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Michael Baigent Orla Kelly Ltd

217 Kingston Road – Phase 2

Flood Risk Assessment

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1 Introduction

1.1 Report Objectives

Michael Baigent Orla Kelly Ltd (MBOK) is working on the planning submission for Phase 2 of the development in 217 Kingston Road, Teddington, TW11 9JN, which is within Richmond Upon Thames Council. MBOK has instructed ByrneLooby to undertake the Flood Risk Assessment (FRA) required as part of the submission.

This flood risk assessment has been undertaken in accordance with the requirements of the National Planning Policy Framework (NPPF, March 2012), the National Planning Practice Guidance (NPPG, March 2014) and the London Borough of Richmond upon Thames Strategic Flood Risk Assessment (SFRA).

The FRA includes flood modelling data for the site provided by the EA within Product 4 (Detailed Flood Risk, included in Appendix C).

1.2 Information Received

The assessment was based upon the following documents:

Proposed Development Drawings

- Drawing 240 2 PL(10) P00 - Planning Application Proposed Site Plan – Rev D
- Drawing 195 PL(20) P00 - Planning Application Proposed Ground Floor – Rev G
- Drawing 195 PL(20) P01 - Planning Application Proposed First Floor – Rev G
- Drawing 195 PL(20) P-1 - Planning Application Proposed Lower Ground Floor – Rev H
- Drawing 195 PL(20) P02 - Planning Application Proposed Second Floor – Rev G
- Drawing 195 PL(20) P03 - Planning Application Proposed Roof Plan – Rev E
- Drawing 195 PL(20) S01 - Planning Section AA – Rev D

Other

- Environmental Agency document THM33468, Product 4 (Detailed Flood Risk) for Kingston Road, Teddington, Middlesex, TW11 9JN (Included in Appendix C)

It should be noted that the above lists are not exhaustive and represent the documents relevant to the design works undertaken.

2 Development Location and Features

2.1 Development Location

The site location is 217 Kingston Road, Teddington, TW11 9JN (Figure 1).

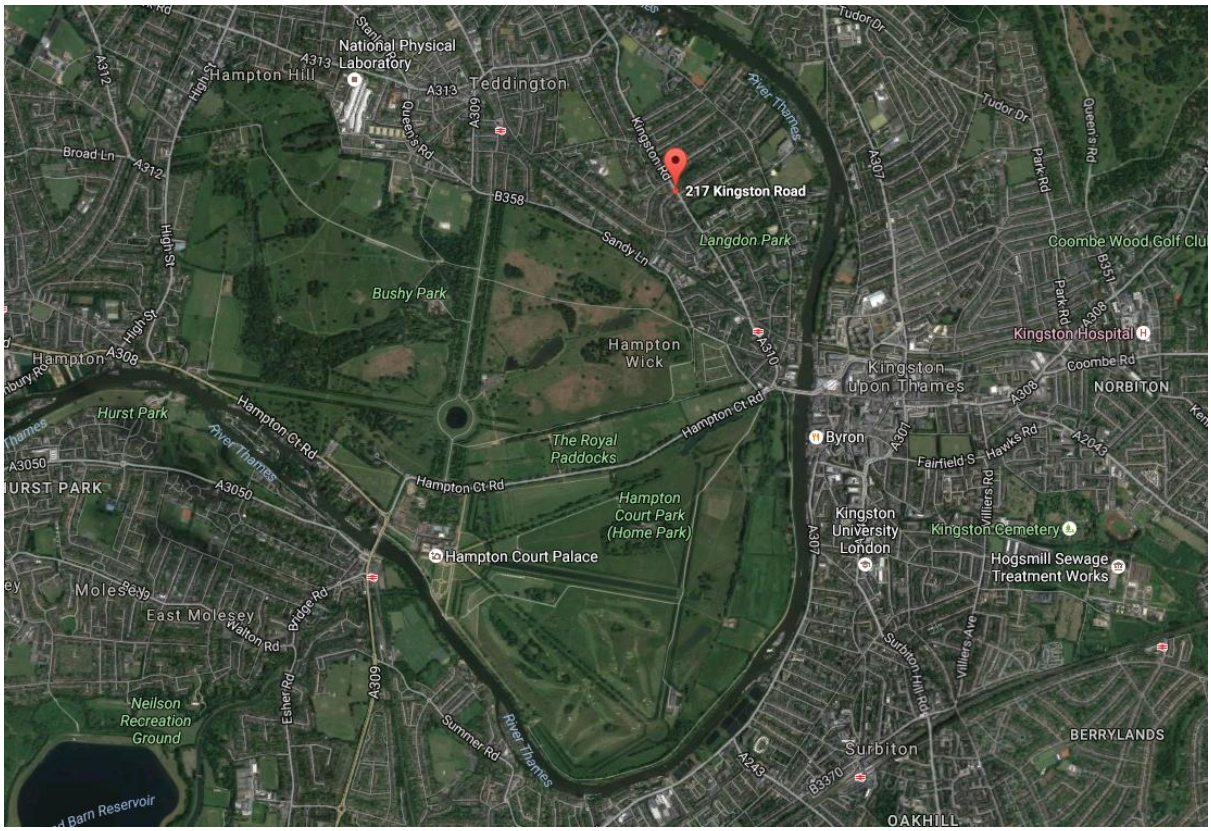


Figure 1 - Development Location

2.2 Hydrological Features

The site is located half a mile away from the River Thames. The site is upstream of the Teddington Weir and therefore the site is not susceptible to tidal flooding.

2.3 Geology and Hydrogeology

BGS maps indicate that the ground conditions comprise Kempton Park Gravels overlying London Clay Formation. Boreholes on BGS website at TQ17 SE187, within half a mile confirms the ground conditions. Groundwater was encountered at -3.3m (5.75mOD).

The Kempton Park Gravels comprise a water bearing strata, which can store significant amounts of water during a flooding event. The Kempton Park Gravels form a superficial aquifer, which in the area is classified as Unproductive by the Environmental Agency (EA). London Clay is an aquiclude that separates the superficial aquifer from the deeper aquifer, which in the London area comprises the Thanet Sand and the Chalk Formation.

2.4 Development Proposals

The existing site has a footprint of approximately 1300m^2. The site is currently under development of a new detached building of 3 storeys (Phase 1 of the development in 217 Kingston Road, which was covered in a previous planning application).

Phase 2 of the development in 217 Kingston Road comprises a 2-story eco-house with the lower ground floor constructed 1.5m below ground level. The eco-house is to be constructed at the rear garden of the new detached building and comprises an approximated footprint of 150m^2, including the outdoors lower ground floor area and stairs. The development will accommodate a single apartment.

The Site Plan for the development is shown in Figure 2.

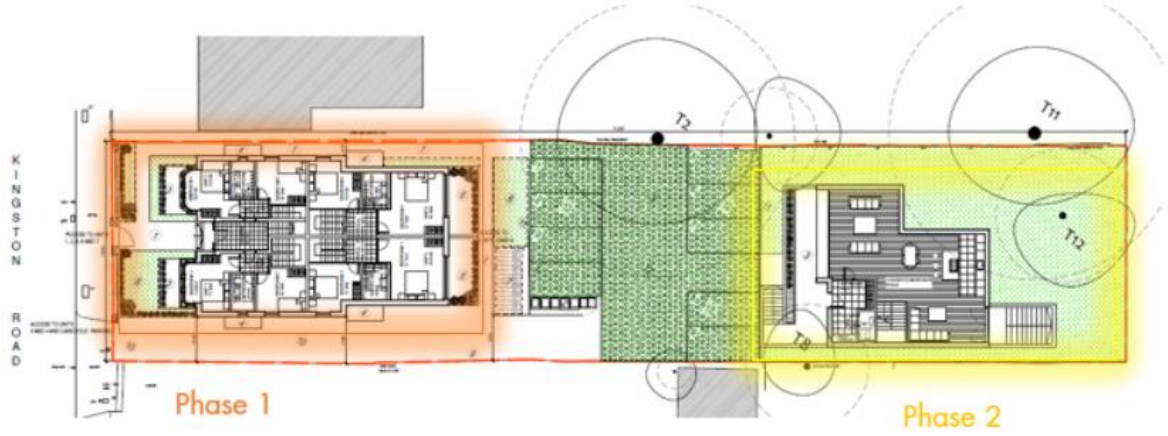


Figure 2 - Site Plan

2.5 Flood Zone Classification

Based upon the Flood Zone Maps (Figure 3 & Figure 4) the entire site is shown to lie within 'medium probability' Flood Zone 2 which represents an annual probability of between a 1% - 0.1% (1/100 to 1/1000) chance of fluvial flooding in any one-year period. The site is therefore located within Flood Zone 2.

Figure 3 is included in the SFRA and is based on the maps published by the EA. Figure 4 was provided within Product 4. Although the scale of both maps is different both are based on the same flood modelling and present identical data.

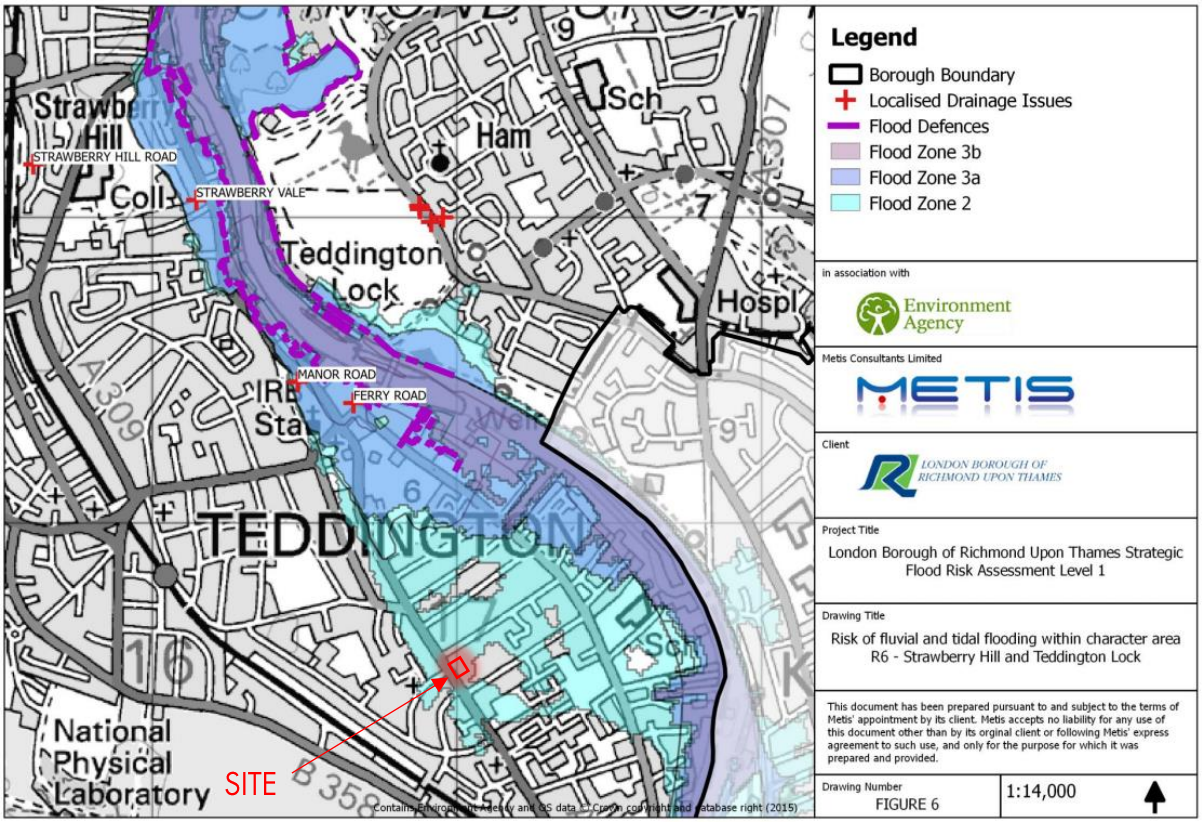


Figure 3 - Flood Zone Map (Figure 06 SFRA)

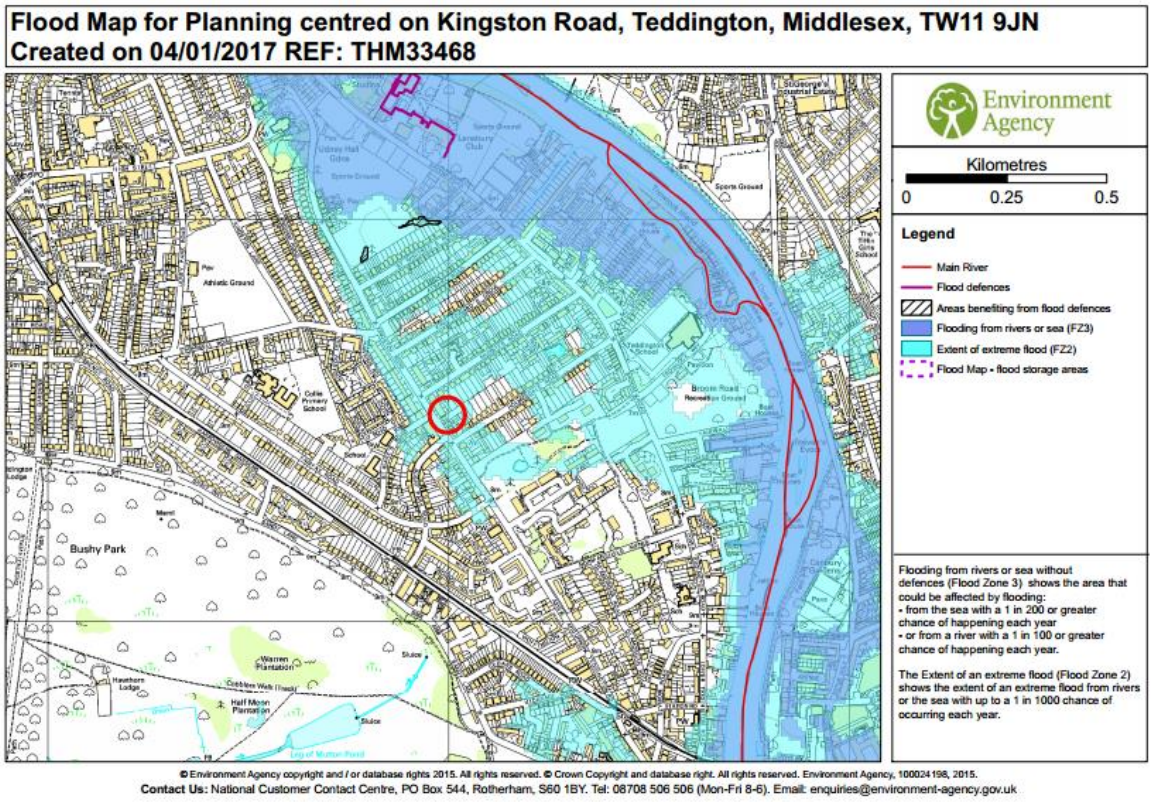


Figure 4 - Flood Zone Map (Product 4)

2.6 Flood Risk Vulnerability

The proposals include the provision of a lower ground floor that is below existing ground level and it may be considered a basement dwelling, which is classified as "Highly Vulnerable" in Table 2 of the National Planning Practice Guidance.

2.7 Flood Risk Compatibility

Table 3 of the National Planning Practice Guidance (NPPG) specifies the Flood risk vulnerability and flood zone 'compatibility' (Figure 5). In accordance with the table, a "Highly Vulnerable" development within Zone 2 can only be considered following application and approval of the Exception Test.

Note that the Exception Test is in addition to the Sequential Test, which is required for all applications and is presented below.

Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	X	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	X	X	X	✓*

Key:

✓ Development is appropriate

X Development should not be permitted.

Figure 5 - Table 3 of the NPPG - Flood Zone Compatibility

2.8 Sequential Test and Sequential Approach

The NPPF outlines the aim of the Sequential Test to steer new developments to areas with the lowest probability 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 probability of flooding. The SFRA provides the basis for applying this test.

In accordance with the SFRA, only if it can be demonstrated that there are no suitable sites within these areas should alternative sites (i.e. within areas that may potentially be at risk of flooding) be contemplated.

2.9 Exception Test

The NPPF recognises that in some Boroughs, including the London Borough of Richmond upon Thames, restricting residential development from areas designated as susceptible of flooding may compromise the viability of existing communities within the Borough. For this reason, the NPPF provides an Exception Test. The Exception Test provides a method of managing flood risk while still allowing necessary sustainable development to occur.

For the Exception Test, in line with the NPPF (paragraph 102), both of the following elements must be passed for the development to be allocated or permitted:

- *"It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a SFRA where one has been prepared".*
- *"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".*

3 Potential Sources of Flooding & Flood Risk Assessment

3.1 Tidal Flooding

The site is located upstream of Teddington Weir and is not susceptible to tidal flooding.

3.2 Fluvial Flooding

The Flood Map in Figure 3 indicates that the site is located within Flood Zone 2: Medium Risk. Figure 6 shows that the Flood Risk from rivers is Low. Although the proposed development lies within 'medium probability' Flood Zone 2 (annual probability of between 1/100 to 1/1000), the site is near the Zone 1 "Low Risk" area, therefore it is considered that the Flood Risk annual probability for the development is nearer to the 1/1000 boundary.

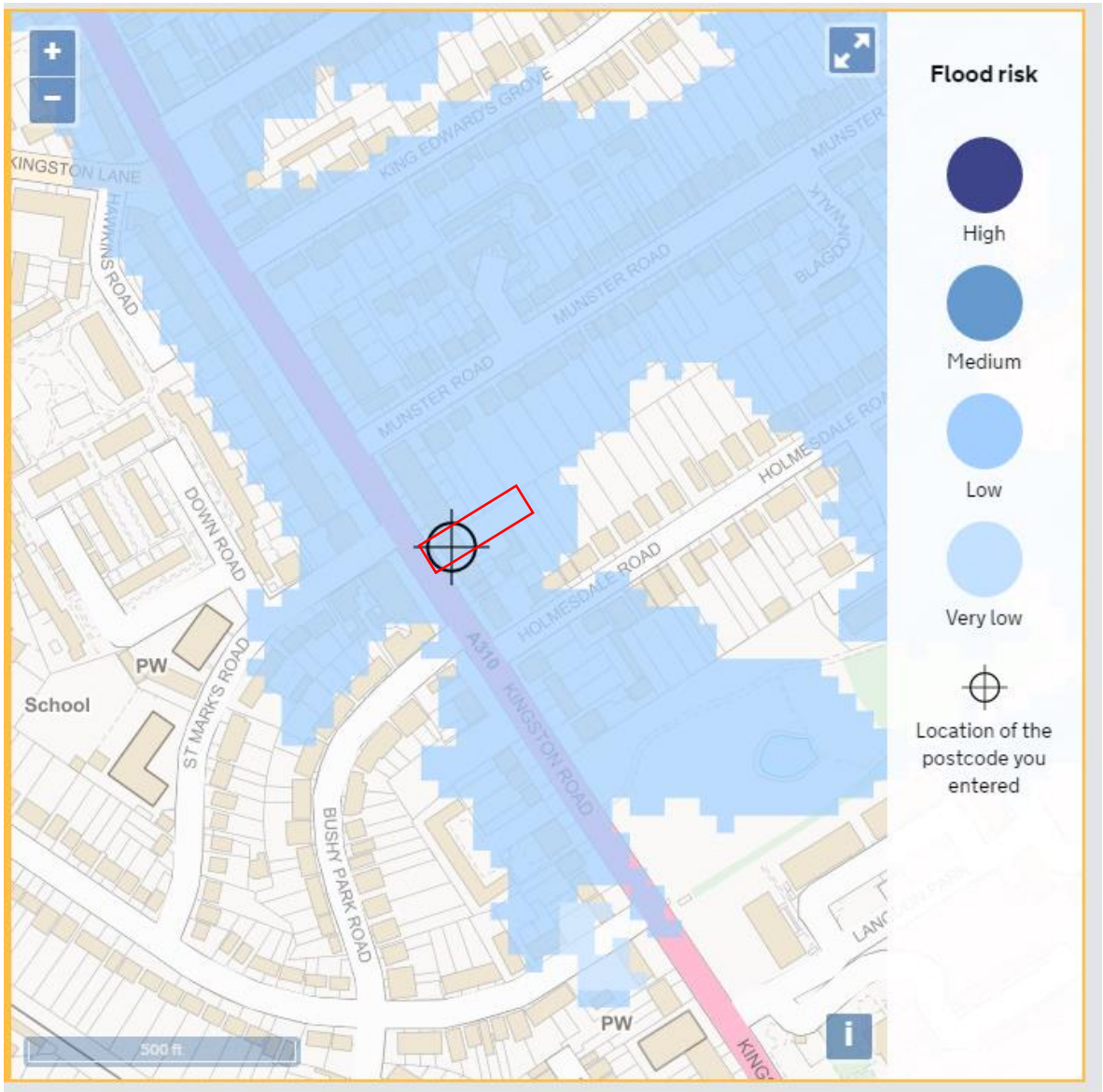


Figure 6 - Flood Risk from Rivers or the Sea (Source EA)

3.3 Historical Flooding

In accordance with Figure 7 there are no known historic flooding events at this Site. Figure K of the SFRA has been included in Appendix A.

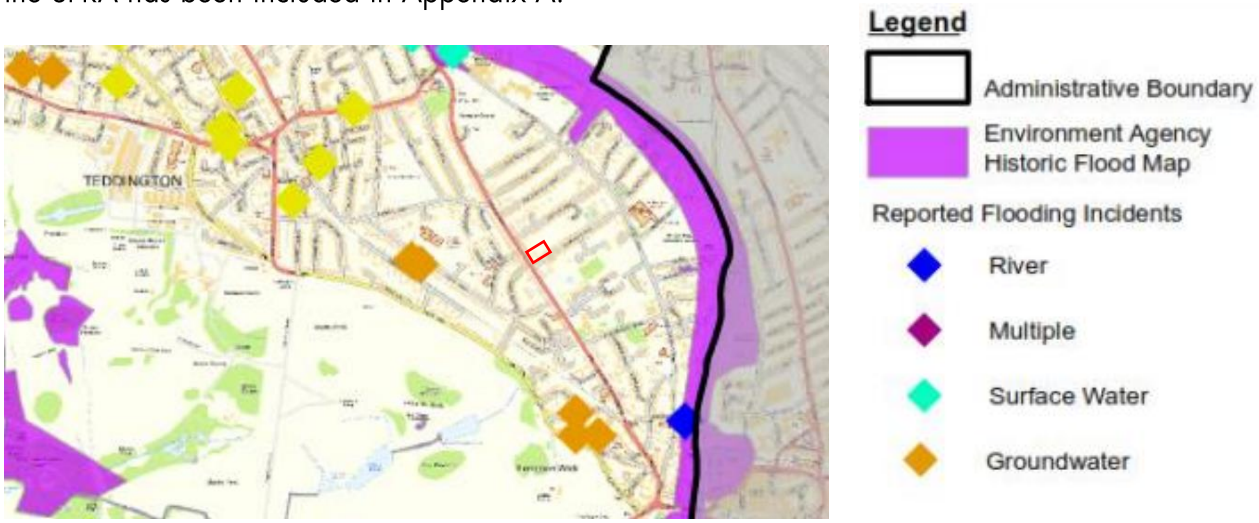


Figure 7 - Historic Flooding (Extracted from Figure K, SFRA)

3.4 Groundwater Flooding

In accordance with Figure 8, the development is susceptible to groundwater flooding below ground level but not at surface. Figure E of the SFRA has been included in Appendix A.

Figure 9 and Figure 10 illustrate the risk of Flooding due to Surface Water in accordance with the EA maps. The risk is Very Low where the Phase 2 Site is located although the risk increases to Low Risk in the site boundary near Kingston Road, which is part of Phase 1 Site. This is consistent with the Site Survey that indicates that ground level for Phase 2 is typically 200mm higher, therefore the risk of groundwater flooding is expected to be lower for Phase 2.

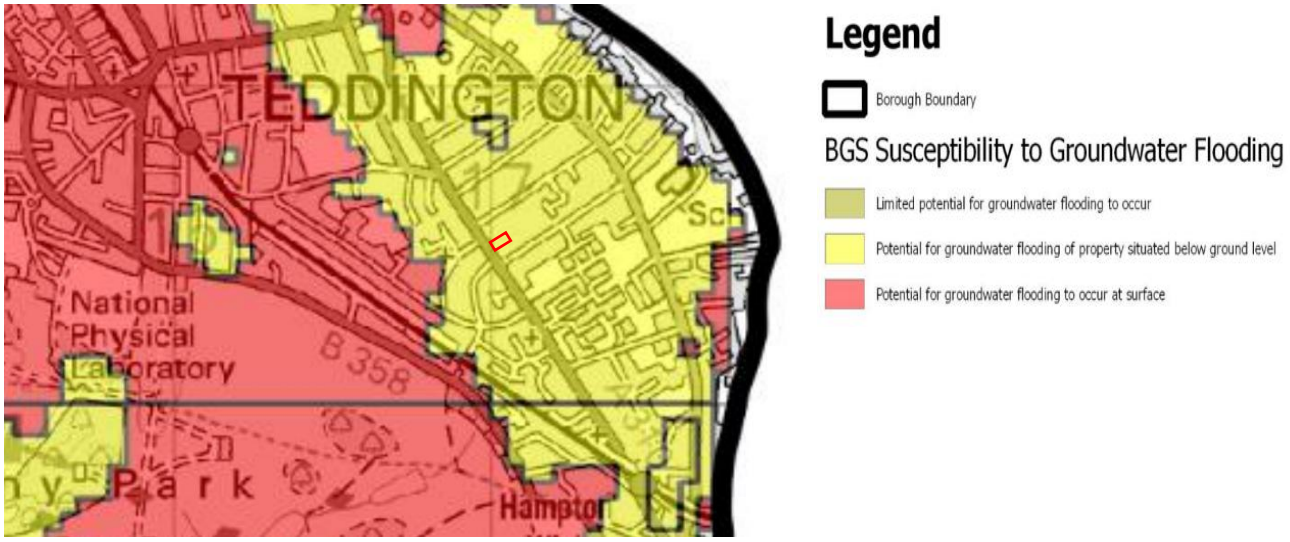


Figure 8 - BGS Susceptibility to Groundwater Flooding (Extracted from Figure E, SFRA)

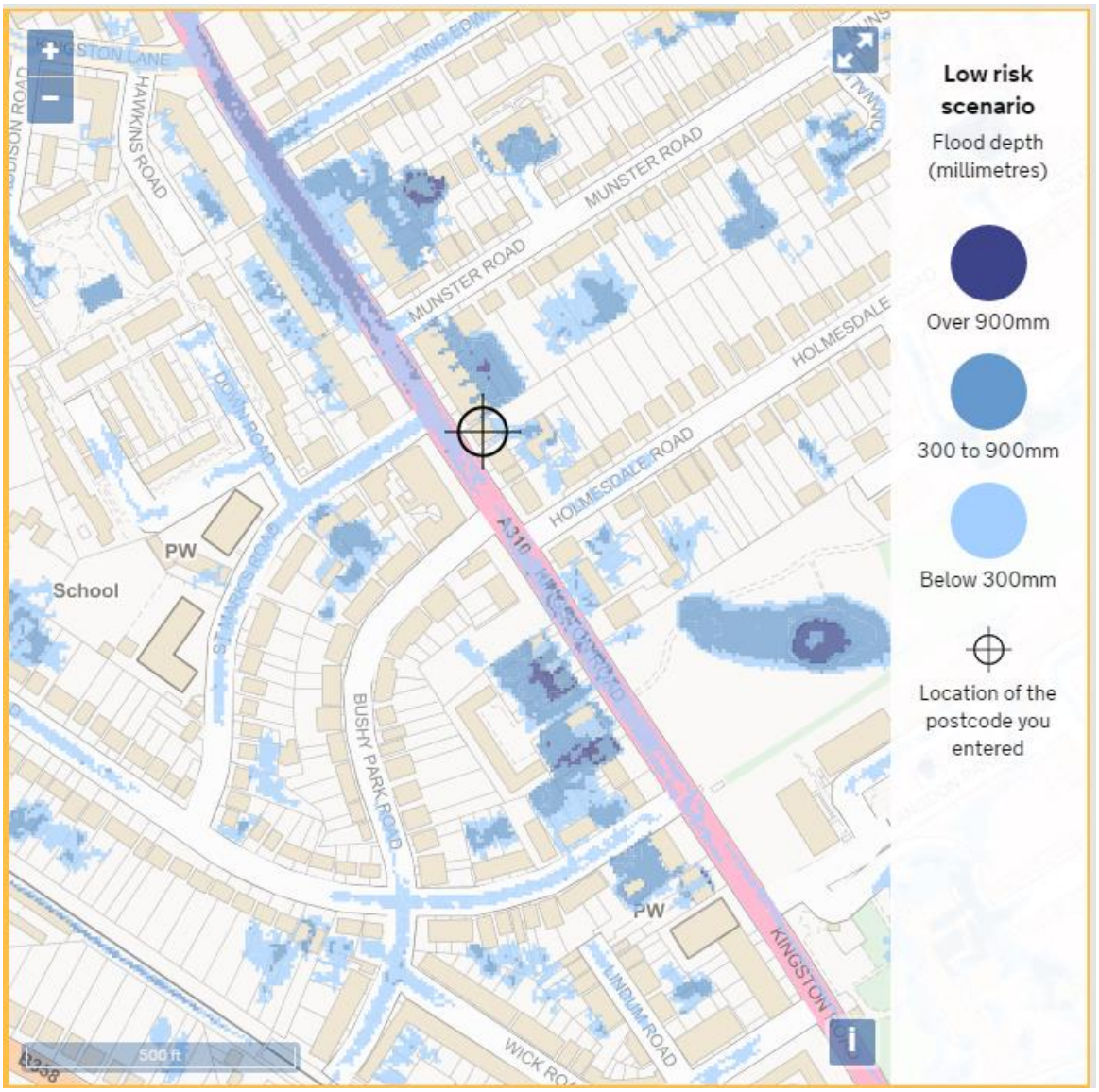


Figure 9 - Flood Risk from Surface Water – Depth (Source EA)

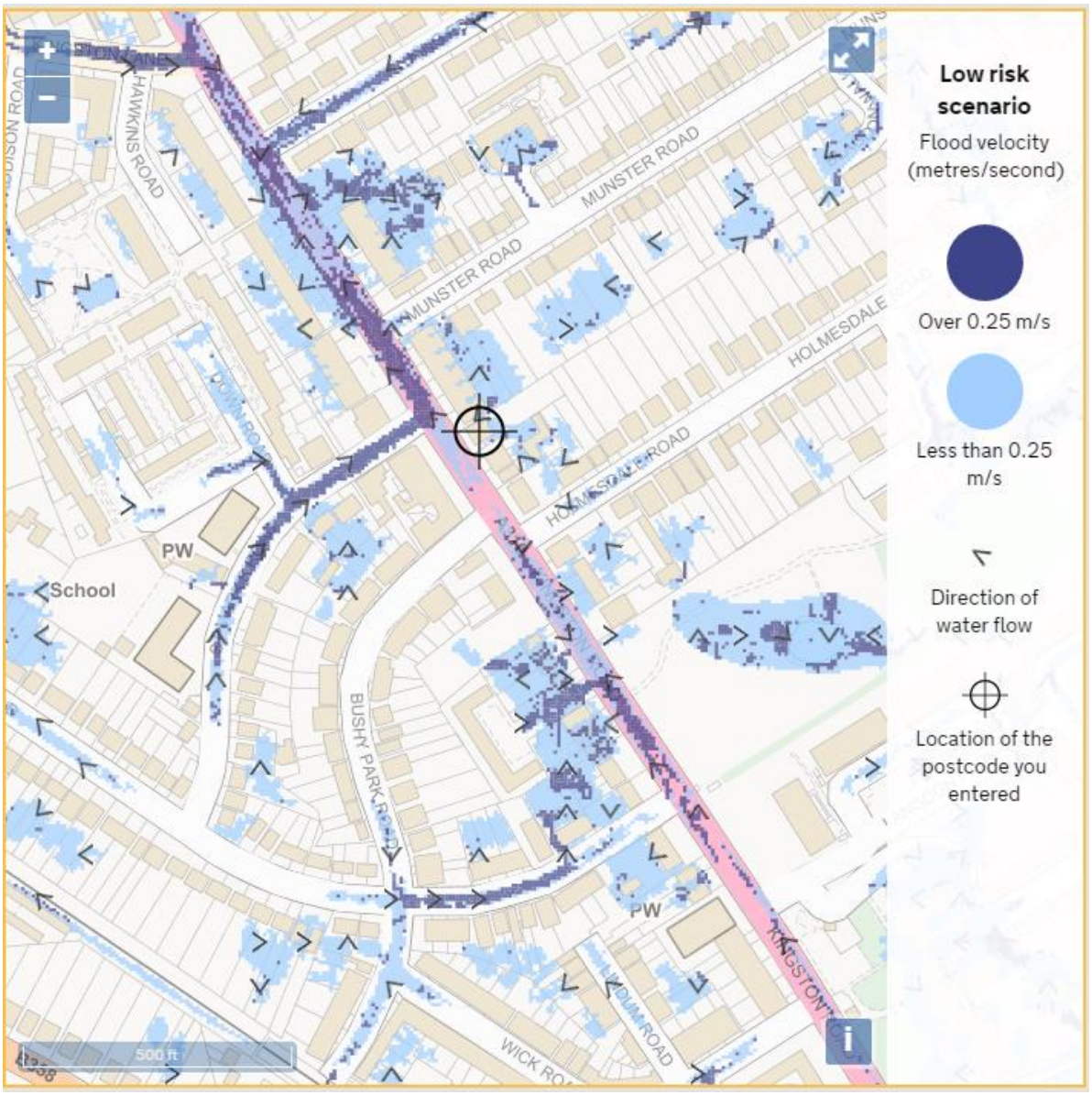


Figure 10 - Flood Risk from Surface Water - Speed (Source EA)

3.5 Flood Defences

In accordance with Figure D of the SFRA, the area does not benefit from flood defences. Figure D of the SFRA has been included in Appendix A.

3.6 Reservoir Flooding

The Site is within the Maximum extent of flooding due to Reservoir Flooding (Figure 11), however in accordance with the EA flooding from reservoirs is extremely unlikely: there has been no loss of life in the UK from reservoir flooding since 1925.

The reservoirs that could affect the site are Queen Mary (grid reference TQ0831069750) and Queen Elizabeth II (grid reference TQ1241067770).

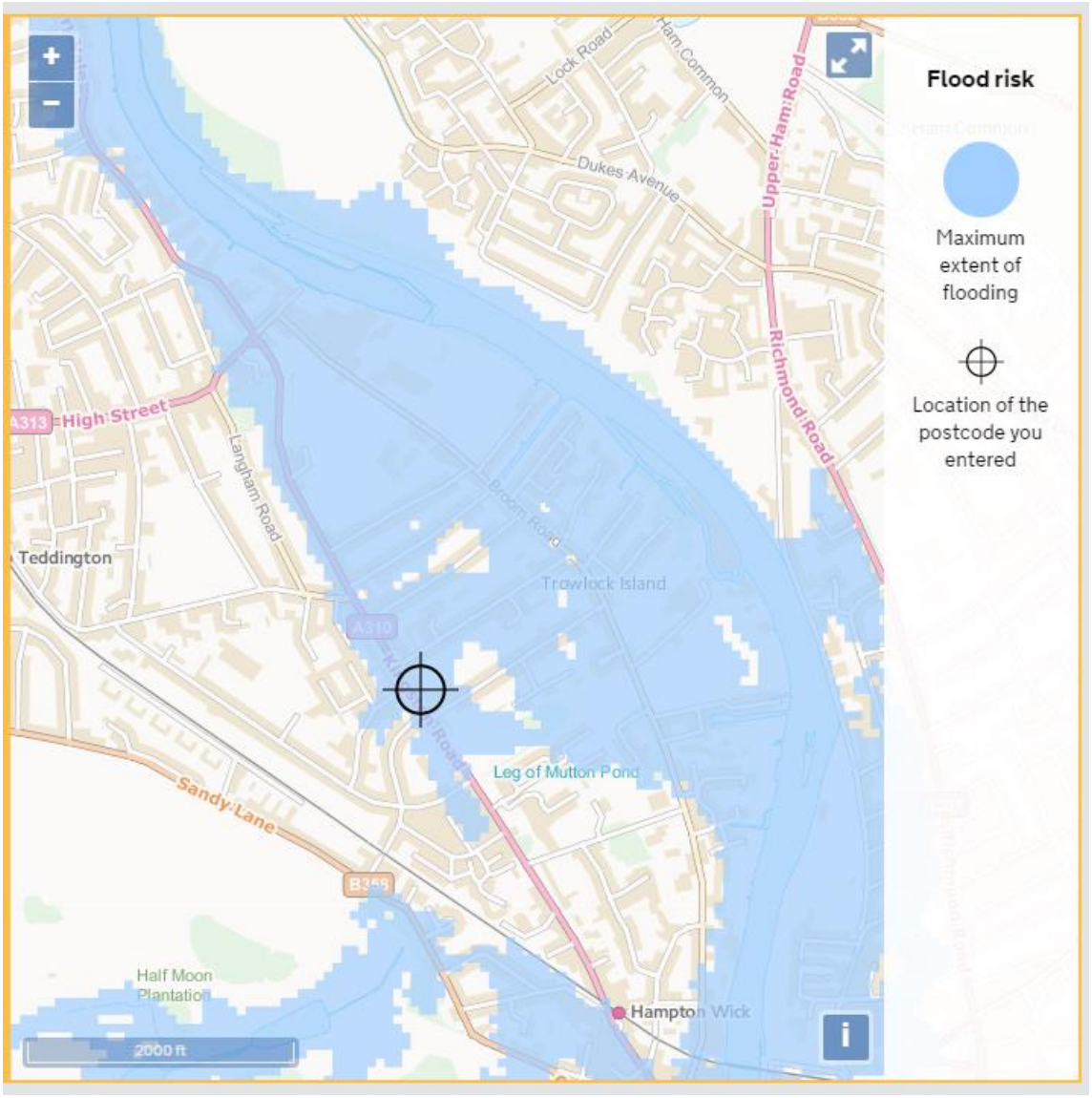


Figure 11 - Flood Risks from Reservoirs (Source EA)

3.7 Climate Change

In accordance with the SFRA, *"the current detailed modelling of the River Thames (upstream of Teddington Weir) has considered the potential impact of climate change upon river flooding over the next 100 years, assuming a 20% increase in the peak design flow. This has been reflected in the presented flood maps.*

It is important to recognise that those properties (and areas) that are currently at risk of flooding may be susceptible to more frequent, more severe flooding in future years.

For this reason, all of the development control recommendations set out below require all floor levels, access routes, drainage systems and flood mitigation measures to be designed with an allowance for climate change".

4 Flood Risk Management Measures

4.1 Raising Floor Levels

For the proposed development located in Zone 2, in accordance with Section 7.6.2 of the SFRA the finished ground floor level should be situated *"a minimum of 300mm above the 1% chance in any one-year event with an allowance for climate change fluvial flood level"*. Note that as the site is located upstream of Teddington Weir, only fluvial risk has been considered regarding raising floor levels.

In accordance with the Site Survey (Appendix B), the ground level for Phase 2 of the development is around 7.15mOD. Drawing 240 2 PL(20) E01 shows the proposed finished ground floor level 1500mm above the existing ground level, at around 9.35mOD.

The 1% chance in any one-year event corresponds with the boundary between Flood Zone 3a (>1% chance) and Flood Zone 2 (between a 1% and a 0.1%). In accordance with Product 4 information the flood level with 1% chance in any one-year in node 063TH01_MN_16.06 is 6.8mOD. As a result, the finished ground level is located more than 1800mm above the 1% chance in any one-year event.

In view of the above raising finished floor levels is not deemed necessary because the finished ground floor level is well above the 300m above the 1% chance in any one-year event as required by the SFRA.

4.2 Basement / Lower Ground Floor

The SFRA specifies that *"Self-contained residential basements and bedrooms at basement level will not be permitted. All basements, basement extensions and basement conversions must have internal access to a higher floor and flood resistant and resilient design techniques must be adopted"*.

The proposed development basement comprises living/kitchen/dining and bathroom spaces, with no bedrooms at basement level.

The lower ground level basement should be constructed with flood resistant materials and to be designed to resist flotation in the event of a flood.

4.3 Off-site Impacts

The development proposals must not exacerbate the existing flood risk and in accordance with the NPPF should seek to reduce the overall level of flood risk in the area.

The new development footprint is around 150m^2. It is recommended that a soakaway drainage system is constructed within the Kempton Park Gravels. As a result, superficial water run-offs would be maintained at close to the equivalent greenfield run-off rate.

Foul drainage should drain to the local sewers. Given the small size of the development (1 unit), the volume of foul water is considered negligible when compared with water volumes during a flooding event.

With these considerations, the development will not have an adverse impact on flood risk off-site.

4.4 Flood Warning

The site is in flood zone 2 and therefore it is recommended for residents to subscribe to the Environment Agency's Flood Warning System.

4.5 Emergency Evacuation Plan

The development is located 0.2miles away from Flood Zone 1 "Very Low Risk" in Bushy Park Road. Residents should be informed of the proposed nominated evacuation route in Figure 12 which comprises:

- Leave the Development towards Bushy Park Road
- Go north along Fairfax Road and towards Teddington Station, where higher ground can be found.

In case of a Flooding emergency, residents must avoid being diverted towards Holmesdale Road, where they may be trapped on a 'dry island' without essential supplies for the duration of the flood event.

Figure 12 - Proposed Nominated Evacuation Route

4.6 Residual Risks

It is important to recognise that flood risk can never be fully mitigated and there will always be a residual risk of flooding.

This residual risk is associated with a number of potential risk factors including (but not limited to):

- A flooding event that exceeds that for which the local drainage system has been designed.
- The residual danger posed to property and life as a result of flood defence failure or exceedance.

- The general uncertainties inherent in the prediction of flooding.
- A reservoir failure.

Residual Risks can be mitigated by subscribing residents to the Environment Agency's Flood Warning System.

The proposed nominated evacuation route should be clearly displayed in the development for all residents.

5 Conclusions

This Flood Risk Assessment report has been prepared to accompany a planning application proposing a redevelopment of land at Phase 2 of 217 Kingston Road, Teddington, TW11 9JN.

The development is located in Flood Risk Zone 2 "Medium Probability" area, with between a 1% and a 0.1% chance in any one-year period of fluvial flooding. The development has been clasified as "Highly Vulnerable", therefore Sequential and Exception tests should be submitted within the Flood Risk Assessment and Planning Application for acceptance by the London Borough of Richmond upon Thames.

The development Flood Risks have been assessed. The following Risks have been identified:

- The Fluvial Flood Risk is considered to be just above 0.1% chance in any one-year period.
- The development is within the Maximum Extent of Reservoir Flood, however the likelihood the Reservoir Flood occurring is very low so this is considered as a residual risk.

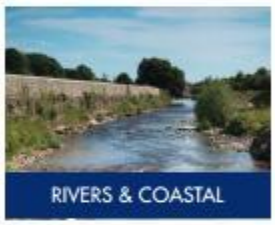
No historical flood events have been recorded in the site.

Flood Risk Management Measures have been proposed, including:

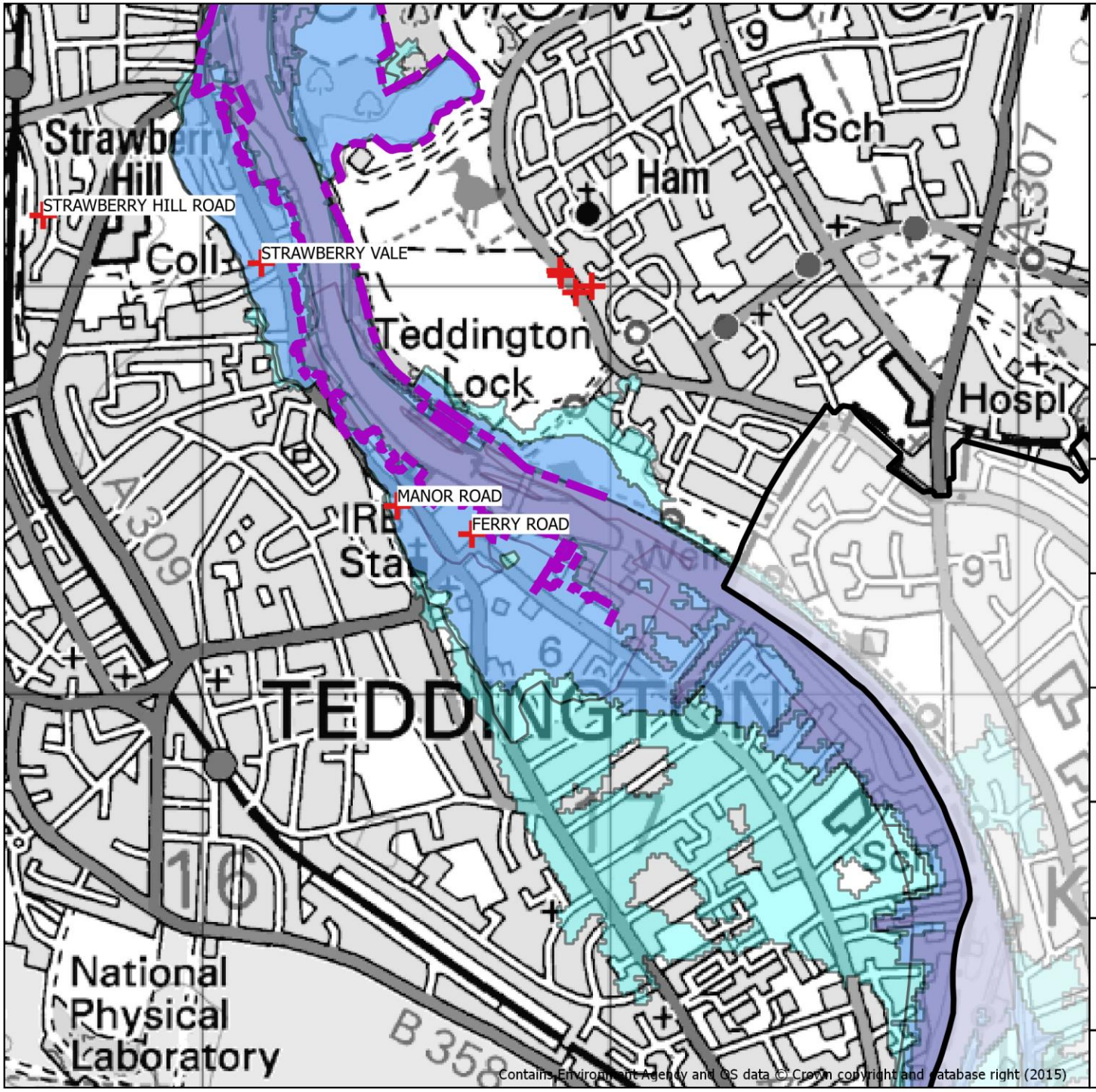
- Basement to be constructed with flood resistant materials and to be designed to prevent flotation.
- Construction of a soakaway drainage system to limit water run-offs that may increase the risk of flood off-site.

Following the above measures, and providing that the Sequencial and Exception tests are passed, it is considered that the development complies with the requirements of the NPPF and is considered acceptable in flood risk terms.

It is important to recognise that flood risk can never be fully mitigated and there will always be a residual risk of flooding. However, the residual risks can be mitigated by subscribing the residents to the Environment Agency's Flood Warning System and ensuring they are aware of the nominated evacuation route.



Appendix A – SFRA Figures



Legend

- Borough Boundary
- Localised Drainage Issues
- Flood Defences
- Flood Zone 3b
- Flood Zone 3a
- Flood Zone 2

in association with

Environment Agency

Metis Consultants Limited

METIS

Client

LONDON BOROUGH OF RICHMOND UPON THAMES

Project Title

London Borough of Richmond Upon Thames Strategic Flood Risk Assessment Level 1

Drawing Title

Risk of fluvial and tidal flooding within character area R6 - Strawberry Hill and Teddington Lock

Drawing Number

FIGURE 6

1:14,000