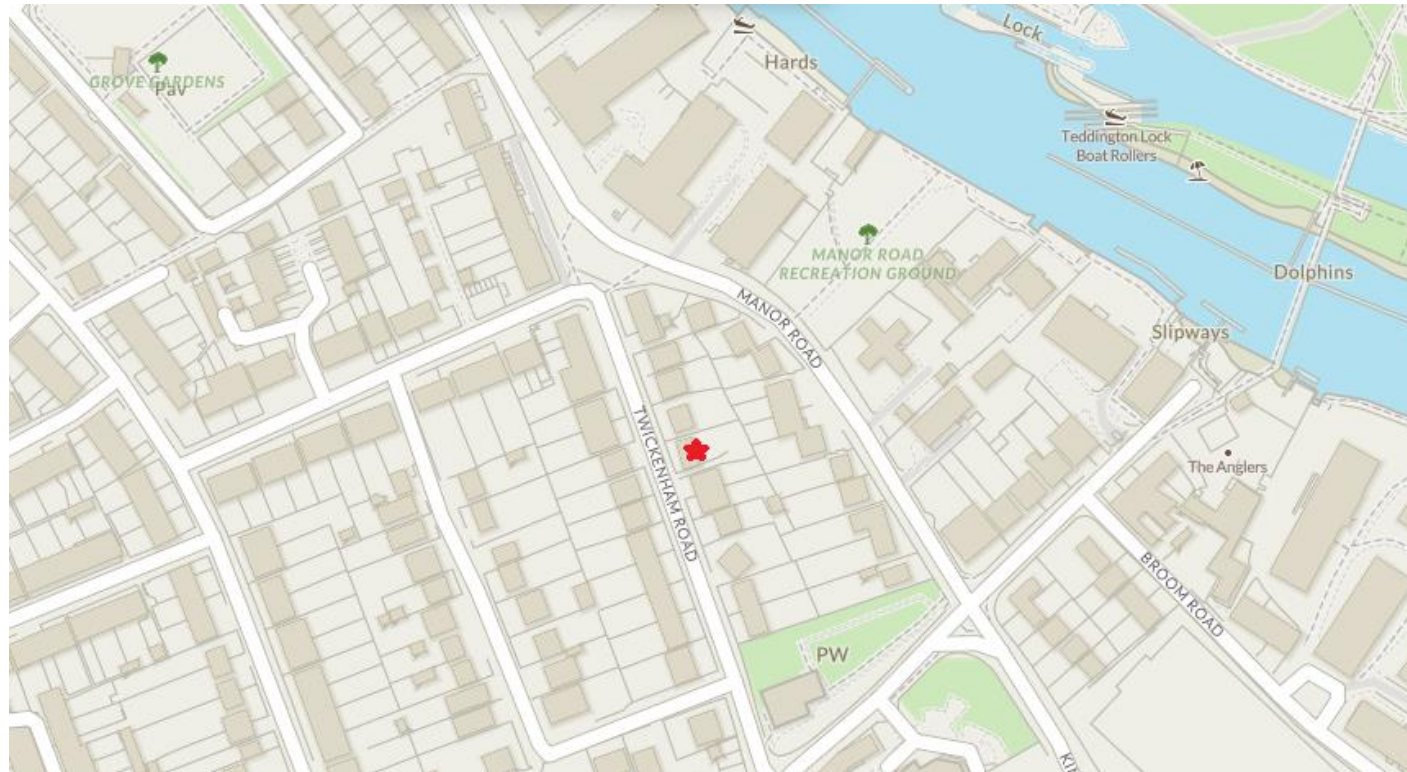


# FLOOD RISK ASSESSMENT FOR:

## ***18 TWICKENHAM ROAD TEDDINGTON TW11 8AG***



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# 1. Introduction

- 1.1 *The site lies in the Teddington ward of the London Borough of Richmond Upon Thames, which includes land on both sides of the River Thames; the only London Borough to do so. Teddington itself lies on the western bank of the river and the Thames is the main and largest river in the Borough. However, the Borough also has secondary rivers which are tributaries to the Thames such as the River Crane, the Beverley Brook (both partly subterranean) and artificial waterways such as the Duke of Northumberland's River and the Longford River. Additionally, the Hogsmill River (not within the Borough) is also a nearby waterway.*
  
- 1.2 *The main waterways / waterbodies of proximity to the site are the River Thames (approx. 200m to the east), the Longford River (approx. 2km to the SW) and the Hogsmill River (approx. 2.5km to the SE). The FRA combined a desktop study, review of available information, consultations and an assessment of all sources of flooding posed to and from the site and proposed development, in accordance with National Planning Policy Framework (NPPF). Appropriate flood mitigation measures were then considered, either as already incorporated on-site, within the scheme or recommended for inclusion at detailed design stage limited to internal alterations. The suitability of the proposal was also reviewed in the context of the NPPF and other planning legislation and documents.*
  
- 1.3 *The NPPF mentions that Flood Risks Assessments (FRAs) should be conducted for new developments proposed on the floodplains of rivers, sites which may be at risk of coastal flooding, of over one hectare or located in a critical drainage area. The site is within the Environment Agency's Flood Zones 2 / 3, indicating medium to high risks of flooding with consideration for flood defences and it is within a critical drainage area. Significantly, the proposal will not increase the footprint of the building, nor will it introduce sleeping accommodation on the lower ground floor. The current lower ground floor is partly uninhabitable (used for storage) and it does not suffer from water ingress, nor does it have a history of flooding.*

## 2. Policy Context

- 2.1 National:** *The National Planning Policy Framework (NPPF, 2021) at section 14 (Meeting the challenge of climate change, flooding and coastal change) identifies that the Planning System should take full account of the changing climate and flood risk. At paragraph 159, it mentions that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere. A sequential test has been prepared for the proposed development.*
- 2.2 Regional:** *The New London Plan Policy SI 12 (Flood Risk Management) at paragraph 9.12.2 states that 'the Regional Flood Risk Appraisal (RFRA) considers all sources of flood risk including tidal, fluvial, surface water, sewer, groundwater and reservoir flooding and has been updated in collaboration with the Environment Agency. The RFRA provides a spatial analysis of flood risk including consideration of risks at major growth locations such as Opportunity Areas and Town Centres and key infrastructure assets. The Government's updated allowances for climate change are reflected in the expected sea level rise and increased flood risks considered in the RFRA. The updated allowances consider the lifetime, vulnerability and location of a development'. Fluvial, tidal and ground water flooding are identified as potential risks for the proposed development and are assessed in this report.*
- 2.3 Local:** *Policies LP 20 and LP 21 of the LBRuT Local Plan (2018) covers climate change adaptation, flood risk and sustainable drainage. Policy LP 20 stipulates that successful adaptation to climate change will depend on how well the issue is recognised and integrated into all decision-making processes, and the development industry has a key part to play in this. The purpose of this policy is to ensure that new development is located and designed so it can adapt to and cope with the potential impacts and consequences of climate change. Policy LP 21 requires all developments to avoid, or minimise, contributing to all sources of flooding, including fluvial, tidal, surface water, groundwater and flooding from sewers, taking climate change into account and without increasing flood risk elsewhere. Development will be guided to areas of lower risk by applying the 'Sequential Test' as set out in national policy guidance, and where necessary, the 'Exception Test' will be applied.*

**2.4** Furthermore, the LBRuT Strategic Flood Risk Assessment (SFRA) supports and informs the Local Plan, including site allocations, by assessing the impact that land use changes and development in the area will have on flood risk. The SFRA provides the basis for applying the Sequential Test to development sites, thereby directing development away from areas at highest risk. The Environment Agency (EA) is lead statutory consultee for fluvial, tidal and groundwater flooding whilst Thames Water is responsible for the public sewer network. However, both are not required to be consulted as part of the planning process for reasons to be explained within the FRA.

### **3. Flood Sources, Potential Risks and Mitigations**

<b>Sources</b>	<b>Site Status</b>	<b>Mitigations</b>
<i>Fluvial / Tidal</i>	<i>The site is in Flood zones 2 / 3 with medium to high risk of flooding</i>	<i>Floor levels within the proposed development will be set no lower than existing levels AND, flood proofing of the proposed development has been incorporated where appropriate. The scheme is for extensions at ground and lower ground floors. The ground floor will be set no lower than the existing finished floor level and the lower ground floor will be slightly lowered but no sleeping accommodation is proposed at this level. The LBRuT SFRA shows that the site is an area with a probability of between 50% and 74.9% chance for groundwater flooding. The mAOD based on LiDAR data for the site is in the order of 8m-10m</i>

<i>Reservoir</i>	<i>There are reservoirs/ artificial waterways within 1km of the site</i>	<i>The EA does not classify the site as being at risk</i>
<i>Groundwater</i>	<i>The LBRuT's SFRA mapping indicates the site is in area at low risk of groundwater flooding</i>	<p><i>The proposed development will not increase the risk of groundwater flooding. Whilst it is proposed to lower the existing lower ground floor slightly, excavation works would be fairly limited and the potential to displace groundwater would be very low, given that the rear part of the site is open and not set below natural ground level</i></p> <p><i>No additional piling is required in construction which could disrupt underground sources such as aquifers. The soil at the surface can support the weight of the building and foundation reinforcement could be required but this will result in no change to site sensitivity or operations</i></p> <p><i>The SFRA show that the area is only at risk of groundwater flooding where properties are situated below ground level. There is no increased potential for elevated groundwater flooding</i></p>
<i>Other artificial Sources</i>	<i>The site is not in reservoir risk area and no other artificial sources are within 250m</i>	<i>Low risk / no mitigation required</i>

<p><i>Surface Water</i></p>	<p><i>EA data indicates that the site is an area at low to medium risk / less susceptible to surface water flooding</i></p>	<p><i>Flood resilience / resistance is to be incorporated where feasible. Whilst some increase in impermeable areas is proposed, this is to be compensated by an area of green roof over the flat roof of the extension at lower ground floor</i></p> <p><i>The development will not increase the peak flow or volume of discharge from the site. There is a low risk overall and no further drainage assessment is required</i></p>
<p><i>Sewer Flooding</i></p>	<p><i>Condition, depth and location of surrounding infrastructure are uncertain. Thames Water cannot provide more specific information on sewer flooding as it identified individual properties and is restricted by the Data Protection Act</i></p>	<p><i>Thames Water should continue its programme of addressing foul sewer flooding. To avoid sewer flooding, detailed computer modelling of development may be required in relation to the sewerage network and this is not feasible for this project</i></p> <p><i>If necessary written confirmation from Thames Water can be obtained to show that adequate capacity exists in the public sewerage network to serve the proposed development but given the location and dense surrounding residential development, this is not necessary</i></p> <p><i>Less than 10 incidents of sewer flooding have been reported to Thames Water in the area</i></p>

<i>Climate Change</i>	<i>Included in the flood modelling extents but the site is not within climate change flood extent area</i>	<i>The recent reversion of the property from 3Nos. flats to 1No. single family dwelling will reduce the peak flow and volume of discharge from the site by the decrease in the number of units/households in the building. The proposed extensions are to support the use of the property as a single-family dwelling</i>
<i>Surface run-off</i>	<i>The site includes some hard surfaces but mainly soft landscaping in the rear garden</i>	<i>The applicants propose a green roof atop the flat roof of the lower ground floor extension, permeable paving and a large area of soft landscaping. Additionally, the applicants are committed to include more permeable surface where possible or necessary to limit surface run-off and infiltrate or evaporate or run off over the surface</i>

## **4. Flood Defence and Sustainable Drainage (SuDS)**

- 4.1** *The main risk of flooding is tidal from the River Thames, but this is controlled by the Thames Tidal Defences which protect the borough from tidal flooding in a combination of raised defences and the Thames Barrier. Plus, there are local flood defences at the nearest point of the riverbank (approx. 170m away). The TE2100 plan flood levels produced by flood modelling are the basis of the Thames Estuary flood risk management strategy. Development planning within the Thames floodplain must use this underlying data when considering flood resistant and resilient design.*
- 4.2** *The TE2100 levels for the ‘present day’ flood model scenario are very similar to those of the preceding River Thames 2008 Joint Probability flood modelling (for equivalent events) which had been used until 2014. The TE2100 however takes into account operation of the Thames Barrier when considering future flood levels. The Thames Barrier requires regular*



*maintenance and with additional closures as the effects of climate change are felt, the opportunity for maintenance will be reduced. To reduce the frequency of Thames Barrier closure in future, tidal flood levels for which it would normally shut the barrier will have to be allowed through so that barrier maintenance may occur. Because levels upstream of the barrier will increase, the tidal walls will need to be heightened to match. The River Thames 2008 Joint Probability Flood Modelling levels do not take this scenario into consideration.*

- 4.3** *Because water levels upstream of the barrier are the highest levels permitted by the operation of the Thames Barrier, the threshold of the flood levels for which the barrier is closed do not have corresponding return periods. If levels and flows are forecasted to be any higher, the Thames Barrier would shut, ensuring that the tide is blocked, and the river maintained to a low level. For this reason, the probability of any given water level upstream of the Barrier is controlled and therefore any associated return period becomes irrelevant.*
- 4.4** *Flooding from residual surface water is also a potential source but the scheme does not propose to increase the amount of hardstanding on site, nor would it not increase the peak flow and volume of discharge of water from the site. Generally, SuDS could be incorporated into parts of the site as the site is within a critical drainage area, and this would include the maximisation of porous and permeable areas and the use of some underground geo-cellular storage for surface water. Such a system would improve surface water storage on-site and the building includes some air blocks as existing. The London Plan Drainage Hierarchy will be followed; there is potential for infiltration and above ground storage in the landscaped features, and any additional permeable paving will not be tanked.*
- 4.5** *The proposed green roof will meet the requirements of LBRuT's Policy LP 17 which states that green roofs are an essential sustainable design consideration and can take many forms in order to maximise their benefits in a given location. Vegetated roofs have many benefits, including the following:*
- Provision of Sustainable Drainage Systems (SuDS) to avoid rapid rain run-off into drains and rivers and improve water quality;*
  - Adaptation to climate change and reduction in urban heat island effects (i.e., aiding cooling);*
  - Mitigation of climate change and carbon savings (i.e. aiding energy efficiency);*
  - Enhancement of biodiversity and provision of important refuges for wildlife in urban areas;*
  - Provision of green space and potentially accessible roof space;*
  - Improvements to visual appearance;*
  - Enhanced roof and sound insulation properties and resilience of the building;*
  - enhanced roof lifespan by protecting underlying waterproofing systems;*

- *Reduction in air and noise pollution; and*
- *Growing food.*

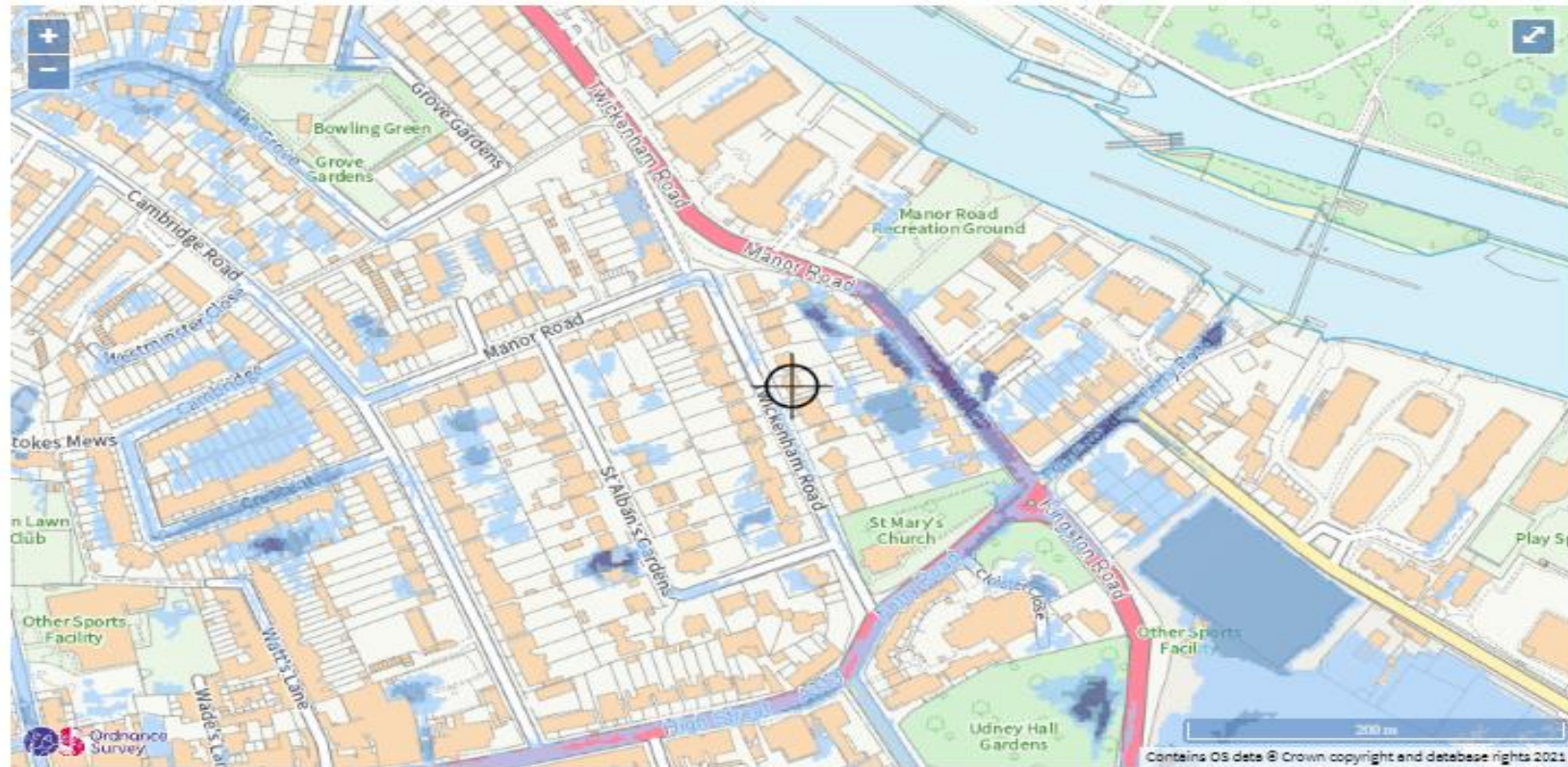
**4.6** *A green roof is defined as having a minimum of 70% soil/vegetation coverage, with a minimum substrate depth of 85mm, and a maximum of 30% hard surface. Green roofs are not roof terraces. Green roofs can be installed on any pitch of roof; however, as the pitch increases, additional specific design measures will be required in order to retain the substrate across the roof surface, which will result in increased costs. The appearance of the green roof also needs to be compatible with the surrounding area. The aim should be to use at least 70% of any potential roof plate area as a green roof; that is, the total roof plate area including space for renewable energy solutions such as photovoltaic panels and solar thermal but excluding non-green roof solutions such as air conditioning units. The Council will take into account relevant viability information.*

**4.7** *The proposed green roof will include biodiversity based with extensive substrate base (depth 80-150mm) and planted/seeded with an agreed mix of species within the first planting season following practical completion of the building works. It would include pre-cultivated sedum vegetation blanket with a New Plywood Deck. It would also include a drainage / protection layer with a sedum blanket of rich sedum mix with mosses and grasses. The Green roofs are an example of source control. Source control measures deal with run-off at, or close to, the surface where rainfall lands. Green roofs have a layer of vegetation or patches of vegetation as part of the roof cover and can:*

- *reduce or eliminate run-off from roof areas*
- *extend the life of your roof*
- *add insulation to your building during the winter months*
- *cool your building during the summer by evaporation*
- *provide sound insulation*
- *reduce the heat island effect in cities*
- *provide a habitat for wildlife.*

## 5. Maps

### 5.1 Environment Agency surface water:



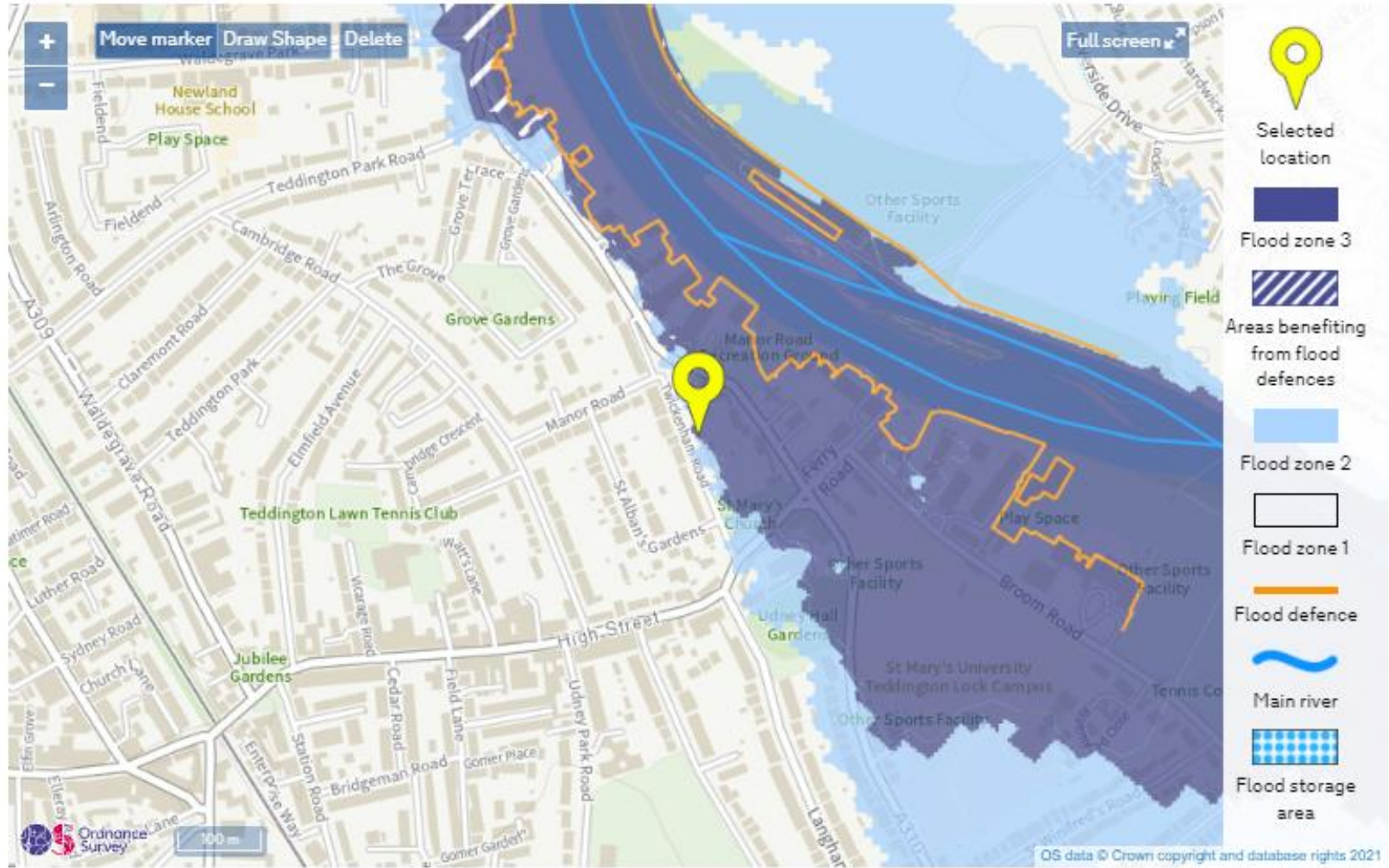
Extent of flooding from surface water

● High ● Medium ● Low ○ Very low ⊕ Location you selected

**Map 1: Surface Water Flooding**



5.2 Environment Agency Likelihood of Flooding:



Map 2: Likelihood of Flooding

**5.3 Environment Agency - Tidal Breach Inundation:**



**Map 3: Tidal Breach Inundation**



**5.4 Area Susceptible To Groundwater Flood:**



**Map 4: Groundwater Flood Risk**

5.5 Thames Water Sewer Incidents:



Map 5: Sewer Flooding

## 6. Sequential Test

6.1 The aim of the sequential test is to steer new development to areas with the lowest risk of flooding. Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower risk of flooding. The SFRA has provided the basis for applying this test. The sequential approach should be used in areas known to be at risk now or in the future from any form of flooding. Based on the SFRA, the proposal would need to pass the exceptional test; however, taking into consideration that the previous use was already in (multiple) residential use and there is no net increase in residential use (rather a decrease since the approval of the reversion scheme), it would not be necessary to apply the exceptional test in this case and the sequential test is still applicable, as the proposal would fall in the less vulnerable group as per below:

Flood Zone	Description	Annual probability of river or sea flooding	Summary of appropriate uses
Zone 1	Low probability	<0.1% chance in any one year	<ul style="list-style-type: none"> <li>All uses</li> </ul>
Zone 2	Medium probability	1% - 0.1% chance in any one year (river) 0.5% - 0.1% chance in any one year (sea)	<ul style="list-style-type: none"> <li>Water Compatible</li> <li>Less Vulnerable</li> <li>More Vulnerable</li> <li>Essential Infrastructure</li> <li>Highly Vulnerable only if Exception Test passed</li> </ul>
Zone 3a	High probability	>1% chance in any one year (river) >0.5% chance in any one year (sea)	<ul style="list-style-type: none"> <li>Water Compatible</li> <li>Less Vulnerable</li> <li>More Vulnerable only if Exception Test passed</li> <li>Essential Infrastructure only if Exception Test passed</li> </ul>
Zone 3b	The functional floodplain. This zone comprises land where water has to flow or be stored in times of flood.	>5% chance in any one year or land which is designed to flood in an extreme (0.1%) flood; exception is Eel Pie Island.	<ul style="list-style-type: none"> <li>Water Compatible</li> <li>Essential Infrastructure only if Exception Test passed</li> </ul>



## **7. Basement and Subterranean Development**

**7.1** *The FRA provides the recommended resilient measures that can be incorporated; it will depend on the construction team as to what construction will actually need to be undertaken as part of detailed design. The lower ground floor extension as standard will have all new flood resistant and resilient standards. This does not invalidate the points and recommendations of this FRA. The FRA cannot simply specify the exact measures that need to be changed. Therefore, in addition to cavity membrane, non-return valves and sump/pump system for the basement, the following measures are appropriate to be incorporated:*

- *Basement/LGF to be fully waterproofed (tanked) and waterproofing to be tied in as appropriate; details to be provided at detailed design to building regulations requirements: to reduce the turnaround time for returning the property to full operation after a flood event.*
- *Plasterboards will be installed in horizontal sheets rather than conventional vertical installation methods to minimise the amount of plasterboard that could be damaged in a flood event*
- *Wall sockets will be raised to as high as is feasible and practicable within the basement/LGF in order to minimise damage if flood waters inundate the property*
- *Any wood fixings will be robust and/or protected by suitable coatings in order to minimise damage during a flood event*
- *Airbricks will be raised to as high as is feasible and practicable*
- *The concrete sub floor as standard will likely be laid to fall to drains or gullies which will remove any build-up of ground water to a sump pump where it will be pumped into the mains sewer. This pump will be fitted with a non-return valve to prevent water backing up into the property should the mains sewer become full*
- *Insulation to the external walls will be specified as rigid board which has impermeable foil facings that are resistant to the passage of water vapour and double the thermal resistance of the cavity.*

## 8. Conclusion

- 8.1** *In conclusion, it is important to note that the whilst the site is in a medium to high risk floodzone, there will be very little change in its susceptibility to flooding. Where there is loss of soft landscaping as a result the proposed extensions, large areas of green roofs over the flat roof of the lower ground floor structure and permeable surfaces would be introduced to counterbalance loss of soft/permeable surfaces.*
- 8.2** *The scheme will reduce risk of flooding overall, as the new lower ground floor would be of modern resilience and resistance, better protected and flood future-proofed than existing. The scheme will comply with all LBRuT's SFRA guidance and the proposed development is categorised as "More Vulnerable" in accordance with the NPPF. However, no sleeping accommodation is proposed at lower ground floor. The proposed scheme introduces no additional highly vulnerable uses, if anything, following the reversion from 3Nos. self-contained flats to 1No. single-family dwellings, this is reduced and can incorporate suitable flood resilient measures. All future occupiers would have access to both ground and lower ground floors which provide adequate escape routes in the event of flooding and due to the sloping nature of the site, flood water is likely to flow down the rear garden, away from the rear garden areas towards the River Thames. Based on the data reviewed to date, the flood risk assessment recommends the scheme could be constructed and continue to be operated safely in flood risk terms without increasing flood risk elsewhere and is therefore appropriate development in accordance with the NPPF.*

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## 9. Environment Agency Form:

Version 3.1  
Advice issued April 2013



### Householder and other minor extensions in Flood Zones 2 and 3

Applications for planning permission should be accompanied by a completed form. An electronic version can be submitted by 'printing' it to a PDF writer.

**This guidance is for domestic extensions and non-domestic extensions where the additional footprint created by the development does not exceed 250 sq. metres. It should NOT be applied if an additional dwelling is being created, e.g. a self contained annex.**

We recommend that:

#### Planning Authorities:

- 1) Refer the applicant to the standing advice pages on the Environment Agency website or provide them with a copy of this page for them to include as part of the planning application submission.
- 2) Check the planning application to ensure that one or other of the mitigation measures from the table below has been incorporated.

#### Applicants:

Complete the table below and include it with the planning application submission. The table, together with the supporting evidence, will form the Flood Risk Assessment (FRA) and will act as an assurance to the Local Planning Authority (LPA) that flood risk issues have been adequately addressed.

Applicant to choose one or other of the flood mitigation measures below	Applicant to provide the LPA with the supporting information detailed below as part of their FRA	Applicant to indicate their choice in the box below. Enter 'yes' or 'no'
<p>Either ;</p> <p>Floor levels within the proposed development will be set no lower than existing levels AND, flood proofing of the proposed development has been incorporated where appropriate.</p>	<p>Details of any flood proofing / resilience and resistance techniques, to be included in accordance with 'Improving the flood performance of new buildings' CLG (2007)</p>	<p>yes</p>
<p>Or;</p> <p>Floor levels within the extension will be set 300mm above the known or modelled 1 in 100 annual probability river flood (1%) or 1 in 200 annual probability sea flood (0.5%) in any year. This flood level is the extent of the Flood Zones</p>	<p>This must be demonstrated by a plan that shows finished floor levels relative to the known or modelled flood level. All levels should be stated in relation to Ordnance Datum<sup>1</sup></p>	

#### Subterranean/basement extensions

Due to the risk of rapid inundation by floodwater basements should be avoided in areas at risk of flooding. The LPA may hold additional guidance for basement extensions.

Self-contained basement dwellings are 'highly vulnerable' development and should not be permitted in Flood Zone 3. We are opposed to these developments.

#### Continued...

<sup>1</sup> Ordnance Datum or the abbreviation 'OD' is the mean level of the sea at Newlyn in Cornwall from which heights above sea level are taken. The contour lines on Ordnance Survey maps measure heights above OD for example, though these are not accurate enough for a flood risk assessment.

### **Cumulative impact of minor extensions and the removal of Permitted Development rights.**

There is potential for the cumulative impact of minor extensions to have a significant effect on flood risk. Where local knowledge (Strategic Flood Risk Assessment held by the LPA/information provided by the parish council) suggests this is the case the guidance contained in FRA guidance note 2 should be applied. FRA guidance note 2 can also be applied where permitted development rights have been removed for flood risk reasons. The Environment Agency does not usually comment on minor development in this category.

### **Permeable paving and changes to permitted development rights for householders**

On the 1<sup>st</sup> October 2008 the General Permitted Development Order (GPDO) in England was amended by the Government (Statutory Instrument 2008 No. 2362).

One of the changes introduced by the GPDO amendment is the removal of permitted development rights for householders wishing to install hard surfacing in front gardens which exceeds 5sq. metres (i.e. 1m x 5 m) without making provision to ensure permeability. This means that use of traditional materials, such as impermeable concrete, where there is no facility in place to ensure permeability, requires an application for planning permission.

In order to help and advise householders of the options for achieving permeability and meeting the condition for permitted development status the Department for Communities and Local Government (CLG) has produced guidance on permeable paving which can be found on the following link <http://www.communities.gov.uk/publications/planningandbuilding/pavingfrontgardens>.

The Environment Agency supports the GPDO amendment as it is in line with the recommendations of the Pitt Report regarding the need to better tackle the impact of surface water flooding. However, Local Planning Authorities should determine these applications in accordance with the CLG guidance **without** consulting the Environment Agency.

**End of comment**