

Reading Borough Council

Level 2 Strategic Flood Risk Assessment



On behalf of:



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





Document Control Sheet

Project Name: Reading Borough CouncilProject Ref:27560/4009Report Title:Level 2 Strategic Flood Risk AssessmentDoc Ref:-Date:December 2017

	Name	Position	Signature	Date				
Prepared by:	Natasha Vaughan	Assistant Engineer	Napa	21/12/17				
Reviewed by:	Richard Fisher	Associate	Aller	21/12/17				
Approved by:	Dan Hayes	Director	Potto	21/12/17				
For and on behalf of Peter Brett Associates LLP								

Revision	Date	Description	Prepared	Reviewed	Approved

This report has been prepared by Peter Brett Associates LLP ('PBA') on behalf of its client to whom this report is addressed ('Client') in connection with the project described in this report and takes into account the Client's particular instructions and requirements. This report was prepared in accordance with the professional services appointment under which PBA was appointed by its Client. This report is not intended for and should not be relied on by any third party (i.e. parties other than the Client). PBA accepts no duty or responsibility (including in negligence) to any party other than the Client and disclaims all liability of any nature whatsoever to any such party in respect of this report.

© Peter Brett Associates LLP 2017



Contents

1	Level 2	Strategic Flood Risk Assessment	1
	1.1	Scope of Report	1
	1.2	L2 SFRA Requirements	2
2	Baselir	e Flood Risk Information	4
	2.1	Sites under Consideration	4
	2.2	Historic Flooding	4
	2.3	Fluvial Flooding	5
	2.4	Surface Water Flooding	5
	2.5	Reservoir Flooding	5
	2.6	Groundwater Flooding	5
	2.7	Sewer Flooding	6
3	Require	ements for Mitigation	7
	3.1	Overview of Mitigation Requirements	7
	3.2	Ground Floor Levels	7
	3.3	Floodplain Storage	7
	3.4	Safe Access and Flood Risk Management	7
	3.5	Surface Water Drainage	9
4	Conclu	sion11	0

Tables

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

Appendices

- Appendix A List of Sites and Location Plan
- Appendix B Site-Specific Reviews



this page is intertionally bland



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.

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%

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

- 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 P	Peak River Flow	v Climate Char	nge Allowance	Ranges
------------	--------------	-----------------	----------------	---------------	--------

Flood Zone	More Vulnerable Development	Less Vulnerable Development					
1	n/a	n/a					
2	25%-35%	25%					
За	35%-70%	25%-35%					
3b	Development shou	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 Consi deration

- 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 Surfac e Water Floodi ng

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 Floodin g

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 Mitiga tion Requir ements

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 Floodpla in 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 Surfac e 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



J\27560 RBC LLFA support\4009 - Level 2 SFRAWPWapinfo



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



AB004 - North of the Station (Local Plan ref: CR11e)									
Grid Reference	eference SU 71490 471490 Post Co)	RG1	8AL		
Topography	and and and and and and and and and and		Dept	Prestinger	Elevati < 35 35 - 36 - 37 - 38 - 39 - The top largely approx 39.4m	on mAOE 36 mA(37 mA) 38 mA(39 mA) 40mAC bograp flat, ra imately AOD.	 40 - 4 41 - 4 42 - 4 43 - 4 44 - 4 44 - 4 45 <	41 mAOD 42 mAOD 43 mAOD 44 mAOD 45 mAOD mAOD ite is /een DD and	
Flood Zone Map	F SLO RELE RELE		Depot		Legen R S F F F	d liver lite Bou lood Zo lood Zo	undary one 2 one 3 one 3b		
Flood Zone 1	10%	Flood Zone 2	90%	Flood Zone 3a	0%	F	Flood Zone 3b	0%	
Surface Water	artice		Depot Station	CarF	Risk o	f Surfa River Site Bou ligh - 1 robabili Aedium robabili ow - 1 i Probabili /ery Lov robabili	ace Water F in 30 annual ity - 1 in 100 an ity in 1000 annu ity w - > 1 in 100 ity	looding nual al 10 annual	

RBC_L2_SFRA_Sites_AB004_Land north of Stn_151217.docx





Development Proposal640-960 dwellings, 50,000m² of offices, 3,000 - 6,000m² net gain of retail, leisure, potential hotel.Vulnerability ClassificationLess V (office More V (reside)							able il), able	
Applica Climate Allowa	able e Change nces	The +25% and to assess a rar provide a bench +35% allowanc	+35% peak river flow clin age of climate change so amark flood level against e used to assess residua	nate change allo cenarios. The +2 which mitigation al risk to the dev	owances s 25% allow n measure relopment	should therefo vance should es should be s	ore be used be used to set, and the	
Climate Change Extents						ver e Boundary n 100 annual obability +25% ange n 100 annual obability +35% ange	Climate Climate	
1 in 10 probab	0 annual bility +25%	60%	1 in 100 annual probability +35%	70%	1 in 100 probabi	annual lity +70%	N/A	
k	Flood Dept No flooding probability f Flood depth in the +35%	th occurs in the flood event, the s in the climate scenario.	present day 1 in 100 ar site experiences maximu change scenarios are ty	nnual probability im flood depths pically 100mm i	v event. of typicall n the +25	In the 1 in 10 y 400mm. % scenario, a	000 annual and 200mm	
cription of Flood Ris	Flood War The River rainfall even rising river period of ac	/arning and Period of Inundation er Thames is a large catchment with flooding typically the result of sustained regional-scale vents. The response time – i.e. the period between the rainfall over the catchment and the rer levels downstream – can be significant, and this ensures there is typically a significant f advance warning (i.e. a period of days) before flooding occurs in the area. issue flood warnings for the area via their 'Flood Information Service' and considerable warning of a flood event can typically be provided to allow the Council, emergency services s and businesses to take appropriate action.						
Des	advance wa	sue flood warnin arning of a flood nd businesses to	ngs for the area via the event can typically be p take appropriate action	rovided to allow	the Cour	ncil, emergen	cy services	





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.

RBC_L2_SFRA_Sites_AB004_Land north of Stn_151217.docx





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;
- 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';

RBC_L2_SFRA_Sites_AB004_Land north of Stn_151217.docx



Planning Recommendations



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







AB005 - Riverside (Local Plan ref: CR11g)									
Grid Reference	e SU 71	550 471550		Post Code	Post Code RG1 8DD				
Topography		And	Depot		Elevati < 35 35 - 36 - 37 - 38 - 39 - The top largely approx 38.6m	on mAOD 36 mAOE 37 mAOE 38 mAOE 39 mAOE 40mAOD 40mAOD bography flat, rang imately 3 AOD.	 40 41 42 43 44 44 45 46 47 48 48 	41 mAOD 42 mAOD 43 mAOD 44 mAOD 45 mAOD mAOD ite is veen DD and	
Flood Zone Map			Depot		Legen R S F F	d liver lood Zone lood Zone lood Zone	lary e 2 e 3 e 3b		
Flood Zone 1	30%	Flood Zone 2	60%	Flood Zone 3a	5%	Flo Zo	ood ne 3b	5%	
Surface Water	Normal Contraction	A CONTRACTOR	Depot	G	Risk o	f Surface River Site Bound ligh - 1 in robability Medium - 1 robability ow - 1 in 1 Probability Yery Low - robability	Water F ary 30 annual in 100 an 1000 annu > 1 in 100	looding Inual al)0 annual	

RBC_L2_SFRA_Sites_AB005_Riverside_151217.docx





Develo Propos	opment sal	250 2,00	- 370 dwelliı 0m² of leisu	ngs and 1,000 - re	Vulnerability Classification	1	Less Vulner More Vulner	able, [.] able
Applica Climata Allowa	able e Change Inces	The a ra (i.e. The mitig to th	+25% and + nge of clima based on th +25% allow gation measure developm	35% peak river flow clir te change scenarios, b e highest vulnerability e vance should be used t ures should be set, and ent.	nate change allo ased on More \ element propose o provide a ber the +35% allow	owances s /ulnerable d). nchmark f /ance use	should be use e proposed de lood level ag d to assess r	d to assess evelopment ainst which esidual risk
Climate Change Extents Change						Climate Climate		
1 in 10 probat	0 annual bility +25%		20%	1 in 100 annual probability +35%	25%	1 in 100 probabi	annual lity +70%	N/A
Risk	Flood Dep The site is probability In the appli maximum f scenario, a	th unaff flood cable lood nd 30	fected in the event, parts climate cha depths in the 00mm in the	present day 1 in 100 a of the site experience r inge scenarios, the maj e northern and western +35% scenario.	annual probabili maximum flood prity of the site r parts of the site	ty event. depths up remains u are typic	In the 1 in 1 to 400mm. naffected by f ally 200mm in	000 annual looding but n 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 rainfall events. The response time – i.e. the period between the rainfall over the catchment ar rising river levels downstream – can be significant, and this ensures there is typically a sign 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 consider advance warning of a flood event can typically be provided to allow the Council, emergency set 								ional-scale ent and the significant onsiderable cy services
	Velocity o The site is climate cha is typically	f Floc in oc ange a slow	od Waters cupied by be allowance so and velocitie	uildings in an urbanised cenarios. When flooding s will correspondingly b	d area, and is in does occur, the be slow with the	npacted to a rate of r direction	o a limited de ise and fall in of flow from v	gree in the water level vest to east

 $RBC_L2_SFRA_Sites_AB005_Riverside_151217.docx$





(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.

RBC_L2_SFRA_Sites_AB005_Riverside_151217.docx





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;
- 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.

RBC_L2_SFRA_Sites_AB005_Riverside_151217.docx



Planning Recommendations







AB006 - Napier Road Junction (Local Plan ref: CR11h)									
Grid Reference	e Sl	SU 71830 73870		Post	Post Code		RG1 8BN		
Topography						Elevati < 35 35 - 3 36 - 3 37 - 3 38 - 3 39 - 4 The top largely approximation of the top largely approximation of the top largely approximation of the top largely approximation of the top	on mAOD 36 mAC 37 mAC 38 mAC 39 mAC 40mAO 40mAO flat, rar imately AOD.	 40 41 42 43 44 44 44 45 46 47 48 49 49 40 41 41 42 43 44 44 44 45 44 44 45 44 45 45 46 47 48 49 44 44 44 45 44 45 44 45 44 44	41 mAOD 42 mAOD 43 mAOD 44 mAOD 45 mAOD mAOD mAOD ite is veen DD and
Flood Zone Map			KING'S T			Legend Sit Flo	l e Bound ood Zone ood Zone	lary e 2 e 3	
Flood Zone 1	0%	Flood Zone 2	100%	Flood Zo 3a	one	0%	FZ	lood one 3b	0%
Surface Water						Risk o	f Surfac liver ligh - 1 ii robabilit ledium - robabilit ow - 1 ir Probabilit (ery Low robabilit	ce Water F ndary n 30 annual y - 1 in 100 ar y n 1000 annu y - > 1 in 100 y	ilooding Inual al)0 annual

 $RBC_L2_SFRA_Sites_AB006_NapierRdJcn_151217.docx$





Develo Propos	opment sal	200 3,0	200 - 300 dwellings and 2,000 -Vulnerability3,000m² retail or commercial useClassification		1	Less Vulnerable, More Vulnerable			
Applica Climate Allowa	able e Change inces	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 Change 1 in 100 annual probability +25% Clim Change 1 in 100 annual probability +35% Clim Change 1 in 100 annual probability +35% Clim							Climate		
1 in 10 probab	0 annual pility +25%		65%	1 in 100 annual probability +35%	80%	1 in 100 probabi	annual lity +70%	N/A	
lisk	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.								
Description of Flood R	sustained reg the catchm is typically a e area. ervice' and ca ncil, emergen	gional-scale ent and the a significant onsiderable acy services							
	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).								



Flood Defences



Reading Borough Council Level 2 Strategic Flood Risk Assessment

	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.
Description of Flood Risk	 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.

A number of important design recommendations are set out below.

 $RBC_L2_SFRA_Sites_AB006_NapierRdJcn_151217.docx$





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;
- 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';

RBC_L2_SFRA_Sites_AB006_NapierRdJcn_151217.docx



Planning Recommendations



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







AB007 - Napier Court (Local Plan ref: CR11i)								
Grid Referenc	e SU 72030 738	SU 72030 73860		e	RG1 8BW			
Topography		K (Red	Cing's Meadow creation Ground)	Elevati < 35 35 - 3 36 - 3 37 - 3 38 - 3 39 - 4 The top largely approxi 38.0m 4	on 40 - mAOD 41 - 36 mAOD 42 - 37 mAOD 43 - 38 mAOD 44 - 39 mAOD > 45 40mAOD > 45 flat, ranging bet imately 37.5m A AOD.	41 mAOD 42 mAOD 43 mAOD 43 mAOD 44 mAOD 45 mAOD 5 mAOD site is ween OD and		
Flood Zone Map		Energis	River Site Boundary Flood Zone 2 Flood Zone 3 Flood Zone 3b					
Flood Zone 1	30% Floo Zone	d 70%	Flood Zone 3a	0%	Flood Zone 3b	0%		
Surface Water		(Re	King's Meadow creation Ground)	Risk o — R S S P P P P P P	f Surface Water River ligh - 1 in 30 annua robability Aedium - 1 in 100 a robability ow - 1 in 1000 ann Probability Yery Low - > 1 in 10 robability	Flooding al nnual ual 100 annual		

RBC_L2_SFRA_Sites_AB007_NapierHse_151217.docx





Develo Propos	opment sal	nent180 - 260 dwellingsVulnerability Classification		1	More Vulnerable				
Applica Climate Allowa	able e Change Inces	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 Extent	e Change s		King's (Recreated)	Meadow on Ground)	Legend Rive Site 1 in prob Cha 1 in prob Cha	er Boundary 100 annual pability +25% nge 100 annual pability +35% nge	Climate Climate		
1 in 10 probat	0 annual bility +25%	10%	1 in 100 annual probability +35%	30%	1 in 100 a probabilit	innual ty +70%	N/A		
isk	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.								
escription of Flood Ri	The River rainfall eve rising river period of a The EA is advance w residents a	The River Thames is a large catchment with flooding typically the result of sustained regional-scale ainfall events. The response time – i.e. the period between the rainfall over the catchment and the sing river levels downstream – can be significant, and this ensures there is typically a significant eriod of advance warning (i.e. a period of days) before flooding occurs in the area.							
D	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).								

RBC_L2_SFRA_Sites_AB007_NapierHse_151217.docx





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.

RBC_L2_SFRA_Sites_AB007_NapierHse_151217.docx



Description of Flood Risk



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;
- 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';

RBC_L2_SFRA_Sites_AB007_NapierHse_151217.docx



Planning Recommendations


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







	AB073 - 28-30 Richfield Avenue (Local Plan ref: WR3c)								
Grid Reference	e SU 70940 470940	Post Code	RG1 8EQ						
Topography	Hotel Park	 Elevat 35 36 37 38 39 The to largely approx 38.8m 	ion 40 - 41 mAOD imAOD 41 - 42 mAOD 36 mAOD 42 - 43 mAOD 37 mAOD 43 - 44 mAOD 38 mAOD 44 - 45 mAOD 39 mAOD 44 - 45 mAOD 40mAOD pography of the site is / flat, ranging between kimately 38.5m AOD and AOD.						
Flood Zone Map	Hotel Park of Hotel		ı d River Site Boundary Flood Zone 2 Flood Zone 3 Flood Zone 3b						
Flood Zone 1	0% Flood 200% For a start of the start of th	Flood Zone 0%	Flood Zone 3b 0%						
Surface Water	Hotel Park Hotel		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						





Develo Propos	opment sal	50 - 80 dwellin	gs	Vulnerability Classification	1	More Vulr	nerable	
Applicable Climate Change Allowances The +25% and +35% peak river flow climate change allowances should therefore to assess a range of climate change scenarios. The +25% allowance should be provide a benchmark flood level against which mitigation measures should be set +35% allowance used to assess residual risk to the development.							ore be used I be used to set, and the	
Climat Extent	e Change s	AVENUE CREMYLL ROA	el Park co Park co Par	Hotel	Legend Rive Site 1 in prob Cha 1 in prob Cha	er Boundary 100 annual pability +25% nge 100 annual pability +35% nge	o Climate o Climate	
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. 							
	The site is is impacted rate of rise of flow fron	occupied by bui d in the higher of and fall in wate n west to east (s	Idings in an urbanised are entral climate change allo r level is slow and velocitio subject to further interroga	ea, a significant owance scenar es will correspo tion of the EA r	t distance fi io. When fil ndingly be nodelling).	rom the ma ooding doe slow, with t	in river, and s occur, the he direction	





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.

RBC_L2_SFRA_Sites_AB073_28-20RichfieldAv_151217





	A num	per of important design recommendations are set out below.				
commendations	Spatia The sit the 1 ii annual shown A revie site in the foll stage. applica	I Planning e lies within Flood Zone 2 'Medium Probability', affected by flooding from the River Thames in n 1000 annual probability flood event. The site is not shown to be impacted by the 1 in 100 probability +25% allowance for climate change event, and approximately half of the site is to be impacted by the +35% allowance for climate change flood event. we of flood risk within the site has been carried out, and it is considered feasible to design the such a way that it remains safe throughout the lifetime of the development. It is essential that owing design recommendations are incorporated into the design process from the conceptual A detailed site-based Flood Risk Assessment will be required as an integral part of the planning tion stage, which should be carried out in accordance with Section 10.4 of the Level 1 SFRA.				
	 Design Recommendations Floor levels within the site should be situated a minimum of 300mm above the 1 in 100 probability plus allowance for climate change, in this instance +25%, assuming a 10 lifetime for residential development. The site is not shown to be impacted by this even therefore floor levels should be raised an appropriate freeboard above the external 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;				
Planning Rec	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, achieve greenfield runoff rates, if feasible, in accordance with Section 13.4 of the SFRA. It is important that SUDS are designed with due consideration to soil and gro conditions. Infiltration techniques should be sought wherever possible, however are be unsuitable in areas of shallow groundwater and/or impermeable soils. Further guid designing for groundwater is provided in Section 6.5 of the Level 1 SFRA. Build 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				





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.





	AB075 - 115-117 Caversham Road (Local Plan ref: CR11f - part)								
Grid Reference	SU 712	60 74180			Post Code	÷	RG1 8AR		
Topography	Sch Curoy				€)	Elevati < 35 35 - 36 - 37 - 38 - 39 - The top largely approx 38.5m	on mAOD 36 mAOE 37 mAOE 38 mAOE 39 mAOE 40mAOD 40mAOD bography flat, rang imately 3 AOD.	 40 41 42 43 44 44 45 46 47 47 48 49 49 40 40 41 41 42 43 44 44 44 44 44 45 45 46 47 48 49 49 40 41 41 41 44 44 44 45 45 46 47 48 48 49 49 41 41 41 44 44 44 45 45 46 47 48 49 49 44 44 44 44 45 46 47 48 49 49 41 41	41 mAOD 42 mAOD 43 mAOD 44 mAOD 45 mAOD mAOD ite is veen DD and
Flood Zone Map	Sch Joy Jan		5	BB AA185	•	Legend Sit	l e Bounda bod Zone 2 bod Zone 3	ry 2 3	
Flood Zone 1	0%	Flood Zone 2	100%	Fle 3a	ood Zone	0%	Flo Zo	ood ne 3b	0%
Surface Water	ach D			13R.19	0	Risk o	f Surface liver lite Bound ligh - 1 in robability fedium - 1 robability ow - 1 in 1 robability ery Low - robability	• Water F ary 30 annual in 100 an 1000 annu > 1 in 100	'looding ınual ıal)0 annual

RBC_L2_SFRA_Sites_AB075_115-117CavRd_151217





Develo Propos	opment sal	75-115 dwellir AB081)	ngs (wider site includes	Vulnerability Classification	1	More Vulr	nerable	
Applica Climate Allowa	able e Change Inces	The +25% and to assess a ra provide a bend +35% allowan	d +35% peak river flow clir inge of climate change so chmark flood level against ce used to assess residua	nate change alle cenarios. The +: which mitigatio al risk to the dev	owances sh 25% allowa n measures /elopment.	nould theref ance should s should be	ore be used I be used to set, and the	
Climate Extents	e Change s	Sch Jorov Venue		60	Legend Rive Site 1 in prob Cha 1 in prob Cha	er Boundary 100 annual vability +25% nge 100 annual vability +35% nge	o Climate o Climate	
1 in 10 probab	0 annual bility +25%	70%	1 in 100 annual probability +35%	85%	1 in 100 a probabilit	innual ty +70%	N/A	
iption 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 							
Desc	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).							





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.





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. 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 Planning Recommendations 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%

RBC_L2_SFRA_Sites_AB075_115-117CavRd_151217





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.







AB0	AB081 - Shurgard Self Storage, 75-77 Caversham Road (Local Plan ref: CR11f - part)								
Grid Reference	ce	SU 71240 74120		Post Code	•	RG1 8AN			
Topography					Elevati < 35 35 - 3 36 - 3 37 - 3 38 - 3 39 - 4 The top largely approx 38.5m 5	on 40 - 41 mAOD 41 - 42 36 mAOD 42 - 43 37 mAOD 43 - 44 38 mAOD 44 - 45 39 mAOD > 45 mA 40mAOD > ets mA 40mAOD > ets mA 9 mAOD > ets mA 40mAOD > ets mA 9 mAOD > ets mA 40mAOD > ets mA 9 mAOD > ets mA 9 mA <th>mAOD mAOD mAOD mAOD MAOD AOD is en</th>	mAOD mAOD mAOD mAOD MAOD AOD is en		
Flood Zone Map		Summer Road	Legend Sit	e Boundary ood Zone 2 ood Zone 3					
Flood Zone 1	0%	Flood Zone 2	100%	Flood Zone 3a	0%	Flood Zone 3b	%		
Surface Water			AATIES C		Risk o	f Surface Water Floo itver ite Boundary igh - 1 in 30 annual robability ledium - 1 in 100 annual robability ow - 1 in 1000 annual robability ery Low - > 1 in 1000 a robability	al		

RBC_L2_SFRA_Sites_AB081_Shurgard_151217





Develo Propos	opment sal	75 - 115 dwell including AB0	ings (wider site 75)	Vulnerability Classificatior	1	More Vulr	nerable	
Applicable Climate Change Allowances The +25% and +35% peak river flow climate change allowar to assess a range of climate change scenarios. The +25% provide a benchmark flood level against which mitigation me +35% allowance used to assess residual risk to the develop						nould theref ance should s should be	ore be used be used to set, and the	
Climate Extent	e Change s				Legend Rive Site 1 in prob Cha 1 in Cha	er Boundary 100 annual ability +25% nge 100 annual bability +35% nge	o Climate o Climate	
1 in 100 annual probability +25%50%1 in 100 annual probability +35%70%1 in 100 annual probability +70%N/A						N/A		
	Flood Dep The flood o over the ex Flood dept in the +35%	oth depths in the 1 i ttent of the site. hs in the climate % scenario.	n 1000 annual probability e change scenarios are ty	flood event typ pically 200mm	ically vary f in the +25%	from 100mr 5 scenario,	n to 400mm and 300mm	
ription of Flood Risk	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							
Desci	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).							





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.





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;
- 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;
- 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;
- 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.

Planning Recommendations









	AB096 – Great Brigham's Mead (Local Plan ref: Not Identified)								
Grid Reference	SU 71	1370 74220		Post Code	•	RG1 8DL			
Topography	I PUNder			Colore Hand	Elevati < 35 35 - 36 - 37 - 38 - 39 - The top largely north, r approx 38.3m	ion mAOD 36 mAOD 37 mAOD 38 mAOD 39 mAOD 40mAOD 40mAOD bography flat, fallin ranging b imately 3 AOD.	 40 - 40 41 - 42 42 - 43 44 - 44 44 - 45 45 6 of the set of	41 mAOD 42 mAOD 43 mAOD 44 mAOD 45 mAOD mAOD ite is south to DD and	
Flood Zone Map	LE BOAD	BRANSSO		Contraction of the second seco	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%	Flo	od ne 3b	0%	
Surface Water		A A A A A A A A A A A A A A A A A A A	in the second se	A La	Risk o	f Surface River Site Bounda ligh - 1 in 3 probability Medium - 1 probability .ow - 1 in 1 Probability /ery Low - probability	• Water F ary 30 annual in 100 an 000 annu > 1 in 100	looding nual al)0 annual	







Develo Propos	opment sal	Residential dv	vellings	Vulnerability Classification	I	More Vulr	nerable
Applica Climate Allowa	able e Change inces	The +35% and to assess a ra provide a ben +70% allowar	d +70% peak river flow clir ange of climate change so chmark flood level against nee used to assess residua	nate change allo enarios. The +3 which mitigation al risk to the dev	owances sh 35% allowa n measures velopment.	nould theref ance should s should be	ore be used I be used to set, and the
Climate Change Extents Climate Change N/A I in 100 annual Probability 125% N/A Legend River Site Boundary 1 in 100 annual Probability 125% 98% 1 in 100 annual Probability 125%						r Boundary 100 annual ability +35% (nge 100 annual ability +70% (nge	Climate Climate
1 in 10 probat	0 annual pility +25%	N/A	1 in 100 annual probability +35%	98%	1 in 100 a probabilit	innual ty +70%	100%
Description of Flood Risk	Yin too annual robability +25% N/A I'n too annual probability 98% I'n too annual probability +70% 100% 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 significan 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 furthe area would typically be of slow velocity with the direction of flow from west to east, subject to furthe						nm over the 800mm. and 800mm gional-scale tent and the a significant onsiderable ncy services nent, and is does occur, oding in the ct to further

RBC_L2_SFRA_Sites_AB096_Grt Brigham_151217.docx





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

RBC_L2_SFRA_Sites_AB096_Grt Brigham_151217.docx





	safely a sources access stage, event.	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.						
	Spatia The site 1 in 100 annual	I Planning e lies within Flood Zone 3a 'High Probability', affected by flooding from the River Thames in the 0 annual probability flood event. The majority of the site is shown to be impacted by the 1 in 100 probability +35% and +70% allowances for climate change flood events.						
	A low design depths	point is located on the northern boundary, which experiences significant flood depths in the event. This low point should not be utilised for development due to the large modelled flood						
Recommendations	A revie site in s the follo stage. A applica	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.						
	Desigr 1.	Recommendations 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;						
Planning	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						





	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.





I	BA003 - Part of Former Battle Hospital, Portman Road (Local Plan ref: WR3i)								
Grid Reference	SU 699	40 73880		Post Code	9	RG30 1/	AN		
Topography	Superstore			Re Contraction of the second s	Elevati < 35 35 - 36 - 37 - 38 - 39 - The top largely approx 40.9m	on mAOD 36 mAOD 37 mAOD 38 mAOD 39 mAOD 40mAOD 40mAOD pography flat, rangi imately 37 AOD.	 40 - 4 41 - 4 42 - 4 43 - 4 44 - 4 > 45 of the s ing betw 7.4m AC 	41 mAOD 42 mAOD 43 mAOD 44 mAOD 45 mAOD mAOD ite is /een DD and	
Flood Zone Map	Superstore 7 Liby	CURZON STREE	ALLE ROUTE	Re Gr	Legen R S F	d liver lite Bounda lood Zone	ary 2		
Flood Zone 1	5%	Flood Zone 2	95%	Flood Zone 3a	0%	Flor	od ne 3b	0%	
Surface Water	Superstore	CURZON STR	A REWOOD		Risk o	f Surface River Site Bounda ligh - 1 in 3 rrobability Medium - 1 rrobability ow - 1 in 10 Probability (ery Low - > rrobability	Water F ary 0 annual in 100 an 000 annu > 1 in 100	looding nual al)0 annual	

RBC_L2_SFRA_Sites_BA003_BattleHosp_151217





Development Proposal	160 - 240 dwellin	gs	Vulnerability Classification	l	More Vulne	rable		
Applicable Climate Chang Allowances	The +25% and +3 to assess a range provide a benchm +35% allowance	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 Chang Extents	Superstore	Superstore Liby			o Climate o Climate			
1 in 100 annual probability +25	5%	1 in 100 annual probability +35%	75%	1 in 100 probabi	annual lity +70%	N/A		
Flood D The floo 1000mm Flood de impact is Flood V The Rive rainfall e rising rive period o The EA advance resident Velocity The site is impact	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 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 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 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 (RG301) 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.

RBC_L2_SFRA_Sites_BA003_BattleHosp_151217





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;
- 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;



Planning Recommendations



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





CA002 - 72 George Street (Local Plan ref: Not Identified)									
Grid Reference	se SU 71900 74440	Post Code	RG4 8DH						
Topography	Pav Christchurch Meadows Hill's Me	Ele Ele Ele Ele Ele Ele Ele Ele	vation 40 - 41 mAOD < 35 mAOD 41 - 42 mAOD 35 - 36 mAOD 42 - 43 mAOD 36 - 37 mAOD 43 - 44 mAOD 37 - 38 mAOD 44 - 45 mAOD 38 - 39 mAOD > 45 mAOD 39 - 40mAOD > 45 mAOD e topography of the site is atively flat, ranging from proximately 36.8m AOD to 1m AOD.						
Flood Zone Map	Christichurch Meadowis Hill's Me	gend River Site Boundary Flood Zone 2 Flood Zone 3 Flood Zone 3b							
Flood Zone 1	0% Flood 30%	Flood Zone 65%	6 Flood Zone 3b 5%						
Surface Water	Pav Christchurch Meadows Hill's M		 k 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 						

RBC_L2_SFRA_Sites_CA002_72GeorgeSt_151217.docx





Develo Propos	opment sal	Re	sidential dw	ellings	Vulnerability Classification	า	More Vul	nerable	
Applic Climat Allowa	able e Change inces	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.							
Climat Extent	e Change s	Pav Christchurch Meadows Hill's Meado				 Legend Site Boundary 1 in 100 annual probability +35% Climate Change 1 in 100 annual probability +70% Climate Change 			
1 in 10 probat	0 annual pility +25%		N/A	1 in 100 annual probability +35%	100%	1 in 100 ar probability	nnual y +70%	100%	
Flood Depth The maximum flood depths around the existing buildings in the 1 in 100 annual probability flood er typically vary from 100mm to 600mm over the site.							y flood event		
	The flood of site.	lepths in the 1 in 1000 annual probability flood event vary from 300mm to 900mm over the							
ood Risk	Flood dept in the +70%	od depths in the climate change scenarios are typically 500mm in the +35% scenario, and 700mm he +70% scenario.							
Description of Flo	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 is impacted in the climate change allowance scenarios. When flooding does occur, the ra								ain river, and e 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).

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.

RBC_L2_SFRA_Sites_CA002_72GeorgeSt_151217.docx





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;
- 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';

RBC_L2_SFRA_Sites_CA002_72GeorgeSt_151217.docx



Planning Recommendations



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







CA004 - 383 Gosbrook Road (Local Plan ref: Not Identified)										
Grid Referenc	e SU 723	SU 72310 74530			Post Code		RG4 8ED			
Topography	IOAD	PW	PION RC	SED		Elevati < 35 35 - 36 - 37 - 38 - 39 - The top largely approx 37.7m	mAOD 36 mAOD 37 mAOD 38 mAOD 39 mAOD 40mAOD 40mAOD bography flat, rang imately 3 AOD.	 40 41 42 43 44 44 45 of the s jing betw 6.9m AC 	41 mAOD 42 mAOD 43 mAOD 44 mAOD 45 mAOD mAOD ite is veen DD and	
Flood Zone Map						Legenα River Site Boundary Flood Zone 2 Flood Zone 3 Flood Zone 3b				
Flood Zone 1	0%	Flood Zone 2	2%	Fle 3a	ood Zone	93%	Floo Zone	od e 3b	5%	
Surface Water	PW CHIAMPYON RD					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				

 $\mathsf{RBC_L2_SFRA_Sites_CA004_GosbrookRd_151217.docx}$





Develo Propos	opment sal	Residential dwe	ellings	Vulnerability Classification	ı	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 Extents	e Change s				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 a probabili	innual ty +70%	100%	
Description of Flood Risk	Obability +25% N/A In two annual probability +35% 100% In two annual probability +70% 100% 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. 100% In two annual probability +70% 100% The flood depths in the 1 in 1000 annual probability flood event typically vary from 500mm to 800mm over the site. The 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 The site is is impacted	FIood Waters occupied by build I in the climate ch	dings in an urbanised ar hange allowance scenar	ea, a significant os. When floodi	t distance fi	rom the m cur, the ra	ain river, and te of rise and	

RBC_L2_SFRA_Sites_CA004_GosbrookRd_151217.docx





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.

RBC_L2_SFRA_Sites_CA004_GosbrookRd_151217.docx



Description of Flood Risk



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;
- 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';



Planning Recommendations



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






CA006 - Reading University Boat Club, Thames Promenade (Local Plan ref: CA1a)											
Grid Reference	се	SU 71320 74620			Post Coo	le	RG4	8BD			
Topography		Pipers	College Car Park	ST	WOLVEY ROAD	Elevatio < 35 m 35 - 36 36 - 37 37 - 38 37 - 38 39 - 40 The topo largely fl approxim 38.6m A	n AOD 3 mAOE 7 mAOE 3 mAOE 9 mAOE 0 mAOD 0 mAOE	 40 - 41 41 - 42 42 - 43 43 - 44 44 - 45 44 - 45 m > 45 m > 9 of the site 37.3m AOE 	mAOD mAOD mAOD mAOD mAOD and and		
Flood Zone Map		A A REE	College Car Park	Legend River Site Boundary Flood Zone 2 Flood Zone 3 Flood Zone 3b							
Flood Zone 1	0%	Flood Zone 2	25%	Fle Zo	ood one 3a	60%	FZ	Flood Zone 3b	15%		
Surface Water		HATERS	College Car Park ABEC			Risk of Site	Surface er e Bound yh - 1 in ybability dium - 1 ybability w - 1 in ybability ry Low - ybability	e Water Flo dary 30 annual 1 in 100 annual 1000 annual - > 1 in 1000	ooding ual annual		

 $RBC_L2_SFRA_Sites_CA006_ReadingUniBoatClub_151217.docx$





Develo Propos	opment sal	16 – 25 resider	ntial dwellings	Vulnerabilit Classificatio	y on	More Vuln	ierable
		The site is loca Probability', an portion of the s be utilised for r	ated within Flood Zone 2 Id the proposed develop site lies within Flood Zon esidential dwellings and	Medium Pro ment is class e 3b 'functiona development s	bability', an ified as Mo al floodplain should be a	d Flood Zo re Vulnerat i'. This area voided.	ne 3a 'High ble. A small a should not
Applic Climat Allowa	able e Change Inces	The areas clas Zone 3a 'High developable, si	sified as Flood Zone 2 a Probability', the worst ca ubject to a number of co	and Flood Zon ase flood zone nditions.	e 3a will bo e on site tha	oth be treate at could be	ed as Flood considered
		The +35% and used to assess used to provide set, and the +7	4 +70% peak river flow of a range of climate cha e a benchmark flood lev 0% allowance used to as	climate chang nge scenarios el against whi ssess residual	e allowance a. The +35% ch mitigatio risk to the	es should th 6 allowance n measures developmen	nerefore be e should be s should be nt.
Climate Change Extents Change							Climate Climate
1 in 10 probat	0 annual bility +25%	90%	1 in 100 annual probability +35%	95%	1 in 100 a probabilit	innual ty +70%	100%
sk	Flood Dep The maxim typically va	th um flood depths ry from 50mm to	around the existing build 5 150mm over the site.	lings in the 1 in	i 100 annua	l probability	[,] flood event
lood Ri	The flood d over the sit	lepths in the 1 in e.	1000 annual probability	flood event typ	oically vary t	from 400mr	n to 600mm
ion of F	Flood deptl in the +70%	hs in the climate 6 scenario.	change scenarios are typ	pically 400mm	in the +35%	6 scenario, a	and 600mm
Descript	Flood War The River rainfall eve rising river period of a	ning and Period Thames is a larg nts. The respon levels downstre dvance warning	d of Inundation ge catchment with floodir use time – i.e. the period cam – can be significant, (i.e. a period of days) be	ng typically the between the r , and this ensu fore flooding c	e result of su ainfall over ures there i occurs in the	ustained reg the catchm s typically a e area.	gional-scale ent and the a significant





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).

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;



Description of Flood Risk



• 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.

S	Spatia The sit Thame by the A revie site in s the follo stage. plannin 1 SFR/	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.							
tio	Desigr	Recommendations							
ing Recommendat	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;							
Plan	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							





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.







	CA007 - Cantay House, Ardler Road (Local Plan ref: Not Identified)										
Grid Reference	се	SU 72120 74750		Post Cod	de	RG4 5AH					
Topography		ARDLER ROAD	TONE	ST JOHN'S ROAD	Elevati < 35 35 - 36 - 37 - 38 - 39 - The top largely approx 37.8m	ion 40 - 41 mAOD mAOD 41 - 42 mAOD 36 mAOD 42 - 43 mAOD 37 mAOD 43 - 44 mAOD 38 mAOD 44 - 45 mAOD 39 mAOD > 45 mAOD 40mAOD > 45 mAOD and the site is flat, ranging between imately 37.2m AOD and AOD.					
Flood Zone Map		ARDLER ROAD		ST JOHN'S ROAD	Legen F	d River Site Boundary Tood Zone 2 Tood Zone 3					
Flood Zone 1	0%	Flood Zone 2	0%	Flood Zone 3a	100%	Flood Zone 3b 0%					
Surface Water			AT THE	C L MARSA	Risk o	f Surface Water Flooding River Site Boundary High - 1 in 30 annual probability Medium - 1 in 100 annual probability Sow - 1 in 1000 annual Probability Yery Low - > 1 in 1000 annual probability					

RBC_L2_SFRA_Sites_CA007_CantayHouse_151217.docx





Develo Propos	opment sal	Residential dwellings	Vulnerability Classification		More Vuln	ierable				
Applica Climate Allowa	able e Change Inces	The +35% and +70% peak river flo a range of climate change scenar benchmark flood level against wh allowance used to assess residua	w climate change allow ios. The +35% allowa ich mitigation measure risk to the developme	limate change allowances should be used to assess The +35% allowance should be used to provide a mitigation measures should be set, and the +70% < to the development.						
Climate Change Site Boundar Extents 1 in 100 annual 1 in 100 annual N/A 1 in 100 annual 100% 1 in 100 annual 100%						6 Climate 6 Climate				
1 in 10 probab	0 annual bility +25%	N/A 1 in 100 annual probability +35%	100%	100% 1 in 100 annual probability +70% 100%						
	Flood Dep The maxim typically va The flood o	th um flood depths around the existing ry from 50mm to 200mm over the s lepths in the 1 in 1000 annual proba	g buildings in the 1 in 1 ite. ability flood event typic	100 annu cally vary	al probabilit [,] from 400m	ty flood event nm to 600mm				
Risk	over the sit Flood dept in the +70%	e. ns in the climate change scenarios 6 scenario.	are typically 400mm in	1 the +35	% scenario	, and 600mm				
ption of Flood	Flood War The River rainfall eve rising river period of a	ning and Period of Inundation Thames is a large catchment with nts. The response time – i.e. the p levels downstream – can be signi dvance warning (i.e. a period of day	flooding typically the r period between the rai ficant, and this ensure (s) before flooding occ	result of s infall ove es there urs in the	sustained ro r the catchr is typically e area.	egional-scale ment and the ' a significant				
Descri	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 The site is is impacted fall in wate west to eas	f Flood Waters occupied by buildings in an urbanis I by the climate change allowance s r level is slow and velocities will c st (subject to further interrogation of	ed area, a significant of cenarios. When floodin prrespondingly be slow the EA modelling).	distance ng does c w, with th	from the m occur, the ra ne direction	ain river, and ite of rise and of flow from				





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.

RBC_L2_SFRA_Sites_CA007_CantayHouse_151217.docx



Description of Flood Risk



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;
- 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%



Page 4 of 5

Planning Recommendations



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.







CA009 - 4-6 Send Road (Local Plan ref: Not Identified)											
Grid Reference	ce	SU 723	90 74480			Post Code		RG4 8	BEH		
Topography		RE ON REST						Elevation 40 - 41 mA(< 35 mAOD 41 - 42 mA(35 - 36 mAOD 42 - 43 mA(36 - 37 mAOD 43 - 44 mA(37 - 38 mAOD 44 - 45 mA(38 - 39 mAOD > 45 mAOD 39 - 40mAOD The topography of the site is largely flat, ranging between approximately 37.0m AOD and 37.5m AOD.			
Flood Zone Map								d liver lite Bour lood Zor lood Zor	ndary ne 2 ne 3 ne 3b		
Flood Zone 1	0%		Flood Zone 2	0%		Flood Zone 3a	95%	FZ	lood one 3b	5%	
Surface Water			N RD			O	Risk o	f Surfac River Site Boun ligh - 1 ir robability Aedium - robability ow - 1 in Probability robability	ce Water F dary 1 30 annual 1 in 100 an 1000 annu 1000 annu y - > 1 in 100	looding nual al 10 annual	

 $RBC_L2_SFRA_Sites_CA009_SendRd_151217.docx$





Develo Propos	pment sal	Residential du	vellings	Vulnerability Classification	I	More Vulne	rable				
Applica Climato Allowa	able e Change inces	The site is loc is classified as The +35% and to assess a ra provide a ben +70% allowar	ated within Flood Zone 3a s More Vulnerable. d +70% peak river flow clii ange of climate change so chmark flood level against ice used to assess residu	'High Probabilit mate change allo cenarios. The +3 which mitigatior al risk to the dev	y', and the owances s 35% allow n measure relopment	e proposed de should therefo vance should es should be s	evelopment ore be used be used to set, and the				
Climate Extents	e Change s	MPION QU S.LI	N/A 1 in 100 annual probability +25% 100% 1 in 100 annual probability +770% 100%								
1 in 10 probab	0 annual bility +25%	N/A	1 in 100 annual probability +35%	100%	1 in 100 probabi	annual lity +70%	100%				
Description of Flood Risk	In 100 annual obability +25% N/A I in 100 annual probability +35% 100% I in 100 annual probability +70% 100% 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. 100% I in 100 annual probability +70% 100% The flood depths in the 1 in 1000 annual probability flood event typically vary from 500mm to 800mm over the extent of the site. The 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										
	The site is river, and is	occupied by ex s impacted in th	; kisting buildings in an urb ne climate change allowar	anised area, a s nce scenarios. W	significant /hen flood	t distance fro ling does occ	m the main cur, the rate				

 $RBC_L2_SFRA_Sites_CA009_SendRd_151217.docx$





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

RBC_L2_SFRA_Sites_CA009_SendRd_151217.docx



Description of Flood Risk



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.

suo	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.									
Idat	Desigr	n Recommendations								
men	1.	floodplain';								
Planning Recom	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								





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

- 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.





CA011 - Former Caversham Nursery (Local Plan ref: Not Identified)										
Grid Reference	SU 71	770 74730		Post Code	÷	RG4 8BH				
Topography	HISAM Rec	creation	PW	Hall	Elevati < 35 35 - 36 - 37 - 38 - 39 - The siturity of the siture of the siturity of the siturity of the siturity of the s	on 40 - 41 mAOD mAOD 41 - 42 mAOD 36 mAOD 42 - 43 mAOD 37 mAOD 43 - 44 mAOD 38 mAOD 44 - 45 mAOD 39 mAOD > 45 mAOD 40mAOD e exists on a gradient, from south to north from imately 37.2m AOD to AOD.				
Flood Zone Map	MESTFI	creation around	PW	Sch Hall	Legen R S F F F	d liver lite Boundary lood Zone 2 lood Zone 3 lood Zone 3b				
Flood Zone 1	0%	Flood Zone 2	10%	Flood Zone 3a	90%	Flood Zone 3b				
Surface Water	Re	Acreation around	PW	Hall	Risk o	f Surface Water Flooding River Site Boundary ligh - 1 in 30 annual robability Medium - 1 in 100 annual robability ow - 1 in 1000 annual Probability Yery Low - > 1 in 1000 annual robability				

 $RBC_L2_SFRA_Sites_CA011_FmrNursery_151217.docx$





Develo Propos	opment sal	Resident	ial dwe	llings	Vulnerability Classification	ı	More Vulne	rable			
Applica Climato Allowa	able e Change Inces	The site Probabilit The +35% to assess provide a +70% all	is loca ty', and % and - s a ran a bench owance	ted within Flood Zone 2 I the proposed developm +70% peak river flow clin ge of climate change sc mark flood level against e used to assess residua	2 'Medium Prot nent is classified nate change allo enarios. The + which mitigatio al risk to the dev	bability', a d as More owances s 35% allow n measure velopment	nd Flood Zor Vulnerable. should therefor vance should es should be s t.	ne 3a 'High bre be used be used to set, and the			
Climate Extents	e Change s	MESTEI	Legend Site Boundary 1 in 100 annual probability +35% Climate Change 1 in 100 annual probability +70% Climate Change 1 in 100 annual probability +70% Climate Change								
1 in 10 probab	0 annual bility +25%	N	/A	1 in 100 annual probability +35%	100%	1 in 100 probabi	annual lity +70%	100%			
ood Risk	Flood Dep The maxim typically va The flood c over the sit Flood deptl in the +70%	th um flood c ry from 10 lepths in th e. ns in the c 6 scenario	depths omm to he 1 in limate o	around the existing build 400 mm over the site. 1000 annual probability change scenarios are ty	lings in the 1 in flood event typ pically 500mm i	100 annu ically vary in the +35	al probability / from 500mm % scenario, a	flood event 1 to 900mm and 800mm			
Description of Flo	 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 The site is	f Flood Wa	aters by build	dings in an urbanised are	ea, a significant	t distance	from the mai	n river, and			

RBC_L2_SFRA_Sites_CA011_FmrNursery_151217.docx





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

RBC_L2_SFRA_Sites_CA011_FmrNursery_151217.docx



Description of Flood Risk



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.

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;



Planning Recommendations



- 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.







XX004 - Confidential Site 4 (Local Plan ref: Not Identified)										
Grid Referend	ce SU 716	40 47170		Post Code)	RG4 8	BN			
Topography			Grou		Elevati < 35 35 - 36 - 37 - 38 - 39 - The top largely point in ranging 38.0m	ion mAOD 36 mAO 37 mAO 38 mAO 39 mAO 40mAOE oograph flat, with the mic betwee AOD an	40 - 4 41 - 4 42 - 4 42 - 4 43 - 4 43 - 4 44 - 4 5 5 7 9 of the sinner 1 dle of the en approximation of the 1 dle o	41 mAOD 42 mAOD 43 mAOD 44 mAOD 45 mAOD mAOD ite is low e site, timately AOD.		
Flood Zone Map	ARL T	N N N	Grou	nd goy	F	a River Good Zon Good Zon	dary e 2 e 3			
Flood Zone 1	0%	Flood Zone 2	100%	Flood Zone 3a	0%	FI	ood one 3b	0%		
Surface Water			Grou		Risk o	f Surfac River Site Bound High - 1 in probability Aedium - probability ow - 1 in Probability (ery Low- probability	e Water F dary 30 annual 1 in 100 an 1000 annu / - > 1 in 100	looding nual al 10 annual		

RBC_L2_SFRA_Sites_XX004_151217.docx





Develo Propos	pment sal	Residential dwe	ellings	Vulnerability Classification		More Vulner	rable		
Applica Climata Allowa	able e Change Inces	The +25% and to assess a rar provide a bench +35% allowanc	+35% peak river flow clir nge of climate change so nmark flood level against e used to assess residua	nate change allov enarios. The +25 which mitigation al risk to the deve	wances s 5% allow measure lopment	should therefo vance should es should be s t.	ore be used be used to set, and the		
Climat Extent	Legend Climate Change Site Boundary Site Boundary 1 in 100 annual probability +25% Cl Change 1 in 100 annual probability +35% Cl Change 1 in 100 annual probability +35% Cl Change 1 in 100 annual probability +35% Cl 1 in 100 annual 90% 1 in 100 annual probability +35% 90% 1 in 100 annual						Climate Climate		
1 in 10 probab	0 annual bility +25%	annual 40% 1 in 100 annual 90% 1 in 100 annual probability +35% N/A							
Description of Flood Risk	Flood Dep The maxim from 100m Flood depti in the +35% Flood War The River rainfall eve rising river period of ac The EA is advance w residents a Velocity of The site is is impacted fall in wate west to eas	th ium flood depths m to 300mm. hs in the climate 6 scenario. ning and Period Thames is a larg nts. The respon- levels downstre dvance warning of sue flood warnin arning of a flood nd businesses to f Flood Waters occupied by buil I in the climate ch r level is slow a st (subject to furth	a over the site in the 1 in change scenarios are ty d of Inundation ge catchment with floodi ase time – i.e. the period am – can be significant (i.e. a period of days) be ngs for the area via the event can typically be p take appropriate action dings in an urbanised ar nange allowance scenari nd velocities will corresp her interrogation of the E	1000 annual prof pically 50mm in ng typically the re- between the rain , and this ensure fore flooding occu eir 'Flood Informa rovided to allow t rea, a significant o os. When flooding pondingly be slow A modelling).	bability f the +25' esult of s nfall ove es there urs in the ation Se the Cour distance g does o v, with th	flood event ty % scenario, a sustained reg r the catchme is typically a e area. ervice' and concil, emergen from the ma boccur, the rate he direction concil	pically vary and 100mm gional-scale ent and the i significant cy services in river and of rise and of flow from		
Des cript ion	Flood Defe While not a approximat	ences i 'formal' flood de ely 0.3km south	efence, the EA asset reg	ister does identify atural high groun	y that the	e River Tham left bank wit	nes, located th a design		

RBC_L2_SFRA_Sites_XX004_151217.docx





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 **Spatial Planning** Planning Recomm ndation 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.

RBC_L2_SFRA_Sites_XX004_151217.docx



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;
- 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.





XX010 - Confidential Site 10 (Local Plan ref: Not Identified)									
Grid Referend	се	SU 72210 74810	U 72210 74810 Post Co				RG4	4 5AP	
Topography		LOSE ST LOT	MARSA	CK STR		Elevati < 35 35 - 36 - 37 - 38 - 39 - The top largely approx 37.6m	on mAO 36 m/ 37 m/ 38 m/ 39 m/ 40mA 40mA pogra flat, r imate AOD.	■ 40 - 41 - 40D ■ 42 - 40D ■ 43 - 40D ■ 44 - 40D ■ 44 - 40D ■ > 45 40D 400 ■ > 45 400 400 ■ 200 400 ■ 200 40	41 mAOD 42 mAOD 43 mAOD 44 mAOD 45 mAOD mAOD ite is veen OD and
Flood Zone Map		LOSE ST JUN	MARSA	CK STR		Legen R S F	d iver ite Bo lood 2 lood 2	oundary Zone 2 Zone 3	
Flood Zone 1	0%	Flood Zone 2	0%	Flood Z 3a	one	100%		Flood Zone 3b	0%
Surface Water				CK STR		Risk o	f Surf liver ligh - ' robab lediun robab ow - 1 robab 'ery Lo robab	face Water F bundary 1 in 30 annual ility n - 1 in 100 ar ility 1 in 1000 annu ility bw - > 1 in 100 ility	looding Inual Ial 20 annual

RBC_L2_SFRA_Sites_XX010_151217.docx





Develo Propos	Residential dwellings Vulnerability Classification		n More Vulnerable		erable			
Applica Climate Allowa	able e Change nces	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 Climate Change					o Climate o Climate			
1 in 10 probab	0 annual oility +25%	N/A 1 i	n 100 annual obability +35%	100%	1 in 100 probabi	annual lity +70%	100%	
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.					y flood event omm over the , and 600mm		
 Flood Warning and Period of Inundation The River Thames is a large catchment with flooding typically the result of sustained regional-so rainfall events. The response time – i.e. the period between the rainfall over the catchment and rising river levels downstream – can be significant, and this ensures there is typically a signific 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 considera advance warning of a flood event can typically be provided to allow the Council, emergency servires and businesses to take appropriate action. 						egional-scale nent and the a significant		
						considerable ency services		
	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).							

RBC_L2_SFRA_Sites_XX010_151217.docx





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.

RBC_L2_SFRA_Sites_XX010_151217.docx



Page 3 of 5

Description of Flood Risk



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;
- 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;
- 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';

RBC_L2_SFRA_Sites_XX010_151217.docx



Planning Recommendations



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







XX015 - Confidential Site 15 (Local Plan ref: Not Identified)										
Grid Reference	e	SU 71900	74670			Post Code	9	RG4	8BL	
Topography		G	OSBR	085 80	TON ROAD	€ 345	Elevati < 35 35 - 36 - 37 - 38 - 39 - The top largely south, approx 37.8m (a)	on mAOI 36 mA 37 mA 38 mA 39 mA 40mA 40mA flat, ri rangin imatel AOD.	$\begin{array}{c} 40 - 40 - 40 - 40 - 40 - 40 - 40 - 40 $	41 mAOD 42 mAOD 43 mAOD 44 mAOD 45 mAOD mAOD ite is orth to DD and
Flood Zone Map		G	OSBR	OQK RO	TON ROAD	345	Legen R S F F	d liver lite Bou lood Z lood Z	undary Ione 2 Ione 3 Ione 3b	
Flood Zone 1	0%	F	lood Ione 2	0%	FI 3a	ood Zone	100%		Flood Zone 3b	0%
Surface Water					DAD B	345	Risk o	f Surf River Site Bou ligh - 1 robabil Medium robabil Ow - 1 Probabi Yobabi Yobabil	ace Water F in 30 annual lity n - 1 in 100 an lity in 1000 annu lity w - > 1 in 100 lity	looding nual al 10 annual

RBC_L2_SFRA_Sites_XX015_151217.docx





Develo Propos	pment sal	Residential dwellings Vulnerability Classification		Vulnerability Classification	n More Vulnerable			
Applica Climate Allowa	able e Change nces	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 Extents	e Change s	G	TON ROAD	Elegen	d iite Boundary in 100 annual robability +35% Clin change in 100 annual robability +70% Clin change	mate mate		
1 in 100 annual probability +25%N/A1 in 100 annual probability +35%100%1 in 100 annual probability +70%					0 annual bility +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 (sul	bject to further	interrogation of the EA mo	delling).				

RBC_L2_SFRA_Sites_XX015_151217.docx





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.

RBC_L2_SFRA_Sites_XX015_151217.docx



Description of Flood Risk



	A num	ber of important design recommendations are set out below.
	Spatia The sit 1 in 10 annual	I Planning e lies within Flood Zone 3a 'High Probability', affected by flooding from the River Thames in the 0 annual probability flood event. The entirety of the site is shown to be impacted by the 1 in 100 probability +35% and +70% allowances for climate change flood events.
	A revie a way factors feasible	ew of flood risk within the site has been carried out. The feasibility of designing the site in such that it remains safe throughout the lifetime of the development is dependent on a number of , and is specifically subject to further assessment of the safe access route. If safe access is not e then it is recommended other forms of development are considered.
	If safe then th concep	access is achievable, or if an alternative (lower vulnerability) form of development is proposed, ne following design recommendations should be considered in the design process from the otual stage.
	A deta applica	iled site-based Flood Risk Assessment will be required as an integral part of the planning tion stage, which should be carried out in accordance with Section 10.4 of the Level 1 SFRA.
suc	Desigr	n Recommendations
nmendatic	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;
ling Recor	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;
Plann	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% 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.

