

# **LONDON BOROUGH OF HOUNSLOW SMALL SITES SMALL BUILDERS PROGRAMME**

## **GARAGE BLOCK AT GARTH COURT, CHISWICK, W4 4QL**

### **Flood Risk Review**

10030793-ARC-XX-XX-RP-CW-0106-01-Flood Risk Review

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Author Kathryn Hooley

Checker Ian Joyner

Approver Ian Joyner

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## VERSION CONTROL

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## Executive Summary

The site (garage block at Garth Court), which is currently predominantly occupied by garages and hardstanding, is part of London Borough of Hounslow's Small Sites Small Builders Programme, and hence may be considered for potential future redevelopment with residential uses.

Flood risk to the site from a range of potential sources has been considered in this Flood Risk Review. The site is located in the theoretical floodplain of the River Thames and is located in Flood Zone 3 on the Flood Map for Planning (Rivers and the Sea). As a result of the high level of protection provided by flood defences, the site has a 'very low' risk of flooding from rivers and the sea, equivalent to an annual chance less than 1 in 1,000 (0.1%). No other local sources of flooding are considered to pose an onerous risk to the site in the context of its potential redevelopment.

According to the National Planning Policy Framework, a Flood Risk Assessment (FRA) would be necessary to support future redevelopment of the site due to its location in Flood Zone 3. The Planning Practice Guidance indicates that the site would be suitable for most types of development, including residential uses. Confirmation from the EA is awaited as to whether the site is within the area considered at residual risk of flooding should the Thames Tidal Defences breach during a major flood. While this would not alter the overall likelihood of flooding, it may mean that further mitigation measures are required to achieve planning approval at the site.

Alongside an FRA, a Drainage Strategy should also be prepared to support future redevelopment of the site to ensure that proposals meet national and local requirements and off-site flood risk is not increased as a result of redevelopment proposals.

# 1 Introduction

## 1.1 Background

Arcadis Consulting (UK) Limited ('Arcadis') has been commissioned by the London Borough of Hounslow (LBH) ('the Client') to undertake technical surveys for a garage block at Garth Court, Chiswick, London, W4 4QL ('the site').

The site is being considered for divestment under the Client's Small Sites Small Builders Programme, which aims to enable positive regeneration. This Flood Risk Review is required to document the risk of flooding and consider potential constraints on future redevelopment, which may include residential uses.

## 1.2 Aim and Objectives

The aim of this Flood Risk Review is to assess and document the potential risk of flooding to the site from all sources (including rivers, the sea, surface water, groundwater and artificial sources) in the context of the site's future development.

Specific objectives of the Flood Risk Review are to:

- Review available sources of published flood risk data, supplemented by targeted data collection/consultation with the Environment Agency (EA) and the applicable Lead Local Flood Authority (LLFA).
- Consider all relevant forms of flood risk (e.g. rivers, the sea, surface water, groundwater and artificial sources), with a risk rating assigned (e.g. HIGH, MEDIUM, LOW) to each form of flooding.
- Confirm the site's Flood Zone designation and consider NPPF<sup>1</sup> acceptability in accommodating residential development, with reference to the Sequential and Exception Tests.

No site inspection, topographic survey or flood estimation/modelling has been undertaken by Arcadis to inform this desktop review.

## 1.3 Data Sources

The following data sources have informed the preparation of this Flood Risk Review:

- EA lidar topographic data (2m tiles TQ17NE and TQ27NW) (Ref. 1)
- EA Long Term Flood Risk Maps, including the 'Risk of Flooding from Rivers and Sea Map', 'Risk of Flooding from Surface Water Map' and 'Risk of Flooding from Reservoirs Map' (Ref. 2)
- EA 'Flood Map for Planning (Rivers and Sea)' (Ref. 3)
- EA 'Recorded Flood Outlines dataset (Ref. 4)
- LBH Strategic Flood Risk Assessment (SFRA) (Ref. 5)
- LBH Preliminary Flood Risk Assessment (PFRA) (Ref. 6) and Addendum (Ref. 7)
- LBH Local Flood Risk Management Strategy (LFRMS) (Ref. 8)
- LBH Surface Water Management Plan (SWMP) (Ref. 9)
- West London SFRA (Ref. 10)
- British Geological Survey (BGS) Geology of Britain Viewer (Ref. 11)
- Defra Magic Maps (for EA Aquifer Designations) (Ref. 12)

## 1.4 Terminology

Flood risk is a product of both the likelihood and consequences of flooding. Throughout this report, flood events are defined according to their likelihood of occurrence. Floods are described according to an 'annual chance', meaning the chance of a particular flood occurring in any one year. This is directly

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<sup>1</sup> A summary of NPPF requirements with respect to flood risk is included in Appendix A.

linked to the probability of a flood. For example, a flood with an annual chance of 1 in 100 (a 1 in 100 chance of occurring in any one year on average), has an annual probability of 1%.

## **1.5 Limitations**

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## 2 Site Overview

### 2.1 Site Description

The site is located at approximate National Grid Reference TQ205780 within the generally urban setting of Hounslow. It occupies an area of approximately 0.03 hectares (ha) and is roughly rectangular on plan, as illustrated in Figure 1.

Great West Road/Ellesmere Road is a dual carriageway that runs adjacent to Garth Court, south of the site. The site is bounded to the south by Garth Court, to the east by Garth Road and by residential buildings to the north and west. It is accessed off Garth Court and is currently occupied by garages and hardstanding.



Figure 1 - Site Location (site outlined in red)

Contains Ordnance Survey data © Crown copyright and database right 2019

### 2.2 Site Topography

Lidar data, shown in extract in Figure 2, indicates that the site is at levels of approximately 6.3-6.7m Above Ordnance Datum (AOD). The site is generally flat although ground levels lowest (6.3-6.5m AOD) in the south-western corner and the centre of the site. Ground levels are highest (6.6-6.7m AOD) along the eastern boundary of the site.

Off-site, ground levels are also generally flat albeit there is a small slope from east of Ellesmere Road (where the ground levels are higher) to west (where the ground levels are lower). The prevailing topography tends to slope downwards to the south-west towards the River Thames.



**Figure 2 – Site Topography (filtered LiDAR data; site boundary outlined in red)**

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### 3 Sources of Flood Risk

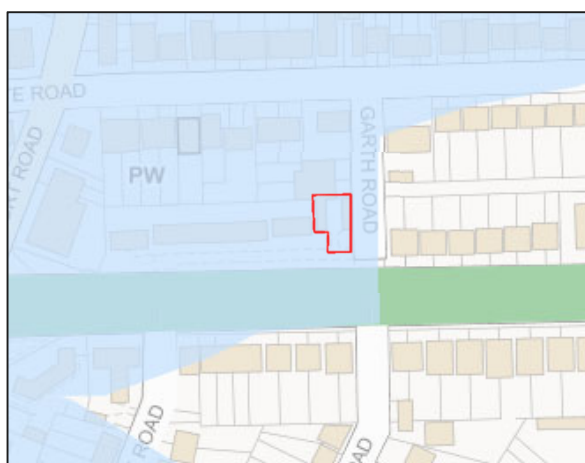
#### 3.1 Flooding from Rivers and the Sea

##### Catchment Overview

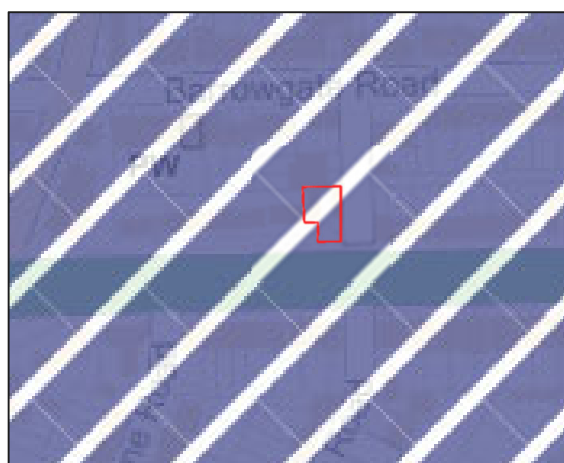
The site is located in the catchment of the River Thames, which drains a total area of approximately 12,935km<sup>2</sup>. The River Thames, which is tidal through this part of West London, flows in south-easterly direction approximately 1km south-west of the site and the River Brent (and Grand Union Canal) discharges to the River Thames over 1.5 km upstream.

##### Flood Mapping

The Risk of Flooding from Rivers and Sea Map is informed by the EA National Flood Risk Assessment (NaFRA), which takes account of flood defence survey information and modelled river levels, factoring in a risk of overtopping of failure of raised defences where they exist, to provide a probabilistic assessment of flooding on a relatively coarse 50m grid. The Flood Map for Planning (Rivers and Sea), which is intended to inform the planning process, does not account for the impact of flood defences, but is created using detailed flood modelling (where available). The map also shows areas benefitting from defences. Extracts of these maps are shown in Figure 3 and Figure 4 respectively.



**Figure 3 – Risk of Flooding from Rivers and Sea Map**  
Contains Environment Agency information © Environment Agency and/or database right



**Figure 4 – Flood Map for Planning (Rivers and Sea)**  
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The Risk of Flooding from Rivers and Sea Map estimates the risk of flooding to the site to be 'very low', equivalent to an annual chance of flooding less than 1 in 1,000 (0.1%).

The Flood Map for Planning (Rivers and Sea) shows the site is located in Flood Zone 3, equivalent to an annual chance of flooding from the tidal River Thames greater than 1 in 200 (0.5%). The tidal floodplain associated with the River Thames is shown to be an 'area benefiting from defences' (ABD). This illustrates that the EA considers the flood defences that protect the site provide protection equivalent to, or in excess of, the 1 in 200 (0.5%) tidal flood that defines Flood Zone 3 in this area.

The tidal nature of the River Thames through central London means that a tidal flood for any given flood frequency results in significantly higher water levels than an equivalent fluvial flood originating upstream. There is significant capacity for the tidal River Thames to convey fluvial flow such that the risk of flooding from rivers is not considered further in this review, and the remainder of this section focuses on the risk of flooding caused by high tides and storm surges originating at sea.

## Historical Flooding

Historical fluvial flood events are listed in the LFRMS and mapped in the PFRA. According to the LFRMS, small areas of Hounslow were exposed to fluvial flooding in the event of overflows from the rivers Brent and Crane (flooding of the latter has occurred in 1965 and 1999). Mapping in the PFRA shows that there are no records of fluvial flooding at the site and this is corroborated by the EA's Recorded Flood Outline dataset.

## Flood Defences

Today the site is protected from flooding by flood defences including raised river walls and the Thames Barrier, known collectively as the Thames Tidal Defences.

The Thames Tidal Defences were constructed in stages over the last century, with the major flood of 1953 prompting construction of the Thames Barrier and a substantial increase in the level of protection provided to London. The defences are considered to protect against a tidal flood event with an annual chance of 1 in 1,000 (0.1%) up to 2030, after which climate change is expected to slowly reduce the level of protection unless further improvements are made.

The approved Thames Estuary 2100 (TE2100) Plan (Ref. 13) details the proposed improvements that will be made to the Thames Tidal Defences, including raising river walls along the banks of the River Thames, to preserve the high standard of protection afforded to the site and surroundings to 2100 and beyond. It is a reasonable assumption, given the amount of property and infrastructure at risk within the tidal floodplain through London, that the recommended works will be undertaken by the EA.

As a result of the Thames Tidal Defences and the approved TE2100 Plan, the site has a 'very low' risk of flooding from rivers and the sea, equivalent to an annual chance less than 1 in 1,000 (0.1%) both in the present day and in future taking account of potential climate change.

## Residual Risk of Flooding

Despite the high level of protection provided by the Thames Tidal Defences, a residual risk of flooding remains should a breach occur in the raised flood defences coincident with a major flood.

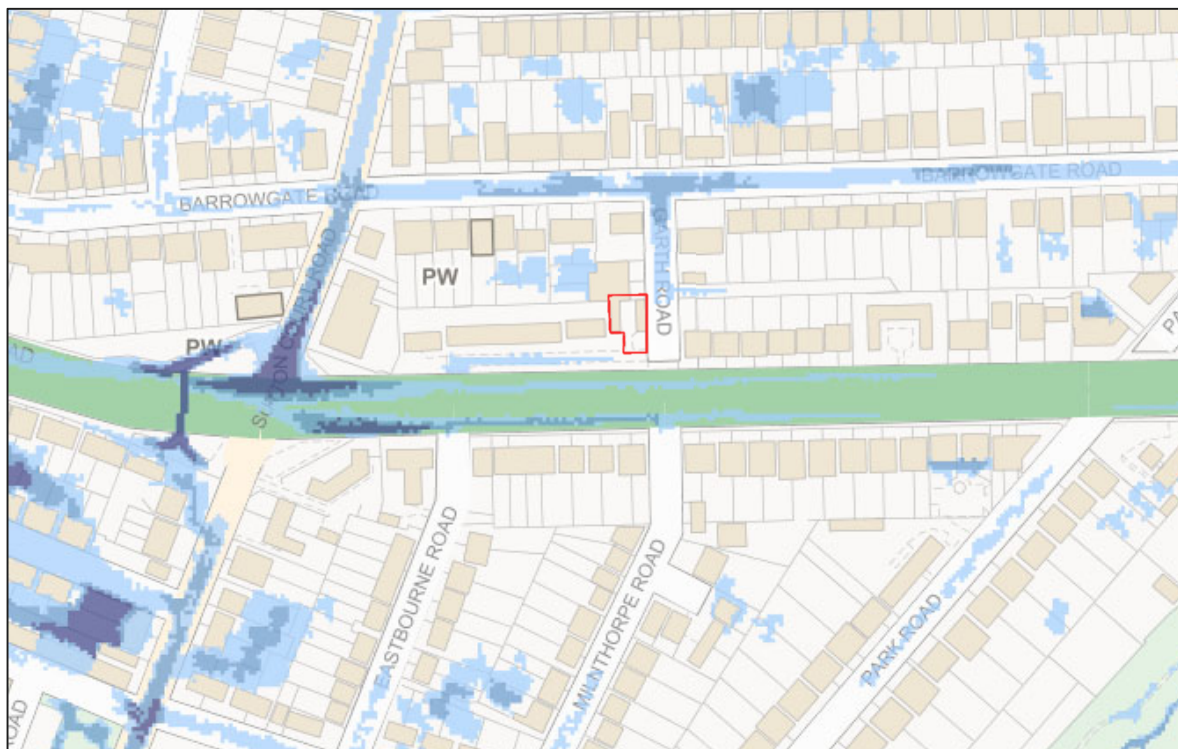
To allow for the consideration of this relatively unlikely scenario in the planning process, the EA has recently undertaken a comprehensive assessment of potential areas of risk, informed by flood modelling that simulated numerous potential breaches along the tidal frontage of the River Thames. A request has been made for a copy of this assessment in the vicinity of the site, but a response is currently pending.

Given the site's location, based on Arcadis experience assessing risk at similar locations within the Thames floodplain and accounting for responses already received from the EA relating to other land parcels assessed on behalf of the Client, it is considered possible that the site will be shown as being outside the area of potential residual risk associated with a breach in the Thames Tidal Defences, such that the residual risk of flooding in the event of a breach remains 'very low'. This will be confirmed upon receipt of a response from the EA. In the event the site is within the predicted breach extents, while this does not alter the overall likelihood of flooding, it may mean that further mitigation measures are required to achieve planning approval (such as raised finished floor levels for example).

**Overall, the site is considered to have a 'very low' risk of flooding from rivers and the sea, and, subject to confirmation of the site's residual risk, this form of flooding is not considered to pose an onerous risk to the site in the context of its potential future redevelopment.**

## 3.2 Flooding from Surface Water

The Risk of Flooding from Surface Water Map is informed by 'direct rainfall' modelling undertaken at a high (2m) resolution. It illustrates those areas at elevated risk of surface water flooding in low spots down-gradient of sloping ground or in the topographic valleys associated with current or former watercourses. An extract of the map is shown in Figure 5 below.



**Figure 5 – Risk of Flooding from Surface Water Map**

*Contains Environment Agency information © Environment Agency and/or database right*

The map indicates that the site is at 'very low' risk of surface water flooding, with an annual chance of less than 1 in 1,000 (0.1%).

In 'low' and 'medium' likelihood surface water flood events, with an annual chance of 1 in 1,000 (0.1%) and 1 in 100 (1%) respectively, some areas of ponding are shown along parts of the road network adjacent to the site. This is generally limited to shallow flooding in the centre of roads adjacent to the site and no flooding is shown to affect the site demise.

According to the records of historical flooding in the PFRA, there have been no recorded incidents of surface water flooding at the site. The nearest surface water historic flood incident occurred 500m east at Hogarth Lane. Mapping in the SWMP shows the Critical Drainage Areas (CDA) in Hounslow which are areas recognised as vulnerable to surface water flooding. The site is not located in a CDA.

**Overall, the site is considered to have a 'very low' risk of surface water flooding, and this form of flooding is not considered to pose an onerous risk to the site in the context of its potential future redevelopment.**

### 3.3 Flooding from Groundwater

Groundwater flood risk is not as well-defined as other sources of flooding and an assessment of risk often requires consideration of geological conditions. Groundwater flooding can occur from two general mechanisms (i) 'clearwater flooding', where the water table in unconfined aquifers rises above the ground surface, associated with permeable bedrock such as chalk and common in areas where 'winterbourne' streams are present, which may run dry for much of the year; and (ii) 'river-groundwater interaction', where river levels interact with permeable superficial deposits along river valleys, potentially flooding areas away from the river without necessarily overtopping the river banks.

According to BGS mapping, the site is underlain by superficial deposits of the Kempton Park Gravel Member above London Clay bedrock. The superficial deposits are classified as a 'Secondary A Aquifer' by the EA, while the London Clay bedrock is classified as 'Unproductive' on account of its low permeability.

According to the PFRA, the site and surrounds are not located in a zone of Increased Potential for Elevated Groundwater (IPEG). Furthermore, the SFRA states that Hounslow is at low risk of groundwater flooding and the mapping presented in the PFRA indicates that there have been no incidents of groundwater flooding at the site.

The unproductive nature of the London Clay bedrock suggests that the likelihood of clearwater flooding is remote. Groundwater is likely to be present at shallow depths within the permeable river terrace gravels overlying the London Clay bedrock at the site. However, water levels in these gravels are anticipated to be in continuity with water levels in the River Thames and, due to the site's distance from the Thames, the likelihood of river-groundwater interaction causing groundwater to rise to the surface is considered similarly low.

**The site is considered to be at 'low' risk of groundwater flooding and this form of flooding is not considered to pose an onerous risk to the site in the context of its potential future redevelopment.**

### 3.4 Flooding from Artificial Sources

#### Sewers

Flooding from sewers can result from lack of sewer capacity, blockages within the sewer network or failure of infrastructure such as pumps. Any area that benefits from sewerage infrastructure has a potential risk of flooding, but the likelihood and consequences are most likely increased by topographic constraints such as low spots or flow paths that could influence the behaviour of floodwater originating from sewers.

Mapping in the PFRA shows incidents of flooding from sewers by postcode. Therefore, it is not possible to identify if any of the recorded incidents occurred at the site. The mapping shows that there have been between 1 to 5 recorded incidents of sewer flooding in the W4 4 postal district.

In the absence of site-specific information on sewer flooding, the Risk of Flooding from Surface Water Map can aid understanding. As the site is not in any flow paths or low spots, which would direct sewer water towards the site, it can be argued that sewer flooding in the vicinity does not pose a notably onerous risk over and above any similar site benefiting from sewers.

#### Reservoirs

The Risk of Flooding from Reservoirs Map illustrates the potential flood extent were large raised reservoirs to fail and release the water that they hold. The map shows that the site is not within this flood extent, with potential flooding in the area generally restricted to the south of Great West Road.

#### Canals

The Grand Union Canal is over 2.5km west of the site and joins the River Thames approximately 1.5km upstream of the site. As the canal is not embanked and the risk of flooding to the site is no greater than the surrounding area, the Grand Union Canal is not considered to pose a significant flood risk to the site.

**Overall, the site is considered to be at 'very low' risk of flooding from artificial sources and this form of flooding is not considered to pose an onerous risk to the site in the context of its potential future redevelopment.**

### 3.5 Future Redevelopment

A Flood Risk Assessment (FRA) would be required to support the development of the site due to its location in Flood Zone 3. According to the Planning Practice Guidance (PPG), the site is suitable for 'Water Compatible' and 'Less Vulnerable' development types but is not suitable for 'Highly Vulnerable' development types on account of its Flood Zone designation (notably this includes basement dwellings).

The Exception Test would need to be satisfied should 'Essential Infrastructure' and 'More Vulnerable' (e.g. residential) uses be proposed. See Appendix A for more information on the PPG and the

Sequential and Exception Tests. The requirements of these tests are re-stated in the specific development guidance published in the West London SFRA.

Based on the findings of this review, it is considered that the Exception Test can be satisfied in support of redevelopment proposals, on account of: (i) the actual risk of flooding from rivers and the sea being 'very low'; (ii) the site may be outside the extent of residual risk associated with breaches in the Thames Tidal Defences as simulated by the EA; and (iii) the absence of elevated risk from other sources of flooding. As previously discussed, confirmation from the EA is awaited as to whether the site is within the area considered at residual risk. If the site is within this area, then the residual risk of flooding may require mitigation measures (such as consideration of raised finished floor levels) to obtain planning approval.

A Drainage Strategy would be required to consider available connections and the capacity of the local sewer network, informed by consultation with Thames Water where necessary. A Drainage Strategy should be designed to meet the London Plan (Ref. 14, Policy 5.15) requirement that developers should aim to achieve greenfield runoff rates and use Sustainable Drainage Systems (SuDS) unless there are practical reasons for not doing so. LBH provide guidance for the application of SuDS in their SFRA and the Drainage Strategy should be developed in consultation with LBH, detailing methods to manage site drainage post-development. Climate change allowances, detailed in the SFRA, also need to be incorporated into the Drainage Strategy. The suitability of these allowances should be confirmed with LBH during consultation.

**Overall, save for the in-principle restriction on Highly Vulnerable development types as detailed in the NPPF and West London SFRA, the site is considered acceptable for most development types. Once the EA can confirm the site's residual risk, flood risk is considered unlikely to onerously constrain development aspirations over and above any similar site in the borough. The findings of this Flood Risk Review can inform the preparation of an FRA required to accompany planning proposals as a result of the site's location in Flood Zone 3.**

## 4 Summary

This desktop Flood Risk Review has investigated the risk of flooding to the site based on a review of relevant data and information in the public domain and obtained from the EA. The following has been concluded:

- The site is located within the theoretical tidal floodplain of the River Thames but there are no recorded instances of fluvial/tidal flooding at the site.
- The site is protected to a very high standard by the Thames Tidal Defences, comprising raised river walls and the Thames Barrier. These defences prevent flooding from both fluvial and tidal flows along the River Thames for flood events up to and including a flood with an annual chance of 1 in 1,000 (0.1%).
- The site therefore has a very low risk of flooding from rivers and the sea, equivalent to an annual chance less than 1 in 1,000 (0.1%).
- This risk rating is not sensitive to climate change because the approved TE2100 Plan will involve raising flood defences in an adaptive manner throughout London to maintain the existing standard of protection into the future as sea levels rise.
- The residual risk of flooding to the site, in the event of a breach in the Thames Tidal Defences, will be confirmed upon receipt of detailed modelling information from the EA in response to a pending data request submitted to inform this Flood Risk Review. Where the site is shown to face an elevated residual risk, this may necessitate mitigation measures such as raised finished floor levels to achieve planning approval.
- No other sources of flooding are considered to pose an onerous risk of flooding to the site in the context of its potential redevelopment and the site is considered to be acceptable in principle for all types of redevelopment with respect to flood risk.
- An FRA will be required to support redevelopment proposals on account of the site's location within Flood Zone 3 on the Flood Map for Planning (Rivers and Sea). The findings of this Flood Risk Review indicate that flooding is unlikely to onerously constrain redevelopment proposals, subject to confirmation of the site's residual risk from the EA.
- It is recommended that a Drainage Strategy is designed in consultation with LBH and Thames Water and that it includes appropriate allowance for climate change.

Table 1 presents a summary of the risk of flooding by source. It should be noted that differing levels of information have been available to assess the risk of flooding for each source, and the ratings for flooding from rivers, the sea and surface water, for example are necessarily more detailed where they are informed by published flood maps and models.

Table 1 – Summary of Flood Risk by Source

Source of Flooding	Qualitative Flood Risk Rating
Rivers	Very Low
The Sea	Very Low
Surface Water	Very Low
Groundwater	Low
Artificial Sources	Very Low



## 5 References

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## APPENDIX A – Planning Policy and Flood Risk

### The National Planning Policy Framework

With regard to flood risk and surface water drainage, the National Planning Policy Framework (NPPF) (Ref. 15) and its accompanying flood risk and coastal change Planning Practice Guidance (PPG) (Ref. 16) set out the Government's planning policy for England and advises on '*how to take account of and address the risks associated with flooding and coastal change in the planning process*'. The principal aim of the NPPF is to achieve sustainable development by accounting for flooding at all stages of the planning process, avoiding inappropriate development in areas at risk of flooding and directing development away from areas where risks are highest. Where development is necessary in areas at risk of flooding, the NPPF aims to ensure it is safe, without increasing flood risk to third parties. Early adoption of, and adherence to, the principles set out in the NPPF with respect to flood risk, can ensure that detailed designs and plans for development take due account of flood risk and the need for appropriate mitigation, if required.

### The Sequential and Exception Tests

The PPG identifies four Flood Zone classifications, detailed in Table A1 below.

Table A1 – Flood Zones

Flood Zone	Annual Probability of Flooding
1 – Low Probability	Fluvial and Tidal <0.1% (AEP)
2 – Medium Probability	Fluvial 0.1-1.0% AEP Tidal 0.1-0.5% AEP
3a – High Probability	Fluvial > 1.0% AEP Tidal > 0.5% AEP
3b – The Functional Floodplain	Fluvial and Tidal >5.0% AEP *Starting point for consideration. Local planning authorities should identify Functional Floodplain, which should not be defined solely by rigid probability parameters.

Source: PPG, Flood Risk and Coastal Change

The NPPF specifies that the suitability of all new development in relation to flood risk should be assessed by applying the Sequential Test to demonstrate that there are no reasonably available sites in areas with a lower probability of flooding that would be appropriate to the type of development proposed. The PPG provides guidance on the compatibility of each land use classification in relation to each of the Flood Zones, as summarised in Table A2.



## Flood Risk Review

Table A2 – Flood Risk Vulnerability Classification

Flood Zone	Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	✓	Exception Test required	✓	✓
Zone 3a	Exception Test required	✓	X	Exception Test required	✓
Zone 3b	Exception Test required	✓	X	X	X
Key:            ✓    Development is appropriate        X    Development should not be permitted					

Source: PPG, Flood Risk and Coastal Change

When the Exception Test is triggered, this requires the development proposals to demonstrate wider sustainability benefits to the community that outweigh flood risk, and that the development will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce overall flood risk.

## Arcadis UK

Arcadis Cymru House,  
St Mellons Business Park,  
Fortran Rd,  
Cardiff  
CF3 0EY

United Kingdom  
T: +44 (0)2920 729 800

[arcadis.com](https://www.arcadis.com)