

2 Context

2.1 Location

The site is situated at the northern end of the cul-de-sac of Hamilton Road. The location of the site is shown on Drawing PL101 of the Application Drawings. In total the site covers an area of approximately 0.26 hectares.

The northern boundary of the site is the railway line, and the River Crane is to the north of that. The river passes under the railway via a culvert approximately 150m to the west of the site.

2.2 The Development

The site is currently developed with dilapidated industrial Victorian buildings and hard-standing. The proposed development consists of the retention and conversion of the existing buildings, and some new construction, to form 3 small houses, and 24 flats. Drawings of the proposed scheme are bound separately.

2.3 Assessment History

This Flood Risk Assessment accompanies the third application for redevelopment on this site. The second application submitted previously in dated March 2006 included an FRA carried out by Fenland Hydrotech Ltd., Report Reference FH1286 dated April 2006. This report determined that the site is in Flood Zone 2 (Low to Medium Risk – Developed Areas) as defined by PPG 25 and concluded that the development would not impede flood flow, would not result in a net loss of floodplain, and would not adversely impact flood risk within or external to the site. It also calculated storm water storage required on site and concluded that there would not be any uncontrolled flooding in a 100 year return period storm.

The Environment Agency were consulted in respect of that application and withdrew their objection to the application on consideration of that FRA, in a letter to L.B. Richmond dated 5th June 2006.

Since that time, PPS 25 has superseded PPG 25, and the EA have completed a more accurate fluvial modelling of the River Crane.

The modelling results were provided to Barnard And Associates in a letter of 28th April 2008. The results are copied in Appendix 1. Barnard And Associates made an evaluation of the levels provided by this modelling in a letter to the EA of 30th April, concluding that the site is mostly in Zone 1 and marginally in Zone 2. The EA replied in a letter of 12th May, requesting an FRA for the development, on the mistaken basis that the site was in Zone 3. This correspondence is copied in Appendix 2.

This FRA stands on its own, and supersedes that of April 2006 in the following manner;

- The site levels are compared to the more accurate predicted flood levels now available
- The Sequential Test of PPS 25 is applied instead of PPG 25
- The built form and the areas of hard and soft landscaping are updated
- Storm water storage required is recalculated.

2.4 Flood Zone Categories

Annex D of PPS25 categorises flood risk into different zones, which are described below. These are illustrated on the Environment Agency's flood zone maps. These maps and the associated information are intended for guidance, and cannot provide details for individual properties. They do not take into account other considerations such as existing flood defences, alternative flooding mechanisms and detailed site based surveys. They do, however, provide high level information on the type and likelihood of flood risk in any particular area of the country. The flood zones are classified as follows:

- Zone 1 – Low probability of flooding – This zone is assessed as having less than a 1 in 1000 annual probability of river or sea flooding in any one year.
- Zone 2 – Medium probability of flooding – This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding or between 1 in 200 and 1 in 1000 annual probability of sea flooding in any one year.
- Zone 3a – High probability of flooding - This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding or 1 in 200 or greater annual probability of sea flooding in any one year.
- Zone 3b – The Functional Floodplain – This zone comprises land where water has to flow or be stored in times of flood and can be defined as land which would flood during an event having an annual probability of 1 in 20 or greater. This zone can also represent areas that are designed to flood in an extreme event as part of a flood alleviation or flood storage scheme.

3 Flood Risk on Site

3.1 Sources of Flooding

The main categories of flooding are discussed below and the risks summarised in Table 1.

Flooding from Rivers – The site lies south of the River Crane and northwest of the River Thames. In their letter of 12th May, the Environment Agency consider the site to be in Flood Zone 3. The EA's current flood map, shown in Figure 1 of Section 3.5 below indicates it is in Zone 1, although in the previous FRA the equivalent map of June 2006 showed it to be in Zone 2. Clearly, flooding from rivers is a risk to be considered.

Flooding from the Sea - The affects of flooding from the sea are not considered in this appraisal.

Flooding from Land (overland flow and surface water runoff) – This typically occurs in low spots where water may pond. Inspection of the site shows that land around it is nearly level, and falls naturally across it and that there are no low-spots that would result in floodwater ponding. It is therefore considered that flooding through this mechanism is unlikely in this area. There is also no historical evidence that suggests that overland flow has been the cause of flooding in this area in the past.

Flooding from Groundwater - Water levels below the ground rise during wet winter months, and fall again in the summer as water flows out into rivers. In very wet winters, rising water levels may lead to the flooding of normally dry land. Inspection of data on groundwater flooding compiled by the British Geological Society shows that the general area in which the development site lies is identified as being at low risk from groundwater flooding.

The Defra Groundwater Flood Scoping Study (May 2004), shows that no groundwater flooding events were recorded during the very wet periods of 2000/01 or 2002/03 and that the site itself is not located within an area where groundwater emergence is predicted. It is considered that the site-specific risk of groundwater flooding is low.

Flooding from Sewers – In urban areas, rainwater is frequently drained into surface water sewers or sewers containing both surface and wastewater known as "combined sewers". Flooding can result when the sewer is overwhelmed by heavy rainfall, becomes blocked or is of inadequate capacity, and will continue until the water drains away.

There are no known records of flooding from sewers in this area. The drainage records of the local streets show that in this area the storm and foul sewers are not combined, but separate. Additionally, the topography of the land within the site and the surrounding area suggests that any above ground flooding that might occur as a result of a surcharged sewer would not pond at the site. The risk of flooding from this source is therefore considered to be low.

A flow limiting brake in the head manhole will control storm water runoff of the new development, and adequate storm water storage will be provided on site to help prevent flooding off site.

Table 1 – Summary of flood sources and risks (* denotes the principal flood risk to the site)

Source of flooding	Initial Level of risk	Appraisal method applied at the initial flood risk assessment stage
Rivers	Low *	Environment Agency flood zone maps
Sea/Estuaries	Low	Environment Agency flood zone maps
Overland flow	Low	Site based appraisal and historical evidence
Groundwater	Low	BGS groundwater flood hazard maps, Defra Groundwater Flood Scoping Study and site specific geological data
Sewers	Low	Site based appraisal and TWU maps

3.2 Flood Mechanism

The most likely flood mechanism for the site is from the River Crane.

The River Crane crosses under the railway tracks upstream to the west of the site and then passes the site on the north side of the railway. The railway is raised and provides a natural flood barrier between the River Crane and the development site.

Notwithstanding the railway barrier, as the River Crane passes the development site, its water levels fall significantly below the development site (nodes C527 through to C533).

Therefore, the specific mechanism of potential flooding for the site would be from the upstream weir approximately 150m west of the site before the River Crane passes under the railway.

The water level relevant to the site is taken as the highest point of the weir (node C535).

3.3 Climate Change

PPS 25 requires that climate change be taken into account when appraising flood risk to new development. Para B9 of Annex B state "In making an assessment of the impacts of climate change on flooding from the land, rivers and sea as part of a flood risk assessment, the sensitivity ranges in Table B.2 may provide a appropriate precautionary response to the uncertainty about climate change impacts on rainfall intensities, river flow, wave height and wind speed."

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

PPS 25, Annex B, Table B.2 Recommended national precautionary sensitivity ranges for peak rainfall intensities, peak river flows, offshore wind speeds and wave heights.

When assessing flood levels, the level data from the Environment Agency modelling with 20% increase in peak river flow has therefore been used.




3.4 Risk Assessment

Local Planning Authorities (LPA) are encouraged to take a risk-based approach to proposals for development in or affecting flood risk areas through the application of the Sequential Test. The objectives of this test are to steer new development away from high-risk areas towards those at lower risk of flooding.

PPS25 states that the Sequential Test should be applied at all stages of the planning process, starting with the Environment Agency's flood zone maps, then considering the Borough's Strategic Flood Risk Assessment (SFRA) and finally the location and design of development within the site.

3.5 Environment Agency Flood Zone Map

The flood zones are classified as follows:

- Zone 1 – Shown not coloured - Low probability of flooding – This zone is assessed as having less than a 1 in 1000 annual probability of river or sea flooding in any one year.
- Zone 2 – Shown Light blue  - Medium probability of flooding – This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding or between 1 in 200 and 1 in 1000 annual probability of sea flooding in any one year.
- Zone 3a - Shown Dark blue  – High probability of flooding - This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding or 1 in 200 or greater annual probability of sea flooding in any one year.
- Zone 3b – Also shown Dark blue  – The Functional Floodplain – This zone comprises land where water has to flow or be stored in times of flood and can be defined as land which would flood during an event having an annual probability of 1 in 20 or greater.

The location of the site is shown on the Environment Agency's flood zone map of August 2008 in Figure 1 below.

The Environment Agency map shows that the site falls outside the shaded zones for flooding.

Figure 1 – Current Flood Zone map showing the location of the development site
(© Environment Agency).



Application site outlined in red.

3.6 Strategic Flood Risk Assessment

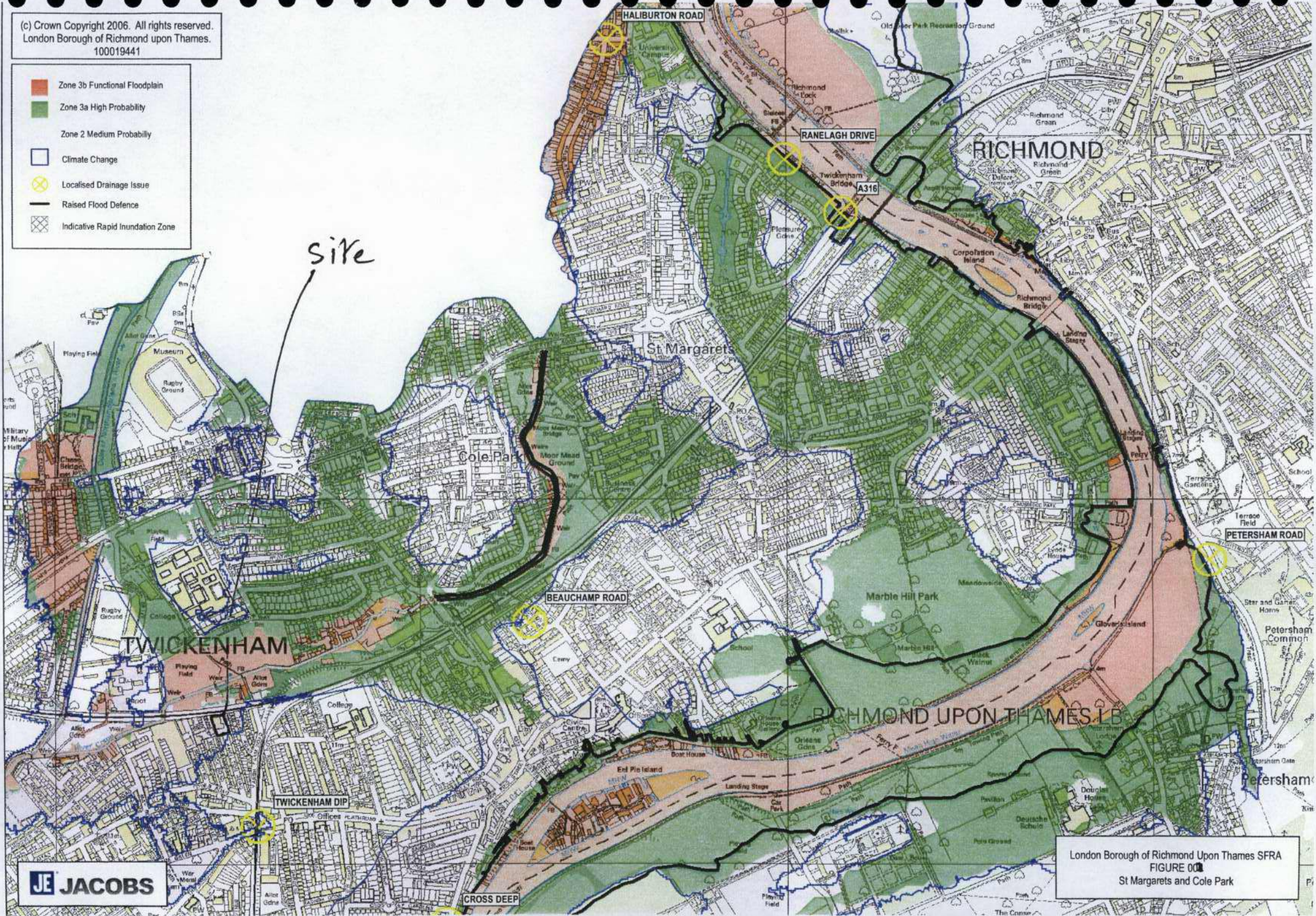
The second level of appraisal is through the consideration of a Local Authority's Strategic Flood Risk Assessment (SFRA). Such a document has been prepared for the London Borough of Richmond. This site is in Character Area R5 – St Margarets & Cole Park. The detailed map for this Character Area is shown at Figure 2 below and shows the site to be outside the shaded areas of Zones 2 or 3 but within the area that could be affected by climate change. It does not provide any more detailed information on flood risk and hazard. Therefore, to be cautious, it is assumed that the site is treated as Zone 2 after the application of increased fluvial flow rates due to climate change.

Figure 2 (overleaf) – Extract from London Borough of Richmond Strategic Flood Risk Assessment

Character Area R5 – St Margarets & Cole Park - Map

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London Borough of Richmond upon Thames.
100019441

- Zone 3b Functional Floodplain
- Zone 3a High Probability
- Zone 2 Medium Probability
- Climate Change
- Localised Drainage Issue
- Raised Flood Defence
- Indicative Rapid Inundation Zone



site

JE JACOBS

London Borough of Richmond Upon Thames SFRA
FIGURE 00
St Margaret's and Cole Park

3.7 Site Specific Data

The most detailed stage at which the Sequential Test can be applied is at a site-based level. A topographical survey of the site has been carried out to provide accurate ground levels, and the design proposal includes accurate proposed surface and building levels.

The more recent fluvial modelling of the River Crane carried out by the Environment Agency enables a comparison between these site levels and the predicted flood levels. The information that has been provided by the Environment Agency for this FRA contains water levels for a range of return period events and for a number of different locations along the watercourse.

The predicted flood levels are shown on the Table of Appendix 1, and the locations of the nodes for the level data are shown on the Figure of Appendix 1. For the most appropriate location for the subject site, which is just upstream of the culvert that passes under the railway line, this information is summarised in Table 2 below.

Table 2 – Modelled flood levels

Annual probability	Water level (m AOD)
1 in 50 year (2% annual probability)	9.536
1 in 100 year (1% annual probability)	9.573
1 in 100 year + 20% allowance for climate change	9.628
1 in 1,000 year (0.1% annual probability)	9.854

In particular, the 1 in 100 year flood level, with 20% increase in flow rate for climate change, at the upper node above where the River Crane passes under the railway, is predicted to be 9.628m AOD. The levels of the existing site vary from 9.78m AOD in the north, nearest the river, to 10.08m AOD in the south. The site is therefore completely outside the area which could be expected to flood in a 1 in 100 year event, and is therefore outside Zone 3.

The Environment Agency flood level data for a 1 in 1,000 year event at this node, at 9.854m AOD, shows a small part of the existing surface could be below that flood event level, and so at least that part of the site is in Zone 2. The site is fairly level but falls slightly from South to North, and in effect the boundary between Zones 1 and 2 runs through the site.

The site is too small, and the building form too constrained, for separate assessment of the buildings to be sensible. For purposes of risk analysis, we therefore consider all of the site to be in Zone 2, in accordance with published information from both the Environment Agency and the London Borough of Richmond.

3.8 Vulnerability

PPS 25 requires Local Planning Authorities to apply the Sequential Test of Annex D. As part of this process it is necessary to consider the type and nature of the development. Table D.2 in PPS25 classifies types of different developments while table D.3 defines their flood risk vulnerability. These have been combined in Table 3 below.

Table 3 - Flood risk vulnerability and flood zone compatibility

Flood Risk Vulnerability Classification	Zone 1	Zone 2	Zone 3a	Zone 3b
Essential infrastructure – Essential transport infrastructure, strategic utility infrastructure, including electricity generating power stations	Y	Y	E	E
High vulnerability – Emergency services, basement dwellings, caravans and mobile homes intended for permanent residential use	Y	E	N	N
More vulnerable – Hospitals, residential care homes, buildings used for dwelling houses, halls of residence, pubs, hotels, non residential uses for health services, nurseries and education	Y	*Y	E	N
Less vulnerable – Shops, offices, restaurants, general industry, agriculture, sewerage treatment plants	Y	Y	Y	N
Water compatible development – Flood control infrastructure, sewerage infrastructure, docks, marinas, ship building, water-based recreation etc.	Y	Y	Y	Y
Key : Y - Development is appropriate N - Development should not be permitted E - Exception test required	* the classification of this development			

From Table 3 above it can be seen that the Zone and use fall into a classification for which development is appropriate, and does not require the Exception Test to be applied.

Based on the predicted flood level for the 1 in100 year return event plus climate change flows in the River Crane that have been supplied by the Environment Agency it can be seen that the site is entirely above the flood level.

3.9 Rate of Rise of Floodwater

Given that the site itself is not affected by the 1 in 100 year flood, the rate and speed of flooding is not of direct concern, however, in the surroundings areas that are more lower-lying than the site, it is likely that the onset of flooding will be relatively rapid once water levels overtop the banks of the river.

As well as the source of flooding, the size and nature of the flood compartment has a major influence on the rate of rise of the floodwaters. For a small, steep sided compartment, the rate of rise will be rapid, whereas for a compartment that is relatively large with respect to the source of flooding and has shallow sloping sides, the rate of rise will be more gradual. The River Crane's flood compartment in this general location fits the description of the latter.

4 Proposed Mitigation

4.1 Raising Floor Levels & Land Raising

The Environment Agency recommends that the minimum floor level of buildings at risk of flooding should be 300mm above the flood level for the 1 in 100 year event plus climate change, to take into account inaccuracies in the flood modelling and to provide a freeboard for localised wave action. The design ground floor level is set at 9.930m AOD 300mm, which is more than 300mm above the design flood level. Consequently no special arrangements are required.

4.2 Storm Water Disposal

The requirements of PPS25 for managing rainfall runoff from developments depend on the pre-developed nature of the site. If it is an undeveloped green-field site then the impact of the development will need to be mitigated so that the runoff from the site replicates the natural drainage characteristics of the pre-developed site. In the case of brown-field sites, drainage proposals will be measured against the existing performance of the site, although it is preferable for solutions to provide runoff characteristics that are closer to green-field behaviour.

The relevant areas of the site and the proposed development are set out below in Table 4.

Table 4 – Site areas affecting rain fall runoff

Areas	Existing (ha)	Proposed (ha)	Difference (ha)	Difference (% of total area)
Impermeable	0.213	0.084	-0.132	-56%
Porous paving	0.000	0.101	+0.101	+43%
Soft Landscaping	0.020	0.048	+0.028	+12%
Total area of site	0.233	0.233	0.000	0%

From the above figures it can be seen that the proposed increase in the area of soft landscaping and the substitution of permeable paving for much of the currently impervious paving within the boundaries of the site will decrease the volume of surface water runoff from the site.

This is beneficial in terms of the risk of flooding to the development and the rest of the flood risk area and further attenuation or control is not strictly required. However, PPS25 does encourage all development to reduce flood risk wherever reasonably practicable, therefore techniques for further reducing runoff are discussed below.

4.3 Storm Water Run-off Attenuation

Many techniques for Sustainable Drainage Systems (SUDs) will not be appropriate for a small development such as this. However, incorporating porous paving will reduce the quantity of water passed into the sewerage network.

In addition, it is proposed to install a flow limiting brake in the head manhole to control the rate of discharge of storm water runoff, and combine this with storm water storage on site. The system will be designed to limit the rate of discharge into the sewers to a level to be agreed with the Environment Agency. This will help prevent flooding external to site.

4.4 Displacement of Floodwater

The construction of new buildings within the 1 in 100 year floodplain has the potential to displace water from that area and to increase flood risk elsewhere. PPS 25 therefore requires that any displacement volume that has the potential to increase risk elsewhere be compensated for as part of a compensatory flood storage scheme.

The proposed development is located outside of the floodplain and consequently is not subject to that requirement.

4.5 Impact on Flood Flows

The development site is a significant distance from the River Crane and is not within the functional flood plain. It is considered that the development will not significantly impede or change flood flow regimes.

4.6 Residual Risk

If the design event were to be exceeded, the result would be increased water levels. Whilst events in excess of the 100 year event have not been quantified by the Environment Agency's model, it could be conservatively estimated that a 1000 year event may result in floodwater reaching the site. However, given the topography and the shallow nature of the flood compartment, it is unlikely that deep flooding will occur on this site.

For this development it has been shown that the proposed development will have ground floor levels that are above the 1 in 100 year flood level and therefore the use of flood resilient construction is not essential.

4.7 Public Safety and Access

PPS25 states that, where required, safe access and escape is available to/from new developments in flood risk areas. The Practice Guide goes on to state that access routes should be such that occupants can safely access and exit their dwellings in design flood conditions and that vehicular access to allow the emergency services to safely reach the development will also normally be required.

This site is located above the design flood level and consequently safe access and escape from the dwellings can be achieved without special measures. The surface levels in Hamilton Road are similar to the site and rise up with distance southwards. It is therefore concluded that there will be a safe dry access from the site during the extreme event throughout the lifetime of the development.

5 Conclusions

The risk of flooding has considered across a wide range of sources and it has been shown that only the risk of fluvial flooding is significant.

The site is elevated above the 1 in 100 year flood level even when the impacts of climate change are taken into consideration.

The proposed development is situated within a Zone 2 flood risk area and is a development type that is classified as being 'appropriate'.

This FRA has demonstrated that with this development will be safe and will not increase flood risk elsewhere.

The proposals are therefore considered to be fully compliant with PPS25.

Hamilton Lofts Ltd.

Proposed Development
At
37 Hamilton Road, Twickenham

Flood Risk Assessment

Final Report

APPENDIX ONE

ENVIRONMENT AGENCY MODELLED LEVELS

August 2008

04086



Mr Edwards via email

Our ref: NE16300MR
Date: 28 April 2008

Dear Mr Edwards

Enquiry regarding Hamilton Road, Twickenham

Thank you for your enquiry.

Please find attached modelled levels for the above site.

This enquiry is now complete and I would like to thank you

If I can be of any further help, please contact me.

Yours sincerely

Michelle Robbins
External Relations Officer
Direct dial 01707 632 319
Direct fax 01707 632 610
Direct email thnortheast@environment-agency.gov.uk

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(Standard Notice – Commercial)

creating a better place



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Environment Agency ref: NE16300MR

The following information has been extracted from the Crane Flood Mapping Study, Halcrow (2008)
 This is a catchment wide flood risk mapping study and not designed to look at flood risk at individual sites
 Some modifications in the area of interest may be needed, such as the addition of extra cross sections

All flood levels are given in metres Above Ordnance Datum (mAOD)

MODELLED FLOOD LEVEL



Node Label	Easting	Northing	Watercourse	Return Period					
				5yr	10yr	20yr	50 yr	100 yr	100 yr + 20%
C538	515124	173311	Crane	9.611	9.683	9.718	9.754	9.788	9.838
C537	515163	173341	Crane	9.575	9.649	9.685	9.722	9.757	9.808
C537d	515163	173341	Crane	9.501	9.574	9.61	9.646	9.681	9.732
C536	515203	173360	Crane	9.462	9.537	9.573	9.61	9.645	9.698
C535	515294	173393	Crane	9.383	9.46	9.497	9.536	9.573	9.628 *
C534	515296	173397	Crane	9.353	9.43	9.467	9.506	9.543	9.598
C533	515293	173409	Crane	9.153	9.209	9.236	9.263	9.289	9.329
C532u	515341	173452	Crane	9.091	9.147	9.173	9.2	9.227	9.267
C532d	515341	173452	Crane	8.989	9.042	9.068	9.093	9.119	9.158
C531	515346	173453	Crane	8.982	9.035	9.061	9.086	9.112	9.151
C531d	515346	173453	Crane	8.982	9.035	9.061	9.086	9.112	9.151
C530	515432	173485	Crane	8.912	8.964	8.99	9.015	9.041	9.08
C530d	515432	173485	Crane	8.912	8.964	8.99	9.015	9.039	9.073
C529u	515460	173500	Crane	8.878	8.929	8.955	8.98	9.004	9.038
C529d	515460	173500	Crane	8.479	8.526	8.548	8.571	8.592	8.623
C528	515504	173513	Crane	8.425	8.471	8.494	8.516	8.537	8.568
C527	515506	173513	Crane	8.431	8.478	8.5	8.523	8.544	8.575
C526	515584	173537	Crane	8.27	8.316	8.339	8.362	8.383	8.413
C525	515698	173562	Crane	8.046	8.093	8.115	8.138	8.159	8.191
C524	515791	173605	Crane	7.819	7.866	7.889	7.913	7.935	7.968

1000yr
10.053
10.027
9.948
9.915
9.854
9.822
9.461
9.433
9.324
9.317
9.3
9.231
9.195
9.161
8.778
8.729
8.736
8.601
8.349
8.14



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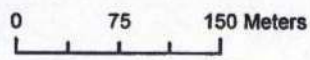
Environment Agency
 2 Bishops Square Business Park
 St Albans Road West
 Hatfield
 Hertfordshire
 AL10 9EX

River Crane Node Map,
 Hamilton Rd, Twickenham,
 TW2 6SN

Ref : NE16300MR
 Grid Ref : 515482 173312
 25th April 2008

Legend

- River Crane
- Node Layer



Produced by:
 Flood Risk Mapping & Data Management
 Thames Region (North East Area)

Hamilton Lofts Ltd.

Proposed Development
At
37 Hamilton Road, Twickenham

Flood Risk Assessment

Final Report

APPENDIX TWO
CORRESPONDENCE

August 2008