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REFURBISHMENT AND CONSTRUCTION AT 25 St. GEORGES ROAD, TWICKENHAM.

FLOOD RISK ASSESSMENT.

Prepared for: Hogarth Architects Ltd.
183 Dawes Road,
London,
SW6 7RG.

Prepared by: - **M Longden** Date: - **15/02/2019.** Report No: - **LDA/FRA/1037/01A.**

FLOOD RISK ASSESSMENT.

Report To: Hogarth Architects Ltd.
183 Dawes Road,
London,
SW6 7RG.

Title: Flood Risk Assessment
Basement Construction at
25 St. George's Road,
Twickenham, TW1 1QS.

Issue / Revision Date: Issue 01A – Amended Application.

Originated By: M Longden …… Date:… 15th February 2019……..

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CONTENTS

Summary of Flood Risk.

Site Name and Address: - 25 St. Georges Road, Twickenham, Richmond Upon Thames, TW1 1QS.

Grid Reference: - 516927E : 174828N.

Current Use: - Residential Dwelling. **Proposed Use:** - Residential Dwelling.

Flood Zone: - EA Classification 3.

Vulnerability class: - More vulnerable.

Is it compatible? No – but mitigation measures are applicable for this existing residential application site.

Application of the Sequential Test: - Although the application site lies in the EA Flood Zone 3a classification – it is a brownfield site with extant planning permission and is considered suitable to provide extended residential accommodation with safeguards and flood defence mitigation.

Exception test. Not required. NPPF guidance advises that the site could be developed with mitigation.

Possible Flood Sources are:-

- Direct rainfall onto the site.
- High flood levels in the local Main Rivers.
- High groundwater levels.
- Breach or over-topping of defences on the local main rivers and reservoirs.

Possible Flood Pathways are:-

- Overland flow including flow along roads
- Overspill from Local main rivers.
- Surcharge from local private and public sewerage systems

Receptors are generally the lower parts of the site where flow could collect. They could include:-

- The proposed buildings within the application site.
- The existing properties abutting the application site.

Fig 1: Site location plan

Section 1. Introduction.

1.1 This Flood Risk Assessment (FRA) has been commissioned on behalf of the property owner (the client) to support a planning application for the refurbishment and the construction at No 25 St Georges Road, Twickenham, TW1 1QS. (application site)

1.2 The application site is located directly off St. Georges Road in this existing residential area of Twickenham. The site comprises of an existing two storey dwelling; externally there is short driveway to an attached garage building, formally laid out gardens extend along the remainder of the frontage, side and rear of the property as shown in Fig 2 below.

FIG 2. Aerial View of Application Site and Surrounds.

1.3 This report has been prepared to identify all sources and consequences of flooding that could impact upon the application site and to provide mitigation measures, where practicable, in support of a planning application for the refurbishment of the existing building and the extension structure.

1.4 The following data has been collected for this site specific FRA.

- Environment Agency planning data for flooding from Rivers/Sea and from Surface Water website.
- Environment Agency 'Product 1 to 8' site specific flood risk data.
- London Borough of Richmond upon Thames – Strategic Flood Risk Assessment (SFRA) Level 1 (March 2016).
- NPPF and DEFRA – Sustainable Drainage Systems (March 2015).

1.5 The following Flood Risk Assessment report is structured as follows:-

- Section 2: presents a review of flood risk policies.
- Section 3: reviews all forms of flooding and identifies those requiring more detailed assessment.
- Section 4: assesses actual flood risk and the potential impact on third party land.
- Section 5: provides the conclusions and recommendations of this site specific FRA.

Section 2. Flood Risk Policies

2.1 **National Planning Policy Framework. (NPPF)**

The now superseded Planning Policy Statement 25: Development and Flood Risk and its accompanying practice guide, set out the Governments spatial planning policy on development and flood risk. It aimed to ensure that flood risk is taken into account by all relevant statutory bodies from regional to local authority planning departments to avoid inappropriate development in areas at risk of flooding and to direct development away from areas of highest risk. Where new development is exceptionally necessary in such areas Government policy aims to make it safe, without increasing flood risk elsewhere and where possible, reducing flood risk overall.

2.1.1 The Government reviewed planning policy and released the new National Planning Policy Framework (NPPF) and an accompanying Technical Guide in 2012, which supersedes PPS25 but retains many of the previous policies.

2.1.2 Local authorities should only consider development in flood risk areas as appropriate where informed by a site-specific FRA, based upon the Environment Agency's Standing Advice on flood risk. The FRA should identify and assess the risks of all forms of flooding to and from the development and demonstrate how flood risks will be managed so that the development remains safe through its lifetime, taking climate change into account.

2.1.3 For flood risks in general, there is a hierarchy that should be applied for flood risk management with avoidance or prevention being the preferred first measure to reduce flood risk. The table below presents the flood risk management hierarchy:-

Table 1. Flood Risk Hierarchy

Flood Risk Management Hierarchy		What it means
1	Assess	Undertake studies to collect data at the appropriate scale and level of detail to understand what flood risk is.
2	Avoidance/prevention	Allocate development to areas of least risk and apportion development types vulnerable to the impact of flooding to areas of least flood risk.
3	Substitution	Substitute less vulnerable development types for those compatible with the degree of flood risk.
4	Control	Implement flood risk management measures to reduce the impact of new development on flood frequency and use appropriate design.
5	Mitigation	Implement measures to mitigate residual risk

2.2 **Flood Risk and Return Period.**

2.2.1 Flood Risk includes the statistical probability of an event occurring and the scale of the potential consequences. The risk is estimated from historical data and expressed in terms of the expected frequency (or return period) of a flood of a given magnitude. The 10 year, 50 year and the 100 year floods have a 10%, 2% and 1% chance respectively occurring in any given year (this is termed the Annual Exceedance Probability, AEP) however over a longer period the probability of flooding is considerably greater.

For example, for the 100 year return period flood:-

- There is a 1% chance of the 100 year flood occurring or being exceeded in any year.
- A 26% chance of it occurring or being exceeded in a 30 year period and
- A 51 % chance of it occurring or being exceeded in a 70 year period.

2.2.2 The table below provides a summary of the relevant AEP and corresponding return period events of a particular sensitivity.

Table 2: Definition of AEP and Return Period Flood Events.

AEP %	Return Period (Years)
100%	1 in 1 year (annual)
10%	1 in 10 year
2%	1 in 50 year
1%	1 in 100 year
0.5%	1 in 200 year
0.1%	1 in 1000 year (extreme)

2.2.3 The NPPF and the accompanying Technical Guide assigns the level of risk depending on the annual probability of fluvial flooding occurring as follows:-

- Flood Zone 1: Low Probability (< 0.1% AEP fluvial/sea flooding).
- Flood Zone 2: Medium Probability (0.1-1.0% AEP fluvial/0.5-0.1% AEP sea flooding)
- Flood Zone 3a: High Probability (>1% AEP fluvial/>0.5% AEP sea flooding)
- Flood Zone 3b: Functional Floodplain (>5% AEP or designed to flood in 0.1% event)

2.2.4 Development should be directed as far as is practicable towards a 'Flood Zone 1' area to avoid fluvial flood risks wherever this is possible. Any development greater than 1 hectare requires a FRA to address design issues related to the control of surface water run-off and climate change, as well as considering any other potential source of flood risk for the development site.

2.3 **DEFRA – Sustainable Drainage Systems – Non-statutory standards for sustainable drainage systems. (March 2015)**

2.3.1 This document sets out the Governments non-statutory standards for sustainable drainage systems to be used in conjunction with the National Planning Policy Framework and the Planning Practice Guide.

2.4 **Environment Agency Flood Risk Classification**

2.4.1 The application site is located in an Environment Agency Flood Zone 3 defended area and within an area susceptible to surface water flooding and reservoir flooding as shown in Figs 3, 4, 5 6, and 7 below – Flood Maps for Planning (Rivers and Sea) and Risk of Flooding from Surface Water respectively. (Note these maps assume no flood defences are present). These Environment Agency flood maps are used as the starting point for all FRA's.

The site falls within Flood Zone 3. (Defended)

Environment Agency

Flood map for planning

Your reference	Location	Created
St Georges Rd	**516910/174836**	**12 Feb 2018 5:42**

Your selected location is in flood zone 3, an area with a high probability of flooding.

This means:

- you must complete a flood risk assessment for development in this area
- you should follow the Environment Agency's standing advice for carrying out a flood risk assessment (see www.gov.uk/guidance/flood-risk-assessment-standing-advice)

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

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Page 1 of 2

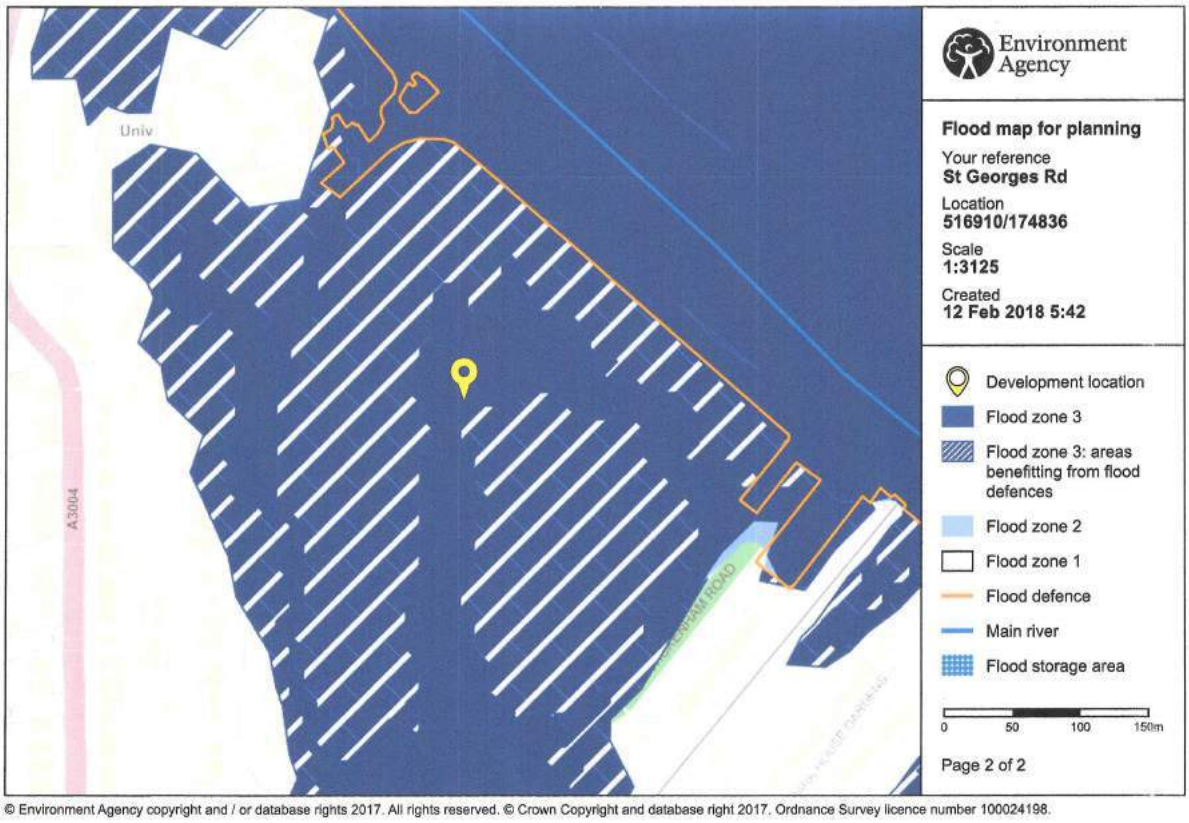

Fig 3 & 4: Environment Agency Flood Zone Report – Rivers and Sea.

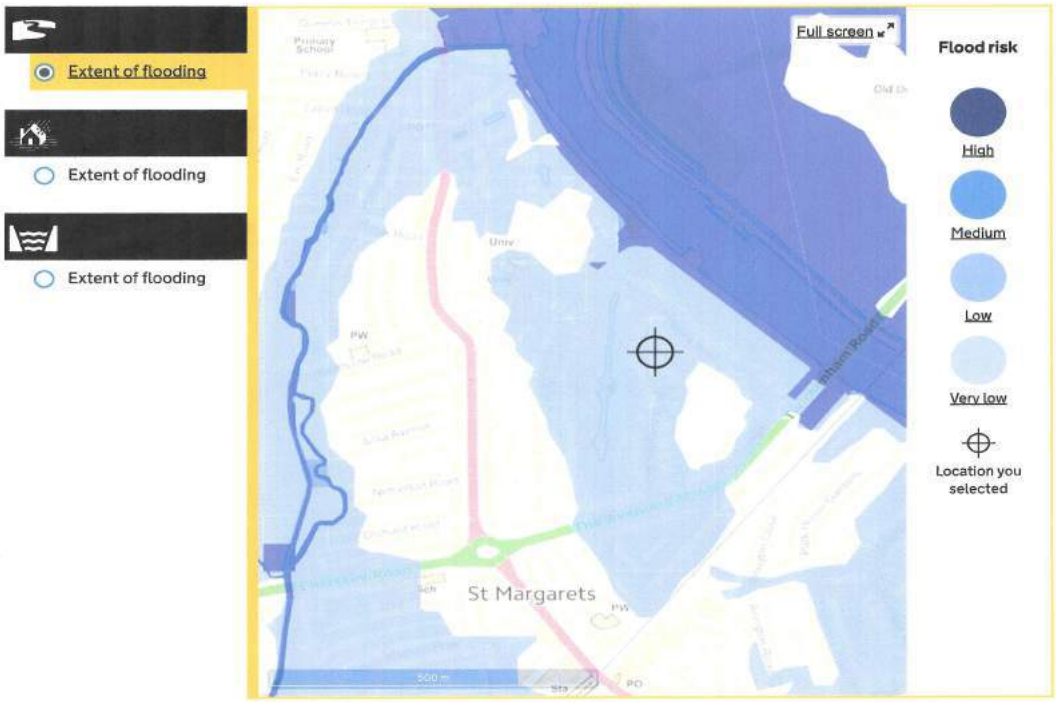

Fig 5: Environment Agency Flood Zone Extents Map – Fluvial Flooding.

Fig 6: Environment Agency Flood Zone Extents Map – Surface Water Flooding.

Fig 7: Environment Agency Flood Zone Extents Map – Reservoir Flooding.

2.5 **London Borough of Richmond upon Thames STRATEGIC FLOOD RISK ASSESSMENT (SFRA) Level 1 (March 2016)**

2.5.1 The primary objective of the LBRuT SFRA is to inform the revision of flooding policies, including the allocation of land for future development, within the Local Plan. More specifically, the SFRA seeks to inform the identification of sustainability objectives, test policy options, allocate land for housing and employment, 'shape' flood risk related policies within the Development Management Plan (DMP) and inform planning application decisions.

2.5.2 The SFRA has a broader purpose in providing a robust depiction of flood risk across the Borough, it can:

- Assist the development control process by providing a more informed response to development proposals affected by flooding, influencing the design of future development within the Borough;
- Help to identify and implement strategic solutions to flood risk, providing the basis for possible future flood attenuation works;
- Support and inform the Borough's emergency planning response to flooding.

2.5.3 The London Borough of Richmond upon Thames (SFRA) Figures 1 to 11 provide an overview of the spatial variation in flood risk throughout the Borough. It is necessary to adopt a sequential approach when considering where land should be allocated for future development. These figures should be used to inform this sequential approach. Furthermore, the NPPG provides clear guidance on appropriate land uses within areas potentially at risk from flooding.

2.5.4 Whilst there is no particular constraint placed upon land use within areas of Zone 1 Low Probability within the Borough, it is strongly recommended that the Borough takes due consideration of flooding from other sources (such as surface water and groundwater).

2.5.5 Areas that have previously flooded from localised sources are depicted in Figures 1 to 11. Many of these localised sources of flooding within LBRuT can be effectively managed through the design process. It is recommended that advice is taken from the Environment Agency for properties at risk of flooding from rivers or the sea to ensure that the severity of the local issue that may affect (or be exacerbated by) the proposed allocation is fully appreciated.

2.5.6 The EA have withdrawn the advice they give in terms of surface water flooding and this is now the responsibility of the LLFA within LBRuT as the statutory consultee for surface water management (flood risk and sustainable drainage systems).

2.6 **London Borough of Richmond upon Thames (Development Management) & Developers.**

2.6.1 It is important that the potential risk of flooding is considered as an integral part of all proposed developments within the Borough. Figures 1 to 11 of LBRuT SFRA provide a measure of the severity of flooding within different areas of the borough. These figures should be used to trigger a more detailed assessment of flood risk related issues within any proposed development application site in that area.

2.6.2 Policy DM SD 6: Flood Risk within the London Borough of Richmond upon Thames adopted Development Management Plan identifies land use and development restrictions relating to the various flood risk zones identified in the character areas.

2.6.3 The assessment of localised flooding related issues is imperative for all proposed development, irrespective of its location and/or scale within the Borough, and the LBRuT SFRA provides some helpful tools to assist in this regard:

- Figures 1 to 11 provide an indication of areas that have been susceptible to localised flooding historically. This is not a comprehensive record of flooding, and relies upon community reports of flooding made to the Borough(s). It is a good indication of areas that may be susceptible however, and reiterates the importance of considering flood risk related issues in areas that are outside of the designated NPPF flood zones.
- Figures 1 to 11 show the Environment Agency Flood Map. This mapping is updated on a quarterly basis and users should consult with the Environment Agency to ensure the best available information is used to inform development.
- Figures A and B provide an overview of the topography and geology of the Borough. The detailed FRA should use this information to assess (in a site based context) the potential risk of localised ponding, flash flooding and/or inundation from groundwater.
- Finally, to provide meaningful recommendations and for ease of reference, the risk of flooding from rivers and the sea within the Borough have been considered on the basis of 'Character Areas'. These are assessed individually in the following sections.

2.7 **Character Area R5 – Twickenham, Eel Pie Island & St Margarets (Figure 5).**

2.7.1 A proportion of St Margarets is situated within zone 3a high probability and zone 2 medium probability. The area is subject to tidal and fluvial flooding from the River Thames and the River Crane.

2.7.2 The areas of Twickenham including Eel Pie Island, which adjoin the River Thames are affected by fluvial and tidal flooding from the Thames, and are within the zone 3b functional floodplain and 3a high probability and this incorporates the application site.

2.7.3 A large proportion of Twickenham north of the railway line is within zone 2 medium probability, affected by fluvial flooding from the River Crane and Duke of Northumberland's River. Large areas of Twickenham (south of the railway line) are situated within zone 1 low probability.

2.7.4 The River Thames drains a considerable catchment area and flooding is typically a result of long duration, regional rainfall events. Flood warnings are provided within the Borough, relating to both fluvial (river) and tidal flooding. The Environment Agency strives to provide as much forewarning as possible of a pending flood event. This provides the Borough, emergency services, residents and businesses with an opportunity to prepare to minimise property damage and risk to life.

LBRuT Local Validation Checklist — April 2015, updated October 2017

Flood Risk Assessment (FRA), commensurate with the scale, nature and location, to include: 1. An accurate assessment of the level of flood risk demonstrating the proposed land use is suitable and will not increase flood risk on or off site and is resilient to climate change: • Including the latest flood map and modelling evidence. Request the latest flood map by emailing kslenquiries@environment-agency.gov.uk • Including the line of the tidal flood defence and the state of the flood defences for sites next to the River Thames 2. A completed Flood Risk Assessment Checklist, which provides guidance and advice to applicants and enables Council officers to ensure that all of the required information is included.	• All development proposals within flood zones 2 and 3 • All sites greater than 1 hectare within flood zone 1 • Development adjacent / within 16 metres of a flood defence • Development proposals within flood zone 1 where there is evidence of a risk from surface water, ground water and sewer flooding	CP3, DM SD6, Sustainable Construction Checklist SPD, SFRA, PPG How to produce a Flood Risk Assessment Flood Risk Assessment Checklist

Fig 8: LPA requirements for a site specific FRA.

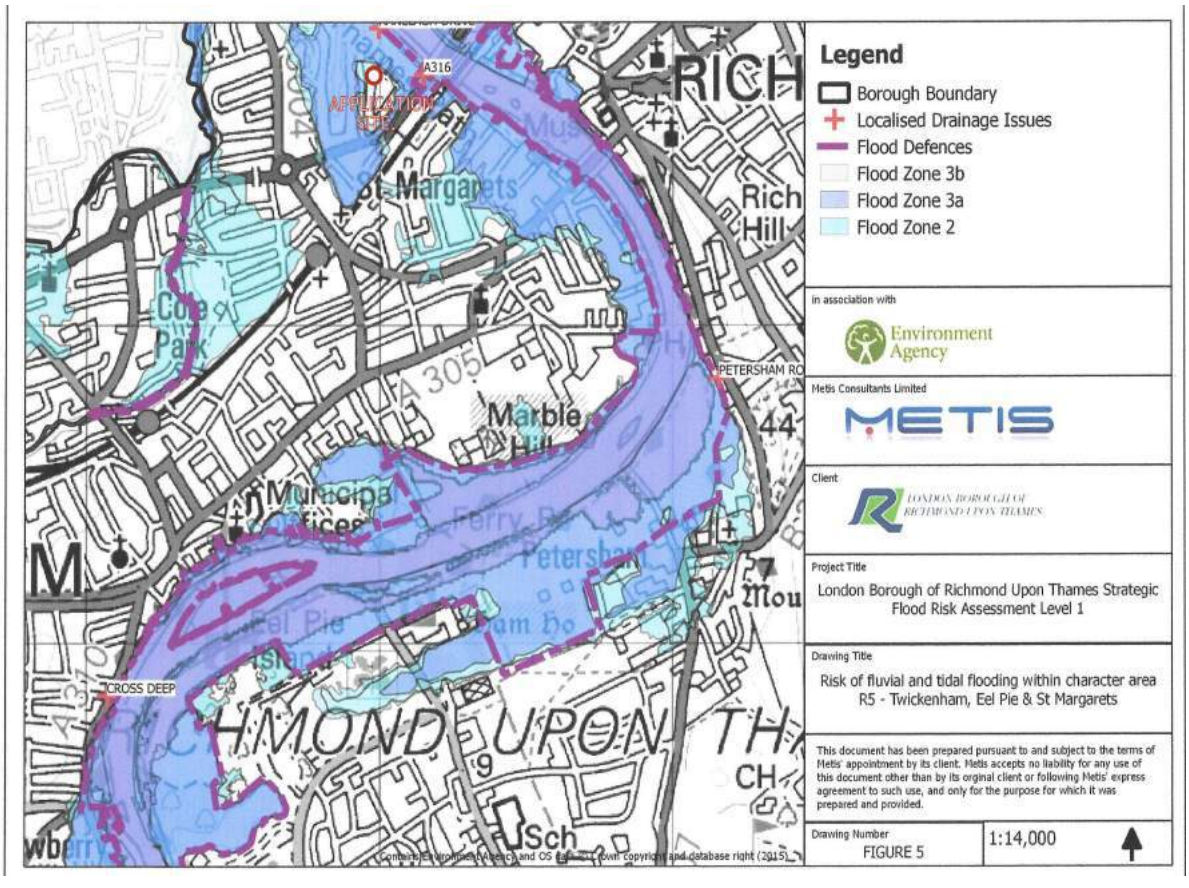

Fig 9: Flood Zone Extents Map - LBRuT SFRA- Fig 5.

2.8 This FRA illustrates the present and projected flood risk issues at the application site and details the measures proposed to mitigate the residual flood risk by rivers, sewers and surface water flooding and the effects of climate change for the lifetime of the proposed development.

2.9 **Development and Flood Risk Compatibility.**

Based on the NPPF flood risk vulnerable and flood zone 'compatibility' table (see table 3) the proposed development would not be appropriate for the site. This is, however based on the designated flood zone and not the actual risk of flooding.

Table 3: Food Risk vulnerability and flood zone 'compatibility'.

Flood-Risk Vulnerability classification		Essential Infrastructure	Water compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	1	YES	YES	YES	YES	YES
	2	YES	YES	Exception test required	YES	YES
	3a	Exception test required	YES	NO	Exception test required	YES
	3b	Exception test required	YES	NO	NO	NO
Key YES NO	Development is appropriate Development should not be permitted					

Although this planning application seeks to provide an element of 'More Vulnerable' development in a Flood Zone 3 area it is considered appropriate as this is a 'Brownfield' site with extant planning permission for residential land-use and in this case it can be shown that permanent safeguards to flooding can be incorporated in the specification of the new dwelling that will mitigate the requirements of the ST and ET.

2.9.1 The NPPF states that the risk-based Sequential Test should be applied at all stages of planning, with the aim to steer new development to areas at the lowest probability of flooding. Development should be directed to areas within Flood Zone 1 wherever possible and, if this is not possible, then sequentially direct development to areas least at risk within Flood Zones 2 and 3.

2.10 **Sequential Test and Exception Tests.**

2.10.1 If, following the application of the Sequential Test, it is not possible, or consistent with wider sustainability objectives, for the development to be located in zones of lower probability of flooding (i.e. flood zone 1) the Exception Test can be applied. This test is only appropriate for use when there are large areas in Flood Zones 2 and 3, where the Sequential test alone cannot deliver acceptable sites but where some continuing development is necessary for wider sustainable development reasons.

2.10.2 For the Exception test to be passed, according to the NPPF (main document) the development has to comply with the following:-

- demonstrate that the development provides wider sustainability benefits to the community which outweigh the flood risk, informed by a SFRA where one has been prepared and
- a site-specific FRA must demonstrate that the development will be safer for its lifetime, taking account of the vulnerability of its users, without increasing flood risk elsewhere and where possible, will reduce flood risk overall.

2.11 **Environment Agency Standing Advice.**

The Environment Agency standing advice for a FRA varies with size of site and the Flood Zone it lies in. As the proposed site falls within Flood Zones 3 Environment Agency requirements for a FRA are (for a site less than 1 ha in flood zone 3) based on the following advice:-

- *Evidence that the Sequential Test has been carried out – see Sequential test process*
- *A Flood Risk Assessment (FRA).*
- *Where the Exception Test (NPPF paragraph 102) is also required, the FRA must be sufficient to pass the test.*

Section 3. Sources of Flooding

The NPPF states that all types of flooding should be considered in the development framework. The extent to which these should be considered will vary and depend on whether they are considered as significant at the spatial planning scale and in setting constraints on development in certain areas. The Environment Agency have been requested to provide 'Product 4 & 8' hydraulic data for the application site and surrounds and this information; ref: HNL76728NR, dated 26/02/18, (FRA/FCA) is referred to and summarised below with the full report incorporated as Appendix 1.

3.1 **History of Flooding at the Application Site.**

- The Environment Agency have advised that they do not hold any records of historic flood events from rivers and/or the sea affecting the area local to the application site.
- The LBRuT SFRA indicates that an extensive area of land adjacent to the application site is at risk of fluvial flooding.

3.2 **Flooding from Rivers and Sea.**

- Based upon the published EA Flood Maps for Planning (Rivers and Sea) the flood map in Fig 3 & 4 above indicates that the application site is susceptible to exceedance from the River Thames.
- The EA detailed FRA/FCA report indicates that the application site lies within Flood Zone 3 – with a 0.5% chance of flooding from the sea (tidal flooding) in any given year.
- The prevailing flood defence measures of the Thames have been designed to provide flood protection to a 1:1000 year (0.1%) design standard and the quality of such defences is possibly higher than in any other part of the country.
- The type and design standard of protection of the flood defences in closest proximity of the application site are as follows:
  1. The defences are all raised ground that are man-made and privately owned.
  2. It is riparian owners responsibility to ensure they are maintained to a crest level of 5.94m AOD for this reach of the River Thames.
  3. The EA inspect the defences twice a year to ensure that they remain fit for purpose and the current condition grade is 2 (Good) on a scale of 1 (very good) to 5 (very poor).
  4. The application site is in an area benefiting from flood defences and being protected by the Thames Barrier the defence protection is 0.1% (1 in 1000) chance in any given year.
  5. In west London, there is a heavy influence from upstream (fluvial flows). The flood defences are built to to manage tidal flood risk only. With very high fluvial flows the river levels in west London could be above the tidal defence level.
  6. The EA modelling node points along the left (west) bank of the River Thames in closest proximity to the application site; ref: a2.7, indicate that the flood defence level is 5.94m AOD (as above), the present flood water level is 5.61m AOD, the future 2016/2100 flood

water level is 5.85m AOD and that flood defence defence locally should be raised to 6.70m AOD.

7. The EA site specific modelled flood levels at the application site as extracted from the 'Thames Upriver Breach Inundation Modelling Study 2017' for 2100/2065 is **5.62m AOD**, affecting the roadside frontage only.
8. The 'Thames Tidal Breach Analysis Mapping' (2100) indicates that the application site is classified as a 'Danger for Some' with an inundation depth of 0.25m to 1.0m at 1 in 200 years (0.5%)
9. The 'Thames Tidal Breach Analysis Mapping' (2014) indicates that the application site has a low hazard warning level with no inundation at 1 in 200 years (0.5%).

3.4 **Flooding from Groundwater.**

- Groundwater flooding can lead to high levels of infiltration to sewers, soakaways, basements and underground services and generally reducing the capability of sub-strata to remove surface water run-off.
- The proposed development is for the refurbishment of an existing building and the construction of extensions accommodation and therefore it is considered that any increase to the impermeable footprint of the building will be minimal and not detrimental to the prevailing ground water conditions at this location.

3.5 **Flooding from Rainfall.**

- Flooding of land can be caused by overland flow / run-off. (sometimes referred to as pluvial flooding) from third party land or public highways due to an exceedance of underground sewerage.
- Based upon the published EA maps for Flooding from Surface Water the application is at risk of flooding from overland flows and pluvial surcharges.
- In this case the existing dwelling is elevated above the adjacent highway by approximately 550mm and therefore should not be affected by overland flows occurring along the public highway.
- The proposed development must not increase the volume of surface water run-off that could contribute to overland flows and wherever possible the refurbishment works should incorporate measures to attenuate rainwater at source.

3.6 **Flooding from Sewers**

- As 3.5 above flooding from surface water, foul water and combined sewers has been reported as a problem at the development site.
- In this case the existing dwelling is elevated above the adjacent highway by approximately 550mm and therefore should not be affected by surcharged sewers impacting upon the public highway adjacent to the application site.

- The regional water authority should be contacted as soon as possible and prior to the detail design stage of the development to determine the best course of action for dealing with all off-site sewerage connections.
- The proposed development must not increase the rate of surface water discharge to the public sewerage system but should 'mimic' or improve on the pre-development situation by using SuDS drainage systems, wherever practicable, so that the flow and volume of surface water run-off from the built development is not problematic.

Section 4.
Flood Risk and Mitigation.

4.1 NPPF requires that any development site that is at risk of flooding should be supported by a Flood Risk Assessment that should consider both the risk to the application site for the lifetime of the development and also the potential risk to other downstream receptors. In this case the application site is within an EA Flood Zone 3a area and has to incorporate mitigation measures to support the application.

4.2 The proposed dwelling and more importantly the residents and also the general public and surrounding private properties should not be placed in in any greater danger from flooding as a result of the development and all assessments should take account of this matter and incorporate a range of protective measures in the final development plans.

4.3 N.P.P.F requires that each flooding mechanism is addressed and levels of risk evaluated. There are three main risks of flooding at the application site as follows:-

- Inundation by floodwaters from watercourses or rivers associated with the exceedance of the water channel. This can include the effects on culverted watercourses where the risk of blockages can occur.
- Overland flows from groundwater and surcharged sewerage systems adjacent to the site.
- Internal flooding of private on-site sewerage as a consequence of blockages or flood-locked outfalls associated with (ii), above.

4.4 To assess the impact on the application site and also downstream receptors for the lifetime of the built development the following paragraphs consider the various sources of flood risk.

A - FLOOD RISK FROM WATER COURSE & MAIN RIVERS.

A1 The EA Flood Map for Planning indicates that the application site is within a Flood Zone 3 area, with a 0.5% chance of flooding from the sea (tidal flooding) in any given year.
The information provided in the EA report ref: HNL76728NR indicates:

- The application site has the benefit of formal flood defences (Thames Barrier) with a design standard of 1:1000 year and that in-channel flows are contained in this regard.
- The upstream fluvial flows to west London districts could be problematic and create in-channel flows that could exceed flood defence levels.
- The application site could be impacted by 'Maximum Likely Water Levels' (MLWL's) of **5.62m AOD** (2100/2065)
- The application site was at risk of inundation from a breach of the flood defences locally but with improving future conditions providing additional protection the 2014 analysis indicates that there is no hazard or potential inundation of the application site.

A2 The EA and the Council will require this FRA to demonstrate that the proposed dwelling will remain safe and operational for its lifetime and that the proposed accommodation can achieve an increased level of flood resilience and flood safety for the occupants. The changes proposed should incorporate the following Flood Resilient Construction measures:

- Using concrete floors rather than timber floors at ground floor level.
- Using flood resilient building materials and fittings.
- Not to provide sleeping accommodation within the proposed basement.
- Fitting non-return valves to prevent sewers surcharging into the property – particularly as this application is for a new basement structure.
- Installation of a sump pump at basement level to deal with any ingress of ground water of surface flooding
- Locating power sockets above any possible flood/inundation level.
- Incorporating temporary door or air vent flood boards to stop the entry of flood water.
- Refer to Appendix 2 for further design details.

A3 The LLFA have requested specific details of the protection to be provided to the exposed lightwell to avoid overland flows impacting on the proposed basement accommodation. The project architects have incorporated the lightwell in the form specified for both natural light and ventilation to the basement facilities. The following design aspects are proposed to mitigate the impact of overland flows or inundation of the application site:

1. The EA advise that the future MLWL will be 5.62m AOD and will only affect the roadside frontage of the application site.
2. The existing dwelling is elevated approximately 550mm higher than the adjacent public highway.
3. A 300mm high dwarf wall will be provided around the perimeter of the light well.
4. Positive drainage is provided in the base of the light well and connected to the surface water pumping system of the main building.

A4 Make a Flood Evacuation Plan available to the residents and be registered with the EA Flood Warning system. Refer to Appendix 3 for further information

<u>B – OVERLAND FLOWS FROM GROUND WATER AND SURCHARGED SEWERAGE SYSTEMS ADJACENT TO THE SITE.</u>

B1 The application site consists of an existing building that is to be refurbished to provide new residential accommodation, particularly at basement level, that will have a slightly larger footprint. It is considered that the future storm water run-off rate of the proposed development will be no greater than the existing run-off rate of the former building particularly if the mitigation measures described in this report and promoted by the Council are adhered to.

C – FLOODING FROM PRIVATE ON-SITE SEWERAGE AND THE RISK OF FLOODING FROM THE BUILT DEVELOPMENT ON DOWNSTREAM RECEPTORS.

C1 Foul water domestic waste will be permitted to discharge to the public sewer system that currently serves the application site and surrounds.

C3 The regional water authority will expect the requirements of Building Regulations – Approved Doc H3 to be applied to establish the preferred hierarchy for any additional surface water disposal. In this case consideration should first be given to discharge to soakaway, infiltration system and/or a watercourse in that priority.

C4 Any surface water discharge from the proposed development will probably only be permitted if the prevailing run-off rate is maintained or reduced, in this case the following principles are proposed:

- All external areas will consist of soft landscaped areas or permeable paving – with falls directed into the site and not outwards towards public spaces.
- Water butts provided for irrigation of landscaped areas.
- Rainwater and grey water harvesting, where practicable, to provide an alternative supply to appliances such as WC's, washing machines and external bib-taps.
- On-site storm water attenuation provided to maintain the post development run off rate where other sustainable measures would prove to be ineffective.
- Ground levels are not significantly altered.

C5 Given the above applied conditions, for foul and surface water discharge, the impact on local hydrology and downstream receptors will be safeguarded for the lifetime of the development.

APPENDIX 1.
EA PRODUCT 4 & 8 HYDRAULIC DATA.

Subject: RE: HNL76728NR - P4 for 25 St Georges Road, Twickenham, TW1 1QS,
From: HNL Enquiries <HNLenquiries@environment-agency.gov.uk>
Date: 26/02/2018 14:33
To: "mail@longdendesign.co.uk" <mail@longdendesign.co.uk>

Dear Mike

Enquiry regarding Product 4 & 8 for FRA 25 St Georges Road, Twickenham, TW1 1QS,

Thank you for your enquiry which was received on 07/02/2018.

We respond to requests under the Freedom of Information Act 2000 and Environmental Information Regulations 2004. The information is attached.

Name	Product 4
Description	Detailed Flood Risk Assessment Map for 25 St Georges Road, Twickenham, TW1 1QS,
Licence	Open Government Licence
Information Warnings	*None.*
Information Warning - OS background mapping	*The mapping of features provided as a background in this product is © Ordnance Survey. It is provided to give context to this product. The Open Government Licence does not apply to this background mapping. You are granted a non-exclusive, royalty free, revocable licence solely to view the Licensed Data for non-commercial purposes for the period during which the Environment Agency makes it available. You are not permitted to copy, sub-license, distribute, sell or otherwise make available the Licensed Data to third parties in any form. Third party rights to enforce the terms of this licence shall be reserved to OS.*
Attribution	Contains Environment Agency information © Environment Agency and/or database rights. Contains Ordnance Survey data © Crown copyright 2017 Ordnance Survey 100024198.

Name	Product 8
Description	Breach Hazard Map for 25 St Georges Road, Twickenham, TW1 1QS,
Licence	Open Government Licence
Information Warnings	1.0 This map shows the level of flood hazard to people (called a hazard rating) if our flood defences are breached at certain locations, for a range of scenarios. The hazard rating depends on the depth and velocity of floodwater, and maximum values of these are also mapped. 2.0 The map is based on computer modelling of simulated breaches at specific locations. Each breach has been modelled individually and the results combined to create this map. Multiple breaches, other combinations of breaches, different sized tidal surges or flood flows may all give different results. 3.0 The map only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring. The likelihood of a breach occurring will depend on a number of different factors, including the construction and condition of the defences in the area. A breach is less likely where defences are of a good standard, but a risk of breaching remains. 4.0 Please contact the Environment Agency for further information on emergency planning associated with flood risk in this area. 5.0 We are aware that there is an issue with the 2014 Max Velocity data. The 0/No data values are showing as yellow when they should follow the same

	outlines as the Max Hazard and Max Depth outlines. We are currently trying to resolve this issue. This does not affect the hazard rating at your site.
Information Warning - OS background mapping	*The mapping of features provided as a background in this product is © Ordnance Survey. It is provided to give context to this product. The Open Government Licence does not apply to this background mapping. You are granted a non-exclusive, royalty free, revocable licence solely to view the Licensed Data for non-commercial purposes for the period during which the Environment Agency makes it available. You are not permitted to copy, sub-license, distribute, sell or otherwise make available the Licensed Data to third parties in any form. Third party rights to enforce the terms of this licence shall be reserved to OS.*
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Following the Flood and Water Management Act 2010, Lead Local Flood Authorities are responsible for the management of groundwater and surface water flooding. They also maintain a register of property flooding incidents. You may want to seek further advice from the London Borough of Harrow.

You can also view and print surface water flood maps online at:

http://watermaps.environment-agency.gov.uk/wiyby/wiyby.aspx?topic=ufmfsw#x=357683&y=355134&scale=2

You can view the reservoir maps on our website:
https://flood-warning-information.service.gov.uk/long-term-flood-risk/map?map=SurfaceWater

These give information on the indicative extent, depth and velocity of reservoir flooding. Reservoir flooding is extremely unlikely to happen. There has been no loss of life in the UK from reservoir flooding since 1925. However, if a large reservoir failed it would cause widespread flooding with serious consequences which could include endangering people's lives. This is why we share and discuss the hazard presented by flooding from reservoirs with partners and are making this information available to the public.

Here is the link to the climate change allowances: https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

Further details about the Environment Agency information supplied can be found on the GOV.UK website:

https://www.gov.uk/browse/environment-countryside/flooding-extreme-weather

If you have requested this information to help inform a development proposal, then you should note the information on GOV.UK on the use of Environment Agency Information for Flood Risk Assessments

https://www.gov.uk/planning-applications-assessing-flood-risk
https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion

Data Available Online

Many of our flood datasets are available online:

- Flood Map For Planning (Flood Zone 2, Flood Zone 3 ,Flood Storage Areas, Flood Defences, Areas Benefiting from Defences, ,)
- Risk of Flooding from Rivers and Sea
- Historic Flood Map
- Current Flood Warnings

Please get in touch if you have any further queries or contact us within two months if you like us to review the information we have sent.

Yours sincerely

Naoimh Richardson

Customers and Engagement Officer
Environment Agency, Hertfordshire and North London
Alchemy, Bessemer Road, Welwyn Garden City, Hertfordshire, AL7 1HE
Direct dial 0203 0257507
Direct email HNLenquiries@environment-agency.gov.uk

Working days: Monday to Friday 7am to 3pm.

From: Enquiries, Unit
Sent: 13 February 2018 09:10
To: 'mail@longdendesign.co.uk' <mail@longdendesign.co.uk>
Subject: FW: Ref 180213/JC05 Re: RESIDENTIAL REDEVELOPMENT, 25 St GEORGES ROAD, RICHMOND UPON THAMES.

Dear Mike

I have passed your e-mail to the local customer team who will deal with your request.

The Freedom of Information Act and Environmental Information Regulations state that a public authority must respond to requests for information within 20 working days, but we aim to respond to all enquiries as quickly as we can.

You can find more information about our service commitment by clicking on the link below:

https://www.gov.uk/government/publications/environment-agency-customer-service-commitment

You can contact our customer team directly on the contact details below, or call the National Customer Contact Centre on 03708 506506 who will transfer you to the area team.

Please quote your enquiry reference 180213/JC05 in any correspondence with us regarding this matter.

Customers and Engagement
Environment Agency
Hertfordshire and North London Area
Alchemy
Bessemer Road
Welwyn Garden City
Hertfordshire
AL7 1HE

Kind regards

Joanne Carney
Customer Service Advisor, Email Management Unit, NCCC
Contact Centre Services - Part of Operations, Regulation & Customer

(Tel: 03708 506 506

Environment Agency

Product 4 (Detailed Flood Risk) for: 25 St. Georges Road, Twickenham, TW1 1QR
Reference: HNL76728NR
Date: 26/02/2018

Contents

The information provided is based on the best data available as of the date of this letter.

You may feel it is appropriate to contact our office at regular intervals, to check whether any amendments/ improvements to the data for this location have been made. Should you re-contact us after a period of time, please quote the above reference in order to help us deal with your query.

This information is provided subject to the enclosed notice which you should read.

Alchemy, Bessemer Road, Welwyn Garden City, Hertfordshire, AL7 1HE
Customer services line: 03708 506 506
Email: NETenquiries@environment-agency.gov.uk
Website: www.environment-agency.gov.uk

Environment Agency

Flood Map Confirmation

The Flood Map for Planning (rivers and the sea):

The Flood Map shows the natural floodplain for areas at risk from river and tidal flooding. The floodplain is specifically mapped ignoring the presence and effect of defences. Although flood defences reduce the risk of flooding they cannot completely remove that risk as they may be over topped or breached during a flood event.

The Flood Map shows Flood Zone 3 - areas with a 1% (or 0.5% in tidal areas) chance of flooding in any given year and Flood Zone 2 – areas with a 0.1% chance of flooding in any given year. In addition, the map also shows the location of some flood defences and the areas that benefit from them.

The Flood Map is intended to act as a guide to indicate the potential risk of flooding. When producing it we use the best data available to us at the time and also take into account historic flooding and local knowledge. The Flood Map is updated on a quarterly basis to account for any amendments required. These amendments are then displayed on the internet at http://maps.environment-agency.gov.uk. Select "Flood Map for Planning (Rivers and Sea)."

At this Site:

The Flood Map shows that this site lies within Flood Zone 3 - with a 0.5% chance of flooding from the sea (tidal flooding) in any given year.

Enclosed is an extract of our Flood Map which shows this information for your area.

Method of production

The Flood Map at this location has been derived using detailed modelling of the tidal River Thames through the Thames Tidal Defences Study completed in 2006 by Halcrow Ltd and fluvial flood zones were derived from the Teddington Fluvial Flood Risk study completed in April 2009 by Halcrow Ltd.

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Model Output Data – Thames Estuary 2100

You have requested in-channel flood levels for the tidal river Thames. These have been taken from the **Thames Estuary 2100 study completed by HR Wallingford in 2008**. The modelled node closest to your site is **a2.7**; the location of these nodes is also shown on the enclosed map.

The TE2100 plan is now live and within it are a set of levels on which the flood risk management strategy is based. The plan is the overarching flood management strategy for the Thames Estuary and therefore any development planning should be based on the same underlying data.

What is the difference between the TE2100 levels and the 2008 Joint Probability levels that have previously been provided?
The values of the two sets of levels are very similar for the present day scenario. However, the TE2100 takes into account operation of the Thames Barrier when considering future levels. The Thames Barrier requires regular maintenance and with additional closures the opportunity for maintenance will be reduced. When this happens, river levels for which we would normally shut the barrier, will have to be allowed through to ensure that the barrier is not shut too often. For this reason, levels upstream of the barrier will increase and the tidal walls will need to be heightened to match. The levels previously provided do not take this scenario into consideration.

Why is there no return period for levels upstream of the barrier?
The levels upstream of the barrier are the highest levels permitted by the operation of the Thames Barrier. If levels and flows are forecast 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. The Thames Barrier and associated defence system have a 1 in 1000 standard which means they ensures that flood risk is managed up to an event that has a 0.1% chance of occurring in any given year. The probability of water levels upriver is ultimately controlled by operation of the Thames Barrier.

Why are the levels in west London higher than the defence crest levels?
In west London there is a heavy influence from upriver flows (fluvial flows). The flood defences are built to manage tidal flood risk only. With very high fluvial flows, the river levels in west London could be above the 0.1% annual probability tidal level.

Why are the climate change/future west London levels lower than the 2008 levels?
The climate change levels are assessed to determine the future tidal defence levels. For this reason they only account for extreme tidal events and not extreme fluvial flow events. The 2008 levels include extreme flows from upriver (fluvial events) as well as extreme tidal events.

For further information about the Thames Barrier please visit our website at:
http://www.environment-agency.gov.uk/homeandleisure/floods/38353.aspx

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TE2100 flood levels:

Upstream of the Thames Barrier, the levels provided are the highest levels permitted by the Barrier.
Downstream of the Thames Barrier they are the 1 in 1000 (0.1%) levels.

In West London, there is a heavy influence from upstream (fluvial) flows. The flood defences are built to manage tidal flood risk only. With very high fluvial flows, the river levels in west London could be above the tidal defence level.

Location	Node	Easting	Northing	Present Day Water Level	Future 2065-2100 Water Level	Future 2100 Water Level
Teddington	2.5	517773	174459	5.66	5.9	6.35
Teddington	2.6	517278	174807	5.64	5.87	6.32
Teddington	a2.6	517173	174880	5.63	5.86	6.31
Richmond	a2.7	517026	174968	5.61	5.85	6.3

TE2100 2008 levels:

Levels downriver of the Thames Barrier are 0.1% AEP (1 in 1000) and levels upriver are the highest levels permitted by the Thames Barrier, described as the Maximum Likely Water Levels (MLWLs). The defence levels (left defence, right defence) are the minimum levels to which the defences should be built.

Location	Node	Easting	Northing	Extreme water level (m)	Left defence (m)	Right defence (m)	Allow for future defence raising to a level of...	
							Left Bank (m)	Right Bank (m)
d/s Richmond sluice	2.8	516863	175134	5.59	5.94	5.94	6.70	6.70
	2.81	516864	175180	5.59	5.94	5.94	6.70	6.70
	2.9u	516742	175353	5.54	5.94	5.94	6.70	6.70
	2.9d	516766	175416	5.54	5.94	5.94	6.70	6.70

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Thames Tidal Upriver Breach Inundation Modelling – 2017

The table below displays site-specific modelled flood levels at your site. These have been taken from the Thames Tidal Upriver Breach Inundation Modelling Study 2017 completed by Atkins Ltd. in May 2017.

We have developed a modelling approach where all upriver breach locations along the Thames are equitably modelled, to ensure a consistent approach across London. This modelling simulates 5679 continuous tidal breaches along the entire extent of the Thames from Teddington to the Thames Barrier. For hard and composite defences breaches are set at 20 m wide; for soft defences, breaches are 50 m wide. In both cases, the defence breach scour distance was assumed to extend into the floodplain by the same distance as the breach width.

For breaches upriver of the Thames Barrier, there is no return period for modelled levels as the levels are controlled by barrier closures. The levels used are referred to as Maximum Likely Water Levels (MLWLs). Therefore 2014 and 2100 epochs were modelled on that basis.

	National Grid Reference		Modelled levels in mAODN for Max Likely Water Level	
Node	Easting	Northing	2065	2100
0	516906	174837	No Flood	6.30
1	516912	174840	No Flood	6.30
2	516914	174836	No Flood	6.30
3	516908	174833	No Flood	6.30
4	516911	174830	No Flood	6.30
5	516913	174827	No Flood	6.30
6	516922	174832	No Flood	6.30
7	516902	174853	5.62	6.30
8	516901	174837	5.62	6.30
9	516903	174822	5.62	6.30
10	516909	174827	No Flood	6.30

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Website: www.environment-agency.gov.uk

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Defence Details

The design standard of protection of the flood defences in this area of the Thames is 0.1% AEP; they are designed to defend London up to a 1 in 1000 year flood event. The defences are all raised, man-made and privately owned. It is the riparian owners' responsibility to ensure they are maintained to a crest level of **5.94m** AODN (the Flood Defence Level in this reach of the Thames). We inspect them twice a year to ensure that they remain fit for purpose. The current condition grade for defences in the area is **2 (good)**, on a scale of 1 (very good) to 5 (very poor). For more information on your rights and responsibilities as a riparian owner, please see our document 'Living on the edge' found on our website at:

https://publications.environment-agency.gov.uk/skeleton/publications/default.aspx

Please see the 'Thames Estuary 2100' document on our website for the short, medium and long term Flood Risk Management strategy for London:

http://www.environment-agency.gov.uk/homeandleisure/floods/125045.aspx

Areas Benefiting from Flood Defences

This site is within an area benefiting from flood defences, as shown on the enclosed extract of our Flood Map. Areas benefiting from flood defences (ABDs) are defined as those areas which benefit from formal flood defences specifically in the event of flooding from rivers with a 1% (1 in 100) chance in any given year, or flooding from the sea with a 0.5% (1 in 200) chance in any given year. In areas protected by the Thames Barrier, the ABDs also show where defences protect up to the 0.1% (1 in 1000) chance in any given year.

If the defences were not there, these areas would be flooded. An area of land may benefit from the presence of a flood defence even if the defence has overtopped, if the presence of the defence means that the flood water does not extend as far as it would if the defence were not there.

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Recorded Flood Events Data

We do not hold records of historic flood events from rivers and/or the sea affecting the area local to this site.
However, please be aware that this does not necessarily mean that flooding has not occurred here in the past, as our records are not comprehensive.

Due to the fact that our records are not comprehensive, we would advise that you make further enquiries locally with specific reference to flooding at this location. You should consider contacting the relevant Local Planning Authority and/or water/sewerage undertaker for the area.

We map flooding to land, not individual properties. Our historic flood event record outlines are an indication of the geographical extent of an observed flood event. Our historic flood event outlines do not give any indication of flood levels for individual properties. They also do not imply that any property within the outline has flooded internally.

Please be aware that flooding can come from different sources. Examples of these are:

- from rivers or the sea;
- surface water (i.e. rainwater flowing over or accumulating on the ground before it is able to enter rivers or the drainage system);
- overflowing or backing up of sewer or drainage systems which have been overwhelmed,
- groundwater rising up from underground aquifers

Currently the Environment Agency can only supply flood risk data relating to the chance of flooding from rivers or the sea. However you should be aware that in recent years, there has been an increase in flood damage caused by surface water flooding and drainage systems that have been overwhelmed.

Other Sources of Flood Risk

The Lead Local Flood Authority for your area are responsible for local flood risk (i.e. surface runoff, ground water and ordinary watercourse) and may hold further information .

You may also wish to consider contacting the appropriate relevant Local Planning Authority and/or water/sewerage undertaker for the area. They may be able to provide some knowledge on the risk of flooding from other sources.

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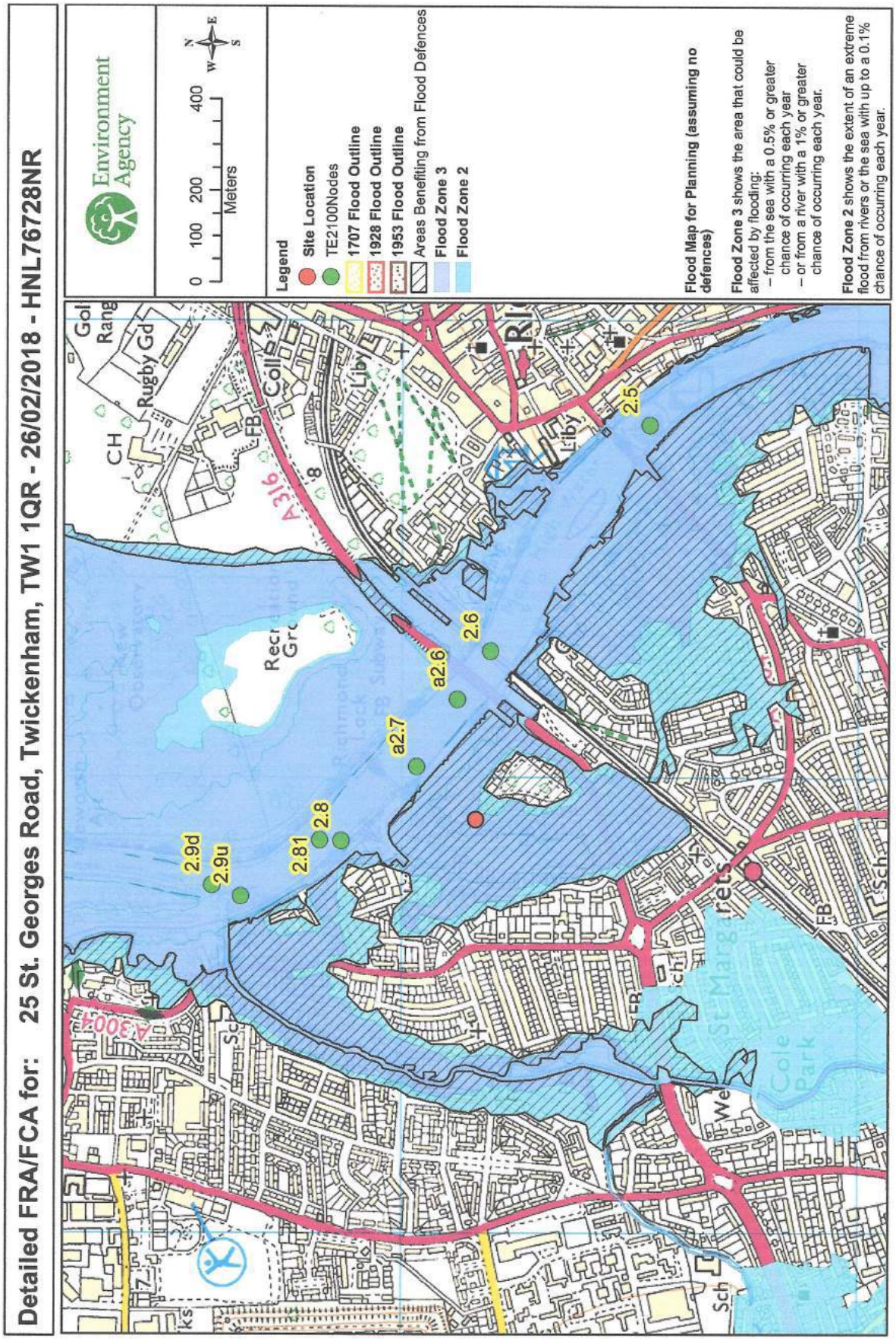
Detailed FRA/FCA for: 25 St. Georges Road, Twickenham, TW1 1QR - 26/02/2018 - HNL76728NR
Environment Agency
0 100 200 400 Meters
N E S W
Legend
Site Location
TE2100Nodes
1707 Flood Outline
1928 Flood Outline
1953 Flood Outline
Areas Benefiting from Flood Defences
Flood Zone 3
Flood Zone 2
Flood Map for Planning (assuming no defences)
Flood Zone 3 shows the area that could be affected by flooding:
– from the sea with a 0.5% or greater chance of occurring each year
– or from a river with a 1% or greater chance of occurring each year.
Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to a 0.1% chance of occurring each year.
2.9d
2.9u
2.81
2.8
a2.7
a2.6
2.6
2.5
A316
A3004
Rugby Gd
CH
FB
Sch
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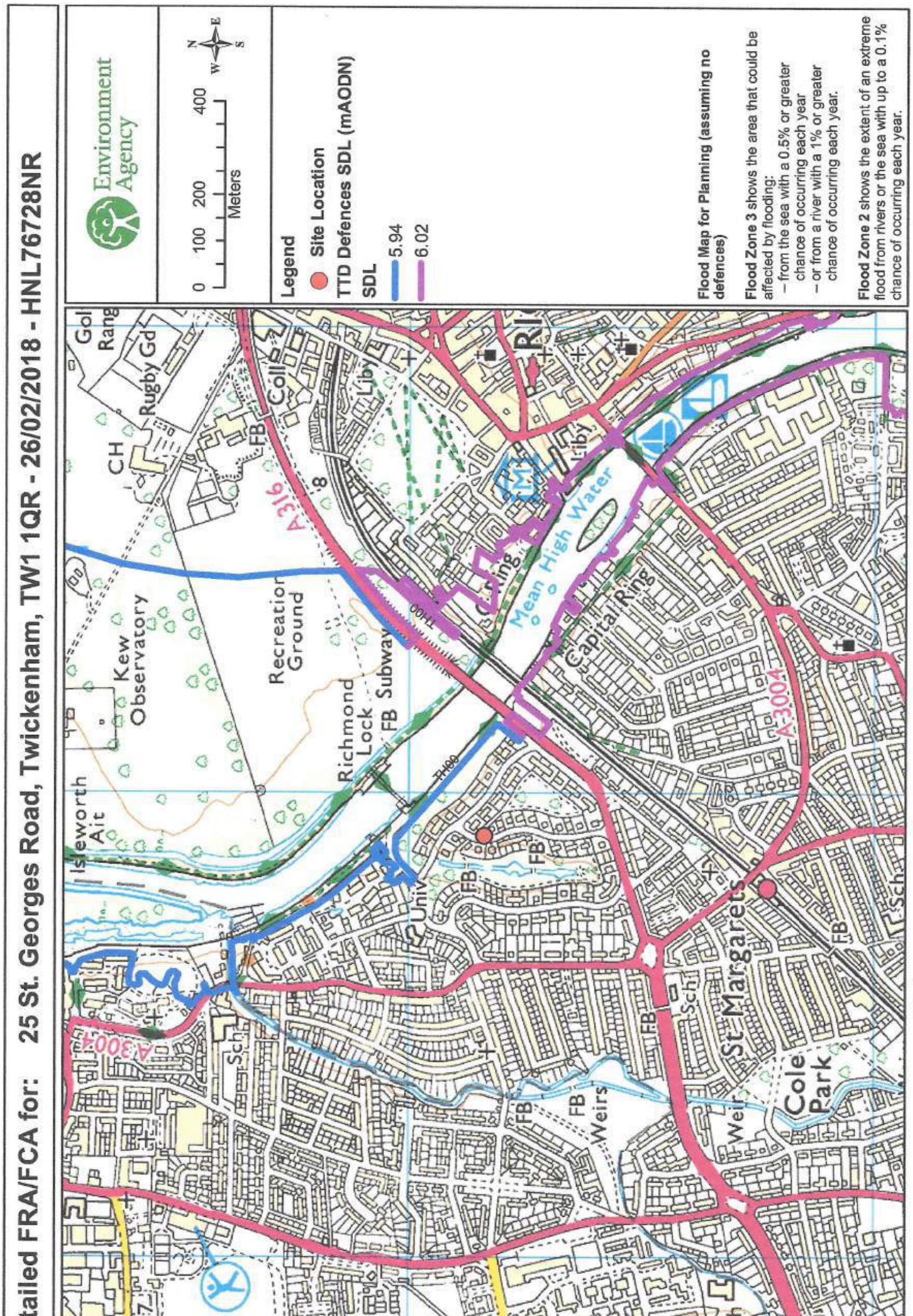
Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk


Detailed FRA/FCA for: 25 St. Georges Road, Twickenham, TW1 1QR - 26/02/2018 - HNL76728NR
Environment Agency
0 100 200 400
Meters
Legend
Site Location
TTD Defences SDL (mAODN)
SDL
5.94
6.02
Flood Map for Planning (assuming no defences)
Flood Zone 3 shows the area that could be affected by flooding:
- from the sea with a 0.5% or greater chance of occurring each year
- or from a river with a 1% or greater chance of occurring each year.
Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to a 0.1% chance of occurring each year.
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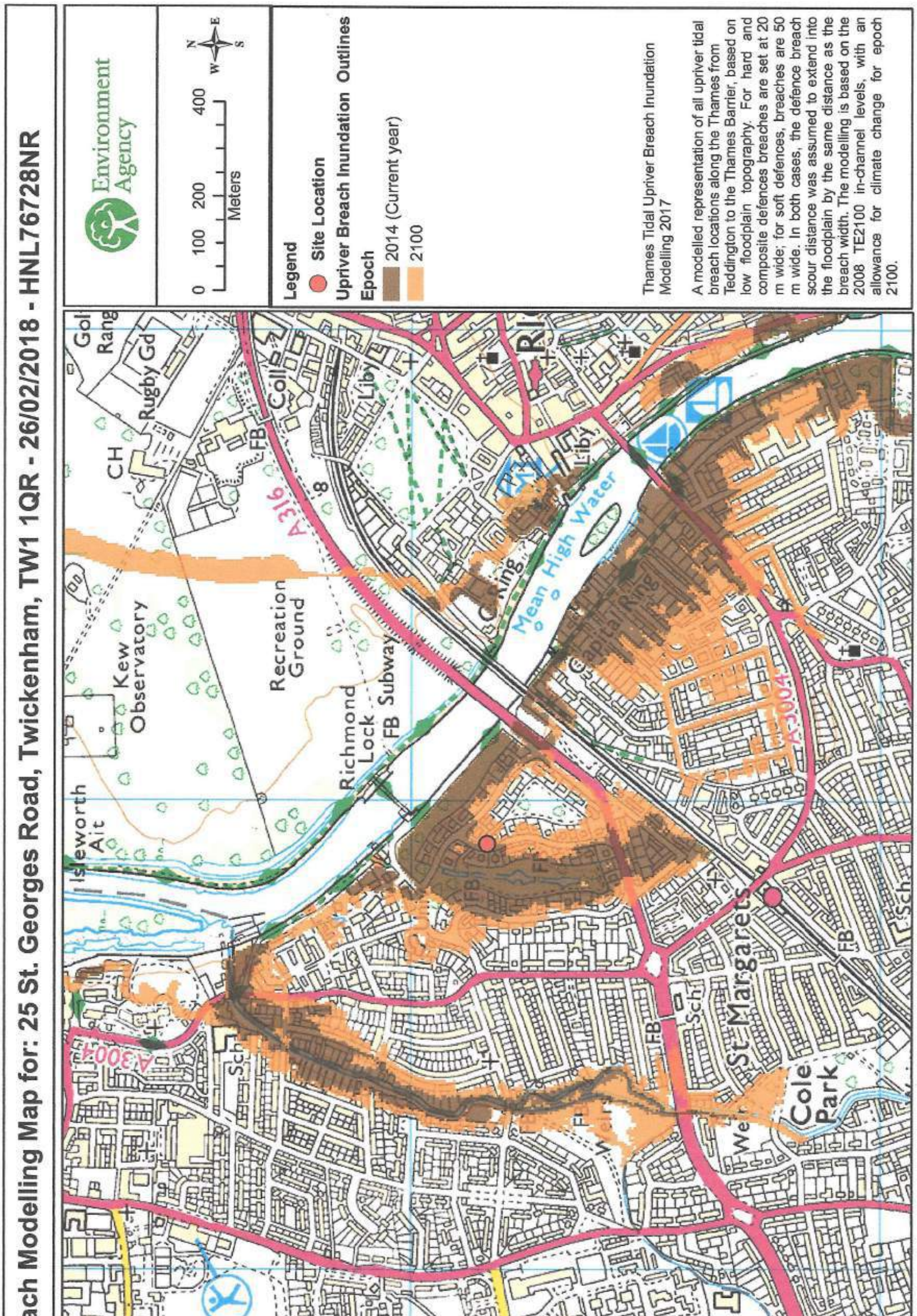
Isleworth Ait
Kew Observatory
Recreation Ground
Richmond Lock
FB Subway
Mean High Water
Capital Ring
St Margarets
Cole Park
Weirs
A316
A3004
Rugby Gd


Breach Modelling Map for: 25 St. Georges Road, Twickenham, TW1 1QR - 26/02/2018 - HNL76728NR
Environment Agency
0 100 200 400
Meters
Legend
Site Location
Upriver Breach Inundation Outlines
Epoch
2014 (Current year)
2100
Thames Tidal Upriver Breach Inundation Modelling 2017
A modelled representation of all upriver tidal breach locations along the Thames from Teddington to the Thames Barrier, based on low floodplain topography. For hard and composite defences breaches are set at 20 m wide; for soft defences, breaches are 50 m wide. In both cases, the defence breach scour distance was assumed to extend into the floodplain by the same distance as the breach width. The modelling is based on the 2008 TE2100 in-channel levels, with an allowance for climate change for epoch 2100.
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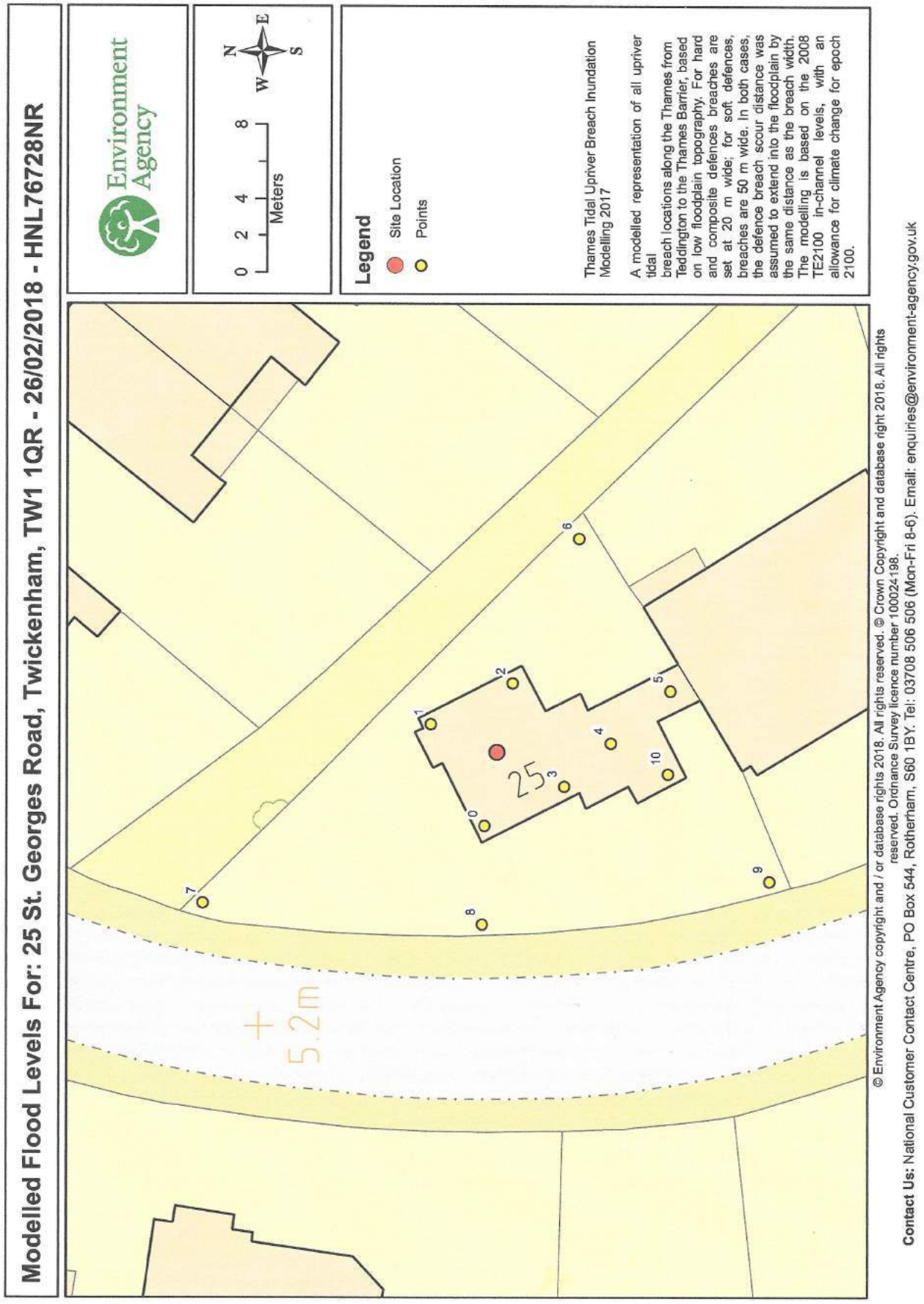
Modelled Flood Levels For: 25 St. Georges Road, Twickenham, TW1 1QR - 26/02/2018 - HNL76728NR
Environment Agency
0 2 4 8
Meters
N
E
W
S
Legend
Site Location
Points
Thames Tidal Upriver Breach Inundation Modelling 2017
A modelled representation of all upriver tidal breach locations along the Thames from Teddington to the Thames Barrier, based on low floodplain topography. For hard and composite defences breaches are set at 20 m wide; for soft defences, breaches are 50 m wide. In both cases, the defence breach scour distance was assumed to extend into the floodplain by the same distance as the breach width. The modelling is based on the 2008 TE2100 in-channel levels, with an allowance for climate change for epoch 2100.
25
+ 5.2m
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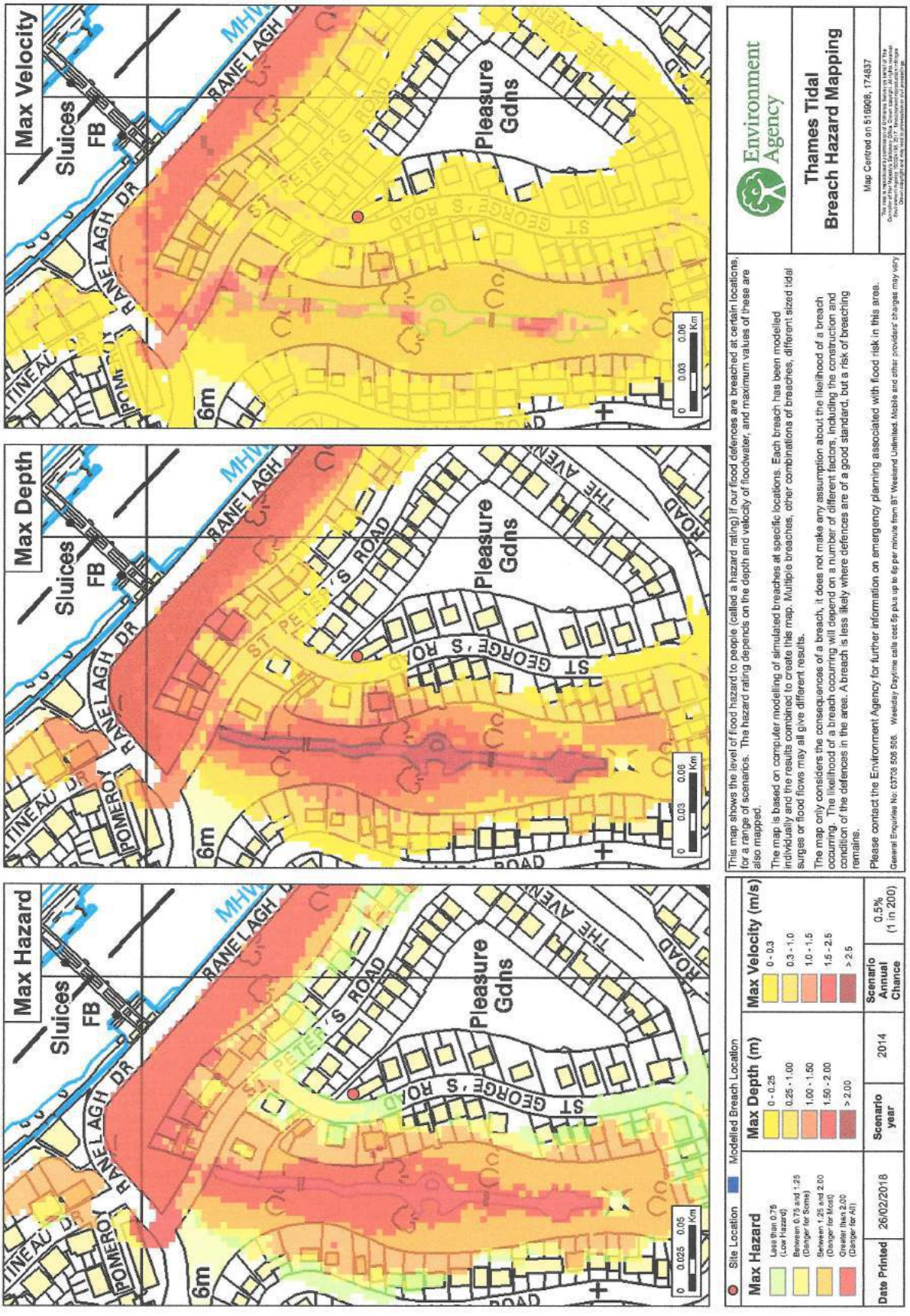
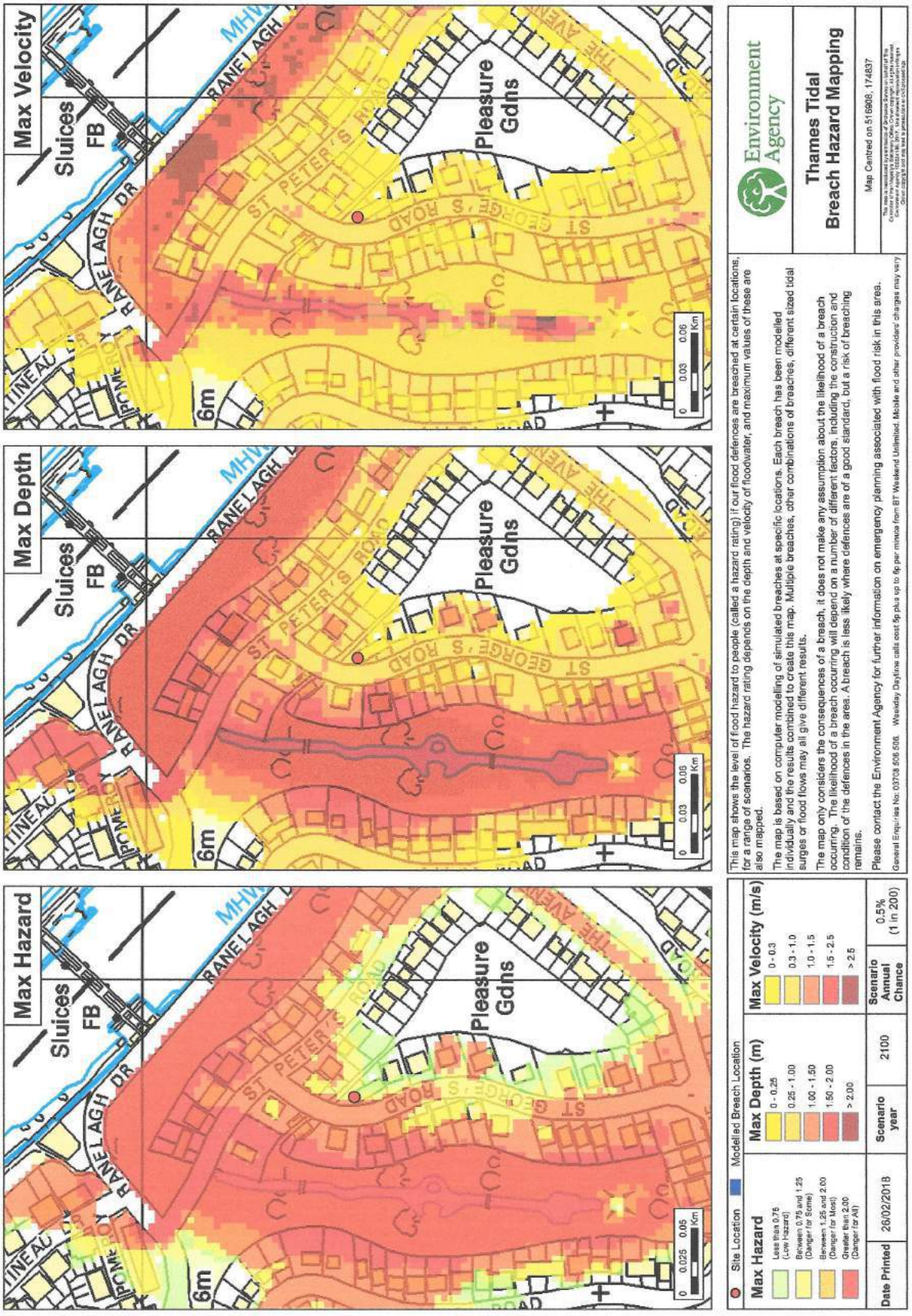

Max Velocity
Max Depth
Max Hazard
Sluices
FB
MHW
RANELAGH DR
POMEROY
TINEAU
6m
Pleasure Gdns
ST GEORGE'S ROAD
THE AVENUE
0 0.03 0.06 Km
0 0.025 0.05 Km
Site Location
Modelled Breach Location
Max Hazard
Less than 0.75 (Low Hazard)
Between 0.75 and 1.25 (Danger for Some)
Between 1.25 and 2.00 (Danger for Most)
Greater than 2.00 (Danger for All)
Max Depth (m)
0 - 0.25
0.25 - 1.00
1.00 - 1.50
1.50 - 2.00
> 2.00
Max Velocity (m/s)
0 - 0.3
0.3 - 1.0
1.0 - 1.5
1.5 - 2.5
> 2.5
Date Printed 26/02/2018
Scenario year 2014
Scenario Annual Chance 0.5% (1 in 200)
This map shows the level of flood hazard to people (called a hazard rating) if our flood defences are breached at certain locations, for a range of scenarios. The hazard rating depends on the depth and velocity of floodwater, and maximum values of these are also mapped.
The map is based on computer modelling of simulated breaches at specific locations. Each breach has been modelled individually and the results combined to create this map. Multiple breaches, other combinations of breaches, different sized tidal surges or flood flows may all give different results.
The map only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring. The likelihood of a breach occurring will depend on a number of different factors, including the construction and condition of the defences in the area. A breach is less likely where defences are of a good standard, but a risk of breaching remains.
Please contact the Environment Agency for further information on emergency planning associated with flood risk in this area.
General Enquiries No: 03708 506 506. Weekday Daytime calls cost 5p plus up to 6p per minute from BT Weekend Unlimited, Mobile and other providers' charges may vary.
Environment Agency
Thames Tidal Breach Hazard Mapping
Map Centred on 516908, 174837


Max Velocity
Max Depth
Max Hazard
Sluices
FB
MHW
RANELAGH DR
ST PETER'S ROAD
ST GEORGE'S ROAD
THE AVENUE
Pleasure Gdns
6m
0 0.03 0.06 Km
0 0.025 0.05 Km
Site Location
Modelled Breach Location
Max Hazard
Less than 0.75 (Low Hazard)
Between 0.75 and 1.25 (Danger for Some)
Between 1.25 and 2.00 (Danger for Most)
Greater than 2.00 (Danger for All)
Max Depth (m)
0 - 0.25
0.25 - 1.00
1.00 - 1.50
1.50 - 2.00
> 2.00
Max Velocity (m/s)
0 - 0.3
0.3 - 1.0
1.0 - 1.5
1.5 - 2.5
> 2.5
Date Printed 26/02/2018
Scenario year 2100
Scenario Annual Chance 0.5% (1 in 200)
This map shows the level of flood hazard to people (called a hazard rating) if our flood defences are breached at certain locations, for a range of scenarios. The hazard rating depends on the depth and velocity of floodwater, and maximum values of these are also mapped.
The map is based on computer modelling of simulated breaches at specific locations. Each breach has been modelled individually and the results combined to create this map. Multiple breaches, other combinations of breaches, different sized tidal surges or flood flows may all give different results.
The map only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring. The likelihood of a breach occurring will depend on a number of different factors, including the construction and condition of the defences in the area. A breach is less likely where defences are of a good standard, but a risk of breaching remains.
Please contact the Environment Agency for further information on emergency planning associated with flood risk in this area.
General Enquiries No: 03708 506 506. Weekday Daytime calls cost 5p plus up to 6p per minute from BT Weekend Unlimited, Mobile and other providers' charges may vary
Environment Agency
Thames Tidal Breach Hazard Mapping
Map Centred on 516906, 174837

APPENDIX 2.
FLOOD RESILIENT DESIGN GUIDANCE.

General advice for resilient design – EA/DCLG document 'Improving the Flood Performance of New Buildings.

Ground supported floors are the preferred option and concrete slabs of at least 150mm thickness should be specified for non-reinforced construction. Hollow slabs are not suitable if the elements are not effectively sealed.

Suspended floors may be necessary where ground supported floors are not suitable, namely in shrinkable/expanding soils (e.g. clay) or where the depth of fill is greater than 600mm. Uplift forces caused by flood water may affect the structural performance of a floor. Suspended floors are generally not recommended in flood-prone areas, for the following reasons: – the sub-floor space may require cleaning out following a flood, particularly a sewer flood. In order to aid this process and where accumulation of polluted sediment is expected, the sub-floor space should slope to an identified area and be provided with suitable access – if cleaning is required, floor finishes may need to be removed to provide access to the sub-floor space. Cheaper, sacrificial, finishes would be the best option. – the steel reinforcement in the concrete beams of 'beam and block' floors may be affected by corrosion and its condition may need to be assessed following repeated or prolonged floods.

Suspended timber floors, particularly when including timber engineered joists, are not generally recommended in flood prone areas because most wooden materials tend to deform significantly when in contact with water and therefore may require replacement. Rapid drying can also cause deformation and cracking. Reinforced concrete floors are acceptable but may be prone to corrosion of any exposed steel in areas of prolonged flooding.

Hardcore and blinding: good compaction is necessary to reduce the risk of settlement and consequential cracking.

Damp Proof Membranes (d.p.m.) should be included in any design to minimise the passage of water through ground floors. Impermeable polythene membranes should be at least 1200 gauge to minimise ripping. Effective methods of joining membrane sections are overlaps of 300mm, and also taping (mastic tape with an overlap of 50mm minimum). Care should be taken not to stretch the membrane in order to retain a waterproof layer. Experience in Scotland has indicated that welted joints in the d.p.m. are an effective jointing solution.

Insulation materials: Water will lower the insulation properties of some insulation materials. Floor insulation should be of the closed-cell type to minimise the impact of flood water. The location of insulation materials, whether above or below the floor slab, is usually based on either achieving rapid heating of the building or aiming for more even temperature distribution with reduced risk of condensation. Insulation placed above the floor slab (and underneath the floor finish) rather than below

would minimise the effect of flood water on the insulation properties and be more easily replaced, if needed. However, water entry may cause insulation to float (if associated with low mass cover) and lead to debonding of screeds. No firm guidance can be provided on best location for insulation where the primary source of flooding is from groundwater. For other types of flooding, placing insulation below the floor slab may be adequate but it is important to recognise that the characteristics of the insulation may be affected by the uplift forces generated by the flood water.

Floor finishes: suitable floor finishes include ceramic or concrete-based floor tiles, stone, and sand/cement screeds. All tiles should be bedded on a cement-based adhesive/bedding compound and water resistant grout should be used. Concrete screeds above polystyrene or polyurethane insulation should be avoided as they hinder drying of the insulation material. Suitable materials for skirting boards include ceramic tiles and PVC. Ceramic tiles are likely to be more economically viable and environmentally acceptable.

Floor sump: provision of a sump and small capacity automatic pump at a low point of the ground floor or basement is recommended in cases where the expected probability of flooding in any one year is 20% or a frequency of flooding of more than once in five years (see Section 4). This system will help the draining process and speed up drying but it may only be effective for shallow depth flooding. The dimensions of the sump and its operational procedure would be calculated and agreed with the planning authority based on the predicted volumes of water to be drained.

Services: under floor services using ferrous materials should be avoided.

APPENDIX 3.
FLOOD EVACUATION PLAN.

Residential Dwelling – St Georges Road. Flood Evacuation Plan

INFORMATION TO BE INCLUDED IN THE RESIDENTIAL HEALTH AND SAFETY PLAN.

1. Introduction

St Georges Road is in the Flood Zone of the River Thames and is susceptible to flooding in a severe storm event from fluvial and pluvial flooding. This report outlines a Flood Plan for residents and visitors to the St Georges Road property. The aim of the flood plan is to minimise the flood risk to the property; provide safe living accommodation; effective routes for evacuation or safe places for all residents and visitors.

The objectives of the Flood Plan are:

1. To provide residents with a safe environment that provides for an effective means of escape or a safe place of refuge in the event of severe flooding and possible inundation of the local area.
2. To prevent the ingress of flood water into the dwelling.
3. To reduce the demands on emergency services in the rare event that the dwelling is subject to flooding.
4. To provide information and useful contact details in the event of flooding.

2. Flood Warning

The works should register with Floodline on 0845 988 1188 (website www.environment-agency.gov.uk/flood)to receive flood warnings as necessary by telephone, fax or email. Flood warnings are of three types as follows:

- FLOOD ALERT – Flooding is possible be alert.
- FLOOD WARNING – Flooding is expected. Immediate action is required.
- SEVERE FLOOD WARNING – Severe flooding and danger to life.

Upon receipt of a flood warning the employees will undertake the actions set out in the appendix to this plan as appropriate to the level of warning.

3. Flood Preparedness

The property owners or residents will be required to regularly check to ensure all doors and evacuation exit routes are accessible and un-hindered. Openings in the building will be provided with water tight doors or flood board protection units as necessary. In addition to openings in the building, flood water can enter through drains, toilets and other outlets or appliances. Facilities will be in place to plug up sinks and wash hand basins to weight the plugs down.

4. Local Authorities

The property owner or resident will be required to liaise as necessary with the Environment Agency and the Emergency Planning Unit of the Council or any other agency that may undertake such duties to update the provisions of this flood plan and keep it relevant to any change in flood risk.

5. Flood Warning Action Plan

The following schedules set out the Planned Actions on receiving a Flood Warning.

Suggested timescale for action:

Immediate: - to be undertaken prior to occupation of the dwelling.

Annual: - to be undertaken every year of occupation.

IMPLEMENTATION OF FLOOD PLAN

AREA	ACTION	RESP	TIMESCALE	COMMENTS
Informing new residents	**All residents will be made aware what the flood risk is and that it is subject to change**	**Property Owner**	**Immediately**	
Provide Flood boards for all identified openings.	**Design and procure and place into store flood boards for all identified openings**	**Property Owner**	**Immediately**	
Additional measures	**Supply sand bags for plugging of sinks, and ventilation points, etc.**	**Property Owner**	**Immediately**	
Service Suppliers	**Prepare plan of all service points to allow gas, water and electricity to be disconnected during a flood**	**Property Owner**	**Immediately**	
Floodline	**Register with Floodline for warnings**	**Owner**	**Immediately**	
Annual Check	**Check Contact details, services, etc.**	**Owner**	**Annually**	

6. Action on Receipt of Flood Warning

AREA	ACTION	RESP	TIMESCALE COMMENTS
Flood Watch Warning	**Be aware, be prepared and monitor Flood warning.**	**Owner**	**As Necessary Floodline(0845 988 1188)**
Flood Warning	**Flooding expected Warn employees Secure building put flood boards in place Plug service entry points**	**Owner**	**As Necessary**
Severe Flood Warning	**Ensure all damage limitation measures are in place liaise with emergency services to evacuate**	**Owner**	**As Necessary**
All Clear	**Flood Warning over revert to normal use**	**Owner**	**As Necessary**

7. Contact Details for residential dwelling at St Georges Road.

Date:
Name:
Address:

Contact Name:

8. General Contact List

	Company Name	Contact Name	Telephone	Mobile
Floodline	Floodline	_____	0845 988 1188	
Electricity Provider	_____	_____	_____	_____
Gas Provider	_____	_____	_____	_____
Water Company	_____	_____	_____	_____
Telephone Provider	_____	_____	_____	_____
Local Public Transport	_____	_____	_____	_____
Local Council Emergency	_____	_____	_____	_____
Insurance Agent	_____	_____	_____	_____

9. Service Cut Off Locations

Service Cut Off	Description of Location
Electricity	_____
Gas	_____
Water	_____

10. Protective Actions

Identify equipment that may need special protective measures, and describe the actions to be taken to prevent damage in the event of a flood.

Description	Location	Action required	By Whom
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

11. Suppliers and External Links

Flood Service Company	Company Name	Contact	Telephone
Security Services	_____	_____	_____
Water Pumping Services	_____	_____	_____
Emergency Power	_____	_____	_____
Equipment Repair	_____	_____	_____
Furniture Removals	_____	_____	_____

FLOOD RISK WARNING PROCEEDURES.

St Georges Road – Flood risk warnings leading to the evacuation of the dwelling will be undertaken in compliance with the following procedures:-

1. FLOOD ALERT.

- Property owner or resident will monitor EA website and to assess weather conditions and local water levels.
- Property owner or resident to prepare all flood equipment.

2. FLOOD WARNING.

- Move all essential equipment and valuable stock to a safe place.
- Turn off all gas, electricity and water supplies if safe to do so.
- Place all flood protection to entry points of the building.
- Escort all visitors and vulnerable family members to a safe place of refuge.

3. SEVERE FLOOD WARNING.

- Move all essential equipment and valuable belongings to a safe place.
- Turn off all gas, electricity and water supplies if safe to do so.
- Place all flood protection to entry points of the building.
- Escort all visitors and vulnerable family members to a safe place of refuge.
- Check all visitors and family members on and off the register.
- All family members to proceed to the safe place of refuge designated and sited within the dwelling. The refuge area could have welfare facilities and access to food and bottled water as necessary.
- All residents are to remain in the safe place of refuge pending rescue by the emergency services or the flood warnings have been reduced.