or schemes do not adversely impact on the cycling network or cyclists and provide appropriate cycle access and sufficient, secure cycle parking facilities.

Policy DM TP8: Off-Street Parking – Retention and New Provision

10.2.19 Developments, redevelopments, conversions and extensions will have to demonstrate that the new scheme provides an appropriate level of off street parking to avoid an unacceptable impact on on-street parking conditions and local traffic conditions.

Twickenham Area Action Plan

10.2.20 The emerging Twickenham Area Action Plan (AAP) will form part of the LDF. It will sets out an overall strategy for the future of Twickenham Town Centre. A consultation draft has been prepared and consultation closed on 31st August 2012. The current programme envisages that the AAP will be adopted early in 2013.The Plan sets out the vision for the town centre over the next 15 years.

10.2.21 London Road, including the station, is identified as an important arrival route from the north. Priorities include the enhancement of this approach to provide increased priority to pedestrians and cycles. This includes the creation of a new route alongside the River Crane for pedestrians and cyclists, improved pedestrian facilities at the junction of London Road / Whitton Road and Arragon Road. As part of this approach the Borough has appointed WS Atkins to design a Twickenham Street Scene and Highways Scheme, which has also been subject to a recent public consultation exercise.

Crane Valley Planning Guidance

10.2.22 This document was published in April 2005 and provides planning guidelines for specific developments which were likely to come forward in the near future around the Crane Valley in Twickenham including the site.

10.2.23 The guidelines state that:

"It is particularly important that development should be compatible in scale and character with the local area, acceptable in traffic and transport terms and to ensure that the wider setting of the area within the West London Green Chain is respected and enhanced."

Summary

10.2.24 The TS concluded that the proposed development is in line with national, regional and local policies.

10.3 Methodology

Scope & Approach

10.3.1 The methodology adopted to assess the effect of the proposed development has been informed by the methodology adopted for the TS.

10.3.2 The TS has been prepared in accordance with the latest guidance from TfL: 'Transport Assessment Best Practice Guidance Document' (April 2010). The TS was based on the Scoping Report agreed in principle by the LBRuT. For this chapter, the assessment of individual environmental elements has been carried out in accordance with the 'Guidelines for the Environmental Assessment of Road Traffic' (1993) published by the Institute of Environmental Assessment (IEA) and, where appropriate, Volume 11 of the Design Manual for Roads and Bridges (DMRB) 'Environmental Assessment' (2008) published by the former Department of Environment, Transport and the Regions (DETR), now Department for Transport. These are recommended tools for the appraisal of environmental impact of road traffic and they identify appropriate standards for assessment.

10.3.3 The environmental impacts during construction and operation have been categorised, based on standards, guidance and professional experience, according to their significance as follows:

- Nature of effect – whether Permanent or Temporary; and
- Significance – whether Severe, Major, Moderate, Minor or Not Significant and whether Beneficial or Adverse (as defined in **Table 10.5**).

10.3.4 The assessment then identifies mitigation measures and residual impacts once mitigation has been implemented.

10.3.5 In order to measure the transport effects of the proposed development, total trip impacts during typical weekday AM and PM peak periods (07:00 to 09:00 and 16:00 to 18:00) were assessed. These periods are considered to be the worst case based on the proposed land uses schedules and in terms of existing and generated traffic flows.

10.3.6 The worst case scenarios in terms of trip generation are based on the in and out trip rates over the peak periods which were agreed with LBRuT as part of the scoping exercise. To decide on the most appropriate trip rates, the TRAVL database was used. The total two-way trips of the proposed development by use are summarised in **Table 10.1** below:

Table 10.1: Trip Generation (All Modes) for proposed uses

Proposed Use	AM Peak (07:00 – 10:00) (All Modes)	PM Peak (16:00 – 19:00) (All Modes)
Residential	125	182
Restaurant	42	343
Community Building	34	87
Total	159	605

10.3.7 The TS and the ES have assessed the effects of existing developments, committed development and the proposed development. The public transport and highway impact assessments have been based upon 2010 traffic flow data obtained from the LBRuT.

10.3.8 The site will be accessed as existing, from London Road. The TS has shown that the highway impacts of the development will not be material compared to the former use of the site as a Royal Mail Sorting Office (i.e. the former sorting office generated by more traffic than the proposed development). The level of on-site parking will be 127 spaces, which is less than the level of parking available for the existing uses. In addition, there is limited scope for parking off-street since the site lies within a Controlled Parking Zone (CPZ).

Assessment Criteria

10.3.9 The Guidelines for the Environmental Assessment of Road Traffic identify that the main impacts which could arise from the development proposals relating to an increased vehicular travel demand would relate to:

- Severance;
- Driver delay;
- Pedestrian delay and amenity;
- Fear and intimidation;
- Accidents and road safety; and
- Dust and dirt (which is considered in the Air Quality chapter, rather than this chapter).

10.3.10 The significance of the effect on these topics will be determined based on the magnitude of the effect, the sensitivity of the receptor and whether the impact is temporary or permanent.

Severance

10.3.11 Severance is described as the perceived division of a community that may arise when a road traffic link runs through an existing settlement. This can occur when a road becomes too heavily trafficked, making crossing the road difficult for pedestrians or cyclists, or when a new route physically divides existing land. It is particularly relevant to situations where access to an essential amenity is impaired.

10.3.12 The guidelines state that:

"The measurement and prediction of severance is extremely difficult. The correlation between the extent of severance and the physical barrier of a road is not clear and there are no predictive formulae which give simple relationships between traffic factors and levels of severance."

10.3.13 In general, marginal changes in existing traffic flow are unlikely to cause material severance effects. Three main indicators for the assessment of separation have been formulated from studies of changes in traffic flow on observed links and are discussed in the Guidelines for the Environmental Assessment of Road Traffic. These comprise:

- Change in flow of up to 30% - minor separation effects;
- Change in flow of up to 60% - moderate separation effects; and
- Change in flow of up to 90% - substantial separation effects.

10.3.14 It must be recognised that these are guidelines only, and are highly dependent on existing ambient traffic levels. They are in no way definitive measures of separation.

10.3.15 A number of factors are considered in determining the level of increased severance arising from the development proposals including road width, traffic flow and composition, traffic speeds, absolute traffic volumes and the availability of crossings.

Driver Delay

10.3.16 Delay to drivers can be predicted through capacity assessments at key points (typically junctions) on the local highway network. The addition of new development generated traffic could result in an increase in the number of vehicles using key routes and junctions. This may lead to additional delays depending on the existing operation, levels of background traffic and development generated traffic.

10.3.17 Within the TS the impact of the development upon driver delay has been assessed on the basis of delay at key junctions. Generally, where a junction is operating within its design capacity, which would be indicated by ratio of flow to capacities (RFC) of less than 0.9 for traffic signals or less than 0.85 for priority junctions or roundabouts then any increase in delay would be regarded as minor adverse.

10.3.18 No standard criteria have been set to establish thresholds for moderate and substantial impacts and so much is left to the judgement of the assessor. For the purposes of this assessment an increase (or decrease in) average vehicle delay to travel through a junction of more than 30 seconds is regarded as moderate and an increase in (or reduction in) delay of more than 1 minute is regarded as major.

Pedestrian Delay and Amenity

10.3.19 Pedestrian delay and amenity for a particular walking journey are related to traffic flows through the impact of changes in vehicular demand on the ability of pedestrians to cross individual routes. This will, therefore, affect an individual's desire to make a particular walking journey. Changes in the volume, speed or composition of traffic are most likely to affect pedestrian delay, with the level of severity dependent on the general level of pedestrian activity and the physical condition of crossing points. Guidelines for the calculation of pedestrian delay are identified in DMRB Volume 11, Section 3.

10.3.20 The determination of what constitutes a material impact on pedestrian delay and amenity is generally left to the judgement of the assessor and knowledge of local factors and conditions. However, the Guidelines for the Environmental Assessment of Road Traffic suggest that pedestrian delay, the time a pedestrian has to wait before crossing a road, at an individual link should not exceed 40 seconds where no crossing facilities are available. It further advises that the lower threshold equates to a two-way flow of approximately 1,400 vehicles per hour.

10.3.21 Pedestrian amenity can be materially affected where traffic flow is halved or doubled. It can also be improved by the provision of new dedicated facilities or segregated routes.

10.3.22 There are a number of factors that need to be considered when determining the level of increased pedestrian delay and amenity attributable to the proposed development including the general level of pedestrian activity, visibility, traffic volumes and general physical conditions.

10.3.23 The assessment also considers the potential effects on pedestrians utilising routes away from the public highways.

Fear and Intimidation

10.3.24 A further effect of traffic flows on pedestrian and cycle movements is the problem of fear and intimidation of individual travellers with respect to the proximity of vehicular movements. The impact of this factor is dependent on the volume of traffic, the number of heavy goods vehicles (HGV), the width of footpath and closeness of the footpath to the carriageway edge. As is the case with pedestrian amenity and delay, there are no commonly agreed thresholds for the measurement of this impact, with appraisal based on the judgement of the assessor.

10.3.25 Thresholds for the degree of hazard to pedestrians related to traffic flow have been based on 18 hour flows and average speeds. These can be used to obtain an initial approximation of the likelihood of pedestrian fear as shown below (see **Table 10.2**).

Table 10.2: Suggested Threshold Guidelines for Pedestrian Fear and Intimidation

Degree of Hazard	Change in 18 Hour Average Traffic Flow (vehicles/hour)	Average 18 Hour HGV Flow	Change in 18 Hour Average Speed (mph)
Substantial	1800+	3000+	20+
Moderate	1200-1800	2000-3000	15-20
Minor	600-1200	1000-2000	10-15

10.3.26 Notwithstanding the thresholds set out above, the guidance suggests that they should be approached with a certain level of caution as the individual factors could be weighted by local circumstances to decide on the overall value of intimidation. For example, a road may show higher speeds but lower flows making crossing easier or high flows but congested and constant traffic, therefore reducing total fear of passing vehicles but increasing crossing difficulties.

10.3.27 A number of factors are considered in determining changes in the level of fear and intimidation experienced by pedestrians and cyclists including changes in traffic volumes, its HGV content, its speed and its proximity to people.

10.3.28 The Guidelines for the Environmental Assessment of Road Traffic suggest that changes in two-way average hourly traffic flows of between +600 and +1200 vehicles measured over an 18-hour period would result in a moderate increase in fear and intimidation.

Accidents and Road Safety

10.3.29 The assessment of accident risk and highway safety is based upon knowledge of existing accident rates and specific local circumstances to identify accident clusters. For example, should a particular link or junction be found to have a high existing accident rate the addition of substantial traffic volumes generally would be expected to have a detrimental effect on highway safety due to further increased opportunities for conflict. Mitigation measures may therefore be required.

Other Impacts

10.3.30 The development will also generate additional demand on the pedestrian, cycle and public transport networks which will affect other users. Additional demand will have environmental consequences in as much as they may lead to overcrowding of existing public transport services, and of footways and cycle tracks, potentially making them less attractive to use. There is no established methodology for assessing such impacts and so a qualitative approach has been adopted.

10.4 Baseline Conditions

Existing Highway Network and Traffic Conditions

10.4.1 The site benefits from an established access point via an existing ramp from London Road (A310). To the north, London Road leads to Chertsey Road (A316), part of the TRLN, which then becomes M3 to Southampton. To the south it leads to Richmond Road (A305) which leads to the A205 and then the A3 which connects London with Portsmouth.

10.4.2 London Road is a dual carriage way with two lanes running on both directions for the most part and a narrow reserve island in the middle and continuous footways on both side of the road. A bus lane runs along the east side of the carriage way.

10.4.3 **Table 10.3** summarises existing daily traffic flows on the highway network surrounding the site.

Table 10.3: Traffic Counts from ATC

24hrs AAWT	Site	Light Vehicles (LV)	Heavy Goods Vehicles (HGV)	Total	% HGVs
Between Site Access & Whitton Road	A310 (London Road) Northbound	9946	468	10414	4.49%
	A310 (London Road) Southbound	9181	875	10055	8.70%
North of London Rd/Whitton Rd Junction	A310 (London Road) Northbound	6358	305	6663	4.57%
	A310 (London Road) Southbound	2976	588	3564	16.50%
	A311 (Heath Road) Eastbound	6623	728	7351	9.90%
	A311 (Heath Road) Westbound	7265	511	7776	6.57%
	B361 (Whitton Road) Northbound	3588	163	3751	4.35%
	B361 (Whitton Road) Southbound	6205	286	6491	4.41%
	A305 (Richmond Road) Northbound	6071	1443	7514	19.21%
	A305 (Richmond Road) Southbound	5288	698	5986	11.66%

Public Transport

10.4.4 The site is within easy walking distance of Twickenham Rail Station and several bus services.

10.4.5 The Public Transport Accessibility Level (PTAL) has been assessed using TfL methodology. The application site has relatively good access by public transport being served by Twickenham Rail Station and nine bus routes. Currently, the site has PTAL ratings between 5, on the site frontage and 4, towards the rear of the site. This indicates that the site has very good accessibility by public transport, especially as LBRuT is an outer London borough.

Bus Network

10.4.6 The site is served by several bus services. The closest bus stop is on London Road to the south of the site. Additional bus services are accessed on Arragon Road and York Road (**Table 10.4**).

Table 10.4: Bus Frequencies

Stop	Route	Service Area	Service Frequency (Peak Hour)		
			Weekday	Saturday	Sunday
Twickenham Station	267	Hammersmith Bus Station to Hampton Court Green	8-11 mins	11-13 mins	15 mins
Twickenham Station	281	Tolworth Tower to Hounslow Bus Station	6-8 mins	7-10 mins	12-13 mins
Arragon Road	110	Arragon Road to West Middlesex Hospital	20-22 mins	20 mins	30 mins
Arragon Road	290	Staines Bus Station to Arragon Road	18-23 mins	20 mins	20 mins
York Street	33	Fulwell Station to	5-12 mins	6-12 mins	15 mins

Stop	Route	Service Area	Service Frequency (Peak Hour)		
			Weekday	Saturday	Sunday
		Hammersmith Bus Station			
York Street	490	Richmond Station to Heathrow Terminal 5	12 mins	12-13 mins	20 mins
York Street	H22	The Bell, Hounslow to Manor Road, Richmond	10-12 mins	12-13 mins	20 mins
York Street	R68	Kew Retail Park to Hampton Court Station	15 mins	14-16 mins	15 mins
York Street	R70	Nurserylands Shopping Centre to Richmond	8-12 mins	10-12 mins	19-22 mins

Rail Network

10.4.7 The closest rail station is Twickenham station which has national rail services to stations including London Waterloo, Windsor and Eton Riverside and Reading. During the peak periods there are approximately 37 trains per hour which stop at Twickenham Station.

Walking and Cycling

10.4.8 The site is located a short walk away, via London Road, from the local bus stops and key local amenities related to education, shopping, healthcare and sports and leisure facilities, thus influencing more sustainable mode of transport for short trips.

10.4.9 No formal pedestrian assessment has been undertaken as part of the Transport Statement. However, a review has been undertaken regarding the quality of the pedestrian routes around the site and in particular those linking the site to the station and to the local bus stops. No major issues had been identified as all of the footways provide sufficient effective widths and the existing signalised crossing is serving adequately the pedestrian desire lines to and from the station.

10.4.10 There are a number of signed cycle ways, and quiet roads suitable for cycling around the site. The proposals include a total of 142 cycle parking spaces for the residential uses, as well as additional spaces for the community building.

Road Safety Analysis

10.4.11 An analysis of accident patterns for the local road network over the last three years was undertaken in section 7.3 of the Transport Statement. During the past three years there have been eleven accidents in the vicinity of the site; nine slight, one serious and one fatal. The fatal accident occurred when a driver attempted a U-turn at the entrance to the site and collided with a cyclist, this accident happened due to driver's error as he failed to see the bicycle.

10.4.12 These accidents did not appear to exhibit any common patterns or to reflect the condition or design of the local highway. Rather, they appear to be related to driver error. It is therefore concluded that there are no road safety issues that may be exacerbated by the proposed development or that need to be addressed by this application.

10.5 Assessment & Mitigation

Trip Generation

10.5.1 The trip rates for the proposed development and for the previous use of the site were estimated using the TRAVL Database in order to project the modal share and the total number of trips during the peak periods for the different proposed uses (**Tables 10.5, 10.6**).

Table 10.5: Average Vehicular Trips by Mode for the Existing use (based upon gross floor area (GFA), Two Way Trips)

Daily Vehicle trips (Two Way)	AM Peak (07:00 – 10:00)	PM Peak (16:00 – 19:00)
521	72	90

Table 10.6: Estimated Total Trip Generation by Mode for Proposed use (Two Way Trips)

Mode	AM Peak (07:00 – 10:00)	PM Peak (16:00 – 19:00)
Car Driver	49	97
Car Passenger	2	36
Public Transport	71	400
Motorcycle	1	3
Pedal Cycle	16	32
Taxi	1	2
Walk	19	36
Total, All Modes	158	605

10.5.2 The estimates for the proposed development car driver trips are similar or lower than the estimated vehicular trip generation for the former Sorting Office use in the peak hours. However, since there is no on-site parking for the restaurant or community uses, the number of car trips accessing the site would mainly be associated with the residential use, which is lower than the Sorting Office use in both peak periods, 46 versus 72 for the AM peak period and 67 versus 90 for the PM peak period. During off peak time there will be a small overall increase in traffic generation reflecting the residential and leisure uses of the site.

10.5.3 The additional numbers of daily trips generated from the proposed site is estimated to be 273 trips.

Traffic Impact Assessment

10.5.4 This section summarises the likely significant effects of the proposed development.

10.5.5 Currently there are 2,000 two way vehicle trips per hour in peak hours on London Road and 20,500 daily two way trips. There will be no impact on existing traffic during peak hours due to the development trips, furthermore the additional daily trips account for an increase of less than 1.5% on existing daily traffic on London Road.

10.5.6 A summary of the forecast percentage changes in traffic movements in the local area in comparison to the baseline traffic conditions for a 24-hour period is shown in the table below. This table relates to a typical weekday.

Table 10.7: Percentage Impact of the Development Traffic (24-hour Flows)

Link	Link Description	24 Hour two way Vehicle Movements		
		Baseline Flows	Development	% Change
A310 (London Road)	Northbound Between Site Access & Whitton Road	10414	133	1.3%
A310 (London Road)	Southbound Between Site Access & Whitton Road	10055	133	1.3%
A310 (London Road)	Northbound	6663	66	1.0%
A310 (London Road)	Southbound	3564	66	1.9%
A311 (Heath Road)	Eastbound	7351	31	0.4%
A311 (Heath Road)	Westbound	7776	31	0.4%
B361 (Whitton Road)	Northbound	3751	66	1.8%
B361 (Whitton Road)	Southbound	6491	66	1.0%
A305 (Richmond Road)	Northbound	7514	33	0.4%
A305 (Richmond Road)	Southbound	5986	33	0.6%

10.5.7 The table above shows the percentage increase in traffic on all links is small enough to be insignificant. No link has an increase in traffic of more than 2%, with an overall increase in daily trips over a 24 hour period of 273. This means that none of the criteria for even a 'minor' effect, as outlined in the methodology section, is exceeded.

10.5.8 Due to the very small increase in traffic, considering all main impacts identified in the methodology, the development proposals environmental impact can be classed as 'Not Significant'. As no significant adverse effects have been identified, no mitigation measures are deemed necessary for this development.

Public Transport Impact Assessment

10.5.9 In the AM peak period (07:00 to 10:00) a total of 71 trips (total to and from the site) are expected to use public transport. These trips are mainly associated with the residential development (60 trips) and are mainly expected to use rail services (53) to travel to work. Given the high capacity of the rail network through Twickenham the impact on the operational capacity of the rail services is considered to be not significant.

10.5.10 Only a small number of trips are expected to use bus services. The residential development is expected to generate an additional 7 trips on local bus services and other uses might generate a further 11 trips. Since there are approximately 28 buses per hour passing the site along London Road, this represents an increased demand of less than one additional trip for every 5 buses. It is therefore considered that this impact is not significant.

10.5.11 During the PM peak period a higher number of people are expected to use public transport to access the site. Overall, a total of 400 people are expected to use public transport to arrive or depart the site over the three hour evening peak period (16:00 to 19:00).

10.5.12 The majority of these public transport trips are associated with the proposed restaurant uses (287 trips). Very few of these trips are likely to be new trips. Rather they will be linked trips with other uses. For example, during the early evening students leaving the college and using rail services from Twickenham Station may stop off at one of the restaurants. Similarly, a proportion of people travelling home from work are likely to call in at the site to use the restaurants. As a result of this and the high level provision of public transport the impact of the proposed restaurants upon the public transport network is considered to be not significant.

10.5.13 The trip generation assessment suggests that, on a typical day, the community building might generate 11 public transport trips in the AM peak and 26 in the PM peak. In general, the community building will cater for local people and therefore a higher proportion of trips are likely to use local bus services rather than rail services. Again, some of the trips are likely to be linked with other town centre uses rather than being entirely new trips. Therefore the impact of the community building on public transport services is considered to be not significant.

10.5.14 The residential development is predicted to generate an additional 87 public transport trips during the evening peak period, 77 using train services and 10 bus services. Most of these trips would be commuters returning to the site from work. Again, the impact of these additional trips when considered against the high capacity of the existing rail and bus services is considered to be not significant.

10.5.15 It is therefore concluded that overall the proposed development may have a minor adverse effect upon either rail or bus services. There should be no requirement for any changes to existing services in order to accommodate the development.

Walking and Cycling Networks

10.5.16 London Road provides access to the site by foot and links the site to the wide range of facilities that are available within the town centre. London Road has well maintained and lit footways. Access to the rail station from the site is facilitated by the existing pelican crossing which is on the direct desire line.

10.5.17 The trip generation assessment suggests that the proposed development might generate 19 all walk and 71 public transport trips, which would involve walking to or from a bus stop / station, during the AM peak period. The majority of these trips would be to and from the station and would be focused on the early morning commute, before the main high demand flows associated with the college occur. The additional pedestrian flows associated with the proposed development can therefore be accommodated by the existing pedestrian network.

10.5.18 During the evening peak there are likely to be higher pedestrian flows generated by the proposed development due to the presence of restaurants and community facilities. The trip generation assessment suggests that the development might generate around 436 such trips during the evening peak period. During the evenings the highest flows are associated with people arriving back at Twickenham from the station. Flows tend to arrive in peaks associated with the train arrival pattern. From observation, existing background flows on the pedestrian network tend to be less peaked during the evening, since many of the students leave before the main commuter peak. Therefore, it is considered that the existing pedestrian infrastructure can accommodate the additional pedestrian flows generated by the proposed development.

10.5.19 The proposed development will allow access through the subway under London Road when major rugby matches are occurring in Twickenham and will also provide access to a riverside walk adjacent to the River Crane. These provisions are considered to be a minor beneficial effect of the proposed development.

Mitigation Measures

10.5.20 The impact of the proposed development on the local highway network will not be significant and therefore no mitigation measures will be necessary for the site to manage adverse effects. However a Travel Plan will be implemented to help manage and reduce the numbers of additional trips due to the development.

10.5.21 A Full Travel Plan for the residential uses has been drafted in addition to a Framework Plan for the Community Building. The Residential Travel Plan will be implemented prior to the first occupation and includes a range of measures to encourage sustainable patterns of travel.

10.5.22 The Travel Plan includes mechanisms for the annual review and monitoring of mode share targets. This will be achieved through travel surveys which will record the main modes of travel to and from the development.

Assessment & Mitigation of Construction Effects

10.5.23 This section provides estimates for the construction traffic generated during the proposed redevelopment of the site as well as undertaking an assessment of the effects of this construction traffic on the local highway network, including the likely routes that vehicles will take to get to and from the development.

10.5.24 It is anticipated that the development will comprise of four phases:

- Site clearance and preparation (Spring 2013);
- Construction of road access and apartment block (16 months: Feb 2012 – June 2015);
- Construction of town houses (15 months: August 2013 – November 2014); and
- Construction of community building (18 months).

10.5.25 Site clearance is anticipated to start in Jan 2013, with first occupation of proposed dwellings due to occur in 2014. The development should be completed during 2015.

10.5.26 Construction impacts will relate to the movement of construction workers and to the movement of materials during both the demolition/site clearance phase and the construction phase. Table provides an overview of likely traffic movements for each phase of development. For each phase the table identifies the likely maximum daily movements during the busiest part of the particular phase. In addition, it assumes that all workers will travel to and from the site by road, whereas in practice a significant proportion may well chose to travel by public transport, given the accessibility of the site by public transport. Therefore, the vehicle estimates can be regarded as being very much a worst case assessment.

Table 10.8: Anticipated Construction Movements per day

Phase	Max Car and Light Vehicle (movts/day)	Max HGVs (movts/day)	Total
Phase 1	10	10	20
Phase 2A	30	24	54
Phase 2B	59	8	67
Phase 3	9	2	11
Phase 4	32	4	36

10.5.27 Based upon this assessment, Phase 2B is likely to involve the highest daily trip generations, with a maximum of 67 vehicle movements per day. These are mainly associated with employees and would therefore primarily involve the movement of cars and light vans. Maximum HGV movements would occur during a short phase of works when the site access roads were constructed, with an estimated 24 HGV movements per day.

10.5.28 It is also considered likely that construction employees will in the main be travelling outside the main AM and PM peak periods. For those employees travelling by public transport, it is also likely that most will also be travelling in the opposite direction to the peak demand of people travelling towards central London and therefore any effect on the public transport system is considered to be not significant.

10.5.29 Generally, the flow of construction traffic would be spread evenly over the working day, with occasional peaks resulting from operational requirements for materials and stock-piling at the site. In practice, it is likely that the contractor will choose to limit traffic flows during the background peak hours. Additionally, a Construction and Logistics (CLP; see below) would be submitted to and approved by the Highway Authority and TfL to ensure that the construction vehicle routes are appropriate; to avoid any overspill parking by contractors and that debris or mud does not get carried onto the surrounding highway. These matters would be secured through a planning condition.

10.5.30 It is anticipated that the approved HGV access route to and from the site will be via the A316 Chertsey Road, which in turn will be accessed either via the B361 Whitton Road (for traffic travelling to and from the west, or via the A310 London Road (for traffic travelling to and from the east). Therefore, HGV will make a right tune into the site from London Road and a left turn out of the site into London Road.

10.5.31 Even during the busiest construction phases, the number of construction related vehicles will be less than will occur during the operational phase of development. It will also be less than occurred historically under the previous sorting office use on the site. In addition, the number of HGV movements will also be substantially less than the number associated with the former sorting office use. As a result the effect of construction traffic should not be significant.

Cumulative Impact

10.5.32 It is anticipated that the construction of this development will occur at broadly the same time as the Twickenham Station site.

10.5.33 The Transport chapter relating to the Sulum development anticipated that the primary vehicle access during construction will be in a position of the current station car park. The assessment did not provide any estimate of likely construction traffic but instead stated that a Demolition and Construction Method Statement (DCMS) would be submitted prior to the start of construction and that this would include details of vehicle routes to be used, hours of working, delivery times, number of vehicle movements and any temporary road or footway closures required during the construction period.

10.5.34 Given the low level of construction traffic associated with the proposed development at the Royal Mail Sorting Office it is not anticipated that the cumulative impact will raise any particular traffic concerns.

Construction and Logistics Plan

10.5.35 In accordance with TfL guidance an outline Construction and Logistics Plan (CLP) has been prepared and this is summarised within Chapter 9 of the TS. Its aim is to provide a framework to enable better manage of all types of freight vehicle movement to and from construction sites. It is intended to improve the safety, efficiency and reliability of deliveries to the site, to identify unnecessary journeys and deliveries that could be made by more sustainable transport modes to help reduce congestion and minimise the environmental impact of freight activity.

10.5.36 The CLP will be put in place during the construction period to manage vehicle trips and HGV routing to and from the site. The CLP aims to reduce the transport impacts of construction traffic accessing the site and to reduce levels of construction waste. It covers a number of aspects including the following:

- Design – at the detailed design stage of the proposed development, consideration will be given as to how to manage the reception of materials to the site depending upon construction phasing and management.
- Procurement Strategy – will consider how best to obtain materials and services in order to reduce the number of service vehicles visiting the site.
- Operational Efficiency – this will include a review of delivery practice, demand smoothing and construction best practice.

- Road Trip reduction – this encompasses access and route arrangements, traffic generation and distribution onto the highway network, in order to reduce impacts, including on safety of vulnerable users (pedestrians and cyclists).

- Targets and Monitoring – regular monitoring and review will be undertaken to ensure that the measures implemented comply with the CLP and the demolition and construction commitments set out within the development specification.

- Waste Management – a Waste Management Strategy has been prepared (see **Appendix A.4)** that will inform the CLP.

10.6 Assessment of Cumulative Effects of MOL Footpath Proposals

10.6.1 The creation of a public footpath through the wider MOL will increase pedestrian and cyclist connectivity in the area, including between areas to the west of the site, including potentially links to the Stoop Stadium and the Richmond Upon Thames College, and Twickenham Railway Station. Detailed information on the final route and design of the footpath is not yet available. However on the basis that LBRuT will give appropriate consideration to pedestrian and cyclist safety it is considered that the provision of the route should provide a minor beneficial cumulative effect to local pedestrians and cyclists.

10.6.2 It is understood that the pedestrian route will be partially lit if not fully lit and will be built in accordance with LBRuT design standards with regards to footway width and forward visibility for cyclists.

10.7 Summary

10.7.1 A Transport Statement has been prepared to assess the transport related effects of the proposed development. This has been used to inform the assessment of transport effects within the Environmental Statement drawing upon relevant guidelines including the Guidelines for the Environmental Assessment of Road Traffic' (1993).

10.7.2 The site is accessed from London Road which provides connections to the local highway network. The site is adjacent to Twickenham Rail Station that provides frequent services to London Waterloo and areas to the west. There are also frequent and wide ranging bus services available from stops close to the site on London Road.

10.7.3 The proposed development will generate similar levels of traffic to the previous Royal Mail Sorting Office use on the site. In comparison with the previous use, peak period (i.e. rush hour) weekday flows are expected to be slightly less during the morning peak period and about the same during the evening peak period. Average weekday flows are expected to increase by around 273 vehicle movements to and from the site. This reflects a 1.5% increase to traffic currently on London Road, therefore any impacts will not be significant.

10.7.4 A full residential Travel plan has been drafted and will be implemented prior to the occupation of the development. The Travel Plan will help to reduce private car trips associated with the proposed development, encouraging walking, cycling and the use of public transport.

10.7.5 There is likely to be increased demands for public transport as a result of the proposed development. Due to the high level of public transport provision in the vicinity of the site this is considered to be a minor adverse effect and no changes to the current public transport provision are considered to be necessary.

10.7.6 The proposed development will allow access through the subway under London Road when major rugby matches are occurring in Twickenham and will also provide access to a riverside walk adjacent to the River Crane. These provisions are considered to be a minor beneficial effect of the proposed development.

10.7.7 An assessment has also been of trips that will be generated during construction. This has identified that construction traffic be less than during operational use, with lower numbers of HGVs than those generated from the site's previous use. A Construction Logistics Plan will be prepared to help reduce local impacts from construction traffic. The effect of construction traffic is considered to be not significant.

11 Noise & Vibration

11.1 Introduction

11.1.1 This chapter presents the noise and vibration assessment of the proposed development and has been prepared by Peter Brett Associates LLP.

11.1.2 It documents the baseline noise climate of the site and the suitability of the site for the proposed development. It describes the potential impacts arising from the construction and operational phases of the proposed development. It proposes mitigation measures to reduce these impacts, as necessary. The chapter provides an assessment of the significance of the predicted residual effects.

11.1.3 A description of the technical terminology used in this chapter is provided in **Appendix F.1**.

11.2 Policy Context

National Policy

The National Planning Policy Framework (NPPF)

11.2.1 The National Planning Policy Framework was published in March 2012. In respect of noise, the document states that:

"The planning system should contribute to and enhance the natural and local environment by …preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of … noise pollution".

11.2.2 It goes on to advise that:

"*Planning policies and decisions should aim to:*

- *Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;*
- *Mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;*
- *Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and*
- *Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason."*

11.2.3 The NPPF indicates that the Noise Policy Statement for England (NPSE) should be used to define *"significant adverse impacts".* A summary of the NPSE is provided below, and it is understood that the UK government is currently undertaking research to quantify the significant observed adverse effect levels for noise.

Noise Policy Statement for England

11.2.4 The Noise Policy Statement for England was published in March 2010. The document seeks to clarify the underlying principles and aims in existing policy documents, legislation and guidance that relate to noise. It also sets out the long term vision of Government noise policy*: "to promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development".*

11.2.5 The NPSE clarifies that noise should not be considered in isolation of the wider benefits of a scheme or development, and that the intention is to minimise noise and noise effects as far as is reasonably practicable having regard to the underlying principles of sustainable development.

Regional Policy

The London Plan: Spatial Development Strategy for Greater London, July 2011

11.2.6 The London Plan, adopted in July 2011, includes Policy 7.15 on noise: 'Reducing noise and enhancing soundscapes'. It states that development proposals should seek to reduce noise by:

a) *"Minimising the existing and potential adverse impact of noise on, from, within, or in the vicinity of, development proposals.*

b) *Separating new noise sensitive development from major noise sources wherever practicable through the use of distance, screening, or internal layout in preference to sole reliance on sound insulation.*

c) *Promoting new technologies and improved practices to reduce noise at source."*

Local Policy

London Borough of Richmond upon Thames - Development Management Plan, Adopted November 2011

11.2.7 The DMP is part of the Development Plan. The Detailed General Policies include DC 5 Neighbourliness, Sunlight and Daylighting:

"*In considering proposals for development the Council will seek to protect adjoining properties from unreasonable loss of privacy, pollution, visual intrusion, noise and disturbance."*

London Borough of Richmond upon Thames Core Strategy (adopted April 2009)

11.2.8 Policy CP1 states local environmental impacts of development with respect to factors such as noise should be minimised.

London Borough of Richmond upon Thames Development Management Plan (adopted November 2011)

11.2.9 Within Policy DM DC 5 it states that the council when considering proposals for development will seek to protect adjoining properties from unreasonable loss of privacy, pollution, visual intrusions and noise.

Twickenham Station and Surroundings Design Standards Supplementary Planning Document, Adopted October 2010

11.2.10 The document states that new buildings should not unreasonably impact on neighbouring residential areas in terms of bulk and mass, overlooking, neighbourliness, sunlighting and daylighting, noise and disturbance.

Twickenham Area Action Plan, July 2011

11.2.11 The emerging Twickenham Area Action Plan (TAAP) will form part of the LDF. While the plan includes site specific proposals it does not contain specific policies or requirements in relation to noise.

Noise Guidance

British Standard 8233: 1999 Sound Insulation and Noise Reduction for Buildings – Code of Practice

11.2.12 BS 8233:1999 sets out the recommended indoor noise levels in habitable rooms for dwellings such as living rooms and bedrooms, when they are unoccupied. These recommended levels are presented in **Table 11.1**.

Table 11.1: Recommended Internal Ambient Levels

Criterion	Typical Situation	Design Range LAeq.T dB	
		Good	Reasonable
Reasonable resting/sleeping conditions	Living rooms	30	40
	Bedrooms1	30	35
1 For a reasonable standard in bedrooms at night, individual noise events (measured with F time-weighting) should not normally exceed 45 dB LAmax.			

11.2.13 BS 8233 also recommends design criteria for intrusive external noise. In gardens and balconies it is desirable that the steady noise level does not exceed 50 $L_{Aeq,T}$ dB and 55 $L_{Aeq,T}$ dB should be regarded as the upper limit.

British Standard 5228: 2009 Code of Practice for Noise and Vibration Control on Construction and Open Sites

11.2.14 For construction noise, BS 5228: 2009 'Code of Practice for Noise and Vibration Control on Construction and Open Sites' (British Standards Institution, 2009) gives recommendations for basic methods of noise and vibration control relating to construction and open sites where work activities/operations generate significant noise and/or vibration levels.

Control of Pollution Act 1974: Implementation of part III – Noise

11.2.15 Control of Pollution Act 1974 (Department of the Environment, 1974) under Noise from Construction and Demolition Sites, Section 60 gives local authorities the power to serve a notice imposing requirements as to the way which construction works are to be carried out. Section 61 gives a person who intends to carry out works the opportunity to determine the local authority's requirements by seeking their consent for the proposed methods of works and mitigation measures.

British Standard 4142: 1997 Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Sites

11.2.16 BS 4142 (British Standards Institution, 1997) sets out methods for determining, at the outside of a residential building, noise levels from factories, industrial premises, fixed installation of sources of an industrial nature in commercial properties.

11.2.17 It further provides methods to determine the background noise level and assess whether the noise from the industrial source is likely to give rise to complaints from people residing in the dwellings assessed.

11.2.18 The method subtracts the background noise level $L_{A90,T}$ (that which is exceeded for 90% of a given duration) from the 'rating level', L_{ArTr}, which is calculated by adjusting the noise source for a character correction, if required. **Table 11.2** shows the assessment levels and advice.

Table 11.2: BS4142 Assessment Levels

LAr,Tr – LA90,T (dB)	Advice
+ 10	Complaints likely
+ 5	Marginal significance
- 10	Complaints unlikely

British Standard 6472:2008 Part 1: Guide to Evaluation of Human Exposure to Vibration in Buildings. Vibration Sources other than Blasting

11.2.19 BS 6472 - Part 1:2008 'Guide to Evaluation of Human Exposure to Vibration in Buildings. Vibration Sources other than Blasting' is used to assess vibration levels experienced by people in buildings from a human comfort perspective.

11.2.20 Human exposure to vibration in buildings can be assessed in terms of Vibration Dose Value (VDV), velocity or weighted root mean square (RMS) acceleration (the square root of the average square of the waveform over a time period, calculated in this way to avoid positive and negative changes averaging to zero). BS 6472-1 indicates that VDVs can be used to assess the human exposure to vibration when the vibrations are of impulsive or intermittent type and can be used to assess both the magnitude and the duration of vibration.

11.2.21 BS 6472-1 outlines recommended VDV criteria for daytime (07:00-23:00hrs) and night time (23:00-07:00hrs) for residential properties. The criteria are presented in **Table 11.3**.

Table 11.3: Daytime and Night-time VDV Criteria for Residential Properties

Place and time	Low probability of adverse comment ms-1.75 1	Adverse comment possible ms-1.75	Adverse comment probable ms-1.75 2
Residential buildings 3 16hr day	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential buildings 8hr night	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8
1 Below these ranges adverse comment is not expected. 2 Above these ranges adverse comment is very likely. 3 For offices and workshops, multiply by factors of 2 and 4 respectively for a 16 hr day.			

World Health Organization – Guidelines for Community Noise: 1999

11.2.22 This document is a review of the medical and scientific knowledge on health impacts of community noise, and provides guidance to health authorities and professionals dealing with the effect of noise in non-industrial environments.

11.2.23 It presents in Table 1 the guideline values for community noise in specific environments. In dwellings, the effect of noise is typically sleep disturbance, annoyance and speech interference.

Calculation of Road Traffic Noise (CRTN): 1988

11.2.24 CRTN is a Department of Transport (DoT) memorandum that describes the procedure to calculate the road traffic noise at a given receptor location.

11.2.25 Section III (The Measurement Method) describes the shortened measurement procedure to be undertaken within 3 consecutive hours between 10:00 and 17:00 hrs. A formula is presented to calculate the noise level dB $L_{A10,18h}$ based on that measurement.

Method for Converting the UK Road Traffic Noise Index $L_{A10,18h}$ to the EU Noise Indices for Road Noise Mapping: 2006

11.2.26 This report was prepared by the Transport Research Laboratory (TRL) and Casella Stanger on behalf of the Department for Environment, Food and Rural Affairs (Defra) in January 2006.

11.2.27 It presents a methodology to convert the noise index for traffic noise derived from CRTN, $L_{A10,18h}$, into the noise indicators required by the Environmental Noise Directive (EU Noise Indices) L_{den} and L_{night}. For road traffic noise, supplementary noise indicators are also presented $L_{Aeq,12h}$ (07:00-19:00), known as L_{day}, $L_{Aeq,4h}$ (19:00-23:00), known as $L_{evening}$ and $L_{Aeq,16h}$ (07:00-23:00).

11.3 Methodology

Consultation with the London Borough of Richmond upon Thames (LBRuT)

11.3.1 Consultation has been undertaken with the Environmental Department at LBRuT on 16th August 2012.

11.3.2 The noise & vibration methodology was discussed and agreed. The following bullet points summarise the discussion:

- A noise & vibration assessment will be undertaken in accordance with the principles in NPPF;
- A qualitative assessment will be undertaken for the construction phase of the proposed development in accordance with BS5288;
- For the operational phase of the proposed development, a noise model will be prepared and validated against the noise survey results;
- Internal noise levels within habitable rooms will be assessed following guidance in BS 8233:1999 with the 'good' internal noise targets to be achieved;
- Noise limits will be proposed for fixed plant associated with the restaurants. A design criterion of rating level 5dB below existing background noise levels was agreed, in accordance with BS4142;
- Noise in garden and outdoor living areas was also discussed. LBRuT advised that they recognise that these spaces may be exposed to noise levels above the BS 8233 upper limit but that mitigation should be concentrated on the building to ensure internal noise levels are met. However, where additional screening can be incorporated to reduce noise exposure externally this would be recommended; and
- The change in noise levels due to the generation of development traffic will be assessed against significance criteria developed for this project.

Baseline Data Collection

11.3.3 A baseline noise survey was undertaken on 7th to 8th October 2010 to determine the ambient noise climate of the site using the procedure provided in BS 7445-1:2003.

11.3.4 **Table 11.4** details the measurement locations (shown in **Figure 11.1** of **Appendix F.2**).

Table 11.4: Details of the Measurement Locations for the Baseline Noise Survey

Measurement Location Reference (see Figure 11.1)	Description
Location 1	Approximately 18m from the railway line, to the South West of the site
Location 2	Approximately 65m from the railway line, to the North West of the site
Location 3	Approximately 5.5m from London Road, to the North East of the site

11.3.5 The survey consisted of an unattended 24-hour measurement at Location 1 starting at 12:26 on 7th October with three consecutive 1-hour measurements at Location 3 between 13:36 and 16:36. Three 30-minute measurements within the same 24-hour period were taken at Location 2 starting at 12:34 and 17:01 on 7th October and 11:23 on 8th October.

11.3.6 The night time noise survey consisted of two 15-minute measurements at Locations 2 and 3 between 23:01 and 00:29 on 7th October 2010 and two 15-minute measurements between 05:23 and 06:55 on 8th October 2010. The two worst-case hours for traffic noise during the night-time period are considered to be 23:00 to 00:00 hrs and 06:00 to 07:00 hrs.

11.3.7 The weather on 7th October was mild with an occasional north-easterly breeze. The maximum gust measured during the short noise measurements was 2.8 ms^{-1}. The temperature at the beginning of the first noise measurement was 22˚C. The measured night time temperature was 16˚C.

11.3.8 Weather conditions on the 8th October were dry and mild with a similar temperature and a maximum wind speed of 2.3 ms^{-1}. These weather conditions were considered suitable for the noise survey.

Instrumentation

11.3.9 Two type 1 sound level meters were used for the survey. Each was mounted at 1.5m above the ground and at a minimum of 3m away from any reflective surface.

11.3.10 The noise instrumentation has valid laboratory certification, which is available upon request. Field calibrations were performed before and after the measurements with no significant fluctuation recorded. The instrumentation used in the noise monitoring is listed in **Table 11.5**. The laboratory calibration date presented has been now superseded, but they are still applicable for this survey.

Table 11.5: Instrumentation Used During the Noise Survey

Item	Type	Manufacturer	Serial Number	Laboratory Calibration Date
Long Term Measurement				
Hand-Held Analyzer	2250	Brüel & Kjær	2626232	15/02/2010
½ " Microphone	4189	Brüel & Kjær	2621211	15/02/2010
B&K Sound Calibrator	4231	Brüel & Kjær	2619375	21/01/2010
Short Measurements				
Hand-Held Analyzer	2250	Brüel & Kjær	2626233	21/01/2010
½ " Microphone	4189	Brüel & Kjær	2621212	21/01/2010
B&K Sound Calibrator	4231	Brüel & Kjær	2619375	21/01/2010

11.3.11 A vibration measurement was undertaken on 7th October 2010 approximately 10m north of the railway line. The location is provided on **Figure 11.1** of **Appendix F.2**. The vibration measurement was undertaken during two hours starting at 13:53 hrs.

11.3.12 **Table 11.6** provides details of the instrumentation used during the vibration survey. It also provides the calibration details for the equipment used.

Table 11.6: Instrumentation Used During the Vibration Survey

Item	Type	Manufacturer	Serial Number	Laboratory Calibration Date
Tri-Axial Vibration Meter	VM-54	Rion	00360140	30/11/2009
Tri-Axial Accelerometer	PV-83CW	Rion	41287	30/11/2009
Whole Body Vibration (UK) program card	VX-54WB1	Rion	V1.1003	30/11/2009

11.3.13 The accelerometer was mounted on a metal plate on the concrete ground slab of a car park adjacent to the railway line.

Assessment

Construction Noise and Vibration

11.3.14 Noise and vibration generated during the construction phase of the development have been assessed qualitatively in accordance with BS 5228:2009 Parts 1 and 2 to minimise the noise and vibration impact of construction activities on nearby receptors. These are considered in more detail in the mitigation section of this chapter.

11.3.15 Although Annex E of BS 5228-1:2009 is an Informative document, and as such is not afforded the same level of authority as the British Standard itself, it provides useful guidance on the significance of noise effects and examples of noise limits for construction noise based on the pre-existing noise climate (i.e. the pre-construction baseline). Day, evening and night-time periods are defined, with limits provided as shown in **Table 11.7.**

Table 11.7: BS 5228 Recommended Construction Noise Limits

Assessment Category and Threshold Value Period	Threshold value, in decibels (LAeq T) (dB)		
	Category A A)	Category B B)	Category C C)
Night-time (23.00−07.00)	45	50	55
Evenings and weekends D)	55	60	65
Daytime (07.00−19.00) and Saturdays (07.00−13.00)	65	70	75

- NOTE 1 A significant effect has been deemed to occur if the total LAeq noise level, including construction, exceeds the threshold level for the Category appropriate to the ambient noise level.
- NOTE 2 If the ambient noise level exceeds the threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a significant effect is deemed to occur if the total LAeq noise level for the period increases by more than 3 dB due to construction activity.
- NOTE 3 Applied to residential receptors only.
- Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.
- Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values.
- Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.
- D) 19.00–23.00 weekdays, 13.00–23.00 Saturdays and 07.00–23.00 Sundays.

11.3.16 The recommended limits are defined as the 'threshold of significance'. Nearby noise-sensitive receptors have been considered to determine the above limits. These include the residential areas of Craneford Close / Craneford Way to the north of the site and Station Road to the south of the site.

11.3.17 Key construction activities with regards to noise and vibration are likely to include demolition and site clearance, incorporating crushing of materials. In addition, earthworks, piling and construction of building structures will also occur.

Operational Noise

Noise Model

11.3.18 A noise model has been prepared using the computer software SoundPLAN version 7.1.

11.3.19 The road traffic noise was predicted following guidance in the CRTN. Rail noise was predicted using the guidance in CRN (Calculation of Rail Noise). Baseline noise survey data has been used to determine the noise source from the railway.

11.3.20 The 'Method for Converting the UK Road Traffic Noise Index $L_{A10,18h}$ to the EU Noise Indices for Road Noise Mapping: 2006' was used to convert the predicted noise levels to the daytime (16 hours) and night-time (8 hours) periods.

11.3.21 Topographical information has been obtained from site specific spot heights complemented with DTM 5m grid.

11.3.22 The following road traffic scenarios have been modelled:

- Baseline Year 2011; and

- Future Year – with proposed development.

11.3.23 The road traffic data incorporated into the model is presented in **Appendix F.3**. Validation of the noise model against the survey results has been undertaken. In order for the model to provide an accurate representation of the noise environment noise levels have been adjusted to account for noise from passing aircraft (details are presented in **Appendix F.3**).

11.3.24 The other source of noise affecting the site is from the recreational sports pitches located directly to the north of the site. The sports pitches contain a football pitch, basketball court and skateboard park. Noise associated with these sources has been measured and been incorporated into the noise model for the daytime scenario. An on-time correction of 50% has been assumed for this source during the daytime. Noise levels associated with these sources is provided in **Appendix F.4**.

Suitability of the Site for Residential Development

11.3.25 Mitigation to meet the internal noise levels for proposed dwellings has been based on the predicted noise levels derived in the modelling scenario 'Future Year – with proposed development.' The mitigation has been assessed to meet the 'good' internal noise level criterion from BS 8233:1999, as agreed with LBRuT.

11.3.26 Break-in noise calculations (noise transmission from outside to inside living rooms/bedrooms) have been undertaken. Calculations have been based on the Building Envelope Insulation spreadsheet prepared by Building Research Establishment (BRE).

Increase in Road Traffic Noise

11.3.27 Change in noise levels at the existing noise-sensitive receptors due to the operation of the proposed development has been assessed in accordance to the significance criteria defined in this chapter.

11.3.28 The model has been used to predict changes in noise at existing dwellings surrounding the site by comparing the future with development and the current baseline scenario.

Noise from Community Use and Fixed Plant

11.3.29 The development may include plant associated with the restaurant and the community building, although at this stage no details are available as to what plant is to be included or their periods of likely operation. Consideration has been given to suitable noise limits for such plant to ensure that it meets the requirements of LBRuT.

11.3.30 LBRuT has indicated that noise from building services plant, including any corrections for acoustic characteristics, should be 5dB below the background noise level when assessed against BS 4142. The limits are defined at 1 metre from the façade of the receptors.

11.3.31 The limits should apply to the cumulative noise from all fixed plant items and have been derived for both the daytime and night-time periods.

11.3.32 For the community use mitigation measures have also been recommended to ensure any noise break out from the proposed concert space and rehearsal facilities do not adversely impact the nearby proposed residential units.

11.3.33 The noise model incorporated a marginally different version of the community building layout. It is considered that the differences do not change the conclusions of the noise assessment.

Significance Criteria

11.3.34 The significance of **residual** effects has been assessed in accordance with the generic significance criteria provided in **Table 5.1**. **Tables 11.8 - 11.10** define the sensitivity of the receptor and the magnitude of the effect which together determine the level of significance.

Table 11.8: Sensitivity of Receptors

Sensitivity	Description
High	Dwellings
Medium	Schools, hospitals, quiet recreation areas
Low	Offices, cafes/bars with external areas
Non Sensitive	Industrial, retail

11.3.35 When considering noise changes from a road traffic source, a comparison is made between the 'with development' and 'without development' scenarios. These changes can potentially increase or decrease noise levels.

11.3.36 When considering the significance of internal or external noise levels for a specific proposed use (such as internal noise levels for dwellings, or construction noise) a comparison is made between the predicted noise levels and the relevant guideline or policy level.

11.3.37 A change of 3 dB is the minimum perceptible under normal conditions, and a change of 10 dB corresponds roughly to halving or doubling the loudness of sound.

Table 11.9: Table of Magnitude

Magnitude	dB Change Compared with Baseline or Difference in Predicted Level Compared to Guideline Level	Description
Negligible	<3 dB	Not perceptible to human ear, within margins of error of measurement.
Small	3 - 5.9 dB	Perceptible but less than a doubling/halving of sound energy.
Medium	6 - 9.9 dB	Up to a doubling/halving of loudness.
Large	>10 dB	Over a doubling of loudness.

11.3.38 **Table 11.10** sets out how the sensitivity of the receptors and the magnitude of the impact have been combined to determine the significance criteria. The criteria range from not significant to severe.

Table 11.10: Significance Criteria

Magnitude		Sensitivity			
		Non Sensitive	**Low**	**Medium**	**High**
	Negligible	Not significant	Not significant	Not significant	Not significant
	Small	Not significant	Not significant	Minor	Moderate
	Medium	Not significant	Minor	Moderate	Major
	Large	Minor	Moderate	Major	Severe

11.3.39 An increase in noise level is described as adverse and a decrease in noise level as beneficial.

11.4 Baseline Conditions

11.4.1 **Tables 11.11 and 11.12** present the summary of the day and night-time measurement results for Locations 1, 2 and 3. The full results of the baseline noise survey are presented in **Appendix F.4**.

Table 11.11: Daytime Noise Survey Results

Measurement Location	Duration	LAeq,T (dB)	LA90,T (dB)
Location 1 – South West of site	16h	62	42
Location 2 – North West of site	1.5h	58	43
Location 3 – North East of site	3h	67	65

Table 11.12: Night-Time Noise Survey Results

Measurement Location	Duration	LAeq,T (dB)	LA90,T (dB)	LAFmax (dB)
Location 1 – South West of site	8h	56	31	82
Location 2 – North West of site	1h	54	32	75
Location 3 – North East of site	1h	64	43	83

11.4.2 The dominant noise source varied at each location: at Location 1 the dominant noise source was rail traffic, at Location 2 the noise sources were mixed (rail and air traffic) and at Location 3 the dominant noise source was road traffic from London Road. This was true for day and night-time, except that there were fewer aeroplane movements during the night-time so the dominant source at Location 2 is rail traffic.

11.4.3 The most common source of L_{Amax} readings above 70 dB was train horns or aircraft overhead.

11.4.4 With respect to the vibration measurements **Table 11.13** provides a summary of the results for the day and night-time calculations undertaken. Vibration is assessed using the vibration dose value parameter, VDV, with calculations undertaken along three translational axis for the X, Y and Z axes. These calculations use an estimated number of passenger trains arriving at Twickenham station per day, based on the first and last passenger trains scheduled to arrive, and the number of trains passing the site during the measurement. This does not include freight trains as there was no data available. LBRuT has confirmed that the adjacent railway is used by minimal freight traffic.

Table 11.13: Results of the Day and Night-Time VDV Calculations

Axis	VDV Weighting	Typical Event VDVb/d (m/s^1.75)	Number of Events		VDVb/d (ms1.75)	
			Daytime	Night-Time	Daytime (16 hours)	Night-Time (8 hours)
X	d	0.001	272	68	0.004	0.003
Y	d	0.000	272	68	0.002	0.001
Z	b	0.014	272	68	0.057	0.040

11.4.5 The overall daytime and night-time VDVs for all three axes (x, y, z) are in the range that BS 6472 describes as "adverse comment is not expected".

11.5 Potential Effects

Construction Noise and Vibration

11.5.1 Construction noise could potentially increase the ambient noise levels at existing noise-sensitive receptors and proposed noise-sensitive receptors that are inhabited whilst construction continues.

11.5.2 BS 5228:2009 Annex E (Informative) states that noise predictions should be undertaken to determine eligibility for noise insulation or temporary re-housing. However, the informative also states that these assessments should be undertaken when a contractor has been appointed and detailed method statements on the construction programme and plant to be used are available. Therefore, a quantitative assessment of the construction phase may be required when such information is available.

11.5.3 The validated noise model has been used to determine the free field baseline noise levels $L_{Aeq,T}$ at the nearest noise sensitive receptors potentially affected by construction noise.

6.5.1. **Table 11.14** provides the construction noise categories in accordance with the threshold values presented in **Table 11.5**.

Table 11.14: Baseline Noise Level at Construction Noise Sensitive Receptor – Daytime

Location	LAeq,16h dB	BS5228 Category
Dwellings north of site on Craneford Way	43	A
Dwelling south of site on Station Road	49	A

11.5.4 It is also recognised that a cumulative construction effect will also occur with work being undertaken at the railway station. However, it assumed that each development would have its own construction management plan in place and noise due to the construction will be mitigated using best practicable means and the overall impact would be a temporary minor adverse impact.

11.5.5 Groundborne vibration is often a cause for concern to occupants of buildings, particularly in relation to construction. Sources of vibration may include piling activities, in particular driven piling. The minimisation of vibration as a result of piling should be considered as part of the site construction management plan.

Operational Noise

Noise Impact upon the Development

11.5.6 The noise model has been used to predict the daytime and night-time noise levels likely to be experienced at the proposed development for a future year. The noise model includes noise from road, rail, aircraft and recreational sources.

11.5.7 **Figures 11.2** and **11.3** provide the daytime and night-time contours for the site. The daytime contours in **Figure 11.2** present the $L_{Aeq,16hr}$ noise level at ground floor. Night-time contours in **Figure 11.3** presents the $L_{Aeq,8hr}$ noise level on first floor.

11.5.8 **Table 11.15** presents the predicted free field noise levels at locations representative of the facades of the proposed development. **Figure 11.4** in **Appendix F.2** presents a description of the facades. Dwellings that are less likely to be significantly affected by noise have been considered collectively as façade 7, which therefore includes all the remaining dwellings not assessed in Facades 1-6.

Table 11.15: Façade Noise Levels

Building	Façade (See Figure 11.4)	Habitable Room	Daytime Noise Level LAeq,16hr (dB)	Night-time Noise Level LAeq,8hr (dB)
Apartments in mixed use building block	1 - North Façade	Living room	60	-
		Bedroom	-	52
	2 – East Façade	Living room	66	-
		Bedroom	-	58
	3 – South Façade	Living room	61	-
		Bedroom	-	56
	4 – West Façade	Living room	55	-
		Bedroom	43	-
Dwellings	5 – Fronting railway	Living room	60	-
		Bedroom	-	55
	6 – Fronting sports pitches to north of site	Living room	59	-
		Bedroom	-	48
	7 – Remaining dwellings	Living room	Less than 58	-
		Bedroom	-	Less than 46

11.5.9 In addition to the L_{Aeq}, noise levels the L_{Amax} noise levels measured during the survey have been assessed. These have been used to ensure the night-time noise criteria from BS 8233:1999 is met for maximum noise levels.

11.5.10 Based on the survey results and correcting for distance from both the railway and London Road to the locations of the dwellings the night-time L_{AMax} noise levels for the site are calculated to be in the range 75 – 77dB(A).

11.5.11 As the L_{Amax} noise level is the dominant noise parameter the mitigation during the night has been based on this level.

11.5.12 During the daytime the modelling results presented in **Table 11.15** have been used to determine the mitigation (i.e. glazing) at the facades of proposed dwellings in each of these areas.

11.5.13 Based on the baseline survey results presented in **Table 11.11**, an average daytime noise level of 58dB $L_{Aeq,T}$ was measured in the middle of the site at Location 2. This reading includes the contribution of aircraft noise in an area that was screened by buildings. This indicates that the upper limit recommended by BS8233 of 55 dB $L_{Aeq,T}$ for garden areas and balconies is likely to be exceeded.

Noise Impact upon Existing Noise Sensitive Receptors

Road Traffic Noise

11.5.14 As described in the methodology section, the potential road traffic noise impact arising from the operation of the development upon the nearby existing sensitive areas has been determined using the noise model.

11.5.15 **Figure 11.5** and **Figure 11.6** show the change in noise levels as a result of the comparison between the modelling scenarios for a future year with development against the baseline scenario.

11.5.16 It can be seen from both figures that the additional road traffic flows introduced by the proposed development would result in an increase of noise levels of less than 3dB, for the daytime and night-time periods. This magnitude is classified as a negligible impact.

11.5.17 It should be noted that the noise model incorporates the road network immediately adjacent to the site only. Contribution from road traffic noise arising from links further away from the site has not been considered as they should not be significant. Therefore, **Figures 11.5** and **Figure 11.6** may show adverse noise impact (negligible) in areas that in reality would not be affected by the proposed development due to their local road network.

Commercial and Fixed Plant Noise

11.5.18 LBRuT has stated that noise from building services plant, including any corrections for acoustic characteristics, should be 5dB below the existing background noise levels.

11.5.19 The limits should apply to the cumulative noise from all fixed plant items and should include any corrections for acoustic characteristics. Limits have been derived for both the daytime and night-time periods. Noise limits for the restaurant have been based on background noise levels measured at Location 3. Noise levels measured at Location 1 have been used to determine limits for noise from the community building.

11.5.20 The proposed noise limits rating level, $L_{ArTr,}$ are presented in **Table 11.16.** The table also provides an indication of the source being assessed and the nearest receptors at which the limits should be met.

Table 11.16: Proposed Fixed Plant Noise Emission Noise Limits

Fixed Plant Location	Receptor Location	Period	Proposed Noise Limit dB LArTr
Restaurant fixed plant	Proposed Dwellings fronting Restaurant	Day	60
		Night	38
Community building plant	Proposed Dwellings fronting community building	Day	37
		Night	26

11.5.21 The proposed limits in **Table 11.16** are defined at 1 metre from the façade of the receptors.

11.6 Mitigation Measures

Construction Noise and Vibration

11.6.1 The following advice is based on the guidance provided in BS 5228 and should be applied to minimise the noise breakout from the construction activities affecting noise sensitive receptors:

- Ensuring the use of quiet working methods, the most suitable plant and reasonable hours of working for noisy operations, where reasonably practicable;
- Locating noisy plant and equipment as far away from dwellings as reasonably possible, and where practical, carry out loading and unloading in these areas;
- Screening plant to reduce noise which cannot be reduced by increasing the distance between the source and the receiver (i.e. by installing noisy plant and equipment behind large site buildings);
- Shutting down any machines that work intermittently or throttling them back to a minimum;
- Orientating plant that is known to emit noise strongly in one direction so that the noise is directed away from houses, where possible;
- Closing acoustic covers to engines when they are in use or idling; and
- Lowering materials slowly, whenever practicable, and not dropping them.

11.6.2 The main source of vibration typically associated with the construction process is piling. The use of alternative methods such as continuous flight auger injected piles, auger bored piles should be considered, depending in the ground conditions to be encountered.

11.6.3 A CEMP will be agreed prior to commencement of construction (refer to **Chapter 4**). It could form part of the agreed working methods with the Local Authorities under Section 61 of the Control of Pollution Act 1974.

Operational Noise

11.6.4 A mitigation strategy for the proposed dwellings has been outlined to indicate the likely building elements required to achieve good internal noise levels.

11.6.5 **Tables 11.17** and **11.18** presents the acoustic performance, Weighted Sound Reduction Index (R_w) dB, required for glazing units during the daytime and night-time. Examples of double glazing units are also provided. For the daytime, specific mitigation has been provided for different facades of the development. However, for the night-time as the parameter assessed is the L_{Amax} which is fairly consistent around the site one glazing level has been set to meet the internal noise criteria for the whole development.

Table 11.17: Façade Mitigation - Daytime

Building	Façade (See Figure 11.4)	Habitable Room	Glazing Rw to meet Internal Noise Levels	Example of Double Glazed Unit (glass width mm / air gap width mm / glass width mm	Internal Noise Level LAeq,16hr dB
Apartments in mixed used building block	1 - North Façade	Living Room	35	10.12.4	<30
	2 – East Façade	Living Room	37	10.12.6	<30
	3 – South Façade	Living Room	35	10.12.4	<30
	4 – West Facade	Living Room	31	4.12.4	<30
Dwellings	5 – Fronting railway	Living Room	35	10.12.4	<30
	6 – Fronting sports pitches to north of site	Living Room	31	4.12.4	<30
	7 – Remaining dwellings on site	Living Room	31	4.12.4	<30

Table 11.18: Façade Mitigation – Night - time

Facades	Habitable Room	Glazing Rw to meet Internal Noise Levels	Example of Double Glazed Unit (glass width mm / air gap width mm / glass width mm	Internal Noise Level LAmax dB
All facades	Bedroom	35	10/12/4	<45

11.6.6 The mitigation outlined above is indicative and might not be sufficient to meet thermal insulation requirements or generally for procurement of building elements. Therefore, the calculations should be reviewed at the detailed design stage.

11.6.7 To meet the internal noise levels windows would remain closed. Therefore, alternative ventilation should be provided. This could take the form of acoustic trickle vents for background ventilation. The acoustic requirement for these would be set at the detailed design stage.Recreational Noise Source

11.6.8 Within the model, noise from the sports pitches located to the north of the site have been incorporated. Internal noise levels can be achieved by use of appropriate glazing described in **Tables 11.7** and **11.8** above. External noise levels would exceed the noise criteria for gardens due to aircraft noise. However, in discussions with LBRuT Environmental Health department it was advised that where mitigation measures can be incorporated to reduce external noise, albeit still exceeding garden noise limits, these would be recommended.

11.6.9 Therefore, further calculations and modelling were undertaken with a 3m noise barrier located along the southern and western boundary of the sports pitches, shielding the housing from the sports pitches. This would provide a reduction in noise levels of up to 5 dB in the garden areas directly adjacent the sports pitches as the surface mass of the barriers should be at least 10 Kg/m^2 (which can be achieved with metal, concrete and timber barriers). Any gaps in the barriers should be minimised to avoid sound transmission through the panel.

Community Building

11.6.10 Within the community building there will be a performance and rehearsal space for music activities. As the location of one of these spaces fronts the proposed dwellings outline mitigation measures has been identified for the community building envelope. The nearest dwellings to the site have been predicted to experience noise levels of 55dB(A) during the day without noise due to the community building.

11.6.11 Noise levels within a music performance centre based on previous measurements are normally in excess of 85dB(A). Therefore to ensure noise breakout does not affect the ambient noise levels of the nearest dwellings it is recommended that the noise due to the music played at the community building does not exceed 55dB(A) at the nearest dwelling. This can be achieved by ensuring the weighted sound reduction index, Rw, of the community buildings elements including wall and windows are in excess of 35dB. It is further recommended that alternative ventilation is provided such that windows from the performance rooms are not opened regularly.

11.7 Residual Effects

Construction Phase

11.7.1 Noise and vibration levels as a result of the construction works will be minimised by implementing the mitigation methods advised in BS 5228:2009 via the CMP.

11.7.2 With mitigation, it is expected that the adverse effect of the construction phase of the proposed development would be considered moderate. However, this effect would be intermittent during the construction period.

Operational Phase

11.7.3 Mitigation measures have been recommended for the proposed noise sensitive receptors. With this recommended mitigation in place the noise level aspirations agreed with LBRuT for the proposed residential uses would not be exceeded; therefore, the effect would be not significant.

11.7.4 Existing noise sensitive receptors would not experience a significant effect from noise arising from development road traffic flows. In addition, fixed plant noise limits have been proposed at the nearest proposed and existing residential receptors in accordance with LBRuT's noise policy to ensure that this effect is also not significant.

11.7.5 To ensure noise breakout does not affect the ambient noise levels of the nearest dwellings mitigation measures have been recommended for the building envelope. With these measures in place the effect would not be significant.

11.8 Assessment of Cumulative Effects of MOL Footpath Proposals

11.8.1 The provision of a public footpath through the wider MOL should not lead to significant cumulative effects in relation to noise. As shown in **Figure 11.5**, the noise impact due to the proposed development predicted for the daytime upon the surroundings (including the wider MOL) is expected to be less than 1dB.. Thisis not perceptible to human ear. As a result users of the footpath will not experience any significant noise effects.

11.9 Summary

11.9.1 A noise and vibration assessment has been undertaken to determine the likely impacts from and upon the proposed development.

11.9.2 Consultation was undertaken on 16th August 2012 with the London Borough of Richmond upon Thames (LBRuT) to agree assessment methodologies. The assessment has been undertaken following the principles set in the National Planning Policy Framework (NPFF).

11.9.3 A baseline noise survey was undertaken between 7th and 8th October 2010 to establish the existing noise climate on site.

11.9.4 A qualitative assessment has been undertaken of the likely noise and vibration impact associated with the construction phase of the proposed development. Noise limits for the construction activities have been proposed at the nearest existing receptors in accordance with British Standard 5288: 2009 Code of Practice for Noise and Vibration Control on Construction and Open Sites. Mitigation measures have been outlined based on best practice measures presented in BS5288. It is considered that, with mitigation in place, the residual effects (i.e. construction noise affecting local receptors) are likely to be moderate and adverse.

11.9.5 A computer noise model has been prepared to assess the likely noise impact arising from the operational phase of the development. The residual effect upon nearby existing dwellings close to the site due to the additional road traffic associated with the proposed development is considered to be not significant as the increase in noise level should not be perceptible to the human ear.

11.9.6 The potential noise impact upon the proposed residential development has been assessed. Mitigations measures have been outlined to meet the good internal noise level criteria agreed with LBRuT.

11.9.7 Noise limits at the nearest existing and proposed receptors for the fixed plant as part of the restaurants and community building have been proposed. These are in accordance with LBRuT's noise policy and BS4142: 1997 Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Sites.

11.10 References

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12 Air Quality

12.1 Introduction

12.1.1 This chapter assesses the impacts of the proposed development on local air quality. It considers the potential effects of construction and operation of the development, and considers the suitability of the site for residential development.

12.1.2 The chapter describes the methods used to assess the impacts, the baseline conditions currently existing at the site and surroundings, the potential impacts of the development, the mitigation measures required to prevent, reduce or offset the impacts and the residual impacts. It has been prepared by Peter Brett Associates LLP.

12.2 Policy Context

The Air Quality Strategy

12.2.1 The UK Air Quality Strategy (2007) establishes the policy framework for ambient air quality management and assessment. The primary objective is to ensure that everyone can enjoy a level of ambient air quality which poses no significant risk to health or quality of life. The Strategy sets out the National Air Quality Objectives (NAQOs) and government policy on achieving these objectives.

12.2.2 Part IV of the Environment Act 1995 introduced a system of Local Air Quality Management (LAQM). This requires local authorities to regularly and systematically review and assess air quality within their boundary, and appraise development and transport plans against these assessments. The relevant NAQOs for LAQM are prescribed in the Air Quality (England) Regulations 2000 and the Air Quality (Amendment) (England) Regulations 2002.

12.2.3 Where an objective is unlikely to be met, the local authority must designate an Air Quality Management Area (AQMA) and draw up an Air Quality Action Plan (AQAP) setting out the measures it intends to introduce in pursuit of the objectives within its AQMA.

12.2.4 The Local Air Quality Management Technical Guidance 2009 (LAQM.TG(09))[6] issued by the Department for Environment, Food and Rural Affairs (Defra) for Local Authorities provides advice as to where the NAQOs apply. These include outdoor locations where members of the public are likely to be regularly present for the averaging period of the objective (which vary from 15 minutes to a year). Thus, for example, annual mean objectives apply at the façades of residential properties, whilst the 24-hour objective (for PM_{10}) would also apply within garden areas. They do not apply to occupational, indoor or in-vehicle exposure.

[6] Defra, 2009, Local Air Quality Management Technical Guidance LAQM.TG(09).

EU Limit Values

12.2.5 The Air Quality Standards Regulations 2010 implements the European Union's Directive on ambient air quality and cleaner air for Europe (2008/50/EC), and includes limit values for NO_2. These limit values are numerically the same as the NAQO values but differ in terms of compliance dates, locations where they apply and the legal responsibility for ensuring that they are complied with. The compliance date for the NO_2 EU Limit Value is 1 January 2010 which is five years later than the date for the NAQO.

12.2.6 Directive 2008/50/EC consolidated the previous framework directive on ambient air quality assessment and management and its first three daughter directives. The limit values remained unchanged, but it now allows Member States a time extension for compliance, subject to European Commission (EC) approval.

12.2.7 The UK has a time extension for compliance of the daily PM_{10} limit value in London until the end of 2011. For the annual average NO_2 limit value, the UK has decided not to seek an extension to the compliance date for those areas of the country where it could not be guaranteed that compliance would be achieved by the latest date allowable under the Directive (1 January 2015).

12.2.8 The Directive limit values are applicable at all locations except:

- Where members of the public do not have access and there is no fixed habitation;
- On factory premises or at industrial installations to which all relevant provisions concerning health and safety at work apply; and
- On the carriageway of roads; and on the central reservations of roads except where there is normally pedestrian access.

12.2.9 The limit values are mandatory whereas there is no legal obligation to meet the NAQOs. Therefore, the limit values carry more weight than the NAQOs.

Assessment Criteria

Human Health Criteria

12.2.10 The NAQOs for NO_2 and PM_{10}, set out in the Air Quality Regulations (England) 2000 and the Air Quality (England) (Amendment) Regulations 2002, are shown in **Table 12.1**.

Table 12.1: Nitrogen Dioxide and PM_{10} Objectives

Pollutant	Time Period	Objective
Nitrogen dioxide (NO2)	1-hour mean	200µg/m3 not to be exceeded more than 18 times a year
	Annual mean	40µg/m3
Particulate matter (PM10)	24-hour mean	50µg/m3 not to be exceeded more than 35 times a year
	Annual mean	40µg/m3

12.2.11 The objectives for NO_2 and PM_{10} were to have been achieved by 2005 and 2004, respectively, and continue to apply in all future years thereafter. Analysis of long term monitoring data suggests that if the annual mean NO_2 concentration is less than 60µg/m^3 then the one-hour mean objective is unlikely to be exceeded where road transport is the main source of pollution. This concentration has been used to screen whether the one-hour mean objective is likely to be achieved[7].

12.2.12 The Air Quality Strategy (2007) includes an exposure reduction target for smaller particles known as $PM_{2.5}$. These are an annual mean target of 25µg/m^3 by 2020 and an average urban background exposure reduction target of 15% between 2010 and 2020.

12.2.13 A new air quality directive (2008/50/EC) was adopted in May 2008, and includes a national exposure reduction target, a target value and a limit value for $PM_{2.5}$, shown in **Table 12.2**. The UK Government transposed this new directive into national legislation in June 2010 (Stationery Office, 2010).

Table 12.2: $PM_{2.5}$ Air Quality Criteria

	Time Period	Objective/Obligation	To be Achieved by
UK objectives	Annual mean	25µg/m3	2020
	3 year running annual mean	15% reduction in concentrations measured at urban background sites	Between 2010 and 2020
European obligations	Annual mean	Target value of 25µg/m3	2010
	Annual mean	Limit value of 25µg/m3	2015
	Annual mean	Stage 2 indicative Limit value of 20µg/m3	2020
	3 year Average Exposure Indicator (AEI)a	Exposure reduction target relative to the AEI depending on the 2010 value of the 3 year AEI (ranging from a 0% to a 20% reduction)	2020
	3 year Average Exposure Indicator (AEI)	Exposure concentration obligation of 20µg/m3	2015

[(a)]The 3 year annual mean or AEI is calculated from the $PM_{2.5}$ concentration averaged across all urban background monitoring locations in the UK e.g. the AEI for 2010 is the mean concentration measured over 2008, 2009 and 2010.

Planning Policy

National

12.2.14 The National Planning Policy Framework (NPPF) was published in March 2012. This sets out the Government's planning policies for England and how they are expected to be applied. In relation to conserving and enhancing the natural environment, paragraph 109 states that:

[7] Defra, 2009. Local Air Quality Management Technical Guidance LAQM.TG(09).

"The planning system should contribute to and enhance the natural and local environment by…. preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability."

12.2.15 Paragraph 124, also states that:

"Planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan."

12.2.16 Paragraph 203 goes on to say:

"Local planning authorities should consider whether otherwise unacceptable development could be made acceptable through the use of conditions or planning obligations. Planning obligations should only be used where it is not possible to address unacceptable impacts through a planning condition."

Mayor's Air Quality Strategy

12.2.17 The Mayor's Air Quality Strategy (2010) sets out policies to improve air quality in London and includes the following measures:

- Ensuring that public transport becomes cleaner;
- Reducing traffic growth by improving public transport and encouraging developers to make easy access to public transport in new developments;
- Introduction of Phase 3 of the Low Emission Zone (LEZ) in 2012 to cover PM10 emissions from minibuses and heavier Light Goods Vehicles (LGVs), and a LEZ nitrogen oxides (NOx) standard from 2015;
- Policy 7 on 'Using the planning process to improve air quality' aims to ensure that no new development has a negative impact on air quality in London. It states that the Mayor will use his planning powers to;
- Develop a check list to guide boroughs and developers in the assessment of potential emissions from new developments;
- Minimise increased exposure to existing poor air quality, particularly in AQMAs and where developments are to be used by large numbers of vulnerable people;
- Ensure air quality benefits are realised through planning conditions and Section 106 agreements; and

- A package of non-transport policy measures is also proposed to reduce localised pollution sources.

London Plan

12.2.18 The London Plan (July 2011) provides strategic planning guidance for Greater London. Each Borough's development plans must be in 'general conformity' with it.

12.2.19 The plan includes Policy 7.14 (Improving Air Quality) which states that development proposals should:

"Promote sustainable design and construction to reduce emissions from the demolition and construction of buildings following the best practice guidance in the GLA and London Councils;

Where biomass boilers are included, set out a detailed air quality assessment that should forecast pollutant concentrations. Permission should only be granted if no adverse impacts from biomass are identified; and

Aim to be 'air quality neutral' and not lead to further deterioration of existing poor air quality (such as areas designated as AQMAs)."

And that boroughs and others with relevant responsibilities should have policies that:

"Seek reductions in levels of pollutants referred to in the Government's National Air Quality Strategy having regard to the Mayor's Air Quality Strategy; and

Take account of the findings of the Air Quality Review and Assessments and Action Plans, in particular where AQMAs have been designated."

12.2.20 The mayor will work with strategic partners to ensure the spatial, transport and design policies of the London Plan support his Air Quality Strategy.

Local Policy

12.2.21 The London Borough of Richmond-upon-Thames's Core Strategy was adopted in April 2009. It forms part of the Local Development Framework (LDF). The Core Strategy includes Policy CP1 on Sustainable Development which states:

"The policy seeks to maximise the effective use of resources including land, water and energy, and assist in reducing any long term adverse environmental impacts of development. The following principles will be promoted:-…1.D Reducing environmental impact…Local environmental impacts of development with respect to factors such as noise, air quality and contamination should be minimised.1.E Environmental gain to compensate for any environmental cost of development will be sought."

London Borough of Richmond-upon-Thames Air Quality Action Plan

12.2.22 The London Borough of Richmond-upon-Thames prepared an Air Quality Action Plan in order to improve air quality within its area following declaration of a Borough wide AQMA. The AQAP sets out a range of London wide, Borough wide and local measures. The AQAP includes a range of 'hard' and 'soft' measures such as the promotion of cleaner technologies, awareness raising and improvements to public transport in order to encourage the use of non-private car modes of transport, improving traffic and parking management, and reducing emissions from existing and proposed properties through improved energy efficiency.

12.2.23 The Action Plan includes Action 7; this sets out the Borough's commitment to pursue land use policies which encourage travel choices which reduce emissions. It also aims to ensure that major new developments are accessible to public transport.

12.3 Methodology

Baseline Conditions

12.3.1 Information on existing air quality has been obtained by collating the results of monitoring carried out by The London Borough of Richmond-upon- Thames within 1km of the site. Background concentrations for the site have been defined using the national pollution maps published by Defra. These cover the whole country on a 1x1 km grid[8].

Construction Effects

12.3.2 During demolition and construction the main potential effects are dust annoyance and locally elevated concentrations of PM_{10}. The suspension of particles in the air is dependent on surface characteristics, weather conditions and on-site activities. Impacts have the potential to occur when dust generating activities coincide with dry, windy conditions, and where sensitive receptors are located downwind of the dust source.

12.3.3 Separation distance is also an important factor. Large dust particles (greater than 30µm), responsible for most dust annoyance, will largely deposit within 100m of sources. Intermediate particles (10-30µm) can travel 200-500m. Consequently, significant dust annoyance is usually limited to within a few hundred metres of its source. Smaller particles (less than 10µm) are deposited slowly and may travel up to 1km, however, the impact on the short-term concentrations of PM_{10} occurs over a shorter distance. This is due to the rapid decrease in concentrations with distance from the source due to dispersion.

12.3.4 A Design Manual for Roads and Bridges (DMRB) Scoping Assessment has been carried out to determine whether construction traffic impacts are likely to be significant.

[8] http://laqm.defra.gov.uk/maps/maps2008.html

12.3.5 The GLA (2006) provides guidelines to determine the likely level of risk construction and demolition impacts will have on local dust complaints and PM_{10} concentrations. Sites are categorised into low, medium and high risk (**Table 12.3**) based on the size of the development, and potential for impacts at sensitive receptors, and the appropriate level of mitigation consequently required. By applying the recommended mitigation, the site is reduced to a low risk site.

Table 12.3: Risk criteria for control of dust and emissions from construction

Risk	Criteria
High	Development of over 15,000 square metres. Development of over 150 properties. Potential for emissions and dust to have significant impact on sensitive receptors.
Medium	Development of between 1,000 and 15,000 square metres. Development of between 10 to 150 properties. Potential for emissions and dust to have an intermittent or likely impact on sensitive receptors.
Low	Development of up to 1,000 square metres. Development of one property and up to a maximum of ten. Potential for emissions and dust to have an infrequent impact on sensitive receptors.

12.3.6 The sensitivity of the study area to construction dust impacts is defined based on the examples provided within the IAQM (2012) guidance (**Table 12.4**), taking into account professional judgement.

Table 12.4: Area Sensitivity Definitions

Sensitivity	Health Receptors
Very High	More than 100 dwellings within 20m. PM10 concentrations exceed the daily mean objective. Contamination present. Very sensitive receptors (schools / hospitals). Construction activities in one area for more than one year.
High	10 – 100 dwellings within 20m. PM10 concentrations approach the daily mean objective.
Medium	Less than 10 dwellings within 20m. PM10 concentrations below the daily mean objective.
Low	No dwellings within 20m. PM10 concentrations well below the daily mean objective.

12.3.7 Consideration was also given to wind and rainfall data due to these affecting the potential for dust generation. A wind rose from Heathrow weather station for 2001 - 2010 was used along with average rainfall data (1971-2000) obtained from the Met Office website.

Significance Criteria - Construction

12.3.8 The construction impact significance criteria are based on:

- Guidance on the Assessment of the Impacts of Construction on Air Quality and the Determination of their Significance, IAQM 2012;

- The control of dust and emissions from construction and demolition Best Practice Guidance, GLA 2006;
- Particulate Matter in the United Kingdom, Air Quality Expert Group, 2005; and
- Air Quality (England) Regulations, 2000 and Air Quality (England) (Amendment) Regulations 2002.

12.3.9 The significance criteria take account of the risk of impact and the likely magnitude (taking into account the scale and nature of the works, the proximity of sensitive receptors, and existing conditions in the area) and the sensitivity of the receptors (as defined by the IAQM guidance). The significance criteria also assume that mitigation appropriate to the level of risk (defined in the mitigation section, based on the GLA 2006 guidance) is put into place.

12.3.10 **Table 12.5** presents the significance criteria used to assess the construction impacts.

Table 12.5: Construction Phase Significance Criteria

Sensitivity of Area	Risk of site giving rise to dust effects		
	High	Medium	Low
Without Mitigation			
Very High	Major adverse	Moderate adverse	Moderate Adverse
High	Moderate adverse	Moderate Adverse	Minor Adverse
Medium	Moderate Adverse	Minor Adverse	Not Significant
Low	Minor Adverse	Not Significant	Not Significant
With Mitigation			
Very High	Minor Adverse	Minor Adverse	Not Significant
High	Minor Adverse	Not Significant	Not Significant
Medium	Not Significant	Not Significant	Not Significant
Low	Not Significant	Not Significant	Not Significant

Operational Impacts

Sensitive Locations

12.3.11 Relevant sensitive locations are places where members of the public might be expected to be regularly present over the averaging period of the objectives. For this assessment, this includes proposed residential properties.

12.3.12 Nitrogen dioxide, PM_{10} and $PM_{2.5}$ concentrations were predicted at the façades of worst-case proposed receptors closest to London Road where the impact of existing road traffic emissions will be greatest (**Figure 12.1, Appendix G.1**). Receptors were modelled at 1.5m, representing exposure at the ground floor.

Impact Predictions

12.3.13 Predictions of nitrogen dioxide, PM_{10} and $PM_{2.5}$ concentrations have been carried out assuming that the development is in place in 2011, which provides a worst-case assessment due to the uncertainty regarding future year emission factors. In addition, concentrations have been predicted at the roadside diffusion tube located on London Road, approximately 40m north of the site, in order to verify the modelled results (see **Appendix G.2** for further details on the verification method).

12.3.14 Predictions have been carried out using the ADMS-Roads dispersion model (v3.1.2). The model requires the user to provide various input data, including the Annual Average Daily Traffic (AADT) flow, the proportion of heavy duty vehicles (HDVs), road characteristics (including road width and street canyon height, where applicable), and the vehicle speed. It also requires meteorological data. The model has been run using the most recent full year of meteorological data (2011) from the monitoring station located at Heathrow Airport, which is considered suitable for this area.

12.3.15 Baseline AADT flows, and the proportions of HDVs, were provided by the project Transport Consultants (PBA). Traffic speeds have been estimated from local speed restrictions and take account of the proximity to junction traffic data used in this assessment are summarised in **Table 12.6**. In addition, the development is predicted to generated approximately 266 vehicles per day.

Table 12.6: Summary of Traffic Data Used in the Assessment (AADT)

Road Link	Traffic Flows (proportion of HDVs)
London Road adjacent to site	19,947 (6.0%)
London Road north of Whitton Road	10,231 (7.5%)
Whitton Road (B361)	9,716 (4.4%)

Values in parentheses are proportions of HDVs

12.3.16 A DMRB Air Quality Scoping Assessment has been carried out to determine whether development traffic impacts are likely to be significant; based on the DMRB guidance, vehicle flows must increase by 1,000 movements, as an AADT, in order for the impact to be considered significant.

12.3.17 The development will not be occupied until 2014 at the earliest. In order to take account of uncertainties relating to future year emission factors, emission factors for 2011 have been utilised in the assessment and model verification has been carried out against 2011 monitoring data.

Energy Centre Impacts

12.3.18 Consideration has been given to the contribution currently made by emissions from domestic properties to background nitrogen dioxide concentrations in proximity to the site. Data show that domestic emissions account for less than 8% of the oxides of nitrogen background concentrations, which equates to less than 2µg/m^3 contribution to nitrogen dioxide concentrations from all domestic properties within approximately one kilometre of the site.

12.3.19 Energy efficiency measures are proposed for the properties to reduce heat loss and consequently reduce energy demands, including the use of heat recovery units. A 70kWe CHP plant is proposed for the site, providing space heating to the proposed apartments, along with boilers to 'top up' where required. The proposed houses will have individual boilers, along with photovoltaic panels. Emissions from the proposed CHP will be roughly equivalent to around 6 standard domestic boilers. In addition, the stack will be located on the tallest building, which will reduce any impacts by improving dispersion. Overall, domestic emissions from the site are likely to be significantly smaller than from existing properties in the area, which themselves are minor contributor to local background concentrations. As a result emissions from the proposed energy plant and domestic boilers should contribute a negligible proportion to nitrogen dioxide concentrations in the area.

Railway Line Impacts

12.3.20 Diesel or coal fired stationary locomotives can give rise to elevated levels of sulphur dioxide close to the point of emission. Large numbers of moving diesel locomotives can give rise to high levels of nitrogen dioxide close to the track (Defra, 2009).

12.3.21 Defra guidance (Defra, 2009) outlines an approach to assess the potential for exceedence of the nitrogen dioxide and sulphur dioxide objectives as a result of emissions from diesel and steam locomotives. Outdoor areas within 15m of railway lines where trains may be stationary for 15 minutes or more may result in elevated sulphur dioxide concentrations. Residential properties within 30m of railway lines where there are large numbers of diesel locomotive movements (identified in the Defra guidance), and where backgrounds nitrogen dioxide concentrations are greater than 25µg/m3, may be at risk of elevated nitrogen dioxide concentrations. Only locations which meet these criteria require further assessment.

Odour Impacts

12.3.22 The proposed development includes two restaurants. There is the potential for emissions from the kitchen ventilation systems to cause odour nuisance at existing and proposed properties.

12.3.23 There are a range of appropriate mitigation measures that could be implemented to minimise odour emissions, however, the system that will need to be installed will depend on the end user. An assessment of the risk of impacts will be carried out, and an appropriate extraction and ventilation system will be proposed (based on Defra Guidance Control of Odour and Noise from Commercial Kitchen Exhaust Systems, 2005), to draw grease and odours from the kitchen into a controllable abatement system. It is suggested that the design and installation of an abatement system appropriate to the end user could be addressed through a planning condition to be satisfied once the end user is known, consistent with the LBRuT EIA Scoping Opinion. It is anticipated that with such mitigation that the development should not lead to any significant odour effects.

Significance during Operation

12.3.24 There is no official guidance in the UK on how to assess the significance of air quality impacts of existing sources on a new development. The approach developed by the Institute of Air Quality Management[9], and incorporated in Environmental Protection UK's guidance document on planning and air quality[10], has therefore been used.

12.3.25 This guidance states that the assessment of significance should be based on professional judgement, taking into account the factors set out in **Table 12.7**, with the overall air quality impact on the scheme described as either 'insignificant', 'minor', 'moderate' or 'major'.

Table 12.7: Factors to be taken into Account in Assigning Significance

Factors to be taken into account in assigning significance
Where new exposure is being introduced into an existing area of poor air quality, then the number of people exposed to levels above the objective or limit value will be relevant. Uncertainty, including the extent to which worst-case assumptions have been made. The extent to which an objective or limit value is exceeded e.g. an annual mean NO2 of 41µg/m3 should attract less significance than an annual mean of 51µg/m3.

Consultation

12.3.26 The methodology used in this assessment was agreed with the air quality officer at LB Richmond-upon-Thames[11].

12.4 Baseline Conditions

Local Air Quality Management

12.4.1 LB Richmond-upon-Thames (LBRuT) has investigated air quality within its area as part of its responsibilities under the LAQM regime. Consequently, a whole Borough Air Quality Management Area (AQMA) has been declared for nitrogen dioxide and PM_{10}.

[9] Institute of Air Quality Management, 2009. Position on the Description of Air Quality Impacts and the Assessment of their Significance, November 2009. The IAQM is the professional body for air quality practitioners in the UK.

[10] EPUK, 2010. Development Control: Planning for Air Quality (2010 Update)

[11] Telephone and email correspondence,5th July 2012

Monitoring

12.4.2 In 2011, LBRuT operated three long-term automatic monitoring stations within its area, all monitoring nitrogen dioxide and PM_{10} concentrations; the Teddington AURN[12] site also measures $PM_{2.5}$ concentrations. The Council also deploys nitrogen dioxide diffusion tubes, prepared and analysed by Gradko (50% TEA in acetone), at a number of locations. Data for seven diffusion tubes which lie within 1km of the site are presented in **Table 12.8**. The diffusion tube on London Road, located within 40m of the northern site boundary, is the most representative of the site, and has been used for model verification.

Table 12.8: Measured Concentrations of Nitrogen Dioxide, 2008 - 2011

Site ID	Site	Site Type	Annual mean (µg/m3)				
			2007	2008	2009	2010	2011
13	Whitton Road	K	47	54	50	53	42.0
14	Cross Deep	K	53	53	54	52	38.0
31	A316	R	66	62	60	53	50.0
32	Kings Street	K	109	106	110	102	75.0
33	Heath Road	K	60	65	63	66	47.0
58	London Road	R	-	-	-	-	44.3a
RUT 01	Civic Centre, York Street	R	57	64	62	70	48.0
Objective			40				

Data taken from the LB Richmond-upon-Thames 2011 Progress Report. Data have been bias adjusted by the Council. Exceedences of the objective are highlighted in bold.
[a] Monitoring commenced at this site in April 2011. The value presented is the average of data collected from April 2011 – March 2012 inclusive. A bias adjustment factor of 0.92 has been applied to the data, consistent with the 2011 data.

Table 12.9: Measured PM_{10} and $PM_{2.5}$ Concentrations, 2008 - 2011

Site ID	Site	Year	PM10 Annual Mean (µg/m3)	Number of Days PM10 >50□g/m3	PM2.5 Annual Mean (µg/m3)
R1	Castelnau	2008	21	12	-
		2009	21	4	-
		2010	21	2	-
		2011	22.8	13	-
R2	Wetlands Centre	2008	19	8	-
		2009	20	5	-
		2010	19	1	-
		2011	21.9	12	-
TD0	Teddington AURN	2008	-	-	-
		2009	-	-	13.2
		2010	-	-	14.4
		2011	-	-	17.1
Objectives			40	35	25

Data taken from the 2011 Progress Report, apart from 2011 data - downloaded from the London Air Quality Network website (www.londonair.org.uk); 2011 data contains provisional data.

12.4.3 The measured nitrogen dioxide concentrations exceed the annual mean objective at all diffusion tubes close to the site. Concentrations have remained similar, with a decrease evident in 2011.

[12] Automatic Urban and Rural Network

12.4.4 PM_{10} and $PM_{2.5}$ concentrations have been well below the objectives (and limit values) during the 2008 – 2011 period at all roadside and suburban locations. Concentrations have remained similar over the four year period.

Background Concentrations

12.4.5 In addition to these measured concentrations, estimated background concentrations for the site have been obtained from the national maps (**Table 12.10**). The predicted background concentrations are well below the relevant objectives.

Table 12.10: Estimated Annual Mean Background Concentrations (µg/m^3)

Year	NO_x	NO_2	PM_{10}	$PM_{2.5}$
2011	37.3	24.1	18.7	12.7
Objectives	-	40	40	25

12.5 Potential Effects

Construction Phase

12.5.1 The main potential effects during construction are dust deposition and elevated PM_{10} concentrations. The following activities have the potential to cause emissions of dust:

- Site preparation including delivery of construction material, erection of fences, barriers and scaffolding, removal of existing surfaces and structures;
- Earthworks including digging foundations and landscaping;
- Materials handling such as storage of material in stockpiles and spillage;
- The construction of temporary roads;
- Movement of construction traffic including haulage, vehicles and plant movements;
- Construction and fabrication of infrastructure and buildings; and
- Disposal of waste materials off-site.

12.5.2 Typically the main cause of unmitigated dust generation on construction sites is from demolition and vehicles using unpaved haul roads, and off-site from the suspension of dust from mud deposited on local roads by construction traffic.

12.5.3 The main determinants of unmitigated dust annoyance are the weather and the distance to the nearest receptor. Based on the GLA criteria (**Table 12.3**), the site is classified as high risk. Mitigation measures set out for high risk sites will therefore be required in order to reduce the level of risk to low risk. The study area is considered to be of medium sensitivity (**Table 12.4**), as there are only 4 dwellings (Railway Cottages) within 20m of the site boundary which are upwind of the site for the majority of the time, and background concentrations of PM_{10} are well below the objective. There is also the potential for occupiers of the initial dwellings to be completed to be affected by any outstanding construction works.

12.5.4 The wind rose for Heathrow Airport weather station for 2011 (**Figure 12.2, Appendix G.1**), shows that the dominant wind directions are from the west and south west. Winds from the south west occur for approximately 24% of the time and winds from the west for approximately 21% of the time. Properties close to the site downwind of the dominant winds are most likely to be affected by construction dust impacts.

12.5.5 Wind speeds of moderate strength (3m/s) or greater are required to suspend dust in the air. For approximately 28% of the time the wind speed was less than moderate, below which dust is unlikely to become suspended in the air.

12.5.6 A daily rainfall of 0.2mm is considered sufficient to prevent fugitive dust generation. Analysis of rainfall data for the area around the site shows that, over the 30 year period from 1971 to 2000, an average of 44 - 47% of days were 'wet days' (i.e. within rainfall over 0.2mm) when there will be natural dust suppression.

12.5.7 For the majority of the time there will be little potential for dust generation even with no mitigation in place because:

- On approximately 44 - 47% of days the rainfall is greater than 0.2mm when there will be natural dust suppression to minimise emissions of dust;
- In winter months surfaces tend to stay damp for significant periods of time; and
- 28% of the time winds are typically less than moderate strength and would not suspend dust in the air from stockpile and open surfaces.

12.5.8 There may, however, be periods when sufficient dust is generated and crosses the site boundary to cause annoyance. This is more likely in the summer months, when higher temperatures evaporate surface moisture more readily.

12.5.9 Worst-case predicted PM_{10} concentrations in the area exceed 50µg/m^3 for only three days a year (compared to the permitted 35). As predicted baseline concentrations in the area are low, it is unlikely that the construction activities would cause an exceedence of the objective. Overall, without mitigation in place, the site is considered to potentially give rise to moderate adverse impacts (**Table 12.5**).

12.5.10 During construction, the maximum number of daily HDV movements is 84. Based on the DMRB guidance, HDV flows must increase by 200 movements, as an AADT, in order for the impact to be considered significant. Consequently, construction traffic impacts are considered insignificant.

Operational Phase

Existing Receptors

12.5.11 A DMRB Scoping Assessment has been carried out to determine whether development related traffic impacts are likely to be significant; the proposed development will generate approximately 266 vehicles per day. As set out in Chapter 10 Transport and Access, this is less traffic than the previous sorting office use, although the sorting office has not been in operation for a number of years.

12.5.12 Based on the DMRB guidance, vehicle flows must increase by 1,000 movements, as an AADT, in order for the impact to be considered significant. Consequently, development related traffic impacts are considered insignificant.

Proposed Receptors

12.5.13 The impact of emissions from existing traffic on air quality for residents of the proposed development was predicted for ten receptors, representing worst case residential exposure within the site. Predicted pollutant concentrations are presented in **Table 12.11**.

Table 12.11: Predicted Concentrations for Receptors within the Development

Receptor	NO_2	PM_{10a}		$PM_{2.5}$
	Annual Mean (µg/m3)	Annual Mean (µg/m3)	Number of Days >50µg/m3	Annual Mean (µg/m3)
1	31.7	19.8	3	13.5
2	28.4	19.4	3	13.1
3	27.3	19.2	2	13.0
4	26.5	19.1	2	12.9
5	25.2	18.6	2	12.7
6	25.3	18.6	2	12.7
7	25.5	18.7	2	12.7
8	26.0	18.7	2	12.7
9	26.5	19.1	2	12.9
10	26.0	18.7	2	12.7
Objectives	40	40	35	25b

[a] The numbers of days with PM_{10} concentrations greater than 50µg/m^3 have been estimated from the relationship with the annual mean concentration described in Defra, 2009.
[b] There are no objectives for $PM_{2.5}$ that apply in 2011, however the European Union limit value of 25µg/m^3 is to be met by 2015.

12.5.14 Predicted concentrations of nitrogen dioxide and PM_{10} are below the relevant objectives at all of the proposed receptors. The predicted nitrogen dioxide concentrations are well below 60µg/m^3, and therefore it is unlikely that the hourly mean objective would be exceeded. Air quality within the proposed development is thus considered acceptable for all future residents.

Railway Line Impacts

12.5.15 There are existing properties within 15m of the tracks in proximity to Twickenham station, however, the council has not identified during the Review and Assessment process any locations where diesel or coal fired locomotives will be stationary for 15 minutes or more. Although there are areas of the proposed development site which lie within 15m of the railway lines, there is therefore unlikely to be a risk of elevated sulphur dioxide concentrations within the proposed development site. The line adjacent to the site is not identified in the Defra guidance as having heavy diesel traffic, and background concentrations of nitrogen dioxide do not exceed 25□g/m3; therefore, there is unlikely to be a risk of elevated nitrogen dioxide concentrations as a result of emissions from trains using the tracks adjacent to the site.

Uncertainty

12.5.16 There are many components that contribute to the uncertainty in predicted concentrations. The model used in this assessment is dependent upon the traffic data that have been input which will have inherent uncertainties associated with them. There is then additional uncertainty as the model is required to simplify real-world conditions into a series of algorithms.

12.5.17 A disparity between the road transport emission projections and measured annual mean concentrations of nitrogen oxides and nitrogen dioxide has recently been identified[13]. Whilst projections suggest that both annual mean nitrogen oxides and nitrogen dioxide concentrations were expected to have fallen by around 15-25% over the past 6 to 8 years, at many monitoring sites levels have remained relatively stable, or have even shown a slight increase. This pattern is evident in the monitoring data presented in **Section 12.4.**

12.5.18 Model uncertainty can be reduced through model verification, in which model outputs are compared with measured concentrations. Because the model has been verified and adjusted against 2011 monitoring data, there can be reasonable confidence in the predicted concentrations. In addition, 2011 emission factors have been utilised in order to take account of the uncertainties relating to future year projections.

12.6 Mitigation Measures

Construction

12.6.1 The construction effects can be minimised through use of the recommended mitigation measures outlined below. The mitigation measures will be included within a Construction Environmental Management Plan (CEMP) to be agreed with LBRuT.

[13] Carslaw, D, Beevers, S, Westmoreland, E and Williams, M, 2011. Trends in NOx and NO_2 emissions and ambient measurements in the UK. Available at: http://uk-air.defra.gov.uk/library/reports?report_id=645

12.6.2 Dust control measures will be rigorously applied close to existing dwellings to the north and east of the site, to reduce the risk of dust complaints and public exposure to elevated PM_{10} concentrations. The relevant mitigation measures for high risk sites from the GLA Best Practice Guidance (GLA, 2006) should be implemented:

Site Preparation:

- Erect solid barriers to site boundary;
- No bonfires on site;
- Plan site layout – machinery and dust causing activities should be located away from sensitive receptors;
- All site personnel should be fully trained;
- Trained and responsible manager on site during working times to maintain logbook of routine site inspections;
- Hard surface site haul routes;
- Where possible, use nearby rail or waterways for transportation to/from site; and
- Put in place real-time dust monitors across the site.

Construction traffic:

- All vehicle engines should be switched off when not in use;
- Vehicles should be cleaned and wheels washed before leaving the site;
- All loads entering and leaving the site must be covered;
- There should be no runoff of water or mud from the site;
- On-road vehicles should comply with set emission standards;
- All non-road mobile machinery to use ultra-low sulphur tax exempt diesel where available and be fitted with appropriate exhaust after-treatment from an approved list;
- Minimise movement of construction traffic around the site; and
- Hard surfacing and effective cleaning of haul routes, and appropriate site speed limit.

Demolition works:

- Cutting equipment to use water as suppressant or suitable local extract ventilation;
- Use enclosed chutes and covered skips; and

- Wrap or screen buildings to be demolished with a suitable material.

Site Activities:

- Minimise dust generating activities, using water as a dust suppressant where appropriate;
- Cover, seed or fence stockpiles to prevent wind generating dust;
- Re-vegetate earthworks and exposed areas; and
- Ensure any concrete crusher / batcher has permit to operate.

Operation

12.6.3 Air quality for future residents of the site has been predicted to be acceptable, therefore additional mitigation measures for the operational phase of the development are not necessary.

12.7 Residual Effects

Construction

12.7.1 It is considered that construction dust could affect receptors located downwind of the dominant winds to the east and northeast of the site boundary, or at dwellings that are occupied while the construction is being completed. With mitigation the site is reduced to a low risk category (GLA, 2006), and construction dust is considered to infrequently affect sensitive receptors. Sensitive receptors will only be affected when mitigation measures are not operating effectively; these receptors may also experience short-term elevated PM_{10} concentrations during construction. However, it is unlikely that the 24-hour PM_{10} concentration will be exceeded at these receptors as the existing background PM_{10} concentrations are low.

12.7.2 The residual impact of the construction of the proposed development will be short term, with construction dust infrequently affecting sensitive receptors, and impacts are judged to be not significant.

Operational Phase

12.7.3 The impact of existing road traffic emissions on air quality for future residents has been determined, and is judged to be not significant as predicted pollutant concentrations at worst case locations on the site are below the relevant objectives.

12.7.4 The relative impact of energy centre and domestic emissions from the proposed development will be smaller than emissions from existing residential properties in the surrounding area due to energy efficiency measures proposed for the properties. Considering the contribution of domestic emissions to background concentrations, the impact is judged to be not significant without mitigation.

12.8 Assessment of Cumulative Effects of MOL Footpath Proposals

12.8.1 The provision of the proposed footpath will not introduce new sensitive receptors to poor air quality and will not have a significant effect on local air quality (increased pedestrian connectivity in the area may very marginally reduce private car use but the effect on local air quality would be negligible). There are not expected to be any significant cumulative effects as a result of the proposed development and the footpath proposals.

12.9 Summary

12.9.1 An air quality assessment has been undertaken to identify the effects of the scheme during construction and operation. The site lies within a Borough wide Air Quality Management Area for exceedences of the nitrogen dioxide and fine particulate matter (PM_{10}) objectives.

12.9.2 The development will not lead to a significant increase in traffic on the local roads; however residents will be subject to the impact of road traffic emissions from the adjacent road network, and the impact of these emissions on air quality for future residents has been assessed.

12.9.3 Concentrations of nitrogen dioxide and PM_{10} have been predicted for ten dwellings representing worst case residential receptors within the site. Predicted concentrations of both pollutants are below the air quality objectives. Overall, air quality impacts of the proposed development are considered to be not significant.

12.9.4 The relative impact of energy centre and domestic emissions from the proposed development will be smaller than emissions from existing residential properties in the surrounding area due to energy efficiency measures proposed for the properties. As domestic properties contribute a very small proportion to concentrations in the area, the impact is judged to be not significant.

12.9.5 The cumulative construction and operational impacts of the adjacent Twickenham Station redevelopment have been considered, and cumulative impacts are considered to be not significant.

12.10 References

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13 Ecology & Nature Conservation

13.1 Introduction

13.1.1 This Chapter has been prepared by The Ecology Consultancy. It describes and evaluates the baseline conditions at the Site and the predicted effects of the proposed development and detailed development on habitats, flora, and fauna (sensitive ecological receptors). It gives particular consideration to potential significant effects on protected and notable species, including the impact of introducing access to the woodland in the west of the Site and the impact of residential properties close to the River Crane. Consequent mitigation, compensation and enhancement measures are described as appropriate.

13.1.2 This assessment is based on information provided in the following reports:

- Royal Mail Depot, Twickenham, - Phase 1 Habitat Survey (WSP, 2009), provided in **Appendix H.1**;
- River Park, Royal Mail Site, Twickenham – Bat Assessment (The Ecology Consultancy 2010), provided in **Appendix H.2**;
- River Park, Royal Mail Site, Twickenham – Interim Breeding Bird Survey (The Ecology Consultancy, April 2011), provided in **Appendix H.3**;
- River Park, Royal Mail Site, Twickenham – Badger Report (The Ecology Consultancy, April 2011), provided in **Appendix H4**;
- Former Twickenham Sorting Office, London – Ecology Review (Aspect Ecology, August 2011), provided in **Appendix H.5**;
- Former Royal Mail Site Preliminary Ecological Appraisal (The Ecology Consultancy, 2012), provided in **Appendix H.6**;
- Former Royal Mail Site Bat Surveys (The Ecology Consultancy, 2012). provided in **Appendix H.7**; and
- Former Royal Mail Site Reptile Surveys (The Ecology Consultancy, 2012) provided in **Appendix H.8**.

13.1.3 This chapter should be read with reference to the Phase 1 habitat map (**Figure 13.1** in **Appendix H.6**) and in conjunction with the above technical reports and detailed Legislation & Planning Policy included in **Appendix H.9**.

13.1.4 During the scoping stage it was identified that the habitats within the site were dominated by buildings and hardstanding, with scattered trees around the boundary of the site and scattered scrub and tall ruderal growing through cracks in the hardstanding. Potentially sensitive ecological receptors include the scattered scrub, buildings, scattered trees and ruderal vegetation. The River Crane at St Margarets (Richmond side) Site of Borough Grade II Importance for Nature Conservation (SINC), although outside of the Site, is directly adjacent to the north eastern boundary and, therefore, may be impacted by works within the Site. Similarly, the Twickenham Junction Rough Site of Local Importance for Nature Conservation (SLINC) is located directly adjacent to the Site, along the entire western boundary.

13.2 Legislation and Planning Policy Context

Legislation

13.2.1 The following legislation is of relevance to this impact assessment. Detailed information on relevant legislation is provided in **Appendix H.9**.

13.2.2 The Conservation of Habitats and Species Regulations 2010 (Habitats Regulations) (Ref 13/1) implements the Bern Convention, and the Birds Directive and the Council Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC, the Habitats Directive) in England and Wales (Ref 13/2). These Directives specify the designation and protection of Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) which are together known as Natura 2000 sites. They also provide protection for various fauna termed European Protected Species (EPS). These include all species of bat. In the UK all EPS receive full protection under the Habitats Regulations through their inclusion on Schedule 2.

13.2.3 The Wildlife and Countryside Act (WCA), 1981 (as amended) (Ref 13/3) provides legal protection for Sites of Special Scientific Interest (SSSI) in England and Wales. It also provides varying levels of protection for all wild birds, including those listed on Schedule 1, (Sch1) which receive greater protection whilst breeding, along with animals listed in Schedule 5 of the Act.

13.2.4 The Natural Environment and Rural Communities (NERC) Act 2006 (Ref 13/4) provides the statutory underpinning to the Biodiversity Action Plan (BAP) process and places a duty on all local authorities and government departments to promote the conservation of the priority species and habitats, which are synonymous with those listed in the UK BAP (Ref 13/5).

Planning Policy

13.2.5 Detailed information on planning policy is provided in **Appendix H.9**.

National Planning Policy

13.2.6 The National Planning Policy Framework (NPPF) (Ref 13/6) was published in March 2012. This replaced, amongst other things, Planning Policy Statement 9 (PPS9) (Ref: 13/7). In regard to biodiversity the NPPF, *inter alia*, stresses the importance of minimising impacts on biodiversity and providing net gains in biodiversity where possible.

Regional Planning Policy

13.2.7 The London Plan, Spatial Development Strategy for Greater London (Mayor of London, 2011) (Ref 13/8) includes three policies of particular relevance to nature conservation and the Site:

- Policy 5.3: Sustainable design and construction – Includes the promotion and protection of biodiversity and green infrastructure as a minimum standard for major development proposals.

- Policy 7.19: Biodiversity and access to nature – Development proposals should: a) wherever possible, make a positive contribution to the protection, enhancement, creation and management of biodiversity; b)prioritise assisting in achieving targets in biodiversity action plans (BAPs) and/or improve access to nature in areas deficient in accessible wildlife sites; c) not adversely affect the integrity of European sites, and be resisted where they have significant adverse impact on European or nationally designated sites or on the population or conservation status of a protected species, or a priority species or habitat identified in a UK, London or appropriate regional BAP or borough BAP.

- Policy 7.21: Trees and woodlands – Existing trees of value should be retained and any loss as a result of development should be replaced following the principle of 'right place, right tree'. Wherever appropriate, the planting of additional trees should be included in new developments, particularly large-canopied species.

13.2.8 Connecting with London's Nature: The Mayor's Biodiversity Strategy (Ref 13/9) complements the London Plan. It sets out how London's biodiversity can be protected, managed and enhanced. It also aims to ensure that people can enjoy and learn about the natural world.

Local Planning Policy

13.2.9 The London Borough of Richmond upon Thames (LBRuT) adopted its Core Strategy in 2009. The objective of the Core Policy CP4, Biodiversity, is that '*The Borough's biodiversity including the Sites of Special Scientific Interest (SSSIs) and Other Sites of Nature Importance will be safeguarded and enhanced. Biodiversity enhancements will be encouraged particularly in areas of deficiency (parts of Whitton, Hampton, Teddington, Twickenham and South Kew), in areas of new development and along wildlife corridors and green chains such as The River Thames and River Crane corridors…..'* The Site is within the River Crane corridor.

Biodiversity Action Plans

UK Biodiversity Action Plans (BAP)

13.2.10 Relevant UK Biodiversity Action Plan (BAP) (Ref: 13/11) priority species for the site include house sparrow *Passer domesticus* and bat species. The priority habitat of relevance to this site is rivers and streams (which includes all natural and near-natural running waters within a 10-30 km stretch). However, the River Crane does not qualify under the BAP criteria as it is has been canalised and, therefore, is not considered to be near-natural.

Regional and Local Biodiversity Action Plans

13.2.11 The London Biodiversity Action Plan, published by the London Biodiversity Partnership (Ref: 13/12), identifies 28 priority habitats and species that are of particular importance in London. Eleven Habitat Action Plans (HAPs), four additional 'important habitats' and eight Species Action Plans (SAPs) with five additional 'important species' are listed.

13.2.12 Specific HAPs and SAPs, or other important habitats listed in the London BAP and the Richmond upon Thames BAP, which are of potential relevance to this site include:

- Broad leaved woodland (directly adjacent to the site to the west which will be retained and protected as part of the development);
- Built Structures (includes some of the buildings within the site);
- Rivers and streams (bordering the north of the site but do not meet the BAP criteria as it is not 'natural' or 'near natural');
- Bats (bat(s) may be roosting and foraging within the site);
- House sparrow (potentially suitable nesting habitats within the site); and
- Song thrush (potentially suitable nesting habitats within the site).

Birds of Conservation Concern

13.2.13 The leading UK governmental and non-governmental bird conservation organisations have reviewed the population status of the birds that are regularly found in the UK (Ref: 13/13). A total of 246 species have been placed onto one of three lists – red, amber or green. Six quantitative criteria are used to assess the population status of each species.

13.3 Red list species are those that are Globally Threatened according to International Union for Conservation of Nature (IUCN) criteria; those whose UK population or range has declined rapidly in recent years; and those that have declined historically and not shown a substantial recent recovery. Amber list species are those with an unfavourable conservation status in Europe, whose population or range has declined moderately in recent years; those whose population has declined historically but made a substantial recent recovery; rare breeders; and those with internationally important or localised populations. Green list species occur regularly in the UK but do not qualify under any or the above criteria.

13.4 Methodology

Consultation

13.4.1 An EIA Scoping Opinion Request was submitted to LBRuT in May 2011. LBRuT provided their EIA Scoping Opinion in August 2012. This chapter has been prepared to fulfil the requirements of the Scoping Report and Opinion.

13.4.2 This scoping process established that the following surveys were required to adequately describe the baseline condition of the site:

- Desk study of existing records for sensitive wildlife features;
- Phase 1 Habitat and protected species scoping survey;
- Breeding bird surveys;
- Bat surveys;
- Badger surveys; and
- Reptile surveys.

13.4.3 The results of the badger and reptile surveys, (Ref: 13/14 & 13/15), although undertaken on the neighbouring Twickenham Junction Rough SLINC have been taken into account as the site is directly adjacent and as such works may have an impact on any animals occupying habitats closest to the western boundary.

13.4.4 The receptors described above were considered in regard to the proposed development to establish the likely 'Zone of Influence' of the scheme following the methodology outlined in IEEM's Guidelines for Ecological Impact Assessment (IEEM) (Ref 13/16). This is defined as the geographic scale over which impacts arising from the proposals could affect sensitive receptors. Accordingly, the impacts upon the habitats and species potentially present were limited to the distance over which indirect impacts, such as dust and disturbance from noise and vibration, could occur. Considered together with the high levels of ambient disturbance within London Boroughs, a precautionary zone of influence of 250 m from the site has generally been used, although this was extended to include designated sites.

Cumulative Impacts

13.4.5 The types of cumulative impacts that may result from the proposed development in combination with other developments in the local area include:

- The same type of impact from multiple sources on single receptors causing a synergistic effect e.g. adverse impacts on water quality of the River Crane, caused by runoff, groundwater discharge etc. This type of cumulative impacts is considered in the discussion of impacts below.

- Different types of impacts on single receptors causing a synergistic effect e.g. the effect of increased noise and external lighting causing increased disturbance to foraging bats along The River Crane at St. Margarets. This type of cumulative impact is considered in the discussion of impacts below.

- Considering the effect of the proposed development along with the redevelopment of Twickenham Railway Station. This is considered in **Section 13.7**.

- Considering the effect of the proposed development along with the clearance of vegetation and the construction of a footpath within the MOL to the west of the site. This is considered in **Section 13.8**.Baseline Data Collection

13.4.6 The various methodologies used to determine the ecological baseline are described within the technical reports in **Appendices H.1 – H.8**. In general the baseline was determined through the combination of a desk study and a Preliminary Ecological Assessment (Phase 1 assessment). Where these identified potential for species of particular value (including protected and BAP species) within the Zone of Influence of the proposed development, detailed Phase 2 species surveys were also undertaken. Detailed methodologies for surveys of sensitive receptors scoped into this assessment are summarised below.

Desk Study

13.4.7 Information on designated sites within a 1 km radius was requested from Greenspace Information for Greater London (GIGL) in June 2012. In addition, information on the sites and the species they support was collated from the London Biodiversity Partnership and London BAP websites (Ref: 13/12).

13.4.8 Searches for recent data (less than 20 years old) were also made and records obtained from the following on-line mapping services and organisations:

- www.magic.gov.uk: managed by Natural England on behalf of Defra and involves Communities and Local Government, English Heritage, the Environment Agency and the Forestry Commission); and

- www.natureonthemap.org.uk (Natural England GIS resource).

Preliminary Ecological Appraisal

13.4.9 A Preliminary Ecological Appraisal of the site was carried out on the 2nd June 2011; the details of this survey are included in the relevant technical report in **Appendix H.6**. Habitats were described and mapped following standard Phase 1 survey methodology (Ref: 13/17). This is the most widely used and accepted method of habitat mapping within the UK. The aim of this survey was to map all dominant habitats within the field survey area and identify any habitats that are considered to be potentially ecologically important and/or have some potential to support any ecologically important and/or legally protected floral or faunal species. During the survey the surveyors also included notes on the potential for the presence of priority BAP habitats/species.

13.4.10 Scientific names are given after the first mention of a species, thereafter, common names only are used. Nomenclature follows Stace (Ref 13/18) for vascular plant species.

Bird Surveys

13.4.11 A late season breeding bird survey was conducted over two visits by The Ecology Consultancy on 7th and 28th May 2010. The surveyor recorded all bird species present and any signs of breeding behaviour were noted. Further details of this survey methodology are provided in the technical report in **Appendix H.2**.

Bat Surveys

13.4.12 All buildings within the site were assessed for their potential to support bat roosts by The Ecology Consultancy in March 2010 and again in June 2012. Following these assessments, dusk bat emergence surveys and bat activity surveys were undertaken in June and July 2012.

13.4.13 On both occasions the ecologists covered all visible aspects of buildings where potentially suitable roost features had been identified, to enable any bats emerging at dusk to be recorded.

13.4.14 All survey methods were based on the best practice guidelines published by the Bat Conservation Trust (Ref 13/19a (2007) and 13/19b (2012)). Full details of the survey methodologies are provided in the bat survey technical reports in **Appendix H.2**.

Badger Survey

13.4.15 A badger survey of the adjacent land west of the site was undertaken by The Ecology Consultancy on 4th March 2011. All accessible areas of suitable habitat were examined for evidence of badger activity. Evidence of activity was classified in accordance with the methodology given in the National Badger Survey (Cresswell et al. 1990; Wilson et al., 1997)

Reptile Surveys

13.4.16 In 2010 reptile surveys were undertaken by The Ecology Consultancy in accordance with the guidance in the JNCC Herpetofauna Workers Manual (Gent & Gibson, 2003). Fifteen artificial refugia, in the form of roofing felts, were placed on the adjacent land west of the site. These were checked for basking reptiles over a series of seven site visits between 17th June and 26th July 2010.

13.4.17 Surveys were repeated in 2012 using the same methodology. Twenty refugia were placed across the site, as above, and seven site visits to check them were carried out between 27th June and 26th July.

Limitations

13.1.2 The limitations of the baseline survey methods are discussed in the technical reports in **Appendix H1 – H8**. Despite these limitations, the survey effort is considered adequate to inform this impact assessment.

Assessment of Value

13.4.18 Habitats within the site and potential species assemblages were evaluated with regard to the guidance on ecological impact assessment (EcIA) published by the Institute of Ecology and Environmental Management (IEEM) in 2011 (Ref: 13/16). Each of the identified statutory and non-statutory sites, habitat types and associated species/populations has been attributed a biodiversity value reflecting their geographic significance, examples are provided below:

- International, e.g. biodiversity feature that is designated or warrants designation as an SAC, SPA, or Ramsar site;
- National, e.g. biodiversity feature that is designated or warrants designation as a Site of Special Scientific Interest (SSSI), National Nature Reserve (NNR);
- Regional, e.g. biodiversity feature which is one of the best examples of its type within the South East;
- Metropolitan, e.g. biodiversity feature that is designated or warrants designation as a county wildlife site /Site of Metropolitan Importance for Nature Conservation (SMI);
- Borough, e.g. biodiversity feature that is designated or warrants designation as a Site of Importance for Nature Conservation (SINC) or other feature which is one of the best examples of its type within the Borough;
- Local, e.g. biodiversity feature which is one of the best examples of its type within a local context (i.e. within ~1km of the scheme extent);
- Biodiversity features of value within the Zone of Influence (site plus approximately 250m buffer); and

- Biodiversity features of negligible value.

13.4.19 This evaluation of biodiversity value has been based upon the following factors:

- Presence of sites or features designated for their nature conservation interest. Examples include internationally, nationally or locally designated sites;
- Size of habitat or species population, habitats or species which are rare, species rich assemblages, species which are endemic or on the edge of their range, large populations or concentrations of uncommon or threatened species and/or plant communities that are typical of valued natural/semi-natural vegetation types;
- Secondary and supporting value, for example, habitats or features which provide a buffer to valued features or which serve to link otherwise isolated features;
- Presence of legally protected sites or species; and
- Presence of UK, RSPB Birds of Conservation Concern, and/or Local BAP habitats and species.

13.4.20 Following IEEM guidance it should be noted that international/national legal protection or UK BAP status does not necessarily imply biodiversity status at the equivalent scale. For example, a badger *Meles meles* sett would receive legal protection at a national scale and a native hedgerow would be a UK BAP priority habitat, but neither feature is likely to be of biodiversity value at a national scale.

13.4.21 The ecological interest of the site and the proposed development has also been evaluated in terms of the development plan policies relating to nature conservation.

Assessment of Impacts and Significance Criteria

13.4.22 Impacts related to loss, fragmentation or degradation of habitats, death or disturbance of animals and potential changes in species range have been defined and described taking into account:

- Magnitude - the size of an impact in quantitative terms where possible;
- Extent - the area over which an impact may occur;
- Duration - the time for which an impact is expected to last;
- Reversibility - a permanent impact is one that is irreversible within a reasonable timescale or for which there is no reasonable chance of action being taken to reverse it; a temporary impact is one from which short-term recovery is possible; and
- Timing and frequency - whether impacts are constant ongoing, separated but recurrent or single events and whether they occur during critical seasons or life-stages of habitats and fauna.

13.4.23 Impacts have been defined as significant if they affect the integrity of a site or ecosystem and/or the conservation objectives for habitats or species population within a given geographical area. IEEM 2006 (Ref: 13/16) offers a definition of integrity:

- The integrity of a site is the coherence of its ecological structure and function, across its whole area that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified; and
- For protected sites, a key measure of integrity is the extent to which its conservation objectives are being met.

13.4.24 Outside protected areas it is unlikely that conservation objectives exist. The integrity should therefore be established through consideration of the following features:

- Extent of the habitats present;
- Composition of particular assemblages and the degree to which these fit into more widely used descriptions of biotypes; and
- Assemblages or age class.

13.4.25 Scarcity of assemblages or degree to which they are replaceable. Beyond the boundaries of sites with specific nature conservation designations and clear conservation objectives, in line with approaches taken in UK BAP, it is recommended that the concept of conservation status is used:

- For habitats, conservation status is determined by the sum of the influences acting on the habitat and its typical species, that may affect its long term distribution, structure, and functions as well as the long-term survival of its typical species; and
- For species, the sum of influences acting on the species concerned that may affect the long-term distribution and abundance of its populations.

13.4.26 The level at which impacts upon integrity, conservation objectives or conservation status are important is defined by the geographic scale at which each receptor is valued. For example an impact upon the integrity of a site of value at a national scale would be of significance at a national scale. In some cases an effect on the integrity or conservation status of the receptor may not occur, but more localised impacts may still be significant at smaller geographic scales. Any legal implications are also described along with policy implications appropriate to the scale of the impact.

13.4.27 In accordance with the EcIA Guidelines, each impact is also given a qualitative description of confidence to reflect the likelihood that the impact would occur. This is required for ecological assessment due to the inherent uncertainty over the response of species and habitats to impacts. It is based upon the level of information available for the receptor at the site, the level of impact, and the ecology of the receptor concerned. The confidence ratings applied are:

- Certain/near certain – probability estimated at 95% chance or higher;
- Probable – probability estimated above 50% but below 95%;
- Unlikely – probability estimated above 5% but below 50%; and
- Extremely unlikely – probability estimated at less than 5%.

13.4.28 The significance established using the IEEM criteria has then been equated with the categories below, which are consistent with the generic significance criteria provided in **Table 5.1**:

- **Major Beneficial**: the effect is of a magnitude likely to cause a permanent beneficial effect on the integrity of an international, national and/or metropolitan value ecological receptor;
- **Moderate Beneficial**: the effect is of a magnitude likely to permanently benefit a borough and/or locally valued ecological receptor;
- **Minor Beneficial**: the effect is of a magnitude likely to benefit a borough and/or locally valued ecological receptor, but there will be no permanent effect on its integrity/conservation status;
- **Not Significant**: no significant effects to any receptor, or significant effects to receptors valued only within the zone of influence;
- **Minor Adverse**: the effect is of a magnitude likely to be adverse to a borough and/or locally valued ecological receptor, but there will be no permanent effect on its integrity/conservation status;
- **Moderate Adverse**: the effect is of a magnitude likely to be adverse to a borough and/or locally valued ecological receptor permanently affecting its integrity; and
- **Major Adverse**: the effect is of a magnitude likely to cause a permanent adverse effect on the integrity of an international, national and/or metropolitan value ecological receptor.

13.5 Baseline Conditions

Introduction

13.5.1 This section focuses on the baseline ecological conditions of relevance to the proposed development. The baseline includes the designated sites within a 1 km radius along with other ecological receptors within the zone of influence. Details of the Phase 1 and Phase 2 ecology surveys are included in **Appendices H.1 – H.8**.

Designated Sites

13.5.2 There are three statutory sites within a 1 km radius of the site. The site itself does not receive any statutory conservation designation. Ten non-statutory sites lie within 1 km of the site boundary. The western boundary of the site lies directly adjacent to Twickenham Junction Rough Sites of Site of Local Importance for Nature Conservation (SLINC); and the north eastern boundary is directly adjacent to the River Crane at St Margarets (Richmond side) Site of Borough Grade 2 Importance for Nature Conservation (SINC). These sites are described in **Table 13.1**. The relevant extracts describing the reasons for designation of all other designated sites and an accompanying context plan can be found in the Preliminary Ecological Appraisal technical report in **Appendix H.6**.

13.5.3 Ham Lands Local Nature Reserve (LNR) lies approximately 0.9 km south east of the site. This LNR comprises an area of in filled gravel pits, old water meadows and a belt of woodland and is considered to be of high recreational value.

Table 13.1: Non-statutory Sites within a 1 km Radius of the Site Boundary

Site Name	Reason for Designation	Area (ha)	Distance from Site (m)	Site Context and Evaluation of Feature within Zone of Influence of the Project
Sites of Metropolitan Importance				
The River Thames and Tidal Tributaries	A wildlife corridor running right across London this site comprises several important habitats rare in London such as saltmarsh. It is an important site for many species of birds, fish and plants.	2304.5	700	Outside the zone of influence.
Crane Corridor	An excellent variety of wetland habitats including ponds and lakes. Several uncommon aquatic plants grow at the site including London rarity small pondweed Potamogeton berchtoldii.	178.05	900	Outside the zone of influence.
Ham Lands	Area of scrub and grassland supporting a high diversity of plant life including nationally scarce yellow vetchling Lathyrus aphaca and dittander Lepidium latifolium.	72.27	900	Outside the zone of influence.
Sites of Borough Grade 1 Importance for Nature Conservation				
Duke of Northumberland's River north of Kneller Road	Habitat supporting an outstanding variety of aquatic plants.	0.73	900	Outside the zone of influence.
Sites of Borough Grade II Importance for Nature Conservation				
River Crane at St Margaret's	A site containing running water, scrub, secondary woodland, semi-improved neutral grassland.	5	900	Outside the zone of influence.
Duke of Northumberland's River north of Kneller Road	An area of amenity grassland, running water, scattered trees and scrub supporting Kingfishers and breeding fish population of the declining stone loach.	0.63	750	Outside the zone of influence.
River Crane at St Margarets	A short section of the River Crane just above its tidal limit spanning the	1.18	Directly adjacent	Only a small proportion of the SINC is adjacent to

Site Name	Reason for Designation	Area (ha)	Distance from Site (m)	Site Context and Evaluation of Feature within Zone of Influence of the Project
(Richmond side)	borough boundary between Richmond and Hounslow.		the site along the northern boundary.	the site. This particular section of the SINC is considered to be of low value due to its artificial banks and lack of marginal vegetation along the site boundary. This entire stretch of the river is of Borough value.
Site of Local Importance for Nature Conservation				
Marble Hill Park and Orleans House Gardens	A landscaped park with ecological features dating back to the 1700s including several veteran trees.	29.66	950	Outside the zone of influence.
Twickenham Junction Rough	An island of undisturbed wildlife habitat between two railway lines. The site contains some secondary woodland and fern communities that are scarce to London. The fern communities comprise four species, of which three (wall-rue, maidenhair spleenwort and black spleenwort) are scarce in London and these are all present within the old brick walls that support the railway embankment along the footpath which leads from the footbridge to Lion Road.	4.54	Directly adjacent the site along the western boundary.	Local value, adjacent to the sites western boundary. The gardens of the new properties will abut the site.
Moor Mead Recreation Ground	A small park containing semi-improved neutral grassland and mature trees.	4.99	500	Outside the zone of influence.

Baseline Habitats

13.5.4 In summary, the site comprises a number of buildings, hardstanding, scattered trees and scrub and ruderal vegetation. The River Crane at St Margaret's (Richmond side) SINC runs adjacent the northern boundary of the site and Twickenham Junction Rough SLINC is directly adjacent the western boundary of the site as per the Preliminary Ecological Appraisal in **Appendix H.6**.

13.5.5 The main habitats of integral ecological value and supporting value for protected and/or notable species within the site are shown in **Appendix H.6** and summarised below.

Evaluation of Features of Ecological Value

Buildings

13.5.6 The majority of the buildings considered under the baseline were assessed as having negligible potential to support bats as they lacked roof voids, and roofing was constructed of concrete asbestos which limits the potential of a building to support roosting bats. However, Building 1 had gaps between the brickwork and the fascia boards, and damaged areas of fascia board that could offer space for crevice dwelling bat species. Therefore, Building 1 was assessed as having low potential value for roosting bats, partly due to its close proximity to a water course which provides a foraging resource for bats. However, further bat surveys (**Appendix H.2 and H.7**) found no evidence of roosting bats in this building.

13.5.7 The buildings were also assessed as having negligible potential to support breeding birds.

13.5.8 No records for black redstart were returned from the 2012 data search. The 2009 survey report (**Appendix H.1**) states that there were 'historic records' for black redstart from 2005 approximately 500m south of the site. However, these records were unattributed and no further details provided.

13.5.9 Previous bird surveys of the site in 2010 did not record the species and it is likely that the riparian habitats/brownfields habitats along the River Thames, approximately 500m south of the site, offer more optimal habitats for this specialised species.

13.5.10 Taking this into account in the context of the surrounding landscape, and the potential for these features to be replicated in the proposed development, the ecological value of the buildings within the site is considered to be Negligible**.**

Trees and Scrub

13.5.11 Trees and scrub within the site are mainly on the perimeter, scattered, sparse and isolated from one another. Due to the small extent and lack of structure and variety in terms of age range, these areas have limited intrinsic wildlife value as habitat for breeding and foraging birds and invertebrates. For these reasons the areas of trees and scrub within the Development site are considered to be of value within the Zone of Influence of the project only.

Water Courses

13.5.12 The River Crane at St Margarets (Richmond side) SLINC is directly adjacent the northern boundary of the site. Rivers provide important habitats for a range of flora and fauna and form important wildlife corridors linking areas of semi-natural habitat. However, the section of the River Crane present within the site is highly canalised and this very much reduces its ecological value. Therefore, this section of watercourse is currently considered of no more than moderate ecological value.

13.5.13 Overall, the River Crane and its associated trees are assessed as being of up to Local value. However, the River Crane is likely to be of far greater value outside the zone of influence of this development, as reflected by its designation, in particular upstream (River Crane, SMINC) for its open water and associated pasture, woodland and heathland habitats.

Baseline Fauna

Birds

Desk Study

13.5.14 The data search revealed that eleven bird species, which are notable due to their status or degree of legal protection, have been recorded within the search area. **Table 13.2** below lists the species and the nearest record. Legal protection includes:

Table 13.2: Bird Species Recorded within a 1 km of the Site

Common Name	Scientific Name	Status	Number of Records / Direction from Site
Caspian gull	Larus cachinnans	BAP Priority London	9 SE
Goldeneye	Bucephala clangula	W&CA Act Sch 1 Part 2	2 SE
Herring gull	Larus argentatus	BAP Priority London	3 SE
Kingfisher	Alcedo atthis	Birds Dir Anx 1, W&CA Act Sch 1 Part 1	5 SE, N
Dunnock	Prunella modularis	BAP Priority London	2 SE, S
Song thrush	Turdus philomelos	BAP Priority London	107 N, E, S, W, NE, NW, SE, SW
Redwing	Turdus iliacus	W&CA Act Sch 1 Part 1	1 SE
Starling	Sturnus vulgaris	BAP Priority London	2 W
House sparrow	Passer domesticus	BAP Priority London, BAP Priority National	137 N, E, S, W, NE, NW, SE, SW
Bullfinch	Pyrrhula pyrrhula	BAP Priority London	1 SE

Breeding Bird Survey

13.5.15 In summary, 15 species of bird were recorded potentially breeding on site during the two site visits (**Appendix H.2**). The surveys recorded only species that are on the Green-list on the British Trust for Ornithology (BTO)/Royal Society for the Protection of Birds (RSPB) Birds of Conservation Concern (BoCC) List,) and a small number of Amber-list species (some of the more common species).

13.5.16 The five records of kingfisher in the data search were from upstream and downstream of the site, which indicates that those sections of the River Crane are richer in biodiversity than the section adjacent to the site.

13.5.17 Overall, due to the limited number of bird species recorded within the site during the surveys, the low number of Amber and absence of Red list species, and the common and widespread nature of the species recorded in the data search and surveys, the site's bird assemblage is likely to be of biodiversity value within the Zone of Influence only.

Bats

Desk Study Data

13.5.18 The nearest bat record was an unidentified member of the family *Vespertilionidae* 160m to the west of the survey area. There are numerous records of identified and unidentified bats in this family around the survey area, dating from 1983 to 2008. The records include unidentified *Myotis*, Daubenton's bat *Myotis daubentonii*, Natterer's bat *Myotis nattereri*, noctule bat *Nyctalus noctula*, unidentified pipistrellus bats *Pipistrellus* sp as well as Nathusius's pipistrelle *Pipistrellus nathusii*, common pipistrelle *P. pipistrellus* and soprano pipistrelle *P. pygmaeus.*

Survey Results

13.5.19 The bat assessments carried out in 2010 and 2012 (**Appendices H.2 and H.7**) identified two buildings with the potential to support roosting bats. During the inspections, no evidence of bats was recorded and the two buildings were evaluated as being of low potential due to the small number of suitable roosting features. Two emergence surveys were carried out in 2010 and again in 2012 for those buildings with potential to support roosting bats.

13.5.20 In both surveys no emerging bats and/or active bats were noted within their typical emergence times. The majority of records during the survey were for soprano pipistrelle bats, with occasional common pipistrelle bats also recorded and a single noctule. In both 2010 and 2012 a brown long-eared bat was recorded which is of local significance as this species is uncommon in urbanised areas due to its sensitivity to artificial light.

13.5.21 The low numbers of bats recorded coupled with the results of the data search, indicate that the River Crane is used as a commuting route by a small number of common bat species. The lack of activity within the site, lack of obvious foraging resource and low building suitability for roosts indicates that the site is of Zone of Influence value for bats. Further detail on the habitat structure and suitability of the site is provided in the Preliminary Ecological Appraisal Report and Bat Report, **Appendix H.6** and **Appendix H2 & H.7**.

Summary

13.5.22 **Table 13.3** summarises the sensitive receptors considered in this assessment, the reasons for their ecological value and their legal and policy status.

Table 13.3: Summary of Sensitive Receptors and Biodiversity Value

Receptor/Feature	Ecological Value	Reason for Ecological Value	Legal and Policy Status
Habitats: Trees and scrub	Zone of Influence	Low ecological value but may support breeding birds.	Potential to support legally protected breeding birds.
Water courses - River Crane at St Margarets (Richmond side) SINC directly adjacent the northern boundary	Local	Low integral ecological value but records show it supports kingfisher upstream and downstream. This could be a receptor in a pollution incident downstream of the river.	NPPF Local planning policy UK and/or Local BAP Priority habitats: Rivers and streams, Wasteland and Tidal Thames Potential to support legally protected and UK BAP species: including bats and kingfisher.
Breeding birds	Zone of Influence	The site boundaries are likely to support common nesting and foraging birds.	Partial protection under WCA (breeding only). UK & London BAP species NPPF & NERC Act
Bats	Zone of Influence	A low level of bat activity recorded during the survey and no evidence that buildings support roosting bats. Small numbers of bats were recorded commuting and foraging around the site.	The Conservation of Habitats and Species Regulations 2010. Wildlife & Countryside Act Sch5. UK & London BAP NPPF & NERC Act

Badgers

Desk Study Data

13.5.23 There was one record of badgers within a 1km radius of the site. However, the location of this record is unknown.

Survey Results

13.5.24 No evidence of setts or badger field signs was observed during the badger activity survey carried out on March 4th 2011.

Reptiles

Desk Study Data

13.5.25 There were no records of reptile species within a 1 km radius of the site.

Survey Results

13.5.26 Between 17th June and 26th July 2010 no reptiles were found on site in any of the seven site visits. The same was true for the seven surveys undertaken in 2012 between 27th June and 26th July.

13.6 Potential Effects

13.6.1 As a result of the proposed demolition and construction activities the following potential effects have been identified:

13.6.2 Construction Phase:

- Loss of or disturbance to habitat including buildings trees and scrub;
- Loss of, fragmentation of or disturbance to habitat used by foraging and commuting bats;
- Loss of, degradation of or disturbance to habitats for breeding birds; and
- Release of sediment and pollutants into watercourses.

13.6.3 Operational Phase:

- Planting completed and maturing;
- Disturbance to birds due to an increase level of human activity;
- Additional street lighting and impacts on bats; and
- Release of contaminated surface water run-off into watercourses.

Construction Phase Impacts

Loss of Habitat

13.6.4 The demolition of the buildings poses a negligible impact at the current time, since there are currently no roosting bats or breeding birds using the buildings within the site. These demolition works may therefore proceed with no current constraints regarding these species. These are mobile species groups, however, which could find and utilise these buildings in the future, particularly when buildings are left vacant, are undisturbed and may fall into disrepair. For this reason, bat and bird surveys require updating after a year to ensure that these species are still absent prior to works, or to enable mitigation to be implemented should they be found to be present. If the programme of works is delayed for any reason, then there may be a risk of impact to roosting bats and breeding birds. The degree of confidence in a negligible impact is therefore uncertain owing to the potential for the programme of works to change.

13.6.5 A limited number of trees and scrub around the side boundaries would be felled as part of the development. This would be a minor adverse impact owing to the permanent loss of this habitat. The extent of habitat loss, however, is largely restricted to scrub and the occasional young individual tree of low quality in terms of intrinsic ecological value. The scrub is limited in extent and the adjacent SLINC land provides a much larger area and connectivity with the allotment, River Crane at St Margarets and rail line habitats. The impact arising from this habitat loss would, therefore, be minimal.

13.6.6 The duration of the impact will be temporary as designed-in compensatory planting of replacement trees and scrub would reverse this impact in the medium term, once planting has reached the maturity of the vegetation present. The works, involving the clearance of the vegetation on site, would comprise a one-off event which are understood to have a flexible programme and can therefore be timed to avoid the sensitive periods for some species (such as breeding birds) or subjected to ecological watching brief. Therefore, the impacts of the loss on these habitats would be not significant in the short-term, and the degree of confidence would be certain.

Damage to Retained Trees

13.6.7 Retained trees, which are located along the boundary of the site, may be adversely impacted where construction works cause damage to their branches, stems and/or roots. Damage to trees would be a minor adverse effect, which is considered to be unlikely, since these issues would be addressed by contractors working in accordance with the CEMP.

Impact on Birds

13.6.8 The potential impacts on breeding birds as a result of construction activities include loss of nesting habitat for breeding birds, which would constitute a minor adverse impact. This impact applies only where suitable habitat exists, which is the boundary habitats only. The area of woodland and scrub west of the site would be retained under the development proposals and the small length of the River Crane would not be impacted upon. Therefore, habitat loss/degradation impacts on breeding birds are predicted to be at Zone of Influence only. The duration of the impacts would be temporary as proposed replacement planting of trees and scrub would reverse this impact in the medium term, once planting has reached the maturity of the vegetation present. The clearance of the vegetation on site would comprise a one-off event, which is understood to have a flexible programme and can therefore be timed to avoid the sensitive periods for breeding birds or carried out under ecological watching brief. This can be stated with a confidence level of probable due to spatial and temporal variation in the distribution of birds in the locality. It should be noted that all nesting birds are legally protected irrespective of their biodiversity value, and Schedule 1 birds are subject to a higher level of protection under Schedule 1 of the WCA 1981.

13.6.9 The proposed works has the potential to disturb breeding birds using the habitats on the edge of the site, which would constitute a minor adverse impact. However, the temporary nature of the disturbance upon birds, the relatively small area affected, the limited quality of the available habitat for birds, and the high levels of baseline disturbance, means that impacts on these receptors is very unlikely to affect the survival of important species or populations of birds or the integrity of the edge habitat. These potential impacts are, therefore, predicted to be significant within the Zone of Influence only. This can be stated with a confidence level of probable due to spatial and temporal variation in the distribution of birds in the locality, and assumptions made around bird populations and construction methodologies (construction methods are not finalised).

Impact on Bats

13.6.10 The loss of, or fragmentation of, suitable foraging habitat for bats would be negligible owing to the low records of bat activity found during the bat surveys and due to the availability of surrounding suitable habitat which maintains the connectivity of the habitat within the site to the wider landscape. This not significant impact can be stated with a confidence level of probable due to the mobile nature of the species.

13.6.11 Disturbance on foraging bats may arise from lighting, noise, vibration and dust during the construction phase. Species of bats which typically forage along watercourses are sensitive to lighting and may be deterred from using lit habitats. The River Crane is likely to provide an important commuting and foraging resource for a small number of widespread bat species and so disturbance to this habitat arising from the proposed works would constitute a minor adverse impact. However, the River Crane is outside of the construction zone and is unlikely to be impacted upon directly by the proposed works. All lighting and other disturbance impacts associated with the works would be temporary in nature throughout the period of construction. As such, impacts on foraging bats on site and along the water courses are predicted to be significant within the Zone of Influence only. This can be stated with a confidence level of probable due to the mobile nature of the species and lack of precise data about their response to increased noise levels and lighting.

Impacts on River Crane

13.6.12 The proposed development would involve the movement of material and thus has the potential to result in sediment entering the River Crane at St Margarets (Richmond side). The presence of machinery, fuel storage, and heavy vehicles on site, could also cause pollution of surface water by spillage of oil, petrol or other substances, although small quantities of hydrocarbons would break down relatively quickly within the aquatic environment and is unlikely to have significant down-stream impacts. During construction, the works to remove existing areas of hard surfacing would also expose the underlying soils. In addition, excavation would be required to facilitate construction of the basement and foundations for proposed structures and the installation of underground utilities. These works would increase the potential for surface water infiltration and leaching of potential contaminants from the near-surface soils in those areas of the site where the existing areas of hard standing would be removed, and for runoff from the site (see **Chapter 8**).

13.6.13 In the absence of mitigation, these impacts have the potential to result in minor adverse impacts on the river habitats and the species these support at the Local level only; this can be stated with a confidence level of unlikely due to works being carried out in accordance with the CEMP, which would address these issues, despite inherent uncertainty over the degree of risk of contamination and the area affected by such degradation.

Operational Phase Impacts

13.6.14 Once the site has been fully constructed and is in use, there is the potential for impacts through habitat creation and increased human activity:

Impacts on Breeding Birds

13.6.15 There will be an increased level of human activity, which may cause disturbance to birds around the site boundary. However, many urban bird species are well adapted to human disturbance and the increased levels of activity will be off-set by the increase in the amount of habitat suitable for use by breeding birds (the planting and garden creation throughout the site). These potential minor adverse impacts are therefore predicted to be significant within the Zone of Influence only. This can be stated with a confidence level of probable due to spatial and temporal variation in the distribution of birds in the locality, and assumptions made around bird populations and design.

Impacts on Bats

13.6.16 Obstruction of the River Crane at St Margarets during the operational phase is not considered likely as it is off-site. It is also anticipated that any light spill from buildings would not have an impact on foraging bats along the River Crane as the trees to be retained would act as a barrier to any light spill. Only a limited amount of foraging bats were utilising the site and as all are likely to commute along the River, any minor adverse impact would be at the Zone of Influence on bats during operation, this can be stated with a confidence level of near-certain.

Impacts on River Crane

13.6.17 Surface water run-off from areas of hard surfacing may be contaminated with silts and other potential contaminants. Accidental leaks and spillages, such as hydrocarbons from road vehicles or from specific users associated with commercial activities, may also give rise to the potential for surface water run-off to be contaminated. The proposed development would include the provision of surface water drainage to areas of hard surfacing to collect and discharge the water from the development. The potential for significant contamination from these sources is considered to be low.

13.6.18 There are areas of soft landscaping proposed within the site plan which means that there would be a decrease in the impermeable area as a result of the development. Therefore, it is expected that the volume of run-off would reduce. The change in use of the site, from light industry to mixed-use, will also reduce the risk of pollution and contamination in the local watercourse and sewer network, improving water quality.

13.6.19 The risk of polluted surface water run-off, leaks, spillages and contamination into the watercourse during the operational phase, together with reduced volume of run-off and reduction of industrial waste, overall results in a negligible impact on the River Crane and associated wildlife. The confidence of this assessment is near-certain.

13.7 Mitigation and Enhancement

13.7.1 The section outlines the measures to avoid, reduce or offset the adverse impacts in accordance with best practice guidance and UK environmental impact, planning and sustainability policies. Enhancements go beyond required mitigation, with the aim of enhancing the site for particular species and biodiversity overall.

Construction Phase Mitigation and Enhancement

Buildings

13.7.2 All buildings assessed as supporting low potential for roosting bats would be subject to repeat baseline survey(s) in accordance with best practice guidelines if demolition were to be scheduled after 2014 (Ref: 13/19b). This would minimise the risk of disturbing individual or small numbers of roosting bats that may have moved into the buildings after the 2012 surveys to ensure legal compliance. All demolition works of buildings would be programmed to avoid roosting and breeding seasons to avoid contravening legislation and minimise impacts.

Tree and Scrub Removal

13.7.3 Trees are relatively uncommon in densely developed parts of London and provide an important ecological resource, particularly for urban bird species and as landscape connectivity for bats. Any retained trees or mature scrub that are likely to be impacted from development proposals would be protected in accordance with *BS 5837:2012 Trees in relation to design, demolition and construction.* Where the scope of works requires the removal or cutting of vegetation (including the removal of the climbing plants along boundary walls), this would be carried out outside of the main bird nesting season (normally considered to be March to August inclusive) or under ecological watching brief to avoid any potential offences relating to nesting birds.

Replacement Planting

13.7.4 While planting is commenced in the construction phase, it is completed in the operational phase when plants also become established and mature, so this impact is considered in fully in the operational phase.

Birds

13.7.5 No vegetation clearance should be carried out during the main breeding bird season (March-August inclusive) in order to avoid impacting upon breeding birds. In the event that this is not possible, then a check of the vegetation would be required. This involves an ecologist inspecting the vegetation carefully for nests and observing the area for nesting activity up to 3 days prior to vegetation clearance taking place. Clearance works may then proceed or may need to be carried out under ecological watching brief.

13.7.6 **Chapter 11** Noise and Vibration identifies measures to be adopted to minimise noise and vibration during construction. Such measures will minimise the effect of noise and vibration on birds

Bats

13.7.7 Loss of roosting habitat (in the buildings) may be a future impact if bats move into the buildings on site. If demolition works do not commence before November 2014, an update bat survey would be required to minimise the risk of contravening legislation. Further surveys would be carried out in accordance with current best practice guidance (Ref: 13/19b).

13.7.8 During construction, there would be no night working, which would necessitate the site to be flood lit at night. In the event that night working, and therefore lighting, is required, the peripheral habitats will remain unlit and any lighting within the site will be low-level, directional (pointing away from the River Crane, tree lines and hedgerows) and will be fitted with back guards to prevent light spill into bat foraging habitat.

13.7.9 Chapter 8 Flood Risk and Hydrology and **Chapter 9** Draining and water Quality identify measures to be adopted to minimise impacts of pollution upon water quality. Such measures will minimise impacts to the River Crane SINC and the protected species supported.

Operational Phase Mitigation and Enhancement

Habitat Replacement

13.7.10 The use of plants of known value to wildlife will be included in species lists for the planting beds throughout the site. At least ten wildlife friendly species would be used in designs that create a well-structured scheme that includes trees, shrubs, climbers, herbaceous perennials and bulbs. A list of suitable plants is included in the Preliminary Ecological Appraisal report, **Appendix H.5**. All planting schemes would utilise a high percentage of native tree and shrub species. Suitable native trees and shrubs providing nectar and berries which would be used include hawthorn *Crataegus monogyna*, elder *Sambucus nigra*, and rowan *Sorbus aucuparis*.

13.7.11 Where horticultural stock that requires hard pruning, including pollarding, is used i.e. willow *Salix* spp., dogwood *Cornus* spp., hazel *Corylus* spp. poplar *Populus* spp. etc. small areas of shrubs and trees would be cut on an alternating basis e.g. every 5 years, to ensure that a good proportion of flowering/fruiting growth is present in any given season. Works would be carried out in the late winter when disturbance to wildlife and removal of flowering or fruiting material providing valuable forage will be minimal.

13.7.12 Several areas of the site have vertical surfaces, such as boundary walls that would provide good locations for establishing climbing plants. This would be of particular value along the in the north east of the site, close to the River Crane, where space to create waterside habitat by other means is lacking. The establishment of green walls would contribute to the London Biodiversity Action Plan for Built Structures.

Birds

13.7.13 To mitigate for the loss of trees and scrub, which provide potentially suitable features for some species of nesting birds, bird boxes will be installed within landscaping and on buildings. A combination of box types would be installed throughout the site. Bird boxes would be located out of the reach of predators such cats or competitors including squirrels. This would be at a height of between 1 – 3 m. Open fronted bird boxes such as the 2H model are designed to accommodate birds such as the robin *Erithacus rubecula* and the wren *Troglodytes troglodytes*, and can be placed much closer to the ground - providing that they are sheltered, because these species prefer sites that are hidden from view. An ideal location would be one that allows for access whilst obscuring from view, such as on a fence or building that is covered by a dense bush, shrubs or creeping plant. These species are likely to colonise the new landscaped areas once established.

13.7.14 The bird boxes would most often be placed facing south-east as this allows exposure to the sun in the morning, but provides relief from constant, direct sunlight in the afternoons. This is particularly important in exposed positions. However, shelter, access and predation risk are the predominant considerations when siting a bird nesting box. Two or three boxes would be sited in different directions to provide a range of temperature conditions (from south-south-east to east-south-east). Taking into consideration the territorial range of the target species for which these boxes are designed, they would be placed in no greater density than 1/>15m.

Bats

13.7.15 The above planting scheme for the site will provide suitable foraging habitat for bats to use within the site and connecting to the wider environment.

13.7.16 To mitigate for the possible impacts of light spillage, lighting required for health and safety would be directional and the Lumes and UV components of lights would be kept to a minimum. A dark corridor along the River Crane at St Margarets (Richmond side) will be maintained. The lighting would be designed through consultation with a bat ecologist to minimise impacts. Research has found that bats are sensitive to artificial lighting and that excessive lighting can delay bats from emerging, thus shortening the time available for foraging, as well as causing bats to move away from suitable foraging grounds or roost sites to alternative dark areas (Ref: 13/21). Consequently, lighting proposals for the development would be designed to minimise lighting on the watercourses to enable continued use as a foraging and/or commuting route, and to maximise the value of habitat creation for bats. The accepted Bat Conservation Trust (BCT) guidelines for lighting with regard to minimising impacts on bats are as follows:

- It is recommended that any new lighting proposals for the site seeks to keep lighting to a minimum, and ideally the site is to be kept dark during key periods of bat activity (0 to 1.5 hours after sunset and1.5 hours before sunrise).

- Lighting that is required for security or safety reasons would use a lamp of no greater than 2000 lumes (150 Watts) and would comprise sensor activated low pressure sodium or mercury lamps (Ref: 13/21; 13/19a).

- Lighting would be directed to where it is needed with minimal light spillage into appropriate foraging or roosting habitat. This can be achieved by limiting the height of the lighting and by using as steep a downward angle as possible and/or a shield or hood that directs the light below the horizontal plane (Ref: 13/21; 13/19a).

- Artificial lighting would not directly illuminate any potential bat roosting features or habitats of value to foraging or commuting bats.

13.7.17 The loss of suitable roosting features within the buildings to be demolished under the proposed development would be mitigated for through the provision of alternative roosting sites. A number of bat boxes and roost features would be attached to or incorporated within the new buildings. Boxes such as Schwegler summer bat boxes (e.g. 1FF for larger species, 2FN particularly for noctules bats, 2F for small species of bats such as pipistrelles and 1FS which is a larger capacity general bat box) and winter hibernation boxes (1FW) would be installed on to retained and newly planted mature trees and buildings to provide roosting opportunities. Bat bricks or bat tubes (e.g. Schwegler woodcrete Brick Box Type 27 for bats or 1FR Bat Tubes) would also be built into the exterior of the buildings to provide artificial roost sites for crevice dwelling bat species, such as pipistrelle bats. Warm roost temperatures are important in summer, to pregnant and lactating females and their young. In winter bats need constant cool temperatures for hibernation. Boxes would be located in a position that is sheltered from strong winds and exposed to the sun for part of the day. Two or three boxes would be sited in different directions on the same building to provide a range of temperature conditions (from south east to south west). Bat boxes would be located close to a linear vegetation feature such as the tree line along the northern boundary, or the river. Some bat species use these features for navigation between their roosting site and feeding ground and to avoid flying in open and exposed areas (Ref: 13/19b). The egress/ingress would not be obscured by vegetation or other obstructions; bats will cling to the surface immediately beneath the egress/ingress before accessing the box, so it is important that this area remains clear. Most species would use higher positioned boxes (around 5m high), although long-eared bats may use a box 1.5m above the ground. The box should be placed as high as it is safe to do.

13.7.18 To mitigate for impacts on foraging resources for bats, and to enhance the site for bats overall, enhancement of the site through planting, and the creation of suitable habitat within the proposed site, would be carried out. These enhanced and new habitats, in combination with proposed extensive planting throughout the site, would aim to be of value to invertebrates (providing an additional prey source for bats) and provide green corridors for commuting and flight lines connecting the site to other foraging and roosting resources in the wider environment.

13.7.19 **Chapter 8** Flood Risk and Hydrology and **Chapter 9** Land and Water Quality identify measures to be adopted to minimise impacts of pollution upon water quality. Such measures will minimise impacts to the River Crane SINC and the protected species supported.

13.8 Residual Effects

13.8.1 The residual impacts take the mitigation and enhancements described above into account. They include construction and operation impacts to off-site and on-site receptors. Only those significant beyond the development boundary or those with legal and policy implications are described, although all potential impacts are summarised in the **Table 13.4** None of the residual impacts identified are likely to contravene wildlife legislation or planning policy.

Buildings

13.8.2 Negligible impacts are assumed if demolition works are carried out within 18 months of the latest bat surveys. With the additional detail provided by the incorporation of suitable roosting and nesting sites for a variety of species, careful programming of works, and the creation of green walls, the proposed mitigation and enhancement for the loss of buildings within the development is likely to result in a minor beneficial effect.

Habitats

13.8.3 Those few boundary trees and scrub to be removed would be replaced by trees and gardens in the proposed landscape plan and therefore the residual impact would result in a minor beneficial effect.

Bats

13.8.4 The combined impacts to potential foraging resources along the River Crane at St Margarets (Richmond side), and from lighting and disturbance, before mitigation, would result in likely adverse impacts at the zone of influence scale to a small number of bats. However, following mitigation including minimising lighting and lighting spillage along the River and the creation of suitable foraging and roosting resources within the site, the significance of the residual impacts of the proposed developments are assessed as having a minor beneficial effect for bats.

Cumulative Effects

13.8.5 It is considered unlikely that significant cumulative impacts on ecological receptors would occur as a result of this project in combination with the redevelopment of Twickenham Railway Station.

13.8.6 The schemes that have been included within the cumulative assessment all involve the redevelopment of existing urban sites. From the limited information available, there is no apparent significant loss of wildlife habitat. It has been assumed that there would be no significant gain in wildlife habitat associated with these schemes. Therefore, together with the redevelopment of Twickenham Railway Station, the cumulative effect of these schemes is considered to be not significant.

Summary of Cumulative Effects

13.8.7 **Table 13.4** provides a summary of the residual effects of the proposed development within the site.

Table 13.4: Table Summarising Impacts, Mitigation and Residual Impacts

Receptor/Feature and Value	Effect	Maximum Significance of Effect before Mitigation (IEEM Criteria)	Mitigation and Enhancement	Residual Effect and Significance
Buildings. Zone of Influence	Construction	Zone of Influence	1. Repeat bat surveys (if necessary) 2. Provision of roosting sites. 3. Provision of foraging habitats	Minor Beneficial
	Operation	Negligible		
Habitats. Zone of Influence	Construction	Zone of Influence	1. Replacement planting of native trees throughout the site, and; 2. Creation of residential gardens	Minor Beneficial
	Operation			
Trees. Zone of Influence	Construction	Zone of Influence	1. Retained trees will be protected in line with BS 5837: 2012.	Not significant
	Operation			
Water Courses. Local	Construction	Local	1. Contamination strategy to be agreed with the EA 2. Agreed CoCP followed by contractors 3. Produce and follow a construction method statement 4. Site/task-specific method statements 5. Time noisiest works to occur outside peak periods of bird activity 6. General measures to minimise noise (Chapter 11) 7. No lighting or other obstruction for bats at night along rivers	Not significant
	Operation	Local	1. Lined SuDS techniques will be incorporated, e.g. bio retention areas, permeable pavements and filter drains 2. Appropriate drainage solutions, e.g. trapped gullies, catchpits and petrol interceptors	

Receptor/Feature and Value	Effect	Maximum Significance of Effect before Mitigation (IEEM Criteria)	Mitigation and Enhancement	Residual Effect and Significance
			3. SuDS maintenance 4. Green planting within the site 5. Retention of a dark corridor along the River Crane for bats 6. Minimise light spill from buildings onto the River Crane	
Breeding Birds. Zone of Influence,	Construction	Zone of Influence	1. See measures for buildings and rivers.	Not significant
	Operation	Zone of Influence	1. Suitable foraging and nesting resources in the site, other green infrastructure within The site, and through the installation of suitable nesting boxes and ledges.	
Bats. Zone of Influence	Construction	Zone of Influence	1. See measures for buildings and water courses.	Minor Beneficial
	Operation	Zone of Influence	1. Biodiverse planting within the site, and the creation of green infrastructure within the landscape proposals for the site. 2. Carefully controlled lighting along the River Crane at St Margarets (Richmond side)	

13.9 Assessment of Cumulative Effects of MOL Footpath Proposals

13.9.1 A small part of the western end of the site is designated as MOL, although the majority of this land has been developed and is currently occupied by a car park associated with the former sorting office. The wider MOL extends to the west, between the railway line and the River Crane, and comprises overgrown bushes and trees, to which there is no public access.

13.9.2 The wider MOL will be transferred to the LBRuT for them to provide a footpath and, potentially, open up the area as a park. It is understood that LBRuT is to shortly submit a planning application for the footpath. As a result, this EIA considers the potential cumulative effect of the proposed development and the proposed footpath on ecological receptors. The following impact assessments are based on an assumed route for the new footpath. It is acknowledged that it may be possible to reinstate an existing footpath, in which case impacts are likely to be reduced.

13.9.3 This assessment is based on information provided by LBRuT and available at the time of preparing the ES. Targeted ecological surveys have not been carried out in the wider MOL as the area is not accessible.

Evaluation of Features of Ecological Value

13.9.4 In the absence of any specific plans showing the location of the footpath, it is possible that the wider MOL to be cleared and through which the footpath will be constructed may comprise, include or abut a SLINC. This is the Twickenham Junction Rough which lies directly adjacent to the site, along the western boundary. It represents an area of undisturbed habitat for wildlife and includes secondary woodland and fern communities which are scarce in London.

13.9.5 The evaluation of this receptor would be local, since habitats of note at the regional level, although present, are not extensive.

Construction Phase Impacts

Loss of Habitat

13.9.6 The habitat clearance may include the loss of, or reduction of, secondary woodland which is scarce in London. Overall, this permanent habitat loss would constitute a minor adverse impact. The extent of the habitat clearance is uncertain owing to the limited available information and so is assessed with a confidence level of probable. The clearance of the vegetation would comprise a one-off event which could either be timed to avoid the sensitive periods for some species (such as breeding birds) or be subjected to ecological watching brief.

13.9.7 This assessment assumes that the wall supporting the four species of ferns would be retained and sensitively managed and, therefore, the loss of these species is not included in this assessment.

13.9.8 Any habitat fragmentation within the site as a result of the proposed development, assessed (see Section 3.5, above), has been considered to be buffered by the presence of surrounding connected habitat. Clearance within the MOL/Twickenham Junction Rough SLINC may therefore constitute wider habitat fragmentation from the site to the wider area. This would be a minor adverse impact and is probable owing to the undetermined extent of habitat clearance to be undertaken and the landscaping proposals for the MOL.

13.9.9 The duration of the impact is uncertain as current proposals for the landscaping of the site are undetermined. Where compensatory planting of replacement trees and scrub could be incorporated, this would reverse the impact of habitat loss in the medium term, once planting has reached the maturity of the vegetation present.

13.9.10 In this case, the impacts of the loss on these habitats would be not significant in the short-term, and the degree of confidence would be probable.

Damage to Retained Trees

13.9.11 Any retained trees within the MOL, where these may be located near to the areas of habitat cleared, may be adversely impacted where construction works cause damage to their branches, stems and/or roots. Damage to trees would be a minor adverse effect, which is considered to be unlikely and it is recommended that this be addressed by contractors working in accordance with a Code of Construction Practice (CoCP).

Impact on Birds

13.9.12 The proposed loss of currently undisturbed habitat may involve a loss of nesting habitat for breeding birds. This would constitute a minor adverse impact and is predicted to be at the level of the Zone of Influence only. This can be stated with a confidence level of probable due to spatial and temporal variation in the distribution of birds in the locality.

13.9.13 The duration of the impacts relating to habitat loss or fragmentation is uncertain as current proposals for the landscaping of the site are undetermined. Where compensatory planting of replacement trees and scrub could be incorporated, and where this would provide nesting habitat for birds, this would reverse these impacts in the medium term, once planting has reached the maturity of the vegetation present. On this basis, habitat loss or fragmentation is considered to be not significant impact, with a confidence level of probable.

13.9.14 The proposed works have the potential to disturb breeding birds using any retained habitat within the MOL. The temporary nature of the disturbance upon birds and the relatively small area affected means that impacts on these receptors are unlikely to affect the survival of important species or populations of birds or the integrity of the habitat. These potential minor adverse impacts are, therefore, predicted to be significant within the Zone of Influence only. This can be stated with a confidence level of probable due to spatial and temporal variation in the distribution of birds in the locality, and assumptions made around bird populations and construction methodologies (construction methods are not finalised).

Impact on Bats

13.9.15 The impacts arising from the loss of or fragmentation of suitable foraging habitat for bats within the site are considered to be minimal due to the availability of connected retained habitat, which includes the MOL. The clearance of this habitat may therefore constitute a minor adverse impact with regard to foraging and/or commuting bats. This impact is uncertain owing to the lack of information about the extent of habitat to be cleared, the remaining habitat connectivity and the fact that this area has not been the subject of targeted bat activity surveys.

13.9.16 The duration of the impacts relating to habitat loss or fragmentation is uncertain as current proposals are undetermined. Where compensatory planting of replacement trees and scrub could be incorporated, and where this would maintain any commuting or foraging corridors used by bats, this would reverse these impacts in the medium term, once planting has reached the maturity of the vegetation present. On this basis, habitat loss or fragmentation is considered to be not significant impact, with a confidence level of probable.

13.9.17 Disturbance to foraging bats may arise from lighting, noise, vibration and dust during the vegetation clearance and footpath construction phase may result in a minor adverse impact. However, these impacts would be temporary in nature, covering the period of construction only. As such, impacts on foraging bats are predicted to be significant within the Zone of Influence only. This can be stated with a confidence level of probable due to the mobile nature of the species and lack of precise data about their response to increased noise levels and lighting.

Impacts on River Crane

13.9.18 The vegetation clearance and footpath construction would involve the movement of materials, and thus has the potential to result in sediment entering the River Crane at St Margarets (Richmond side). In the absence of mitigation, these impacts have the potential to result in adverse impacts on the river habitats and the species supported at the Local level only; this can be stated with a confidence level of unlikely due to works being carried out in accordance with a recommended CoCP, which would address these issues, despite inherent uncertainty over the degree of risk of contamination and the extent of the area affected.

Operational Phase Impacts

13.9.19 Once the footpath has been established and is in use, there is the potential for impacts through habitat creation and increased human activity:

Impacts on Habitats

13.9.20 Retained habitat within the wider MOL is likely to be subjected to increased disturbance arising from increased levels of human activity. Such activity may include children playing and dog walking, which may extend disturbance beyond any delineated footpaths. This would constitute a minor adverse impact on habitats present. These impacts may be off-set by landscaping proposals but, as yet, these are undetermined. This assessment can therefore be stated with a confidence level of probable due to assumptions made regarding the extent of habitat clearance and the uncertainties regarding the landscaping proposals.

Impacts on Breeding Birds

13.9.21 The increased level of human activity may cause disturbance to birds in retained or replaced habitat within the wider MOL. However, many urban bird species are well adapted to human disturbance. It is possible that any increased levels of human activity may be off-set by a proposed planting scheme for the wider MOL but, as yet, this is undetermined. These potential minor adverse impacts are therefore predicted to be significant within the Zone of Influence only. This can be stated with a confidence level of probable due to spatial and temporal variation in the distribution of birds in the locality, assumptions made around bird populations and design and the lack of information on the landscaping proposals.

Impacts on Bats

13.9.22 It is not known if the footpath through the wider MOL would be lit and, if so, what the lighting scheme would comprise. No targeted bat surveys could be carried out within the wider MOL to determine how bats use this area, however, only a limited amount of foraging bats were recorded utilising the site adjacent to the wider MOL. It may therefore be conservatively inferred that bat records are unlikely to vary greatly in the adjacent habitat. Impacts arising from lighting within the wider MOL, and where this may spill onto the corridor of the River Crane, are likely to constitute a minor adverse impact on commuting and foraging bats. This impact would be at the Zone of Influence only for bats during the operational phase, with a confidence level of near-certain.

Impacts on River Crane

13.9.23 The habitat clearance and creation of a footpath may result in a slight increase in surface water run-off. This would be off-set against the expected reduction in surface water run-off from the site as a result of the proposed decrease in the impermeable area a result of the development. Therefore, it is anticipated that any difference in run-off would be negligible and the confidence of this assessment is probable, owing to detail regarding the extent habitat clearance and post-works landscaping being as yet undetermined.

Mitigation and Enhancement

13.9.24 The section outlines the measures to avoid, reduce or offset the adverse impacts in accordance with best practice guidance and UK environmental impact, planning and sustainability policies. Enhancements go beyond required mitigation, with the aim of enhancing the site for particular species and biodiversity overall. It is recommended that these measures be considered by LBRuT in relation to the design and implementation of the footpath proposals.

Construction Phase Mitigation and Enhancement

Habitat Removal

13.9.25 Trees are relatively uncommon in densely developed parts of London and provide an important ecological resource, particularly for urban bird species and as landscape connectivity for bats. In the absence of clearly determined clearance and landscaping plans, it is recommended that habitat loss is minimised or that, where possible, trees lost would be replaced by planting native specimens.

13.9.26 It is anticipated that the existing wall supporting the fern colonies would be retained and that, should any repair works or stabilising works be necessary, these should be carried out sensitively to ensure the maintenance of these colonies.

Habitat Protection

13.9.27 Any retained trees or mature scrub that are likely to be impacted from development proposals should be protected in accordance with *BS 5837:2012 Trees in relation to design, demolition and construction.* Where the scope of works requires the removal or cutting of vegetation this should be carried out outside of the main bird nesting season (normally considered to be March to August inclusive) or under ecological watching brief to avoid any potential offences relating to nesting birds.

Birds

13.9.28 No vegetation clearance should be carried out during the main breeding bird season (March-August inclusive) in order to avoid impacting upon breeding birds. In the event that this is not possible, then a check of the vegetation would be required. This involves an ecologist inspecting the vegetation carefully for nests and observing the area for nesting activity up to 3 days prior to vegetation clearance taking place. Clearance works may then proceed or may need to be carried out under ecological watching brief.

Bats

13.9.29 During vegetation clearance and the construction of the footpath, there should be no night working, which would necessitate the site to be flood lit.

Operational Phase Mitigation and Enhancement

Habitat Replacement

13.9.30 It is recommended that where replacement planting schemes would be implemented, that these would be informed by existing baseline data for the SLINC or by targeted surveys, to ensure that schemes are appropriate for the location. It is further recommended that the use of plants of known value to wildlife would be included in planting schemes and that a native tree and shrub species providing nectar and berries would be included, such as hawthorn *Crataegus monogyna*, elder *Sambucus nigra*, and rowan *Sorbus aucuparis*.

13.9.31 In the event that species that require hard pruning, including pollarding, are included (such as willow *Salix* spp., dogwood *Cornus* spp., hazel *Corylus* spp. and poplar *Populus* spp.), it is recommended that small areas of shrubs and trees are cut on an alternating basis (e.g. every 5 years), to ensure that a good proportion of flowering/fruiting growth is present in any given season. On this basis, pruning should be carried out in the late winter when disturbance to wildlife and removal of flowering or fruiting material providing valuable forage would be minimal. The arisings could be used to create habitat piles which could be located in discreet areas in the MOL as further enhancement measures for invertebrates.

13.9.32 SLINCs are designated in part for bringing people into closer contact with nature and, therefore, there is the possibility to enhance this site by adding information boards about habitats and species present, including their biodiversity value and their interest. It is recommended that this is carried out in conjunction with a Habitat Management Plan, which would set out how key species and habitats within the site would be managed to enhance its value for biodiversity.

Birds

13.9.33 To mitigate for the loss of trees and scrub, which provide potentially suitable features for some species of nesting birds, bird boxes could be installed. A combination of box types could be installed throughout the site. Bird boxes would need be located out of the reach of predators such cats or competitors including squirrels. This would be at a height of between 1 – 3 m. Open fronted bird boxes such as the 2H model are designed to accommodate birds such as the robin *Erithacus rubecula* and the wren *Troglodytes troglodytes*, and can be placed much closer to the ground - providing that they are sheltered, because these species prefer sites that are hidden from view. An ideal location would be one that allows for access whilst obscuring from view, such as on a fence or building that is covered by a dense bush, shrubs or creeping plant. These species are likely to colonise the new landscaped areas once established.

13.9.34 The bird boxes should generally be placed facing south-east as this allows exposure to the sun in the morning, but provides relief from constant, direct sunlight in the afternoons. This is particularly important in exposed positions. However shelter, access and predation risk are the predominant considerations when siting a bird nesting box.

Bats

13.9.35 Where planting schemes, such as that described above, can be implemented, this would offer suitable foraging habitat for bats to use, and strengthen habitat connectivity to the wider environment.

13.9.36 To mitigate for the possible impacts of light spillage, lighting required for health and safety should be directional and the Lumes and UV components of lights would be kept to a minimum. A dark corridor along the River Crane at St Margarets (Richmond side) should be maintained. The lighting would be designed through consultation with a bat ecologist to minimise impacts. Research has found that bats are sensitive to artificial lighting and that excessive lighting can delay bats from emerging, thus shortening the time available for foraging, as well as causing bats to move away from suitable foraging grounds or roost sites to alternative dark areas (Ref: 13/21). Consequently, lighting proposals should be designed to minimise lighting on the watercourses to enable continued use as a foraging and/or commuting route, and to maximise the value of habitat creation for bats. The accepted Bat Conservation Trust (BCT) guidelines for lighting with regard to minimising impacts on bats are as follows:

- It is recommended that any new lighting proposals for the site seeks to keep lighting to a minimum, and ideally the site is to be kept dark during key periods of bat activity (0 to 1.5 hours after sunset and1.5 hours before sunrise).

- Lighting that is required for security or safety reasons would use a lamp of no greater than 2000 lumes (150 Watts) and would comprise sensor activated low pressure sodium or mercury lamps (Ref: 13/21; 13/19a).

- Lighting would be directed to where it is needed with minimal light spillage into appropriate foraging or roosting habitat. This can be achieved by limiting the height of the lighting and by using as steep a downward angle as possible and/or a shield or hood that directs the light below the horizontal plane (Ref: 13/21; 13/19a).

- Artificial lighting would not directly illuminate any potential bat roosting features or habitats of value to foraging or commuting bats.

Residual Effects

13.9.37 Residual impacts take mitigation and enhancements into account. They include construction and operation impacts to off-site and on-site receptors.

13.9.38 On the basis that the above assumptions are correct and that the recommended mitigation and enhancement measures are implemented, the residual effects are provided below. Only those which are significant beyond the Zone of Influence or those with legal and policy implications are described.

Habitats

13.9.39 It is assumed that the wall supporting the fern colonies would be retained, that habitat loss would be minimised, and that lost trees would be replanted with appropriate species. It is recommended that any replacement planting schemes are informed by a targeted survey or by existing baseline information for the SLINC. Species-specific mitigation should be informed by ecological surveys. On-going management of the SLINC should being assured through a Habitat Management Plan. Where these measures are implemented, there is the potential for the residual impact to be a minor beneficial effect. This is further enhanced if successful public engagement can be achieved through the installation of information boards.

Bats

13.9.40 The combined impacts to potential foraging resources along the River Crane at St Margarets (Richmond side), and from lighting and disturbance, before mitigation, would result in likely adverse impacts at the Zone of Influence scale to a small number of bats. In the event that the lighting within the SLINC and the lighting spillage along the River Crane can be minimised, and that suitable foraging and roosting resources can be created within the MOL, then the significance of the residual impacts of the proposed developments are likely to be minor beneficial effect for bats.

Cumulative Effects

13.9.41 It is considered unlikely that significant cumulative impacts on ecological receptors would occur.

13.10 Summary

13.10.1 The site consist largely of buildings and hardstanding with scattered trees around the boundary of the site and scattered scrub and tall ruderal growing through cracks in the hardstanding, mainly around the boundary of the site. These habitats are of limited extent and value and as such none of the habitats at the site were of nature conservation significance beyond the extent of the development footprint. The adjacent MOL is a SLINC designated for supporting four fern species within a wall, of which three are scarce to London, and secondary woodland which is also scarce within London.

13.10.2 There are records for protected and notable species with 1 km of the site, including bats and several species of bird of conservation concern. The site has limited potential to support these species. The scattered vegetation will support a restricted diversity and numbers of common breeding birds. Some common Biodiversity Action Plan species, such as dunnock and house sparrow, may breed in very low numbers, which would be of no more than local significance. Buildings were assessed as having negligible to low potential to support roosting bats, and the low numbers of bats recorded indicate that the River Crane is used as a commuting route by a small number of common bat species. The lack of activity within the site, lack of obvious foraging resource and low building suitability for roosts indicates that the site is of only very local value for bats.

13.10.3 The on-site construction effects are the removal of habitats, the potential for killing and injuring birds during site clearance, the removal of nesting and roosting opportunities, and disturbance to birds and bats due to increased noise. The removal of a proportion of vegetation at the site would have an adverse effect, although one of little significance. The commitment to replace that which is removed with vegetation of equal or greater extent and wildlife value will mean that the effect of temporary habitat loss will be reduced to negligible. The replacement of vegetation will ensure that there is no long term loss of bird nesting and foraging opportunities at the site and further compensation would be achieved through the installation of bird boxes. While there is the potential to kill or injure birds during site clearance, this will be avoided though appropriate timing of site clearance and pre-construction surveys and mitigation in order to achieve a negligible effect. It is not considered that site works will have a significantly disturbing effect on birds as any birds present nearby will be habituated to relatively high noise levels in the surrounding, highly urbanised environment. Further, bird populations likely to be present in the immediate vicinity of the site will be of limited conservation significance due to the nature of available habitat.

13.10.4 The potential operational effects on ecology are disturbance to habitats birds and bats from an increase in disturbance from people and vehicles, and from lighting. However, it is not considered that adverse effects will arise. In the case of birds, as noted above, the species present will be tolerant of disturbance and habituated to noise, and effects will be negligible.

It is anticipated that the lighting strategy for the development will result in a decrease in light spillage and effects on bats, therefore, would be minor beneficial.

13.10.5 Overall, the effects on ecology from the development are judged to be not significant, additional benefits would be achieved through the use of species of wildlife value in landscaping and provision of bird boxes. Given the limited severity of temporary effects, these additional measures could result in the overall effect being minor beneficial.

13.11 References

13/1 - HMSO, 2010, Conservation of Habitats and Species Regulations

13/2 - EEC, 1992, Natural Habitats and Wild Fauna and Flora (92/43/EEC, the Habitat Directive)

13/3 - HMSO, 1981, Wildlife and Countryside Act, as amended

13/4 - HMSO, 2006, Natural Environment and Rural Communities Act

13/5 - [Accessed in July 2011] UK Biodiversity Action Plan, http://jncc.defra.gov.uk/default.aspx?page=5155

13/6 - Office of the Deputy Prime Minister, 2005, Planning Policy Statement 9: Biodiversity and Geological Conservation

13/7 - Office of the Deputy Prime Minister, 2005, Biodiversity & geological Conservation: Statutory Obligations & Their Impact Within The Planning System. Government Circular

13/8 - Mayor of London, 2011, London Plan Spatial Development Strategy For Greater London

13/9 - London Biodiversity Partnership, http://www.lbp.org.uk/

13/10 - London Borough of Richmond upon Thames, 2007, Richmond upon Thames Unitary Development Plan

13/11 - UK Biodiversity Partnership, 2007, UK Biodiversity Action Plan

13/12 - London Biodiversity Partnership, 2007, London Biodiversity Action Plan

13/13 - RSPB, 2009, Birds of Conservation Concern

13/14 - The Ecology Consultancy, 2011, Badger Survey

13/15 - The Ecology Consultancy, 2012, Reptile Survey

13/16 - IEEM, 2006, Guidelines for Ecological Impact Assessment in Britain and Ireland.

13/17 - JNCC, 2010, Handbook for Phase 1 habitat survey – a technique for environmental audit

13/18 - Stace, C.A., 2010, New Flora of the British Isles 3rd Edition

13/19a - Bat Conservation Trust, 2007, Bat Surveys-Good Practice Guidelines

13/19b - Hundt, 2012, Bat Surveys-Good Practice Guidelines 2nd Edition

13/20 - Environment Agency, October 2007, Pollution Prevention Guidelines Works and maintenance in or near water: PPG5

13/21 - Jones, J., 2000, Impact of Lighting on Bats

14 Daylight, Sunlight & Overshadowing

14.1 Introduction

14.1.1 This chapter assesses the likely significant effects of the proposed development on daylight, sunlight and overshadowing. In particular it considers the potential effects on levels of daylight and sunlight to windows to habitable rooms in existing adjacent residential properties and on overshadowing to existing adjacent amenity spaces, in line with the policies from London Borough of Richmond upon Thames (LBRuT)'s Development Management Plan and relevant Supplementary Documents (see **Section 14.2**). It also considers the level of overshadowing of the proposed amenity spaces within the proposed development and the daylight levels within the proposed residential units.

14.1.2 This chapter describes relevant planning polices and good practice guidance and highlights the methods used to assess the effects. Baseline conditions in the adjacent residential properties are discussed and potential effects are considered, as well as the cumulative impact of the proposed development and the adjacent consented Twickenham Station scheme (planning application ref. no. 11/1443/FUL).

14.1.3 This chapter has been prepared by Anstey Horne & Co Limited ("Anstey Horne"), daylight and sunlight specialists, and should be read in conjunction to the tabulated results and drawings contained within **Appendix I**:

- **Appendix I.1**: Drawings of the 3D computer model – baseline and proposed conditions;
- **Appendix I.2**: Drawings of the 3D computer model – proposed conditions of the cumulative impact assessment;
- **Appendix I.3**: Results tables and drawings – daylight analysis of the adjacent residential properties for the baseline and proposed conditions;
- **Appendix I.4**: Results tables and drawings – daylight analysis of the adjacent residential properties for the future baseline and proposed conditions for the cumulative impact assessment;
- **Appendix I.5**: Results tables and drawings for the daylight analysis for the proposed residential units;
- **Appendix I.6**: Drawings of the 2 hours sun contour overshadowing analysis – baseline and proposed conditions; and
- **Appendix I.7**: Drawings of the 2 hours sun contour overshadowing analysis – proposed conditions of the cumulative impact assessment.

14.1.4 The sports pitches to the north of the site are lit. Consideration has been given to the potential for such lighting to affect the amenity of future residents of the proposed development. It is not expected that such lighting, which is typical of lighting in urban areas, will have significant amenity effects in relation to resident amenity within the proposed dwellings and gardens. Such effects have not therefore been considered further within the chapter.

14.2 Policy Context

National Planning Policy

14.2.1 There is no national planning policy concerning the effects of development on daylight, sunlight and overshadowing.

Regional Planning Policy

The London Plan - Spatial Development Strategy for Greater London (July 2011)

14.2.2 The Mayor of London's 'The London Plan – Spatial Development Strategy for Greater London (July 2011), Policy 7.7 (Location and design of tall and large buildings) states: *"Tall and large buildings should be part of a plan-led approach to changing or developing an area by the identification of appropriate, sensitive and inappropriate locations. Tall and large buildings should not have an unacceptably harmful impact on their surroundings… Tall buildings: a) Should not affect their surroundings adversely in terms of microclimate, wind turbulence, overshadowing, noise, reflected glare, aviation, navigation and telecommunication interference…b) should not impact on local or strategic views adversely".*

14.2.3 In Policy 7.6 on Architecture of the same document, it states that "buildings and structures should … not cause unacceptable harm to the amenity of surrounding land and buildings, particularly residential buildings, in relation to privacy, overshadowing, wind and microclimate".

Local Planning Policy

14.2.4 The site is located within the LBRuT and its replacement plan for the Unitary Development Plan (UDP) will be the Local Development Framework (LDF). The LDF includes the Development Management Plan (DMP) and Development Plan Documents (DPDs), which build on the Core Strategy adopted in April 2009 and includes more detailed policies for the management of development.

14.2.5 The DMP was adopted on 1st November 2011 and the UDP is now superseded, with the exception of site specific proposals and the policy on waste collection and disposal. A summary of the DMP policies relevant to daylight, sunlight and overshadowing is now set out below.

14.2.6 LBRuT's Policy DM DC 5 (Neighbourliness, Sunlighting and Daylighting) states: "In considering proposals for development the Council will seek to protect adjoining properties from unreasonable loss of privacy, pollution, visual intrusion, noise and disturbance... The Council will generally seek to ensure that the design and layout of buildings enables sufficient sunlight and daylight to penetrate into and between buildings, and that adjoining land or properties are protected from overshadowing in accordance with established standards".

14.2.7 Policy DM DC 5 also states with respect to light that: "… the Council will be guided in general terms by the standards set out in Site Layout, Planning for Sunlight and Daylight, and in Sun on Ground Indicators (BRE 1991); or any standards replacing them, to ensure this."

14.2.8 With respect to private amenity space provided within new development in the form of balconies, LBRuT's Policy DM DC 6 (Balconies and Upper Floor Terraces) remarks that: *"Purpose built, well designed and positioned balconies or terraces are encouraged where new residential units are on upper floors. They should be: sufficiently deep to allow adequate access and circulation around furniture; preferably located next to a dining or living space; preferably receive direct sunlight; designed to provide some shelter and privacy to neighbouring properties, either by using screens or by setting the balcony back within the façade; balustrades designed to screen stored items from view; designed for security and safety"*.

14.2.9 The Council has also produced a series of Supplementary Planning Documents (SPD) providing greater detail on Council policies within the LDF to support decisions on planning applications, including on daylight and sunlight. The Residential Design Standards SPD (adopted March 2010) is pertinent to this proposed development; it gives advice on the impact on neighbours, privacy and overlooking, minimum room sizes, good building layout, provision of gardens, and outdoor play space requirements. In section 3.1 (Neighbourliness – Sunlight and Daylight) of Chapter no.3 within the Residential Design Standards SPD, it states that:

"If no substantial loss of sunlight or daylight to adjoining dwellings and gardens occurs, residential development will generally be acceptable subject to the overall design quality, impact on the character of the area and sustainability of the proposal."

14.2.10 The SPD also states that: "Residential development should create good living conditions and should not cause any significant loss of daylight or sunlight to habitable rooms or gardens in neighbouring properties. In deciding the acceptability of proposals the council will be guided by the Building Research Establishment (BRE) standards. Regard will also be made to the impact on residential amenity and the patterns of use of the rooms and gardens".

Guidance

14.2.11 Detailed guidance on daylight, sunlight and overshadowing is published by the Building Research Establishment (BRE). The daylight and sunlight assessments documented in this chapter have been undertaken in accordance with the methodologies and numerical guidelines recommended in BRE Report 209 *"Site layout planning for daylight and sunlight: A guide to good practice"* (PJ Littlefair, Second Edition, 2011). The BRE document gives guidance on site layout to retain good daylighting and sunlighting in existing surrounding buildings. Whilst the guide is intended for use by designers, consultants and planning officials and gives numerical guidelines, these criteria should not be seen as absolute targets. As the document specifically state: *"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"*. Therefore, while the methods of assessment given are technically robust, the numerical guidelines should be applied flexibly and considered in the round with other town planning principles.

14.2.12 BS8206-2:2008 "Lighting for buildings - Part 2: Code of practice for daylighting" (British Standards Institution, 2008) cites BRE Report 209 as being a source of "guidance regarding the loss of light to existing buildings following construction of a proposed new development".

14.3 Methodology

Scope of the Assessment

14.3.1 This study seeks to determine the effect of the proposed development on the amount of daylight and sunlight to windows and rooms serving habitable space in existing adjacent residential properties and on the level of overshadowing to any existing amenity spaces surrounding the site. The objective has also been to determine the levels of daylight within a representative sample of habitable rooms within the proposed residential units.

14.3.2 A cumulative impact assessment has also been undertaken to determine the effect of the proposed development on the daylight and sunlight to windows and rooms serving habitable space in existing adjacent residential properties and on the level of overshadowing to any existing adjacent amenity spaces. This scenario assumes that the proposed development and the neighbouring consented scheme at Twickenham Station are both built-out.

Extent of the Study Area

14.3.3 The adjacent existing residential properties that have been assessed for daylight and sunlight in this study are nos. 1 to 4 Railway Cottages, Brewery Lane, as stated in the LBRuT's Scoping Opinion dated 22 August 2012. The location of these properties is shown outlined in black on drawings ROL_6593_8_007 to 009 at **Appendix I.1**.

14.3.4 An assessment has also been undertaken of the daylight levels for a representative sample of the proposed habitable rooms within the residential units on the lower ground, ground and second floors of the Apartment Block and also within the eastern most terrace houses (Terrace A/B) of the proposed development. These rooms have been analysed with the adjacent consented Twickenham Railway Station scheme in situ within our 3D computer model.

14.3.5 The existing adjacent amenity spaces that have been assessed for overshadowing are those set out in LBRuT's Scoping Opinion, namely, the adjacent Heatham House sports grounds and River Crane, both to the north of the site. The proposed amenity spaces within the proposed development that have been assessed for overshadowing are the publically accessible piazza north of the Apartment Block, and the private communal amenity space within the internal courtyard of the same Apartment Block. These open spaces are shown outlined in blue on the drawings at **Appendix I.6**.

14.3.6 A cumulative impact assessment has also been undertaken in relation to daylight, sunlight and overshadowing for the existing adjacent residential buildings and amenity spaces, as well as for the amenity space within the proposed development, referenced above.

Method of Data Collection

14.3.7 The impact assessment was undertaken using computer modelling and simulation, the methodology for which is described further below.

14.3.8 The information that was used during compilation of the computer model is as follows:

- Proposed development:
  - John Thompson & Partners (JTP)'s plans, sections and elevations of the proposed scheme received 29 October 2012.
- Existing site and existing surrounding buildings:
  - MK Survey topographical and elevational survey drawings ("16368.dwg");
  - OS map of the site and surrounding areas; and
  - Aerial photography of the site and surrounding area obtained from Microsoft Bing.
- Internal room arrangements within the existing surrounding buildings:
  - Floor plans obtained from estate agents website for no. 3 Railway Cottages, Brewery Lane.
- Neighbouring consented scheme for cumulative impact assessment:
  - JTP's 3D SketchUp computer model ("120515_Twickenham Site 3D.skp") of consented Twickenham Station scheme (planning application 11/1443/FUL).

Site Visit / Other Assessment

14.3.9 A site visit was undertaken on 31st May 2012. The internal arrangements and room uses of nos. 1 to 4 Railway Cottages were researched online. LBRuT's online planning records yielded no floor plans, but a floor plan was obtained from an estate agents website for no. 3 Railway Cottage. Where plans or access were not available, layouts have been estimated based on a visual external inspection from the site and/or public highway. Where internal layouts have had to be estimated, this has no bearing upon the sunlight test of the first daylight test (vertical sky component) because the assessments are made at the centre of the windows, which have been located with measured survey information. It is only relevant to the second daylight test (daylight distribution), but in the absence of suitable plans, estimation is the conventional approach.

Assessment Modelling

14.3.10 Computer simulation was used in order to carry out the impact assessment using the tests recommended in BRE Report 209 (see 'Assessment Methodology' section below). A 3D computer model was built in AutoCAD, which covered: the existing site; the proposed development; the existing adjacent buildings to be assessed; the neighbouring consented scheme for the cumulative assessment; and any other background massing that has a bearing on daylight, sunlight and overshadowing to the identified receptors. The information that was used to compile the 3D computer model is listed in paragraph 14.3.8 above.

14.3.11 Specialist software, which uses the Waldram method of analysis, as described in Appendix B of BRE Report 209, was then used to quantify the level of daylight, sunlight and overshadowing at the receptors in the baseline condition, the proposed development conditions and in the cumulative impact assessment. This allowed the level of effect to be quantified with a high degree of accuracy.

14.3.12 An assessment was undertaken of the effect of the proposed development on daylight and sunlight to the existing adjacent residential properties known as nos. 1 to 4 Railway Cottages, Brewery Lane, and an overshadowing assessment was undertaken of the surrounding amenity of the River Crane and the Heatham House sports grounds. The 3D computer model of the existing condition (buildings shown in green) is illustrated on Anstey Horne drawing nos. ROL6593_3_007 to 009, and the proposed condition (buildings shown in yellow) is illustrated on drawing nos. ROL_6593_08_007 to 009 at **Appendix I.1**. The daylight and sunlight results for the surrounding properties are shown at **Appendix I.3** and the overshadowing results for the surrounding amenity spaces at **Appendix I.6**.

14.3.13 An assessment was undertaken of the daylight within a representative sample of proposed habitable rooms within the residential units on the lower ground, ground and second floors of the Apartment Block and also within the Terrace A/B houses of the proposed development. These rooms have been analysed with the adjacent consented Twickenham Railway Station scheme in situ within the 3D computer model. The daylight results for the proposed residential accommodation are shown at **Appendix I.5**.

14.3.14 A cumulative impact assessment was also undertaken of the combined effect of the proposed development and the neighbouring consented Twickenham Station scheme on daylight and sunlight to nos. 1 to 4 Railway Cottages, and a cumulative overshadowing assessment was undertaken of the surrounding amenity of the River Crane and the Heatham House sports grounds. The 3D computer model of the proposed condition for the cumulative impact assessment is illustrated on Anstey Horne drawing nos. ROL6593_09_007 to 009 at **Appendix I.2**, with the proposed buildings shown in yellow and the consented Twickenham Station scheme shown labelled in blue.

Assessment Methodology

14.3.15 The assessment of likely effects of the proposed development has taken into account the operational phase of the completed scheme. The construction phase is not relevant for the assessment of daylight, sunlight and overshadowing because the full effects will only occur once the proposed development is complete.

14.3.16 The impact assessment was carried out using the tests recommended in BRE Report 209. The tests are described below.

Daylight Tests to Existing Adjacent Dwellings

14.3.17 Section 2.2 of BRE Report 209 makes recommendations concerning the effect of new development on daylight to existing buildings. The BRE guide recommends carrying out two more detailed daylight tests, namely the vertical sky component (VSC) and daylight distribution tests.

14.3.18 The VSC test measures the amount of sky visible at the centre of a window on the external plane of the window wall. It has a maximum value of almost 40% for a completely unobstructed vertical window wall. The test takes no account of the size of the window being tested, the size of the room it lights or the fact that the room may be lit by more than one window. The results can therefore be misleading if considered in isolation and need to be read in conjunction with the results of the second test, namely daylight distribution.

14.3.19 The daylight distribution test calculates the area at working plane level inside a room that will have a direct view of the sky. This is done by plotting the no-sky line, which is the line on the horizontal working plane beyond which no direct light from the sky will reach. This no-sky line is plotted in both the baseline and 'with new development' conditions so that the effect on daylight distribution can be quantified as either a loss or gain in lit area.

14.3.20 One benefit of the daylight distribution test is that the resulting contour plans show where the daylight falls within a room and a judgment may be made as to whether the room will retain light to a reasonable depth.

14.3.21 In respect of dwellings the BRE guide states that daylight in living rooms, dining rooms and kitchens should be assessed. Bedrooms should also be checked, although it states that these are less important. Other rooms such as bathrooms, toilets, storerooms, circulation areas and garages need not be assessed.

Sunlight Tests to Existing Adjacent Dwellings

14.3.22 Section 3.2 of BRE Report 209 makes recommendations concerning the effect of developments on levels of sunlight to existing buildings. The guide suggests *"all main living rooms of dwellings, and conservatories, 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."*

14.3.23 The available sunlight is checked by measuring the percentage of annual probable sunlight hours (APSH) at the centre point of the window on the plane of the outside surface of the wall. Probable sunlight hours is defined as *"the total amount of hours in the year that the sun is expected to shine on unobstructed ground, allowing for average levels of cloudiness for the location in question"*.

Daylight Tests to Proposed Residential Units within the Proposed Development

14.3.24 Section 2.2 of BRE Report 209 makes recommendations concerning daylight within a new development. Daylight provision within new rooms may be checked by calculating the Average Daylight Factor (ADF) inside the room, which is a basis on which BS8206 makes recommendations on interior daylighting. When undertaking the ADF test, the obstruction caused by balconies is taken into account.

14.3.25 In the ADF assessment the following values were taken:

- Diffuse light transmittance for the window glazing – 0.68 (double glazing with low-emissivity coating);
- Average reflectance of the room surfaces – 0.4 for the floor (light veneer wood) and 0.81 (pale cream paint) for the walls and ceiling; and
- Net glazed area – 0.8 for the frame correction factor (metal frames and large panes).

Overshadowing Test

14.3.26 Section 3.3 of BRE Report 209 makes recommendations concerning the effect of new development on sunlight to open spaces situated between buildings, such as main back gardens of houses, allotments, parks and playing fields, children's playgrounds, outdoor swimming pools, sitting-out areas (such as in public squares) and focal points for views (such as a group of monuments or fountains). The guide recommends that the level of overshadowing on such areas should be checked on the equinox (21st March).

14.3.27 The BRE guide notes that sunlight into these open spaces is valuable for a number of reasons, to: “provide attractive sunlit views (all year); make outdoor activities like sitting out and children’s play more pleasant (mainly warmer months); encourage plant growth (mainly spring and summer); dry out the ground, reducing moss and slime (mainly in colder months); melt frost, ice and snow (in winter); dry clothes (all year).”

14.3.28 The BRE guide recognises that each of the above open spaces has different sunlighting requirements and that it is difficult to suggest a hard and fast rule. It recommends that *"at least half of the amenity areas listed above should receive at least two hours of sunlight on 21 March"*.

14.3.29 When assessing the impact of a proposed development on the level of overshadowing of an existing open amenity space, the BRE guide recommends that *"if, as a result of new development the area which can receive two hours of direct sunlight on 21 March is reduced to less than 0.8 times its former size, this further loss of sunlight is significant. The garden or amenity area will tend to look more heavily overshadowed"*.

14.3.30 The BRE method of assessment takes no account of fences or walls less than 1.5 metres high or trees or shrubs. The guide notes that: *"Normally trees and shrubs need not be included, partly because their shapes are almost impossible to predict, and partly the dappled shade of a tree is more pleasant than a deep shadow of a building (this applies to deciduous trees)"*. This is especially the case for deciduous trees because they provide welcome shade in the summer whilst allowing sunlight to penetrate during the winter months.

Application of the Guidance in BRE Report 209

14.3.31 BRE Report 209 is an advisory document and does not constitute a rigid set of rules. In its introduction it is stated:

- *"(Its) main aim is … to help ensure good conditions in the local environment considered broadly, with enough sunlight and daylight on or between buildings for good interior and exterior conditions.*
- *"The guide is intended for building designers and their clients, consultants and planning officials. 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.*
- *Although it gives numerical guidelines, these should be interpreted flexibly since natural lighting is only one of many factors in site layout design."*

14.3.32 In theory the BRE guidance may be applied to any setting, whether that is a city centre, suburban area or rural village. However, the document notes: *"In special circumstances the developer or planning authority may wish to use different target values. For example, in a historic city centre, or 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 buildings."* At page 7 it is stated that: *"numerical values given here are purely advisory. Different criteria may be used on the requirements for daylighting in an area viewed against other site layout constraints"*. Care must therefore be taken in applying the recommendations of BRE Report 209 because rigid application of the numerical guidelines could well give rise to under-utilisation of land.

14.3.33 The BRE guide's principal numerical guideline for impact on surrounding buildings is based on the general premise that a reduction to less than 0.8 times a former value will be noticeable to the occupier.

Significance Criteria

14.3.34 The significance level attributed to each effect has been assessed based on the magnitude of change due to the proposed development, the sensitivity of the affected receptor to change and the value of the resource. Magnitude of change and the sensitivity of the affected receptor/receiving environment are both assessed on a scale of Severe, Major, Moderate, Minor and Not Significant. In the case of daylight, sunlight and overshadowing effects, other factors that are relevant to the assessment of significance are that the effects will permanent, can be determined with certainty and arise as a direct consequence of the proposed development.

14.3.35 BRE Report 209 does not use the same scale of 'Severe', 'Major', 'Moderate', 'Minor' and 'Not Significant' for assessing magnitude of change from the baseline conditions, as is used throughout this ES. Its numerical guidelines are as follows:

BRE Daylight Criteria

14.3.36 When assessing the impact on existing buildings the BRE guide states that the diffuse daylighting will be adversely affected if either:

- The VSC measured at the centre of an existing main window is less than 27%, and less than 0.8 times its former value; or
- The area of the working plane inside a room which can receive direct skylight is reduced to less than 0.8 times its former value.

14.3.37 So, the BRE guidelines operate on the principle that if the amount of daylight is reduced to less than 0.8 times its former value (i.e. if there will be more than a 20% loss) the reduction will be noticeable to the building's occupants. However, the guide also states that *"there is little point in designing tiny gaps in the roof lines of a new development in order to safeguard no-sky lines in existing buildings"*.

14.3.38 When assessing daylight provision in new buildings, BS8206 and BRE Report 209 recommend the following minimum ADF values in dwellings:

- 1% for bedrooms;
- 1.5% for living rooms; and
- 2% for kitchens.

14.3.39 Where a room serves more than one purpose, the minimum ADF should be that for the room type with the highest value. For example, in a space which combines a living room and a kitchen the minimum recommended ADF is 2%.

BRE Sunlight Criteria

14.3.40 The BRE guide advises that for windows facing within 90° of due south, "if this window point can receive more than 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". The guide further advises that: "If the available sunlight hours are both less than the amount above and less than 0.8 times their former value, either over the whole year or just during the winter months (21st September to 21st March), then the occupants of the existing building will notice the loss of sunlight; if the overall loss is greater than 4% of APSH, the room may appear colder and less cheerful and pleasant."

14.3.41 So, again, the guidelines operate on the principle that a reduction in sunlight to less than 0.8 times the former value (i.e. a loss of more than 20%) will be noticeable to the building's occupants unless the 25% annual and 5% winter values referred to above will be retained.

14.3.42 It has been acknowledged by the author of the guidelines that the first edition (1991) tended to overplay small losses of sunlight in cases where the existing window either received very little sunlight year round or in the winter months. Hence under the second edition (2011), a third numerical criterion has now been added, so that for sunlight to be considered to be adversely affected the reduction in sunlight should now also be greater than 4% APSH.

BRE Overshadowing Criteria

14.3.43 The BRE guidelines state: "It is recommended that for it to appear adequately sunlit throughout the year, at least half of a garden or amenity area should receive at least two hours of sunlight on the 21st March. If as a result of new development an existing garden or amenity area does not meet the above, and the area which can receive 2 hours of sun on the 21st March is less than 0.8 times its former value, then the loss of sunlight is likely to be noticeable."

Criteria used in this ES

14.3.44 In short, the BRE guide works on the general principle that a reduction in daylight or sunlight to an existing receptor to less than 0.8 times its former value will be noticeable, unless the quantity retained will be above a certain level, or, for sunlight, the absolute loss is 4% APSH or less, at which point the magnitude of change becomes irrelevant. Beyond those numerical guidelines it is left to professional judgement to assess the significance of the magnitude of change.

14.3.45 In order for this chapter to be consistent with other chapters in the ES, it has been necessary to define a scale of 'Severe', 'Major', 'Moderate', 'Minor' or 'Not significant' change according to certain deviations from the baseline conditions. The starting point has been to take the BRE numerical guidelines for daylight and overshadowing and then extrapolate them further, as shown in **Tables 14.1** and **14.2**.

Table 14.1: Scale for Magnitude of Change in Daylight to Existing Dwellings

Magnitude	Vertical Sky Component Test	Daylight Distribution Test
Severe	Proposed VSC <27% and <0.2 times former value	Proposed daylit area is <0.2 times former value
Major	Proposed VSC <27% and between <0.2-0.39 times former value	Proposed daylit area is between <0.2-0.39 times former value
Moderate	Proposed VSC <27% and between <0.4-0.59 times former value	Proposed daylit area is between <0.4-0.59 times former value
Minor	Proposed VSC <27% and between <0.6-0.79 times former value	Proposed daylit area is between <0.6-0.79 times former value
Not Significant	Proposed VSC ≥ 27% OR Proposed VSC <27% and ≥0.8 times former value	Proposed daylit area is ≥0.8 times former value

14.3.46 When considering the sensitivity of the receptors BRE Report 209 offers helpful guidance. As explained above the BRE guidance considers living rooms, dining rooms and kitchens to be more important than bedrooms. It also states that *"windows to bathrooms, toilets, storerooms, circulation areas and garages need not be analysed"*. Consequently, for the purposes of this assessment, living rooms, dining rooms and kitchens have been attributed high sensitivity, bedrooms low sensitivity and bathrooms, toilets, store rooms and circulation areas negligible sensitivity.

Table 14.2: Scale for Magnitude of Change in Overshadowing to Existing Adjacent Amenity Space

Magnitude	BRE Area-Based 2-Hour Sun Contour on 21 March Test
Severe	Proportion of existing amenity space in 2 hours or more of sun: <50% AND <0.2 times former value
Major	Proportion of existing amenity space in 2 hours or more of sun: <50% AND between <0.2-0.39 times former value
Moderate	Proportion of existing amenity space in 2 hours or more of sun: <50% AND between <0.4-0.59 times former value
Minor	Proportion of existing amenity space in 2 hours or more of sun: <50% AND between <0.6-0.79 times former value
Not Significant	Proportion of existing amenity space in 2 hours or more of sun: EITHER ≥ 50% OR ≥0.8 times former value

14.3.47 As explained above, BRE Report 209 notes that sunlight is of value to an amenity space for a number of reasons, which depend, to a greater or lesser degree, on the nature of the amenity space. However the guidance offers no distinction between the sensitivity of one type of amenity space relative to another. For the purposes of this assessment, therefore, the River Crane (due to its ecological designation – see Chapter 16, Ecology & Nature Conservation), the existing sports grounds of Heatham House and proposed amenity spaces are considered to have a medium sensitivity. The sensitivity of each of the receptors assessed in this chapter of the ES is summarised in **Table 14.3** below.

Table 14.3: Sensitivity of Receptors

Sensitivity	Receptor
Negligible	Bathrooms, toilets, store rooms, circulation areas
Low	Bedrooms,
Medium	River Crane, sports grounds, proposed amenity spaces
High	Living rooms, dining rooms and kitchens

14.4 Baseline Conditions

14.4.1 The baseline daylight, sunlight and overshadowing conditions at and around the site have been quantified and are described below. The individual receptors and their various sensitivities are also discussed.

Daylight to Existing Adjacent Residential Dwellings

14.4.2 The existing levels of available daylight received by the existing adjacent residential properties (nos. 1 to 4 Railway Cottages) have been quantified using the VSC test at their windows and daylight distribution test on the working plane inside their rooms, all as previously described.

14.4.3 Detailed results of the baseline daylight conditions are set out on the tables and drawings attached at **Appendix I.3**:

- Table I.3-P1 – vertical sky component (VSC) results;
- Table I.3-P2 – daylight distribution (DD) results; and
- Anstey Horne drawing nos. ROL_6593_8_101 – daylight distribution contour plans.

14.4.4 Out of 16 windows tested, 7 (44%) receive more than the BRE guideline of 27% VSC in the baseline condition.

14.4.5 Out of 14 habitable rooms tested, 8 (57%) receive daylight over at least 80% of the area of the working plane.

14.4.6 These baseline results show that the local levels of obstruction are moderate, with about half receiving daylight levels in excess of the suggested BRE numerical target values.

Sunlight to Existing Adjacent Residential Buildings

14.4.7 In accordance with BRE recommendations, nos. 1 to 4 Railway Cottages have not been tested because there are no windows, which face towards the site, within 90 degrees of due south. As a result no significant sunlight effect should occur as a result of the proposed development.

Overshadowing to Existing Adjacent Amenity Spaces

14.4.8 The existing receptors assessed are the sports grounds to Heatham House and the River Crane. These are identified on Anstey Horne drawing no ROL_6593_8_301 at **Appendix I.6**.

14.4.9 The areas within the amenity spaces that receive 2 hours of sun or more on 21 March in the baseline condition (labelled "EXISTING" on the aforementioned drawing) is shown shaded in yellow. The River Crane has been divided into smaller sections to give a more accurate picture of the levels of overshadowing on the key areas in closest proximity to the development. The two sports grounds of Heatham House nearest to the proposed development have been assessed separately by the same logic.

14.4.10 The results of the assessment for the River Crane show that the areas tested will receive 2 hours direct sunlight to between 72.9% and 87.5% in the baseline condition and therefore meet the BRE guideline of 50%. The results for the sports grounds to Heatham House show that both amenity areas tested will receive direct sunlight for 2 hours or more on 21st March to 100% of their total areas and therefore meet the guidelines.

Future Baseline

14.4.11 If no development was to take place on the site or any of the surrounding properties then the baseline conditions would remain as they are now. However, it is inevitable that some developments will take place in this area, at some point in the future, and the high levels of daylight and limited levels of overshadowing at the identified receptors would change as other developments are built in the surrounding area. In the case of the adjacent consented Twickenham Station scheme, this will generally have a limited effect to the light levels currently enjoyed by the existing surrounding receptors, as identified later in this Chapter.

14.5 Assessment of Effects

Daylight to Existing Adjacent Residential Buildings

14.5.1 Detailed results of the daylight conditions in the existing surrounding buildings with the proposed development in place are set out on the tables and drawings attached at **Appendix I.3**.

14.5.2 Out of 16 windows tested within the residential accommodation at 1 to 4 Railway Cottages, Brewery Lane, 6 (38%) will receive more than the BRE 27% VSC guideline in the proposed condition.

14.5.3 Out of 14 habitable rooms tested, 7 (50%) will receive daylight over at least 80% of the area of the working plane in the proposed condition.

14.5.4 By comparing these figures with those for the baseline condition it is evident that the proposed development will result in a very small reduction in the number of windows that will achieve the absolute target of 27% VSC, from 7 to 6. Similarly, there will be a very small change in the number of rooms that will achieve the absolute target of 80% daylight area, from 8 to 7.

14.5.5 Looking at absolute values in this way can be helpful, but it is usually more informative to look at the magnitude of change at each of the receptors.

14.5.6 The detailed VSC results are set out in Table I.3-P1 at **Appendix I.3**, which show the values in the baseline and proposed conditions and the factor of former value. Looking at the magnitude of change to VSC, all (100%) 16 of the windows tested will meet the BRE 0.80 times former value VSC guideline in the proposed condition. In fact, there will actually be small improvements in VSC to 6 windows within these properties. This is because the terraced houses within the proposed development opposite are orientated in such a way as to allow more sky light to the windows concerned, in contrast to the uniform obstruction posed by the existing buildings.

14.5.7 The detailed results for effects on daylight distribution are set out in Table P2 and on Anstey Horne drawing no's. ROL_6593_8_101, which are attached at **Appendix I.3**. Looking at the magnitude of change to daylight distribution, 13 out of 14 rooms tested (93%) meet the BRE 0.80 times former value guideline for daylight distribution. The one remaining room, within no. 4 Railway Cottages, will retain 0.79 times its former value. This is fractionally below the 0.80 times guideline and is understood to be a bedroom, which the BRE guide recognises as being less important than living rooms. In addition, it is worth noting that this bedroom relates to a property which receives increases in VSC to three windows serving main living rooms.

14.5.8 In overall terms, the magnitude of change in daylight to the surrounding residential buildings is predicted to be not significant. The sensitivity of the existing receptor that fractionally falls outside the guidelines for daylight distribution is low. Therefore, the effect on daylight to the adjacent residential properties is considered to be not significant.

Sunlight to Existing Adjacent Residential Buildings

14.5.9 In accordance with BRE recommendations, nos. 1 to 4 Railway Cottages have not been tested because there are no windows, which face towards the development site, within 90 degrees of due south. There should not be a significant effect.

Overshadowing to Existing Adjacent Amenity Spaces

14.5.10 The results of the BRE area-based 2 hours sun contour overshadowing analysis on 21st March for the River Crane and the sports grounds of Heatham House are shown on Anstey Horne drawing no. ROL_6593_8_301 at **Appendix I.6**.

14.5.11 The areas within the amenity spaces that receive 2 hours of sun or more on 21st March in the proposed condition (labelled "PROPOSED") is shown in yellow on the aforementioned drawing.

14.5.12 The results of the assessment for the River Crane show that the areas tested will receive 2 hours of direct sunlight to between 73% and 85.8% in the proposed condition and therefore meet the BRE guideline of 50%. The results for the sports grounds to Heatham House show that both amenity areas tested will receive direct sunlight for 2 hours or more to 100% of their total areas and therefore meet the guidelines.

14.5.13 The proposed development will result in a magnitude of change in overshadowing to the River Crane and the Heatham House sports grounds that is predicted to be not significant. Therefore, the effect on overshadowing to the existing surrounding amenity spaces is considered to be not significant.

Overshadowing to Amenity Space within the Proposed Development

14.5.14 The results of the BRE area-based 2 hours sun contour overshadowing analysis on 21 March for the amenity space within the proposed development are shown on Anstey Horne drawing no. ROL_6593_8_302 at **Appendix I.6**.

14.5.15 The proposed amenity spaces within the proposed development have been split into two key areas; the piazza to the north of the Apartment Block, and the private communal amenity space within the internal courtyard of the Apartment Block.

14.5.16 The percentage of the piazza amenity space that will receive direct sunlight for 2 hours or more, shown in yellow on the drawing, will be 57.5% and therefore meets the BRE guideline of 50%. The internal courtyard will receive direct sunlight for 2 hours or more to 8% of its area, which is below the guideline. However, the proposed courtyard is a focal point rather than a sitting-out area (each apartment will have a private balcony) and it links directly to the well sunlit public piazza.

14.5.17 Appendix I of the BRE guide notes that the provision of public open space with good sunlight can be classified as a beneficial impact. The proposed development is therefore considered to result in a minor beneficial effect on overshadowing to amenity spaces within the proposed development.

Daylight within the Proposed Residential Units within the Site

14.5.18 In line with LBRuT's Scoping Opinion, an assessment has been undertaken of the daylight levels within the proposed residential units. This has been undertaken on the basis of a representative selection of habitable rooms within the development, including living rooms, living/dining rooms, living/kitchen/dining rooms and bedrooms for daylight.

14.5.19 The assessment covers a total sample of 52 habitable rooms, spread evenly throughout the key areas of the proposed development. 36 habitable rooms have been assessed within the Apartment Block, located in the northeast corner of the site, covering the lower ground, ground and second floors. It should be borne in mind that this puts an emphasis on less well-lit rooms, because not as many rooms on the upper floors, where the light conditions will obviously be better, have been assessed. A representative sample of 16 habitable rooms within the easternmost terrace houses (Terrace A/B) have been assessed, due to the larger obstruction presented to these buildings by the adjacent Apartment Block to the east.

14.5.20 The assessment has considered the potential cumulative effect resulting from the consented Twickenham Station scheme and the proposed development being built-out.

14.5.21 Detailed results are set out on the tables and drawings attached at **Appendix I.5** in:

- Table I.5-P3 – average daylight factor (ADF) results; and
- Anstey Horne drawing nos. ROL_6593_9_901 to 905 – ADF plans.

14.5.22 Taking the rooms tested within the proposed Apartment Block, the analysis shows that 29 (81%) of the 36 rooms tested will achieve an ADF that is generally well in excess of the BRE minimum recommendation for the room type. Indeed, well over half of all rooms tested will enjoy ADF values which are at least 50% better than the target values suggested, with some rooms enjoying over double the guideline amounts. Of the 7 remaining rooms, 2 are only just below the ADF levels suggested for their use, and all are served by windows where the access to daylight is necessarily limited by projecting balconies to the flats above. With any new development of this nature, it would be considered highly desirable to provide private amenity spaces such as balconies, as evidenced in LBRuT's Policy DM DC 6 which encourages the provision of private amenity space on upper levels of new developments. There is consequently a trade-off with regard to the light received by the rooms below.

14.5.23 For the rooms tested within the proposed Terrace A/B houses, the analysis shows that all (100%) of the 16 rooms tested will achieve an ADF that is well in excess of the BRE minimum recommendation for the room type. In fact, most of the rooms tested will enjoy daylight levels that are at least 50% above the target values recommended.

14.5.24 Across the development as a whole, our sample therefore shows that 45 (87%) of a total 52 rooms will achieve the ADF numerical values suggested for their room use.

14.5.25 It is therefore considered that there should not be any significant effects in relation to daylight within the proposed residential units within the development.

Cumulative Impact Assessment

14.5.26 As per LBRuT's Scoping Opinion, this ES has considered the potential cumulative impacts in terms of the effect to daylight and sunlight of any other reasonably foreseeable neighbouring developments within the vicinity of the site, together with the proposed development.

14.5.27 This has entailed assessing the cumulative effect with the consented Twickenham Station scheme. Any other developments in the local area are either too far away, or not visible from, the receptors such that there will be no discernible effect on daylight, sunlight or overshadowing, over and above the effects that will be caused by the proposed development.

14.5.28 For this exercise, the Twickenham Station scheme was built into the 3D computer model so that the cumulative impact of the proposed development with the consented Twickenham Station scheme could be assessed.

14.5.29 The cumulative impact assessment considers daylight to 1 to 4 Railway Cottages, overshadowing to the existing adjacent amenity space of the River Crane and the Heatham House sports grounds, and overshadowing to the amenity space within the proposed development.

Daylight to Existing Adjacent Residential Buildings

14.5.30 Detailed results of the daylight conditions in the existing surrounding buildings for the cumulative impact assessment are set out on the tables and drawings attached at **Appendix I.4**.

14.5.31 The detailed VSC results in Table I.4-P1 – Cumulative at **Appendix I.4** show the values in the baseline and cumulative conditions and the factor of former value. Looking at the magnitude of change to VSC, 16 out of 16 (100%) of windows tested will meet the BRE 0.80 times former value VSC guideline in the cumulative condition.

14.5.32 The detailed results for effects on daylight distribution are set out in Table I.4-P2 – Cumulative and on Anstey Horne drawing no's. ROL_6693_9_101, which are attached at **Appendix I.4**. Looking at the magnitude of change to daylight distribution, 13 out of 14 rooms tested (93%) will meet the BRE 0.80 times former value guideline for daylight distribution. The one remaining room will retain 0.79 times its former value. This is fractionally below the 0.80 times guideline and likely relates to a bedroom, which the BRE recognise as being less important than living rooms.

14.5.33 By comparing these figures with those for the proposed condition, it is evident that the cumulative impact of the proposed development and the consented Twickenham Station scheme will have no additional effect on the number of windows and rooms that will meet the BRE guidelines. There will also be no discernible additional effect on the levels of daylight retained and therefore the cumulative effect is considered to be not significant.

Overshadowing to Existing Adjacent Amenity Spaces

14.5.34 The results of the BRE area-based 2 hours sun contour overshadowing analysis on 21st March for the cumulative impact assessment for the River Crane and the sports grounds of Heatham House are shown on Anstey Horne drawing no. ROL_6593_9_301 at **Appendix I.7**.

14.5.35 The areas within the amenity spaces that receive 2 hours of sun or more on 21st March in the proposed condition (labelled "PROPOSED") is shown in yellow on the aforementioned drawing.

14.5.36 The results of the assessment for the River Crane show that the areas tested will receive direct sunlight to between 60.8% and 85.8% in the cumulative scenario, and will therefore meet the BRE guideline of 50%. The results for the sports grounds to Heatham House show that both amenity areas tested will continue to receive direct sunlight for 2 hours or more to 100% of their total areas and therefore meet the guidelines.

14.5.37 By comparing these figures with those for the proposed condition, it is evident that the cumulative impact of the proposed development and the consented Twickenham Station scheme will have no effect on the number of amenity spaces that meet the BRE guidelines. There will also be very little effect on the levels of retained sunlight for 2 hours or more on 21st March and therefore the cumulative effect is considered to be not significant.

Overshadowing to Amenity Space within the Proposed Development

14.5.38 The results of the BRE area-based 2 hours sun contour overshadowing analysis on 21st March for the amenity space within the proposed development in the cumulative scenario are shown on Anstey Horne drawing no. ROL_6593_5_302 at **Appendix I.7**.

14.5.39 The percentage of the piazza that will receive direct sunlight for 2 hours or more, shown in yellow, will be 48.6% and therefore will be just below the BRE guideline of 50%. The internal courtyard will receive direct sunlight for 2 hours or more to 8%.

14.5.40 By comparing these figures with those for the proposed condition, it is evident that the cumulative impact of the proposed development and the consented Twickenham Station scheme will have a small effect on the number of amenity spaces that meet the BRE guidelines. Nevertheless, the piazza amenity space will still enjoy very close to the guideline of 50% of its area in 2 hours sunlight. Therefore the cumulative effects is still considered to be minor beneficial.

14.6 Mitigation Measures

14.6.1 The proposed development has been designed with a certain amount of mitigation 'built in' so as to lessen the daylight and sunlight effects on the surrounding existing environment. For example, the terrace houses have been positioned in a series of well-spaced linear blocks on a north-south axis, so as to allow light between the buildings and consequently minimise the effect on daylight to the residential properties of 1 to 4 Railway Cottages opposite. As no adverse effects have been identified no further mitigation is necessary.

14.7 Assessment of Cumulative Effects of MOL Footpath Proposals

14.7.1 The creation of a new footpath link through the wider MOL will provide public access to the wider MOL. The proposed development at the western end of the site is limited to houses, while rear gardens will also separate these houses from the wider MOL. It is therefore considered that the proposed development should not have any significant effects in relation to daylight/sunlight/over shadowing on this future footpath link across the wider MOL.

14.8 Summary

14.8.1 The site is principally occupied by low level buildings. Consequently, the existing adjacent residential properties at 1 to 4 Railway Cottages, Brewery Lane, generally receive good levels of daylight in the baseline condition. The existing adjacent amenity spaces (sports grounds associated with Heatham House and the River Crane) receive either minor or, in the case of the Heatham House sports grounds, no overshadowing from the existing buildings at the site in the baseline condition. The main sources of overshadowing on the River Crane are its banks and the surrounding boundary walls.

14.8.2 In virtually all cases the relevant Building Research Establishment (BRE) guidelines, *Site layout planning for daylight and sunlight: A guide to good practice (2011),* for effect on daylight to existing adjacent properties will be satisfied and there will be a number of gains in light. A sunlight assessment has not been necessary because the windows, which face the site, are not within 90º of due south. Overall the proposed development will not have a significant effect on daylight and sunlight to existing adjacent residential buildings.

14.8.3 The effect on overshadowing of the existing adjacent amenity spaces will not be significant as the areas assessed will all satisfy the relevant BRE guidelines.

14.8.4 The provision of the piazza amenity space within the proposed development will be well sunlit and therefore provide a minor beneficial effect.

14.8.5 The daylight levels within the proposed residential accommodation will meet the recommended levels in the BRE guidelines for the vast majority of the representative sample of rooms tested. This offers good levels of daylight for an urban scheme that incorporates important private amenity spaces (i.e. balconies).

14.8.6 Mitigation measures cannot be employed to reduce or compensate for the effects on daylight, sunlight and overshadowing, so the residual effects remain the same as the pre-mitigation effects identified above. However, where possible, mitigation has been integrated into the scheme design to minimise the effects, for example, through careful positioning and spacing of the proposed buildings.

14.9 References

Building Research Establishment, *Site layout planning for daylight and sunlight: A guide to good practice,* 2011

Mayor of London, The London Plan: *Spatial Development Strategy for Greater London*, July 2011

London Borough of Richmond upon Thames, *Core Strategy*, April 2011

London Borough of Richmond upon Thames, *Twickenham Station and Surroundings Design Standards: Supplementary Planning Document (SPD)*, October 2010

London Borough of Richmond upon Thames, *Development Management Plan*, November 2011

15 Built Heritage

15.1 Introduction

15.1.1 This chapter assesses the impact of the proposed development on built heritage in the vicinity of the site; there is no significant built heritage on the site itself. The chapter has been prepared by Jeffery W. George and Associates

15.1.2 Several site visits have been made, principally on 24th May, 19th June and 5th July 2012 when a meeting was held with the London Borough of Richmond upon Thames (LBRuT) planning officer for the site and surrounding area.

15.2 Policy Context

15.2.1 With the replacement in March 2012 of PPS5, the primary consideration in this assessment is now to satisfy the requirements required or implied by the provisions of the NPPF (National Planning Policy Framework). This assessment of built heritage is intended to be a Statement of Significance in relation to the designated and non-designated heritage assets adjacent to the site.

15.2.2 In addition to meeting the detailed guidance in the NPPF, regard has been paid to the relevant heritage/ conservation policies in the LBRuT's Core Strategy in so far as they deal with matters concerning impact on heritage assets caused by new development.

15.2.3 With regard to the NPPF, particular regard has been paid to Section 12, *"Conserving and enhancing the historic environment*," specifically paragraphs 128, 132, 134 and 135. A number of designated and non-designated heritage assets will be affected to some degree by new development on this site and the following definitions have been used from Annex 2: Glossary of the NPPF as a basis for identifying nearby buildings in this assessment:

- Designated heritage asset:
  - A World Heritage Site, Scheduled Monument, Listed Building, Protected Wreck Site, Registered Park and Garden, Registered Battlefield or Conservation Area designated under the relevant legislation.
- Heritage asset:
  - A building, monument, site, place, area or landscape identified as having a degree of significance meriting consideration in planning decisions, because of its heritage interest. Heritage asset includes designated heritage assets and assets identified by the local planning authority (including local listing).
- Historic Environment:

- All aspects of the environment resulting from the interaction between people and places through time, including all surviving physical remains of past human activity, whether visible, buried or submerged, and landscaped and planted or managed flora.

- Setting of a Heritage asset:

  - The surroundings in which a heritage asset is experienced. Its extent is not fixed and may change as the asset and its surroundings evolve. Elements of a setting may make a positive or negative contribution to the significance of an asset, may affect the ability to appreciate that significance or may be neutral.

- Significance (for heritage policy):

  - The value of a heritage asset to this and future generations because of its heritage interest. That interest may be archaeological, architectural, artistic or historic. Significance derives not only from a heritage asset's physical presence, but also from its setting.

15.3 Methodology

Assessment Methodology

15.3.1 The assessment criteria used in determining the importance of the designated and non-designated heritage assets affected by the proposed development follow these recommended by English Heritage. These are as follows:

- Period;
- Rarity;
- Documentation;
- Group value;
- Survival and/ or condition;
- Fragility and/or vulnerability;
- Diversity; and
- Potential.

Significance Criteria

15.3.2 Identification of impacts- impacts on the heritage assets may consist of:

- Direct primary impacts resulting in destruction of standing buildings or buried archaeological remains;

- Direct secondary impacts resulting in destruction; and
- Direct impacts upon setting reducing the appreciation of the resource e.g. by noise, visual intrusion, dust. These impacts may be attributable to construction and later operation of the proposed development.

15.3.3 Indirect impacts may arise from how the proposals facilitate, encourage or inhibit other developments or changes to the environment not within the control of the developer. Indirect effects may include:

- Indirect impacts by disconnection involving removing a monument, building or site from its original context;
- Indirect impacts through the loss of an amenity, (e.g. historic buildings or scheduled monuments open to the public); and
- Noise pollution resulting in the fitting of double glazing to buildings.

15.3.4 Construction impacts include all those impacts which will result in permanent impacts from construction. Construction works may involve direct primary impacts, including:

- Demolition and clearance works;
- Evacuation works (e.g. For structures/ services, cuttings, footings, planting and drainage works); and
- Disturbance of buried archaeological remains by piling.

15.3.5 There may also be secondary direct impacts, such as vibration damage to historic buildings and other structures by piling.

Consultation

15.3.6 In assessing the impact on above ground heritage assets, a baseline assessment was undertaken to identify the location of Statutorily Listed Historic Buildings, and other features of built heritage, to establish the visual role the existing site plays in their setting, and also to establish the visual role that the existing site plays in the setting of, and views into and out of, the Queens Road Conservation Area (no. 47).

15.3.7 The Statutory Lists of Buildings of Special Architectural and Historic Interest, relevant maps and plans and other documents were considered in order to identify those elements of the built environment that are of heritage asset importance in surrounding streets and spaces.

15.3.8 A combination of desk-top study and fieldwork has identified the visual role of the existing site in the baseline analysis. The current importance of the site in the setting of above ground heritage assets depends on both proximity and context, and to evaluate how the setting of these assets will change as a result of development, a combination of photographs, visual impact views as set out on drawings, and visualisations and plans of the proposed development have been used.

Significance Criteria

15.3.9 In order to evaluate the significance of impacts on above ground heritage assets, two tables have been prepared based on the relative impacts of views from heritage assets towards the site. These 'Impact on Key Views' tables have been prepared to take account of the existing situation before new development, and after its completion with significance judged in accordance with the generic significance criteria provided in **Table 5.1**.

15.4 Baseline Conditions

Site Description

15.4.1 The site lies almost opposite Twickenham Railway Station, within the local authority area of the LBRuT. It is bounded:

- To the south by the main railway line from London Waterloo to Richmond, Staines, Windsor and Ascot, and by Brewery Lane between the site and the railway line;
- To the east by London Road (designated A310);
- To the west by the wider MOL to which there is no public access; and
- To the north by the River Crane, some recreation land between the river and the site, and on the north bank of the river by residential development in Craneford Close, and also Heatham House and its grounds.

Statutorily Listed Buildings Adjacent to the Site:

15.4.2 There is one Statutorily Listed Building, Heatham House, located to the north of the site in Whitton Road (designated B361). It is listed Grade 2 and was first listed on 2nd September 1952. Whilst being a designated heritage asset, the house, walls, entrance gates and piers do not form part of an Asset Grouping, as defined by English Heritage.

15.4.3 The full English Heritage (EH) Schedule is as follows:

"Mid 18th century. Brown brick. Hipped tiled roof to parapet. Two storeys over a basement. 8 bays wide, with a full height 3- window splayed bay to left. To right of the bay, a pilastered doorcase, running through to include the first floor window as a feature, with moulded stucco surround, pediment and balustrading. Brick band below parapet. Some windows altered. Walls, iron gates and overthrow, and brick piers of the carriage entrances (with urns) are included in the listing. Garden front has curved double staircase to ground floor entrance, over central arch. Interior not seen".

15.4.4 The building, with various modern outbuildings in the ground is used by LBRuT for community (children's services) purposes and, from a limited inspection, the interior seems to have been considerably altered and adapted for its present use. The house faces north-east, away from the site and the only views of the site would be of the eastern end from the side elevation of Heatham House. However, there are no windows at all on the side elevation (just blank recesses) and a number of large outbuildings and trees within the grounds block any views meaning that there is no visual connection in the summer months. It is suspected that in the winter months without foliage there would be glimpses of the site between the outbuildings, and vice- versa from the site to the windowless side elevation of Heatham House.

Other Buildings of Heritage Interest

15.4.5 Numbers. 2, 4, and 6 Whitton Road are sited opposite the entrance to Heatham House and have an oblique view southwards of the very front boundary of the site on London Road. They are late Victorian in date, with ground floor shops, three storeys in height, built of yellow stock brick with red brick dressings and shaped "Flemish" style gables. They are unlisted, not in a Conservation Area, but they have a local authority designation of "Buildings of Townscape Merit". This is understood to be the equivalent of local listing in LBRuT's evaluation, so the buildings rank as a non-designated Heritage Asset.

15.4.6 Nos. 2- 6 Whittton Road continues as a terrace to the north with a modern infill building and a pair of houses with "Flemish" gables in rather neglected condition. These buildings have no visual connection with the site.

15.4.7 To the south- east nos. 2- 6 Whitton Road continue as a terrace numbered 111-117 London Road. Probably of Edwardian date, the three storey red brick buildings have ground floor shops. They have no local designation so are not heritage assets. However, they are of minor heritage interest as a group and looking southwards along London Road, they have oblique views of the frontage of the site.

15.4.8 No. 2 Cole Park Road is a very pretty "Arts and Crafts" cottage on the corner of Cole Park Road and London Road. The cottage faces north- east, away from the site, but the rear first floor dormer windows look across the River Crane (the cottage backs onto the river) and London Road to the front of the site. The house has the local designation "Building of Townscape Merit," so is to be regarded as a non- designated heritage asset within this context.

15.4.9 Nos. 1- 4 Railway Cottages, Brewery Lane, are situated immediately to the south of the site, separated only by the narrow lane. Arranged as two pairs of cottages and built of London stock brick with steep pitched slate roofs, they seem to be little altered from the latter part of the 19th century, when it is understood that they were built as part of a fairly large railway development with sidings. Each cottage is two- storeyed and faces directly north over the middle of the site. Whilst they have some undeniable heritage interest, they have no local planning designation. However, they do have an English Heritage designation of having "Archaeological Priority."

15.4.10 These cottages are the only structures near the site where the impact of new development may be significant and possibly adverse to their amenities. This is discussed in the following section.

15.4.11 The final group of buildings affected to some degree by the new development lie further to the south on the other side of the railway line. They comprise 'The Albany' public house, numbered 1 Queens Road, and the adjacent row of houses nos. 1- 8 Station Road. 'The Albany' is a much enlarged late Victorian pub that faces east looking over Station Yard towards the railway station. The side elevation faces north towards the site. Behind the pub, nos. 1- 8 Station Road are four pairs of late Victorian town houses that face directly over the railway towards the site. Most of the houses have been somewhat altered and divided into flats. 'The Albany' and all the houses have the local designation 'Buildings of Townscape Merit.' Moreover, they are all located within the designated Queens Road Conservation Area (no. 47). Thus, as a whole they constitute a designated heritage asset. The Conservation Area is centred upon Queens Road to the south, and consists mainly of large late Victorian houses similar in date to nos. 1- 8 Station Road. None of these houses has any visual link with the site LBRuT has published a planning guidance note for the Queens Road Conservation Area but it contains no specific references or policies relevant to the buildings discussed above.

15.5 Assessment of Effects

15.5.1 In assessing the existing and potential impact of the new development on key views, it is considered significant that by any evaluation the buildings that presently exist on the site are unsightly and detrimental to the townscape, irrespective of their condition. It is arguable therefore, that a well-landscaped residential development of appropriate height and scale will bring about a marked enhancement of the quality of the local environment.

15.5.2 The assessment has identified that there should be no physical effects on the heritage assets identified, with effects being limited to alterations to views from the heritage assets.

15.5.3 There are five individual or groups of buildings that are relevant to the assessment of impact on key views, and these have been described in the previous section. Only in one case, nos. 1- 4 Railway Cottages, is the magnitude of change high enough to score a 'high' on the 'sensitivity' scale. The tables below set out the findings and assessment.

Table 15.1: Impact of Existing Key Views of Site from Heritage Buildings

Building	Nature of View	Sensitivity
Heatham House, Whitton Road. Heritage Asset, Listed Grade	No view from house itself; glimpses through trees of site from grounds.	Negligible
Houses/ Shops in Whitton Road/ London Road. Non-Designated Heritage Asset	Distant oblique views of London Road frontage of site.	Negligible
2 Cole Park Road. Non-Designated Heritage Asset	View from rear first floor dormer windows across London Road to frontage of site.	Low
1-4 Railway Cottages, Brewery Lane. Non-Designated Heritage Asset	Directly over site; very close to existing semi- derelict buildings.	High
Albany P.H. and 1-8 Station Road. Designated Heritage Asset	Face directly over site from other side of railway.	Medium

Table 15.2: Impact of the New Development on Key Views from Heritage Buildings

Building	Sensitivity	Magnitude of Change	Mitigation	Residual Impact
Heatham House	Negligible	Very low	None needed	Negligible
Terrace in Whitton Road/ London Road	Negligible	Very low	None needed	Negligible
2 Cole Park Road	Low	Low	None needed	Neutral
1- 4 Railway Cottages	High	High	Landscaping to integrate the new development and provide screening where possible.	Minor adverse in respect of nos. 3 and 4
Albany P.H. / 1- 8 Station Road	Medium	Medium	None needed	Neutral

15.5.4 It can be seen from the above that our only concern from the heritage buildings aspect relates to the potential impact of the new development on nos. 1- 4 Railway Cottages. Whilst it can be argued that the present situation is highly unsatisfactory, whereby their front elevations are only separated from an unattractive industrial building by a narrow lane, redevelopment offers the opportunity to improve their immediate environment. This would be the case in respect of nos. 1 and 2, which would gain a relatively open aspect northwards over the landscaped private parking area for a block of five townhouses. However, nos. 3 and 4 would face the side elevation of a new house. This could create a potential overlooking problem that should be partially mitigated by the proposed landscaping to the north of Brewery Lane. However the cottages would benefit from the improved townscape of the site.

15.5.5 With regard to 'The Albany' and nos. 1- 8 Station Road, their present aspect northwards over the railway is predominantly of an unsightly and neglected industrial site. Residential development would add some impact in terms of overall height of built form, but with the landscaping proposed should, at the very least, produce a neutral residual impact.

15.6 Assessment of Cumulative Effects of MOL Footpath Proposals

15.6.1 The creation of a footpath through the MOL should not lead to any significant cumulative effects in relation to built heritage.

15.7 Summary

15.7.1 From a cultural heritage perspective, the principle of new development on this site raises very few issues:

- There is only one statutorily listed building (Grade II) nearby, Heatham House in Whitton Road. Only the side elevation of this building, which has no windows, faces the site and in any case views are almost entirely blocked by mature trees and outbuildings in the grounds. Residential development on the site will have a not significant impact provided the existing Heatham House tree cover and the outbuildings remain.

- A terrace of houses and shops in Whitton Road and London Road (in part a non-designated heritage asset) have distant oblique views of the London Road frontage of the site, upon which the proposed development will have a not significant impact.

- No. 2 Cole Park Road, an 'Arts and Crafts' cottage and non- designated heritage asset, has similar oblique views of the front of the site from rear- facing impact.

- Nos. 1- 4 Railway Cottages, Brewery Lane, have an English Heritage 'Archaeological Priority' designation. Their present outlook is severely affected by existing development on the site and any new development is likely to have a minor adverse impact on nos. 3 and 4 based on landscaping being proposed along Brewery Lane.

- 'Albany' Public House and nos. 1-8 Station Road are a designated heritage asset, being located within the Queens Road Heritage Area. Their present outlook from a distance northwards over the site is unattractive; residential development with landscaping will be at least neutral in residual impact, and probably an improvement.

15.7.2 Overall, it is considered that from the built heritage aspect, redevelopment of this site for residential purposes provides the opportunity for some significant environmental improvements to the townscape on and around the site.

16 Archaeology

16.1 Introduction

16.1.1 This chapter assesses the effects of the proposed development upon buried archaeological deposits which may be present within the site. It concentrates on the site preparation and construction phase, which is when any effects that may occur would be expected to arise. It is supported by **Appendix K**, which comprises the below ground archaeological desk based assessment (DBA) for the site and its wider area, which provides a comprehensive survey of all relevant data sources, including a full cartographic regression exercise. **Appendix K** should be referred to for any further details regarding the below ground archaeology at the site and its wider area.

16.1.2 This chapter describes the planning policy guidance context relevant to archaeology at the site, and describes the methods used to assess the potential effects. The baseline conditions at the site and its immediate vicinity are described, as are the potential direct and indirect effects of the proposed development arising from demolition and construction works.

16.1.3 Both this chapter and **Appendix K** have been prepared for St James Group Limited by CgMs Consulting, by a professional archaeologist who is a Member of the Institute for Archaeologists.

16.2 Policy Context

16.2.1 In March 2012, the government published the National Planning Policy Framework (NPPF), which replaces national policy relating to heritage and archaeology (PPS5: Planning Policy Statement 5: Planning for the Historic Environment). The Practice Guide which was issued with PPS5 is still however valid, together with documentation translating former PPS5 policy into its NPPF counterpart.

16.2.2 The relevant Strategic Development Plan Framework is provided by the London Plan Spatial Development Strategy for Greater London published July 2011. Policy 7.8 *Heritage Assets and Archaeology* concerns Archaeology and supports the identification, recording, interpretation and protection of archaeological assets within a planning context. It states that the significance of a Heritage Asset and Historic Environment must be conserved and enhanced wherever possible; in the case of archaeological remains, if preservation is not possible, adequate means must be put in place for investigation.

16.2.3 The relevant local Development Plan framework is provided by the London Borough of Richmond upon Thames (LBRuT) Unitary Development Plan (UDP) adopted in 2005. Policies STG2 *The Environment*, BLT7 *Archaeological Sites*, BLT8 *Evaluation of Archaeological Sites* and BLT9 *Development of Archaeological Sites* covers the identification, recording, interpretation and protection of archaeological assets which are likely to be impacted by development.

16.2.4 In short, government legislation and policy provides a framework which:

- Protects designated archaeological Heritage Assets (which can include World Heritage Sites, Scheduled Ancient Monuments, Protected Wreck Sites, and Registered Battlefields);
- Protects the settings of these designated archaeological Assets;
- Has a presumption in favour of the *in-situ* preservation of designated and other nationally important archaeological Heritage Assets;
- Emphasises the need to establish the significance and value of both designated and non-designated archaeological Heritage Assets;
- In appropriate circumstances requires adequate information (from field evaluation and assessment) to enable informed decisions; and
- Provides for the excavation and investigation of those archaeological Heritage Assets whose significance can be realised and public appreciation of the Asset enhanced.

16.2.5 **Appendix K** includes the detail of the national, regional and local policies regarding archaeological potential at the site.

16.3 Methodology

16.3.1 A below ground archaeological desk based assessment (DBA) has been prepared for the site and its wider context, in accordance with the guidance set out in the NPPF, together with relevant regional and local plan policy (see **Appendix K**). The DBA has been completed in accordance with relevant guidance provided by the Institute for Archaeologists (IfA), English Heritage (EH) and the Greater London Archaeological Advisory Service (GLAAS).

16.3.2 The preparation of this baseline report included the following:

- A consideration of data on the Greater London Historic Environment Record (GLHER) within a 1km radius of the site (referred to as the study area);
- Analysis of site-specific geotechnical information;
- An examination of cartographic and documentary evidence in the British Library and Richmond Local History Library; and
- A comprehensive map regression exercise using maps and plans from the mid-18th century until the present day.

16.3.3 From the assimilation of the above data and the use of professional judgement, the likely archaeological potential of the site has been established, with the result that considerations regarding the need for design, civil engineering and archaeological solutions to the Archaeological potential have been identified. Determination of the importance of Cultural Heritage Assets is based on existing statutory designations and, for undesignated Assets, the Secretary of State's non-statutory criteria (formerly set out at Annex 4 to PPG16) together with professional judgement, and the criteria set out in **Table 16.1** below.

16.3.4 The assessment of the scale of impacts, as set out in **Table 5.1**, is based on extensive professional experience gained on other major developments across south eastern and central England. In particular, impacts associated with construction have been considered.

Table 16.1: Assessment of Importance of Cultural Heritage Asset

Sensitivity	Criteria
High	World Heritage Site, Listed Buildings, Registered Parks and Gardens and Scheduled Ancient Monuments. Undesignated assets of national significance.
Moderate	Designated or undesignated features of regional importance including Conservation Areas or Archaeological Priority Zones.
Low	Features of local interest only including buildings of merit and undesignated local archaeological assets.
Negligible	Sites with no surviving heritage component.

16.4 Baseline Conditions

16.4.1 Geologically the study site lies within an area of Kempton Park River Terrace Gravels, above the solid London Clay deposits. Geotechnical information derived from the site in 2010 revealed deposits of made ground 0.9-2.5m thick at the site, above alluvial deposits and sands and gravels. In places, the alluvium had been removed entirely so that the made ground rested directly on the sands and gravels. A peat deposit was identified in a borehole towards the eastern end of the study site.

16.4.2 Topographically the study site lies on the banks of the River Crane level at c.8-9m AOD. From the quantities of made ground present at the identified during geotechnical investigations, it is evident that the site has been artificially raised.

16.4.3 A review of archaeological information within a one kilometre radius of the study site has revealed the presence of quantities of prehistoric material, typically individual finds of flintwork dating to the Palaeolithic, Mesolithic and Neolithic periods, typically to the south of the site. However, occupation evidence dated to the Bronze Age has been found to the south of the site, while evidence of Iron Age and early Roman activity has been identified to the east of the site. Little evidence has been identified to suggest either early prehistoric activity, or Anglo-Saxon/Medieval activity within the immediate vicinity of the site.

16.4.4 The historic map regression undertaken in the DBA (**Appendix K**) shows that while the eastern part of the site has been developed from at least the eighteenth century onwards, the central/western part of the site was impacted by the presence of an orchard and subsequent nursery during the later nineteenth and early twentieth centuries.

16.4.5 A moderate/high archaeological potential has therefore been identified, for the early Prehistoric, Late Iron Age/Early Roman periods across the site, and for the Post Medieval periods on the eastern part of the site. Due to the recorded presence of peat deposits at the site itself, a palaeoenvironmental potential can also be considered at the site.

16.4.6 Should the site contain archaeological remains as set out above, the available evidence suggests that such remains are likely to be only of local significance.

16.5 Potential Effects

16.5.1 The scale of the Development suggests that any archaeological remains now present within the study site would be impacted by the redevelopment process, resulting in a moderate adverse effect.

16.5.2 On the eastern part of the site, the demolition of the former Post Office buildings and the construction of the proposed apartment block and community building can be considered to have a potential impact upon remains of the Post Medieval brewery complex, and also on palaeoenvironmental remains as revealed in the geotechnical investigations.

16.5.3 On the central/western parts of the study site, the development of the terraces of houses, access roads, garages and associated amenity areas can be considered to have a potential impact upon remains of prehistoric and Roman date, and also upon potential palaeoenvironmental remains.

16.5.4 A summary of the following impacts associated with the Construction Phase is set out below:

- Demolition of existing structures;
- Machine site stripping and landforming;
- Cutting of drainage;
- Construction of roads;
- Excavation associated with basements; and
- Cutting of foundations and services.

16.5.5 Following construction of the development, the operational phase of the development would have no appreciable archaeological impacts, resulting in a not significant long term archaeological effect during this phase.

16.6 Mitigation Measures

16.6.1 A programme of archaeological mitigation measures will be implemented prior to the commencement of construction ground works. Initially these will comprise a programme of geoarchaeological borehole survey, together with targeted evaluation trial trenching. Depending on the results of this work, further mitigation may comprise:

- Further archaeological monitoring during construction groundworks;
- Archaeological excavation, post excavation assessment and publication; and
- Design measures to achieve preservation in situ.

16.6.2 In view of the archaeological potential of the site, and the perceived significance of such remains (see **Section 16.4** above) together with the presence of the existing buildings and associated access constraints, it is suggested that all further archaeological mitigation measures could follow planning consent secured by appropriate archaeological planning conditions.

16.7 Residual Effects

16.7.1 Subject to the implementation of appropriate mitigation measures, which are set out in **Section 16.6** above are anticipated to include a suite of relevant fieldwork measures, securing preservation of archaeological remains by record, there are likely to be no residual effects on underlying archaeological deposits as a result of the proposed development.

16.8 Assessment of Cumulative Effects of MOL Footpath Proposals

16.8.1 It is anticipated that the construction of the footpath would involve minimal below ground works. As such the creation of a footpath through the MOL should not lead to any significant cumulative effects in relation to archaeology.

16.9 Summary

16.9.1 The site has been reviewed for its below ground archaeological potential.

16.9.2 In line with national, regional and local development plan policy, a review of available geological and archaeological data, together with historic records, including a map regression from the eighteenth century onwards, has been carried out at the site.

16.9.3 This exercise has identified a potential for the prehistoric, Iron Age/Roman and Post Medieval/Modern periods. Overall the remains are deemed to be of probable local significance.

16.9.4 Archaeological deposits occurring within the site will be impacted by the construction phase of the development only, and a suite of appropriate mitigation measures have been proposed to secure preservation by record.

16.9.5 Due to the perceived significance of the likely archaeological remains, together with on-site constraints, it is proposed that relevant mitigation measures (archaeological evaluation or monitoring) are carried out following the granting of planning permission, in order to deal appropriately with the sites archaeological potential.

16.9.6 Following the implementation of appropriate mitigation measures it is anticipated that the impact of development upon archaeology will be not significant.

16.10 References

Department of Communities and Local Government *National Planning Policy Framework* 2012

Department of Communities and Local Government/Department of Culture Media and Sport/English Heritage *PPS5 Planning for the Historic Environment: Historic Environment Planning Practice Guide* 2010

English Heritage *Comparison of PPS5 Policies with Historic Environment-Related Policies in the NPPF – Part 1* 5 April 2012 unpublished document

English Heritage *Comparison of PPS5 Policies with Historic Environment-Related Policies in the NPPF – Part 2* 5 April 2012 unpublished document

17 Townscape & Visual

17.1.1 A Townscape and Visual Impact Assessment (TVIA) has been undertaken to identify the effects of the proposed development on the local townscape and on views of the site. Consideration has been given to effects during both construction and operation of the development. The TVIA is provided as **Appendix L.1**. The TVIA has been informed by an Arboricultural Impact Assessment which is provided in **Appendix L.2**.

17.1.2 The TVIA identifies the existing townscape and visual baseline conditions at the site and surrounding area and assesses the potential effects of the proposed development on the townscape and visual amenity. Mitigation measures have been identified as appropriate. The assessment has been undertaken in accordance with the requirements of The Guidelines for Landscape and Visual Impact Assessment and to fulfil the requirements of the EIA Scoping Opinion.

17.1.3 Viewpoints have been agreed with LBRuT to represent the visual impact of the proposed development. Verified views have been prepared to illustrate how the proposed development will be viewed from each of these locations. In addition further visualisations have been prepared for key viewpoints to illustrate the effect of the proposed development and the consented redevelopment of Twickenham Railway Station.

17.1.4 The site is currently occupied by hardstanding and a number of disused commercial buildings associated with the former use of the site as a sorting office. The buildings are generally in a dilapidated condition and the site is considered to generally detract from the local townscape.

17.1.5 The construction of the proposed development is considered to have a generally minor adverse effect on the local townscape and on the selected viewpoints. This is a result of construction activities, including cranes, which are likely to more a noticeable townscape and visual feature than the current, albeit dilapidated, conditions prevailing at the site. However such adverse effects are only temporary and will be partially mitigated through good construction practices.

17.1.6 The permanent effect of the proposed development on the local townscape is generally beneficial. This is a result of the high quality development proposed, the creation of new public realm on London Road and enhancing access to the River Crane, improving the character of this important town centre site adjacent to the railway station. A minor beneficial cumulative effect is also anticipated in relation to the cumulative effects of LBRuT's intentions to provide a footpath through the wider MOL.

17.1.7 The effect of the proposed development once completed typically varies between minor beneficial, not significant and minor adverse depending upon the view and receptor under consideration. The nature of the effect depends on the extent to which the development is visible and how the development is viewed in relation to surrounding buildings, trees and the sky. The effect of the development is however typically not significant or minor as a result of the careful and high quality design of the development and the massing responding to adjacent buildings.

17.1.8 The cumulative assessment of the proposed development along with the redevelopment of the railway station has identified that the railway station development is typically more prominent, due to the greater height and massing of the railway station development. As a result the proposed development of the sorting office site is typically obscured when viewed from the east and seen against the taller railway station redevelopment buildings when viewed from west.

18 Waste

18.1.1 Peter Brett Associates LLP has been commissioned to produce a waste strategy for the proposed development. The full Waste Strategy is included in **Appendix A.4** of the Environment Statement.

18.1.2 The Waste Strategy is based on The Berkeley Group's commitment to a 10 year sustainability strategy, 'Vision 2020'. This Vision 2020 aims to raise the standard of sustainable development in relation to new homes. To do so they have specific commitments which apply to waste issues and which have informed the waste strategy:

- Providing recycling bins for every home;
- Design all homes to achieve at least level 3 of the Code for Sustainable Homes; and
- Reuse over 80% of construction, demolition and excavation waste.

18.1.3 There are three main elements to the Waste Strategy covering demolition, construction and operational waste. The Waste Strategy gives details of each stage and the expected waste arisings and how they will be managed.

18.1.4 It is estimated that demolition will result in 7,710 tonnes of waste of which 90% will be concrete and tarmac. Recycling of such arisings could take place on site with processing of concrete and tarmac to produce a coarse aggregate that can be used in construction. The waste strategy should exceed the Berkeley Group 80% target for demolition wastes.

18.1.5 Construction waste is estimated at 2,150m^3, with a further 4,330m^3 created from excavation of the basements. As with demolition wastes construction waste will be re-used on site where practicable. A Site Waste Management Plan will be prepared detailing how construction and demolition wastes will be managed on-site.

18.1.6 Operational waste volumes are estimated to be approximately 100 tonnes per annum for the residential units with 43 tonnes of that being recycled and the remainder sent for disposal. For the commercial units (the restaurants and the community building) it is estimated there will be 240 tonnes of waste per annum.

18.1.7 The residential waste will be managed through LBRuT's existing waste management contracts. Development has been designed to allow space for waste and recyclable storage in and out of homes. Implementation of Borough-wide schemes to reduce waste sent to landfill, including improving community awareness, will improve recycling rates. The commercial waste management arrangements will require specific consultation by the future operators with appropriate waste management companies, depending upon the waste to be generated.

18.1.8 More details of the waste arisings and management are shown in the Waste Strategy **Appendix A.4**.

19 Utilities

19.1 Introduction

19.1.1 This chapter provides a summary of the utility provision relevant to the site and the proposed development, along with reinforcements or diversions that will be required to support the proposed development. This chapter has been prepared by RSK.

19.2 Water

19.2.1 Thames Water records of public water mains in the vicinity of the site indicate the following mains are present:

- A 30 inch main which enters the site at the junction with London Road, runs beneath the ramp parallel to London Road and exits the site on the southern boundary to pass under the railway line.
- The major infrastructure in London Road comprises of a 33 inch main and a 12 inch main, both within the footpath adjacent to the site.
- Private distribution mains which are located within the site.

19.2.2 Thames Water has indicated that they need to carry out a flow and pressure test on the adjacent mains to confirm the water pressure available for the development. However due to the water main infrastructure in the locality this is unlikely to be an issue.

19.2.3 As the existing London Road junction and ramp are being retained there are no plans to divert the existing Thames Water infrastructure.

19.3 Gas

19.3.1 Transco records indicate that there is a 6 inch main in the footpath of London Road at the site entrance and continues over the railway bridge. This main serves the existing development on the site with an intake room shown adjacent to the site entrance. It is anticipated that a connection to this main to serve the new development will be required and that will duplicate the current situation.

19.4 Electricity

19.4.1 Electricity cable records for the area indicate that there are high voltage (HV) cables beneath the ramp into the site and also beneath the tunnel under the London Road railway bridge entering the site from the east. These continue behind railway cottages on Brewery Lane to the Network Rail substation and across the wider MOL to the west.

19.4.2 It is envisaged that the proposed development will be served from this existing HV network with a new substation being established on site. No major diversions of the existing plant are anticipated.

19.5 Telecommunications

19.5.1 There is a BT duct route in the footpath of London Road adjacent to the site, which crosses the junction into the site. The supply to the site enters via the ramp and it is understood that the supply to the railway cottages crosses the site. It is envisaged that the proposed development will be supplied from the existing network in London Road and no diversions are anticipated.

19.5.2 Consultation with Virgin Media, Viatel and Cable and Wireless has all indicated that they have no plant in the area that will be affected by the development.

19.6 Transport for London

19.6.1 There is a controller for the traffic lights on London Road within the footpath adjacent to the western boundary wall of the site with a duct route leading to the lights. It is not envisaged that this will be affected by the proposed development.

20 Summary & Impact Interactions

20.1 Introduction

20.1.1 Environmental effects can result from incremental changes caused by the interactions between effects resulting from a project. For the purpose of this assessment, the interactions between effects associated with the proposed development are defined as 'combined effects'.

20.1.2 The direct and indirect effects of the proposed development have been assessed within the relevant topic chapters of the ES prepared by suitable technical specialists. Environmental effects are assessed relative to the topic under consideration. This approach can lead to the interaction of effects being reported in separate chapters but the collective effect on the same environmental resource(s) not being considered.

20.1.3 In response this chapter, prepared by Peter Brett Associates LLP, summarises the principal findings of each topic chapter of the ES to enable assessment of the potential for impact interactions. This chapter also provides a summary of the environmental effects identified throughout the ES and allows a judgement to be made of the overall effect of the proposed development during construction and operation.

20.2 Methodology

20.2.1 The assessment methodology for combined effects involves the identification of impact interactions associated with both the construction and operational phases of the proposed development upon one or more environmental resources. This is undertaken using a qualitative appraisal process.

20.2.2 This approach has been used by PBA for numerous EIAs and draws upon the following guidance:

- Institute of Environmental Management & Assessment, (2004), Guidelines for Environmental Impact Assessment (IEMA).
- Hyder, (1999), Final Report on the Study on the Assessment of Indirect and Cumulative Impacts, as well as Impact Interactions within the Environmental Impact Assessment (EIA) Process NE80328/D3/2, European Commission Directorate General XI, Environment, Nuclear Safety and Civil Protection.
- Mitigation measures are identified in each of the topic chapters, and have been used to inform the assessment presented in this chapter.

20.2.3 The assessment of the significance of effects has been based on the generic significance criteria provided in **Table 5.1**.

20.3 Construction Effects

20.3.1 The majority of the environmental effects identified during construction are not significant.

20.3.2 There is expected to be a moderate adverse effect on local communities in relation to noise and vibration, however this will be intermittent during the construction period. Effects on views of the site and on the local townscape are also generally adverse during construction. Local communities may experience a minor beneficial effect as a result of employment opportunities during construction. Other issues that could affect local people, such as air quality and effects associated with construction traffic, should not be significant.

20.3.3 Overall therefore there is considered to be a minor adverse effect on local communities as a result of the construction of the proposed development.

20.4 Operation Effects

20.4.1 The most significant effects during the operation of the proposed development relate to socio-economics. The provision of a new community building will provide a range of flexible new facilities for the local community and new residents that is considered to be a moderate beneficial effect. Employment opportunities during the operation of the development are considered to be a minor beneficial effect, while increased demand for local services (health, education, etc.) are generally a minor adverse effect.

20.4.2 The proposed drainage strategy will reduce the risk of flooding at the site and in the surrounding area, which is a moderate beneficial effect to local communities.

20.4.3 Effects in relation to the townscape of the local area are generally beneficial, while the effects on key views are either beneficial or adverse depending on how the development affects the view in question.

20.4.4 There should be a minor beneficial effect on pedestrians and cyclists through the creation of a riverside walk, and a minor adverse effect in relation to increased pressure on public transport (albeit that the site benefits from a high standard of local public transport). Other transport related effects should not be significant.

20.4.5 Other effects on local communities are not significant.

20.4.6 As a result therefore the proposed development is considered to have a moderate beneficial effect on local communities.

20.5 Assessment of Cumulative Effects of MOL Footpath Proposals

20.5.1 The proposed footpath through the wider MOL, and potentially opening up the MOL as a park, will improve connectivity in the local area for the existing local community and future occupiers of the proposed development. The local community and future occupiers will also benefit from a new recreational facility. Both of these effects are considered to be minor beneficial effects.

20.5.2 There is the potential for minor adverse effects in relation to the ecological value of the MOL due to vegetation clearance to accommodate the footpath, increased recreational pressure and, should the footpath be lit, from lighting affecting bats. These effects are considered to be minor adverse. However, recommendation measures for LBRuT to consider in the design and implementation of the footpath have been identified to mitigate these effects such that the residual effect should be not significant or beneficial.

20.5.3 It is therefore considered that the cumulative effect of the proposed development and LBRuT's footpath proposals should be minor and beneficial.

21 Glossary

AADT	Annual Average Daily Traffic
ABS	Annual Business Survey
ADF	Average Daylight Factor
AMD	Assessed Maximum Demand
AOD	Above Ordnance Datum
AOND	Area of Outstanding Natural Beauty
APSH	Annual Probable Sunlight Hours
ATC	Automated Traffic Count
AQAP	Air Quality Action Plan
AQEG	Air Quality Expert Group
AQMA	Air Quality Management Area
AQR & A	Air Quality Review and Assessment
BAP	Biodiversity Action Plan
BCT	Bat Conservation Trust
bgl	Below ground level
BGS	British Geological Survey
BIS	Business, Innovation and Skills
BNL	Basic Noise Level
BPEO	Best Practicable Environmental Opinion
BRE	Building Research Establishment
BREEAM	BRE Environmental Assessment Method
BRES	Business Register Employment Survey
BS	British Standard
BSI	British Standards Institute

CAMS	Catchment Abstraction Management Strategy
CCS	Considerate Construction Scheme
CEMP	Construction Environmental Management Plan
CFMP	Catchment Flood Management Plan
CfSH	Code for Sustainable Homes
CHP	Combined Heat and Power
CIBSE	Chartered Institute of Building Services Engineers
CIEH	Chartered Institute of Environmental Health
CIRIA	Construction Industry Research and Information Association
CLEA	Contaminated Land Exposure Assessment Framework
CLP	Construction Logistics Plan
cm	Centimetre
CoCP	Codes of Construction Practice
CPA	Control of Pollution Act
CPZ	Controlled Parking Zone
CRN	Calculation of Rail Noise
CRoW Act	Countryside and Rights of Way Act
CRTN	Calculation of Road Traffic Noise
CS	Core Strategy
CSO	Combined Sewer Overflow
CWS	County Wildlife Sites
dB	Decibel
DBA	Desk Based Assessment
DCLG	Department for Communities and Local Government
DCMS	Demolition and Construction Meth Statement

Defra	Department for Environmental, Food and Rural Affairs
DETR	Department of Environment, Transport and the Regions
Diffusion Tube	A passive sampler used for collecting nitrogen dioxide in the air.
DMP	Development Management Plan
DMRB	Design Manual for Roads and Bridge
DoT	Department of Transport
DPD	Development Plan Document
DTM	Digital Terrain Model
EA	Environmental Agency
EC	European Commission
EcIA	Ecological Impact Assessment
EDPD	Employment Development Plan Document
EFT	Emissions Factor Toolkit
EH	English Heritage
EHO	Environmental Health Officer
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPA	Environmental Protection Act
EPS	European Protected Species
EPUK	Environmental Protection UK
ES	Environmental Statement
EU	European Union
FE	Form Entry
FORC	Friends of the River Crate
FRA	Flood Risk Assessment

FTE	Full Time Equivalent
GAC	Generic Assessment Criteria
GEA	Gross External Area
GIA	Gross Internal Area
GIGL	Greenspace Information for Greater London
GLA	Greater London Authority
GLAAS	Greater London Archaeological Advisory Service
GLHER	Greater London Historic Environment Record
GQA	Generic Quality Assessment
g/s	Grams per Second
GVA	Gross Value Added
Ha	Hectares
HA	Highways Agency
HAP	Habitat Action Plan
HCA	Homes and Communities Agency
HDV	Heavy Duty Vehicles
HEPPG	Historic Environment Planning Practice Guide
HER	Historical Environment Record
HGV	Heavy Good Vehicle
HUDU	Healthy Urban Development Unit
HV	High Voltage
IAQM	Institute for Air Quality Management
IEA	Institute of Environmental Assessment
IEEM	Institute of Ecology and Environmental Management
IEMA	Institute for Environmental Management and Assessment

IfA	Institute for Archaeologists
ILA	International Labour Organisation
ILE	Institute of Lighting Engineers
IUCN	International Union for Conservation of Nature
JSA	Jobseekers Allowance
Kg	Kilograms
kHz	Kilohertz
km	Kilometre
kV	Kilovolts
kW	Kilowatts
l/hr	Litres per Hour
LAQM	Local Air Quality Management
LAQM.TG(09)	Local Air Quality Management Technical Guidance 2009
LBRuT	London Borough of Richmond upon Thames
LCN	Local Cycle Network
LDF	Local Development Framework
LDS	Local Development Scheme
LDV	Light Duty Vehicle
LEA	Local Economic Assessment
LEZ	Low Emission Zone
LGV	Light Goods Vehicle
LNAPL	Light Non Aqueous Phase Liquid
LNR	Local Nature Reserve
LPA	Local Planning Authority
LPAC	London Planning Advisory Committee

LSOA	Lower Super Output Area
LTP	Local Transport Plan
LV	Low Voltage
LZC	Low or Zero Carbon
m	Metres
m^2	Square metres
mg/kg	Milligrams per kilometre
mg/l	Milligrams per litre
mm	Millimetres
mph	Miles per Hour
m/s	metres per second
MAGIC	Multiagency Geographic Information for the Countryside
MOL	Metropolitan Open Land
MPS2	Minerals Policy Statement 2
MVHR	Mechanical Ventilation Heat Recovery
NAQOs	National Air Quality Objectives
NCA	National Character Areas
NGWCLC	National Ground Water Contaminated Land Centre
NEC	Noise Exposure Categories
NERC	Natural Environment and Rural Communities Act
NMR	National Monuments Record
NNR	National Nature Reserve
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
NPPF	National Planning Policy Framework

NPSE	Noise Policy Statement for England
NSL	No Sky Line
µg/m3	Microgram per Cubic Meter
OD	Ordnance Datum
ODPM	Office of the Deputy Prime Minister
OffPAT	Office of Project and Programme Advice and Training
ONS	Office for National Statistics
OS	Ordnance Survey
PAHs	Polycyclic Aromatic Hydrocarbons
PBA	Peter Brett Associates LLP
PCBs	Polychlorinated Biphenyls
PCT	Primary Care Trust
PFRA	Preliminary Flood Risk Assessment
PIA	Personal Injury Accident
PID	Photo Ionisation Detector
PM_{10}	Particulate Matter (Less than 10 microns in diameter)
$PM_{2.5}$	Particulate Matter (Less than 25 microns in diameter)
PPE	Personal Protection Equipment
PPG	Planning Policy Guidance
PPG	Pollution Prevention Guidelines
PPS	Planning Policy Statement
PRA	Preliminary Risk Assessment
PROW	Public Rights of Way
PSC	Potential Sources of Contamination
PTAL	Public Transport Accessibility Level

PZVI	Potential Zone of Visual Influence
RAF	Royal Air Force
REC	Regional Electricity Company
Receptor	A location where the effects of pollution may occur
RFC	Ratio of Flow to Capacities
RMS	Root Mean Square
RPG	Regional Planning Guidance
RSS	Regional Spatial Strategy
Rw	Weighted Sound Reduction Index
SAB	SUDS Approved Body
SAC	Special Area of Conservation
SAP	Species Action Plans
SFRA	Strategic Flood Risk Assessment
SINC	Site of Importance for Nature Conservation
SLINC	Site of Local Importance for Nature Conservation
SNCI	Sites of Nature Conservation Interest/Importance
SPA	Special Protection Area
SPD	Supplementary Planning Document
SPG	Supplementary Planning Guidance
SPZ	Source Protection Zone
SRN	Strategic Road Network
SSSI	Sites of Special Scientific Interest
SuDS	Sustainable Urban Drainage System
SVOC	Semi-volatile Organic Compounds
SWMP	Site Waste Management Plan

SWRDA	South West Regional Development Agency
TA	Transport Assessment
TAAP	Twickenham Area Action Plan
TCZ(s)	Townscape Character Zone(s)
TfL	Transport for London
TPH	Total Petroleum Hydrocarbons
TPO(s)	Tree Preservation Order(s)
TRL	Transport Research Laboratory
TS	Transport Statement
TVIA	Townscape and Visual Impact Assessment
TW	Thames Water
TZV	Theoretical Zone of Visibility
UDP	Unitary Development Plan
UST	Underground Storage Tanks
VDV	Vibration Dose Value
VOA	Valuation Office Agency
VOC	Volatile Organic Compound
VSC	Vertical Sky Component
WCA	The Wildlife and Countryside Act 1981 (as amended)
WFD	Water Framework Directive
WMS	Working Method Statements
WRA	Water Resources Act
WRZ	Water Resource Zone