LONDON BOROUGH OF HOUNSLOW SMALL SITES SMALL BUILDERS PROGRAMME

GARAGES ADJACENT TO 86 BEECH AVENUE, BRENTFORD, TW8 8NH

Flood Risk Review

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Executive Summary

The site (garages adjacent to 86 Beech Avenue), which is currently occupied by garages and hard standing, 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 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 (NPPF), a Flood Risk Assessment (FRA) is not necessary to support any future development of the site as it is located in Flood Zone 1 on the Flood Map for Planning (Rivers and Sea), is less than 1 hectare (ha) in area and this Flood Risk Review demonstrates that the site is not at risk of flooding from other local sources.

A Drainage Strategy should nevertheless 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 London Borough of Hounslow Council (LBH) ('the Client') to undertake a desktop Flood Risk Review for garages adjacent to 86 Beech Avenue, Brentford, London, TW8 8NH ('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 potential for 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[1] 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 lidar tile TQ17NE) (Ref. 1)
- EA Long Term Flood Risk Maps (Ref. 2), including the 'Risk of Flooding from Rivers and Sea Map', 'Risk of Flooding from Surface Water Map' and 'Risk of Flooding from Reservoirs Map'
- EA 'Flood Map for Planning' (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)
- Department for Environment, Food and Rural Affairs (DEFRA) Magic Mapping (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

[1] 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 (NGR) TQ167773 in a suburban area, within LBH. It occupies an area of approximately 0.01 hectares (ha) and is rectangular on plan, as illustrated in Figure 1.

The site currently comprises a row of garages along the north-western boundary and hardstanding on the remainder of the site. The site is bounded to the south-east by Almond Grove is surrounded by residential property on all other sides. The Hounslow Loop railway line is located approximately 90m to the north-west of the site on a south-west to north-east axis.

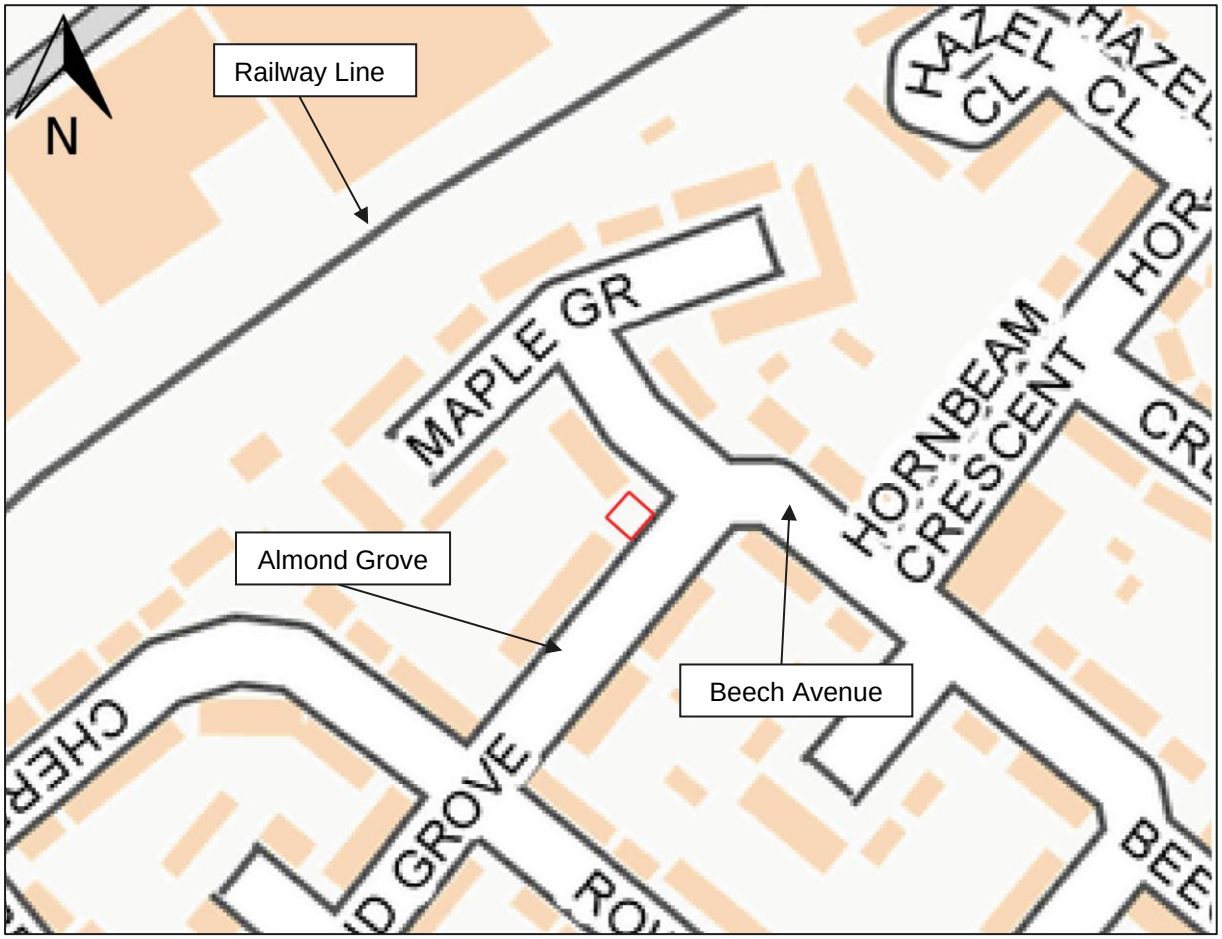


Figure 1 - Site Location (site boundary outlined in red)

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2.2 Site Topography

As illustrated in Figure 2, LiDAR data indicates that the site is generally flat, with ground levels typically around 9.8m Above Ordnance Datum (AOD). The site slopes slightly downwards from a level of approximately 10.1mAOD along the north-western boundary towards the south-eastern boundary where levels are approximately 9.1mAOD.

Off-site, the prevailing topography typically slopes downwards from north-west to south-east. Ground levels in the immediate surroundings are typically similar to the site. Land to the north-west, adjacent to the railway is higher than the site although the railway line itself is lower, indicative of the railway line being cut into the typical land profile.

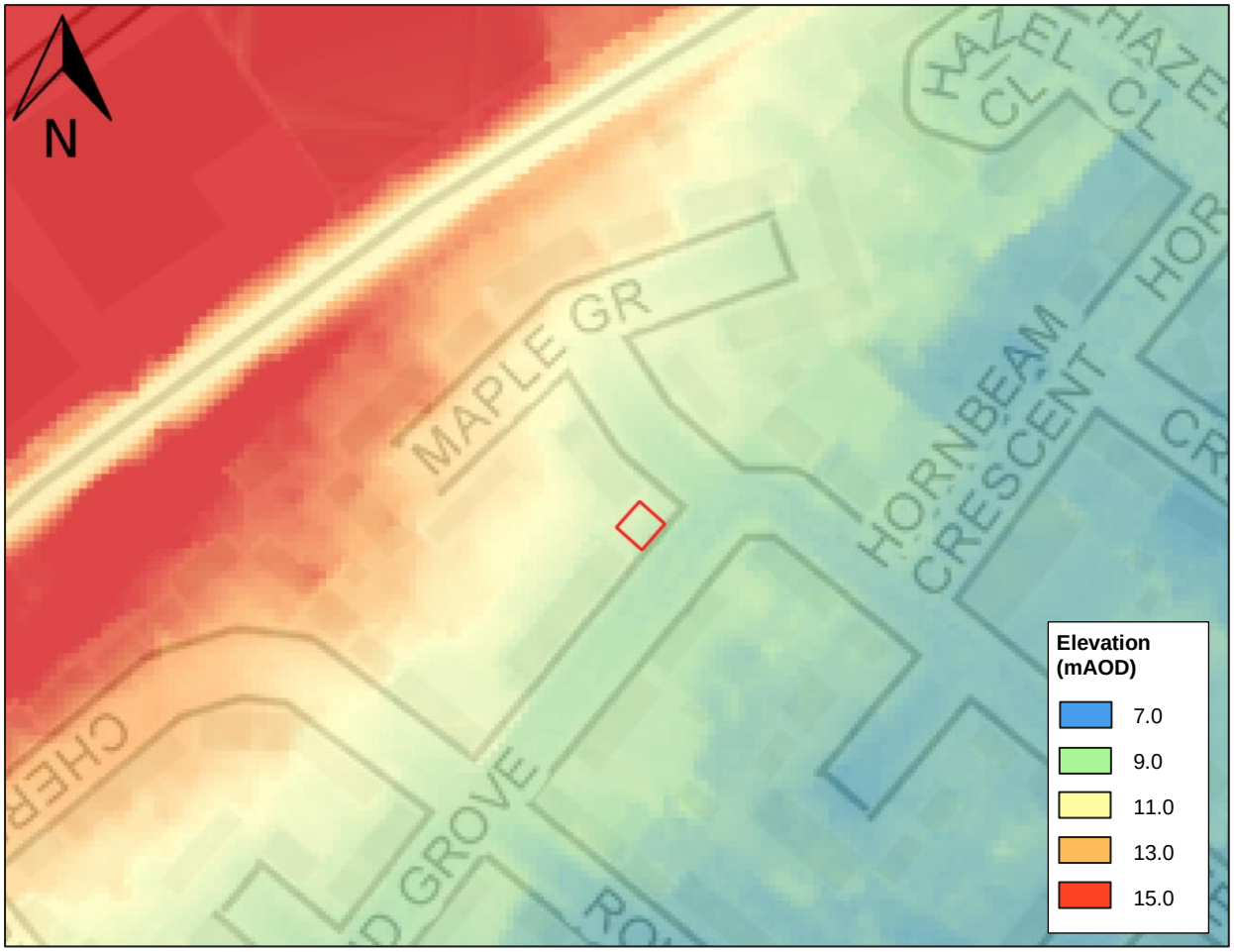


Figure 2 – Site Topography (filtered LiDAR data; site boundary outlined in red)

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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 Brent, which drains a total area of approximately 151km^2.

The River Brent joins the Grand Union Canal (GUC), upstream of Brentford, approximately 2.8km north-west of the site. Downstream of this point the River Brent flows along the canalised route of the GUC, where water levels are maintained by locks and weirs. The GUC passes the site approximately 460m to the north-east and flows in a south-easterly direction before discharging into the River Thames at Brentford, via the Thames Lock and Brentford Dock, approximately 1.1km east of the site.

The River Thames flows in a generally north-easterly direction past Brentford, passing within approximately 1.1km of the site to the south-east.

Historical Flooding

The PFRA and SFRA indicates that there are no historical flood outlines or recorded incidences of fluvial flooding at the site. This is corroborated by the EA 'Recorded Flood Outlines' dataset.

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

The Risk of Flooding from Rivers and Sea Map shows that the site is outside the extent of flooding associated with rivers and the sea and has a 'very low' risk of flooding, equivalent to an annual chance demonstrably less than 1 in 1,000 (0.1%). Accordingly, the Flood Map for Planning (Rivers and Sea) shows that the site is located in Flood Zone 1, equivalent to an annual chance of flooding less than 1 in 1,000 (0.1%).

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

3.2 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.

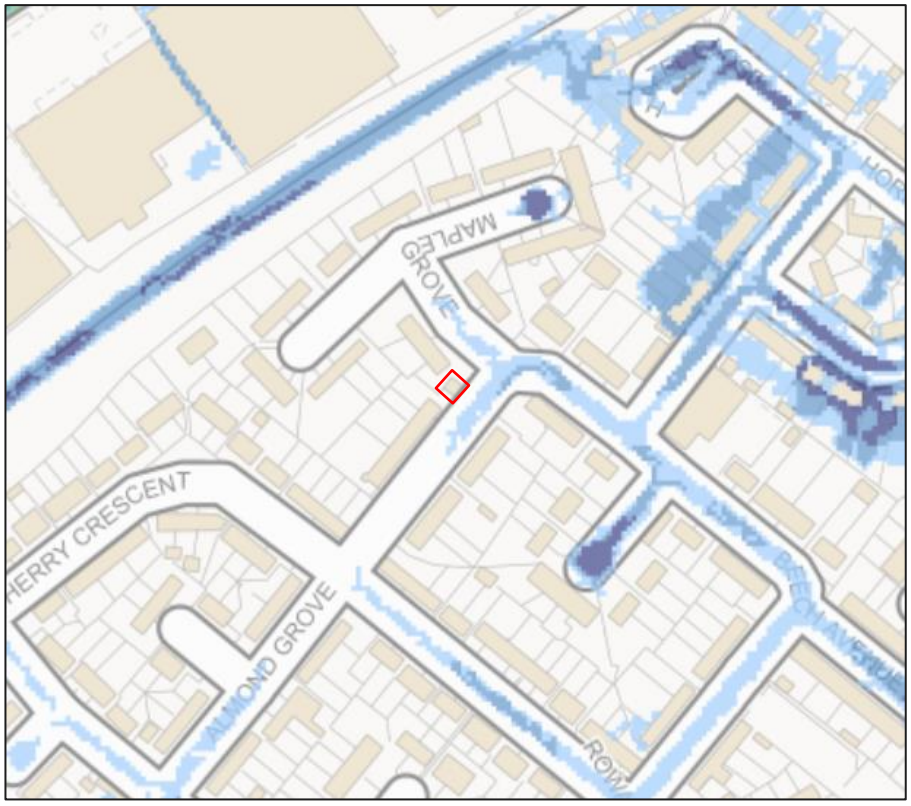


Figure 5 – Risk of Flooding from Surface Water Map
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The map indicates that the site is at 'very low' risk of surface water flooding, equivalent to an annual chance less than 1 in 1,000 (0.1%).

Flooding 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, is restricted to the centre of Beech Avenue and Almond Grove at its junction with Beech Grove. This is generally limited to shallow flooding in the centre of the road network and no flooding is shown to affect the site demise or immediate surrounding area. In 'high' likelihood surface water flood events flooding is restricted to isolated areas of the road network and topographical low spots such as the railway line such that flooding here is not indicative of a wider drainage issue nor considered to pose an onerous risk to the site.

The site is not located within a Critical Drainage Area (CDA), areas recognised as vulnerable to surface water flooding in the SWMP. The nearest CDA is located 100m to the north-west (Group 1_034 CDA), where it incorporates the railway line and immediately adjacent land within the railway cutting.

According to the records of historical surface water flooding in the PFRA, there have been no recorded incidents of surface water flooding at the site.

Overall, the site is considered to be at '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 bedrock comprising London Clay and classified by the EA as 'Unproductive' aquifer on account of its low permeability. There are no superficial deposits mapped beneath the site.

The SFRA states that the borough is typically considered to be at low risk of groundwater flooding. The mapping presented in the PFRA indicates that there have been no incidents of groundwater flooding recorded in the vicinity of the site and the site is not located in an area of Increased Potential for Elevated Groundwater (IPEG).

The unproductive nature of the London Clay bedrock and the absence of superficial deposits at the site means that the likelihood of risk of either clearwater flooding or river-groundwater interaction causing groundwater to rise to the surface is remote.

Overall, the site is considered to be at 'very 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 a relatively small number of recorded incidents (between 1 to 5) of sewer flooding in the 'TW8 8' postcode area.

In the absence of site-specific information on sewer flooding, the Risk of Flooding from Surface Water Map can aid understanding by indicating low spots that may be vulnerable were local sewers to cause flooding. As the site is not affected by any surface water flow paths or low spots, which would direct sewer water towards the site, it is concluded that sewer flooding in the vicinity does not pose an onerous risk to the site over and above that it poses to any similar developed area that benefits from sewerage infrastructure.

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.

Canals

The River Brent flows within the GUC approximately 460m to the north-east of the site. The GUC is not, however, raised above surrounding ground levels and there is no risk of a breach in the canal banks resulting in flooding to the local area. This is particularly true for the site and surrounds which are located outside the River Brent floodplain.

The SFRA notes that there have been recorded incidences of flooding onto the canal towpath. However, water levels within the GUC are maintained by locks and weirs such that the risk of more widespread flooding is limited.

Overall, it is considered that the risk of flooding from artificial sources is 'very low' 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) is not necessary to support the development of the site as it is located in Flood Zone 1, less than 1ha in area and this Flood Risk Review has demonstrated that the site is not at risk of flooding from other sources. Specific planning application validation requirements should however be confirmed with LBH at the time a future planning application is prepared.

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. 13, 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, flood risk is considered unlikely to substantively constrain redevelopment potential at the site.

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. The following has been concluded:

- The site is located outside the floodplain of the River Thames and is at 'very low' risk of flooding from rivers and the sea, equivalent to an annual chance of less than 1 in 1,000 (0.1%).
- 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.
- The findings of this Flood Risk Review suggest that an FRA is not necessary to support the development of the site.
- 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	Very Low
Artificial Sources (Infrastructure Failure)	Very Low

5. References

1. Department of Environment, Food and Rural Affairs, 2019. Defra Data Service Platform. Accessed November 2019 via: https://environment.data.gov.uk/

2. Environment Agency, 2019. Long term flood risk information. Accessed November 2019 via: https://flood-warning-information.service.gov.uk/long-term-flood-risk/

3. Environment Agency, 2019. Flood Map for Planning. Accessed November 2019 via: https://flood-map-for-planning.service.gov.uk/

4. Environment Agency, 2019, Recorded Flood Outlines dataset. Accessed November 2019 via: https://data.gov.uk/dataset/16e32c53-35a6-4d54-a111-ca09031eaaaf/recorded-flood-outlines

5. Jacobs, 2007. London Borough of Hounslow Strategic Flood Risk Assessment.

6. Capita Symonds, 2011. London Borough of Hounslow Preliminary Flood Risk Assessment.

7. London Borough of Hounslow, 2017. Addendum to the Preliminary Flood Risk Assessment.

8. London Borough of Hounslow, 2014. London Borough of Hounslow Local Flood Risk Management Strategy.

9. Capita Symonds, 2011. London Borough of Hounslow Surface Water Management Plan.

10. Metis Consultants, 2018. West London Strategic Flood Risk Assessment. Accessed November 2019 via: https://westlondonsfra.london/

11. British Geological Survey, 2019. Geology of Britain Viewer. Accessed November 2019 via: http://mapapps.bgs.ac.uk/geologyofbritain/home.html

12. Department for Environment, Food and Rural Affairs, 2013. Magic Map Interactive Map. Accessed November 2019 via: https://magic.defra.gov.uk

13. Greater London Authority, 2019. The Current London Plan. Accessed November 2019 via: https://www.london.gov.uk/what-we-do/planning/london-plan/current-london-plan

14. Ministry of Housing, Communities and Local Government, 2019. National Planning Policy Framework.

15. Ministry of Housing, Communities and Local Government, 2014. Planning Practice Guidance: Flood Risk and Coastal Change.

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. 14) and its accompanying flood risk and coastal change Planning Practice Guidance (PPG) (Ref. 15) 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.

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	✓	✗	Exception Test required	✓
Zone 3b	Exception Test required	✓	✗	✗	✗
Key:	✓ Development is appropriate		✗ 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.

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