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Proposed Residential Redevelopment
Broom Road, Teddington TW11 9BE
Teddington Riverside
Flood Risk Assessment

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Hydro-Logic Services data analysis advice

Haymarket Media

Teddington Riverside

Flood Risk Assessment (Appendices)

Report K0358/1

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Appendix A Pro-Forma for Undertaking a Flood Risk Assessment (Appendix B of Practice Guide (CLG, 2009))

This proforma has been completed in such a way as to identify the sections in the accompanying report where the relevant issues are addressed.

1 Development description and location
1a. What type of development is proposed and where will it be located? • A location plan at an appropriate scale should be provided with the FRA, or cross referenced to the main application when it is submitted.
Section 2.1
1b. What is its vulnerability classification? • Vulnerability classifications are provided in Table D.2, Annex D of PPS25
Section 2.3
1c. Is the proposed development consistent with the Local Development Documents?
?
1d. Please provide evidence that the Sequential Test or Exception Test has been applied in the selection of this site for this development type? • Evidence is required that the Sequential Test has been used in allocating the proposed land use proposed for the site and that reference has been made to the relevant Strategic Flood Risk Assessment (SFRA) in selecting development type and design (See paragraphs 16-20 and Annex D of PPS25). Your Local Planning Authority planning officer should be able to provide site-specific guidance on this issue. • Where use of the Exception Test is required, evidence should be provided that all three elements of this test have been passed (see paragraphs 20 and Annex D of PPS25). Your Local Planning Authority planning officer should be able to provide site-specific guidance on this issue.
Section 2.3
1e. *[Particularly relevant to minor developments (alterations & extensions) & changes of use]* Will your proposal increase overall the number of occupants and/or users of the building/land; or the nature or times of occupation or use, such that it may affect the degree of flood risk to these people?
2. Definition of the flood hazard
2a. What sources of flooding could affect the site? (see Annex C PPS25). • This may include hazards such as the sea, reservoirs or canals, which are remote from the site itself, but which have the potential to affect flood risk (see Chapter 3 of the Practice Guide).
Section 3.2
2b. For each identified source, describe how flooding would occur, with reference to any historic records wherever these are available. • An appraisal of each identified source, the mechanisms that could lead to a flood occurring and the pathways that flood water would take to, and across, the site. • Inundation plans, and textural commentary, for historic flood events showing any information available on the mechanisms responsible for flooding, the depth to which the site was inundated, the velocity of the flood water, the routes taken by the flood water and the rate at which flooding occurred.
Section 3.3
2c. What are the existing surface water drainage arrangements for the site? • Details of any existing surface water management measures already in place, such as sewers and drains and their capacity.
Section 3.4
3. Probability
3a Which flood zone is the site within? • The flood zones are defined in Table D.1 of Annex D PPS25.
Sections 2.2

3b If there is a Strategic Flood Risk Assessment covering this site, what does it show?

- The planning authority can advise on the existence and status of the SFRA.

Section 2.3

3c What is the probability of the site flooding taking account of the contents of the SFRA and of any further site-specific assessment?

This may need to include

- a description of how any existing flood risk management measures affect the probability of a flood occurring at the site FRA Pro-forma
- supporting evidence and calculations for the derivation of flood levels for events with a range of annual probability
- inundation plans of, and cross sections through, the existing site showing flood extents and levels associated with events with a range of annual probability
- a plan and description of any structures which may influence the probability of a flood occurring at the site. This may include bridges, pipes/ducts crossing a watercourse, culverts, screens, embankments or walls, overgrown or collapsing channels and their likelihood to choke with debris.
- details of any modelling studies completed to define the exiting degree of flood risk (Ref Chapter 3 of the PG)

Section 3.5

3d What are the existing rates and volumes of run-off generated by the site?

- This should generally be accompanied by calculations of run-off rates and volumes from the existing site for a range of annual probability events (see Chapter 4 of the Practice Guide).

Section 4.3

4. Climate change

4a How is flood risk at the site likely to be affected by climate change?

- Annex B of PPS25 and Chapters 3 and 5 of the Practice Guide provide guidance on how to assess the impacts of climate change.

Section 4.6

5. Detailed development proposals

Where appropriate, are you able to demonstrate how land uses most sensitive to flood damage have been placed in areas within the site that are at least risk of flooding, including providing details of the development layout?

- Reference should be made to Table D.2 of PPS25.
- Chapter 4 of the Practice Guide provide guidance on how the sequential approach can be used to inform the lay-out of new development sites.

Section 4.1

6. Flood risk management measures

How will the site be protected from flooding, including the potential impacts of climate change, over the development's lifetime?

- This should show that the flood risk management hierarchy has been followed and that flood defences are a necessary solution. This should include details of any proposed flood defences, access/egress arrangements, site drainage systems (including what consideration has been given to the use of sustainable drainage systems) and how these will be accessed, inspected, operated and maintained over the lifetime of the development. This may need to include details of any modelling work undertaken in order to derive design flood levels for the development, taking into account the presence of any new infrastructure proposed.

Section 4.2

7. Off site impacts

7a How will you ensure that your proposed development and the measures to protect your site from flooding will not increase flood risk elsewhere?

This should be over the lifetime of the development taking climate change into account. The assessment may need to include:

- Details of the design basis for any mitigation measures (for example trash screens, compensatory flood storage works and measures to improve flood conveyance). A description of how the design quality of these measures will be assured and of how the access, operation, inspection and maintenance issues will be managed over the lifetime of the development.
- Evidence that the mitigation measures will work, generally in the form of a hydrological and hydraulic modelling report.
- An assessment of the potential impact of the development on the river, estuary or sea environment and fluvial/coastal geomorphology. A description of how any impacts will be mitigated and of the likely

longer-term sustainability of the proposals.
Section 4.3
7b How will you prevent run-off from the completed development causing an impact elsewhere? • Evidence should be provided that drainage of the site will not result in an increase in the peak rate or in the volumes of run-off generated by the site prior to the development proceeding.
Section 4.3
8. Residual risks
8a What flood-related risks will remain after you have implemented the measures to protect the site from flooding? • Designing for event exceedence on site drainage systems is covered in Chapter 5 of the Practice Guide. Guidance on other residual risks is provided in Chapter 7.
Section 4.4
8b How, and by whom, will these risks be managed over the lifetime of the development? • Reference should be made to flood warning and evacuation procedures, where appropriate, and to likely above ground flow routes should sewers or other conveyance systems become blocked or overloaded. This may need to include a description of the potential economic, social and environmental consequences of a flood event occurring which exceeds the design standard of the flood risk management infrastructure proposed and of how the design has sought to minimize these – including an appraisal of health and safety issues.
Section 4.4

Appendix B Flood Emergency Plan

B.1 Introduction

This is the Flood Emergency Plan for the Teddington Riverside development. It has been prepared with help and guidance from the Environment Agency and LBRT and informed by the Planning Advice Note for Guidance on Producing a Flood Emergency Plan (LBRT, 2011).

B.2 General

B.2.1 Scope, Objectives and Background

The purpose of this document is to present the flood emergency plan for the proposed Teddington Riverside development. Its content is relevant to residents in order that they understand both the risks of flooding and the actions that they will need to take to prepare for and to respond to flooding. The document is also relevant to the emergency services and LBRT officials who will be required to manage the emergency response during flooding.

The objectives are:

- To inform residents of the risks of flooding.
- To outline proper and safe procedures to be followed before and during flooding.
- To explain the meanings of flood warnings and what action will be required and by whom.
- To provide clear advice on emergency procedures to be followed before and during a flood event.

The important aspects of this plan include:

- The different types of flooding that may affect the area, principally tidal and fluvial.
- The process and evolution of flooding in the area.
- The emergency access and egress routes to be followed at different stages of a flood
- Risks and hazards posed to people and property.
- The emergency contacts.

B.2.2 Location and Proposal

The Teddington Riverside site is currently a commercial site, for the Teddington Studios and The Haymarket Group. The proposed development involves demolition of existing buildings and replacement with residential accommodation, mostly provided in four blocks.

The accompanying FRA has shown that the residential accommodation will be protected from flooding by setting the finished floor level above existing ground level. The design flood level has been agreed with the Environment Agency and the LBRT and is at 6.97 mAOD and corresponds with the 1 in 100 (1%) probability with allowance for climate change. All residential accommodation has been set a minimum of 0.3 m above the design flood level (nominally at 7.30 mAOD), and so is at an acceptably low risk of flooding.

The FRA has also noted that the development proposal will lead to a slight reduction in the flood risk to surrounding properties. This is due to two factors:

- A reduction in the impermeable area on the site from virtually 100% to41%

- An increase in flood storage resulting from there being a smaller area of buildings in the area liable to flooding.

The most important flood risk issue for the proposed development is that of access and egress which is the main focus of this Appendix.

The flood risk to the site and its residents depends strongly on the flooding processes. The highest threat in terms of flood levels and the duration of flooding is from *fluvial flooding*. However, the site may be affected by *tidal flooding* and access routes around the site may be affected by *surface water flooding*.

It is of the utmost importance that residents are made aware of the flooding mechanisms and that they follow emergency procedures appropriate to that mechanism. Although the mechanisms may interact, the overwhelming expectation is that one mechanism is dominant during a particular extreme event.

The characteristics of the different types of flooding are reviewed briefly.

Fluvial flooding

- This results from prolonged heavy rainfall in the Thames catchment which includes parts of Gloucestershire, Oxfordshire and Berkshire.
- It is likely to be in the winter months and when the catchment is saturated due to several months of above average rainfall.
- Snowmelt has contributed to earlier flood events (eg 1947) and freezing of the ground surface in the catchment may make flooding more severe.
- Flooding at the site will be preceded by flooding at major towns along the Thames, including Oxford and Reading.
- With the flood forecasting technology available to the Environment Agency, it will be possible to forecast the flooding with a lead time of several days.
- Flood events may last for several days, or even weeks, based on observations of historic Thames floods, such as that in 1947.
- Roads such as Broom Road and Ferry Road may be closed for long periods during the flooding. The depth of “fluvial flooding” along Broom Road is illustrated in Figure B-1.

Tidal flooding

- The Thames is tidal as far as the Teddington Locks. Tidal flooding may result from high astronomical tides, particularly during “spring tides”. This is not a reference to the season of spring, but to more extreme range of tidal water levels that occur in response to planetary movements with a frequency of about 2 weeks.
- The tidal flooding may also be made worse by *storm surge* conditions in the North Sea. These result in elevated water levels due to reduced atmospheric pressure and wind.
- With the storm surge forecasting capability of the Meteorological Office and the Environment Agency, it should be possible to forecast tidal flooding with a lead time of 12 hours.
- Tidal flooding can interact with fluvial flooding. Results from combined modelling provided by the Environment Agency are shown in Figure B-2 and compared with fluvial flood levels.
- Flood events will last for up to a few hours, essentially at the peak of the tidal cycle, though this will be affected by the fluvial flows and operation of the Thames Barrier.
- Local roads such as Ferry Road may be closed during tidal flooding events.
- There may be sequences of tidal flooding at intervals of around 12 hours associated with the natural tidal cycle.

Figure B-1 Fluvial flood levels

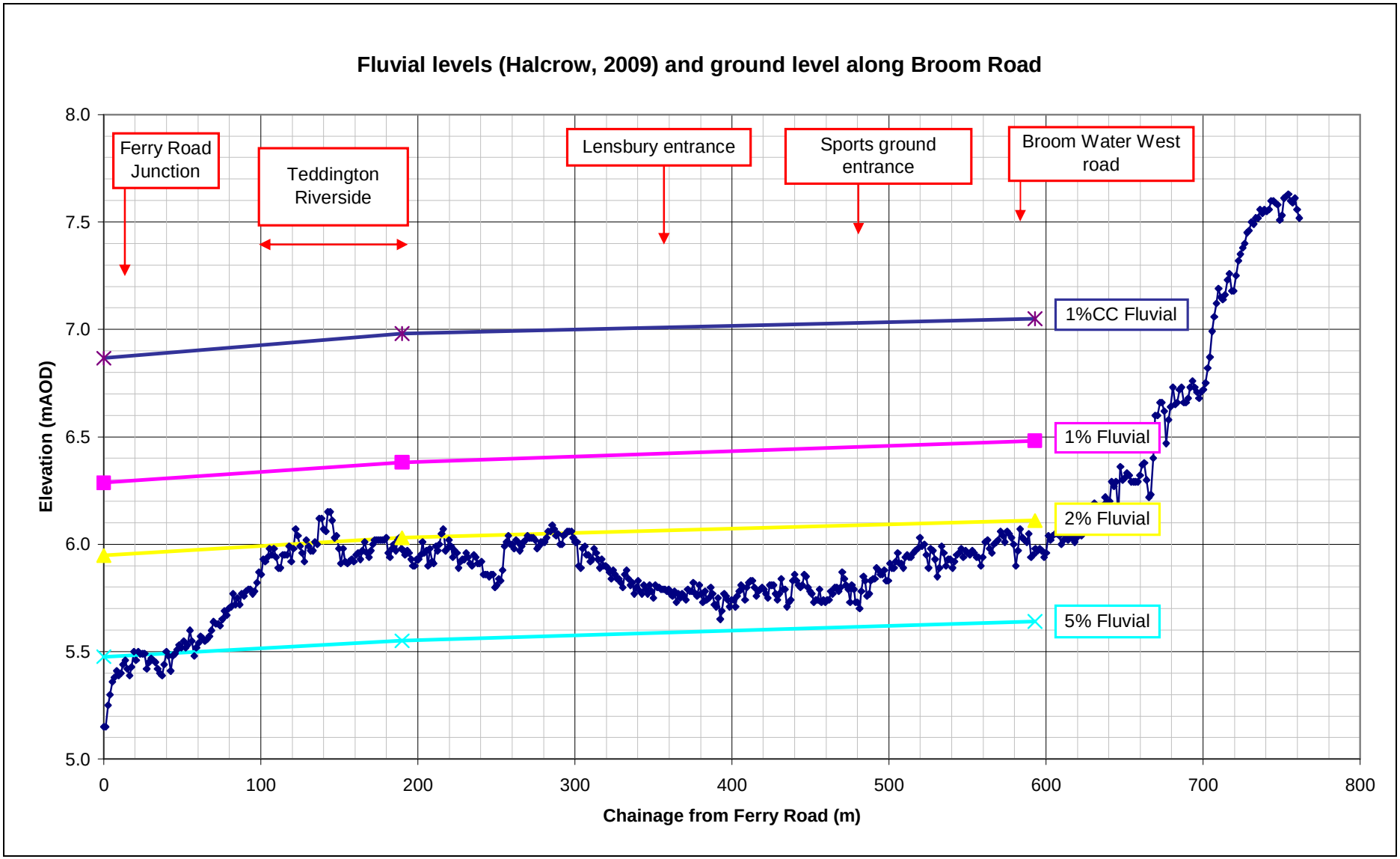
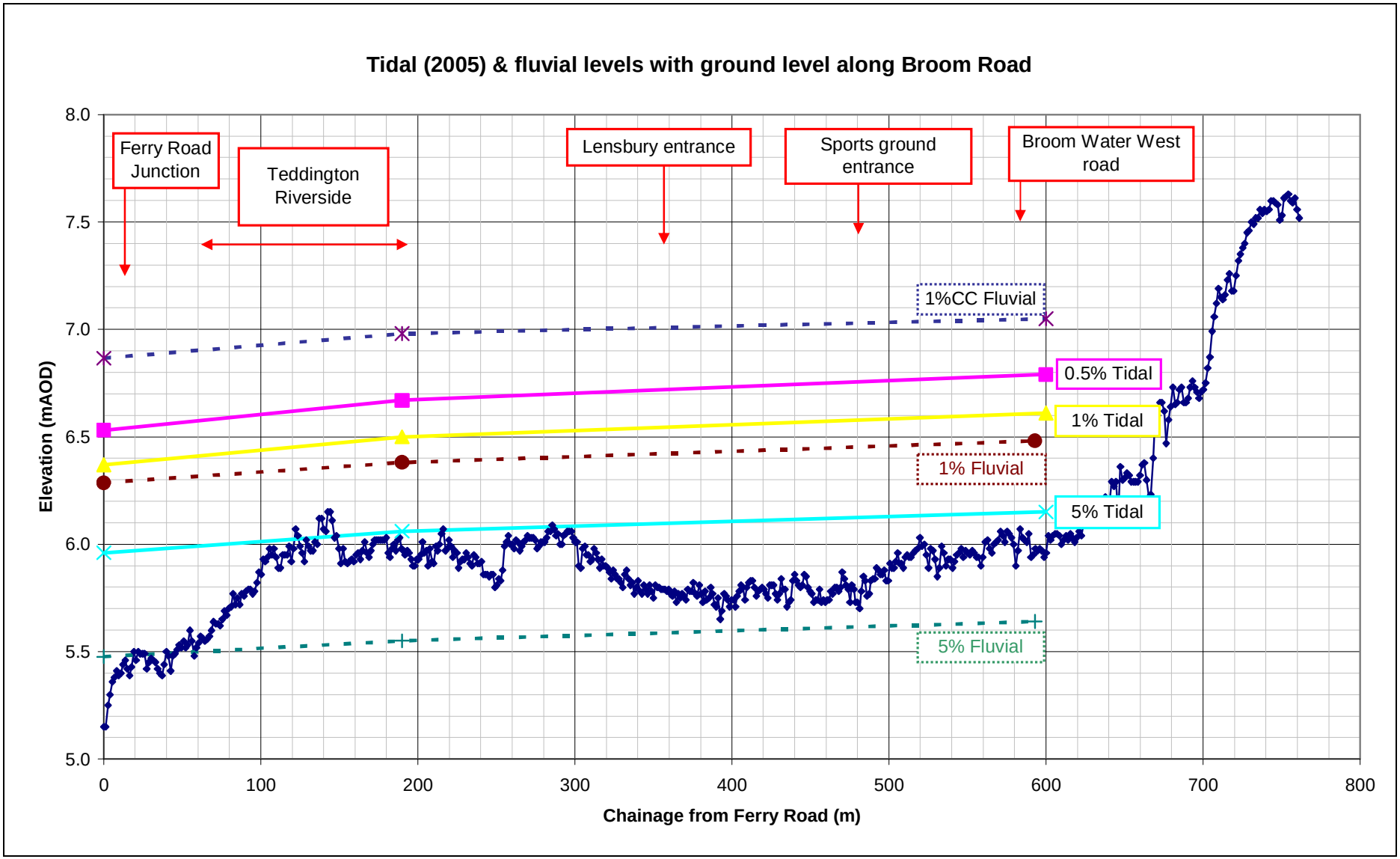


Figure B-2 Comparison of tidal and fluvial flood levels



For most frequencies (or return periods), the tidal flooding provides the highest flood levels. However, the most extreme flooding is fluvial in origin. This is why the finished floor levels for the site have been set by reference to the 1% **fluvial** flood, with allowance for climate change.

Surface water flooding

- Surface water flooding occurs due to intense local rainfall that is too heavy for the drains to handle.
- It typically occurs in the summer months, often associated with intense thunder storms, but surface water flooding can also occur in autumn and winter, for example when leaves can block the inlets to drains.
- The duration of flooding is typically short, lasting only a few hours, or less. This is because the surface water is usually able to dissipate through the drainage system, following the end of the storm.
- The Teddington site is elevated above the surrounding land and so will be unaffected by surface water flooding. However, low lying access roads such as Ferry Road may be affected.
- Roads such as Ferry Road may be closed for a few hours during surface water flooding events.

The impact of the flood mechanism on flood extents and flood hazard is presented in Section B.2.3 along with a detailed review of access/egress arrangements. For extreme flooding, when road closures are fully in place, raised walkways within the site will provide a "safe" route to the north-west corner of the site. A proposed telescopic bridge will be deployed in advance of major flooding and this will provide a link to the Teddington Lock footbridge, allowing "dry" access to the Ham Bank. These arrangements are described in more detail in the following Section.

The site will remain fully operational during a flood event, and it is not envisaged that there will be any need for evacuation. The design team for the scheme have been aware of the risks of flooding from the outset. Mitigation measures have been put in place to ensure maintenance of key infrastructure for the duration of any flooding. Specific measures are discussed in the Servicing Strategy by Cundall (2013) and include provision of dedicated back up generator and online UPS systems and on site water tank of 25 m^3 volume, plus rainwater harvesting tank (225 m^3).

It is likely that Broom Road will continue to constitute the main access route to the site for emergency vehicles and *in extremis* small boats. The design layout incorporates ramps up from Broom Road to the site that can serve as a safe point of entry under these extreme conditions.

There are subterranean car parks on the site. These will be equipped with flood barriers to prevent entry of water. These will be closed in accordance with the site management plan and following due warnings to residents. Once the barriers have been closed, no vehicular exit will be possible for the duration of the flood event.

B.2.3 Risk Assessment Summary

(a) General statement of risk

As indicated in the previous Section, all residential accommodation will be at a safe level, excluding the Town Houses. This safe level is defined as the 1% (1 in 100) flood level with allowance for climate change plus a contingency of 300 mm. For the Town Houses, flood resistance and resilience measures will be provided. All property will therefore be at an acceptably low level of flood risk. As indicated above, precautionary measures have been included in the design to ensure that the site can remain operational and inhabitable during extended flood periods. The most important issue in relation to the flooding is that of access and egress for residents.

(b) Sequence of fluvial flooding

This FRA and emergency plan are able to benefit from the long history of detailed computational modelling of the Thames at Teddington by the Environment Agency and its consultants. The outputs from these models provide a clear picture of the flood extent for floods with different levels of severity. They also provide information on the depth of floodwater and the velocity – both of which are important in establishing the hazard to people.

The results of model runs for **fluvial flooding** are presented in Figure B-1 for different frequencies of flooding:

- 1 in 20 (5%)
- 1 in 50 (2%)
- 1 in 100 (1%)
- 1 in 100 with allowance for climate change (1%CC) – this is the reference or design flood

The four images illustrate how a (fluvial) flood would spread across the site and the surrounding area. The extent is represented by the flood hazard which is described in Table B-1. Note that the maps have used a blue shading to reflect the "Very low hazard" classification, rather than the white shown in the table.

Table B-1 Hazard to People Classification System

Flood Hazard Rating (HR)	Colour Code	Hazard to People Classification	Use of flood emergency plans to manage flood risk
Less than 0.75		Very low hazard – caution	Acceptable
0.75 to 1.25		Danger for some – includes children, the elderly and the infirm	Maybe acceptable
1.25 to 2.0		Danger for most – includes the general public	Unlikely to be acceptable
More than 2.0		Danger for all – includes the emergency services	Unacceptable

The results in Figure B-1 show that for the 5% (1 in 20) fluvial flood, the site is fully accessible via Broom Road and Ferry Road. However, there is a marked change for the 2% (1 in 50) fluvial flood with Broom Road classed as "Low Hazard" and "Danger for Some".

Ferry Road is affected to a greater extent and is classed as "Danger for Most". The main reason for this marked change is that the Thames spills out of bank, upstream of the site. The path taken by the flow is across the playing fields to the south-west of Broom Road. This low lying area is subsequently filled to a depth of up to 1.5 m and contributes to the high hazard rating. More extreme floods see an expansion of areas of "Danger for most" and "Danger for all".

(c) Sequence of tidal flooding

As indicated above, there is a low risk of the site being affected by tidal flooding in isolation. There may be some localised impacts on access (eg on Ferry Road), but there will always be an alternative access route via Broom Road.

The major impact of tidal flooding is when it occurs in combination with fluvial flooding. This combined occurrence has been investigated in detail by Halcrow (2009) on behalf of the Environment Agency. Many computer model runs have been undertaken to establish flood levels for a wide range of fluvial and tidal combinations and these are available for the Thames both upstream and downstream of the site. For the reference flood, the combined levels are lower than those for the "fluvial extremes" that are described above. Accordingly, this FRA has based the design and access/egress issues entirely on the fluvial extreme levels. This is not to suggest that tidal effects are unimportant, but that they do not contribute to the design levels.

The existing tidal defences are at a level of 6.1 mAOD. They afford sufficient protection to the site such that it is in flood zone 3a, with an annual probability of flooding of 5% (1 in 20) for the current conditions. Several instances of overtopping of these defences may therefore be expected during the lifetime of the development. Moderate overtopping will lead to flooding of the garden area between Blocks A/B/C and the Thames. The duration of overtopping may last from a few minutes to a few hours. However, since overtopping will occur for the full river frontage, it is likely that the gardens will fill to a level in excess of 6.1 mAOD. Flood water may be present for several days afterwards as water drains back to the Thames and infiltrates to the ground. Demountable barriers will prevent water from entering the stairwell/liftwells at the base of Blocks A, B and C.

(d) Surface Water Flooding

Surface water flooding will not affect the site directly as it is raised above the surrounding ground; this is clear from the 2% fluvial flood map (Figure B-4). Surface water flooding will affect low lying streets around the site such as Ferry Road. The indirect effect of the flooding will therefore be to restrict normal access via this road, which is likely to be impassable for severe events. Broom Road, being elevated above the surrounding land will not be affected and is likely to remain open.

(e) Emergency Access and Egress routes

The closure of Broom Road to non-emergency traffic is a crucial event for residents. For the duration of any closure, the normal access/egress to and form the site will be via the Teddington Lock footbridge. All residential accommodation will benefit from "safe" access from the site to the opposite bank at Ham. The details of this route are presented in Section B.3.5. This is likely to be supplemented by informal "shuttle" arrangements with the use of suitable vehicles (eg tractors and trailers) to enable residents to access the safe areas on the Teddington bank directly.

(f) Practicalities of Emergency Access and Egress

The practicalities of the emergency access routes depend greatly upon the flooding mechanism. For **purely tidal flooding** and **surface water flooding**, flood durations and associated closures will be of the order of a few hours at most. This will pose considerable short term disruption and inconvenience to daily routines of residents. This will be most pronounced for those with time commitments (eg collecting children from schools, carers etc). It is the expectation that the quality of tidal forecasting will be good and that, provided that this can be communicated to residents, appropriate alternative plans may be made.

Under the Site Management Plan, staff will be on stand by and provision should be made for dealing with elderly or infirmed – even given the short duration of flooding. This will require appropriate rostering of staff at such times. As indicated above, this will benefit from the likely quality of forecasts of tidal flooding.

The practicalities for **fluvial** and **combined fluvial/tidal flooding** will, by contrast require special consideration. This is because of the likely duration of fluvial flooding and the additional hazards posed by the extent of flooding. The depth and velocity of flood water will also contribute to the overall hazard.

An indication of the flood extents is provided in Figure B-4. The durations of flooding and associated hazards are available from the results of detailed simulations provided by the Environment Agency. The durations for which the critical section of Broom Road will be subject to different levels of hazard to pedestrians is summarised in Table B-2. This shows that Broom Road would be rated as "No Hazard" for the 5% flood and "Danger for Some" for the 2% flood. The general suburban situation of Broom Road is such that the boundary garden walls at the front of each property will provide assistance to those needing to use the road. There are no special hazards (eg falls or open sections) that would cause particular concern.

For the 1% flood, the rating is "danger for most" and pedestrian access would be suspended under these conditions. With a maximum depth of around 0.7 m, access by emergency vehicles would be possible under these conditions.

For the 1%CC, the rating is "Danger for all" and with flood depths of over 1 m, access by standard emergency vehicles would also likely be restricted.

Table B-2 Durations of Hazards to People on Broom Road in hours (fluvial)

Probability	Low hazard	Danger for some	Danger for most	Danger for all
1%CC	303	260	232	84
1%	258	164	128	0
2%	222	78	0	0
5%	0	0	0	0

The suspension of Broom Road for access/egress would then require the emergency access via the Teddington Lock footbridge to be used. It is clear from Table B-2 that the durations over which this access would need to be used are of the order of 5 days for the 1% flood and 10 days for the 1%CC flood. Whilst this will have a significant impact upon the lives of the residents, there will be major disruption to the lives of many people along the Thames and risk to life. The associated load on the emergency authorities is likely to be great. Accordingly, Site Management arrangements should seek to make as small a load as possible on the emergency services. It is proposed to do this by the following:

- Prompt provision of instructions to residents of imminent flooding by warnings and communications systems
- Deployment of the proposed telescopic bridge and managing the flow of people across this route.
- Arrangements for vehicles for transporting people to safe areas on Teddington bank, subject to emergency services approval.
- Arrangements for increased use of roads, parking and bus services on Ham bank.
- Special provision for the elderly/infirmed residents to enable provision of food and access
- Enabling residents and businesses in the immediate area that are affected by flooding to benefit from these arrangements.
- An annual drill comprising deployment of the telescopic bridge and other measures and a "walk-through" of the access/egress route

More details of the emergency arrangements are provided in Section B.3.5.

Figure B-3 Ham Lands showing possible area for temporary car parking

The design of the site is such that all access routes internal to the site are at a minimum of 6.8 mAOD and residential floor levels are predominantly at 7.3 mAOD. However, much of the site will be affected by flooding and the indicative durations for different probabilities of flooding are shown in Table B-3. These likely overstate the duration as they do not make allowance for draining of water from the site (e.g. the flood storage area) back into the Thames once river levels have fallen (eg via flap valves or by infiltration). The presence of water on the site poses a hazard due to its depth. It is largely "standing water" in view of the protected and elevated position of the site.

Table B-3 Approximate duration of flooding on site (fluvial)

Probability	Duration (h)
1%CC	273
1%	216
5%	0
2%	0

Figure B-4 Hazard maps for 5%, 2%, 1% and 1%CC fluvial flood events

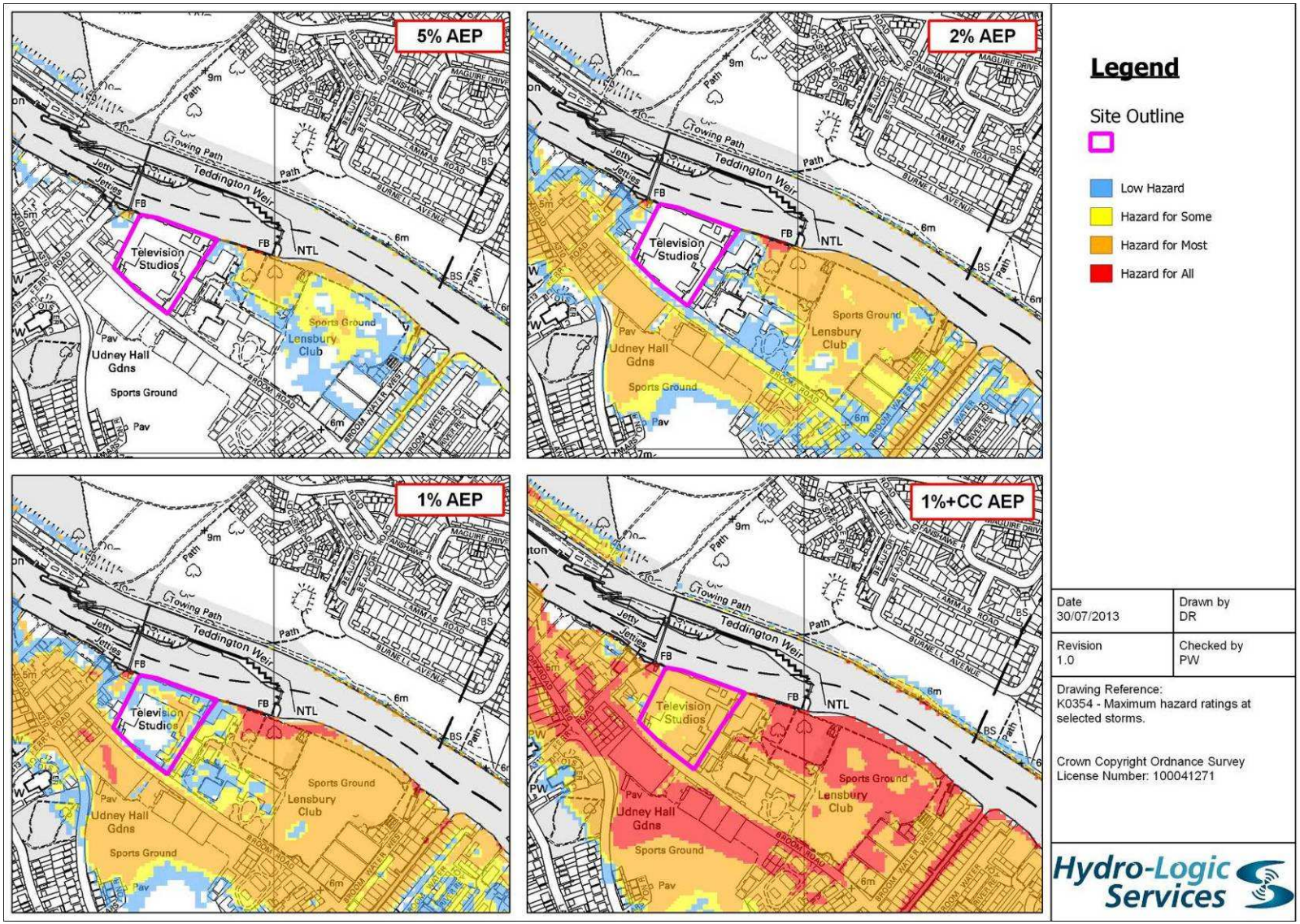
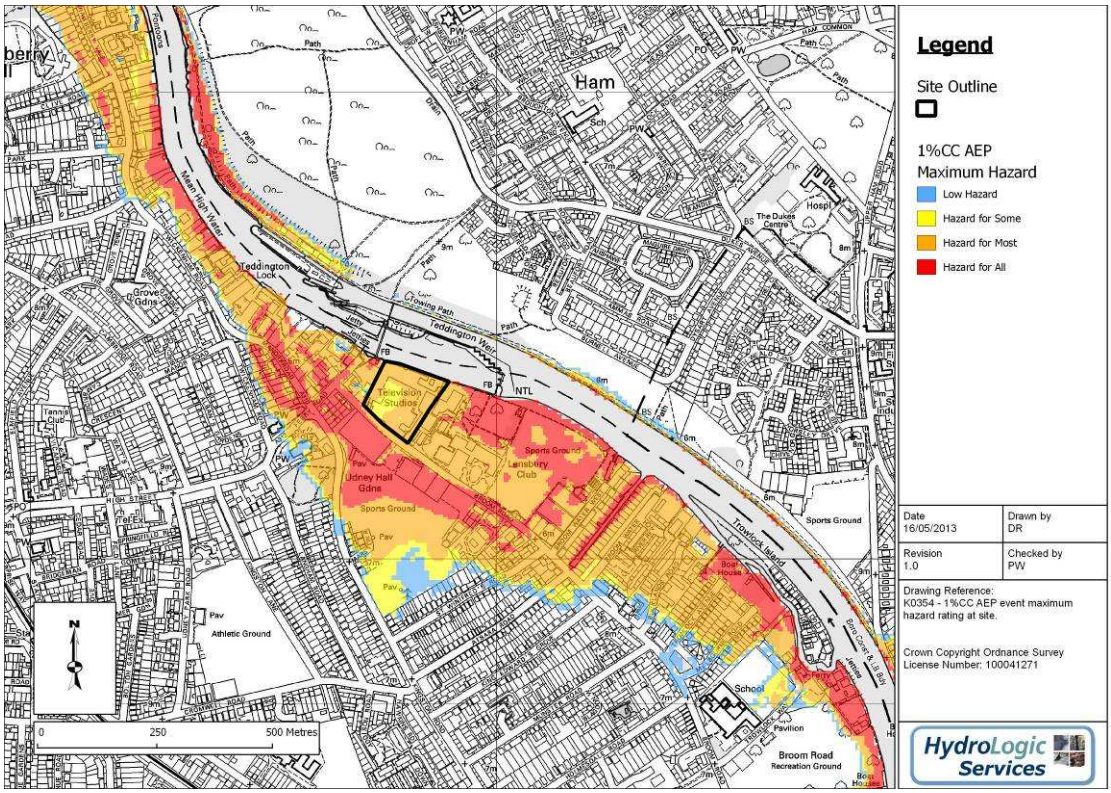


Figure B-5 Flood depth map for 1%CC showing for area around the site



B.2.4 Assessment of potential Mitigation Measures

The mitigation measures for the site are largely based on suitable design with all residential levels set a minimum of 300 mm above the design flood level. Mitigation will however be required for the subterranean car parks by deployment of flip-up flood barriers at the entrance and exit. Warnings will be provided to residents of planned closures. The impacts of closing the car parks will be limited since they will often be associated with closure of the surrounding roads in any event.

This plan relies upon the availability of the Teddington Lock footbridge as a viable means of access/egress under continued extreme flood conditions. The Footbridge consists of two separate bridges separated by a small island. The two footbridges were built between 1887 and 1889, funded by donations from local residents and businesses. The western bridge consists of a suspension bridge crossing the weir stream and linking the island to Teddington. The eastern bridge is an iron girder bridge crossing the lock cut and linking the island to Ham on the Surrey bank. In recent years wooden ramps have been added to the approach to the bridge on the Ham side and to the middle part on the small island so that cycles and pushchairs etc. can avoid the steps up to and down from that section of the bridge.

B.3 Flood Procedures

B.3.1 Lead times

Warnings will be communicated to residents via the following means:

- Screen display at Site Management Office on the Piazza (Block A)
- Web site
- Email to residents (or nominated party) of any change in warnings
- Text message to residents (or nominated party) of any change
- Automated phone message if required

The information will be based on the Flood Alert Notice (see Figure B-6) and for which briefing material will be available in each property and on the web site. This will enable residents to be kept informed of the developing situation of any flood event and in particular, when the area is safe following a flood.

The communication system will be particularly important during a flood event when there is an extended period of road closure. The systems can be used to provide specific instructions.

B.3.2 Flood Warnings

Flood Warnings will be issued via the Flood Alert Notice. Whilst this will echo the formal Environment Agency warnings, it will provide a site-specific interpretation for residents along with any specific instructions.

B.3.3 Flood Alert Notice

A draft Flood Alert Notice is shown in Figure B-6, providing information in a standard format for residents. The Alert Notices should be used for small and moderate floods (as well as major floods), partly for raising the interest and awareness of flood events, but also to help residents to develop an understanding of flood risk at the site. This will pay dividends during major flood events. Additional information will be available from other sources eg web site, Management Office.

B.3.4 Actions upon receiving Alerts and Warnings

(a) General

Given that there will be no requirement for residents to evacuate the site, there is no need for an emergency procedure for all residents. However, Site Staff should make provision for emergency measures for elderly/infirmed residents. All residents will be impacted by the progressive closure of access routes and by the potential requirement to use the Teddington Lock footbridge to access/egress the site. Once an alert has been received that Broom Road is likely to be closed, Site Management staff will put in place the procedures for deployment of the telescopic bridge.

(b) For short duration tidal/combined flooding events

Short duration tidal flooding events occur in response to minor overtopping of the existing defences. The tidal defences are slightly above the flood zone 3a/3b boundary, indicating that the current annual probability of occurrence of such events is around 5% (1 in 20).

Preparatory actions:

- Review the likely timing and severity of the event by liaison with Environment Agency and emergency services;
- Ensure relevant "amber/red" warnings are issued on display screens, email, text, web, phone, in person;
- Prepare and deploy the demountable defences for the exits to the gardens.

Action to be taken by residents will include:

- Be mindful of the overtopping of the defences and of flooding to the gardens and lower areas of car parking

Amber warnings would indicate a risk of flooding within 72 hours, red warning, a risk within 24 hours.

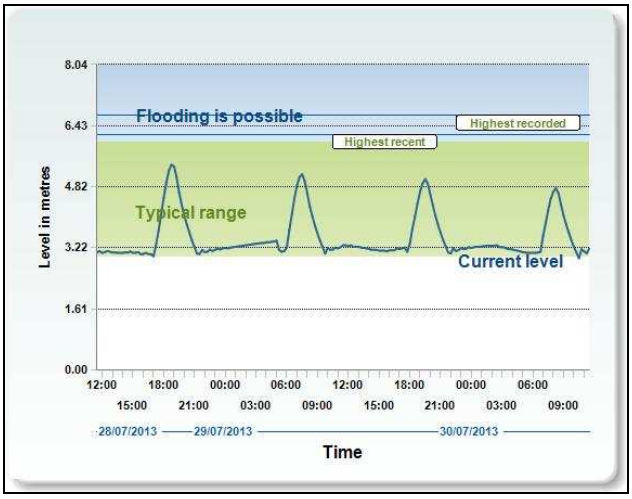
(c) For extended" closure of Broom Road for fluvial flooding

Extended closure may occur in response to extreme fluvial or combined fluvial/tidal events.

Preparatory actions:

- Review need for additional staff as the flood event may require more resources to deal with than are available from the Site Management team;
- Ensure relevant "amber/red" warnings are issued on display screens, email, text, web, phone, in person;
- Establish communication with local flood co-ordinators from Emergency Services/Council;
- Establish link to Environment Agency;
- Ensure availability of vehicles/drivers for informal "shuttle" transport on Teddington Bank.
- Deploy the "telescopic" bridge;
- Prepare to deploy the car park barriers, following suitable warnings to residents.

Figure B-6 Sample display panel

<table>
<tr><th colspan="2">Teddington Riverside: Flood warning information</th></tr>
<tr><td>Environment Agency
 
</td><td>Current water level = 6.60 mAOD
 
</td></tr>
<tr><td>Flood type</td><td>FLUVIAL TIDAL SFC WATER</td></tr>
<tr><td>Access
Footbridge
Broom Road
Ferry Road
Car park</td><td>Open/Closed Comment
OPEN All clear – “tidal” flow from 4 to 6 pm
OPEN Closed from 2100 GMT today to non-em. vehicles
CLOSED Closed until further notice
CLOSED Closed until further notice</td></tr>
<tr><td>Special instructions</td><td>• It is expected that the flood will peak at 2100 (9 pm) on date.
• Based on current forecasts, the EA do not expect Broom Road to reopen until date.
• Car parks at Riverside Drive Ham are now open.
• “Shuttle” operating from Broom Road</td></tr>
</table>

Action to be taken by residents will include:

- Shopping for food and other essentials that may be required during an extended flood event;
- Relocation of vehicles that may be required for the duration of any flood event to Ham or alternative locations;
- Informing employers, colleagues, family, schools etc of the situation and of likely delays in the coming weeks;
- Familiarise oneself with the emergency arrangements; and
- Make provision, where possible, for periods of working from home.

B.3.5 Safe Egress Procedures & Evacuation Routes

(a) Procedures

The availability of safe access/egress routes will be communicated via the Flood Alert Notice. This will indicate when residents will be able to use Broom Road and when the access/egress will be via the Teddington Lock footbridge.

Due care will be needed for children, push chairs etc when using the emergency access route, both within and beyond the site. There are ramps as an alternative to the steps on the Lock footbridge and this improves the accessibility.

(b) The routes

The access route from the site to the car parking area at Ham is summarised in Table B-4 and shown in Figure B-7 and Figure B-9.

Photographs are provided of the existing parts of the route external to the site in Figure B-11 to Figure B-15. The first part of the route involves walkways and the telescopic bridge that are yet to be built. The bridge will need to accommodate the possible future need to raise the defence levels at the site in line with Environment Agency strategy from the Thames Estuary 2100 project.

The telescopic bridge will be a dedicated facility, permanently stored on site and housed within a heavy duty vehicle, itself garaged in a secure lock-up in the north-west corner of the site. It will be deployed by manoeuvring the vehicle/facility such that the telescopic bridge can engage with the ramped section of the Teddington Lock footbridge. Use of the bridge will need to be managed as there will be a restriction on the number of people on the bridge at any time. Its deployment will be checked at least annually as part of the annual flood drill. Residents will have the chance to walk on the bridge during such events. More frequent operational and maintenance checks will be undertaken by Site Management staff. Some photographs illustrating the possible form of the bridge are shown in Figure B-8.

Figure B-7 Access/Egress route – external to site

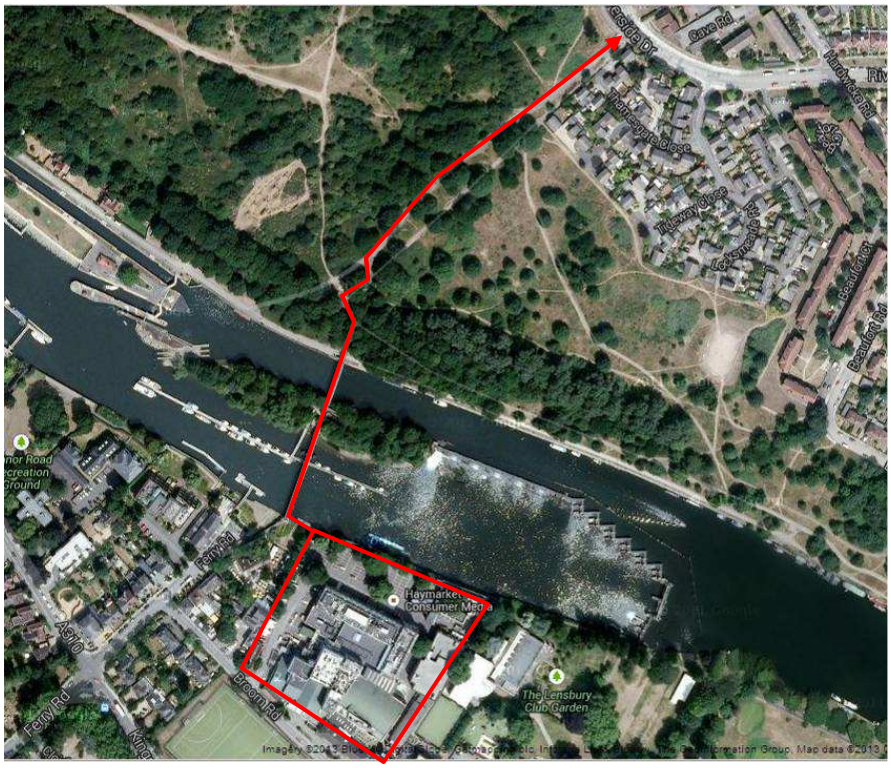


Figure B-8 Telescopic Bridge –design concept

Table B-4 Description of Access/Egress Route

Approx. distance (m)	Description	Hazards
-	Walkway within site	Set at 6.8 mAOD on central Piazza and along western boundary to north-west corner.
0 to 25	Telescopic Bridge	Set at level of at least 7.0 mAOD, but able to traverse “raised” flood defences at 6.9 mAOD
25 to 40	Teddington Lock Footbridge	Ramp on left bank, with constriction in walkway to restrict unauthorized use.
40 to 205	Bridge over lock channel	Elevated well above lock with ramps as alternative to steps.
205 to 465	Path through park	Minimum ground level at base of bridge is 7.2 mAOD. No lighting in park.

Figure B-9 Access/Egress route within the site

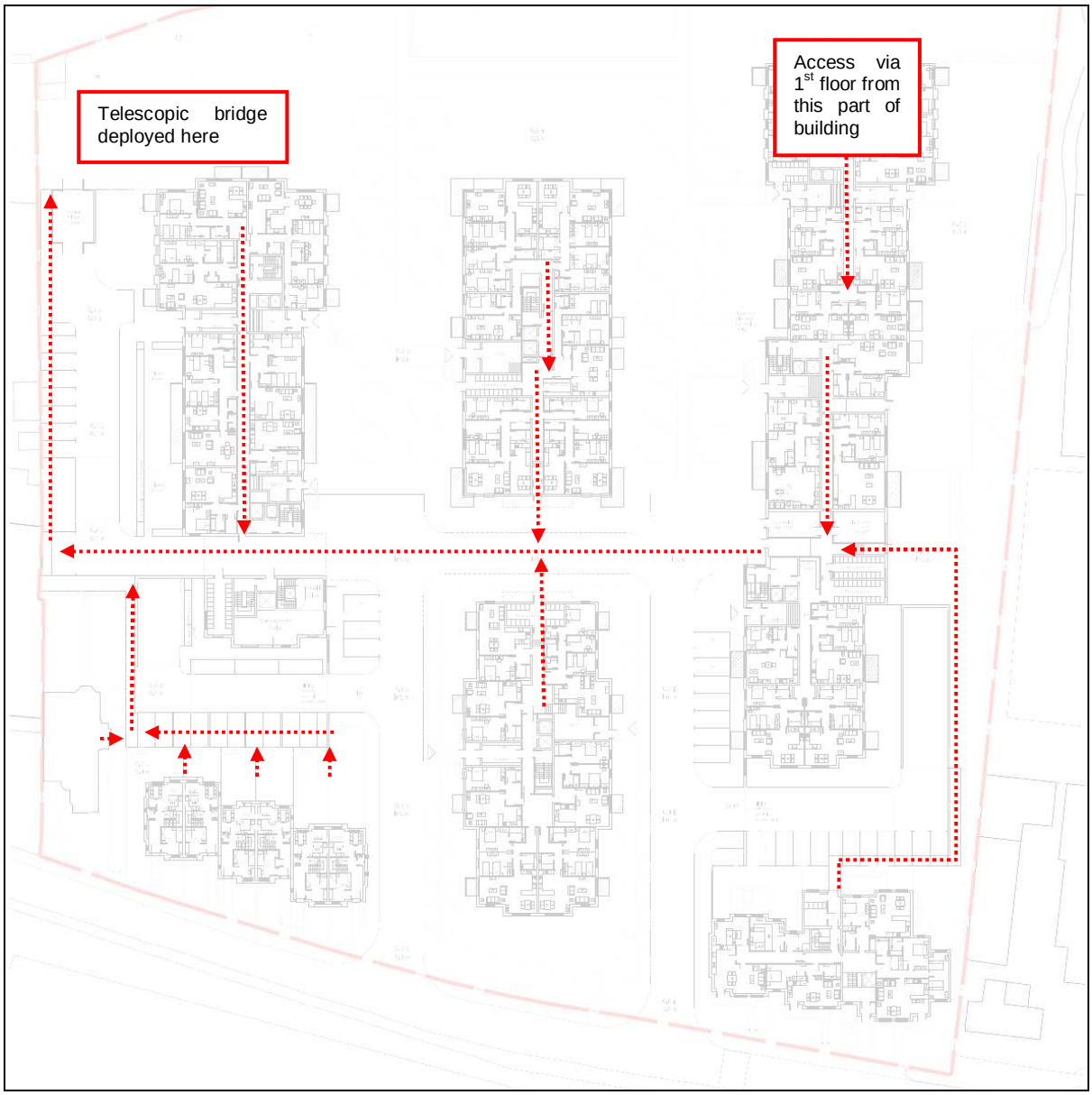


Figure B-10 Teddington Lock Footbridge showing existing access from the Anglers' Arms

Figure B-11 Teddington Lock Footbridge looking south; detail shows ramp and constrictions

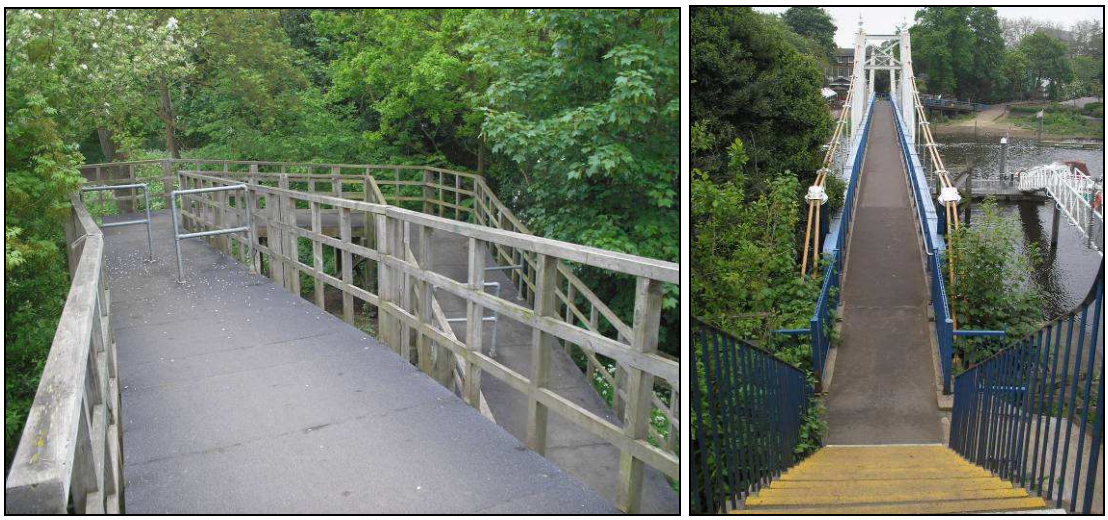


Figure B-12 Access from bridge over Lock to right (northern) bank

Figure B-13 Existing defences on Teddington bank above 6.1 mAOD (5% level at 6.06 mAOD)

Figure B-14 Existing egress from The Anglers to the foot bridge

Figure B-15 Ground levels on Ham bank – note above 1%CC flood level of 6.97 mAOD

B.3.6 On-Site and/or Temporary Refuge

The site will provide a permanent refuge from flooding as the principal residential blocks will all be above the reference design flood level, or provide internal access to higher floors. The Town Houses in Block E whose floor levels are below the reference flood level will feature "flood resistance" measures in the design. The Houses all have upper stories that can provide safe refuge. The ramps at the Broom Road entrance to the site will provide a flexible approach to the site, well able to cope with a range of flood levels. In *extremis*, the existence of the RNLI station just downstream of the site off Twickenham Road as shown in Figure B-16 is reassuring. This is the most upstream of four sites on the tidal Thames and has four boats available.

Figure B-16 Location of Teddington RNLI Station

B.3.7 Actions Post-Evacuation & Post Flood

It is not envisaged that the site would be evacuated, so this Section refers to actions post-Broom Road closure.

Following the reopening of Broom Road, site staff will be responsible for:

- Inspection and replace/repair as required any flood related defences, including demountable barriers, flood resistant doors, non-return valves, flip-up barriers.
- Dismantling of equipment used during the event which will need to be cleaned and checked then either returned or stored.
- Review the areas on the Ham bank used during the flood event
- Inspecting the access/egress route, including the telescopic bridge for any signs of damage, whether due to flooding or not and initiating any repairs that may be required.
- Cleaning of areas affected by flooding eg removal of trash and washing down areas of hard standing and paths
- Debriefing forum at which any key lessons learned from the flood can be raised. Residents' representatives should have an input to this forum.
- Preparation of Post-Event Report dealing with the sequence of events and actions, informed by the debriefing forum and encouraging feedback from residents. The Report should include a Section on Recommended Actions along with any improvements for the Emergency Plan and Warning procedures.

- Key findings from the Report should be communicated to officials from LBRT, Environment Agency and emergency services as required.

Following the reopening of Broom Road, the residents will be able to:

- Relocate their vehicles to the site
- Contribute to the Debriefing forum and Post Event Report (see above) and provide feedback on the flood event and on how procedures can be improved for subsequent events.

The time taken for residents to return to normal will be relatively short following any flood event as, once vehicles have been relocated, the only issues of import will be the washing down of flooded paths and clearance of trash.

B.3.8 Dangers of Flood Water

The proximity of the site to the River Thames means that residents should have some appreciation of the presence of water and associated hazard. This will be reinforced by warning notices at various locations and the provision of appropriate rescue equipment. Warnings should address not only the risk of drowning but also the risk of contact with contaminated flood water and the dangers of underwater obstacles.

B.4 Management of the Flood Emergency Plan

The management of the plan and in particular its updating following a flood event has already been addressed in part through the suggested Debriefing Forum and Post-Event Report. These will provide the basis for updating the Emergency Plan.

The plan will need to be reviewed ahead of any planned raising of the flood defences. This has been indicated as a possibility by the Environment Agency and will have an important consequence on the plan. Whilst flood frequency and impacts will be reduced, the plan should accommodate the reduced frequency and awareness of flood risk, coupled with the consideration for any breaches in the defences.

B.4.1 Business Continuity Plans

The site is wholly residential, so no businesses will be directly affected by the flooding. However, there is likely to be a significant indirect impact given the likely difficulty for people to travel to places of work. In the early stages of a flood, the provision of business continuity will not be a priority. However, following the peak of the flood, there may be scope for provision of business continuity support for those that either cannot reach their normal place of work or for whom this is difficult.

B.4.2 List of Key Contacts

A list of key contacts is given in Table B-7.

B.4.3 Plan Usage and Dissemination

The key actions that are required include:

- Provide all residents with a copy of the Flood Emergency Plan. This will highlight the key sources of information on flooding.
- The Emergency Plan would need to be kept in each residence.

- Maps prominently placed, showing the emergency access route under flood conditions
- Explanatory notes for the flood warnings to be available with the screen information and on the web site.
- Full information will also be available via the internet on warnings and actions.

An annual flood awareness drill should be undertaken and will most likely require closure of the site to members of the public. This will allow a "walk through" of the emergency procedures, from the site to the temporary car park at Ham. This will provide an opportunity to use the telescopic bridge, to show possible water levels under flood conditions, to test the various flood barriers and to highlight potential problem areas.

The drill should be undertaken by Site staff, but it is highly likely that staff from the Environment Agency and LBRT would support and contribute to this event. It could be timed to coincide with awareness campaigns run by the Environment Agency. These are typically in the autumn, which would be appropriate given that the most likely time for fluvial flood extremes is in the winter.

B.4.4 Document Control and Monitoring

This Emergency Plan has been prepared for the scheme as envisaged at the time of Planning Application. The Plan should be updated to reflect the Scheme "as built" and to refine it so that it is suitable for a non-technical readership.

The procedure for updating this plan has been described above. The document would be "owned" by the Site Management staff, who would apply relevant control procedures to ensure key changes were communicated to all residents and updated on the web site.

Table B-5 Flood emergency plan assessment form

Assessment Area/Section	Sub-criteria	Priority	Cross-reference
Scope, objectives and background	Scope, objectives and purpose of Plan	L	B.2.1
Location and proposal	Detailed site description, incl. Location	M	B.2.2
	Source of flooding	M	B.2.2
	Flood zone (SFRA and EA)	M	B.2.2
	Proposed land use/ use of building	M	B.2.2
	Important infrastructure and vulnerable areas, people and equipment	H	??
	Access/egress points	H	B.2.3 f
Risk assessment summary	Satisfactory FRA summary	L	B.2.3 a
	Flood maps	M	Figure B-4
	Flood hazard rating incl. Assessment and maps	H	B.2.3 b and e
	Impact of flooding, incl. Vulnerable people, structures, other hazards etc.	H	B.2.3 f
Mitigation measures	Assessment of potential mitigation measures and products	M	B.2.4
Flood warnings	Assessment of available flood warnings	M	B.3.2
	Advanced warning time	M	B.3.2
Flood alert notices	Dissemination of flooding warnings	M	B.3.3
Actions upon receiving flood alerts and warnings	Site specific escalation plan based on EA flood warning codes	H	B.3.4
	Alert procedures	M	Figure B-6
Safe egress and evacuation routes	Safe access to and from development	H	B.3.5 b
	Evacuation procedures	H	B.3.5 a
	People/property	M	B.3.5 a
	Evacuation routes (shown on map	H	Figure B-7
	Safe place of refuge (shown on map)	H	Figure B-7
	Welfare of people	L	B.3.6
On site and/or temporary refuge	Details of refuge, including on-site and/or temporary	M	B.3.6
	Quality of refuge	L	n/a
	Flood kit	L	n/a
Actions post evacuation	Welfare of people after evacuation	M	n/a
	Contact details of relevant authorities	L	Table B-7
	Post flooding clean up plan	L	B.3.7
After a flood	Estimated time taken for return to normal use	L	B.3.7
	Procedures required post flood	M	B.3.7
Business continuity	Advice to businesses; Continuity plans	L	B.4.1
List of key contacts	List all relevant key contacts	M	Table B-7
Dangers of flood water	Education on dangers of flood water	M	B.3.8
Plan usage and dissemination	Methods to raise plan awareness	M	B.4.3
	Awareness policy	L	B.4.3
	Exercise/test/practice of plan and evacuation	M	B.4.3
Document control	Document monitoring and review plan	L	B.4.4
	Responsibility for plan maintenance	L	B.4.4

Based on APPENDIX 3 – FLOOD EMERGENCY PLAN CHECKLIST & ASSESSMENT CRITERIA, from LBRT (2011)

Table B-6 Interpretation of Environment Agency flood warnings

EA Flood Warning	Explanation	What to do
 **FLOOD ALERT** FLOODING IS POSSIBLE. BE PREPARED.	Flooding of low laying land and roads is expected. Be alert, be prepared, and watch out.	➢ Monitor local news and weather forecasts ➢ Be aware of water levels near you. ➢ Be prepared to act on your flood plan ➢ Check on the safety of pets and livestock ➢ Prepare a flood kit of essential items ➢ Charge your mobile phone
 **FLOOD WARNING** FLOODING IS EXPECTED. IMMEDIATE ACTION REQUIRED.	Flooding of homes and businesses is expected. Act now!	➢ Move cars, pets, food, valuables and important documents to safety. ➢ Get flood protection equipment in place. ➢ Turn off gas, electricity and water supplies if safe to do so ➢ Put flood protection equipment in place ➢ Be prepared to evacuate your home. ➢ Protect yourself, your family and help others. ➢ Act on your flood plan
 **SEVERE FLOOD WARNING** SEVERE FLOODING. DANGER TO LIFE	Severe flooding is expected. There is extreme danger to life and property. Act now!	➢ Stay in a safe place with a means of escape ➢ Be ready should you need to evacuate ➢ Co-operate with the emergency services ➢ Call 999 if you are in immediate danger

Table B-7 List of key Contacts

Organisation	Service	Name/number
Site office		To be advised
Environment Agency	Advice, warnings	Floodline number = 0845 988 1188
Environment Agency	Advice, warnings	http://www.environment-agency.gov.uk/default.aspx
LBRT	Council services	08456 122 660
LBRT	Emergency out of hours	020 8744 2442
Thames Valley Police	Non-emergency enquiries	101
Thames Water	24 hour service	0845 7200 898
Energy	Various	http://www.energynetworks.org/ Gives contacts for all energy companies

Appendix C Allowances for climate change in NPPF

Table C-1 Recommended contingency allowances for net sea level rise

Administrative Region	1990-2025	2025-2055	2055-2085	2085-2115
East of England, East Midlands, London, SE England (south of Flamborough Head)	4.0	8.5	12.0	15.0
South West	3.5	8.0	11.5	14.5
NW England, NE England (north of Flamborough Head)	2.5	7.0	10.0	13.0

Table 4 (p10) from NPPF (DCLG, 2012b)

Notes:

1. For deriving sea levels up to 2025, the 4mm/yr, 3mm/yr and 2.5mm/yr rates (covering the three groups of administrative Regions respectively), should be applied back to the 1990 base sea level year. From 2026 to 2055, the increase in sea level in this period is derived by adding the number of years on from 2025 (to 2055), multiplied by the respective rate shown in the table. Subsequent time periods 2056-2085 and 2086-2115 are treated similarly.
2. Refer to Defra FCDPAG3 *Economic Appraisal Supplementary Note to Operating Authorities – Climate Change Impacts*, October 2006, for details of the derivation of this table. In particular, Annex A1 of this Note shows examples of how to calculate sea level rise.
3. Vertical movement of the land is incorporated in the table and does not need to be calculated separately.

Table C-2 Recommended contingency allowances for rainfall, river flow, wind and waves

Parameter	1990-2025	2025-2055	2055-2085	2085-2115
Peak rainfall intensity	+5%	+10%	+20%	+30%
Peak river flow	+10%	+20%	+20%	+20%
Offshore wind speed	+5%	+5%	+10%	+10%
Extreme wave height	+5%	+5%	+10%	+10%

Table 5 (p11) from NPPF (DCLG, 2012b)

Notes:

1. Refer to *Defra FCDPAG3 Economic Appraisal Supplementary Note to Operating Authorities – Climate Change Impacts, October 2006*, for details of the derivation of this table.
2. For deriving peak rainfall, for example, between 2025-2055 multiply the rainfall measurement (in mm/hour) by 10 per cent and between 2055-2085 multiply the rainfall measurement by 20 per cent. So, if there is a 10mm/hour event, for the 2025-2055 period this would equate to 11mm/hour; and for the 2055/2085 period, this would equate to 12mm/hour. Other parameters in Table B.2 are treated similarly.

Appendix D Pre-Application Response from the Environment Agency

creating a better place

Environment Agency

Dr Paul Webster
HydroLogic Services
18-20 West End Road
Mortimer Common
Reading
RG7 3TF

Our ref: SL/2013/111434/01-L01
Your ref: K0358

Date: 7 August 2013

Dear Dr Webster

Conversion of Teddington studios to residential scheme at Teddington Studios Broom Road, Teddington, Middlesex, TW11 9BE.

Thank you for consulting us at the pre-application stage. Having reviewed the information submitted we would like to highlight the following issues and opportunities that will need addressing.

- Functional Flood Plain
- Sequential test
- Flood risk
- Defence raising and T2100
- Surface water drainage
- Potential for Land Contamination

We look forward to working with and are happy to review any draft reports and attend a meeting to discuss the issues raised. If you have any questions please contact me.

Yours sincerely

Joe Martyn
Planning Advisor

Direct dial 0203 263 8087
Direct e-mail joseph.martyn@environment-agency.gov.uk

Please note that the view expressed in this letter by the Environment Agency is a response to a pre application enquiry only and does not represent our final view in relation to any future planning application made in relation to this site. We reserve the right to change our position in relation to any such application. You should seek your own expert advice in relation to technical matters relevant to any planning application before submission.

Functional Flood Plain
As you are aware the site is partially located in the functional flood plain (FZ3b). Residential development is classified as more vulnerable in Table 2 (Flood risk vulnerability classification) of the Technical Guidance to the National Planning Policy Framework.

Table 1 (Flood zones) sets out the suitability of certain type of development within areas of flood risk. More vulnerable development is classed as inappropriate development in flood zone 3b. Within section 3a of the submitted document Scoping Flood Risk Assessment it is stated that the site is not considered to be is the functional floodplain as the flood defences protect the site to a level above that of the 1 in 20 year flood level. For this argument to be acceptable it should be discussed and agreed with Richmond Local Planning Authority. Functional Flood Plain is defined by LPA's with their strategic flood risk assessment (SFRA's). Until indicated to otherwise by Richmond we will consider this site to fall within 3b.

Within section 3b of the Scoping Flood Risk Assessment it is indicated the flood mapping carried out by your selves has shown that the site falls outside of flood zone 3b. We have not had to opportunity to review this information but are happy to do so to assess it technical accuracy. If the comparison of the modeled flood level and a topographic survey for the site lies outside the 1 in 20 extent we are happy to confirm this. This should then be discussed with Richmond Local Planning Authority to decide if this mean the site falls outside flood zone 3b.

If the site is deemed to fall outside of the functional floodplain to the satisfaction of Richmond Local Planning Authority then the following issues with also need to the considered through a Flood Risk Assessment.

Sequential Test
As highlighted in the document this site will have to undergo the sequential test. We are pleased to see that this is being discussed with the local authority at the earliest possible stage. We will require that evidence of this is submitted at the planning application stage.

Flood Risk
Twickenham Studio is at risk of both tidal and fluvial flooding. The defence levels near Teddington protect against the tidal event up to and including the 1 in 1000 year tidal event. They are lower than the extreme water level during fluvial dominated events. Fluvial levels are expected to reach 7.0 to 7.5m AOD in this area. This will have to be addressed through the FRA.

Defence height
Thames Estuary 2100: Improvements to the Flood Risk Management System - Implementation Guidance states that in the future the defences in this area will need to be raised to 8.9 mAOD, and the FRA should demonstrate that this will be possible for the proposed development.

In addition to planning permission, under the terms of the Water Resources Act 1991, and the Thames Region Land Drainage Byelaws, 1981, the prior written consent from us is required for proposed works or structures, in, under, over or within 16 metres of the landward side of the tidal flood defences.

Built Footprint
It will need to be shown that any increase in built footprint within the 1 in 100 chance in any year including an allowance for climate change flood extent can be directly compensated for, on a volume-for-volume and level-for-level basis to prevent a loss of floodplain storage. Please be aware that if there are no available areas for compensation above the design flood level, then compensation will not be possible and no increases in built footprint will be allowed. The use of voids, stilts or undercroft parking as mitigation for a loss in floodplain storage should be avoided as experience shows that they become blocked over time by debris or domestic effects, and we would recommend to the Local Planning Authority that these are not accepted as methods of compensation.

Finished Floor Level
We require any new developments within the floodplain to ensure that finished floor levels are set no lower than 300millimetres above the 1 in 100 chance in any year including an allowance for climate change flood level, to protect people and the property from flooding. Where this cannot be achieved due to other planning constraints, we request that floor levels are set as high as possible (for extensions to existing buildings, no lower than the existing floor levels) and that flood resilience/resistance measures are considered, where appropriate, up to the design flood level.

Safe Access
During a flood, the journey to safe, dry areas completely outside the 1 in 100 chance in any year including an allowance for climate change floodplain would involve crossing areas of potentially fast flowing water. Those venturing out on foot in areas where flooding exceeds 100millimetres or so would be at risk from a wide range of hazards, including for example unmarked drops, or access chambers where the cover has been swept away. Safe access and egress routes should be assessed in accordance with the guidance document 'FD2320 (Flood Risk Assessment Guidance for New Developments)'. Where safe, dry access cannot be achieved, an emergency flood plan that deals with matters of evacuation and refuge to demonstrate that people will not be exposed to flood hazards should be submitted to and agreed with the local planning authority.

Surface Water Drainage
For sites greater than 1 Hectare in size, a surface water strategy should be carried out as part of a FRA to demonstrate that the proposed development will not create an increased risk of flooding from surface water. The surface water strategy should be carried out in accordance with the National Planning Policy Framework and PPS25 Practice Guide, giving preference to infiltration over discharge to a watercourse, which in turn is preferable to discharge to surface water sewer.

Drainage Scheme Requirements
Infiltration rates should be worked out in accordance with BRE 365. If it is not feasible to access the site to carry out soakage tests before planning approval is granted, a desktop study may be undertaken looking at the underlying geology of the area and assuming a worst-case infiltration rate for that site. If infiltration methods are likely to be ineffective then discharge may be appropriate. In any case the surface water strategy should clearly show that:

- Peak Discharge rates from the site should meet the requirements of Policy 5.13 of the London Plan (July 2011). Policy 5.13 states that: "developers should aim to achieve greenfield runoff from their site through

incorporating rainwater harvesting and sustainable drainage", with a 50% reduction in the runoff rate being the essential standard that must be achieved (London Plan Supplementary Planning Guidance: Sustainable Design and Construction).

- Storage volumes required on site up to a 1 in 100 chance in any year including an allowance for climate change storm event can be provided;
- The site will not flood from surface water up to a 1 in 100 chance in any year including an allowance for climate change storm event, or that any surface water flooding can be safely contained on site up to this event.

Sustainable Drainage Techniques

Any surface water strategy should try to utilise sustainable drainage techniques, in accordance with the SuDS management train (Ciria C609). Guidance on the preparation of surface water strategies can be found in the Defra/Environment Agency publication "Preliminary rainfall runoff management for developments". Guidance on climate change allowances can be found within the National Planning Policy Framework
Technical Guidance.

SuDS are an approach to managing surface water run-off which seeks to mimic natural drainage systems and retain water on or near the site as opposed to traditional drainage approaches which involve piping water off site as quickly as possible. SuDS involve a range of techniques which include soakaways, infiltration trenches, permeable pavements, grassed swales, ponds and wetlands. SuDS offer significant advantages over conventional piped drainage systems in reducing flood risk by attenuating the rate and quantity of surface water run-off from a site, promoting groundwater recharge, and improving water quality and amenity.

The variety of SuDS techniques available means that virtually any development should be able to include a scheme based around these principles.
Further information on SuDS can be found in:

- PPS25 Practice Guide
- CIRIA C522 document Sustainable Drainage Systems – design manual for England and Wales
- CIRIA C697 document SuDS manual

Further Information

Our External Relations Team can provide any relevant flooding information that we have available; the model information included in section 3c for scoping flood risk assessment has been superseded. Please be aware that there may be a charge for this information. Please email: NETenquiries@environment-agency.gov.uk

For further information on our flood map products please visit our website at: www.environment-agency.gov.uk/research/planning/93498.aspx
Strategic Flood Risk Assessments (SFRA) are undertaken by local planning authorities as part of the planning process. The SFRA may contain information to assist in preparing site-specific Flood Risk Assessments (FRA) . Applicants should consult the SFRA while preparing planning applications. Please contact your local authority for further information.

Potential for Land Contamination

We will need a Preliminary Risk Assessment (PRA) to assess if land contamination may be present at the site. This should be submitted with the planning application. The PRA needs to include information on *past and current uses, if sensitive controlled waters receptors are present and if the site could pose a pollution risk.* The PRA should also consider if any aspects of the proposed development could pose a pollution risk should contamination be present (i.e. deep drilling to facilitate the installation of foundation piles, site drainage). Further work such as an intrusive site investigation may be required depending on the findings of the PRA.

We recommend that developers should:

1. Follow the risk management framework provided in CLR11, 'Model Procedures for the Management of Land Contamination', when dealing with land potentially affected by contamination;
2.
3. Refer to our 'Guiding Principles for Land Contamination' documents for the type of information that should be included in a PRA;
4.
5. Refer to our 'Groundwater Protection: policy and practice (GP3)' documents.

Of the drainage options for a site, infiltration techniques (primarily soakaways) pose the highest risk of polluting the groundwater. Some general information is provided below in relation to the use of infiltration techniques. Ultimately, any drainage design must be protective of the groundwater and in line with our 'Groundwater Protection: policy and practice (GP3)' for the use of infiltration techniques to be approved.

- If contamination is present in areas proposed for infiltration, we will require the removal of all contaminated material and provision of satisfactory evidence of its removal;
- The point of discharge should be kept as shallow as possible. Deep bored infiltration techniques are not acceptable;
- The distance between the point of discharge and the groundwater table should be a minimum of five metres;
- Only clean, uncontaminated water should be discharged into the ground.

Advice for developers

We have updated our advice for developers and it is now a joint agency document with advice from Environment Agency, Natural England and Forestry Commission, it's available to view on our website
http://www.environment-agency.gov.uk/business/sectors/136252.aspx

Appendix E Teddington Riverside: Illustrative Landscape Master Plan

Appendix F Teddington Riverside: Landscape Layout

Offices at

Bromyard

Reading

Sheffield

Stirling

Tiverton

Registered office

Hydro-Logic Services LLP
Old Grammar School
Church Street
Bromyard
Herefordshire
HR7 4DP

Registered in England OC381974