

Ivy Road, Enfield

Flood Risk Review

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Ivy Road, Enfield

Flood Risk Review

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Executive Summary

The site (comprising two land parcels off Ivy Road, Enfield), which is currently occupied by a mixture of residential gardens and hard standing, may be considered for potential future development.

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%). The eastern land parcel is potentially at risk from surface water flooding and further investigation is recommended. No other sources pose onerous risk to the site in the context of its potential development.

34A Flood Risk Assessment (FRA) may be necessary to support the development of the site. It is located in Flood Zone 1 and is less than 1ha in area, however this Flood Risk Review has identified a potential surface water overland flow path through part of the eastern land parcel, which should be further investigated and understood.

A Surface Water Drainage Strategy should nevertheless be prepared to support future redevelopment of the site to ensure that proposals meet national and local policy requirements and off-site flood risk is not increased as a result of any development proposal.

1 Introduction

1.1 Background

Arcadis Consulting (UK) Limited ('Arcadis') has been commissioned by Levitt Bernstein, on behalf of Enfield Council ('the Client'), to undertake technical surveys for two parcels of land off Ivy Road, Enfield, London N14 4LP ('the site').

This Flood Risk Review is required to document the risk of flooding at the site 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.
- 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 NPPF¹ 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 (1m tiles TQ29SE) (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' (Ref. 3)
- EA 'Recorded Flood Outlines dataset (Ref. 4)
- Enfield Strategic Flood Risk Assessment (SFRA) (Ref. 5)
- Enfield Local Flood Risk Management Strategy (LFRMS) (Ref. 6)
- British Geological Survey (BGS) Geology of Britain Viewer (Ref. 7)
- Defra Magic Maps (for EA Aquifer Designations) (Ref. 8)
- National Planning Policy Framework (Ref. 9)
- PPG5: Flood Risk and Coastal Change (Ref. 10)

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

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

chance', meaning the chance of a particular flood occurring in any one year. This is directly 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 proposed site comprises two discrete land parcels, both situated just off Ivy Road, at National Grid References (NGR) TQ 29578 94674 and TQ 29634 94726, within the urban area of Southgate in Enfield. The two areas occupy approximately 0.11 hectares (ha), with the larger of the two parcels of land located to the west, covering 0.09ha, as shown in Figure 1.

The land situated in the west currently has split use, the western arm of the site is a residential garden, and the remainder is being used as a carpark. The site to the east is currently hardstanding accommodating garages for the properties to the south of the road.

The nearest watercourse is identified on the EA Flood Map for Planning as an unnamed main river which flows into the Houndsden Gutter approximately 1.4km downstream. The watercourse appears to split along Linden Way to flow in two channels that re-join to the west of Chase Road. One arm of the watercourse passes to the south of the western parcel of land and the other flows in close proximity to the eastern area, as shown in Figure 2. Despite the watercourse being shown on EA mapping, the watercourse is not visible as an open channel on OS, Google, or Bing mapping.

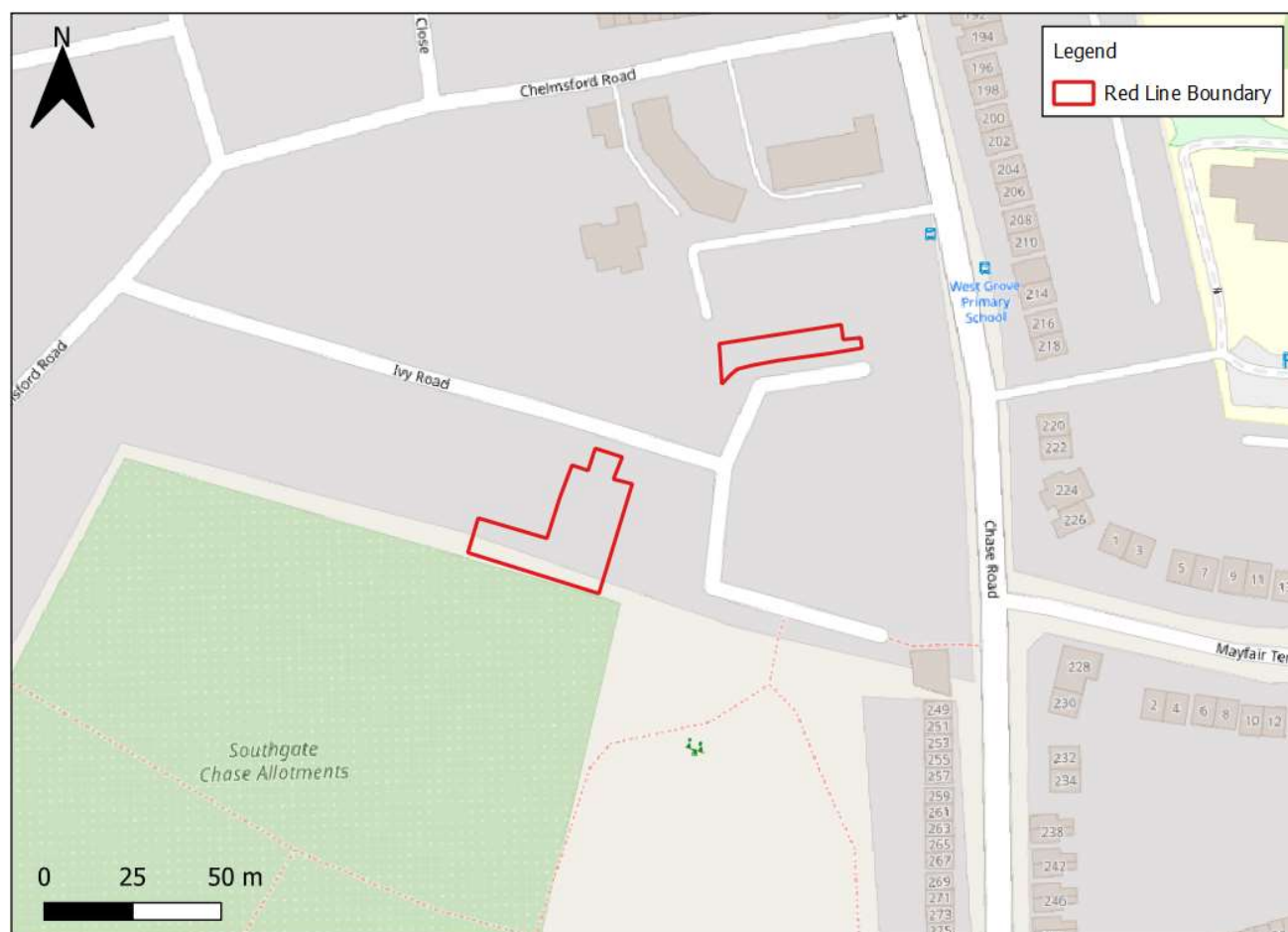


Figure 1: Site Location (Site outlined in red)

Contains Ordnance Survey data © Crown copyright and database right 2021

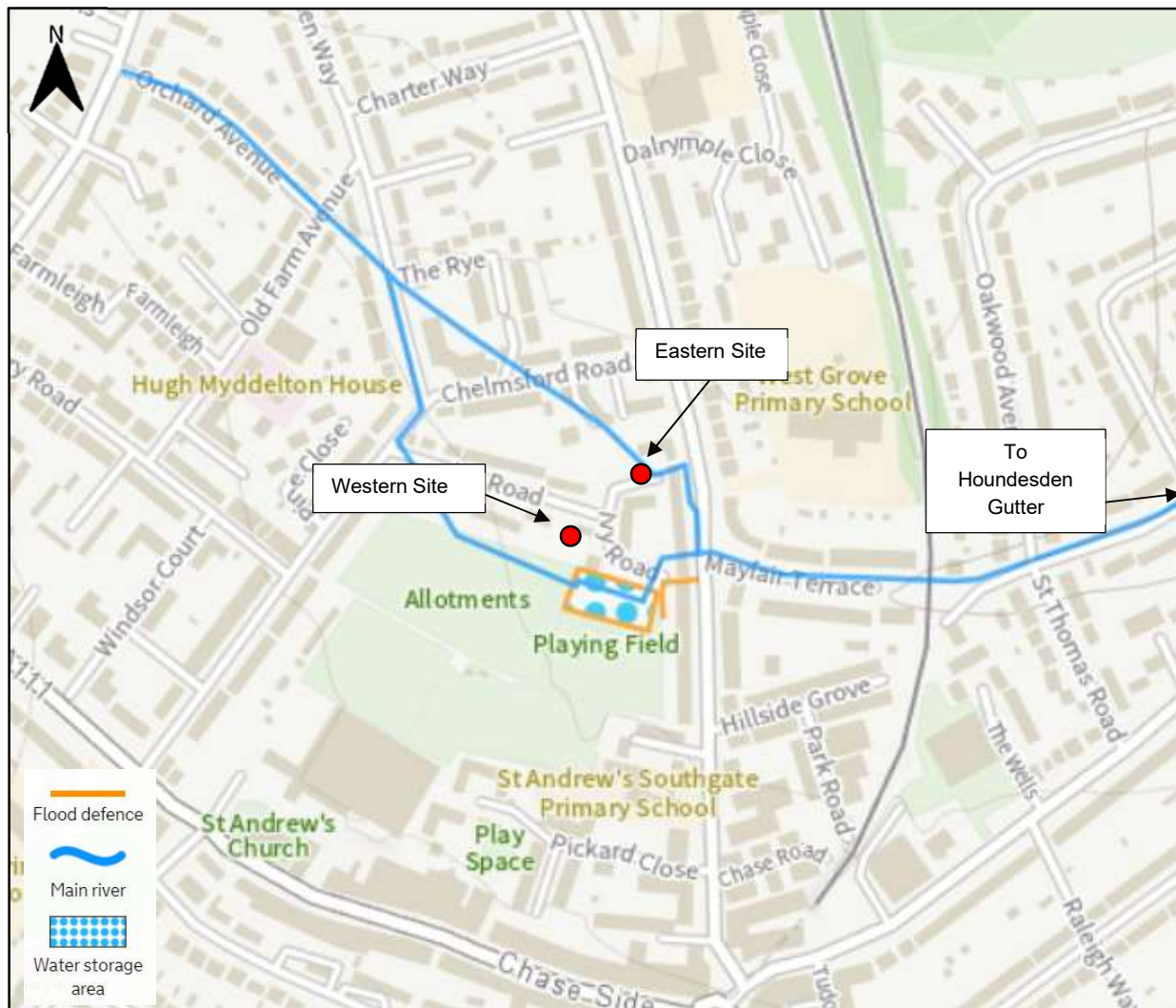


Figure 2: Site Location with notable water features (Sites shown by red dots)
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2.2 Site Topography

LiDAR data, shown in Figure 3, indicates that ground levels within the western land parcel range from 59.0m to 57.64m Above Ordnance Datum (mAOD), with the highest elevations present in the western arm of the site, decreasing towards the north and east. The land to the east is lower, with elevations ranging from 55.92m to 53.27m AOD, the topography sloping in an easterly direction.



Figure 3: Site Topography (filter lidar data; site boundary outlined in red)

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3 Sources of Flood Risk

3.1 Flooding from Rivers and the Sea

3.1.1 Catchment Overview

The site is located in the catchment of an unnamed tributary of the Houndsden Gutter which drains an approximate area of 2.85km². The Houndsden Gutter flows in an easterly direction towards the Salmon's Brook which flows in a southerly direction towards the Walthamstow Reservoirs approximately 7km to the south east of the site.

3.1.2 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 or 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.

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 1, defined as land with an annual chance of flooding from these sources of less than 1 in 1000 (0.1%).

3.1.3 Historic Flooding

The EA holds details on the extent of historic flooding within England. The Historic Flood Map shows the maximum extent of Recorded Flood Outlines from river, sea and groundwater springs that meet a set criteria. The mapping does not include historic flooding from surface water events. The Historic Flood Map does not show any recorded flood events within the vicinity of the site.

Overall, the site is considered to have a 'very low' risk of flooding from rivers and the sea, and these forms of flooding are not considered to pose a constraint in the context of its potential future development.

3.2 Flooding from Surface Water

The Risk of Flooding from Surface Water (RoFSW) 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 4.

The map indicates that the western land parcel is at 'very low' risk of flooding from surface water, equivalent to an annual chance of flooding of less than 1 in 1000 (0.1%). The access to this site, via Ivy Road, is shown to be at 'low risk' indicating a chance of flooding between 0.1% and 1% in any year.

On the eastern land parcel surface water flood risk is mapped to vary, ranging from low to high (meaning that each year the chance of flooding is greater than 3.3%). This site appears to be crossed by an overland flow path that follows the alignment of the watercourse shown in Figure 2. Depths of floodwater in the high risk surface water flood event are typically shallow, mapped as less than 300mm, reaching up to 900mm locally.

A review of the topography indicates that the eastern land parcel lies is situated within a slight depression that forms part of an overland flow path towards the south east, mirroring the course of the watercourse. This small valley feature could provide a flow route for surface water through the site and the risk of flooding from this source should be investigated further, informed by site survey and further data collection to characterise the watercourse, which is presumed to be culverted.

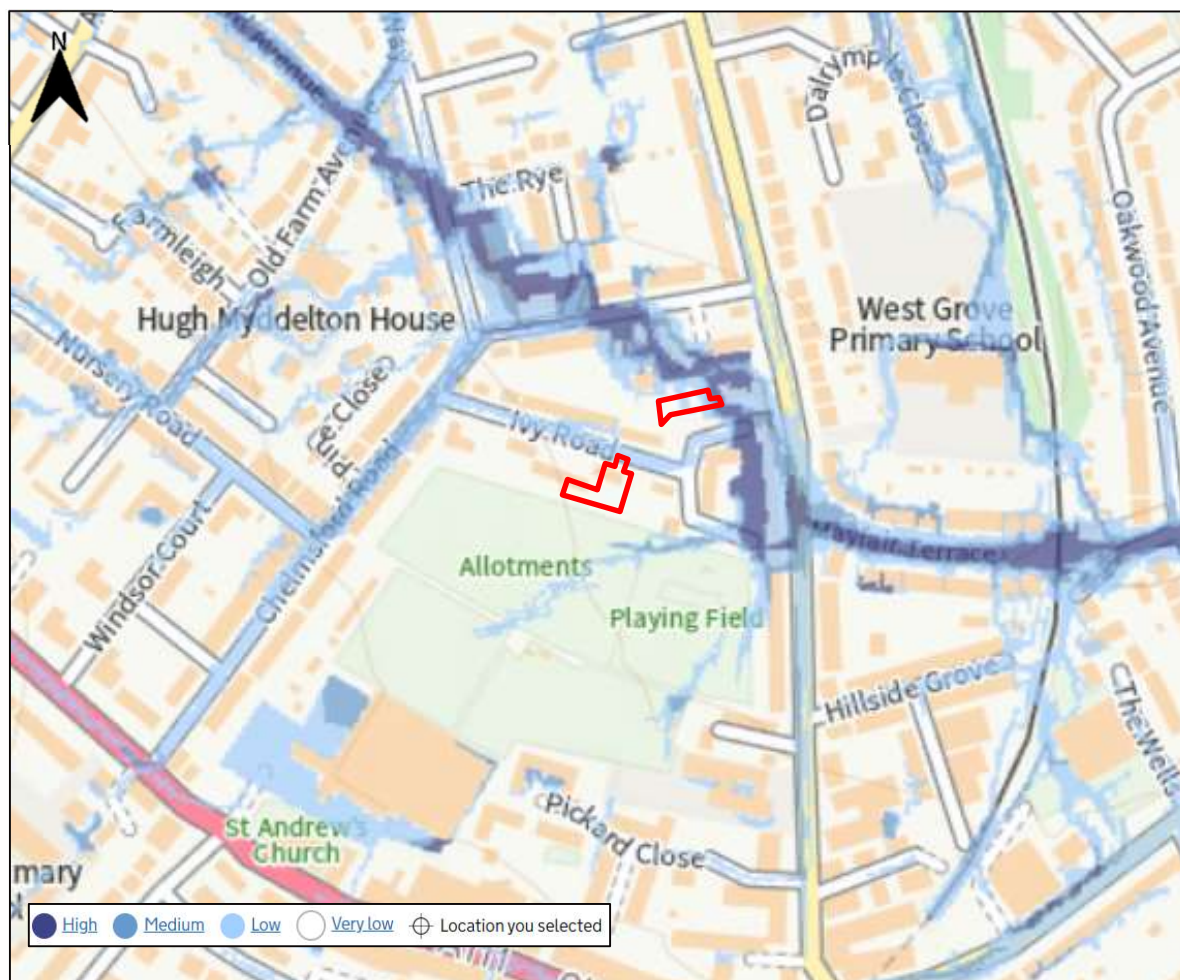


Figure 4: Risk of Flooding from Surface Water Map (site boundary shown in red)
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Historic surface water flood events are mapped within the Enfield Level 1 Strategic Flood Risk Assessment. The report contains no historical records of flooding within the vicinity of the site. Similarly, no historic flood events near the site are mentioned within the Local Flood Risk Management Strategy.

Overall, surface water flood risk is considered to pose a potential constraint at the eastern land parcel which requires further investigation and assessment. However, it is considered the risk could be suitably managed so as not to prevent future development of the site.

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.

A review of the BGS online mapping shows that the site is underlain by sedimentary bedrock of the London Clay formation including clay, silt and sand that is classified as an 'Unproductive Aquifer', on account of its low permeability. There are no superficial deposits recorded at the site.

Furthermore, according to the Local Flood Risk Management Strategy for Enfield, groundwater flooding within the Enfield area is not considered to be a significant risk to people or property due to the prevailing geological conditions. The Enfield SFRA presents the 'Areas Susceptible to Groundwater Flooding' map which indicates that the risk of groundwater flooding to the site is '<25%', which is the lowest risk category. Mapping of historical groundwater flood events in the Enfield SFRA contains no record of flooding at the site or in its surroundings from this source.

The site is considered to be at 'low' risk of groundwater flooding and this form of flooding is not considered to pose a constraint in the context of its potential future development.

3.4 Flooding from Artificial Sources

3.4.1 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.

The SRFA for Enfield indicates that the public sewerage network is managed by Thames Water and lists historic sewer flooding events by postcode from the last 20 years. The mapping indicates that there has only been one recorded sewer flooding event in the 'N14 4' postal district, suggesting that the general area does not have a high risk of sewer flooding.

In the absence of site-specific information on sewer flooding, the Risk of Flooding from Surface Water Map can aid understanding. As an overland flow path crosses part of the eastern land parcel, it is possible that in the event of a sewer flood along Ivy Road, flood waters could be directed towards the site. However, this form of flooding is not considered to pose a notably onerous risk over and above any similar site served by sewers.

3.4.2 Reservoirs

The Risk of Flooding from Reservoirs Map illustrates the potential flood extent were large, embanked reservoirs to fail and release the water that they hold, both when river levels are normal and when there is also flooding from rivers. The map shows that the site is not within these mapped flood extents.

3.4.3 Canals

There are no canals in the vicinity of the site. A review of the Canal and River Trust Network Map indicates that the nearest canal is the Lee Navigation, situated approximately 6.7km to the east of the site. Owing to this distance, canal flooding is not considered to pose a flood risk to the site.

3.4.4 Other Water Storage Areas

Figure 2 shows that there is a water storage area located in the Ivy Road Recreation Ground, south of the site. Figure 4.2 in the Enfield SFRA presents the locations of flood storage areas across the Borough and indicates that this storage area comprises underground tanks. As a flood risk management asset, this would be expected to be routinely maintained and operated to reduce flood risk locally. This feature is not considered to pose a flood risk development constraint.

Overall, flooding from artificial sources is not considered to pose an onerous risk to the site in the context of its potential future development.

3.5 Future Development

A Flood Risk Assessment (FRA) may be necessary to support the development of the site. It is located in Flood Zone 1 and is less than 1ha in area, however this Flood Risk Review has identified a potential surface water overland flow path through part of the eastern land parcel, where the risk of flooding is mapped as high. This should be further investigated and understood. Specific planning application validation requirements should be confirmed with LBE at the time a future planning application is prepared.

A Surface Water Drainage Strategy would be required. This strategy should identify available connections to and the of capacity of the local surface water sewer network, informed by consultation with Thames Water where necessary. A strategy for managing runoff from the site should be developed to meet the London Plan (Ref. 12, Policy SI 13) requirement that developers should aim to achieve greenfield runoff rates, with a preference for green over grey features which follow the drainage hierarchy. The Drainage Strategy should be developed in consultation with LBE and should detail methods to manage site drainage post-development, accounting for climate change.

Overall, flood risk is considered unlikely to substantively constrain development potential at the site.

4 Summary

This desktop Flood Risk Review has investigated the risk of flooding to the site using relevant data and information in the public domain. The following has been concluded:

- The site is located outside the floodplain of any nearby watercourse 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%).
- There is a potential risk of surface water flooding on part of the eastern land parcel, linked to an overland flow route through the site. This should be investigated further.
- No other sources are considered to pose an onerous risk of flooding to the site in the context of its potential development and the site is considered to be acceptable in principle for all types of development with respect to flood risk.
- The findings of this Flood Risk Review suggest that an FRA may be necessary to support the development of the site.
- It is recommended that a Surface Water Drainage Strategy is developed in consultation with Enfield Council 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	Medium
Groundwater	Low
Artificial Sources	Low

5 References

1. Defra, 2021. Defra Data Service Platform. Accessed January 2022 via: <https://environment.data.gov.uk/>
2. Environment Agency, 2022. Long term flood risk information. Accessed January 2022 via: <https://flood-warning-information.service.gov.uk/long-term-flood-risk/>
3. Environment Agency, 2022. Flood Map for Planning. Accessed January 2022 via: <https://flood-map-for-planning.service.gov.uk/>
4. Environment Agency, 2022. Recorded Flood Outlines dataset. Accessed January 2022 via: <https://data.gov.uk/dataset/16e32c53-35a6-4d54-a111-ca09031eaaaf/recorded-flood-outlines>
5. Enfield Council, June 2021. New Enfield Local Plan 2041: Level 1 Strategic Flood Risk Assessment.
6. London Borough of Enfield, 2016. London Borough of Enfield Local Flood Risk Management Strategy.
7. British Geological Survey, 2019. Geology of Britain Viewer. Accessed January 2022 via: <https://www.bgs.ac.uk/map-viewers/geology-of-britain-viewer/>
8. Defra, 2013. Magic Map Interactive Map. Accessed January 2022 via: <https://magic.defra.gov.uk>
9. Department for Communities and Local Government, 2021. National Planning Policy Framework.
10. Department for Communities and Local Government, 2021. Planning Practice Guide: Flood Risk and Coastal Change.
11. Greater London Authority, 2021. The Current London Plan. Accessed January 2022 via: <https://www.london.gov.uk/what-we-do/planning/london-plan/new-london-plan/london-plan-2021>

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.

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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.

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