Reading Borough Council

Level 2 Strategic Flood Risk Assessment

On behalf of:

Reading Borough Council
Working better with you

Project Ref: 27560/4009 | Rev: - | Date: December 2017

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Document Control Sheet

Project Name: **Reading Borough Council**

Project Ref: **27560/4009**

Report Title: **Level 2 Strategic Flood Risk Assessment**

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Date: **December 2017**

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Approved by:	Dan Hayes	Director		21/12/17
For and on behalf of Peter Brett Associates LLP				

Revision	Date	Description	Prepared	Reviewed	Approved

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Appendices

1 Level 2 Strategic Flood Risk Assessment

1.1 Scope of Report

1.1.1 Peter Brett Associates LLP (PBA) was commissioned by Reading Borough Council (RBC) to undertake a 'Level 2 Strategic Flood Risk Assessment' ('L2 SFRA'), to considers the flood risk to 18 sites throughout the Borough.

1.1.2 The administrative area of RBC is significantly impacted by fluvial flooding due to the presence of a number of main rivers within the area, including the River Thames, River Kennet, Foudry Brook and Holy Brook. The results of the Level 1 (L1) SFRA indicated that it is not possible to accommodate all necessary development outside of areas at flood risk, therefore consideration of the sites located within areas identified to be at risk of flooding should be completed.

1.1.3 The L2 SFRA is intended to provide an evidence base, to allow RBC to undertake the (flood risk) Sequential Test to the submitted sites, which are proposed for allocation as part of the Local Plan, and are identified within Flood Zone 2 'Medium Probability' or Flood Zone 3 'High Probability'.

1.1.4 The results will assist the Council in understanding the flood risk posed to new development sites and will inform RBC's assessment of site suitability for inclusion in the RBC new Local Plan.

1.1.5 This assessment incorporates information from the new L1 SFRA released 2017, and is in accordance with the updated local and national legislation.

1.1.6 This L2 SFRA provides a more detailed assessment of flood risk at sites identified in Flood Zones 2 and 3, as well as those affected by climate change scenarios. Different sources of flooding are considered, and information on historic flooding provided where applicable and possible.

1.1.7 The National Planning Policy Framework (NPPF) provides the following detailed definitions of Flood Zones, which were also provided within the L1 SFRA:

- **Flood Zone 1 'Low Probability'** – less than 1 in 1000 (0.1%) annual probability of river flooding;
- **Flood Zone 2 'Medium Probability'** – between 1 in 100 (1%) and 1 in 1000 (0.1%) annual probability of river flooding, or between 1 in 200 (0.5%) and 1 in 1000 (0.1%) annual probability of sea flooding;
- **Flood Zone 3a 'High Probability'** – greater than 1 in 100 (1%) annual probability of river flooding, or 1 in 200 (0.5%) of sea flooding; and
- **Flood Zone 3b 'Functional Floodplain'** – land where water has to flow or be stored in times of flood. The starting point for identifying this is land which floods with an annual probability of 1 in 20 (5%) or greater.

1.1.8 The extent of Flood Zone 3b 'Functional Floodplain' identified in the L1 SFRA was utilised within this assessment.

1.2 L2 SFRA Require ments

1.2.1 The L2 SFRA has been prepared in accordance with the NPPF and associated Planning Policy Guidance (PPG) on Flood Risk and Coastal Change, and in accordance with the latest EA guidance on climate change (February 2016).

1.2.2 In considering flood risk to the sites, it is necessary to fully consider the potential impacts of climate change for the lifetime of the development. Details of the latest EA climate change guidance on the application of climate change allowances in flood risk assessments is provided via the following link:

https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances.

1.2.3 This guidance provides contingency allowances for potential increases in peak river flow in Table 1, and for potential increases in rainfall intensity in Table 2. **Table 1-1** outlines the allowances relevant for the Thames River Basin District.

Table 1-1: Climate Change - Peak River Flow Allowances

River Basin District	Allowance Category	Total Potential Change Anticipated for '2020s'	Total Potential Change Anticipated for '2050s'	Total Potential Change Anticipated for '2080s'
Thames	Upper End	25%	35%	**70%**
	Higher Central	15%	25%	**35%**
	Central	10%	15%	**25%**

1.2.4 These allowances should be applied to reflect the proposed design life of buildings, and the 2080s horizon is the typical standard for most forms of new residential/commercial development unless there are specific justification for a shorter lifespan.

1.2.5 The specific range of allowances to be considered in the new development under consideration within this L2 SFRA – i.e. either 'More Vulnerable' residential or 'Less Vulnerable' commercial/industrial development – is detailed in the **Table 1-2** below:

Table 1-2: Applicable Peak River Flow Climate Change Allowance Ranges

Flood Zone	More Vulnerable Development	Less Vulnerable Development
1	**n/a**	**n/a**
2	**25%-35%**	**25%**
3a	**35%-70%**	**25%-35%**
3b	***Development should not be permitted***	

1.2.6 The L2 SFRA should provide sufficient information to inform the application of the Exception Test, where appropriate through considering:

- Flood probability;
- Flood depth;
- Flood velocity;
- Rate of onset of flooding; and
- Duration of flooding.

1.2.7 The Exception Test is detailed within paragraph 102 of the NPPF, and is a method used to demonstrate that flood risk to people and property will be managed satisfactorily, while allowing necessary development to be permitted in situations where suitable sites at lower risk of flooding are not available. The NPPF states:

> *"…For the Exception Test to be passed:*
>
> *it must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a Strategic Flood Risk Assessment where one has been prepared; and*
>
> *a site-specific flood risk assessment must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall."*

2 Baseline Flood Risk Information

2.1 Sites under Consideration

2.1.1 This L2 SFRA has been prepared to determine the risk of flooding from a number of sources (fluvial, surface water, sewer and artificial sources) at specified proposed development sites, as advised by RBC.

2.1.2 The site details and reference numbers correspond to those identified within the 'Housing and Economic Land Availability Assessment' (May 2017), and further detailed in the RBC 'Sequential and Exception Test' (November 2017).

2.1.3 The sites assessed and a location plan in relation to the administrative area of Reading Borough and the main rivers are provided in **Appendix A**.

2.1.4 Where a site has been identified in the Local Plan, the relevant reference number has also been provided.

2.1.5 The sources of information used to inform the site-specific assessments is as detailed below, with the relevant location (or Map prefix) provided for cross-reference to the L1 SFRA.

2.2 Historic Flooding

L1 SFRA Map F2 (EA Historic Records) and F3 (RBC Records)

2.2.1 Historic records of flooding were provided by the EA in the form of their Recorded Flood Outlines (RFO) for the Borough. This shows the *"extents of known flooding from rivers, the sea and groundwater"* over the study area. The below events were previously provided for the L1 SFRA:

- March 1947;
- June 1971 (River Kennet only);
- November 1974;
- August 1977;
- September 1992;
- October 1993;
- December 2000;
- January 2003;
- July 2007; and
- Winter 2013/14.

2.2.2 Flood records were provided by RBC for the L1 SFRA and were also utilised within this study.

2.3 Fluvial Flooding

L1 SFRA Map F5 (Modelled Flood Extents) and F5CC (Modelled Flood Extents with Climate Change Allowances)

2.3.1 The probability of fluvial flooding was assessed using the available detailed hydraulic modelling.

2.3.2 The detailed hydraulic models completed as part of the River Thames (Reading Complex Change) Flood Alleviation Study (June 2011) and the River Kennet Flood Study (2007) were utilised within this assessment.

2.3.3 As part of the L1 SFRA, PBA have re-run the EA River Thames and River Kennet models to assess the flooding impacts based on the EA climate change allowances guidance, as discussed in **Section 1.2**. This work has provided modelled flood extents for the 1 in 100 annual probability +25%, +35% and +70% allowance for climate change scenarios and the appropriate allowances – subject to proposed use and Flood Zone – have been considered when assessing the sites.

2.3.4 It is noted that the EA have confirmed that they are in the process of updating the hydraulic models through the Reading area, with outputs currently anticipated towards the end of 2018.

2.4 Surface Water Flooding

L1 SFRA Map F6

2.4.1 The risk of flooding from surface water was determined using the EA's updated 'Flood Map for Surface Water' ('uFMfSW') released in 2013 as their third iteration of a national scale surface water modelling exercise.

2.5 Reservoir Flooding

L1 SFRA Map F7

2.5.1 The Reservoir Flood Map shows the potential extent of flooding in the event of a breach from large reservoirs (over 25,000 cubic metres of water).

2.5.2 This mapping study assumes a worst-case scenario; i.e. that a breach occurs for the full height and width of the impounding structure when the water level is near the crest.

2.6 Ground water Flooding

L1 SFRA Map F8

2.6.1 The EA 'Areas Susceptible to Groundwater Flooding' (AStGWF) dataset is a strategic scale map showing groundwater flooding probability areas on a 1km square grid. The data is annotated to show what percentage of the 1km area could be susceptible to groundwater flooding, thus providing an indication of the degree of probability of groundwater flooding that is present within a broad area.

2.6.2 The accompanying guidance specifies that *"these data show likelihood of groundwater flooding occurring and is therefore a hazard not risk-based dataset".*

2.7 Sewer Flooding

L1 SFRA Map F9

2.7.1 The risk of sewer flooding at each site was determined using the postcode DG5 register incident count (provided by Thames Water Utilities Ltd for the L1 SFRA), which counts the number of internal and external sewer incidents which have occurred within the postcode area of the site.

3 Requirements for Mitigation

3.1 Overview of Mitigation Requirements

3.1.1 The following sub-sections provide an overview of the mitigation requirements for new development, which are detailed further in the L1 SFRA and have been applied in the recommendations when undertaking the site-specific reviews in **Appendix B**.

3.2 Ground Floor Levels

L1 SFRA Section 12.3

3.2.1 In accordance with the requirements of the relevant British Standards and EA guidance, it is recommended that floor levels of new development are set a minimum of 300mm above the modelled 1 in 100 annual probability plus appropriate allowance for climate change fluvial flood level.

3.2.2 Where a range of climate change allowances are applicable, the generally accepted approach is to use the lower end of the specified range of climate change allowances as a baseline for mitigation requirements.

3.2.3 The higher end is considered as a sensitivity test to consider residual risk and inform additional freeboard requirements – i.e. if floor levels should ideally be above this level, otherwise flood resistant/resilient measures should be incorporated to protect development under such conditions.

3.3 Floodplain Storage

L1 SFRA Section 12.5

3.3.1 Any new development located in the vicinity of a watercourse should be constructed such that it does not reduce the available floodplain storage capacity over a site, which could potentially cause an increase in flood levels on-site or elsewhere.

3.3.2 The impacts require consideration over the proposed lifetime of the development and should therefore be considered up to the 1 in 100 annual probability plus appropriate allowance for climate change flood level.

3.3.3 In assessing the proposed sites for allocation, a high level assessment has been provided in terms of the impact of development on the site to the floodplain storage capacity, with consideration of the availability of compensatory flood storage in the form of higher ground or the removal of (non-floodable) existing building footprint.

3.4 Safe Access and Flood Risk Management

L1 SFRA Section 12.7

3.4.1 It is necessary to consider safe access arrangements as part of the mitigation for any new development and the policy recommendations for safe access and flood risk management are outlined within Section 12.7 of the L1 SFRA.

3.4.2 For proposed 'Less Vulnerable' uses – i.e. commercial or office use where sleeping accommodation is not provided – safe access can typically be addressed through the incorporation of management systems including, in the event of widespread flooding, closure

of the site in advance of flooding affecting the area and re-opening after the flooding has receded.

3.4.3 For 'More Vulnerable' uses, the provision of safe access is a more sensitive issue, particularly in areas affected by flooding from the River Thames (where flooding characteristics are typically of significant lead-in time but also of long duration when flooding does occur).

3.4.4 Section 12.7 of the L1 SFRA set out the issues relating to new development and safe access. Following further discussions with RBC as part of the L2 SFRA it was considered that, based on the flooding characteristics of the area, a more pragmatic approach is required in assessing safe access for new residential development.

3.4.5 This is a particular concern in areas such as Lower Caversham, where a 'physical' safe route at the peak of the 1 in 100 annual probability plus appropriate allowance for climate change flood level is not feasible, and the agreed approach below facilitates regeneration of areas susceptible in severe flood events whilst ensuring that development is not intensified in the areas most at risk of frequent flooding.

3.4.6 The following hierarchy should therefore be applied when considering the provision of safe access to new development in RBC:

More Vulnerable Development:

a) The preference is to have a continuous dry route at the 1 in 100 annual probability plus appropriate allowance for climate change event;

b) If (a) is not achievable, then developer should assess if safe access is available at the current 1 in 100 annual probability flood event (in accordance with Defra flood hazard guidance);

If (b) is achievable, then it is considered safe access in more extreme events could be addressed through provision of a site 'Flood Management and Evacuation Plan', subject to a detailed analysis of the flood hazard along the route and RBC emergency planning department approval;

If (b) is <u>not</u> achievable, it is recommended that the site is <u>not</u> suitable for new (or intensification of) permanent residential development and other uses should be considered (i.e. 'Less Vulnerable' commercial/office development).

3.4.7 The above approach is intended specifically in relation to residential dwellings. Certain other forms of 'More Vulnerable' development, such as hotels, operate as managed facilities and are therefore better placed to introduce suitable operating procedures in the event of an anticipated flood, including Flood Management and Evacuation Plans, to ensure occupants/users take appropriate action and, if necessary, vacate the site in advance of the area being impacted. As such, it is important to discuss the arrangements for safe access with RBC at the earliest opportunity.

3.5 Surface Water Drainage

L1 SFRA Section 13

3.5.1 Any new development needs to ensure that proposed surface water drainage arrangements are appropriately designed to ensure no increase – and preferably a decrease – in flood risk with priority given to the use of Sustainable Drainage Systems (SuDS) to replicate, as closely as possible, the natural (pre-development) drainage regime of a site.

3.5.2 Different forms of SuDS contribute to the key pillars of water quantity, water quality, amenity and biodiversity and measures which provide an enhancement of these elements should be actively encouraged.

3.5.3 As of April 2015, the Lead Local Flood Authority (LLFA) has become the statutory consultee for surface water management on planning applications for 'major development'. As the LLFA, RBC are therefore responsible for the approval of surface water drainage systems within such development. Major development consists of any of the following:

- The provision of dwelling houses where residential development of 10 or more units; or where the development is to be carried out on a site having an area of 0.5 hectares or more and the number of units is not known;
- The provision of a building or buildings where the floor space to be created by the development is 1,000 square metres or more; or,
- Development carried out on a site having an area of 1 hectare or more.

3.5.4 The L1 SFRA should be reviewed to provide guidance on design criteria and level of detail for surface water drainage submissions.

4 Conclusion

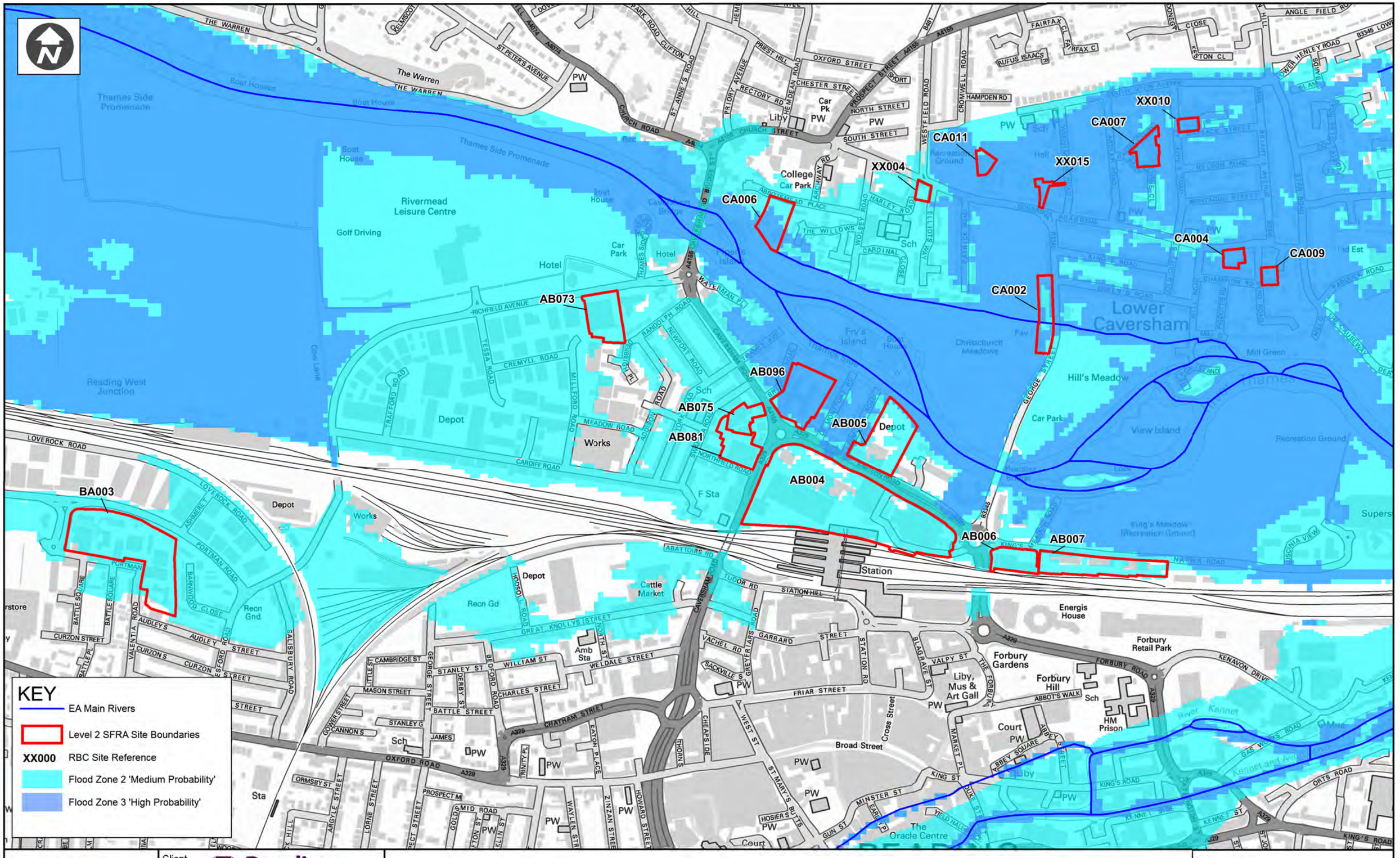
4.1.1 This Level 2 Strategic Flood Risk Assessment (L2 SFRA) considered 18 potential development sites based in Flood Zones 2 'Medium Probability' and Flood Zone 3 'High Probability'.

4.1.2 Of these sites, it was considered that, provided appropriate flood risk mitigation techniques are incorporated into the development design, that development would be feasible in accordance with the requirements of the NPPF. All of the sites would be subject to a site-specific detailed FRA, and a number of them would benefit from further analysis of the safe access arrangements.

Appendix A List of Sites and Location Plan

L2 SFRA Reference	Site Name	Local Plan Reference
AB004	North of the Station	CR11e
AB005	Riverside	CR11g
AB006	Napier Road Junction	CR11h
AB007	Napier Court	CR11i
AB073	28-30 Richfield Avenue	WR3c
AB075	115-117 Caversham Road	CR11f - part
AB081	Subgard Self-Storage, 75-77 Caversham Road	CR11f - part
AB096	Great Brigham's Mead	Not Identified
BA003	Part of former Battle Hospital, Portman Road	WR3i
CA002	72 George Street	Not Identified
CA004	383 Gosbrook Road	Not Identified
CA006	Reading University Boat Club, Promenade Road	CA1a
CA007	Cantay House, Ardler Road	Not Identified
CA009	4-6 Send Road	Not Identified
CA011	Former Caversham Nursery, 82 Gosbrook Road	Not Identified
XX004	Confidential site 4	Not Identified
XX010	Confidential site 10	Not Identified
XX015	Confidential site 15	Not Identified

PBA Drawing ref: 27560/4009/001 – Location of Sites Overlaid on EA Flood Zone Map



pba peterbrett www.peterbrett.com Peter Brett Associates LLP READING Tel: 0118 950 0761 Fax: 0118 959 7498	Client: Reading Borough Council — Working better with you Contains Ordnance Survey data © Crown copyright and database right 2010	**RBC SFRA Level 2** Location of Sites Overlaid on EA Flood Zone Map	Date: 11/12/2017 Scale: NTS Drawn By: NV Checked By: RF Rev: - Figure Number **27560/4009/001**

.\\27560 RBC LLFA support\4009 - Level 2 SFRA\WP\MapInfo

Appendix B Site-Specific Reviews

The references used are from the Council's Housing and Economic Land Availability Assessment (November 2017):

- AB004 – North of the Station
- AB005 – Riverside
- AB006 – Napier Road Junction
- AB007 – Napier Court
- AB073 – 28-30 Richfield Avenue
- AB075 – 115-117 Caversham Road
- AB081 – Subgard Self-Storage, 75-77 Caversham Road
- AB096 – Great Brigham's Mead
- BA003 – Part of former Battle Hospital, Portman Road
- CA002 – 72 George Street
- CA004 – 383 Gosbrook Road
- CA006 – Reading University Boat Club, Promenade Road
- CA007 – Cantay House, Ardler Road
- CA009 – 4-6 Send Road
- CA011 – Former Caversham Nursery, 82 Gosbrook Road
- XX004 – Confidential Site 4
- XX010 – Confidential Site 10
- XX015 – Confidential Site 15

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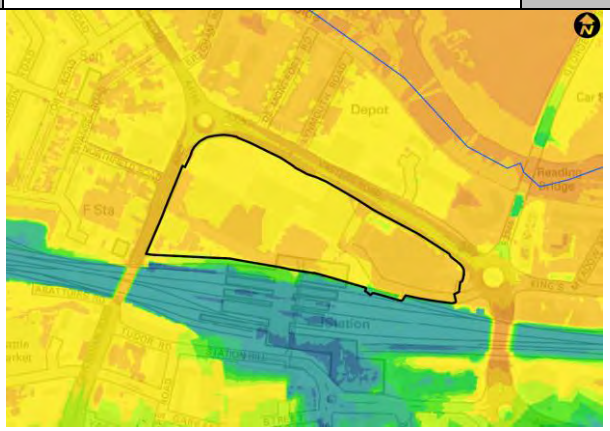
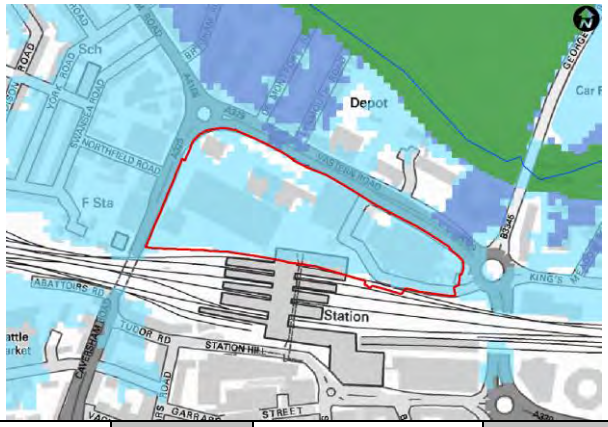
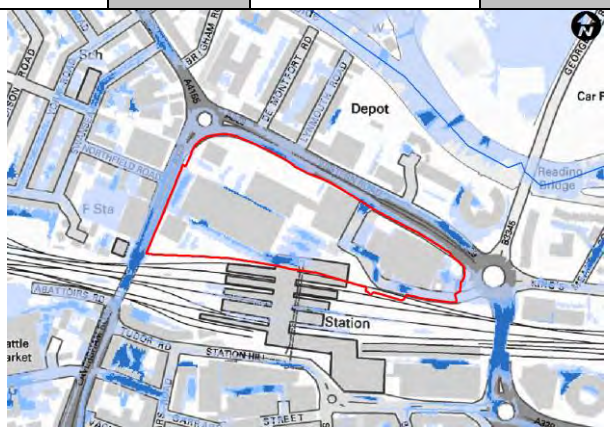
AB004 - North of the Station (Local Plan ref: CR11e)							
Grid Reference	SU 71490 471490			**Post Code**	RG1 8AL		
Topography				**Elevation** < 35 mAOD 35 - 36 mAOD 36 - 37 mAOD 37 - 38 mAOD 38 - 39 mAOD 39 - 40mAOD 40 - 41 mAOD 41 - 42 mAOD 42 - 43 mAOD 43 - 44 mAOD 44 - 45 mAOD > 45 mAOD The topography of the site is largely flat, ranging between approximately 37.5m AOD and 39.4m AOD.		
Flood Zone Map				**Legend** River Site Boundary Flood Zone 2 Flood Zone 3 Flood Zone 3b			
Flood Zone 1	10%	**Flood Zone 2**	90%	**Flood Zone 3a**	0%	**Flood Zone 3b**	0%
Surface Water				**Risk of Surface Water Flooding** River Site Boundary High - 1 in 30 annual probability Medium - 1 in 100 annual probability Low - 1 in 1000 annual Probability Very Low - > 1 in 1000 annual probability			

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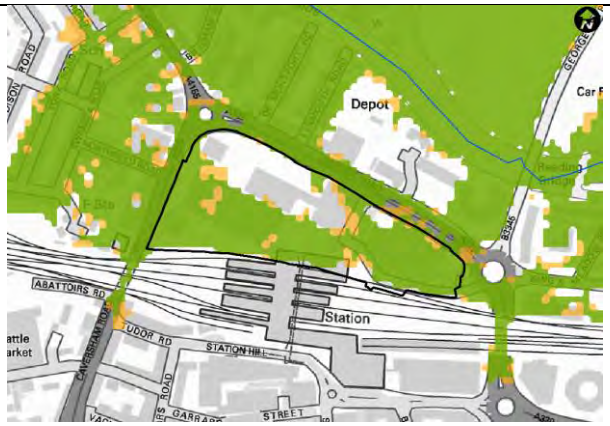
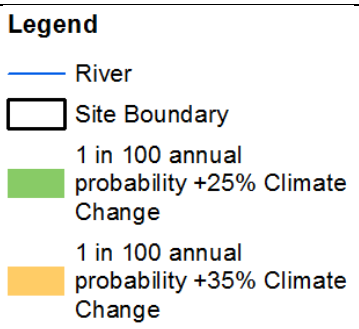
Development Proposal	640-960 dwellings, 50,000m^2 of offices, 3,000 - 6,000m^2 net gain of retail, leisure, potential hotel.	**Vulnerability Classification**	Less Vulnerable (offices/retail), More Vulnerable (residential)
Applicable Climate Change Allowances	The +25% and +35% peak river flow climate change allowances should therefore be used to assess a range of climate change scenarios. The +25% allowance should be used to provide a benchmark flood level against which mitigation measures should be set, and the +35% allowance used to assess residual risk to the development.		
Climate Change Extents			

1 in 100 annual probability +25%	60%	**1 in 100 annual probability +35%**	70%	**1 in 100 annual probability +70%**	N/A

Description of Flood Risk

Flood Depth

No flooding occurs in the present day 1 in 100 annual probability event. In the 1 in 1000 annual probability flood event, the site experiences maximum flood depths of typically 400mm.

Flood depths in the climate change scenarios are typically 100mm in the +25% scenario, and 200mm in the +35% scenario.

Flood Warning and Period of Inundation

The River Thames is a large catchment with flooding typically the result of sustained regional-scale rainfall events. The response time – i.e. the period between the rainfall over the catchment and the rising river levels downstream – can be significant, and this ensures there is typically a significant period of advance warning (i.e. a period of days) before flooding occurs in the area.

The EA issue flood warnings for the area via their 'Flood Information Service' and considerable advance warning of a flood event can typically be provided to allow the Council, emergency services residents and businesses to take appropriate action.

Velocity of Flood Waters

The site is occupied by buildings in an urbanised area, a relatively significant distance from the main river, and is impacted in the climate change allowance scenarios. When flooding does occur, the rate of rise and fall in water level is slow and velocities will correspondingly be slow, with the direction of flow from west to east (subject to further interrogation of the EA modelling).

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Description of Flood Risk	**Flood Defences** While not a 'formal' flood defence, the EA asset register does identify that the River Thames, located approximately 0.2km north of the site, includes bank protection on its right bank with a design standard of 1 in 5 years. The condition is currently at 4 (poor), on a scale of 1 (very good) to 5 (very poor).
	Other Sources of Flooding The Level 1 SFRA indicates that the site has not been subject to historic river flooding, and is not noted to have been impacted by flood events from other sources. Vastern Road, located north of the site, has previously been impacted by flooding. External areas are noted to be impacted by surface water flooding, which, if surface water drainage strategy is not sufficiently incorporated into proposed development design, could result in ponding of water following heavy rainfall events. Site drainage must therefore be considered with respect to future development, and must be assessed in accordance with Sections 13.4 and 13.5 of the Level 1 SFRA. The susceptibility to groundwater flooding varies between '25% to 50%' and '>75%'. The Thames Water DG5 information indicates that the site is within a postcode (RG1 8) that has 21-50 recorded sewer flood incidents, both internal and external. The site is not located within a maximum modelled breach extent of reservoir flooding and is therefore at negligible risk of flooding in the event of a reservoir breach.
	Overview of Flood Risk A summary of the flood risk to the site is provided below: • The site is classified as Flood Zone 2 'Medium Probability' (between 1 in 100 and 1 in 1000 annual probability of river flooding); • The maximum flood depth during the 1 in 1000 annual probability event is typically 400mm; • Approximately half of the site is impacted by the 1 in 100 annual probability +25% allowance for climate change flood event with general depths of 100mm, rising to 200mm in the 1 in 100 annual probability +35% climate change allowance scenario; • The site is largely classified as at Very Low risk of surface water flooding, with localised areas between Low and High risk; • The site is at negligible risk of flooding in the event of a reservoir breach; • The pedestrian access route via Vastern Road is impacted by the 1 in 100 annual probability +35% climate change allowance flood event. Further analysis of flood depths/flood hazard is required and development may be reliant on advance warning measures and provision of a Flood Risk Management/Evacuation Plan. For the commercial elements an evacuation plan should be sufficient and the building could be vacated and secured in advance of flooding. The site is shown to be at 'Medium' probability of fluvial flooding, at a range of very low to high risk of surface water flooding and may be susceptible to groundwater and sewer flooding. The site is therefore potentially at risk of flooding from a number of sources but it is considered feasible that the site can be developed safely and in accordance with the requirements of the NPPF, to mitigate the potential risks of these sources of flooding. It is important that the design process considers the risk of flooding at the earliest conceptual stage, encompassing measures that will ensure the safety of future tenants/residents during a flood event. A number of important design recommendations are set out below.

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Planning Recommendations

Spatial Planning

The site lies within Flood Zone 2 'Medium Probability', affected by flooding from the River Thames in the 1 in 1000 annual probability flood event. The majority of the site is shown to be impacted by the 1 in 100 annual probability +25% and +35% allowances for climate change flood events.

A review of flood risk within the site has been carried out, and it is considered feasible to design the site in such a way that it remains safe throughout the lifetime of the development.

It is essential that the following design recommendations are incorporated into the design process from the conceptual stage. A detailed site-based Flood Risk Assessment will be required as an integral part of the planning application stage, which should be carried out in accordance with Section 10.4 of the Level 1 SFRA.

Design Recommendations

1. Floor levels within the site should be situated a minimum of 300mm above the 1 in 100 annual probability plus allowance for climate change, in this instance +25%, assuming a 100 year lifetime for residential development;

2. Flood storage should be analysed to show that the proposed building footprint of the development will not cause a detriment to the available storage during the 1 in 100 annual probability +25% climate change allowance flood event. The presence of a significant existing building footprint suggest that floodplain storage capacity could be improved through effective design measures;

3. Where appropriate, buildings should adopt resilient design techniques to minimise the damage and disruption sustained by businesses and/or residents following a flooding event. Further guidance can be found in BRE Digest DG523 'Flood Resilient Building', the Department for Communities and Local Government document 'Improving the Flood Performance of New Buildings – Flood Resilient Construction', and Section 12.4 of the Level 1 SFRA';

4. Sustainable Drainage Systems (SuDS) should be incorporated into the site design, aiming to achieve greenfield runoff rates, if feasible, in accordance with Section 13.4 of the Level 1 SFRA. It is important that SUDS are designed with due consideration to soil and groundwater conditions. Infiltration techniques should be sought wherever possible, however are likely to be unsuitable in areas of shallow groundwater and/or impermeable soils. Further guidance on designing for groundwater is provided in Section 6.5 of the Level 1 SFRA. Buildings and landscaping should be designed within the site to avoid locking overland flow routes;

5. Safe access is available in the current 1 in 100 annual probability flood event and would therefore meet the requirements of Section 3.4 of the L2 SFRA provided a 'Flood Management and Evacuation Plan' is prepared to consider the impacts in the climate change scenarios. Future tenants/residents within the site should be made aware of the potential risks of flooding, and should be actively encouraged to sign up to the Environment Agency's Flood Information Service to receive flood alerts, flood warnings and severe flood warnings well in advance of an event;

6. It is essential to ensure that all basement areas within flood affected areas of the site are watertight, and the entrance point is situated above the 1 in 100 annual probability +25% allowance for climate change flood level. Basements should not be used to provide habitable areas in locations classified at Flood Zone 2 'Medium Probability';

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	7. Residual risk to the development should be investigated against the 1 in 100 annual probability +35% allowance for climate change flood event.

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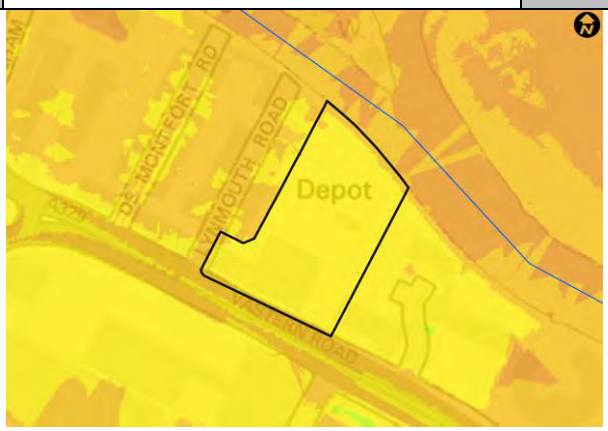
AB005 - Riverside (Local Plan ref: CR11g)			
Grid Reference	SU 71550 471550	**Post Code**	RG1 8DD

Topography

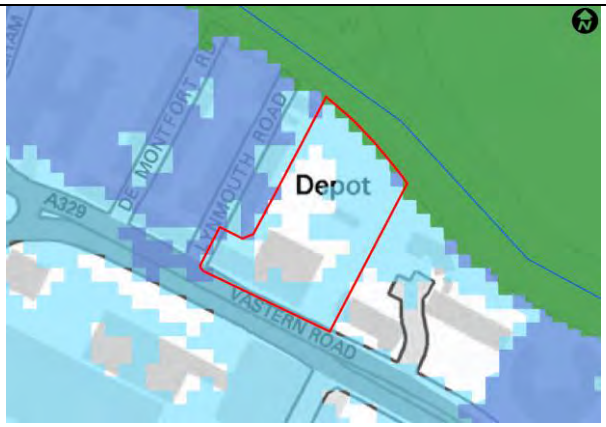


Elevation

- < 35 mAOD
- 35 - 36 mAOD
- 36 - 37 mAOD
- 37 - 38 mAOD
- 38 - 39 mAOD
- 39 - 40mAOD
- 40 - 41 mAOD
- 41 - 42 mAOD
- 42 - 43 mAOD
- 43 - 44 mAOD
- 44 - 45 mAOD
- > 45 mAOD

The topography of the site is largely flat, ranging between approximately 38.2m AOD and 38.6m AOD.

Flood Zone Map

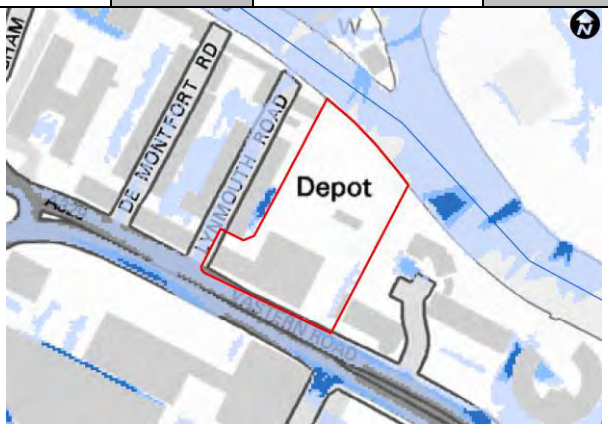


Legend

- River
- Site Boundary
- Flood Zone 2
- Flood Zone 3
- Flood Zone 3b

Flood Zone 1	30%	**Flood Zone 2**	60%	**Flood Zone 3a**	5%	**Flood Zone 3b**	5%

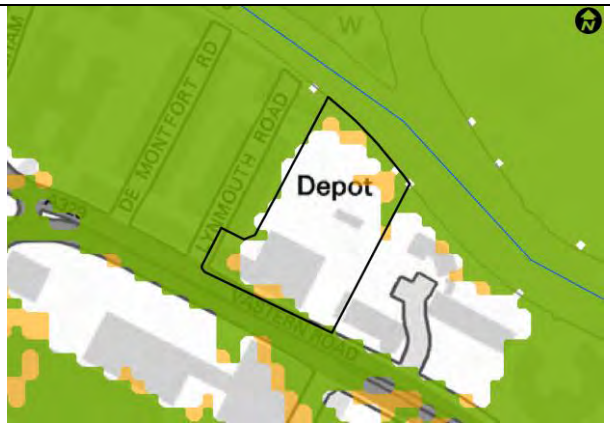
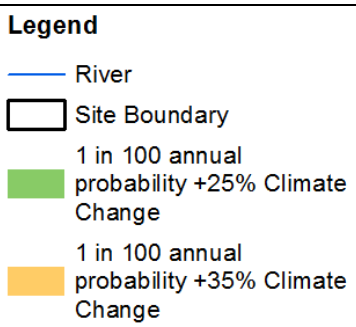
Surface Water



Risk of Surface Water Flooding

- River
- Site Boundary
- High - 1 in 30 annual probability
- Medium - 1 in 100 annual probability
- Low - 1 in 1000 annual Probability
- Very Low - > 1 in 1000 annual probability

Reading Borough Council
Level 2 Strategic Flood Risk Assessment

Development Proposal	250 - 370 dwellings and 1,000 - 2,000m^2 of leisure	**Vulnerability Classification**	Less Vulnerable, More Vulnerable
Applicable Climate Change Allowances	The +25% and +35% peak river flow climate change allowances should be used to assess a range of climate change scenarios, based on More Vulnerable proposed development (i.e. based on the highest vulnerability element proposed). The +25% allowance should be used to provide a benchmark flood level against which mitigation measures should be set, and the +35% allowance used to assess residual risk to the development.		
Climate Change Extents			

1 in 100 annual probability +25%	20%	**1 in 100 annual probability +35%**	25%	**1 in 100 annual probability +70%**	N/A

Description of Flood Risk

Flood Depth
The site is unaffected in the present day 1 in 100 annual probability event. In the 1 in 1000 annual probability flood event, parts of the site experience maximum flood depths up to 400mm.

In the applicable climate change scenarios, the majority of the site remains unaffected by flooding but maximum flood depths in the northern and western parts of the site are typically 200mm in the +25% scenario, and 300mm in the +35% scenario.

Flood Warning and Period of Inundation
The River Thames is a large catchment with flooding typically the result of sustained regional-scale rainfall events. The response time – i.e. the period between the rainfall over the catchment and the rising river levels downstream – can be significant, and this ensures there is typically a significant period of advance warning (i.e. a period of days) before flooding occurs in the area.

The EA issue flood warnings for the area via their 'Flood Information Service' and considerable advance warning of a flood event can typically be provided to allow the Council, emergency services residents and businesses to take appropriate action.

Velocity of Flood Waters
The site is in occupied by buildings in an urbanised area, and is impacted to a limited degree in the climate change allowance scenarios. When flooding does occur, the rate of rise and fall in water level is typically slow and velocities will correspondingly be slow with the direction of flow from west to east

Reading Borough Council
Level 2 Strategic Flood Risk Assessment

Description of Flood Risk	(subject to further interrogation of the EA modelling). However, the northern boundary is adjacent to the River Thames channel and higher velocity flows would be anticipated at this location.
	Flood Defences While not a 'formal' flood defence, the EA asset register does identify that the River Thames, located adjacent to the northern boundary of the site, includes bank protection on its right bank with a design standard of 1 in 5 years. The condition is currently at 4 (poor), on a scale of 1 (very good) to 5 (very poor).
	Historic Records and Other Sources of Flooding The Level 1 SFRA indicates that the northern boundary of the site – due to the proximity of the River Thames – has been subject to historic river flooding in 1977, 2000, 2003, 2012 and 2013/14, and notes that an area east of the site has previously been impacted by fluvial flooding, caused by blockage. The site is not noted to have been impacted by historic flooding from other sources. Vastern Road, located south of the site, has previously been impacted by road flooding. Site drainage must be considered accordingly and must be assessed in accordance with Sections 13.4 and 13.5 of the Level 1 SFRA. The susceptibility to groundwater flooding varies between '25% and 50%'. The Thames Water DG5 information indicates that the site is within a postcode (RG1 8) that has 21-50 recorded sewer flood incidents, both internal and external. The site is not located within a maximum modelled breach extent of reservoir flooding and is therefore at negligible risk of flooding in the event of a reservoir breach.
	Overview of Flood Risk A summary of the flood risk to the site is provided below: • The majority of the site is classified as Flood Zone 2 'Medium Probability' (between 1 in 100 and 1 in 1000 annual probability of river flooding); • The site is unaffected in the present day 1 in 100 annual probability event. Maximum flood depths during the 1 in 1000 annual probability event are up to 400mm; • A minor portion of the western and northern boundaries is impacted by the 1 in 100 annual probability +25% allowance for climate change flood event with depths up to 200mm, rising to 300mm in the +35% climate change allowance scenario; • The site is largely classified as at Very Low risk of surface water flooding, with a minor area of Low risk on the eastern boundary; • The site is at negligible risk of flooding in the event of a reservoir breach; • The pedestrian access route via Vastern Road would be available in the present day 1 in 100 annual probability event but would be impacted in climate change scenarios. Further analysis of flood depths/flood hazard is required and development would be reliant on provision of a Flood Management and Evacuation Plan. The site is shown to be at 'Medium' probability of fluvial flooding, at very low/low risk of surface water flooding and may be susceptible to groundwater and sewer flooding. The site is therefore potentially at risk of flooding from a number of sources but it is considered feasible that the site can be developed safely and in accordance with the requirements of the NPPF, to mitigate the potential risks of these sources of flooding. It is important that the design process considers the risk of flooding at the earliest conceptual stage, encompassing measures that will ensure the safety of future tenants/residents during a flood event. A number of important design recommendations are set out below.

Reading Borough Council
Level 2 Strategic Flood Risk Assessment

Planning Recommendations

Spatial Planning

The site lies within Flood Zone 2 'Medium Probability', affected by flooding from the River Thames in the 1 in 1000 annual probability flood event. Small areas of the site are shown to be impacted by the 1 in 100 annual probability +25% and +35% allowances for climate change flood events.

A review of flood risk within the site has been carried out, and it is considered feasible to design the site in such a way that it remains safe throughout the lifetime of the development.

It is essential that the following design recommendations are incorporated into the design process from the conceptual stage. A detailed site-based Flood Risk Assessment will be required as an integral part of the planning application stage, which should be carried out in accordance with Section 10.4 of the Level 1 SFRA.

Design Recommendations

1. Floor levels within the site should be situated a minimum of 300mm above the 1 in 100 annual probability plus allowance for climate change, in this instance +25%, assuming a 100 year lifetime for residential development;

2. Flood storage should be analysed to show that the proposed building footprint of the development will not cause a detriment to the available storage during the 1 in 100 annual probability +25% climate change allowance flood event;

3. Where appropriate, buildings should adopt resilient design techniques to minimise the damage and disruption sustained by businesses and/or residents following a flooding event. Further guidance can be found in BRE Digest DG523 'Flood Resilient Building', the Department for Communities and Local Government document 'Improving the Flood Performance of New Buildings – Flood Resilient Construction', and Section 12.4 of the Level 1 SFRA';

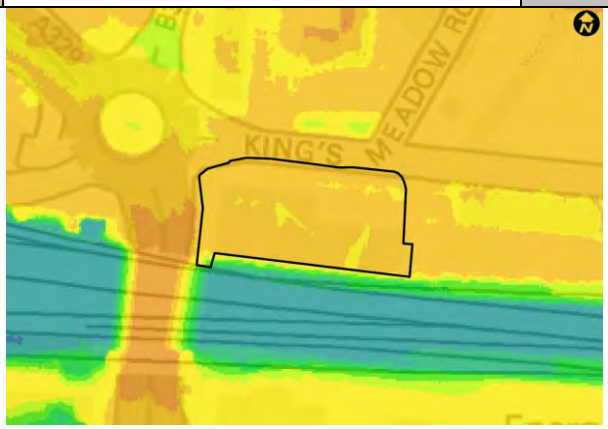
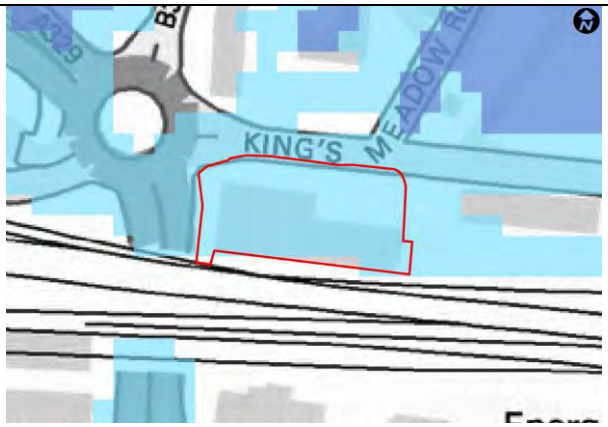
4. Sustainable Drainage Systems (SuDS) should be incorporated into the site design, aiming to achieve greenfield runoff rates, if feasible, in accordance with Section 13.4 of the Level 1 SFRA. It is important that SUDS are designed with due consideration to soil and groundwater conditions. Infiltration techniques should be sought wherever possible, however are likely to be unsuitable in areas of shallow groundwater and/or impermeable soils. Further guidance on designing for groundwater is provided in Section 6.5 of the Level 1 SFRA. Buildings and landscaping should be designed within the site to avoid locking overland flow routes;

5. Safe access is available in the current 1 in 100 annual probability flood event and would therefore meet the requirements of Section 3.4 of the L2 SFRA provided a 'Flood Management and Evacuation Plan' is prepared to consider the impacts in the climate change scenarios. Future tenants/residents within the site should be made aware of the potential risks of flooding, and should be actively encouraged to sign up to the Environment Agency's Flood Information Service to receive flood alerts, flood warnings and severe flood warnings well in advance of an event;

6. It is essential to ensure that all basement areas within flood affected areas of the site are watertight, and the entrance point is situated above the 1 in 100 annual probability +25% allowance for climate change flood level. Basements should not be used to provide habitable areas in locations classified at Flood Zone 2 'Medium Probability';

7. Residual risk to the development should be investigated against the 1 in 100 annual probability +35% allowance for climate change flood event.

Reading Borough Council
Level 2 Strategic Flood Risk Assessment

AB006 - Napier Road Junction (Local Plan ref: CR11h)							
Grid Reference	SU 71830 73870			**Post Code**	RG1 8BN		
Topography				**Elevation** < 35 mAOD 35 - 36 mAOD 36 - 37 mAOD 37 - 38 mAOD 38 - 39 mAOD 39 - 40mAOD 40 - 41 mAOD 41 - 42 mAOD 42 - 43 mAOD 43 - 44 mAOD 44 - 45 mAOD > 45 mAOD The topography of the site is largely flat, ranging between approximately 37.5m AOD and 38.0m AOD.		
Flood Zone Map				**Legend** Site Boundary Flood Zone 2 Flood Zone 3			
Flood Zone 1	0%	**Flood Zone 2**	100%	**Flood Zone 3a**	0%	**Flood Zone 3b**	0%
Surface Water				**Risk of Surface Water Flooding** River Site Boundary High - 1 in 30 annual probability Medium - 1 in 100 annual probability Low - 1 in 1000 annual Probability Very Low - > 1 in 1000 annual probability			

Reading Borough Council
Level 2 Strategic Flood Risk Assessment

Development Proposal	200 - 300 dwellings and 2,000 - 3,000m^2 retail or commercial use	**Vulnerability Classification**	Less Vulnerable, More Vulnerable
Applicable Climate Change Allowances	The +25% and +35% peak river flow climate change allowances should therefore be used to assess a range of climate change scenarios, based on More Vulnerable proposed development (i.e. based on the highest vulnerability element proposed). The +25% allowance should be used to provide a benchmark flood level against which mitigation measures should be set, and the +35% allowance used to assess residual risk to the development.		
Climate Change Extents			**Legend** River Site Boundary 1 in 100 annual probability +25% Climate Change 1 in 100 annual probability +35% Climate Change

1 in 100 annual probability +25%	65%	**1 in 100 annual probability +35%**	80%	**1 in 100 annual probability +70%**	N/A

Description of Flood Risk

Flood Depth
The site is unaffected in the present day 1 in 100 annual probability event. In the 1 in 1000 annual probability flood event, parts of the site experience maximum flood depths between 100mm and 400mm.

Flood depths in the climate change scenarios are typically 100mm in the +25% scenario, and 200mm in the +35% scenario.

Flood Warning and Period of Inundation
The River Thames is a large catchment with flooding typically the result of sustained regional-scale rainfall events. The response time – i.e. the period between the rainfall over the catchment and the rising river levels downstream – can be significant, and this ensures there is typically a significant period of advance warning (i.e. a period of days) before flooding occurs in the area.

The EA issue flood warnings for the area via their 'Flood Information Service' and considerable advance warning of a flood event can typically be provided to allow the Council, emergency services residents and businesses to take appropriate action.

Velocity of Flood Waters
The site is occupied by buildings in an urbanised area, a significant distance from the main river, and is impacted in the climate change allowance scenarios. When flooding does occur, the rate of rise and fall in water level is slow and velocities will correspondingly be slow, with the direction of flow from west to east (subject to further interrogation of the EA modelling).

Reading Borough Council
Level 2 Strategic Flood Risk Assessment

Description of Flood Risk

Flood Defences
While not a 'formal' flood defence, the EA asset register does identify that the River Thames, located approximately 0.14km north of the site, includes bank protection on its right bank with a design standard of 1 in 2 years. The condition is currently at a combination of 2 (good) and 4 (poor), on a scale of 1 (very good) to 5 (very poor).

Historic Records and Other Sources of Flooding
The Level 1 SFRA shows that the site is not noted to have been impacted by historic river flooding, or by flooding from other sources. Flood information has been provided for Forbury Road, located west of the site, and is shown to have previously been impacted by flooding. Site drainage must be considered accordingly and must be assessed in accordance with Sections 13.4 and 13.5 of the Level 1 SFRA.

The susceptibility to groundwater flooding is '>75%'. The Thames Water DG5 information indicates that the site is within a postcode (RG1 8) that has 21-50 recorded sewer flood incidents, both internal and external.

The site is not located within a maximum modelled breach extent of reservoir flooding and is therefore at negligible risk of flooding in the event of a reservoir breach.

Overview of Flood Risk
A summary of the flood risk to the site is provided below:

- The site is classified as Flood Zone 2 'Medium Probability' (between 1 in 100 and 1 in 1000 annual probability of river flooding) and is not noted to have been impacted by historic flooding;
- The site is unaffected in the present day 1 in 100 annual probability event. The maximum flood depth during the 1 in 1000 annual probability event is typically between 100mm and 400mm;
- The majority of the site is impacted by the 1 in 100 annual probability +25% allowance for climate change flood event with general depths between 100mm and 200mm;
- Maximum flood depths for the 1 in 100 annual probability +35% climate change allowance typically vary between 200mm and 300mm;
- The site is largely classified as at Very Low risk of surface water flooding, with minor, localised areas between Low and Medium risk;
- The site is at negligible risk of flooding in the event of a reservoir breach;
- The pedestrian access route via Napier Road is impacted by the 1 in 100 annual probability +25% climate change scenario. Further analysis of flood depths/flood hazard is required and development may be reliant on advance warning measures and provision of a Flood Risk Management/Evacuation Plan.

The site is shown to be at medium risk of fluvial flooding, at a range of very low to medium risk of surface water flooding and may be susceptible to groundwater and sewer flooding. The site is therefore potentially at risk of flooding from a number of sources but it is considered feasible that the site can be developed safely and in accordance with the requirements of the NPPF, to mitigate the potential risks of these sources of flooding.

It is important that the design process considers the risk of flooding at the earliest conceptual stage, encompassing measures that will ensure the safety of future tenants/residents during a flood event.

A number of important design recommendations are set out below.

Reading Borough Council
Level 2 Strategic Flood Risk Assessment

Planning Recommendations

Spatial Planning

The site lies within Flood Zone 2 'Medium Probability', affected by flooding from the River Thames in the 1 in 1000 annual probability flood event. The majority of the site is shown to be impacted by the 1 in 100 annual probability +25% and +35% allowances for climate change flood events.

A review of flood risk within the site has been carried out, and it is considered feasible to design the site in such a way that it remains safe throughout the lifetime of the development.

It is essential that the following design recommendations are incorporated into the design process from the conceptual stage. A detailed site-based Flood Risk Assessment will be required as an integral part of the planning application stage, which should be carried out in accordance with Section 10.4 of the Level 1 SFRA.

Design Recommendations

1. Floor levels within the site should be situated a minimum of 300mm above the 1 in 100 annual probability plus allowance for climate change, in this instance +25%, assuming a 100 year lifetime for residential development;

2. Flood storage should be analysed to show that the proposed building footprint of the development will not cause a detriment to the available storage during the 1 in 100 annual probability +25% climate change allowance flood event. The existing site contains a significant existing building footprint – however, a significant proportion of this is currently a floodable undercroft parking area;

3. Where appropriate, buildings should adopt resilient design techniques to minimise the damage and disruption sustained by businesses and/or residents following a flooding event. Further guidance can be found in BRE Digest DG523 'Flood Resilient Building', the Department for Communities and Local Government document 'Improving the Flood Performance of New Buildings – Flood Resilient Construction', and Section 12.4 of the Level 1 SFRA';

4. Sustainable Drainage Systems (SuDS) should be incorporated into the site design, aiming to achieve greenfield runoff rates, if feasible, in accordance with Section 13.4 of the Level 1 SFRA. It is important that SUDS are designed with due consideration to soil and groundwater conditions. Infiltration techniques should be sought wherever possible, however are likely to be unsuitable in areas of shallow groundwater and/or impermeable soils. Further guidance on designing for groundwater is provided in Section 6.5 of the Level 1 SFRA. Buildings and landscaping should be designed within the site to avoid locking overland flow routes;

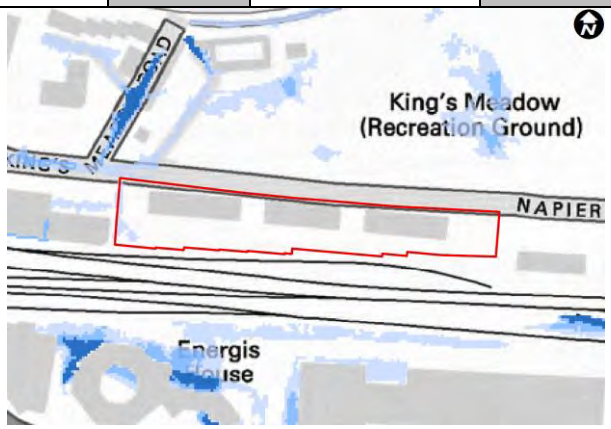
5. Safe access is available in the current 1 in 100 annual probability flood event and would therefore meet the requirements of Section 3.4 of the L2 SFRA provided a 'Flood Management and Evacuation Plan' is prepared to consider the impacts in the climate change scenarios. Future tenants/residents within the site should be made aware of the potential risks of flooding, and should be actively encouraged to sign up to the Environment Agency's Flood Information Service to receive flood alerts, flood warnings and severe flood warnings well in advance of an event;

6. It is essential to ensure that all basement areas within flood affected areas of the site are watertight, and the entrance point is situated above the 1 in 100 annual probability +25% allowance for climate change flood level. Basements should not be used to provide habitable areas in locations classified at Flood Zone 2 'Medium Probability';

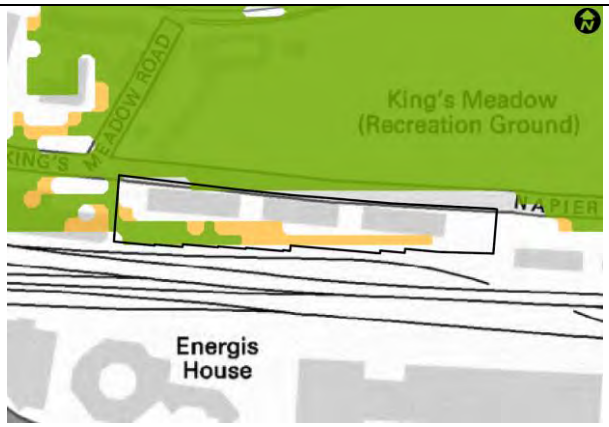
Reading Borough Council
Level 2 Strategic Flood Risk Assessment

	7. Residual risk to the development should be investigated against the 1 in 100 annual probability +35% allowance for climate change flood event.

Reading Borough Council
Level 2 Strategic Flood Risk Assessment

AB007 - Napier Court (Local Plan ref: CR11i)							
Grid Reference	SU 72030 73860			**Post Code**	RG1 8BW		
Topography				**Elevation** < 35 mAOD 35 - 36 mAOD 36 - 37 mAOD 37 - 38 mAOD 38 - 39 mAOD 39 - 40mAOD 40 - 41 mAOD 41 - 42 mAOD 42 - 43 mAOD 43 - 44 mAOD 44 - 45 mAOD > 45 mAOD The topography of the site is largely flat, ranging between approximately 37.5m AOD and 38.0m AOD.		
Flood Zone Map				**Legend** River Site Boundary Flood Zone 2 Flood Zone 3 Flood Zone 3b			
Flood Zone 1	30%	**Flood Zone 2**	70%	**Flood Zone 3a**	0%	**Flood Zone 3b**	0%
Surface Water				**Risk of Surface Water Flooding** River Site Boundary High - 1 in 30 annual probability Medium - 1 in 100 annual probability Low - 1 in 1000 annual Probability Very Low - > 1 in 1000 annual probability			

Reading Borough Council
Level 2 Strategic Flood Risk Assessment

Development Proposal	180 - 260 dwellings	**Vulnerability Classification**	More Vulnerable
Applicable Climate Change Allowances	The site is located within Flood Zone 2 'Medium Probability', and the proposed development is classified as More Vulnerable (the extent of Flood Zone 1 'Low Probability' is largely limited to the existing building footprint). The +25% and +35% peak river flow climate change allowances should therefore be used to assess a range of climate change scenarios. The +25% allowance should be used to provide a benchmark flood level against which mitigation measures should be set, and the +35% allowance used to assess residual risk to the development.		
Climate Change Extents		**Legend** River Site Boundary 1 in 100 annual probability +25% Climate Change 1 in 100 annual probability +35% Climate Change	
1 in 100 annual probability +25%	10%	**1 in 100 annual probability +35%**	30%
1 in 100 annual probability +70%	N/A		

Description of Flood Risk

Flood Depth

The site is unaffected in the present day 1 in 100 annual probability event. The flood depths in the 1 in 1000 annual probability flood event typically vary between 100mm and 300mm over the site.

Flood depths in the climate change scenarios are typically 100mm in the +25% scenario, and 200mm in the +35% scenario.

Flood Warning and Period of Inundation

The River Thames is a large catchment with flooding typically the result of sustained regional-scale rainfall events. The response time – i.e. the period between the rainfall over the catchment and the rising river levels downstream – can be significant, and this ensures there is typically a significant period of advance warning (i.e. a period of days) before flooding occurs in the area.

The EA issue flood warnings for the area via their 'Flood Information Service' and considerable advance warning of a flood event can typically be provided to allow the Council, emergency services residents and businesses to take appropriate action.

Velocity of Flood Waters

The site is occupied by buildings in an urbanised area, a significant distance from the main river, and is impacted in the climate change allowance scenarios. When flooding does occur, the rate of rise and fall in water level is slow and velocities will correspondingly be slow, with the direction of flow from west to east (subject to further interrogation of the EA modelling).

Reading Borough Council
Level 2 Strategic Flood Risk Assessment

Description of Flood Risk	**Flood Defences** While not a 'formal' flood defence, the EA asset register does identify that the River Thames, located approximately 0.14km north of the site, includes bank protection on its right bank with a design standard of 1 in 5 years. The condition is currently at 2 (good), on a scale of 1 (very good) to 5 (very poor).
	Historic Records and Other Sources of Flooding The Level 1 SFRA indicates that the site has not been subject to historic river flooding, and is not noted to have been impacted by flood events from other sources. Site drainage must be considered accordingly and must be assessed in accordance with Sections 13.4 and 13.5 of the Level 1 SFRA. The susceptibility to groundwater flooding is '>75%'. The Thames Water DG5 information indicates that the site is within a postcode (RG1 8) that has 21-50 recorded sewer flood incidents, both internal and external. The site is not located within a maximum modelled breach extent of reservoir flooding and is therefore at negligible risk of flooding in the event of a reservoir breach.
	Overview of Flood Risk A summary of the flood risk to the site is provided below: • The site is classified as Flood Zone 2 'Medium Probability' (between 1 in 100 and 1 in 1000 annual probability of river flooding) and has not been subject to historic river flooding; • The maximum flood depth during the 1 in 1000 annual probability event is typically between 100mm and 300mm; • A minor portion of the site is impacted by the 1 in 100 annual probability +25% allowance for climate change flood event with general depths between 10mm and 100mm; • Maximum flood depths for the 1 in 100 annual probability +35% climate change allowance typically vary between 10mm and 200mm; • The site is largely classified as at Very Low risk of surface water flooding, with minor, localised areas at Low risk; • The site is at negligible risk of flooding in the event of a reservoir breach; • The pedestrian access route via Napier Road is partly impacted by the 1 in 100 annual probability +25% climate change allowance scenario. Further analysis of flood depths/flood hazard is required and development may be reliant on advance warning measures and provision of a Flood Risk Management /Evacuation Plan. The site is shown to be at medium risk of fluvial flooding, at a range of Very Low to Low risk of surface water flooding and may be susceptible to groundwater and sewer flooding. The site is therefore potentially at risk of flooding from a number of sources but it is considered feasible that the site can be developed safely and in accordance with the requirements of the NPPF, to mitigate the potential risks of these sources of flooding. It is important that the design process considers the risk of flooding at the earliest conceptual stage, encompassing measures that will ensure the safety of future tenants/residents during a flood event. A number of important design recommendations are set out below.

Reading Borough Council
Level 2 Strategic Flood Risk Assessment

Planning Recommendations

Spatial Planning

The site lies within Flood Zone 2 'Medium Probability', affected by flooding from the River Thames in the 1 in 1000 annual probability flood event. A small proportion of the site is shown to be impacted by the 1 in 100 annual probability +25% and +35% allowances for climate change flood events.

A review of flood risk within the site has been carried out, and it is considered feasible to design the site in such a way that it remains safe throughout the lifetime of the development.

It is essential that the following design recommendations are incorporated into the design process from the conceptual stage. A detailed site-based Flood Risk Assessment will be required as an integral part of the planning application stage, which should be carried out in accordance with Section 10.4 of the Level 1 SFRA.

Design Recommendations

1. Floor levels within the site should be situated a minimum of 300mm above the 1 in 100 annual probability plus allowance for climate change, in this instance +25%, assuming a 100 year lifetime for the residential development;

2. Flood storage should be analysed to show that the proposed building footprint of the development will not cause a detriment to the available storage during the 1 in 100 annual probability +25% climate change allowance flood event. The presence of a significant existing building footprint suggests that floodplain storage capacity could be improved through effective design measures;

3. Where appropriate, buildings should adopt resilient design techniques to minimise the damage and disruption sustained by businesses and/or residents following a flooding event. Further guidance can be found in BRE Digest DG523 'Flood Resilient Building', the Department for Communities and Local Government document 'Improving the Flood Performance of New Buildings – Flood Resilient Construction', and Section 12.4 of the Level 1 SFRA';

4. Sustainable Drainage Systems (SuDS) should be incorporated into the site design, aiming to achieve greenfield runoff rates, if feasible, in accordance with Section 13.4 of the Level 1 SFRA. It is important that SUDS are designed with due consideration to soil and groundwater conditions. Infiltration techniques should be sought wherever possible, however are likely to be unsuitable in areas of shallow groundwater and/or impermeable soils. Further guidance on designing for groundwater is provided in Section 6.5 of the Level 1 SFRA. Buildings and landscaping should be designed within the site to avoid locking overland flow routes;

5. Safe access is available in the current 1 in 100 annual probability flood event and would therefore meet the requirements of Section 3.4 of the L2 SFRA provided a 'Flood Management and Evacuation Plan' is prepared to consider the impacts in the climate change scenarios. Future tenants/residents within the site should be made aware of the potential risks of flooding, and should be actively encouraged to sign up to the Environment Agency's Flood Information Service to receive flood alerts, flood warnings and severe flood warnings well in advance of an event;

6. It is essential to ensure that all basement areas within flood affected areas of the site are watertight, and the entrance point is situated above the 1 in 100 annual probability +25% allowance for climate change flood level. Basements should not be used to provide habitable areas in locations classified at Flood Zone 2 'Medium Probability';

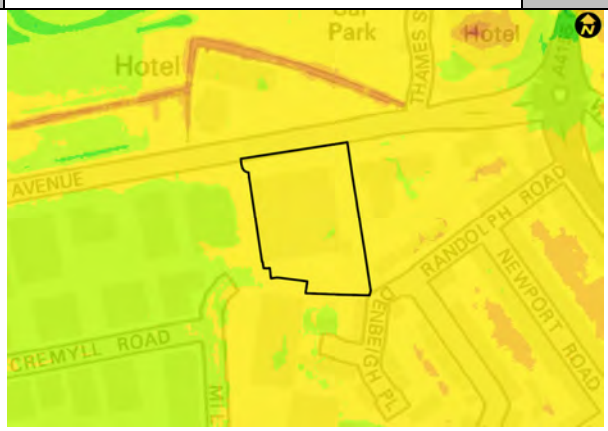
Reading Borough Council
Level 2 Strategic Flood Risk Assessment

	7. Residual risk to the development should be investigated against the 1 in 100 annual probability +35% allowance for climate change flood event.

Reading Borough Council
Level 2 Strategic Flood Risk Assessment

AB073 - 28-30 Richfield Avenue (Local Plan ref: WR3c)			
Grid Reference	SU 70940 470940	**Post Code**	RG1 8EQ

Topography



Elevation

< 35 mAOD	40 - 41 mAOD
35 - 36 mAOD	41 - 42 mAOD
36 - 37 mAOD	42 - 43 mAOD
37 - 38 mAOD	43 - 44 mAOD
38 - 39 mAOD	44 - 45 mAOD
39 - 40mAOD	> 45 mAOD

The topography of the site is largely flat, ranging between approximately 38.5m AOD and 38.8m AOD.

Flood Zone Map

Legend

- River
- Site Boundary
- Flood Zone 2
- Flood Zone 3
- Flood Zone 3b

Flood Zone 1	0%	Flood Zone 2	100%	Flood Zone 3a	0%	Flood Zone 3b	0%

Surface Water

Risk of Surface Water Flooding

- River
- Site Boundary
- High - 1 in 30 annual probability
- Medium - 1 in 100 annual probability
- Low - 1 in 1000 annual Probability
- Very Low - > 1 in 1000 annual probability

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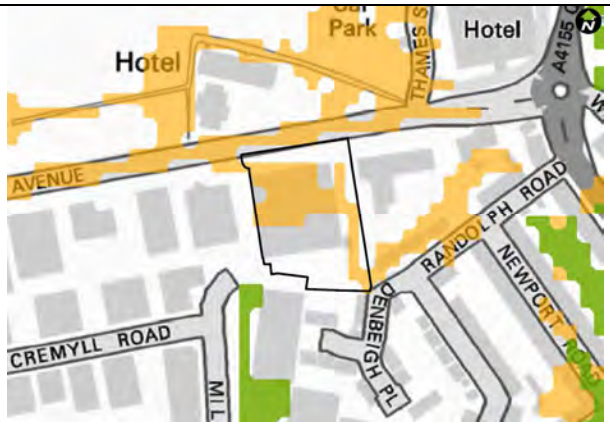
Level 2 Strategic Flood Risk Assessment

Development Proposal	50 - 80 dwellings	**Vulnerability Classification**	More Vulnerable
Applicable Climate Change Allowances	The +25% and +35% peak river flow climate change allowances should therefore be used to assess a range of climate change scenarios. The +25% allowance should be used to provide a benchmark flood level against which mitigation measures should be set, and the +35% allowance used to assess residual risk to the development.		
Climate Change Extents			

1 in 100 annual probability +25%	0%	**1 in 100 annual probability +35%**	40%	**1 in 100 annual probability +70%**	N/A

Description of Flood Risk

Flood Depth

The flood depths in the 1 in 1000 annual probability flood event vary from 100mm to 200mm over the extent of the site.

Flood depths in the climate change scenarios are typically 100mm in the +35% scenario (the site is unaffected in the +25% scenario).

Flood Warning and Period of Inundation

The River Thames is a large catchment with flooding typically the result of sustained regional-scale rainfall events. The response time – i.e. the period between the rainfall over the catchment and the rising river levels downstream – can be significant, and this ensures there is typically a significant period of advance warning (i.e. a period of days) before flooding occurs in the area.

The EA issue flood warnings for the area via their 'Flood Information Service' and considerable advance warning of a flood event can typically be provided to allow the Council, emergency services residents and businesses to take appropriate action.

Velocity of Flood Waters

The site is occupied by buildings in an urbanised area, a significant distance from the main river, and is impacted in the higher central climate change allowance scenario. When flooding does occur, the rate of rise and fall in water level is slow and velocities will correspondingly be slow, with the direction of flow from west to east (subject to further interrogation of the EA modelling).

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Description of Flood Risk

Flood Defences

While not a 'formal' flood defence, the EA asset register does identify that the River Thames, located approximately 0.3km east of the site, includes bank protection on its right bank with a design standard of 1 in 5 years. The condition is currently at 4 (poor), on a scale of 1 (very good) to 5 (very poor).

Historic Records and Other Sources of Flooding

The SFRA indicates that the site has been subject to historic river flooding in 1947 and 1977, but is not noted to have been impacted by flood events from other sources.

Some external areas are noted to be at low risk of surface water flooding, which, if surface water drainage strategy is not sufficiently incorporated into proposed development design, could result in ponding of water following heavy rainfall events. Site drainage must therefore be considered accordingly and must be assessed in accordance with Sections 13.4 and 13.5 of the Level 1 SFRA.

The susceptibility to groundwater flooding varies between '25% to 50%'. The Thames Water DG5 information indicates that the site is within a postcode (RG1 8) that has 21-50 recorded sewer flood incidents, both internal and external.

The site is not located within a maximum modelled breach extent of reservoir flooding and is therefore at negligible risk of flooding in the event of a reservoir breach.

Overview of Flood Risk

A summary of the flood risk to the site is provided below:

- The site is classified as Flood Zone 2 'Medium Probability' (between 1 in 100 and 1 in 1000 annual probability of river flooding), and has been subject to historic river flooding in 1947 and 1977;
- The maximum flood depth during the 1 in 1000 annual probability event is typically between 100mm and 200mm;
- The site is not impacted by the 1 in 100 annual probability +25% allowance for climate change flood event;
- Parts of the site are impacted in the 1 in 100 annual probability +35% climate change allowance event with maximum flood depths of approximately 100mm;
- The site is largely classified as at Very Low risk of surface water flooding, with small areas surrounding the existing building classified as Low risk;
- The site is at negligible risk of flooding in the event of a reservoir breach;
- Continuous safe access is currently available during the 1 in 100 annual probability event via Richfield Avenue to the north. The safe route remains available in the 1 in 100 annual probability +25% allowance for climate change flood event and only becomes affected in the +35% scenario.

The site is shown to be at medium risk of fluvial flooding, at a range of very low to low risk of surface water flooding and may be susceptible to groundwater and sewer flooding. The site is therefore potentially at risk of flooding from a number of sources; however, it is considered feasible that the site can be developed safely and in accordance with the requirements of the NPPF, to mitigate the potential risks of these sources of flooding.

It is important that the design process considers the risk of flooding at the earliest conceptual stage, encompassing measures that will ensure the safety of future tenants/residents during a flood event.

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Level 2 Strategic Flood Risk Assessment

	A number of important design recommendations are set out below.
Planning Recommendations	**Spatial Planning** The site lies within Flood Zone 2 'Medium Probability', affected by flooding from the River Thames in the 1 in 1000 annual probability flood event. The site is not shown to be impacted by the 1 in 100 annual probability +25% allowance for climate change event, and approximately half of the site is shown to be impacted by the +35% allowance for climate change flood event. A review of flood risk within the site has been carried out, and it is considered feasible to design the site in such a way that it remains safe throughout the lifetime of the development. It is essential that the following design recommendations are incorporated into the design process from the conceptual stage. A detailed site-based Flood Risk Assessment will be required as an integral part of the planning application stage, which should be carried out in accordance with Section 10.4 of the Level 1 SFRA.
	Design Recommendations 1. Floor levels within the site should be situated a minimum of 300mm above the 1 in 100 annual probability plus allowance for climate change, in this instance +25%, assuming a 100 year lifetime for residential development. The site is not shown to be impacted by this event, and therefore floor levels should be raised an appropriate freeboard above the external general ground level; 2. The site is not impacted by the 1 in 100 annual probability plus 25% climate change allowance flood event, therefore the flood storage during this design event is not expected to be impacted through development proposals. The presence of a significant existing building footprint also suggests that floodplain storage capacity in more extreme events could be improved through effective design measures; 3. Where appropriate, buildings should adopt resilient design techniques to minimise the damage and disruption sustained by businesses and/or residents following a flooding event. Further guidance can be found in BRE Digest DG523 'Flood Resilient Building', the Department for Communities and Local Government document 'Improving the Flood Performance of New Buildings – Flood Resilient Construction', and Section 12.4 of the Level 1 SFRA'; 4. Sustainable Drainage Systems (SuDS) should be incorporated into the site design, aiming to achieve greenfield runoff rates, if feasible, in accordance with Section 13.4 of the Level 1 SFRA. It is important that SUDS are designed with due consideration to soil and groundwater conditions. Infiltration techniques should be sought wherever possible, however are likely to be unsuitable in areas of shallow groundwater and/or impermeable soils. Further guidance on designing for groundwater is provided in Section 6.5 of the Level 1 SFRA. Buildings and landscaping should be designed within the site to avoid locking overland flow routes; 5. Safe access would be available in the 1 in 100 annual probability +25% climate change allowance scenario and is in accordance with the requirements in Section 3.4 of the L2 SFRA. Future tenants/residents within the site should be made aware of the potential risks of flooding, and should be actively encouraged to sign up to the Environment Agency's Flood Information Service to receive flood alerts, flood warnings and severe flood warnings well in advance of an event; 6. It is essential to ensure that all basement areas within flood affected areas of the site are watertight, and the entrance point is situated an appropriate freeboard above the general

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	ground level. Basement dwellings in Flood Zone 2 'Medium Probability' are considered appropriate subject to the Exception Test. 7. Residual risk to the development should be investigated against the 1 in 100 annual probability +35% allowance for climate change flood event.

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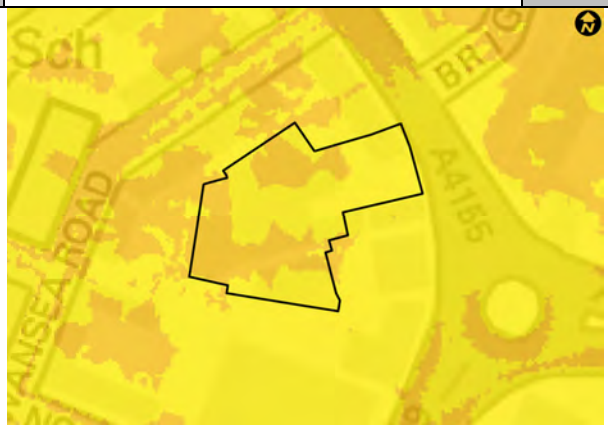
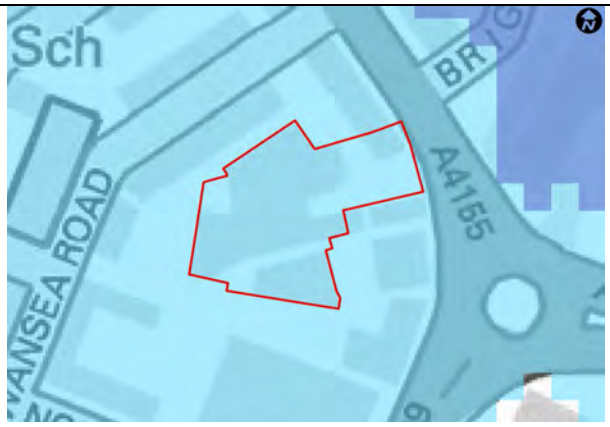
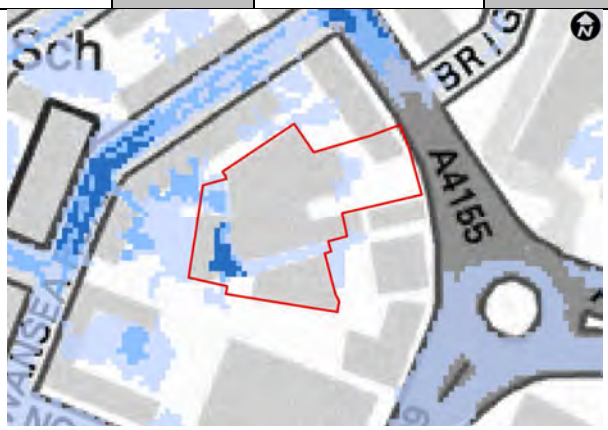
AB075 - 115-117 Caversham Road (Local Plan ref: CR11f - part)							
Grid Reference	SU 71260 74180			**Post Code**	RG1 8AR		
Topography				**Elevation** < 35 mAOD 35 - 36 mAOD 36 - 37 mAOD 37 - 38 mAOD 38 - 39 mAOD 39 - 40mAOD 40 - 41 mAOD 41 - 42 mAOD 42 - 43 mAOD 43 - 44 mAOD 44 - 45 mAOD > 45 mAOD The topography of the site is largely flat, ranging between approximately 37.8m AOD and 38.5m AOD.		
Flood Zone Map				**Legend** Site Boundary Flood Zone 2 Flood Zone 3			
Flood Zone 1	0%	**Flood Zone 2**	100%	**Flood Zone 3a**	0%	**Flood Zone 3b**	0%
Surface Water				**Risk of Surface Water Flooding** River Site Boundary High - 1 in 30 annual probability Medium - 1 in 100 annual probability Low - 1 in 1000 annual Probability Very Low - > 1 in 1000 annual probability		

Reading Borough Council
Level 2 Strategic Flood Risk Assessment

Development Proposal	75-115 dwellings (wider site includes AB081)	**Vulnerability Classification**	More Vulnerable
Applicable Climate Change Allowances	The +25% and +35% peak river flow climate change allowances should therefore be used to assess a range of climate change scenarios. The +25% allowance should be used to provide a benchmark flood level against which mitigation measures should be set, and the +35% allowance used to assess residual risk to the development.		
Climate Change Extents			
1 in 100 annual probability +25%	70%	**1 in 100 annual probability +35%**	85%	**1 in 100 annual probability +70%**	N/A

Description of Flood Risk

Flood Depth

The flood depths in the 1 in 1000 annual probability flood event typically vary from 100mm to 500mm over the site.

Flood depths in the climate change scenarios are typically 300mm in the +25% scenario, and 400mm in the +35% scenario.

Flood Warning and Period of Inundation

The River Thames is a large catchment with flooding typically the result of sustained regional-scale rainfall events. The response time – i.e. the period between the rainfall over the catchment and the rising river levels downstream – can be significant, and this ensures there is typically a significant period of advance warning (i.e. a period of days) before flooding occurs in the area.

The EA issue flood warnings for the area via their 'Flood Information Service' and considerable advance warning of a flood event can typically be provided to allow the Council, emergency services residents and businesses to take appropriate action.

Velocity of Flood Waters

The site is occupied by buildings in an urbanised area, a significant distance from the main river, and is impacted in the climate change allowance scenarios. When flooding does occur, the rate of rise and fall in water level is slow and velocities will correspondingly be slow, with the direction of flow from west to east (subject to further interrogation of the EA modelling).

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Level 2 Strategic Flood Risk Assessment

Description of Flood Risk

Flood Defences

While not a 'formal' flood defence, the EA asset register does identify that the River Thames, located approximately 0.25km north east of the site, includes bank protection on its right bank with a design standard of 1 in 5 years. The condition is currently at 4 (poor), on a scale of 1 (very good) to 5 (very poor).

Historic Records and Other Sources of Flooding

The SFRA data indicates that the site has not been subject to historic river flooding, but the site, or an area in the close vicinity of the site, was impacted by groundwater flooding during the 2000-01 and 2002-03 events. It is not noted to have been impacted by flood events from other sources.

External areas are noted to be impacted by surface water flooding, which, if surface water drainage strategy is not sufficiently incorporated into proposed development design, could result in ponding of water following heavy rainfall events. Site drainage must therefore be considered accordingly, and must be assessed in accordance with Sections 13.4 and 13.5 of the Level 1 SFRA.

The susceptibility to groundwater flooding varies between '25% to 50%'. The Thames Water DG5 information indicates that the site is within a postcode (RG1 8) that has 21-50 recorded sewer flood incidents, both internal and external.

The site is not located within a maximum modelled breach extent of reservoir flooding and is therefore at negligible risk of flooding in the event of a reservoir breach.

Overview of Flood Risk

A summary of the flood risk to the site is provided below:

- The site is classified as Flood Zone 2 'Medium Probability' (between 1 in 100 and 1 in 1000 annual probability of river flooding) and has not been subject to historic river flooding;
- The maximum flood depth during the 1 in 1000 annual probability event is typically between 100mm and 500mm;
- The majority of the site is impacted by the 1 in 100 annual probability +25% allowance for climate change flood event with general depths between 100mm and 300mm;
- Maximum flood depths for the 1 in 100 annual probability +35% climate change allowance typically vary between 100mm and 400mm;
- The site is mainly classified as at Very Low risk of surface water flooding, with localised areas between Low and High risk;
- The site is at negligible risk of flooding in the event of a reservoir breach;
- Continuous safe access is currently available during the 1 in 100 annual probability event via Vastern Road. The access route via Caversham Road/Vastern Road is partly impacted by the 1 in 100 annual probability +25% climate change allowance scenario. Development would be reliant on advance warning measures and the suitability of a Flood Risk Management/Evacuation Plan should be considered.

The site is shown to be at medium risk of fluvial flooding, at a range of very low to high risk of surface water flooding and may be susceptible to groundwater and sewer flooding. The site is therefore potentially at risk of flooding from a number of sources. Subject to further analysis of the safe access arrangements, it is considered feasible that the site can be developed safely and in accordance with the requirements of the NPPF, to mitigate the potential risks of these sources of flooding.

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	It is important that the design process considers the risk of flooding at the earliest conceptual stage, encompassing measures that will ensure the safety of future tenants/residents during a flood event. A number of important design recommendations are set out below.
Planning Recommendations	**Spatial Planning** The site lies within Flood Zone 2 'Medium Probability', affected by flooding from the River Thames in the 1 in 1000 annual probability flood event. The majority of the site is shown to be impacted by the 1 in 100 annual probability +25% and +35% allowances for climate change flood events. A review of flood risk within the site has been carried out, and it is considered feasible to design the site in such a way that it remains safe throughout the lifetime of the development. It is essential that the following design recommendations are incorporated into the design process from the conceptual stage. A detailed site-based Flood Risk Assessment will be required as an integral part of the planning application stage, which should be carried out in accordance with Section 10.4 of the Level 1 SFRA.
	Design Recommendations 1. Floor levels within the site should be situated a minimum of 300mm above the 1 in 100 annual probability plus allowance for climate change, in this instance +25%, assuming a 100 year lifetime for residential development; 2. Flood storage should be analysed to show that the proposed building footprint of the development will not cause a detriment to the available storage during the 1 in 100 annual probability +25% climate change allowance flood event. The presence of a significant existing building footprint suggests that floodplain storage capacity could be improved through effective design measures; 3. Where appropriate, buildings should adopt resilient design techniques to minimise the damage and disruption sustained by residents following a flooding event. Further guidance can be found in BRE Digest DG523 'Flood Resilient Building', the Department for Communities and Local Government document 'Improving the Flood Performance of New Buildings – Flood Resilient Construction', and Section 12.4 of the Level 1 SFRA'; 4. Sustainable Drainage Systems (SuDS) should be incorporated into the site design, aiming to achieve greenfield runoff rates, if feasible, in accordance with Section 13.4 of the Level 1 SFRA. It is important that SUDS are designed with due consideration to soil and groundwater conditions. Infiltration techniques should be sought wherever possible, however are likely to be unsuitable in areas of shallow groundwater and/or impermeable soils. Further guidance on designing for groundwater is provided in Section 6.5 of the Level 1 SFRA. Buildings and landscaping should be designed within the site to avoid locking overland flow routes; 5. Safe access would be available in the current 1 in 100 annual probability flood event. The impacts on the route should be assessed for the 1 in 100 annual probability +25% climate change allowance and a Flood Management and Evacuation Plan' should be prepared to ensure the development is in accordance with the requirements in Section 3.4 of the L2 SFRA. Future tenants/residents within the site should be made aware of the potential risks of flooding, and should be actively encouraged to sign up to the Environment Agency's Flood Information Service to receive flood alerts, flood warnings and severe flood warnings well in advance of an event; 6. It is essential to ensure that all basement areas within flood affected areas of the site are watertight, and the entrance point is situated above the 1 in 100 annual probability +25%

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Level 2 Strategic Flood Risk Assessment

	allowance for climate change flood level. Basement dwellings in Flood Zone 2 'Medium Probability' are considered appropriate subject to the Exception Test; 7. Residual risk to the development should be investigated against the 1 in 100 annual probability +35% allowance for climate change flood event.

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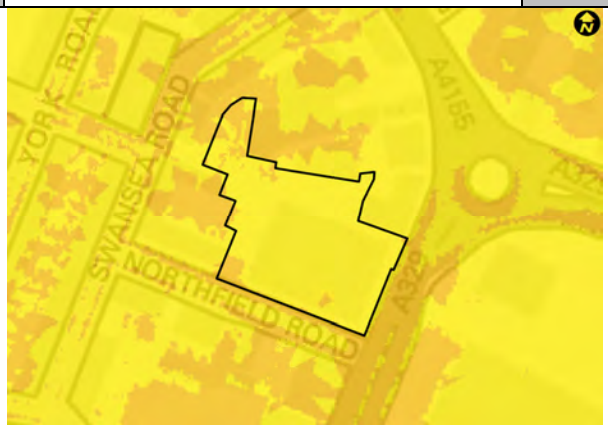
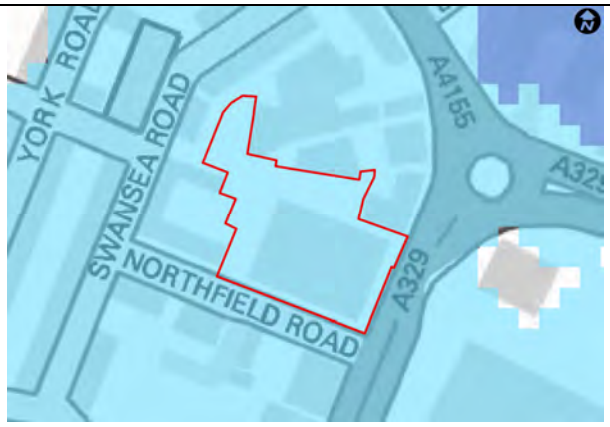
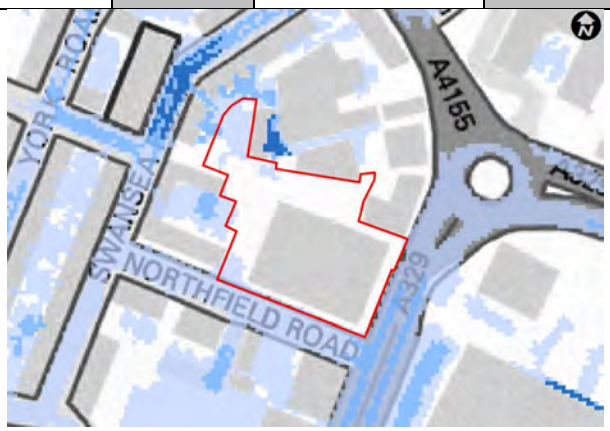
AB081 - Shurgard Self Storage, 75-77 Caversham Road (Local Plan ref: CR11f - part)							
Grid Reference	SU 71240 74120			**Post Code**	RG1 8AN		
Topography					**Elevation** < 35 mAOD 35 - 36 mAOD 36 - 37 mAOD 37 - 38 mAOD 38 - 39 mAOD 39 - 40mAOD 40 - 41 mAOD 41 - 42 mAOD 42 - 43 mAOD 43 - 44 mAOD 44 - 45 mAOD > 45 mAOD The topography of the site is largely flat, ranging between approximately 37.9m AOD and 38.5m AOD.		
Flood Zone Map					**Legend** Site Boundary Flood Zone 2 Flood Zone 3		
Flood Zone 1	0%	**Flood Zone 2**	100%	**Flood Zone 3a**	0%	**Flood Zone 3b**	0%
Surface Water					**Risk of Surface Water Flooding** River Site Boundary High - 1 in 30 annual probability Medium - 1 in 100 annual probability Low - 1 in 1000 annual Probability Very Low - > 1 in 1000 annual probability		

Reading Borough Council
Level 2 Strategic Flood Risk Assessment

Development Proposal	75 - 115 dwellings (wider site including AB075)	**Vulnerability Classification**	More Vulnerable
Applicable Climate Change Allowances	The +25% and +35% peak river flow climate change allowances should therefore be used to assess a range of climate change scenarios. The +25% allowance should be used to provide a benchmark flood level against which mitigation measures should be set, and the +35% allowance used to assess residual risk to the development.		
Climate Change Extents			**Legend** River Site Boundary 1 in 100 annual probability +25% Climate Change 1 in 100 annual probability +35% Climate Change

1 in 100 annual probability +25%	50%	**1 in 100 annual probability +35%**	70%	**1 in 100 annual probability +70%**	N/A

Description of Flood Risk

Flood Depth

The flood depths in the 1 in 1000 annual probability flood event typically vary from 100mm to 400mm over the extent of the site.

Flood depths in the climate change scenarios are typically 200mm in the +25% scenario, and 300mm in the +35% scenario.

Flood Warning and Period of Inundation

The River Thames is a large catchment with flooding typically the result of sustained regional-scale rainfall events. The response time – i.e. the period between the rainfall over the catchment and the rising river levels downstream – can be significant, and this ensures there is typically a significant period of advance warning (i.e. a period of days) before flooding occurs in the area.

The EA issue flood warnings for the area via their 'Flood Information Service' and considerable advance warning of a flood event can typically be provided to allow the Council, emergency services residents and businesses to take appropriate action.

Velocity of Flood Waters

The site is occupied by buildings in an urbanised area, a significant distance from the main river, and is impacted in the climate change allowance scenarios. When flooding does occur, the rate of rise and fall in water level is slow and velocities will accordingly be slow, with the direction of flow from west to east (subject to further interrogation of the EA modelling).

Reading Borough Council
Level 2 Strategic Flood Risk Assessment

Description of Flood Risk

Flood Defences

While not a 'formal' flood defence, the EA asset register does identify that the River Thames, located approximately 0.26km north east of the site, includes bank protection on its right bank with a design standard of 1 in 5 years. The condition is currently at 4 (poor), on a scale of 1 (very good) to 5 (very poor).

Historic Records and Other Sources of Flooding

The Level 1 SFRA indicates that the site has not been subject to historic river flooding, but notes that an area in the close vicinity of the site was impacted by groundwater flooding during the 2000-01 and 2002-03 events. It is not noted to have been impacted by flood events from other sources.

Site drainage must be considered accordingly and must be assessed in accordance with Sections 13.4 and 13.5 of the Level 1 SFRA.

The susceptibility to groundwater flooding varies between '25%' and 50%'. The Thames Water DG5 information indicates that the site is within a postcode (RG1 8) that has 21-50 recorded sewer flood incidents, both internal and external.

The site is not located within a maximum modelled breach extent of reservoir flooding and is therefore at negligible risk of flooding in the event of a reservoir breach.

Overview of Flood Risk

A summary of the flood risk to the site is provided below:

- The site is classified as Flood Zone 2 'Medium Probability' (between 1 in 100 and 1 in 1000 annual probability of river flooding) and has not been subject to historic river flooding;
- The maximum flood depth during the 1 in 1000 annual probability event is typically between 100mm and 400mm;
- Approximately half of the site is impacted by the 1 in 100 annual probability +25% allowance for climate change flood event with general depths of 200mm;
- Maximum flood depths for the 1 in 100 annual probability +35% climate change allowance are typically 300mm;
- The site is largely classified as at Very Low risk of surface water flooding, with localised areas of Low risk;
- The site is at negligible risk of flooding in the event of a reservoir breach;
- Continuous safe access is currently available during the 1 in 100 annual probability event. The access route is impacted by the 1 in 100 annual probability +25% climate change allowance scenario. Development would be reliant on advance warning measures and the suitability of a Flood Risk Management/Evacuation Plan should be considered.

The site is shown to be at medium risk of fluvial flooding, at a range of very low to high risk of surface water flooding and may be susceptible to groundwater and sewer flooding. The site is therefore potentially at risk of flooding from a number of sources. Subject to further analysis of safe access arrangements, it is considered feasible that the site can be developed safely and in accordance with the requirements of the NPPF, to mitigate the potential risks of these sources of flooding.

It is important that the design process considers the risk of flooding at the earliest conceptual stage, encompassing measures that will ensure the safety of future tenants/residents during a flood event.

A number of important design recommendations are set out below.

Reading Borough Council
Level 2 Strategic Flood Risk Assessment

Planning Recommendations

Spatial Planning

The site lies within Flood Zone 2 'Medium Probability', affected by flooding from the River Thames in the 1 in 1000 annual probability flood event. The majority of the site is shown to be impacted by the 1 in 100 annual probability +25% and +35% allowances for climate change flood events.

A review of flood risk within the site has been carried out, and it is considered feasible to design the site in such a way that it remains safe throughout the lifetime of the development. It is essential that the following design recommendations are incorporated into the design process from the conceptual stage. A detailed site-based Flood Risk Assessment will be required as an integral part of the planning application stage, which should be carried out in accordance with Section 10.4 of the Level 1 SFRA.

Design Recommendations

1. Floor levels within the site should be situated a minimum of 300mm above the 1 in 100 annual probability plus allowance for climate change, in this instance +25%, assuming a 100 year lifetime for residential development;

2. Flood storage should be analysed to show that the proposed building footprint of the development will not cause a detriment to the available storage during the 1 in 100 annual probability +25% climate change allowance flood event. The presence of a significant existing building footprint suggests that floodplain storage capacity could be improved through effective design measures;

3. Where appropriate, buildings should adopt resilient design techniques to minimise the damage and disruption sustained by residents following a flooding event. Further guidance can be found in BRE Digest DG523 'Flood Resilient Building', the Department for Communities and Local Government document 'Improving the Flood Performance of New Buildings – Flood Resilient Construction', and Section 12.4 of the Level 1 SFRA;

4. Sustainable Drainage Systems (SuDS) should be incorporated into the site design, aiming to achieve greenfield runoff rates, if feasible, in accordance with Section 13.4 of the Level 1 SFRA. It is important that SUDS are designed with due consideration to soil and groundwater conditions. Infiltration techniques should be sought wherever possible, however are likely to be unsuitable in areas of shallow groundwater and/or impermeable soils. Further guidance on designing for groundwater is provided in Section 6.5 of the Level 1 SFRA. Buildings and landscaping should be designed within the site to avoid locking overland flow routes;

5. Safe access would be available in the current 1 in 100 annual probability flood event. The impacts on the route should be assessed for the 1 in 100 annual probability +25% climate change allowance and a Flood Management and Evacuation Plan' should be prepared to ensure the development is in accordance with the requirements in Section 3.4 of the L2 SFRA. Future tenants/residents within the site should be made aware of the potential risks of flooding, and should be actively encouraged to sign up to the Environment Agency's Flood Information Service to receive flood alerts, flood warnings and severe flood warnings well in advance of an event;

6. It is essential to ensure that all basement areas within flood affected areas of the site are watertight, and the entrance point is situated above the 1 in 100 annual probability +25% allowance for climate change flood level. Basement dwellings in Flood Zone 2 'Medium Probability' are considered appropriate subject to the Exception Test;

7. Residual risk to the development should be investigated against the 1 in 100 annual probability +35% allowance for climate change flood event.

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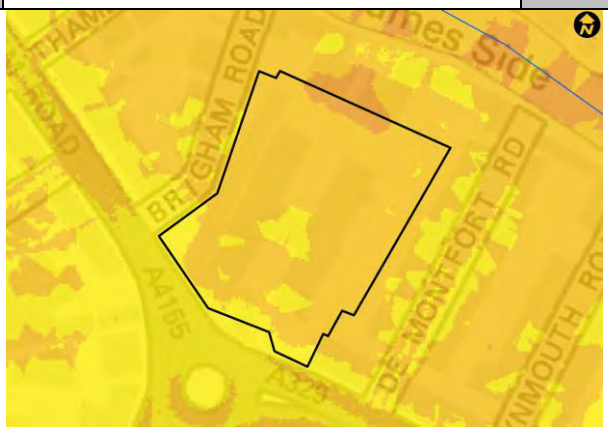
Level 2 Strategic Flood Risk Assessment

AB096 – Great Brigham's Mead (Local Plan ref: Not Identified)			
Grid Reference	SU 71370 74220	**Post Code**	RG1 8DL

Topography



Elevation

< 35 mAOD	40 - 41 mAOD
35 - 36 mAOD	41 - 42 mAOD
36 - 37 mAOD	42 - 43 mAOD
37 - 38 mAOD	43 - 44 mAOD
38 - 39 mAOD	44 - 45 mAOD
39 - 40mAOD	> 45 mAOD

The topography of the site is largely flat, falling from south to north, ranging between approximately 36.5m AOD and 38.3m AOD.

Flood Zone Map

Legend

- River
- Site Boundary
- Flood Zone 2
- Flood Zone 3
- Flood Zone 3b

Flood Zone 1	0%	**Flood Zone 2**	10%	**Flood Zone 3a**	90%	**Flood Zone 3b**	0%

Surface Water

Risk of Surface Water Flooding

- River
- Site Boundary
- High - 1 in 30 annual probability
- Medium - 1 in 100 annual probability
- Low - 1 in 1000 annual Probability
- Very Low - > 1 in 1000 annual probability

Reading Borough Council
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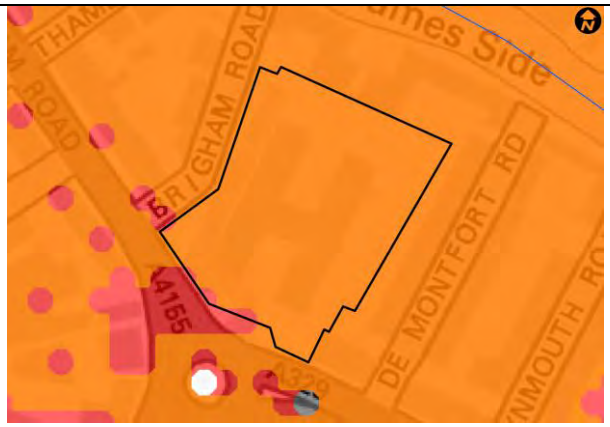
Development Proposal	Residential dwellings	**Vulnerability Classification**	More Vulnerable
Applicable Climate Change Allowances	The +35% and +70% peak river flow climate change allowances should therefore be used to assess a range of climate change scenarios. The +35% allowance should be used to provide a benchmark flood level against which mitigation measures should be set, and the +70% allowance used to assess residual risk to the development.		
Climate Change Extents			**Legend** River Site Boundary 1 in 100 annual probability +35% Climate Change 1 in 100 annual probability +70% Climate Change

1 in 100 annual probability +25%	N/A	**1 in 100 annual probability +35%**	98%	**1 in 100 annual probability +70%**	100%

Description of Flood Risk

Flood Depth
The flood depths in the 1 in 100 annual probability flood event vary from 100mm to 300mm over the site. The flood depths in the 1 in 1000 annual probability flood event vary from 600mm to 800mm.

Flood depths in the climate change scenarios are typically 500mm in the +35% scenario, and 800mm in the +70% scenario.

Flood Warning and Period of Inundation
The River Thames is a large catchment with flooding typically the result of sustained regional-scale rainfall events. The response time – i.e. the period between the rainfall over the catchment and the rising river levels downstream – can be significant, and this ensures there is typically a significant period of advance warning (i.e. a period of days) before flooding occurs in the area.

The EA issue flood warnings for the area via their 'Flood Information Service' and considerable advance warning of a flood event can typically be provided to allow the Council, emergency services residents and businesses to take appropriate action.

Velocity of Flood Waters
The site is in an urbanised area, separated from the main river channel by built development, and is impacted in severe flood events (1 in 100 annual probability and greater). When flooding does occur, the rate of rise and fall in water level is slow and velocities will also be slow. Any fluvial flooding in the area would typically be of slow velocity with the direction of flow from west to east, subject to further interrogation of the EA modelling.

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Description of Flood Risk	**Flood Defences** While not a 'formal' flood defence, the EA asset register does identify that the River Thames, located approximately 0.1km north of the site, includes natural high ground of its right bank with a design standard of 1 in 5 years. The condition is currently at 4 (poor), on a scale of 1 (very good) to 5 (very poor).
	Historic Records and Other Sources of Flooding The SFRA data indicates the site has not been subject to historic fluvial flooding and is not noted to have been impacted by flood events from other sources. There are two records of groundwater flooding located west of the site, specifically for the 2000/01 and 2002/03 events. Vastern Road has previously been impacted by highway flooding. Isolated external areas of the site are noted to be potentially at risk of surface water flooding, which, if a surface water drainage strategy is not appropriately considered in the proposed development design, could result in ponding of water following heavy rainfall events. The susceptibility to groundwater flooding site varies between '25% and 50%'. The Thames Water DG5 information indicates that the site is within a postcode (RG1 8) that has 21-50 recorded sewer flood incidents, both internal and external. The site is not located within a maximum modelled breach extent of reservoir flooding and is therefore at negligible risk of flooding in the event of a reservoir breach.
	Overview of Flood Risk A summary of the flood risk to the site is provided below: • The majority of the site is classified as Flood Zone 3a 'High Probability', with a 1 in 100 annual probability of river flooding. Available data indicate no historic records of flooding over the site; • The flood depth during the 1 in 100 annual probability event is typically between 100mm and 300mm; • The maximum flood depth during the 1 in 1000 annual probability event is typically between 600mm and 800mm; • The majority of the site is impacted by the 1 in 100 annual probability +35% climate change flood event, with flood depths typically between 400mm and 600mm; • The whole site is impacted in the 1 in 100 annual probability +70% climate change flood event, with maximum flood depths rising to between 700mm and 900mm; • The site is largely classified as at Very Low risk of surface water flooding, with localised areas between Low and Medium risk; • The site is at negligible risk of flooding in the event of a reservoir breach; • Continuous safe access is currently available during the 1 in 100 annual probability event via Vastern Road. At the peak of the 1 in 100 annual probability +35% climate change allowance flood event, flood depths on the access route rise to over 250mm, thereby impacting on pedestrian safe access. Development would be reliant on advance warning measures and the suitability of a Flood Risk Management/Evacuation Plan should be considered. The site is shown to be at high risk of fluvial flooding, and at a range of very low to medium risk of surface water flooding. The site may be susceptible to groundwater and sewer flooding, the extent to which could be determined using site-specific information. The site is therefore potentially at risk of flooding from a number of sources, however, it is considered feasible that the site can be developed

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	safely and in accordance with the requirements of the NPPF to mitigate the potential risks of these sources of flooding – subject to approval in principle to a management/evacuation plan to address safe access. It is important that the design process considers the risk of flooding at the earliest conceptual stage, encompassing measures that will ensure the safety of future tenants/residents during a flood event. A number of important design recommendations are set out below.
Planning Recommendations	**Spatial Planning** The site lies within Flood Zone 3a 'High Probability', affected by flooding from the River Thames in the 1 in 100 annual probability flood event. The majority of the site is shown to be impacted by the 1 in 100 annual probability +35% and +70% allowances for climate change flood events. A low point is located on the northern boundary, which experiences significant flood depths in the design event. This low point should not be utilised for development due to the large modelled flood depths. A review of flood risk within the site has been carried out, and it is considered feasible to design the site in such a way that it remains safe throughout the lifetime of the development. It is essential that the following design recommendations are incorporated into the design process from the conceptual stage. A detailed site-based Flood Risk Assessment will be required as an integral part of the planning application stage, which should be carried out in accordance with Section 10.4 of the Level 1 SFRA.
	Design Recommendations 1. Floor levels within the site should be situated a minimum of 300mm above the 1 in 100 annual probability plus allowance for climate change, in this instance +35%, assuming a 100 year lifetime for residential development; 2. Flood storage should be analysed to show that the proposed building footprint of the development will not cause a detriment to the available storage during the 1 in 100 annual probability +35% climate change allowance flood event. The presence of a significant existing building footprint suggests that floodplain storage capacity could be improved through effective design measures; 3. Where appropriate, buildings should adopt resilient design techniques to minimise the damage and disruption sustained by residents following a flooding event. Further guidance can be found in BRE Digest DG523 'Flood Resilient Building', the Department for Communities and Local Government document 'Improving the Flood Performance of New Buildings – Flood Resilient Construction', and Section 12.4 of the Level 1 SFRA; 4. Sustainable Drainage Systems (SuDS) should be incorporated into the site design, aiming to achieve greenfield runoff rates, if feasible, in accordance with Section 13.4 of the Level 1 SFRA. It is important that SUDS are designed with due consideration to soil and groundwater conditions. Infiltration techniques should be sought wherever possible, however are likely to be unsuitable in areas of shallow groundwater and/or impermeable soils. Further guidance on designing for groundwater is provided in Section 6.5 of the Level 1 SFRA. Buildings and landscaping should be designed within the site to avoid locking overland flow routes; 5. Safe access would be available in the current 1 in 100 annual probability flood event from the southern boundary of the site. The impacts on the route should be assessed for the 1 in 100 annual probability +35% climate change allowance and a Flood Management and Evacuation Plan' should be prepared to ensure the development is in accordance with the requirements in Section 3.4 of the L2 SFRA. Future tenants/residents within the site should be made aware of the potential risks of flooding, and should be actively encouraged to sign up to the

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	Environment Agency's Flood Information Service to receive flood alerts, flood warnings and severe flood warnings well in advance of an event; 6. It is essential to ensure that all basement areas within flood affected areas of the site are watertight, and the entrance point is situated above the 1 in 100 annual probability +35% allowance for climate change flood level. Basements should not be used to provide habitable areas in locations classified at Flood Zone 3a 'High Probability'; 7. Residual risk to the development should be investigated against the 1 in 100 annual probability +70% allowance for climate change flood event.

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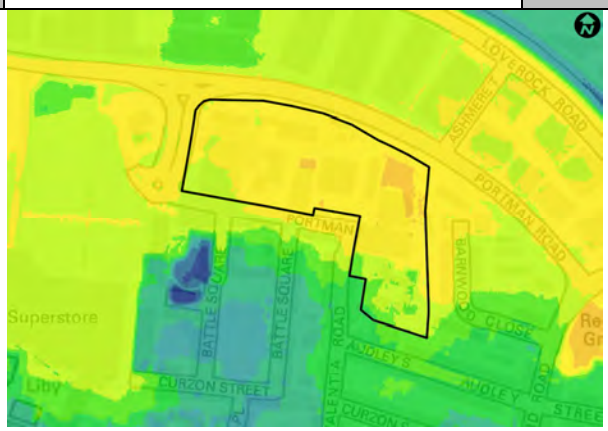
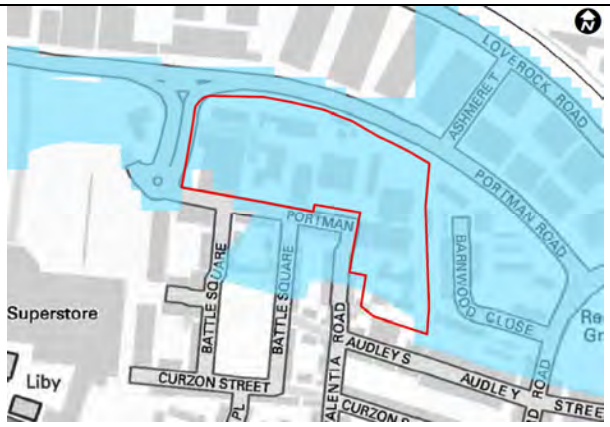
BA003 - Part of Former Battle Hospital, Portman Road (Local Plan ref: WR3i)							
Grid Reference	SU 69940 73880			**Post Code**	RG30 1AN		
Topography					**Elevation** < 35 mAOD 35 - 36 mAOD 36 - 37 mAOD 37 - 38 mAOD 38 - 39 mAOD 39 - 40mAOD 40 - 41 mAOD 41 - 42 mAOD 42 - 43 mAOD 43 - 44 mAOD 44 - 45 mAOD > 45 mAOD The topography of the site is largely flat, ranging between approximately 37.4m AOD and 40.9m AOD.		
Flood Zone Map					**Legend** River Site Boundary Flood Zone 2		
Flood Zone 1	5%	**Flood Zone 2**	95%	**Flood Zone 3a**	0%	**Flood Zone 3b**	0%
Surface Water					**Risk of Surface Water Flooding** River Site Boundary High - 1 in 30 annual probability Medium - 1 in 100 annual probability Low - 1 in 1000 annual Probability Very Low - > 1 in 1000 annual probability		

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Development Proposal	160 - 240 dwellings	**Vulnerability Classification**	More Vulnerable
Applicable Climate Change Allowances	The +25% and +35% peak river flow climate change allowances should therefore be used to assess a range of climate change scenarios. The +25% allowance should be used to provide a benchmark flood level against which mitigation measures should be set, and the +35% allowance used to assess residual risk to the development.		
Climate Change Extents		**Legend** River Site Boundary 1 in 100 annual probability +25% Climate Change 1 in 100 annual probability +35% Climate Change	

1 in 100 annual probability +25%	5%	**1 in 100 annual probability +35%**	75%	**1 in 100 annual probability +70%**	N/A

Description of Flood Risk

Flood Depth

The flood depths in the 1 in 1000 annual probability flood event typically vary between 350mm and 1000mm over the extent of the site.

Flood depths in the climate change scenarios are typically 300mm in the +25% scenario where an impact is observed, and 400mm in the +35% scenario.

Flood Warning and Period of Inundation

The River Thames is a large catchment with flooding typically the result of sustained regional-scale rainfall events. The response time – i.e. the period between the rainfall over the catchment and the rising river levels downstream – can be significant, and this ensures there is typically a significant period of advance warning (i.e. a period of days) before flooding occurs in the area.

The EA issue flood warnings for the area via their 'Flood Information Service' and considerable advance warning of a flood event can typically be provided to allow the Council, emergency services residents and businesses to take appropriate action.

Velocity of Flood Waters

The site is occupied by buildings in an urbanised area, a significant distance from the main river, and is impacted in the climate change allowance scenarios. When flooding does occur, the rate of rise and fall in water level is slow and velocities will correspondingly be slow, with the direction of flow from west to east (subject to further interrogation of the EA modelling).

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Description of Flood Risk

Flood Defences

While not a 'formal' flood defence, the EA asset register does identify that the River Thames, located approximately 1km north of the site, includes bank protection on its right bank with a design standard of 1 in 5 years. The condition is currently at 3 (moderate), on a scale of 1 (very good) to 5 (very poor).

Historic Records and Other Sources of Flooding

The SFRA indicates that the site has been subject to historic river flooding in 1947 and 1977, but is not noted to have been impacted by flood events from other sources.

External areas are noted to be severely impacted by surface water flooding, which, if surface water drainage strategy is not sufficiently incorporated into proposed development design, could result in ponding of water following heavy rainfall events. Site drainage must therefore be considered accordingly and must be assessed in accordance with Sections 13.4 and 13.5 of the Level 1 SFRA.

The susceptibility to groundwater flooding varies between '50% and 75%' and '>75%'. The Thames Water DG5 information indicates that the site is within a postcode (RG30 1) that has over 101 recorded sewer flood incidents, both internal and external.

The site is not located within a maximum modelled breach extent of reservoir flooding and is therefore at negligible risk of flooding in the event of a reservoir breach.

Overview of Flood Risk

A summary of the flood risk to the site is provided below:

- The is classified as Flood Zone 2 'Medium Probability' (between 1 in 100 and 1 in 1000 annual probability of river flooding) and has been subject to historic river flooding in 1947 and 1977;
- The maximum flood depth during the 1 in 1000 annual probability event is typically between 350mm and 1000mm;
- A small area of the site is impacted by the 1 in 100 annual probability +25% allowance for climate change flood event with general depths between 100mm and 400mm;
- Maximum flood depths for the 1 in 100 annual probability +35% climate change allowance typically vary between 100mm and 800mm;
- The site is largely classified as at Low risk of surface water flooding, with large areas between Medium and High risk, and an area at Very Low risk at the south eastern extent;
- The site is at negligible risk of flooding in the event of a reservoir breach;
- Continuous safe access is currently available during the 1 in 100 annual probability event via Portman Road. The access route remains available in the 1 in 100 annual probability +25% climate change allowance scenario. Although the road on the north side of the site is affected in the +35% scenario, alternative safe access to the south-west may be available.

The site is shown to be at medium risk of fluvial flooding, at a range of very low to high risk of surface water flooding and may be susceptible to groundwater and sewer flooding. The site is therefore potentially at risk of flooding from a number of sources; however, it is considered feasible that the site can be developed safely and in accordance with the requirements of the NPPF, to mitigate the potential risks of these sources of flooding.

It is important that the design process considers the risk of flooding at the earliest conceptual stage, encompassing measures that will ensure the safety of future tenants/residents during a flood event.

A number of important design recommendations are set out below.

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Planning Recommendations

Spatial Planning

The site lies within Flood Zone 2 'Medium Probability', affected by flooding from the River Thames in the 1 in 1000 annual probability flood event. A minor portion of the site is shown to be impacted by the 1 in 100 annual probability +25% allowance for climate change, and the majority of the site by the +35% allowance for climate change flood events.

A review of flood risk within the site has been carried out, and it is considered feasible to design the site in such a way that it remains safe throughout the lifetime of the development. It is essential that the following design recommendations are incorporated into the design process from the conceptual stage. A detailed site-based Flood Risk Assessment will be required as an integral part of the planning application stage, which should be carried out in accordance with Section 10.4 of the Level 1 SFRA.

Design Recommendations

1. Floor levels within the site should be situated a minimum of 300mm above the 1 in 100 annual probability plus allowance for climate change, in this instance +25%, assuming a 100 year lifetime for residential development;

2. Flood storage should be analysed to show that the proposed building footprint of the development will not cause a detriment to the available storage during the 1 in 100 annual probability +25% climate change allowance flood event. The presence of a significant existing building footprint suggest that floodplain storage capacity could be improved through effective design measures;

3. Where appropriate, buildings should adopt resilient design techniques to minimise the damage and disruption sustained by businesses and/or residents following a flooding event. Further guidance can be found in BRE Digest DG523 'Flood Resilient Building', the Department for Communities and Local Government document 'Improving the Flood Performance of New Buildings – Flood Resilient Construction', and Section 12.4 of the Level 1 SFRA';

4. Sustainable Drainage Systems (SuDS) should be incorporated into the site design, aiming to achieve greenfield runoff rates, if feasible, in accordance with Section 13.4 of the Level 1 SFRA. It is important that SUDS are designed with due consideration to soil and groundwater conditions. Infiltration techniques should be sought wherever possible, however are likely to be unsuitable in areas of shallow groundwater and/or impermeable soils. Further guidance on designing for groundwater is provided in Section 6.5 of the Level 1 SFRA. Buildings and landscaping should be designed within the site to avoid locking overland flow routes;

5. Safe access would be available in the current 1 in 100 annual probability flood event and the 1 in 100 annual probability +25% climate change allowance and a Flood Management and Evacuation Plan' should be prepared to ensure the development is in accordance with the requirements in Section 3.4 of the L2 SFRA. Future tenants/residents within the site should be made aware of the potential risks of flooding, and should be actively encouraged to sign up to the Environment Agency's Flood Information Service to receive flood alerts, flood warnings and severe flood warnings well in advance of an event;

6. It is essential to ensure that all basement areas within flood affected areas of the site are watertight, and the entrance point is situated above the 1 in 100 annual probability +25% allowance for climate change flood level. Basement dwellings in Flood Zone 2 'Medium Probability' are considered appropriate subject to the Exception Test;

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	7. Residual risk to the development should be investigated against the 1 in 100 annual probability +35% allowance for climate change flood event.

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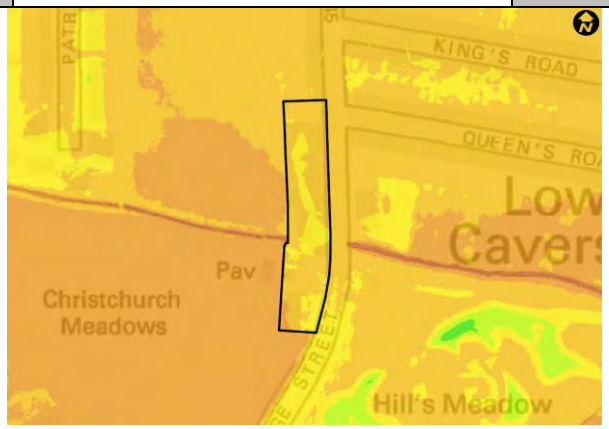
CA002 - 72 George Street (Local Plan ref: Not Identified)			
Grid Reference	SU 71900 74440	**Post Code**	RG4 8DH

Topography

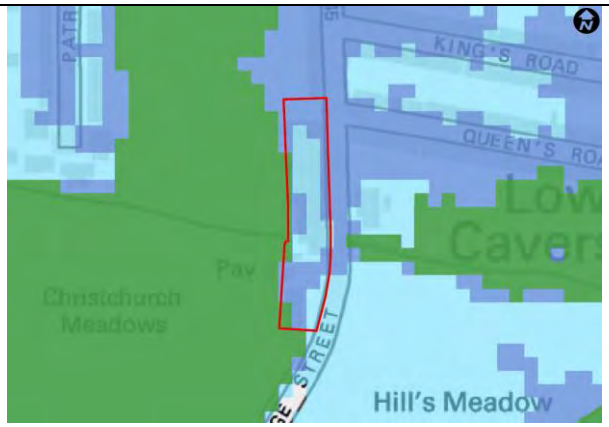


Elevation

- < 35 mAOD
- 35 - 36 mAOD
- 36 - 37 mAOD
- 37 - 38 mAOD
- 38 - 39 mAOD
- 39 - 40mAOD
- 40 - 41 mAOD
- 41 - 42 mAOD
- 42 - 43 mAOD
- 43 - 44 mAOD
- 44 - 45 mAOD
- > 45 mAOD

The topography of the site is relatively flat, ranging from approximately 36.8m AOD to 38.1m AOD.

Flood Zone Map

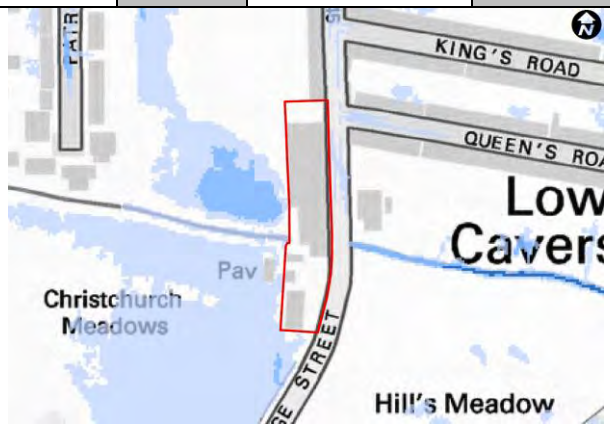


Legend

- River
- Site Boundary
- Flood Zone 2
- Flood Zone 3
- Flood Zone 3b

Flood Zone 1	0%	**Flood Zone 2**	30%	**Flood Zone 3a**	65%	**Flood Zone 3b**	5%

Surface Water



Risk of Surface Water Flooding

- River
- Site Boundary
- High - 1 in 30 annual probability
- Medium - 1 in 100 annual probability
- Low - 1 in 1000 annual Probability
- Very Low - > 1 in 1000 annual probability

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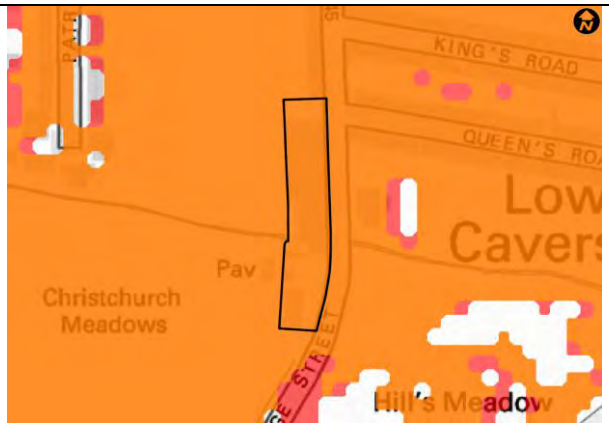
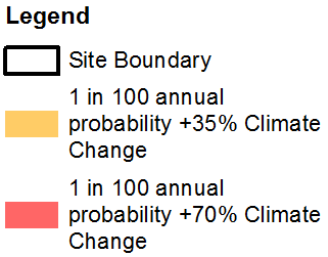
Development Proposal	Residential dwellings	**Vulnerability Classification**	More Vulnerable
Applicable Climate Change Allowances	The site is located within Flood Zone 3a 'High Probability', and the proposed development is classified as More Vulnerable (the extent of Flood Zone 2 'Medium Probability' is limited to the existing building footprints). The +35% and +70% peak river flow climate change allowances should be used to assess a range of climate change scenarios. The +35% allowance should be used to provide a benchmark flood level against which mitigation measures should be set, and the +70% allowance used to assess residual risk to the development.		
Climate Change Extents			

1 in 100 annual probability +25%	N/A	**1 in 100 annual probability +35%**	100%	**1 in 100 annual probability +70%**	100%

Description of Flood Risk

Flood Depth
The maximum flood depths around the existing buildings in the 1 in 100 annual probability flood event typically vary from 100mm to 600mm over the site.

The flood depths in the 1 in 1000 annual probability flood event vary from 300mm to 900mm over the site.

Flood depths in the climate change scenarios are typically 500mm in the +35% scenario, and 700mm in the +70% scenario.

Flood Warning and Period of Inundation
The River Thames is a large catchment with flooding typically the result of sustained regional-scale rainfall events. The response time – i.e. the period between the rainfall over the catchment and the rising river levels downstream – can be significant, and this ensures there is typically a significant period of advance warning (i.e. a period of days) before flooding occurs in the area.

The EA issue flood warnings for the area via their 'Flood Information Service' and considerable advance warning of a flood event can typically be provided to allow the Council, emergency services residents and businesses to take appropriate action.

Velocity of Flood Waters
The site is occupied by buildings in an urbanised area, a significant distance from the main river, and is impacted in the climate change allowance scenarios. When flooding does occur, the rate of rise

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Description of Flood Risk	and fall in water level is slow and velocities will correspondingly be slow, with the direction of flow from west to east (subject to further interrogation of the EA modelling).
	Flood Defences While not a 'formal' flood defence, the EA asset register does identify that the River Thames, located approximately 0.3km south of the site, includes bank protection on its left bank with a design standard of 1 in 5 years. The condition is currently at 3 (moderate), on a scale of 1 (very good) to 5 (very poor).
	Historic Records and Other Sources of Flooding The Level 1 SFRA indicates the site has been subject to historic river flooding in 1947, 1977 and 2013/14, but is not noted to have been impacted by historic flooding from other sources. Gosbrook Road, located north of the site, has previously been impacted by fluvial flooding due to drainage capacity issues. Site drainage must be considered accordingly and must be assessed in accordance with Sections 13.4 and 13.5 of the Level 1 SFRA. The susceptibility to groundwater flooding site varies between '25% and 50%'. The Thames Water DG5 information indicates that the site is within a postcode (RG4 8) that has over 101 recorded sewer flood incidents, both internal and external. The site is not located within a maximum modelled breach extent of reservoir flooding and is therefore at negligible risk of flooding in the event of a reservoir breach.
	Overview of Flood Risk A summary of the flood risk to the site is provided below: • The site is classified as Flood Zone 3a 'High Probability' (1 in 100 or greater annual probability of river flooding) and has been subject to historic river flooding in 1947, 1977 and 2013/14; • The maximum flood depth during the 1 in 100 annual probability event is typically between 100mm and 600mm; • The maximum flood depth during the 1 in 1000 annual probability event is typically between 300mm and 900mm; • The whole site is impacted by the 1 in 100 annual probability +35% allowance for climate change flood event, with general depths between 200mm and 1000mm; • Maximum flood depths for the 1 in 100 annual probability +70% climate change allowance are between 400mm and 1200mm; • The site is classified as at 'Very Low' risk of surface water flooding; • The site is at negligible risk of flooding in the event of a reservoir breach; • Pedestrian safe access is potentially available to the site, subject to further analysis of the impacts along George Street and provided the development includes raised access arrangements to the south-eastern corner of the site and onto George Street. The site is shown to be at medium to high risk of fluvial flooding, at very low risk of surface water flooding and may be susceptible to groundwater and sewer flooding. The site is therefore potentially at risk of flooding from a number of sources; however, it is considered feasible that the site could be developed safely and in accordance with the requirements of the NPPF to mitigate the potential risks of these sources of flooding. It is important that the design process considers the risk of flooding at the earliest conceptual stage, encompassing measures that will ensure the safety of future tenants/residents during a flood event. A number of important design recommendations are set out in the following section.

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Planning Recommendations

Spatial Planning

The site lies within Flood Zone 3a 'High Probability' and is affected by flooding from the River Thames in the 1 in 100 and 1 in 1000 annual probability flood events. The whole site is shown to be impacted by the 1 in 100 annual probability +35% and +70% allowance for climate change flood events.

A review of flood risk within the site has been carried out. The feasibility of designing the site in such a way that it remains safe throughout the lifetime of the development is dependent on a number of factors, and is specifically subject to further assessment of the safe access route. It is essential that the following design recommendations are incorporated into the design process from the conceptual stage. A detailed site-based Flood Risk Assessment will be required as an integral part of the planning application stage, which should be carried out in accordance with Section 10.4 of the Level 1 SFRA.

Design Recommendations

1. Floor levels within the site should be situated a minimum of 300mm above the 1 in 100 annual probability plus allowance for climate change, in this instance +35%, assuming a 100 year lifetime for residential development;

2. Flood storage should be analysed to show that the proposed building footprint of the development will not cause a detriment to the available storage during the 1 in 100 annual probability +35% climate change allowance flood event. The presence of a significant existing building footprint suggests that floodplain storage capacity could be improved through effective design measures;

3. Where appropriate, buildings should adopt resilient design techniques to minimise the damage and disruption sustained by residents following a flooding event. Further guidance can be found in BRE Digest DG523 'Flood Resilient Building', the Department for Communities and Local Government document 'Improving the Flood Performance of New Buildings – Flood Resilient Construction', and Section 12.4 of the Level 1 SFRA;

4. Sustainable Drainage Systems (SuDS) should be incorporated into the site design, aiming to achieve greenfield runoff rates, if feasible, in accordance with Section 13.4 of the Level 1 SFRA. It is important that SUDS are designed with due consideration to soil and groundwater conditions. Infiltration techniques should be sought wherever possible, however are likely to be unsuitable in areas of shallow groundwater and/or impermeable soils. Further guidance is provided in Section 6.5 of the Level 1 SFRA. Buildings and landscaping should be designed within the site to avoid locking overland flow routes;

5. Safe access would be available in the current 1 in 100 annual probability flood event from the south-east boundary of the site. The impacts on the route should be assessed for the 1 in 100 annual probability +35% climate change allowance and a Flood Management and Evacuation Plan' should be prepared to ensure the development is in accordance with the requirements in Section 3.4 of the L2 SFRA. It is essential that future tenants/residents within the site are made aware of the potential risks of flooding, and are actively encouraged to sign up to the Environment Agency's Flood Information Service to receive flood alerts, flood warnings and severe flood warnings well in advance of an event;

6. It is essential to ensure that all basement areas within flood affected areas of the site are watertight, and the entrance point is situated above the 1 in 100 annual probability +35% allowance for climate change flood level. Basements should not be used to provide habitable areas in locations classified as Flood Zone 2 'Medium Probability' or Flood Zone 3a 'High Probability';

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	7. Residual risk to the development should be considered against the 1 in 100 annual probability +70% allowance for climate change flood event.

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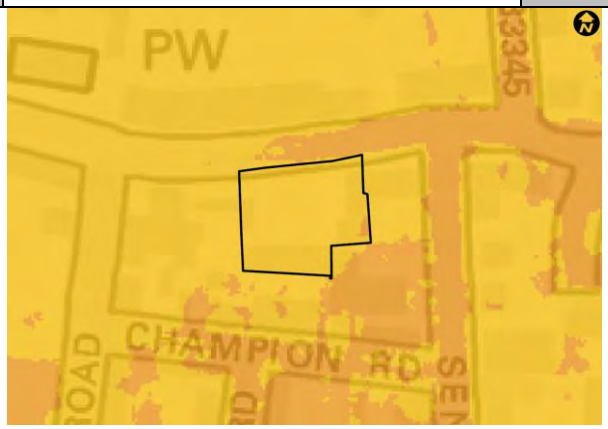
CA004 - 383 Gosbrook Road (Local Plan ref: Not Identified)			
Grid Reference	SU 72310 74530	**Post Code**	RG4 8ED

Topography

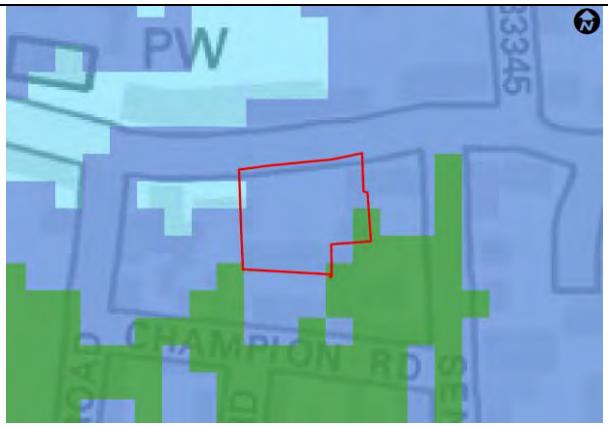


Elevation

< 35 mAOD	40 - 41 mAOD
35 - 36 mAOD	41 - 42 mAOD
36 - 37 mAOD	42 - 43 mAOD
37 - 38 mAOD	43 - 44 mAOD
38 - 39 mAOD	44 - 45 mAOD
39 - 40mAOD	> 45 mAOD

The topography of the site is largely flat, ranging between approximately 36.9m AOD and 37.7m AOD.

Flood Zone Map

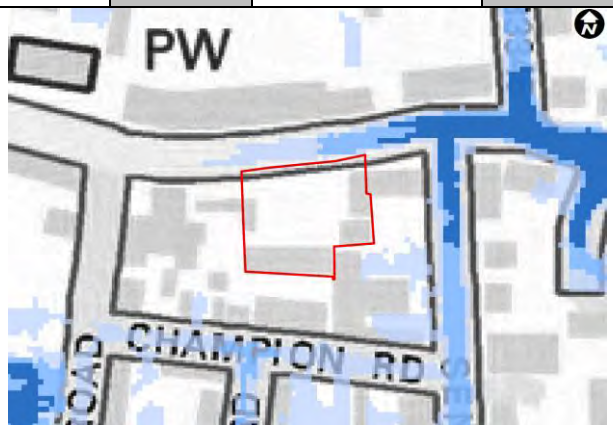


Legend

- River
- Site Boundary
- Flood Zone 2
- Flood Zone 3
- Flood Zone 3b

Flood Zone 1	0%	**Flood Zone 2**	2%	**Flood Zone 3a**	93%	**Flood Zone 3b**	5%

Surface Water



Risk of Surface Water Flooding

- River
- Site Boundary
- High - 1 in 30 annual probability
- Medium - 1 in 100 annual probability
- Low - 1 in 1000 annual Probability
- Very Low - > 1 in 1000 annual probability

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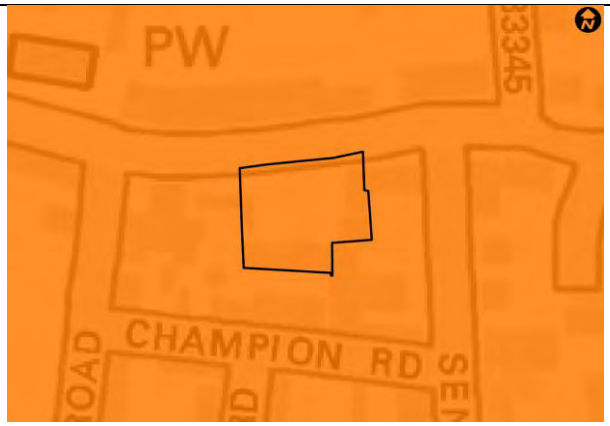
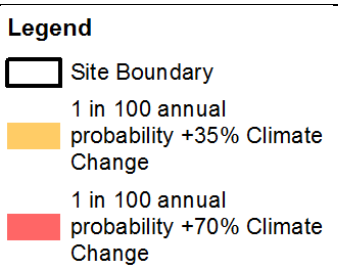
Development Proposal	Residential dwellings	**Vulnerability Classification**	More Vulnerable
Applicable Climate Change Allowances	The site is largely located within Flood Zone 3a 'High Probability', and the proposed development is classified as More Vulnerable. The +35% and +70% peak river flow climate change allowances should therefore be used to assess a range of climate change scenarios. The +35% allowance should be used to provide a benchmark flood level against which mitigation measures should be set, and the +70% allowance used to assess residual risk to the development.		
Climate Change Extents			
1 in 100 annual probability +25%	N/A	**1 in 100 annual probability +35%**	100%
1 in 100 annual probability +70%	100%		

Description of Flood Risk

Flood Depth
The maximum flood depths around the existing buildings in the 1 in 100 annual probability flood event typically vary from 100mm to 400mm over the site.

The flood depths in the 1 in 1000 annual probability flood event typically vary from 500mm to 800mm over the site.

Flood depths in the climate change scenarios are typically 500mm in the +35% scenario, and 700mm in the +70% scenario.

Flood Warning and Period of Inundation
The River Thames is a large catchment with flooding typically the result of sustained regional-scale rainfall events. The response time – i.e. the period between the rainfall over the catchment and the rising river levels downstream – can be significant, and this ensures there is typically a significant period of advance warning (i.e. a period of days) before flooding occurs in the area.

The EA issue flood warnings for the area via their 'Flood Information Service' and considerable advance warning of a flood event can typically be provided to allow the Council, emergency services residents and businesses to take appropriate action.

Velocity of Flood Waters
The site is occupied by buildings in an urbanised area, a significant distance from the main river, and is impacted in the climate change allowance scenarios. When flooding does occur, the rate of rise and

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Level 2 Strategic Flood Risk Assessment

Description of Flood Risk	fall in water level is slow and velocities will correspondingly be slow with the direction of flow from west to east (subject to further interrogation of the EA modelling).
	Flood Defences While not a 'formal' flood defence, the EA asset register does identify that the River Thames, located approximately 0.2km south of the site, includes high ground on its left bank with a design standard of 1 in 2 years. The condition is currently at 3 (moderate), on a scale of 1 (very good) to 5 (very poor).
	Historic Records and Other Sources of Flooding The Level 1 SFRA indicates that the site has been subject to historic river flooding in 1947 and 1977, but is not noted to have been impacted by flood events from other sources. Site drainage must be considered accordingly and must be assessed in accordance with Sections 13.4 and 13.5 of the Level 1 SFRA. The susceptibility to groundwater flooding varies between '50% and 75%'. The Thames Water DG5 information indicates that the site is within a postcode (RG4 8) that has over 101 recorded sewer flood incidents, both internal and external. The site is not located within a maximum modelled breach extent of reservoir flooding and is therefore at negligible risk of flooding in the event of a reservoir breach.
	Overview of Flood Risk A summary of the flood risk to the site is provided below: • The site is classified as Flood Zone 3a 'High Probability' (1 in 100 or greater annual probability of river flooding) and has been subject to historic river flooding in 1947 and 1977; • The maximum flood depth during the 1 in 100 annual probability event is typically between 100mm and 400mm; • The maximum flood depth during the 1 in 1000 annual probability event is typically between 500mm and 800mm; • The whole site is impacted by the 1 in 100 annual probability +35% climate change allowance event with general depths between 400mm and 700mm; • Maximum flood depths for the 1 in 100 annual probability +70% climate change allowance event typically vary between 600mm and 900mm; • The site is classified as at Very Low risk of surface water flooding; • The site is at negligible risk of flooding in the event of a reservoir breach; • The pedestrian access route via Gosbrook Road is impacted by the 1 in 100 annual probability flood event, thereby impacting on pedestrian safe access. The site is shown to be at high risk of fluvial flooding, at very low risk of surface water flooding, and may be susceptible to groundwater and sewer flooding. The site is therefore potentially at risk of flooding from a number of sources. Safe access is impacted in a flood event of 1 in 100 annual probability or greater, and the feasibility of new residential development is therefore subject to further assessment of the mitigation strategy based on the approach detailed in the L2 SFRA. It is important that the design process considers the risk of flooding at the earliest conceptual stage, encompassing measures that will ensure the safety of future tenants/residents during a flood event. A number of important design recommendations are set out below.

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Planning Recommendations

Spatial Planning

The site lies within Flood Zone 3a 'High Probability', affected by flooding from the River Thames in the 1 in 100 annual probability flood event. The entirety of the site is shown to be impacted by the 1 in 100 annual probability +35% and +70% allowances for climate change flood events.

A review of flood risk within the site has been carried out. The feasibility of designing the site in such a way that it remains safe throughout the lifetime of the development is dependent on a number of factors, and is specifically subject to further assessment of the safe access route.

It is essential that the following design recommendations are incorporated into the design process from the conceptual stage. A detailed site-based Flood Risk Assessment will be required as an integral part of the planning application stage, which should be carried out in accordance with Section 10.4 of the Level 1 SFRA.

Design Recommendations

1. Floor levels within the site should be situated a minimum of 300mm above the 1 in 100 annual probability plus allowance for climate change, in this instance +35%, assuming a 100 year lifetime for residential development;

2. Flood storage should be analysed to show that the proposed building footprint of the development will not cause a detriment to the available storage during the 1 in 100 annual probability +35% climate change allowance flood event. The presence of existing building footprint suggests that floodplain storage capacity could be improved through effective design measures;

3. Where appropriate, buildings should adopt resilient design techniques to minimise the damage and disruption sustained by businesses and/or residents following a flooding event. Further guidance can be found in BRE Digest DG523 'Flood Resilient Building', the Department for Communities and Local Government document 'Improving the Flood Performance of New Buildings – Flood Resilient Construction', and Section 12.4 of the Level 1 SFRA';

4. Sustainable Drainage Systems (SuDS) should be incorporated into the site design, aiming to achieve greenfield runoff rates, if feasible, in accordance with Section 13.4 of the Level 1 SFRA. It is important that SUDS are designed with due consideration to soil and groundwater conditions. Infiltration techniques should be sought wherever possible, however are likely to be unsuitable in areas of shallow groundwater and/or impermeable soils. Further guidance on designing for groundwater is provided in Section 6.5 of the Level 1 SFRA. Buildings and landscaping should be designed within the site to avoid locking overland flow routes;

5. Safe access is impacted in the current 1 in 100 annual probability flood event. Further analysis is required to assess if a safe route is available in accordance with the requirements in Section 3.4 of the L2 SFRA and, if so, a Flood Management and Evacuation Plan' should be prepared. Future tenants/residents within the site should be made aware of the potential risks of flooding, and should be actively encouraged to sign up to the Environment Agency's Flood Information Service to receive flood alerts, flood warnings and severe flood warnings well in advance of an event;

6. It is essential to ensure that all basement areas within flood affected areas of the site are watertight, and the entrance point is situated above the 1 in 100 annual probability +35% allowance for climate change flood level. Basements should not be used to provide habitable areas in locations classified at Flood Zone 3a 'Medium Probability';

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	7. Residual risk to the development should be investigated against the 1 in 100 annual probability +70% allowance for climate change flood event.

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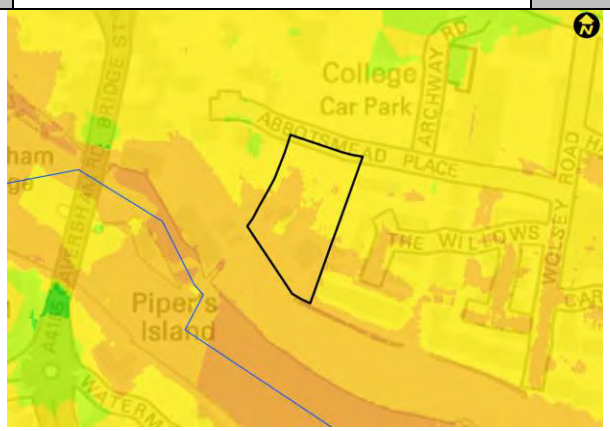
CA006 - Reading University Boat Club, Thames Promenade (Local Plan ref: CA1a)			
Grid Reference	SU 71320 74620	**Post Code**	RG4 8BD

Topography

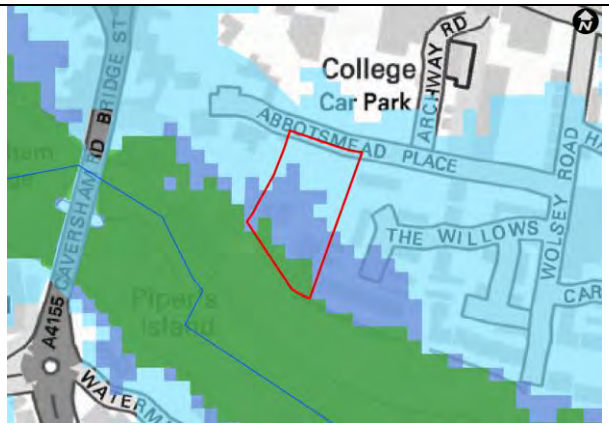


Elevation

- < 35 mAOD
- 35 - 36 mAOD
- 36 - 37 mAOD
- 37 - 38 mAOD
- 38 - 39 mAOD
- 39 - 40mAOD
- 40 - 41 mAOD
- 41 - 42 mAOD
- 42 - 43 mAOD
- 43 - 44 mAOD
- 44 - 45 mAOD
- > 45 mAOD

The topography of the site is largely flat, ranging between approximately 37.3m AOD and 38.6m AOD.

Flood Zone Map

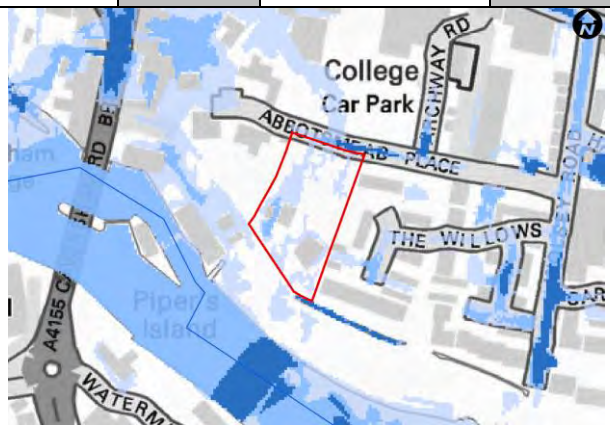


Legend

- River
- Site Boundary
- Flood Zone 2
- Flood Zone 3
- Flood Zone 3b

Flood Zone 1	0%	Flood Zone 2	25%	Flood Zone 3a	60%	Flood Zone 3b	15%

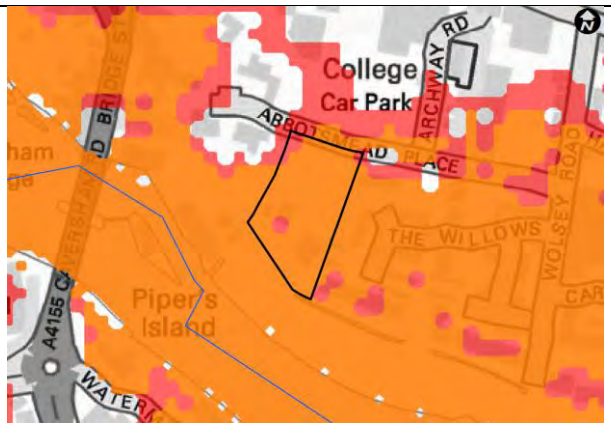
Surface Water



Risk of Surface Water Flooding

- River
- Site Boundary
- High - 1 in 30 annual probability
- Medium - 1 in 100 annual probability
- Low - 1 in 1000 annual Probability
- Very Low - > 1 in 1000 annual probability

Reading Borough Council
Level 2 Strategic Flood Risk Assessment

Development Proposal	16 – 25 residential dwellings	**Vulnerability Classification**	More Vulnerable
Applicable Climate Change Allowances	The site is located within Flood Zone 2 'Medium Probability', and Flood Zone 3a 'High Probability', and the proposed development is classified as More Vulnerable. A small portion of the site lies within Flood Zone 3b 'functional floodplain'. This area should not be utilised for residential dwellings and development should be avoided. The areas classified as Flood Zone 2 and Flood Zone 3a will both be treated as Flood Zone 3a 'High Probability', the worst case flood zone on site that could be considered developable, subject to a number of conditions. The +35% and +70% peak river flow climate change allowances should therefore be used to assess a range of climate change scenarios. The +35% allowance should be used to provide a benchmark flood level against which mitigation measures should be set, and the +70% allowance used to assess residual risk to the development.		
Climate Change Extents		**Legend** River Site Boundary 1 in 100 annual probability +35% Climate Change 1 in 100 annual probability +70% Climate Change	

1 in 100 annual probability +25%	90%	**1 in 100 annual probability +35%**	95%	**1 in 100 annual probability +70%**	100%

Description of Flood Risk	**Flood Depth** The maximum flood depths around the existing buildings in the 1 in 100 annual probability flood event typically vary from 50mm to 150mm over the site. The flood depths in the 1 in 1000 annual probability flood event typically vary from 400mm to 600mm over the site. Flood depths in the climate change scenarios are typically 400mm in the +35% scenario, and 600mm in the +70% scenario.
	Flood Warning and Period of Inundation The River Thames is a large catchment with flooding typically the result of sustained regional-scale rainfall events. The response time – i.e. the period between the rainfall over the catchment and the rising river levels downstream – can be significant, and this ensures there is typically a significant period of advance warning (i.e. a period of days) before flooding occurs in the area.

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	The EA issue flood warnings for the area via their 'Flood Information Service' and considerable advance warning of a flood event can typically be provided to allow the Council, emergency services residents and businesses to take appropriate action.
	Velocity of Flood Waters The site is occupied by buildings in an urbanised area, and is impacted in the climate change allowance scenarios. When flooding does occur, the rate of rise and fall in water level is slow and velocities will correspondingly be slow, with the direction of flow from west to east (subject to further interrogation of the EA modelling).
Description of Flood Risk	**Flood Defences** While not a 'formal' flood defence, the EA asset register does identify that the River Thames, located approximately 0.05km south of the site, includes bank protection on its left bank with a design standard of 1 in 5 years. The condition is currently at 3 (moderate), on a scale of 1 (very good) to 5 (very poor).
	Historic Records and Other Sources of Flooding The Level 1 SFRA indicates the site has been subject to historic river flooding in 1947, 1977, 2003 and 2013/14, but is not noted to have been impacted by flood events from other sources. External areas are noted to be impacted by surface water flooding, which, if surface water drainage strategy is not sufficiently incorporated into proposed development design, could result in ponding of water following heavy rainfall events. Site drainage must therefore be considered accordingly and must be assessed in accordance with Sections 13.4 and 13.5 of the Level 1 SFRA. According to the Level 1 SFRA, the susceptibility to groundwater flooding varies between '25%' and 50%'. The Thames Water DG5 information indicates that the site is within a postcode (RG4 8) that has over 101 recorded sewer flood incidents, both internal and external. The site is not located within a maximum modelled breach extent of reservoir flooding and is therefore at negligible risk of flooding in the event of a reservoir breach.
	Overview of Flood Risk A summary of the flood risk to the site is provided below: • The southern part of the site is classified as Flood Zone 3a 'High Probability', with a 1 in 100 annual probability of river flooding; • The maximum flood depth during the 1 in 100 annual probability event is approximately 750mm; • The maximum flood depth during the 1 in 1000 annual probability event is approximately 1200mm, with the remainder of the site experiencing depths typically between 400mm and 600mm; • The majority of the site is impacted by the 1 in 100 annual probability +35% climate change allowance event, with maximum flood depths of 1100 mm, and general depths between 300mm and 500mm; • Maximum flood depths for the 1 in 100 annual probability +70% climate change allowance increase to 1300mm, with general depths between 500mm and 700mm; • The site is largely classified as at 'Very Low' risk of surface water flooding, with localised areas between Low and Medium risk; • The site is at negligible risk of flooding in the event of a reservoir breach;

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	• Pedestrian safe access is potentially available to the site, subject to further analysis of the impacts along Abbotsmead Place, north of the site, provided the development includes raised access arrangements to the north western corner of the site The site is shown to be at high/medium risk of fluvial flooding, is mainly 'very low' risk of surface water flooding and may be susceptible to groundwater and sewer flooding. The site is therefore potentially at risk of flooding from a number of sources; however, it is considered feasible that the site can be developed safely and in accordance with the requirements of the NPPF, to mitigate the potential risks of these sources of flooding. It is important that the design process considers the risk of flooding at the earliest conceptual stage, encompassing measures that will ensure the safety of future tenants/residents during a flood event. A number of important design recommendations are set out below.

Planning Recommendations	**Spatial Planning** The site lies partly within Flood Zone 3a 'Medium Probability', affected by flooding from the River Thames in the 1 in 100 annual probability flood event. The majority of the site is shown to be impacted by the 1 in 100 annual probability +35% and +70% allowances for climate change flood events. A review of flood risk within the site has been carried out, and it is considered feasible to design the site in such a way that it remains safe throughout the lifetime of the development. It is essential that the following design recommendations are incorporated into the design process from the conceptual stage. A detailed site-based Flood Risk Assessment will be required as an integral part of the planning application stage, which should be carried out in accordance with Section 10.4 of the Level 1 SFRA.
	Design Recommendations 1. All 'More Vulnerable' uses should be steered towards areas within the site that are at lowest risk. If at all possible, residential uses should be restricted to those areas within the site that fall within Flood Zone 2 'Medium Probability'; 2. No development, excepting water compatible or essential infrastructure, should be proposed for the area of the site classified as Flood Zone 3b 'functional floodplain'. The Exception Test must be passed for essential infrastructure; 3. Floor levels within the site should be situated a minimum of 300mm above the 1 in 100 annual probability plus allowance for climate change, in this instance +35%, assuming a 100 year lifetime for residential development; 4. Flood storage should be analysed to show that the proposed building footprint of the development will not cause a detriment to the available storage during the 1 in 100 annual probability +35% climate change allowance flood event; 5. Where appropriate, buildings should adopt resilient design techniques to minimise the damage and disruption sustained by businesses and/or residents following a flooding event. Further guidance can be found in BRE Digest DG523 'Flood Resilient Building', the Department for Communities and Local Government document 'Improving the Flood

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	Performance of New Buildings – Flood Resilient Construction', and Section 12.4 of the Level 1 SFRA'; 6. Sustainable Drainage Systems (SuDS) should be incorporated into the site design, aiming to achieve greenfield runoff rates, if feasible, in accordance with Section 13.4 of the Level 1 SFRA. It is important that SUDS are designed with due consideration to soil and groundwater conditions. Infiltration techniques should be sought wherever possible, however are likely to be unsuitable in areas of shallow groundwater and/or impermeable soils. Further guidance on designing for groundwater is provided in Section 6.5 of the Level 1 SFRA. Buildings and landscaping should be designed within the site to avoid locking overland flow routes; 7. Safe access would be available in the current 1 in 100 annual probability flood event from the northern boundary of the site. The impacts on the route should be assessed for the 1 in 100 annual probability +35% climate change allowance and a Flood Management and Evacuation Plan' should be prepared to ensure the development is in accordance with the requirements in Section 3.4 of the L2 SFRA. Future tenants/residents within the site should be made aware of the potential risks of flooding, and be actively encouraged to sign up to the Environment Agency's Flood Information Service to receive flood alerts, flood warnings and severe flood warnings well in advance of an event; 8. It is essential to ensure that all basement areas within flood affected areas of the site are watertight, and the entrance point is situated above the 1 in 100 annual probability +35% allowance for climate change flood level. Basements should not be used to provide habitable areas in locations classified at Flood Zone 2 'Medium Probability' or Flood Zone 3a 'High Probability'; 9. Residual risk to the development should be considered against the 1 in 100 annual probability +70% allowance for climate change flood event.

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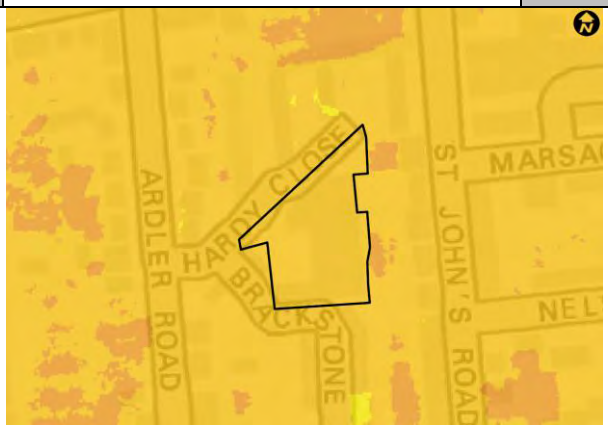
CA007 - Cantay House, Ardler Road (Local Plan ref: Not Identified)			
Grid Reference	SU 72120 74750	**Post Code**	RG4 5AH

Topography

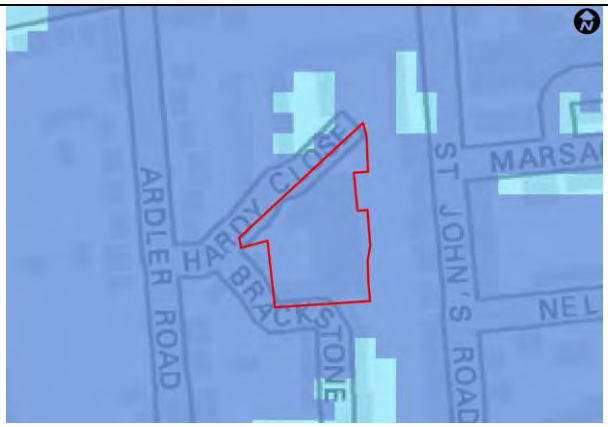


Elevation

- < 35 mAOD
- 35 - 36 mAOD
- 36 - 37 mAOD
- 37 - 38 mAOD
- 38 - 39 mAOD
- 39 - 40mAOD
- 40 - 41 mAOD
- 41 - 42 mAOD
- 42 - 43 mAOD
- 43 - 44 mAOD
- 44 - 45 mAOD
- > 45 mAOD

The topography of the site is largely flat, ranging between approximately 37.2m AOD and 37.8m AOD.

Flood Zone Map

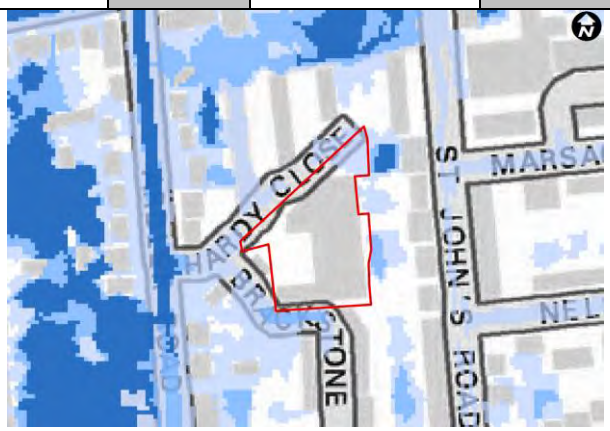


Legend

- River
- Site Boundary
- Flood Zone 2
- Flood Zone 3

Flood Zone 1	0%	Flood Zone 2	0%	Flood Zone 3a	100%	Flood Zone 3b	0%

Surface Water



Risk of Surface Water Flooding

- River
- Site Boundary
- High - 1 in 30 annual probability
- Medium - 1 in 100 annual probability
- Low - 1 in 1000 annual Probability
- Very Low - > 1 in 1000 annual probability

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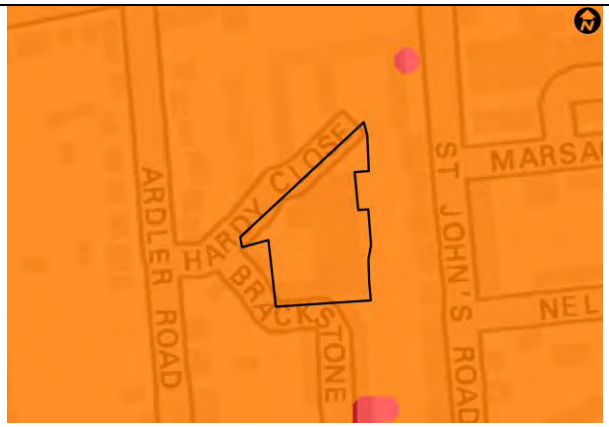
Development Proposal	Residential dwellings	**Vulnerability Classification**	More Vulnerable
Applicable Climate Change Allowances	The +35% and +70% peak river flow climate change allowances should be used to assess a range of climate change scenarios. The +35% allowance should be used to provide a benchmark flood level against which mitigation measures should be set, and the +70% allowance used to assess residual risk to the development.		
Climate Change Extents			**Legend** Site Boundary 1 in 100 annual probability +35% Climate Change 1 in 100 annual probability +70% Climate Change

1 in 100 annual probability +25%	N/A	**1 in 100 annual probability +35%**	100%	**1 in 100 annual probability +70%**	100%

Description of Flood Risk

Flood Depth

The maximum flood depths around the existing buildings in the 1 in 100 annual probability flood event typically vary from 50mm to 200mm over the site.

The flood depths in the 1 in 1000 annual probability flood event typically vary from 400mm to 600mm over the site.

Flood depths in the climate change scenarios are typically 400mm in the +35% scenario, and 600mm in the +70% scenario.

Flood Warning and Period of Inundation

The River Thames is a large catchment with flooding typically the result of sustained regional-scale rainfall events. The response time – i.e. the period between the rainfall over the catchment and the rising river levels downstream – can be significant, and this ensures there is typically a significant period of advance warning (i.e. a period of days) before flooding occurs in the area.

The EA issue flood warnings for the area via their 'Flood Information Service' and considerable advance warning of a flood event can typically be provided to allow the Council, emergency services residents and businesses to take appropriate action.

Velocity of Flood Waters

The site is occupied by buildings in an urbanised area, a significant distance from the main river, and is impacted by the climate change allowance scenarios. When flooding does occur, the rate of rise and fall in water level is slow and velocities will correspondingly be slow, with the direction of flow from west to east (subject to further interrogation of the EA modelling).

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Description of Flood Risk

Flood Defences

While not a 'formal' flood defence, the EA asset register does identify that the River Thames, located approximately 0.5km south of the site, includes high natural banks on its left bank with a design standard of 1 in 2 years. The condition is currently at 3 (moderate), on a scale of 1 (very good) to 5 (very poor).

Historic Records and Other Sources of Flooding

The Level 1 SFRA indicates that the site has been subject to historic river flooding in 1947 and 1977, but is not noted to have been impacted by flood events from other sources. Ardler Road, located west of the site, has records of highways flooding (RBC Highways) and a recorded flood incident (Reading Borough Fire and Rescue Service - RBFRS). A record of groundwater flooding (2000/01) exists north west of the site. Site drainage must be considered accordingly, and must be assessed in accordance with Sections 13.4 and 13.5 of the Level 1 SFRA.

According to the Level 1 SFRA, the susceptibility to groundwater flooding varies between '50% and 75%'. The Thames Water DG5 information indicates that the site is within a postcode (RG4 5) that has 51-100 recorded sewer flood incidents.

The site is not located within a maximum modelled breach extent of reservoir flooding and is therefore at negligible risk of flooding in the event of a reservoir breach.

Overview of Flood Risk

A summary of the flood risk to the site is provided below:

- The site is classified as Flood Zone 3a 'High Probability', with a 1 in 100 annual probability of river flooding;
- The maximum flood depths during the 1 in 100 annual probability event are typically between 50mm and 200mm;
- The maximum flood depths during the 1 in 1000 annual probability event are typically between 600mm and 800mm;
- The site is impacted by the 1 in 100 annual probability +35% climate change allowance event, with maximum flood depths typically between 200mm and 400mm;
- Maximum flood depths for the 1 in 100 annual probability +70% climate change allowance scenario are typically between 400mm and 600mm;
- The site is largely classified as at Very Low risk of surface water flooding, and is at negligible risk of flooding in the event of a reservoir breach;
- The surrounding area is impacted at the peak of the 1 in 100 annual probability flood event, thereby impacting on pedestrian safe access.

The site is shown to be at high risk of fluvial flooding, at a very low/low risk of surface water flooding and may be susceptible to groundwater and sewer flooding. The site is therefore potentially at risk of flooding from a number of sources.

Safe access is impacted in a flood event of 1 in 100 annual probability or greater, and the feasibility of new residential development is subject to further assessment of the mitigation strategy based on the approach detailed in the L2 SFRA.

It is important that the design process considers the risk of flooding at the earliest conceptual stage, encompassing measures that will ensure the safety of future tenants/residents during a flood event.

A number of important design recommendations are set out below.

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Planning Recommendations

Spatial Planning

The site lies within Flood Zone 3a 'High Probability', affected by flooding from the River Thames in the 1 in 100 annual probability flood event. The entirety of the site is shown to be impacted by the 1 in 100 annual probability +35% and +70% allowances for climate change flood events.

A review of flood risk within the site has been carried out. The feasibility of designing the site in such a way that it remains safe throughout the lifetime of the development is dependent on a number of factors, and is specifically subject to further assessment of the safe access route.

It is essential that the following design recommendations are incorporated into the design process from the conceptual stage. A detailed site-based Flood Risk Assessment will be required as an integral part of the planning application stage, which should be carried out in accordance with Section 10.4 of the Level 1 SFRA.

Design Recommendations

1. Floor levels within the site should be situated a minimum of 300mm above the 1 in 100 annual probability plus allowance for climate change, in this instance +35%, assuming a 100 year lifetime for residential development;

2. Flood storage should be analysed to show that the proposed building footprint of the development will not cause a detriment to the available storage during the 1 in 100 annual probability +35% climate change allowance flood event. The presence of a significant existing building footprint suggests that floodplain storage capacity could be improved through effective design measures;

3. Where appropriate, buildings within the site should adopt resilient design techniques to minimise the damage and disruption sustained by businesses and/or residents following a flooding event. Further guidance can be found in BRE Digest DG523 'Flood Resilient Building', the Department for Communities and Local Government document 'Improving the Flood Performance of New Buildings – Flood Resilient Construction', and Section 12.4 of the Level 1 SFRA;

4. Sustainable Drainage Systems (SuDS) should be incorporated into the site design, aiming to achieve greenfield runoff rates, if feasible, in accordance with Section 13.4 of the Level 1 SFRA. It is important that SUDS are designed with due consideration to soil and groundwater conditions. Infiltration techniques should be sought wherever possible, however are likely to be unsuitable in areas of shallow groundwater and/or impermeable soils. Further guidance on designing for groundwater is provided in Section 6.5 of the Level 1 SFRA. Buildings and landscaping should be designed within the site to avoid locking overland flow routes;

5. Safe access is impacted in the current 1 in 100 annual probability flood event. Further analysis is required to assess if a safe route is available in accordance with the requirements in Section 3.4 of the L2 SFRA and, if so, a Flood Management and Evacuation Plan' should be prepared. Future tenants/residents within the site should be made aware of the potential risks of flooding, and should be actively encouraged to sign up to the Environment Agency's Flood Information Service to receive flood alerts, flood warnings and severe flood warnings well in advance of an event;

6. It is essential to ensure that all basement areas within flood affected areas of the site are watertight, and the entrance point is situated above the 1 in 100 annual probability +35%

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	allowance for climate change flood level. Basements should not be used to provide habitable areas in locations classified at Flood Zone 3a 'High Probability'; 7. Residual risk to the development should be investigated against the 1 in 100 annual probability +70% allowance for climate change flood event.

Reading Borough Council
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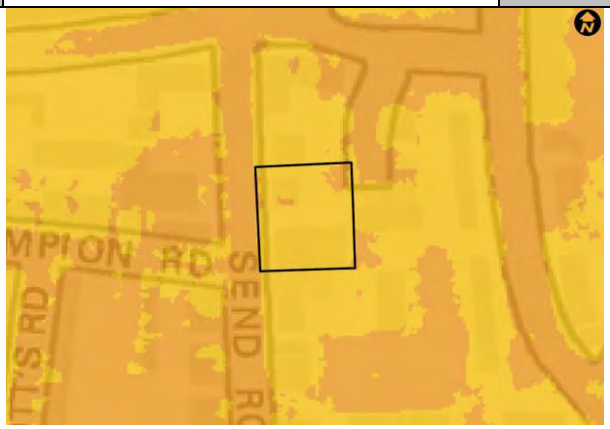
CA009 - 4-6 Send Road (Local Plan ref: Not Identified)			
Grid Reference	SU 72390 74480	**Post Code**	RG4 8EH

Topography

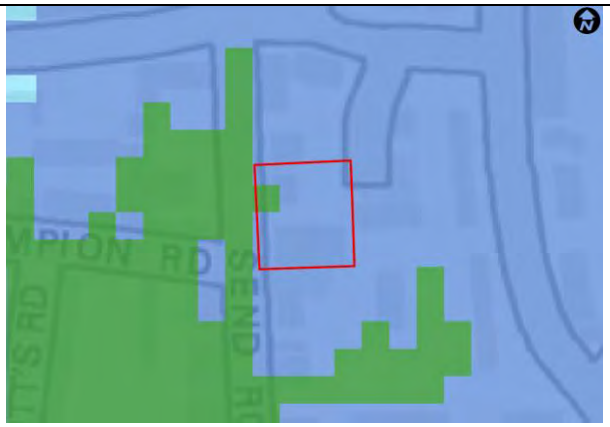


Elevation

< 35 mAOD	40 - 41 mAOD
35 - 36 mAOD	41 - 42 mAOD
36 - 37 mAOD	42 - 43 mAOD
37 - 38 mAOD	43 - 44 mAOD
38 - 39 mAOD	44 - 45 mAOD
39 - 40mAOD	> 45 mAOD

The topography of the site is largely flat, ranging between approximately 37.0m AOD and 37.5m AOD.

Flood Zone Map

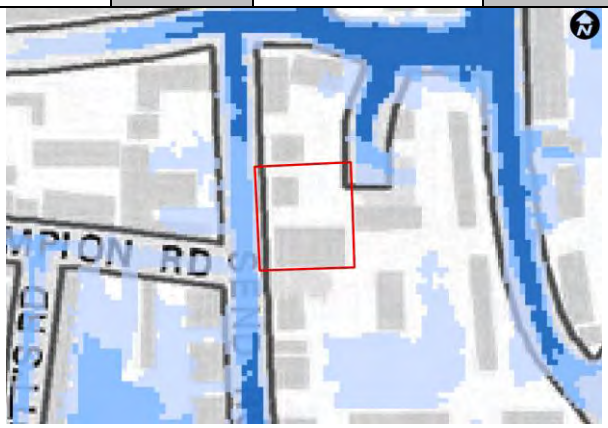


Legend

- River
- Site Boundary
- Flood Zone 2
- Flood Zone 3
- Flood Zone 3b

Flood Zone 1	0%	**Flood Zone 2**	0%	**Flood Zone 3a**	95%	**Flood Zone 3b**	5%

Surface Water



Risk of Surface Water Flooding

- River
- Site Boundary
- High - 1 in 30 annual probability
- Medium - 1 in 100 annual probability
- Low - 1 in 1000 annual Probability
- Very Low - > 1 in 1000 annual probability

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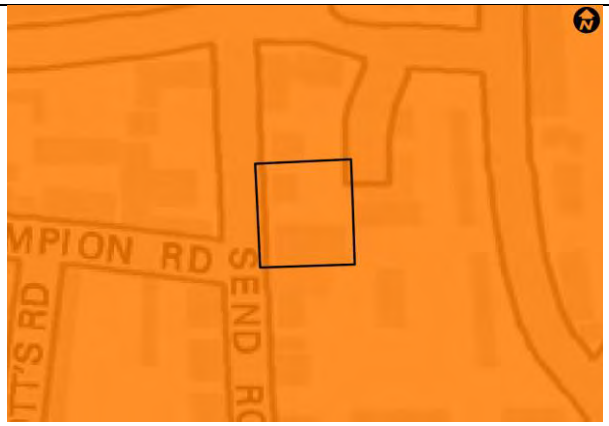
Development Proposal	Residential dwellings	**Vulnerability Classification**	More Vulnerable
Applicable Climate Change Allowances	The site is located within Flood Zone 3a 'High Probability', and the proposed development is classified as More Vulnerable. The +35% and +70% peak river flow climate change allowances should therefore be used to assess a range of climate change scenarios. The +35% allowance should be used to provide a benchmark flood level against which mitigation measures should be set, and the +70% allowance used to assess residual risk to the development.		
Climate Change Extents			
1 in 100 annual probability +25%	N/A	**1 in 100 annual probability +35%**	100%	**1 in 100 annual probability +70%**	100%
Description of Flood Risk	**Flood Depth** The maximum flood depths around the existing buildings in the 1 in 100 annual probability flood event typically vary from 10mm to 300mm over the site. The flood depths in the 1 in 1000 annual probability flood event typically vary from 500mm to 800mm over the extent of the site. Flood depths in the climate change scenarios are typically 500mm in the +35% scenario, and 800mm in the +70% scenario.		
	Flood Warning and Period of Inundation The River Thames is a large catchment with flooding typically the result of sustained regional-scale rainfall events. The response time – i.e. the period between the rainfall over the catchment and the rising river levels downstream – can be significant, and this ensures there is typically a significant period of advance warning (i.e. a period of days) before flooding occurs in the area. The EA issue flood warnings for the area via their 'Flood Information Service' and considerable advance warning of a flood event can typically be provided to allow the Council, emergency services residents and businesses to take appropriate action.		
	Velocity of Flood Waters The site is occupied by existing buildings in an urbanised area, a significant distance from the main river, and is impacted in the climate change allowance scenarios. When flooding does occur, the rate		

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Description of Flood Risk	of rise and fall in water level is slow and velocities will correspondingly be slow with the direction of flow from west to east (subject to further interrogation of the EA modelling).
	Flood Defences While not a 'formal' flood defence, the EA asset register does identify that the River Thames, located approximately 0.2km south of the site, includes bank protection on its left bank with a design standard of 1 in 5 years. The condition is currently at 3 (moderate), on a scale of 1 (very good) to 5 (very poor).
	Historic Records and Other Sources of Flooding The Level 1 SFRA indicates the site was impacted by 1947 and 1977 river flood events, and Send Road, adjacent to the site, was impacted by the 2003 river flood event. It is not noted to have been impacted by flood events from other sources. There are a number of records of flooding provided by RBC in the close vicinity of the site, including the southern extent of Send Road, and on Gosbrook Road, located north of the site. Site drainage must be considered accordingly with respect to future development, and must be assessed in accordance with Sections 13.4 and 13.5 of the Level 1 SFRA. The susceptibility to groundwater flooding varies between '50% and 75%'. The Thames Water DG5 information indicates that the site is within a postcode (RG4 8) that has over 101 recorded sewer flood incidents, both internal and external. The site is not located within a maximum modelled breach extent of reservoir flooding and is therefore at negligible risk of flooding in the event of a reservoir breach.
	Overview of Flood Risk A summary of the flood risk to the site is provided below: • The site is classified as Flood Zone 3a 'High Probability' (1 in 100 or greater annual probability of river flooding) and has been subject to historic river flooding in 1947 and 1977; • The maximum flood depth during the 1 in 100 annual probability event typically between 10mm and 300mm; • The maximum flood depth during the 1 in 1000 annual probability event is typically between 500mm and 800mm; • The entirety of the site is impacted by the 1 in 100 annual probability +35% climate change allowance flood event, with general depths between 300mm and 600mm; • Maximum flood depths for the 1 in 100 annual probability +70% climate change allowance typically vary between 600mm and 900mm; • The site is largely classified as at Very Low risk of surface water flooding; • The site is at negligible risk of flooding in the event of a reservoir breach; • The pedestrian access route via Send Road is impacted by the 1 in 20 annual probability floodplain, although a lower hazard route may be available to the north-east, although this is within the current 1 in 100 annual probability floodplain. The site is shown to be at high risk of fluvial flooding, at very low risk of surface water flooding and may be susceptible to groundwater and sewer flooding. The site is therefore potentially at risk of flooding from a number of sources. Further analysis is required to assess if a safe route is available in accordance with the requirements in Section 3.4 of the L2 SFRA and, if so, a Flood Management and Evacuation Plan' should be

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	prepared. Future tenants/residents within the site should be made aware of the potential risks of flooding, and should be actively encouraged to sign up to the Environment Agency's Flood Information Service to receive flood alerts, flood warnings and severe flood warnings well in advance of an event; Subject to further analysis of the safe access arrangements, it is considered feasible that the site can be developed safely and in accordance with the requirements of the NPPF, to mitigate the potential risks of these sources of flooding. It is important that the design process considers the risk of flooding at the earliest conceptual stage, encompassing measures that will ensure the safety of future tenants/residents during a flood event. A number of important design recommendations are set out below.
Planning Recommendations	**Spatial Planning** The site lies within Flood Zone 3a 'High Probability', affected by flooding from the River Thames in the 1 in 100 annual probability flood event. The entirety of the site is shown to be impacted by the 1 in 100 annual probability +35% and +70% allowances for climate change flood events. A small portion of the site lies within Flood Zone 3b 'functional floodplain'. This area should not be utilised for residential dwellings and development should be avoided. A review of flood risk within the site has been carried out. The feasibility of designing the site in such a way that it remains safe throughout the lifetime of the development is dependent on a number of factors. It is essential that the following design recommendations are incorporated into the design process from the conceptual stage. A detailed site-based Flood Risk Assessment will be required as an integral part of the planning application stage, which should be carried out in accordance with Section 10.4 of the Level 1 SFRA.
	Design Recommendations 1. Development should be avoided within the area defined as Flood Zone 3b 'functional floodplain'; 2. Floor levels within the site should be situated a minimum of 300mm above the 1 in 100 annual probability plus allowance for climate change, in this instance +35%, assuming a 100 year lifetime for residential development; 3. Flood storage should be analysed to show that the proposed building footprint of the development will not cause a detriment to the available storage during the 1 in 100 annual probability +35% climate change allowance flood event. The presence of a significant existing building footprint suggests that floodplain storage capacity could be improved through effective design measures; 4. Where appropriate, buildings should adopt resilient design techniques to minimise the damage and disruption sustained by businesses and/or residents following a flooding event. Further guidance can be found in BRE Digest DG523 'Flood Resilient Building', the Department for Communities and Local Government document 'Improving the Flood Performance of New Buildings – Flood Resilient Construction', and Section 12.4 of the Level 1 SFRA'; 5. Sustainable Drainage Systems (SuDS) should be incorporated into the site design, aiming to achieve greenfield runoff rates, if feasible, in accordance with Section 13.4 of the Level 1

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SFRA. It is important that SUDS are designed with due consideration to soil and groundwater conditions. Infiltration techniques should be sought wherever possible, however are likely to be unsuitable in areas of shallow groundwater and/or impermeable soils. Further guidance on designing for groundwater is provided in Section 6.5 of the Level 1 SFRA. Buildings and landscaping should be designed within the site to avoid locking overland flow routes;

6. Safe access is impacted in the current 1 in 100 annual probability flood event. Further analysis is required to assess if a safe route is available in accordance with the requirements in Section 3.4 of the L2 SFRA and, if so, a Flood Management and Evacuation Plan' should be prepared. Future tenants/residents within the site should be made aware of the potential risks of flooding, and should be actively encouraged to sign up to the Environment Agency's Flood Information Service to receive flood alerts, flood warnings and severe flood warnings well in advance of an event;

7. It is essential to ensure that all basement areas within flood affected areas of the site are watertight, and the entrance point is situated above the 1 in 100 annual probability +35% allowance for climate change flood level. Basements should not be used to provide habitable areas in locations classified at Flood Zone 3a 'High Probability';

8. Residual risk to the development should be investigated against the 1 in 100 annual probability +70% allowance for climate change flood event.

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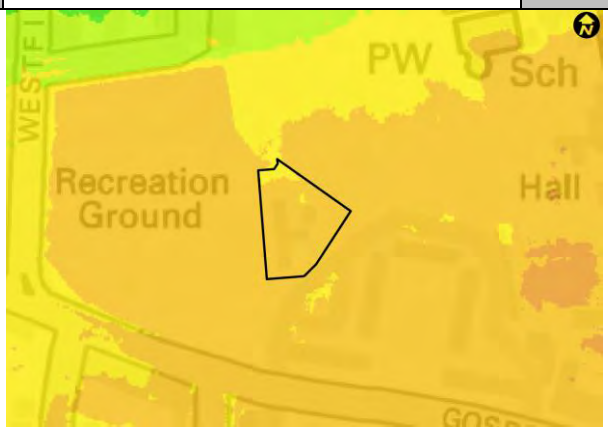
CA011 - Former Caversham Nursery (Local Plan ref: Not Identified)			
Grid Reference	SU 71770 74730	**Post Code**	RG4 8BH

Topography

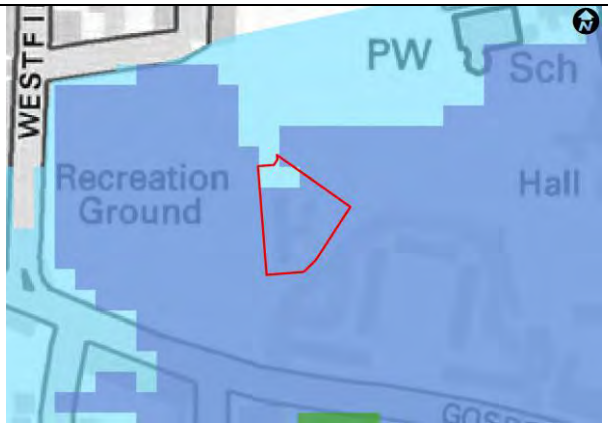


Elevation

< 35 mAOD	40 - 41 mAOD
35 - 36 mAOD	41 - 42 mAOD
36 - 37 mAOD	42 - 43 mAOD
37 - 38 mAOD	43 - 44 mAOD
38 - 39 mAOD	44 - 45 mAOD
39 - 40mAOD	> 45 mAOD

The site exists on a gradient, rising from south to north from approximately 37.2m AOD to 38.3m AOD.

Flood Zone Map

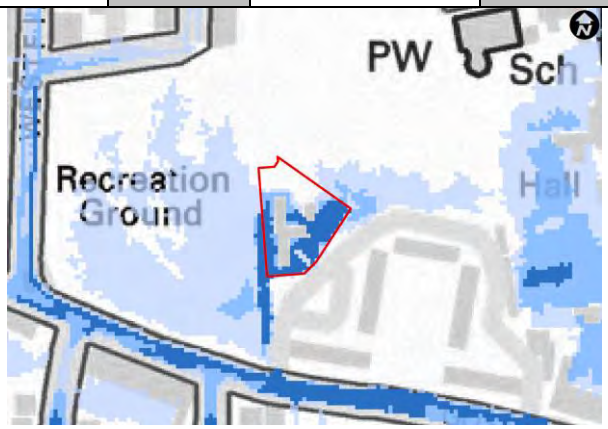


Legend

- River
- Site Boundary
- Flood Zone 2
- Flood Zone 3
- Flood Zone 3b

Flood Zone 1	0%	**Flood Zone 2**	10%	**Flood Zone 3a**	90%	**Flood Zone 3b**	0%

Surface Water



Risk of Surface Water Flooding

- River
- Site Boundary
- High - 1 in 30 annual probability
- Medium - 1 in 100 annual probability
- Low - 1 in 1000 annual Probability
- Very Low - > 1 in 1000 annual probability

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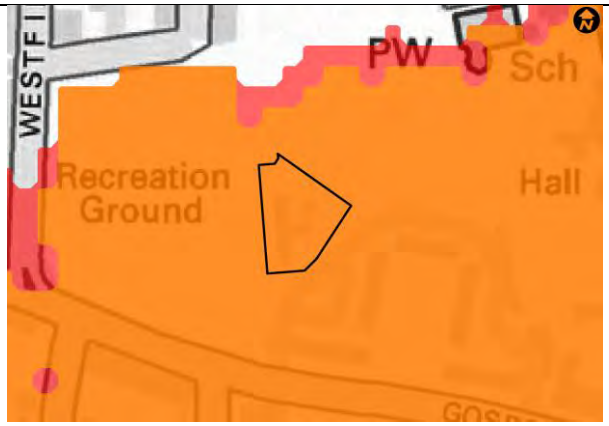
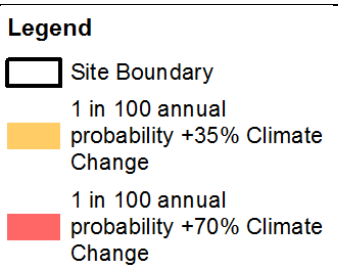
Development Proposal	Residential dwellings	**Vulnerability Classification**	More Vulnerable
Applicable Climate Change Allowances	The site is located within Flood Zone 2 'Medium Probability', and Flood Zone 3a 'High Probability', and the proposed development is classified as More Vulnerable. The +35% and +70% peak river flow climate change allowances should therefore be used to assess a range of climate change scenarios. The +35% allowance should be used to provide a benchmark flood level against which mitigation measures should be set, and the +70% allowance used to assess residual risk to the development.		
Climate Change Extents			

1 in 100 annual probability +25%	N/A	**1 in 100 annual probability +35%**	100%	**1 in 100 annual probability +70%**	100%

Description of Flood Risk

Flood Depth
The maximum flood depths around the existing buildings in the 1 in 100 annual probability flood event typically vary from 10mm to 400 mm over the site.

The flood depths in the 1 in 1000 annual probability flood event typically vary from 500mm to 900mm over the site.

Flood depths in the climate change scenarios are typically 500mm in the +35% scenario, and 800mm in the +70% scenario.

Flood Warning and Period of Inundation
The River Thames is a large catchment with flooding typically the result of sustained regional-scale rainfall events. The response time – i.e. the period between the rainfall over the catchment and the rising river levels downstream – can be significant, and this ensures there is typically a significant period of advance warning (i.e. a period of days) before flooding occurs in the area.

The EA issue flood warnings for the area via their 'Flood Information Service' and considerable advance warning of a flood event can typically be provided to allow the Council, emergency services residents and businesses to take appropriate action.

Velocity of Flood Waters
The site is occupied by buildings in an urbanised area, a significant distance from the main river, and is impacted in the climate change allowance scenarios. When flooding does occur, the rate of rise and

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Description of Flood Risk	fall in water level is slow and velocities will correspondingly be slow, with the direction of flow from west to east (subject to further interrogation of the EA modelling).
	Flood Defences While not a 'formal' flood defence, the EA asset register does identify that the River Thames, located approximately 0.3km south of the site, includes natural high ground on its left bank with a design standard of 1 in 2 years. The condition is currently at 3 (moderate), on a scale of 1 (very good) to 5 (very poor).
	Historic Records and Other Sources of Flooding The Level 1 SFRA indicates that the site has been subject to river flooding in 1947 and 1977, but is not noted to have been impacted by flood events from other sources. Gosbrook Road, located south of the site, has previously been impacted by fluvial flooding. External areas are noted to be at risk of surface water flooding, which emphasises the importance of an effective surface water drainage strategy as part of any proposed development, to prevent ponding of water following heavy rainfall events, in accordance with Sections 13.4 and 13.5 of the Level 1 SFRA. The susceptibility to groundwater flooding varies between '25% and 50%'. The Thames Water DG5 information indicates that the site is within a postcode (RG4 8) that has over 101 recorded sewer flood incidents, both internal and external. The site is not located within a maximum modelled breach extent of reservoir flooding and is therefore at negligible risk of flooding in the event of a reservoir breach.
	Overview of Flood Risk A summary of the flood risk to the site is provided below: • The majority of the site is classified as Flood Zone 3a 'Medium Probability', with a 1 in 100 annual probability of river flooding; • The maximum flood depth during the 1 in 100 annual probability event typically between 10mm and 400mm; • The maximum flood depth during the 1 in 1000 annual probability event is typically between 500mm and 900mm; • The whole site is impacted by the 1 in 100 annual probability +35% climate change allowance flood event, with general depths between 300mm and 700mm; • Maximum flood depths for the 1 in 100 annual probability +70% climate change allowance typically vary between 600mm and 1000mm; • The site is largely classified as at High risk of surface water flooding, with areas to the north at Very Low risk; • The site is at negligible risk of flooding in the event of a reservoir breach; • The access route via the adjacent road and Gosbrook Road to the south is impacted in the 1 in 100 annual probability flood event. The site is shown to be at high risk of fluvial flooding, at a range of very low to high risk of surface water flooding and may be susceptible to groundwater and sewer flooding. The site is therefore potentially at risk of flooding from a number of sources. Safe access via the access road/Gosbrook Road is impacted in a flood event of 1 in 100 annual probability or greater, although a pedestrian route at lower probability of flooding (outside the current 1 in 100 annual probability floodplain) may be available to the north-west via the adjacent recreation

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	ground. The feasibility of new residential development is subject to further assessment of the mitigation strategy based on the approach detailed in the L2 SFRA. It is important that the design process considers the risk of flooding at the earliest conceptual stage, encompassing measures that will ensure the safety of future tenants/residents during a flood event. A number of important design recommendations are set out below.

Planning Recommendations	**Spatial Planning** The site largely lies within Flood Zone 3a 'High Probability', affected by flooding from the River Thames in the 1 in 100 annual probability flood event. The entirety of the site is shown to be impacted by the 1 in 100 annual probability +35% and +70% allowances for climate change flood events. A review of flood risk within the site has been carried out. The feasibility of designing the site in such a way that it remains safe throughout the lifetime of the development is dependent on a number of factors, and is specifically subject to further assessment of the safe access route. It is essential that the following design recommendations are incorporated into the design process from the conceptual stage. A detailed site-based Flood Risk Assessment will be required as an integral part of the planning application stage, which should be carried out in accordance with Section 10.4 of the Level 1 SFRA.
	Design Recommendations 1. Floor levels within the site should be situated a minimum of 300mm above the 1 in 100 annual probability plus allowance for climate change, in this instance +35%, assuming a 100 year lifetime for residential development; 2. Flood storage should be analysed to show that the proposed building footprint of the development will not cause a detriment to the available storage during the 1 in 100 annual probability +35% climate change allowance flood event. The presence of a significant existing building footprint suggests that floodplain storage capacity could be improved through effective design measures; 3. Where appropriate, buildings within the site should adopt resilient design techniques to minimise the damage and disruption sustained by businesses and/or residents following a flooding event. Further guidance can be found in BRE Digest DG523 'Flood Resilient Building', the Department for Communities and Local Government document 'Improving the Flood Performance of New Buildings – Flood Resilient Construction', and Section 12.4 of the Level 1 SFRA; 4. Sustainable Drainage Systems (SuDS) should be incorporated into the site design, aiming to achieve greenfield runoff rates, if feasible, in accordance with Section 13.4 of the Level 1 SFRA. It is important that SUDS are designed with due consideration to soil and groundwater conditions. Infiltration techniques should be sought wherever possible, however are likely to be unsuitable in areas of shallow groundwater and/or impermeable soils. Further guidance on designing for groundwater is provided in Section 6.5 of the Level 1 SFRA. Buildings and landscaping should be designed within the site to avoid locking overland flow routes;

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5. Safe access via the access road is impacted in the current 1 in 100 annual probability flood event. Further analysis is required to assess if a safe route is available in accordance with the requirements in Section 3.4 of the L2 SFRA and, if so, a Flood Management and Evacuation Plan' should be prepared. Future tenants/residents within the site should be made aware of the potential risks of flooding, and should be actively encouraged to sign up to the Environment Agency's Flood Information Service to receive flood alerts, flood warnings and severe flood warnings well in advance of an event;

6. It is essential to ensure that all basement areas within flood affected areas of the site are watertight, and the entrance point is situated above the 1 in 100 annual probability +35% allowance for climate change flood level. Basements should not be used to provide habitable areas in locations classified at Flood Zone 2 'Medium Probability';

7. Residual risk to the development should be investigated against the 1 in 100 annual probability +70% allowance for climate change flood event.

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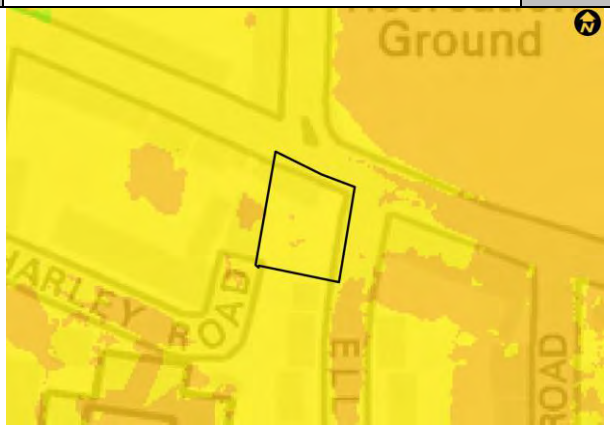
XX004 - Confidential Site 4 (Local Plan ref: Not Identified)			
Grid Reference	SU 71640 47170	**Post Code**	RG4 8BN

Topography

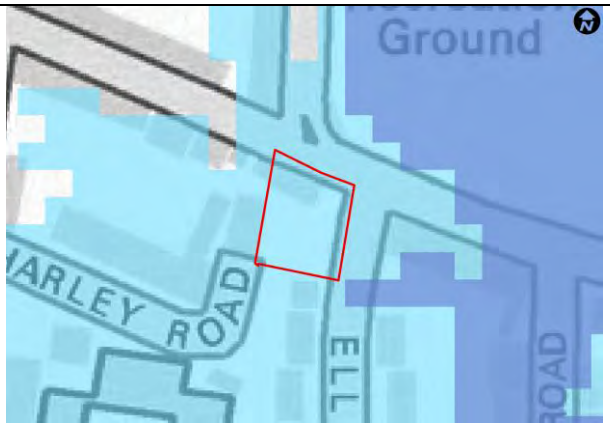


Elevation

- < 35 mAOD
- 35 - 36 mAOD
- 36 - 37 mAOD
- 37 - 38 mAOD
- 38 - 39 mAOD
- 39 - 40mAOD
- 40 - 41 mAOD
- 41 - 42 mAOD
- 42 - 43 mAOD
- 43 - 44 mAOD
- 44 - 45 mAOD
- > 45 mAOD

The topography of the site is largely flat, with a minor low point in the middle of the site, ranging between approximately 38.0m AOD and 38.4m AOD.

Flood Zone Map

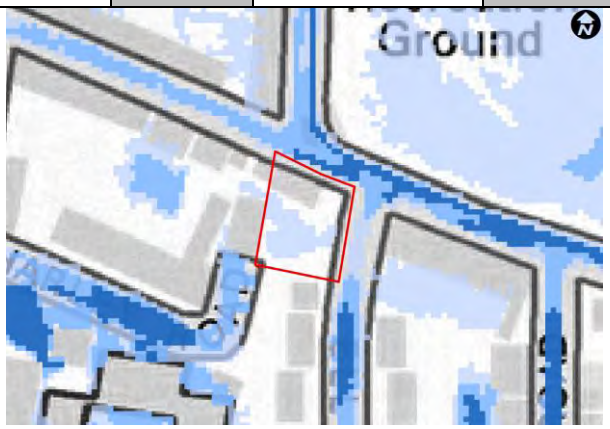


Legend

- River
- Site Boundary
- Flood Zone 2
- Flood Zone 3

Flood Zone 1	0%	Flood Zone 2	100%	Flood Zone 3a	0%	Flood Zone 3b	0%

Surface Water



Risk of Surface Water Flooding

- River
- Site Boundary
- High - 1 in 30 annual probability
- Medium - 1 in 100 annual probability
- Low - 1 in 1000 annual Probability
- Very Low - > 1 in 1000 annual probability

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Development Proposal	Residential dwellings	**Vulnerability Classification**	More Vulnerable
Applicable Climate Change Allowances	The +25% and +35% peak river flow climate change allowances should therefore be used to assess a range of climate change scenarios. The +25% allowance should be used to provide a benchmark flood level against which mitigation measures should be set, and the +35% allowance used to assess residual risk to the development.		
Climate Change Extents			
1 in 100 annual probability +25%	40%	**1 in 100 annual probability +35%**	90%
1 in 100 annual probability +70%	N/A		

Description of Flood Risk

Flood Depth
The maximum flood depths over the site in the 1 in 1000 annual probability flood event typically vary from 100mm to 300mm.

Flood depths in the climate change scenarios are typically 50mm in the +25% scenario, and 100mm in the +35% scenario.

Flood Warning and Period of Inundation
The River Thames is a large catchment with flooding typically the result of sustained regional-scale rainfall events. The response time – i.e. the period between the rainfall over the catchment and the rising river levels downstream – can be significant, and this ensures there is typically a significant period of advance warning (i.e. a period of days) before flooding occurs in the area.

The EA issue flood warnings for the area via their 'Flood Information Service' and considerable advance warning of a flood event can typically be provided to allow the Council, emergency services residents and businesses to take appropriate action.

Velocity of Flood Waters
The site is occupied by buildings in an urbanised area, a significant distance from the main river and is impacted in the climate change allowance scenarios. When flooding does occur, the rate of rise and fall in water level is slow and velocities will correspondingly be slow, with the direction of flow from west to east (subject to further interrogation of the EA modelling).

Description

Flood Defences
While not a 'formal' flood defence, the EA asset register does identify that the River Thames, located approximately 0.3km south of the site, includes natural high ground on its left bank with a design

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	standard of 1 in 2 years. The condition is currently at 3 (moderate), on a scale of 1 (very good) to 5 (very poor).
	Historic Records and Other Sources of Flooding The Level 1 SFRA indicates that the site has not been subject to historic river flooding, and is not noted to have been impacted by flood events from other sources. Surrounding roads are susceptible to surface water flooding which could result in ponding of water following heavy rainfall events. Site drainage must be considered accordingly and must be assessed in accordance with Sections 13.4 and 13.5 of the Level 1 SFRA. The susceptibility to groundwater flooding varies between '25% and 50%'. The Thames Water DG5 information indicates that the site is within a postcode (RG4 8) that has over 101 recorded sewer flood incidents, both internal and external. The site is not located within a maximum modelled breach extent of reservoir flooding and is therefore at negligible risk of flooding in the event of a reservoir breach.
	Overview of Flood Risk A summary of the flood risk to the site is provided below: • The majority of the site is classified as Flood Zone 2 'Medium Probability' (between 1 in 100 and 1 in 1000 annual probability of river flooding); • The maximum flood depth during the 1 in 1000 annual probability event is typically between 100mm and 300mm; • Approximately half of the site is impacted by the 1 in 100 annual probability +25% allowance for climate change flood event with general depths between 50mm and 100mm; • Maximum flood depths for the 1 in 100 annual probability +35% climate change allowance typically vary between 50mm and 200mm; • The site is largely classified as at Very Low risk of surface water flooding; • The site is at negligible risk of flooding in the event of a reservoir breach; • Pedestrian safe access is available to the site at the current 1 in 100 annual probability flood event, and a route onto Gosbrook Road to the north is also likely to be safe in the 1 in 100 annual probability +25% allowance for climate change event (provided the development includes appropriate raised access arrangements to the northern boundary of the site). The site is shown to be at medium risk of fluvial flooding, at very low risk of surface water flooding and may be susceptible to groundwater and sewer flooding. The site is therefore potentially at risk of flooding from a number of sources; however, it is considered feasible that the site can be developed safely and in accordance with the requirements of the NPPF, to mitigate the potential risks of these sources of flooding. It is important that the design process considers the risk of flooding at the earliest conceptual stage, encompassing measures that will ensure the safety of future tenants/residents during a flood event. A number of important design recommendations are set out below
Planning Recommendation	**Spatial Planning** The site lies within Flood Zone 2 'Medium Probability', affected by flooding from the River Thames in the 1 in 1000 annual probability flood event. The majority of the site is impacted by the 1 in 100 annual probability +25% and +35% allowances for climate change flood events.

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	A review of flood risk within the site has been carried out, and it is considered feasible to design the site in such a way that it remains safe throughout the lifetime of the development. It is essential that the following design recommendations are incorporated into the design process from the conceptual stage. A detailed site-based Flood Risk Assessment will be required as an integral part of the planning application stage, which should be carried out in accordance with Section 10.4 of the Level 1 SFRA.
	Design Recommendations 1. Floor levels within the site should be situated a minimum of 300mm above the 1 in 100 annual probability plus allowance for climate change, in this instance +25%, assuming a 100 year lifetime for residential development; 2. Flood storage should be analysed to show that the proposed building footprint of the development will not cause a detriment to the available storage during the 1 in 100 annual probability +25% climate change allowance flood event. The presence of a significant existing building footprint suggests that floodplain storage capacity could be improved through effective design measures; 3. Where appropriate, buildings should adopt resilient design techniques to minimise the damage and disruption sustained by businesses and/or residents following a flooding event. Further guidance can be found in BRE Digest DG523 'Flood Resilient Building', the Department for Communities and Local Government document 'Improving the Flood Performance of New Buildings – Flood Resilient Construction', and Section 12.4 of the Level 1 SFRA'; 4. Sustainable Drainage Systems (SuDS) should be incorporated into the site design, aiming to achieve greenfield runoff rates, if feasible, in accordance with Section 13.4 of the Level 1 SFRA. It is important that SUDS are designed with due consideration to soil and groundwater conditions. Infiltration techniques should be sought wherever possible, however are likely to be unsuitable in areas of shallow groundwater and/or impermeable soils. Further guidance on designing for groundwater is provided in Section 6.5 of the Level 1 SFRA. Buildings and landscaping should be designed within the site to avoid locking overland flow routes; 5. Safe access to/from the site should be assessed in accordance with the requirements in Section 3.4 of the L2 SFRA. It is anticipated a safe access route could be provided from the northern boundary of the site. Future tenants/residents within the site should be made aware of the potential risks of flooding, and should be actively encouraged to sign up to the Environment Agency's Flood Information Service to receive flood alerts, flood warnings and severe flood warnings well in advance of an event; 6. It is essential to ensure that all basement areas within flood affected areas of the site are watertight, and the entrance point is situated above the 1 in 100 annual probability +25% allowance for climate change flood level. Basements should not be used to provide habitable areas in locations classified at Flood Zone 2 'Medium Probability'; 7. Residual risk to the development should be investigated against the 1 in 100 annual probability +35% allowance for climate change flood event.

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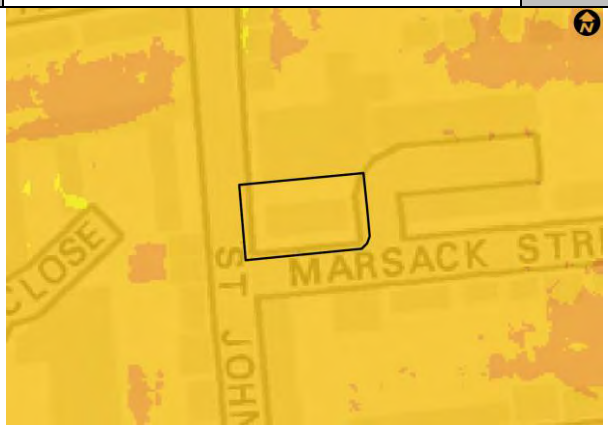
XX010 - Confidential Site 10 (Local Plan ref: Not Identified)			
Grid Reference	SU 72210 74810	**Post Code**	RG4 5AP

Topography

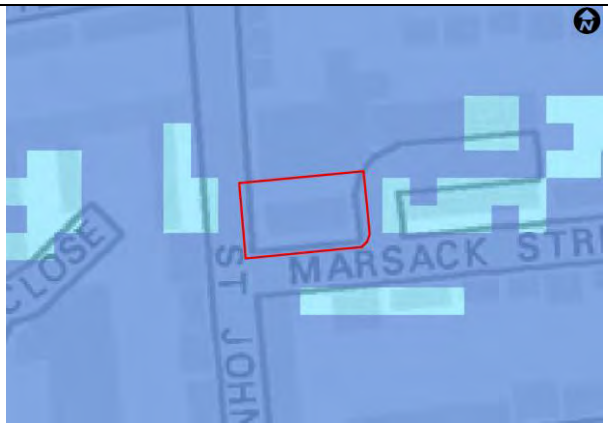


Elevation

- < 35 mAOD
- 35 - 36 mAOD
- 36 - 37 mAOD
- 37 - 38 mAOD
- 38 - 39 mAOD
- 39 - 40mAOD
- 40 - 41 mAOD
- 41 - 42 mAOD
- 42 - 43 mAOD
- 43 - 44 mAOD
- 44 - 45 mAOD
- > 45 mAOD

The topography of the site is largely flat, ranging between approximately 37.0m AOD and 37.6m AOD.

Flood Zone Map

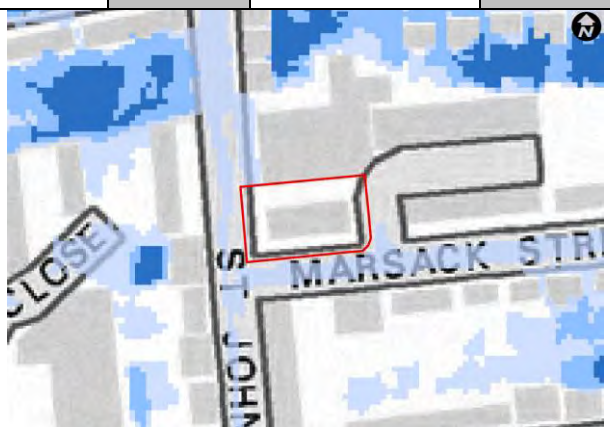


Legend

- River
- Site Boundary
- Flood Zone 2
- Flood Zone 3

Flood Zone 1	0%	**Flood Zone 2**	0%	**Flood Zone 3a**	100%	**Flood Zone 3b**	0%

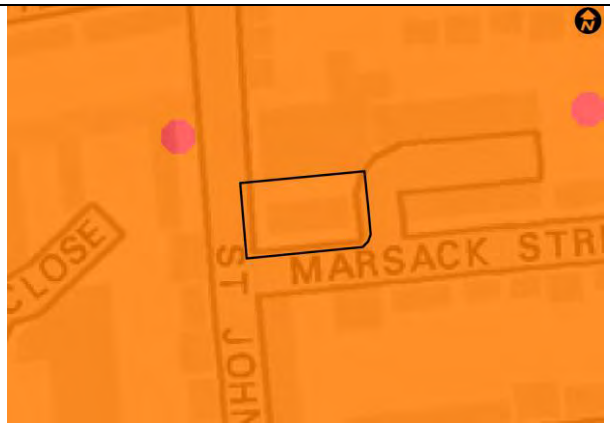
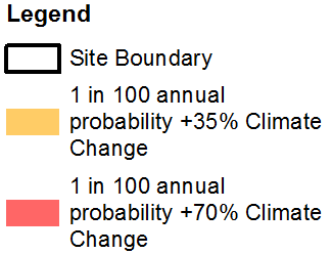
Surface Water



Risk of Surface Water Flooding

- River
- Site Boundary
- High - 1 in 30 annual probability
- Medium - 1 in 100 annual probability
- Low - 1 in 1000 annual Probability
- Very Low - > 1 in 1000 annual probability

Reading Borough Council
Level 2 Strategic Flood Risk Assessment

Development Proposal	Residential dwellings	**Vulnerability Classification**	More Vulnerable
Applicable Climate Change Allowances	The +35% and +70% peak river flow climate change allowances should therefore be used to assess a range of climate change scenarios. The +35% allowance should be used to provide a benchmark flood level against which mitigation measures should be set, and the +70% allowance used to assess residual risk to the development.		
Climate Change Extents			

1 in 100 annual probability +25%	N/A	**1 in 100 annual probability +35%**	100%	**1 in 100 annual probability +70%**	100%

Description of Flood Risk

Flood Depth

The maximum flood depths around the existing building in the 1 in 100 annual probability flood event typically vary from 10mm to 200mm over the site.

The flood depths in the 1 in 1000 annual probability flood event vary from 400mm to 600mm over the site.

Flood depths in the climate change scenarios are typically 300 mm in the +35% scenario, and 600mm in the +70% scenario.

Flood Warning and Period of Inundation

The River Thames is a large catchment with flooding typically the result of sustained regional-scale rainfall events. The response time – i.e. the period between the rainfall over the catchment and the rising river levels downstream – can be significant, and this ensures there is typically a significant period of advance warning (i.e. a period of days) before flooding occurs in the area.

The EA issue flood warnings for the area via their 'Flood Information Service' and considerable advance warning of a flood event can typically be provided to allow the Council, emergency services residents and businesses to take appropriate action.

Velocity of Flood Waters

The site is occupied by buildings in an urbanised area, a significant distance from the main river, and is impacted in the climate change allowance scenarios. When flooding does occur, the rate of rise and fall in water level is slow and velocities will correspondingly be slow with the direction of flow from west to east (subject to further interrogation of the EA modelling).

Reading Borough Council
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Description of Flood Risk

Flood Defences

While not a 'formal' flood defence, the EA asset register does identify that the River Thames, located approximately 0.5km south of the site, includes natural high ground on its left bank with a design standard of 1 in 2 years. The condition is currently at 3 (moderate), on a scale of 1 (very good) to 5 (very poor).

Historic Records and Other Sources of Flooding

The Level 1 SFRA indicates that the site has been subject to historic river flooding in 1947 and 1977, but is not noted to have been impacted by flood events from other sources. Briant's Avenue, located east of the site, has previously been impacted by highway flooding. Site drainage must be considered accordingly and must be assessed in accordance with Sections 13.4 and 13.5 of the Level 1 SFRA.

The susceptibility to groundwater flooding varies between '50% and 75%'. The Thames Water DG5 information indicates that the site is within a postcode (RG4 5) that has 51-100 recorded sewer flood incidents, both internal and external.

The site is not located within a maximum modelled breach extent of reservoir flooding and is therefore at negligible risk of flooding in the event of a reservoir breach.

Overview of Flood Risk

A summary of the flood risk to the site is provided below:

- The site is classified as Flood Zone 3a 'High Probability' (1 in 100 or greater annual probability of river flooding) and has been subject to historic river flooding in 1947 and 1977;
- The maximum flood depth during the 1 in 100 annual probability event is typically between 100mm and 200mm;
- The maximum flood depth during the 1 in 100 annual probability event is typically between 400mm and 600mm;
- The whole site is impacted by the 1 in 100 annual probability +35% climate change allowance with general depths between 200mm and 400mm;
- Maximum flood depths for the 1 in 100 annual probability +70% climate change allowance typically vary between 500mm and 700mm;
- The site is classified as at Very Low risk of surface water flooding;
- The site is at negligible risk of flooding in the event of a reservoir breach;
- The pedestrian access route via St John's Road is impacted by the 1 in 100 annual probability +35% climate change allowance flood event. Further analysis of flood depths/flood hazard is required and development may be reliant on advance warning measures and provision of a Flood Risk Management/Evacuation Plan.

The site is shown to be at high risk of fluvial flooding, at very low risk of surface water flooding and may be susceptible to groundwater and sewer flooding. The site is therefore potentially at risk of flooding from a number of sources.

Subject to further analysis of safe access arrangements based on the approach detailed in the L2 SFRA, it is considered feasible that the site can be developed safely and in accordance with the requirements of the NPPF, to mitigate the potential risks of these sources of flooding.

It is important that the design process considers the risk of flooding at the earliest conceptual stage, encompassing measures that will ensure the safety of future tenants/residents during a flood event.

A number of important design recommendations are set out below.

Reading Borough Council
Level 2 Strategic Flood Risk Assessment

Planning Recommendations

Spatial Planning

The site lies within Flood Zone 3a 'High Probability', affected by flooding from the River Thames in the 1 in 100 annual probability flood event. The entirety of the site is shown to be impacted by the 1 in 100 annual probability +35% and +70% allowances for climate change flood events.

A review of flood risk within the site has been carried out. The feasibility of designing the site in such a way that it remains safe throughout the lifetime of the development is dependent on a number of factors, and is specifically subject to further assessment of the safe access route.

It is essential that the following design recommendations are incorporated into the design process from the conceptual stage. A detailed site-based Flood Risk Assessment will be required as an integral part of the planning application stage, which should be carried out in accordance with Section 10.4 of the Level 1 SFRA.

Design Recommendations

1. Floor levels within the site should be situated a minimum of 300mm above the 1 in 100 annual probability plus allowance for climate change, in this instance +35%, assuming a 100 year lifetime for residential development;

2. Flood storage should be analysed to show that the proposed building footprint of the development will not cause a detriment to the available storage during the 1 in 100 annual probability +35% climate change allowance flood event. The presence of a significant existing building footprint suggests that floodplain storage capacity could be improved through effective design measures;

3. All buildings within the site should adopt resilient design techniques to minimise the damage and disruption sustained by businesses and/or residents following a flooding event. Further guidance can be found in BRE Digest DG523 'Flood Resilient Building', the Department for Communities and Local Government document 'Improving the Flood Performance of New Buildings – Flood Resilient Construction', and Section 12.4 of the Level 1 SFRA';

4. Sustainable Drainage Systems (SuDS) should be incorporated into the site design, aiming to achieve greenfield runoff rates, if feasible, in accordance with Section 13.4 of the Level 1 SFRA. It is important that SUDS are designed with due consideration to soil and groundwater conditions. Infiltration techniques should be sought wherever possible, however are likely to be unsuitable in areas of shallow groundwater and/or impermeable soils. Further guidance on designing for groundwater is provided in Section 6.5 of the Level 1 SFRA. Buildings and landscaping should be designed within the site to avoid locking overland flow routes;

5. Safe access is impacted in the current 1 in 100 annual probability flood event. Further analysis is required to assess if a safe route is available in accordance with the requirements in Section 3.4 of the L2 SFRA and, if so, a Flood Management and Evacuation Plan' should be prepared. Future tenants/residents within the site should be made aware of the potential risks of flooding, and should be actively encouraged to sign up to the Environment Agency's Flood Information Service to receive flood alerts, flood warnings and severe flood warnings well in advance of an event;

6. It is essential to ensure that all basement areas within flood affected areas of the site are watertight, and the entrance point is situated above the 1 in 100 annual probability +35% allowance for climate change flood level. Basements should not be used to provide habitable areas in locations classified at Flood Zone 3a 'High Probability';

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	7. Residual risk to the development should be investigated against the 1 in 100 annual probability +70% allowance for climate change flood event.

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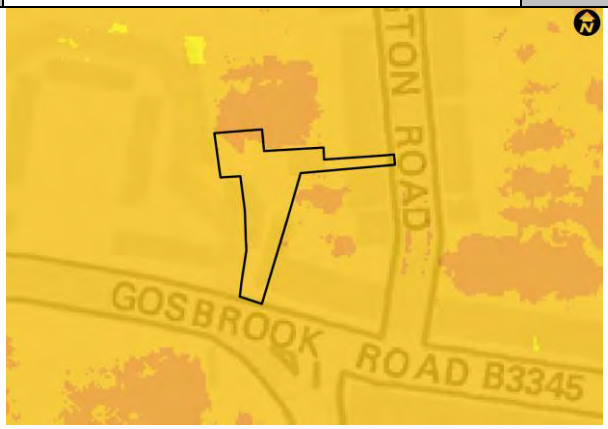
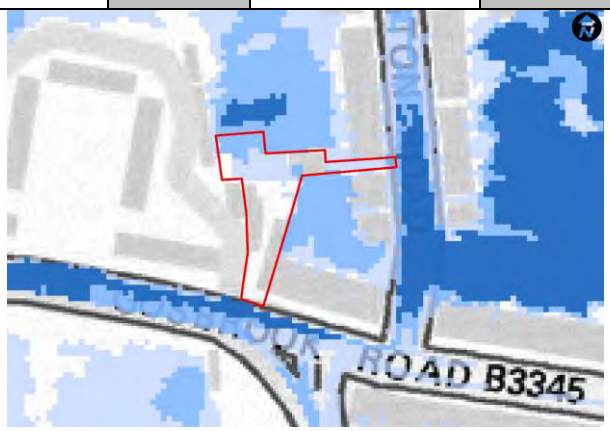
XX015 - Confidential Site 15 (Local Plan ref: Not Identified)							
Grid Reference	SU 71900 74670			**Post Code**	RG4 8BL		
Topography				**Elevation** < 35 mAOD 35 - 36 mAOD 36 - 37 mAOD 37 - 38 mAOD 38 - 39 mAOD 39 - 40mAOD 40 - 41 mAOD 41 - 42 mAOD 42 - 43 mAOD 43 - 44 mAOD 44 - 45 mAOD > 45 mAOD The topography of the site is largely flat, rising from north to south, ranging between approximately 36.9m AOD and 37.8m AOD.		
Flood Zone Map				**Legend** River Site Boundary Flood Zone 2 Flood Zone 3 Flood Zone 3b			
Flood Zone 1	0%	**Flood Zone 2**	0%	**Flood Zone 3a**	100%	**Flood Zone 3b**	0%
Surface Water				**Risk of Surface Water Flooding** River Site Boundary High - 1 in 30 annual probability Medium - 1 in 100 annual probability Low - 1 in 1000 annual Probability Very Low - > 1 in 1000 annual probability			

Reading Borough Council
Level 2 Strategic Flood Risk Assessment

Development Proposal	Residential dwellings	**Vulnerability Classification**	More Vulnerable
Applicable Climate Change Allowances	The +35% and +70% peak river flow climate change allowances should therefore be used to assess a range of climate change scenarios. The +35% allowance should be used to provide a benchmark flood level against which mitigation measures should be set, and the +70% allowance used to assess residual risk to the development.		
Climate Change Extents			**Legend** Site Boundary 1 in 100 annual probability +35% Climate Change 1 in 100 annual probability +70% Climate Change

1 in 100 annual probability +25%	N/A	**1 in 100 annual probability +35%**	100%	**1 in 100 annual probability +70%**	100%

Description of Flood Risk

Flood Depth
The flood depths in the 1 in 100 annual probability flood event typically vary from 300mm to 700mm over the extent of the site.

The flood depths in the 1 in 1000 annual probability flood event typically vary from 700mm to 1100mm over the extent of the site.

Flood depths in the climate change scenarios are typically 800mm in the +35% scenario, and 1000mm in the +70% scenario.

Flood Warning and Period of Inundation
The River Thames is a large catchment with flooding typically the result of sustained regional-scale rainfall events. The response time – i.e. the period between the rainfall over the catchment and the rising river levels downstream – can be significant, and this ensures there is typically a significant period of advance warning (i.e. a period of days) before flooding occurs in the area.

The EA issue flood warnings for the area via their 'Flood Information Service' and considerable advance warning of a flood event can typically be provided to allow the Council, emergency services residents and businesses to take appropriate action.

Velocity of Flood Waters
The site is occupied by buildings in an urbanised area, a significant distance from the main river, and is impacted in the climate change allowance scenarios. When flooding does occur, the rate of rise and fall in water level is slow and velocities will correspondingly be slow with the direction of flow from west to east (subject to further interrogation of the EA modelling).

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Description of Flood Risk

Flood Defences

While not a 'formal' flood defence, the EA asset register does identify that the River Thames, located approximately 0.3km south of the site, includes natural high ground on its left bank with a design standard of 1 in 2 years. The condition is currently at 3 (moderate), on a scale of 1 (very good) to 5 (very poor).

Historic Records and Other Sources of Flooding

The Level 1 SFRA indicates the site has been subject to historic river flooding in 1947 and 1977, but is not noted to have been impacted by flood events from other sources. Gosbrook Road, located south of the site, is noted to have been impacted by fluvial flooding. A record of groundwater flooding (2000/01) exists north east of the site. Site drainage must therefore be considered accordingly and must be assessed in accordance with Sections 13.4 and 13.5 of the Level 1 SFRA.

The susceptibility to groundwater flooding varies between '25% and 50%'. The Thames Water DG5 information indicates that the site is within a postcode (RG4 8) that has over 101 recorded sewer flood incidents, both internal and external.

The site is not located within a maximum modelled breach extent of reservoir flooding and is therefore at negligible risk of flooding in the event of a reservoir breach.

Overview of Flood Risk

A summary of the flood risk to the site is provided below:

- The site is classified as Flood Zone 3a 'High Probability' (1 in 100 or greater annual probability of river flooding) and has been subject to historic river flooding in 1947 and 1977;
- The maximum flood depth during the 1 in 100 annual probability event is typically between 300mm and 700mm;
- The maximum flood depth during the 1 in 1000 annual probability event is typically between 700mm and 1100mm;
- The whole site is impacted by the 1 in 100 annual probability +35% climate change allowance flood event with general depths between 600mm and 1000mm;
- Maximum flood depths for the 1 in 100 annual probability +70% climate change allowance typically vary between 800mm and 1200mm;
- The site is largely classified as at Very Low risk of surface water flooding, with localised areas between Low and Medium risk in the northern half of the site;
- The site is at negligible risk of flooding in the event of a reservoir breach;
- The pedestrian access route via Gosbrook Road is impacted in the 1 in 100 annual probability flood event. Further analysis of flood depths/flood hazard is required and development may be reliant on advance warning measures and provision of a Flood Risk Management/Evacuation Plan.

The site is shown to be at medium risk of fluvial flooding, at a range of very low to high risk of surface water flooding and may be susceptible to groundwater and sewer flooding. The site is therefore potentially at risk of flooding from a number of sources.

Based on the flood depth information above, it would not be possible to meet RBC criteria for provision of safe access. However, this is based on EA LiDAR data and would require further analysis to confirm.

It is important that the design process considers the risk of flooding at the earliest conceptual stage, encompassing measures that will ensure the safety of future tenants/residents during a flood event.

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	A number of important design recommendations are set out below.
Planning Recommendations	**Spatial Planning** The site lies within Flood Zone 3a 'High Probability', affected by flooding from the River Thames in the 1 in 100 annual probability flood event. The entirety of the site is shown to be impacted by the 1 in 100 annual probability +35% and +70% allowances for climate change flood events. A review of flood risk within the site has been carried out. The feasibility of designing the site in such a way that it remains safe throughout the lifetime of the development is dependent on a number of factors, and is specifically subject to further assessment of the safe access route. If safe access is not feasible then it is recommended other forms of development are considered. If safe access is achievable, or if an alternative (lower vulnerability) form of development is proposed, then the following design recommendations should be considered in the design process from the conceptual stage. A detailed site-based Flood Risk Assessment will be required as an integral part of the planning application stage, which should be carried out in accordance with Section 10.4 of the Level 1 SFRA.
	Design Recommendations 1. Floor levels within the site should be situated a minimum of 300mm above the 1 in 100 annual probability plus allowance for climate change, in this instance +35%, assuming a 100 year lifetime for residential development; 2. Flood storage should be analysed to show that the proposed building footprint of the development will not cause a detriment to the available storage during the 1 in 100 annual probability +35% climate change allowance flood event; 3. Where appropriate, buildings within the site should adopt resilient design techniques to minimise the damage and disruption sustained by businesses and/or residents following a flooding event. Further guidance can be found in BRE Digest DG523 'Flood Resilient Building', the Department for Communities and Local Government document 'Improving the Flood Performance of New Buildings – Flood Resilient Construction', and Section 12.4 of the Level 1 SFRA'; 4. Sustainable Drainage Systems (SuDS) should be incorporated into the site design, aiming to achieve greenfield runoff rates, if feasible, in accordance with Section 13.4 of the Level 1 SFRA. It is important that SUDS are designed with due consideration to soil and groundwater conditions. Infiltration techniques should be sought wherever possible, however are likely to be unsuitable in areas of shallow groundwater and/or impermeable soils. Further guidance on designing for groundwater is provided in Section 6.5 of the Level 1 SFRA. Buildings and landscaping should be designed within the site to avoid locking overland flow routes; 5. Safe access is impacted in the current 1 in 100 annual probability flood event. Further analysis is required to assess if a safe route is available in accordance with the requirements in Section 3.4 of the L2 SFRA and, if so, a Flood Management and Evacuation Plan' should be prepared. Future tenants/residents within the site should be made aware of the potential risks of flooding, and should be actively encouraged to sign up to the Environment Agency's Flood Information

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	Service to receive flood alerts, flood warnings and severe flood warnings well in advance of an event; 6. It is essential to ensure that all basement areas within flood affected areas of the site are watertight, and the entrance point is situated above the 1 in 100 annual probability +35% allowance for climate change flood level. Basements should not be used to provide habitable areas in locations classified at Flood Zone 3a 'High Probability'; 7. Residual risk to the development should be investigated against the 1 in 100 annual probability +70% allowance for climate change flood event.