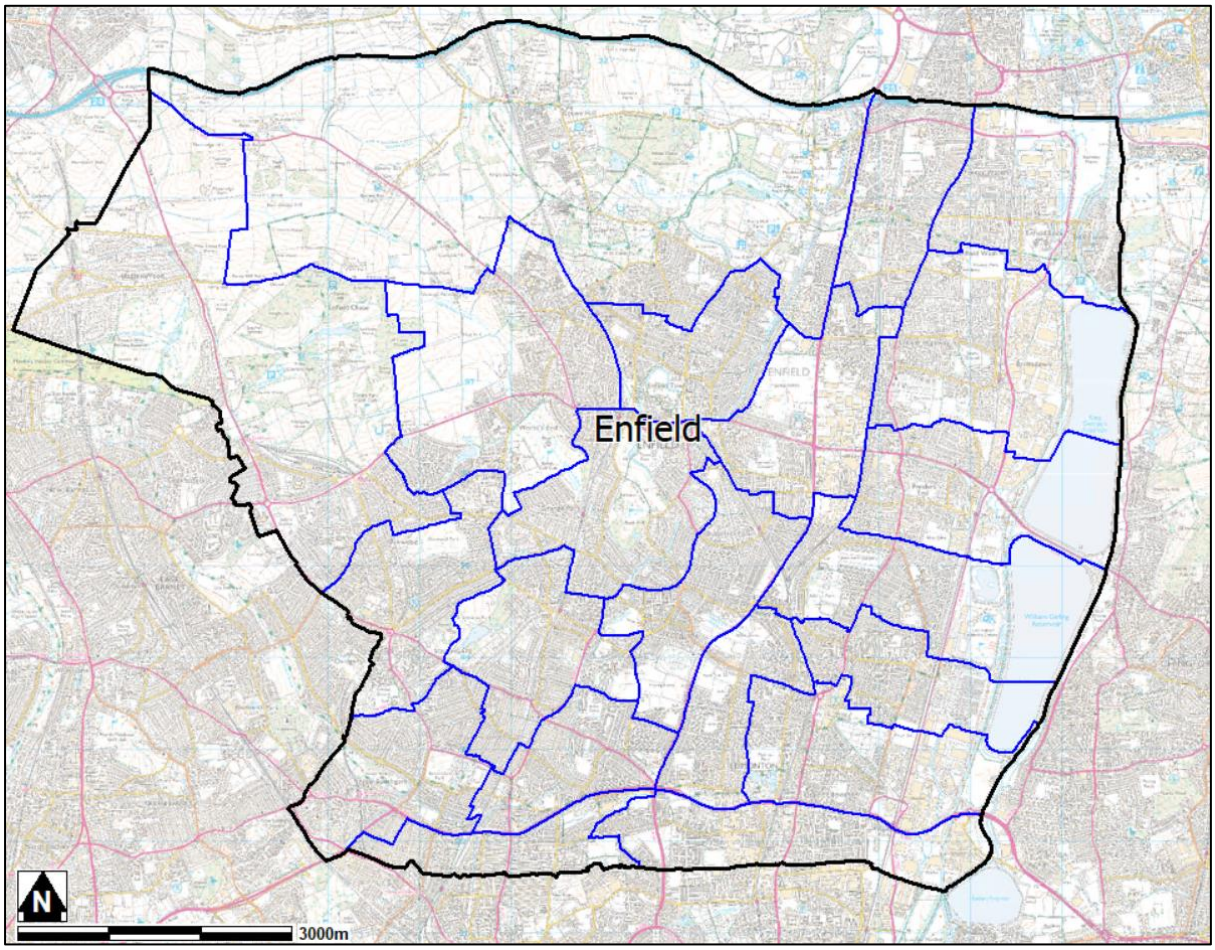
Enfield London Borough

Flood Risk Assessment



June 2023

Planning Policy and Guidance

National Policy Planning Framework

Under National Policy Planning Framework (NPPF), proposed developments should be located as to: "avoiding, so far as possible, development in current and future medium and high flood risk areas"[1]. To understand this risk, the guidance states 'sequential testing'[2] should be carried out. This is the assessment of historic/current and future flood risk and if necessary, the testing should steer development to the lowest flood risk areas.

If a development can not be moved into a lower risk zone, the exception test maybe applied.

London Borough of Enfield (LBE) Local Plan

The LBE draft local plan[3] details the vision for growth and development within the council, but this is coupled with the measures and responsibilities for both the council and developers.

Regarding flood risk, Draft Policy SE8 details "New development must avoid and reduce the risk of flooding."

For more information, please refer to the local plan.

The LBE draft local plan SE8 states Flood Risk Assessments are to be carried out for new development proposals. Please follow the links below for guidance on completing a Flood Risk Assessment (FRA) for sites located in Flood Zone 1, 2 or 3:

Flood risk assessment in flood zone 1
Flood risk assessment in flood zones 2 and 3

Further information is also available online at the Environment Agency (EA) Flood Map for Planning (Rivers and Sea) website.

Climate change Guidance

The EA updated their guidance on climate change in May 2022.

Within this guidance, it is detailed that the Upper End 2080's fluvial flow for the Thames basin could see 54% increase in flow.

[1] https://www.gov.uk/guidance/flood-risk-and-coastal-change#para20

[2] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1005759/NPPF_July_2021.pdf

[3] https://www.enfield.gov.uk/__data/assets/pdf_file/0023/12668/ELP-2039-Reg-18-for-consultation-Planning.pdf

Proposed Development: COC9a

The Site

The proposed development is COC9a. It is located within Cockfosters Station Car Park (Parcel a) Cockfosters Road, Barnet, postcode EN4 0DZ and is 1.15 hectare.

The proposed development site is Mixed use residential.

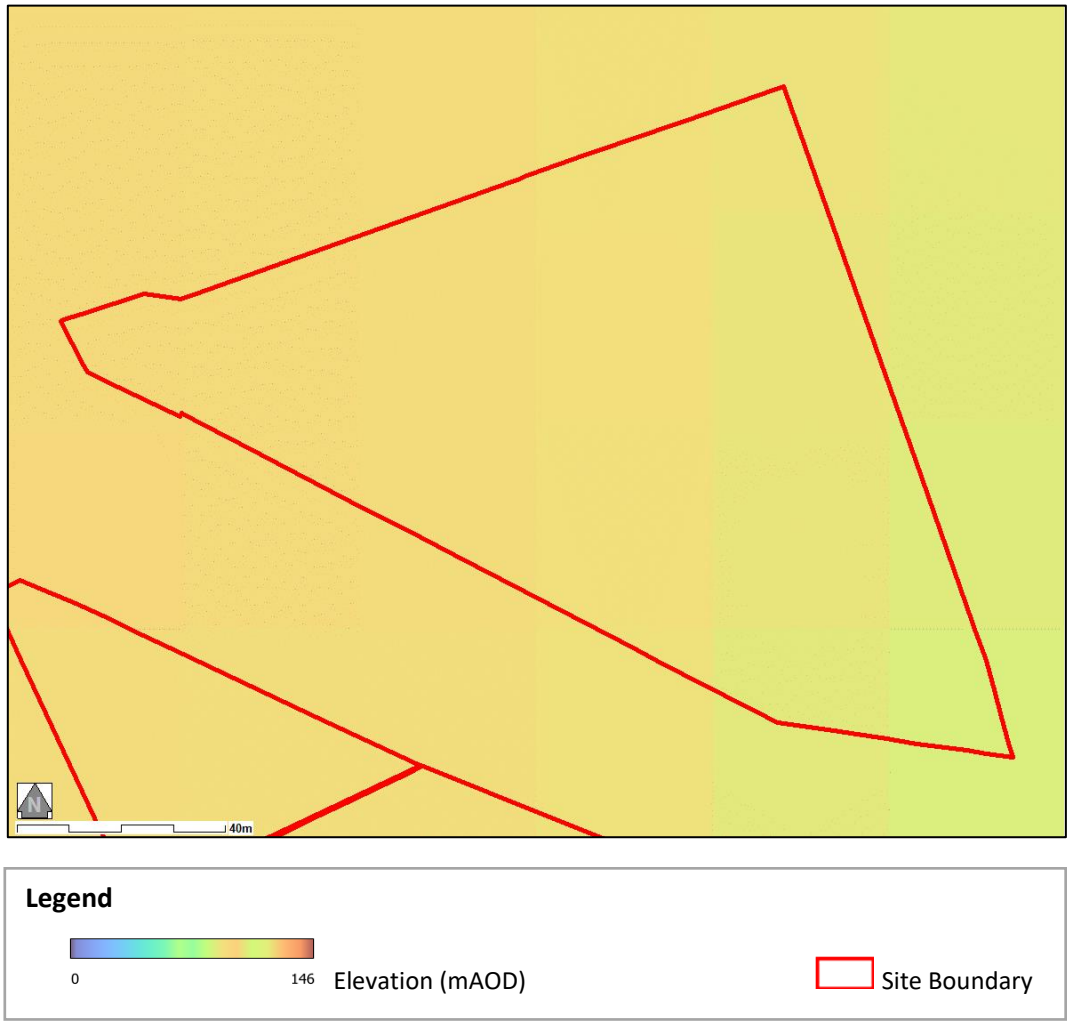


Figure 1 Topography

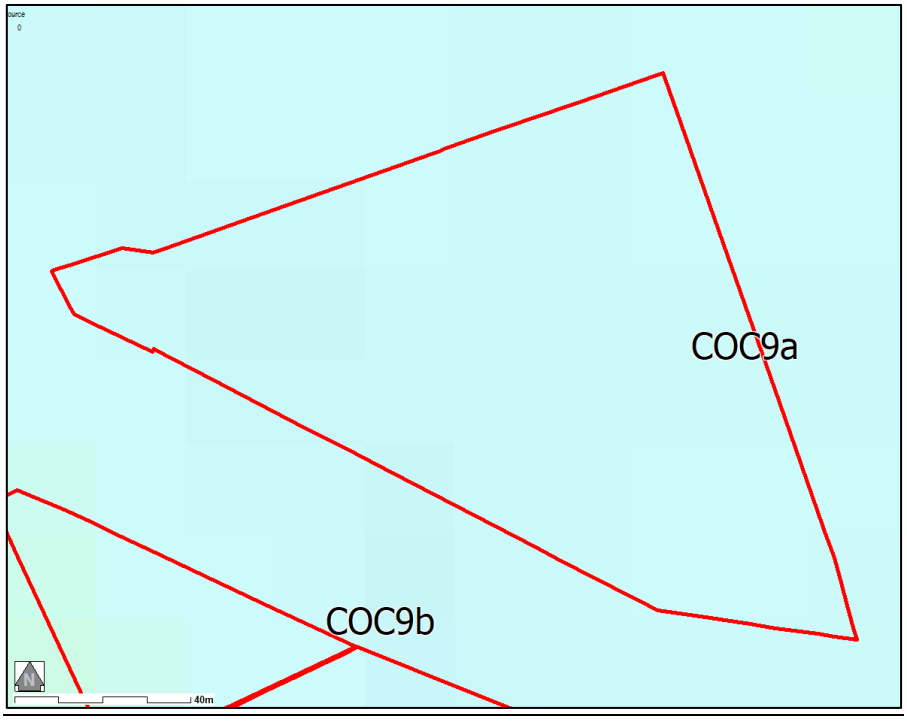
For more details regarding the topographic map of Enfield London Borough (LBE), please see Appendix A.

The development is >=200 m from a 'main' watercourse. LBE Draft Local Plan SE9 states that "an adequate set back from the watercourse (open or culverted) to allow for maintenance". What is classified as an appropriate distance is to be decided based on consultation with key stakeholders: Lead Local Flood Authority (LLFA), EA, Thames Water, Canals & Rivers Trust.

Groundwater Information

Soil (ID)

In the following section details regarding the soil on the site are presented.



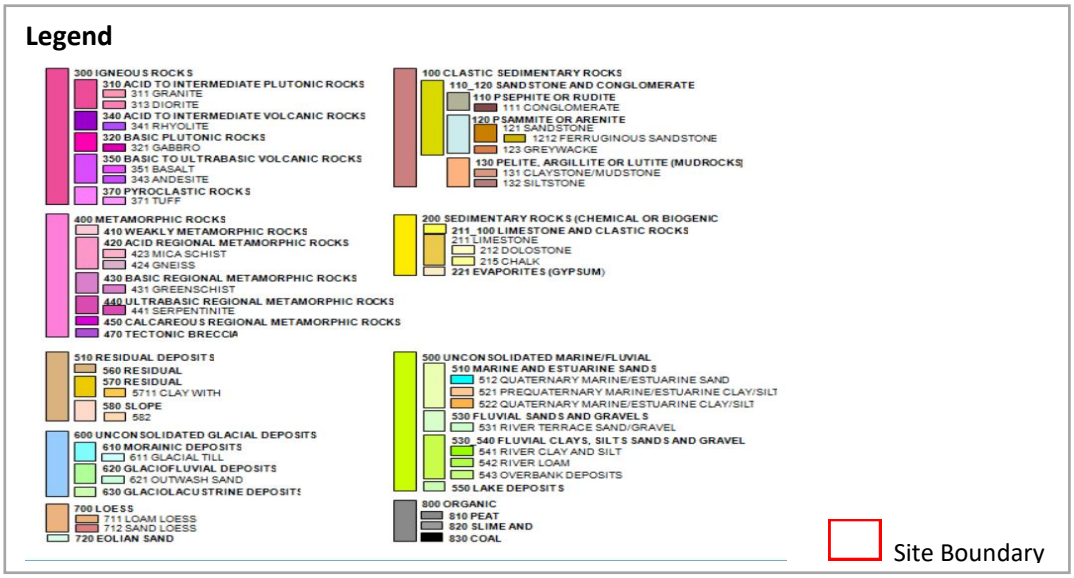


Figure 2 Soil ID

Based on Figure 2 and the UK Soil Observatory[4] the material on site is: Glacial till.

[4] https://mapapps2.bgs.ac.uk/ukso/home.html

Susceptibility of Groundwater Flooding (British Geological Society information)

Groundwater flooding is the emergence of groundwater at the ground surface. It can occur in a variety of geological settings including valleys in areas underlain by chalk, and in river valleys with thick deposits of alluvium and river gravels. Groundwater flooding happens in response to a combination of already high groundwater levels (usually during mid or late winter) and intense or unusually lengthy storm events. Groundwater flooding often lasts much longer than flooding caused by a river overflowing its banks. It may last many months and can cause significant social and economic disruption to the affected areas.

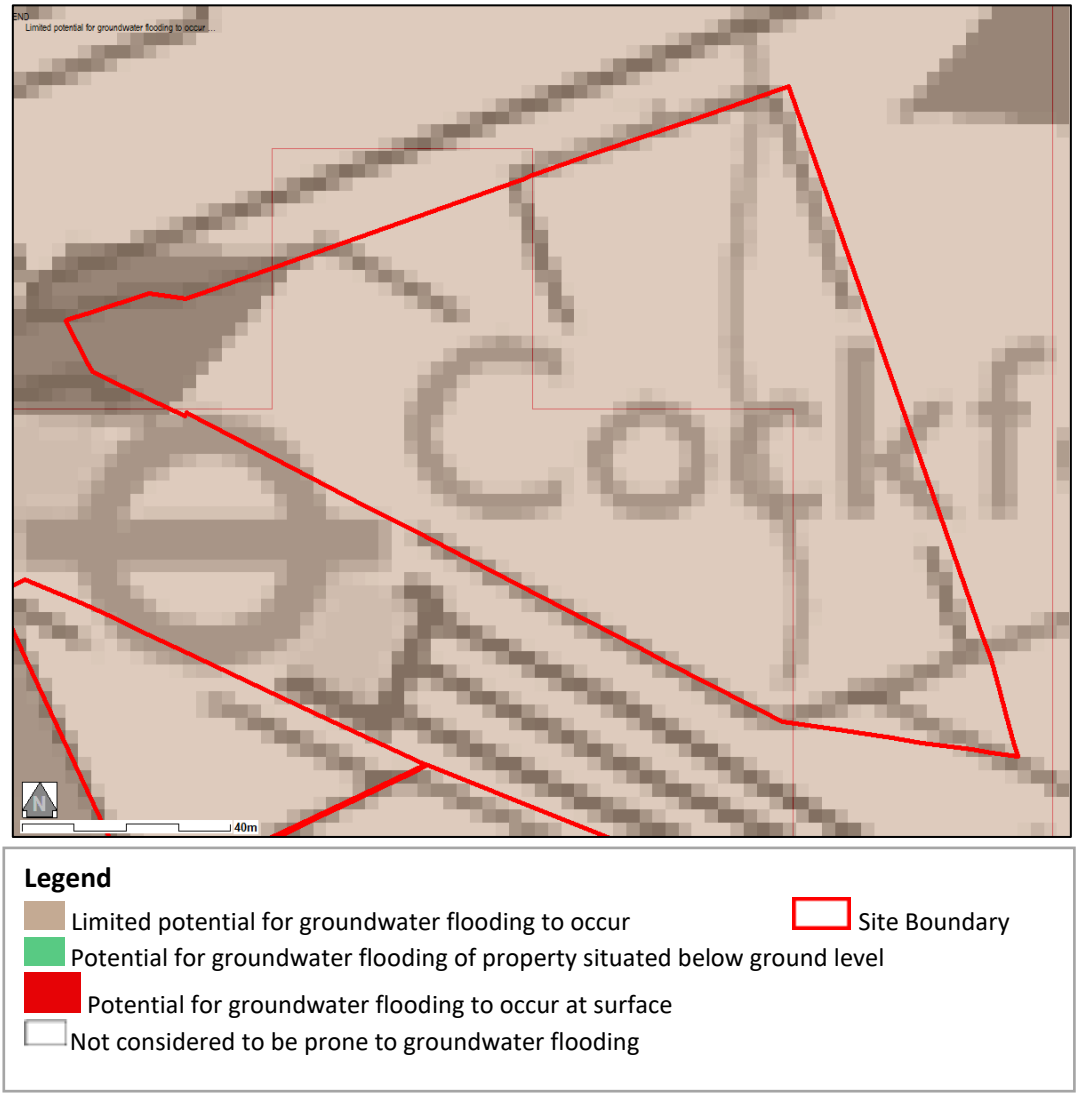


Figure 3 Groundwater Flooding

As per LBE draft policy SE8, developments must "apply appropriate construction techniques to limit potential disturbance to natural groundwater flows". In addition, "groundwater FRA will be required where basement levels are proposed."

According to Figure 3 there is limited potential for groundwater. The British Geological Survey website holds further information, including FAQs and advice, on groundwater flooding.

Susceptibility of Groundwater Flooding (Environment Agency)

Areas Susceptible to Groundwater Flooding is a strategic scale map showing groundwater flood areas on a 1km square grid. It was developed specifically by the Environment Agency for use by Lead Local Flood Authorities (LLFAs) for use in Preliminary Flood Risk Assessment (PFRA) as required under the Flood Risk Regulations. The data was produced to annotate indicative Flood Risk Areas for PFRA with information to allow LLFAs to determine whether there may be a risk of flooding from groundwater. It is also being made available to LLFAs to support PFRA, so that LLFAs can obtain a broad feel for the wider areas which might be at risk from groundwater flooding. It covers England and Wales.

This data has used the top two susceptibility bands of the British Geological Society (BGS) 1:50,000 Groundwater Flood Susceptibility Map and thus covers consolidated aquifers (chalk, sandstone etc., termed 'clearwater' in the data attributes) and superficial deposits. It does not take account of the chance of flooding from groundwater rebound. It shows the proportion of each 1km grid square where geological and hydrogeological conditions show that groundwater might emerge. The susceptible areas are represented by one of four area categories (see Figure 4) showing the proportion of each 1km square that is susceptible to groundwater emergence. It does not show the likelihood of groundwater flooding occurring.

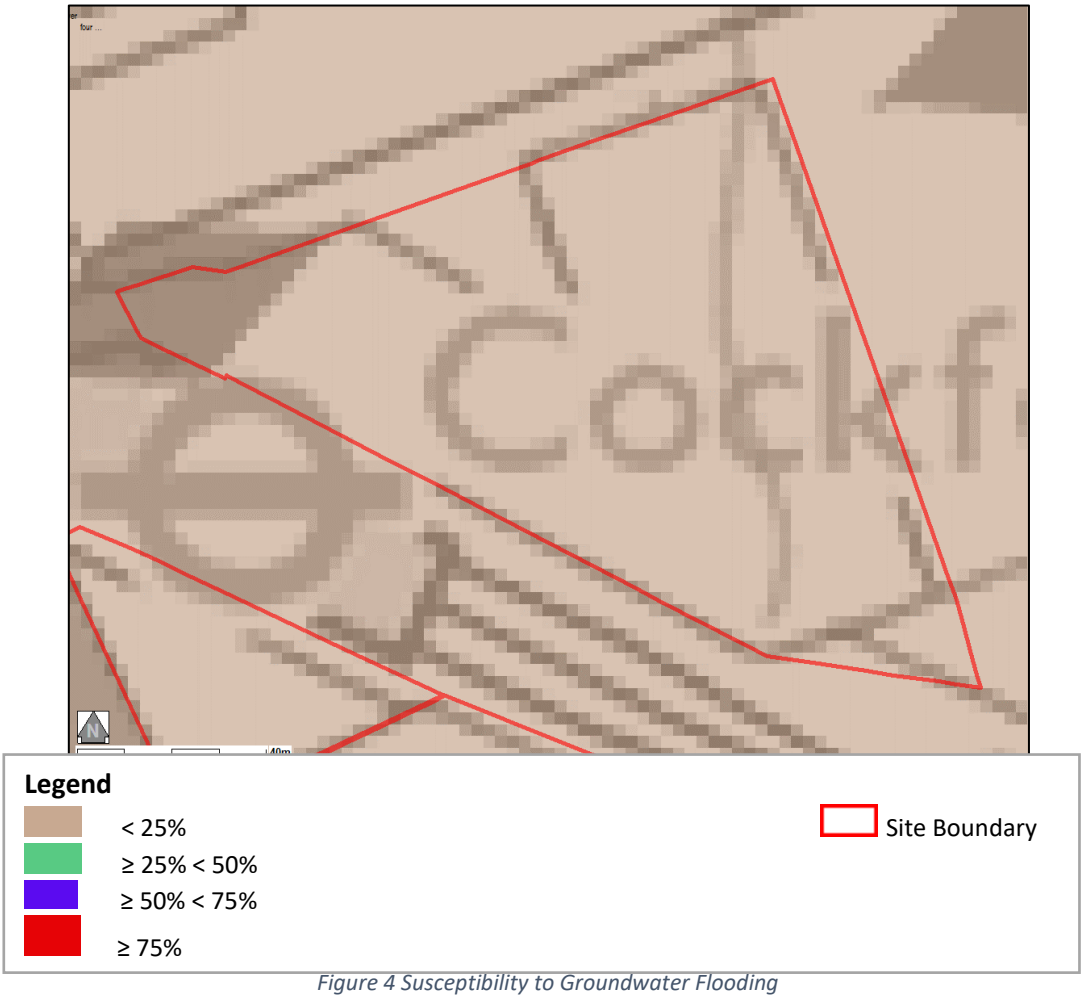


Figure 4 Susceptibility to Groundwater Flooding

Figure 4 above shows that the site has been classed with risk of groundwater flooding: < 25%

Ground Water

Resources

The Environment Agency has produced a series of maps to broadly define areas relevant to the protection of groundwater. These are based on the maps and concepts that are described in a document known as the Policy and Practice for the Protection of Groundwater (PPPG). The guidance has since been updated to Groundwater Protection: Principles and Practice (GP3). This approach considers: the vulnerability of the groundwater resources as a whole; and the specific importance of areas which form the catchments to the main sources of supply.

Groundwater resources are assigned a vulnerability class. This is subdivided into minor (variably permeable groundwater) and major (highly permeable ground water).

Figure 5 Groundwater Resources

Figure 5 above shows that the groundwater resources on the site is classed as: Minor

Vulnerability

The ground water vulnerability can be used to indicate where groundwater resources may be vulnerable from activities carried out on the surface land. Other information, such as the depth of groundwater and thickness and type of overlying cover, will always be required for a site-specific assessment. The following map identifies six groundwater vulnerability classes, which are based on soil type and underlying geology type.

Major_H: Highly permeable groundwater with high leaching potential
Major_I: Highly permeable groundwater with intermediate leaching potential
Major_L: Highly permeable groundwater with low leaching potential
Minor_H: Variably permeable groundwater with high leaching potential
Minor_L: Variably permeable groundwater with low leaching potential
Minor_I: Variably permeable groundwater with intermediate leaching potential

Figure 6 Groundwater Vulnerability

Figure 6 shows that the groundwater vulnerability is classed as: Minor H and Minor L

Groundwater Summary

Based on this data, a groundwater FRA may be required.

Predicted Flood Risk Assessment

Risk of flooding from Rivers and Sea

Rivers and sea predicted flood risk map shows the chance of flooding from rivers and the sea. The information presented is split into four categories and the mapping considers the influence of any of flood defences, and the condition they are in. This data has been collected from the Environment Agency and is considered 'National Scale' and should be used to guide/inform.

The data is a spatial dataset with the floodplain split into 50m x 50m cells and each allocated one of four flood risk likelihood categories.

- High: each year, there is a chance of flooding of greater than 1 in 30 (3.3%).
- Medium: each year, there is a chance of flooding of between 1 in 30 (3.3%) and 1 in 100 (1%).
- Low: each year, there is a chance of flooding of between 1 in 100 (1%) and 1 in 1000 (0.1%).
- Very Low: each year, there is a chance of flooding of less than 1 in 1000 (0.1%).

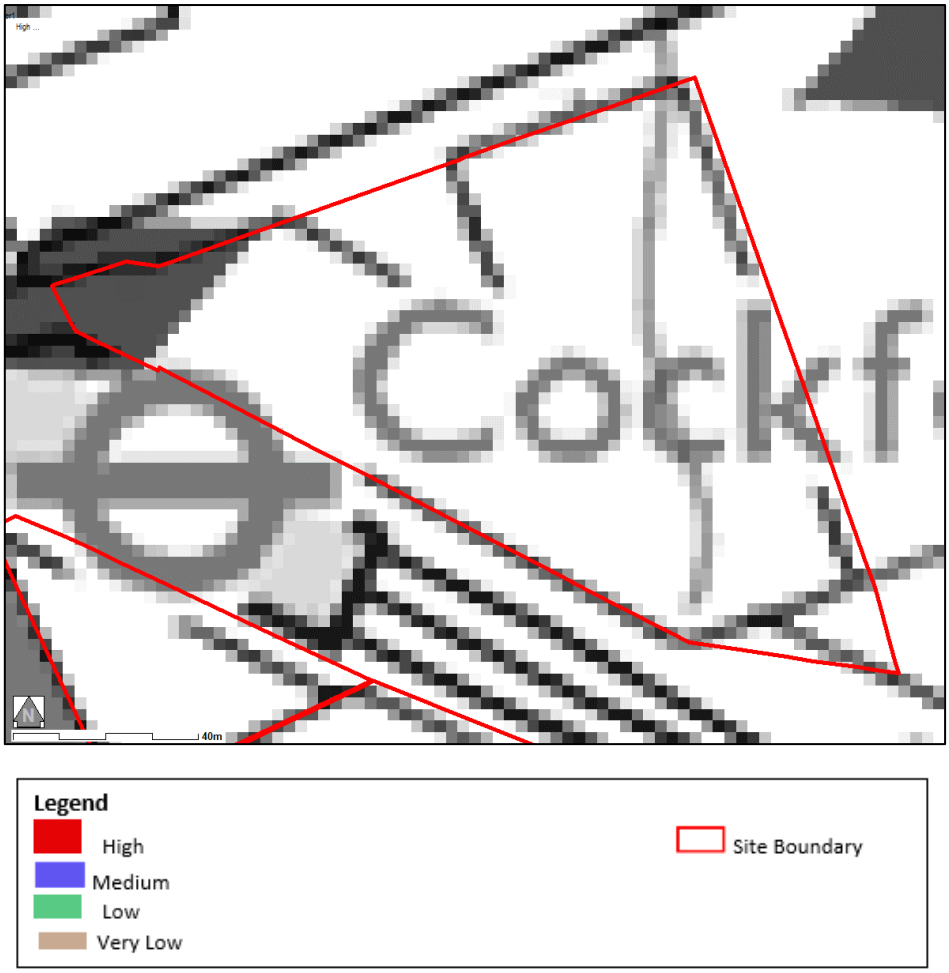


Figure 7 Flood Risk from Rivers and Sea

The above Figure presents that on the site the chance of flooding from the rivers and the sea is: Minimal

Flood Risk Zone (EA)

The Environment Agency (EA) Flood Zones refer to the probability of river and sea flooding, ignoring the presence of any natural or constructed defences. The Flood Zone definitions are provided in the National Planning Policy Framework. For ease of understanding, this is considered 'National Scale' and is relatively coarse.

The Environment Agency Flood Map for Planning below (Figure 8) shows the site is at minimal risk of flooding after ignoring the presence of local flood defences.

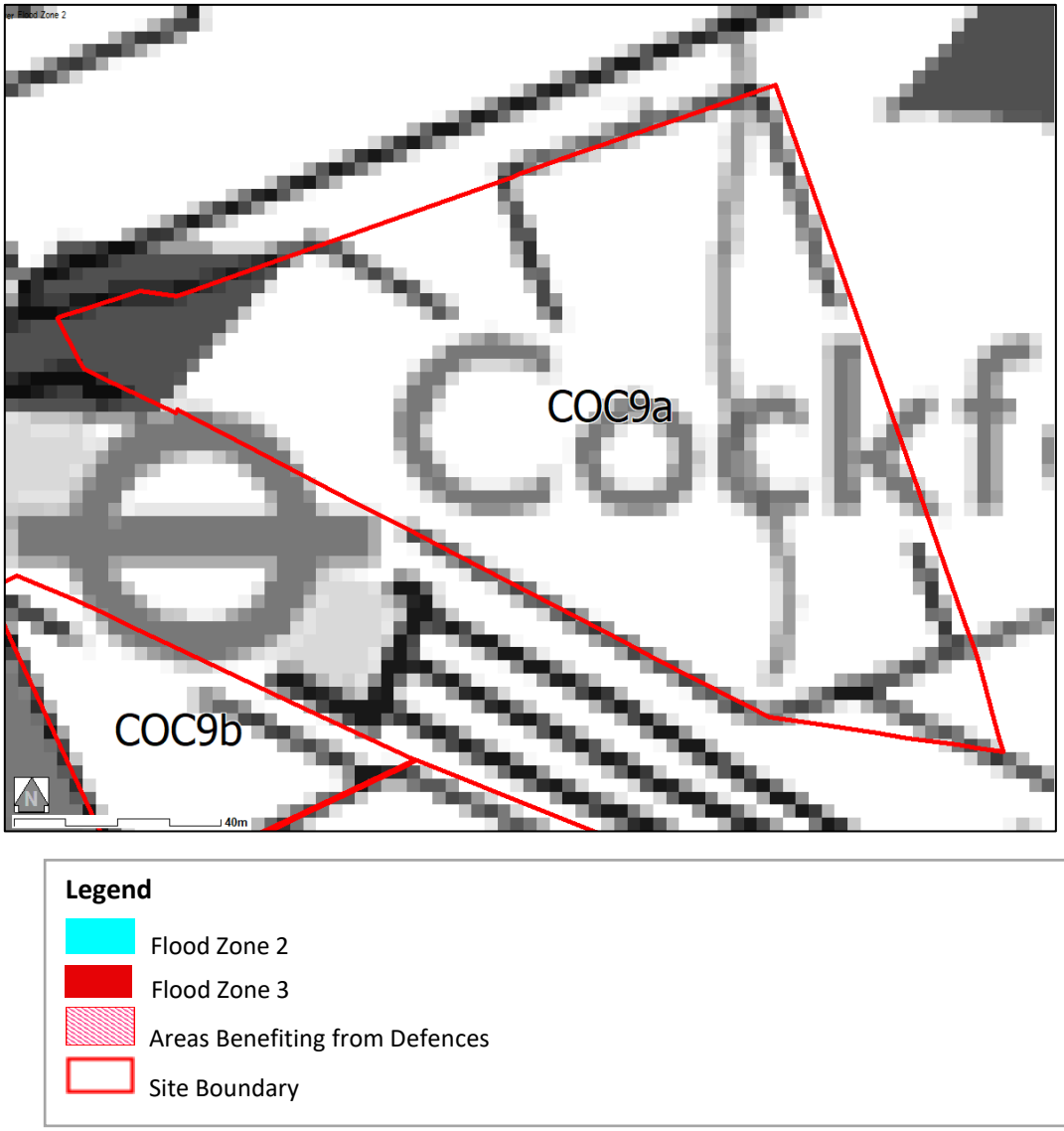


Figure 8 Flood Zones

Flood Risk Zone (provided by Enfield.gov.uk; Source:EA)

The Environment Agency (EA) Flood Zones refer to the probability of river and sea flooding, ignoring the presence of any natural or constructed defences. The Flood Zone definitions are provided in the National Planning Policy Framework. These flood zones are generally produced via enhanced models when compared to the National scale results.

The Environment Agency Flood Map for Planning below (Figure 9) shows the site is at minimal risk of flooding after ignoring the presence of local flood defences.

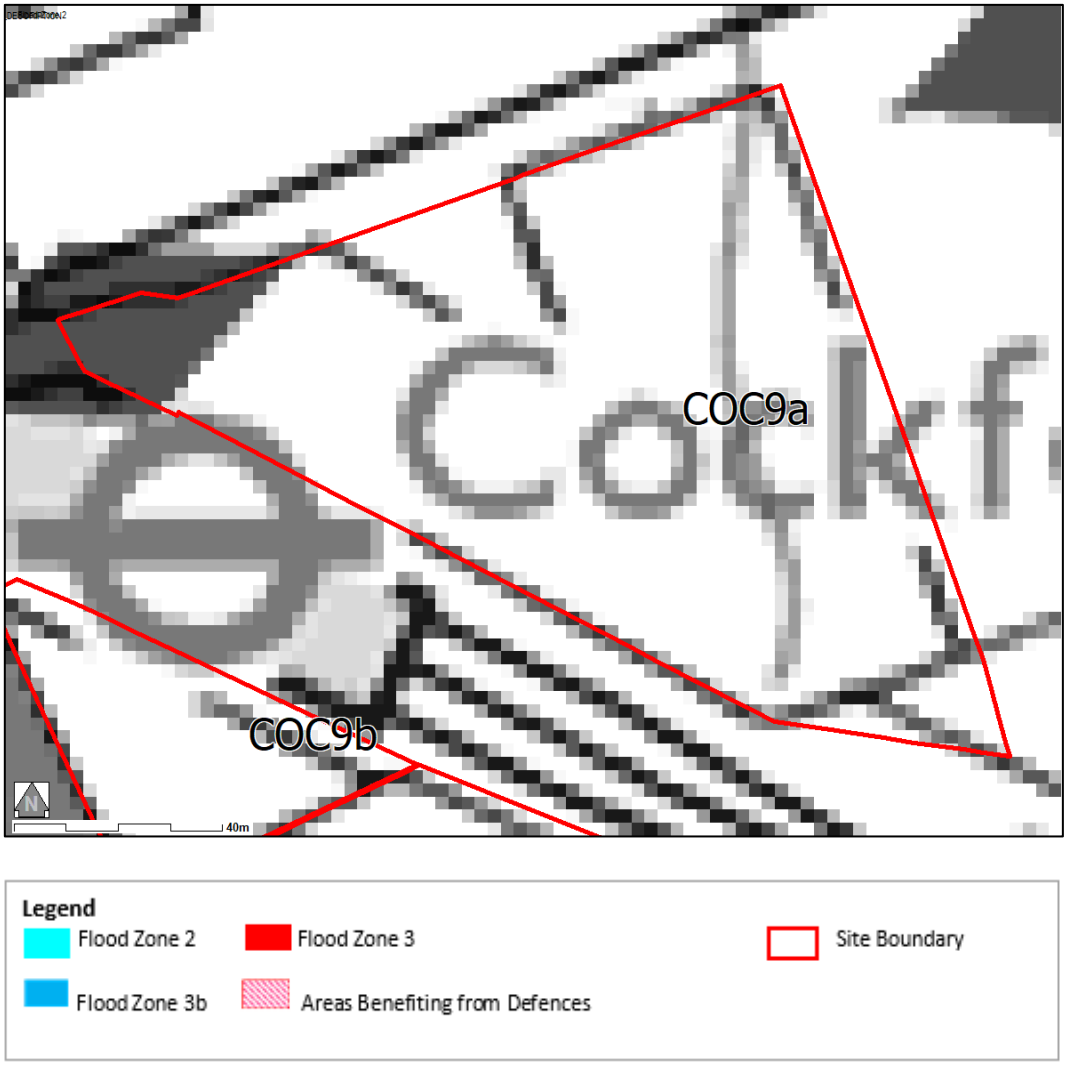


Figure 9 Flood Zones

Fluvial Flooding – Climate Change

The impact of climate change means flooding events will happen with increased frequency and with greater magnitude. The results shown are for a 17% increase in fluvial flow. Depending upon the exact nature of the development, more extreme flow scenarios may need to be considered. Please refer to the EA guidance for further information.

Figure 10 Fluvial Flooding (1 in 100 year + 17%CC)

The site is at minimal risk of fluvial flooding, as shown in Figure 10.

Surface Water Flooding (EA)

The sites within surface water flooding zones may be at risk of flooding during an intense storm event. Similar flood mitigation measures to those suggested for sites within in the EA Flood Zones 2 and 3 should also be considered in surface water flooding zones.

If the development is located within a surface water zone, follow the recommendations.

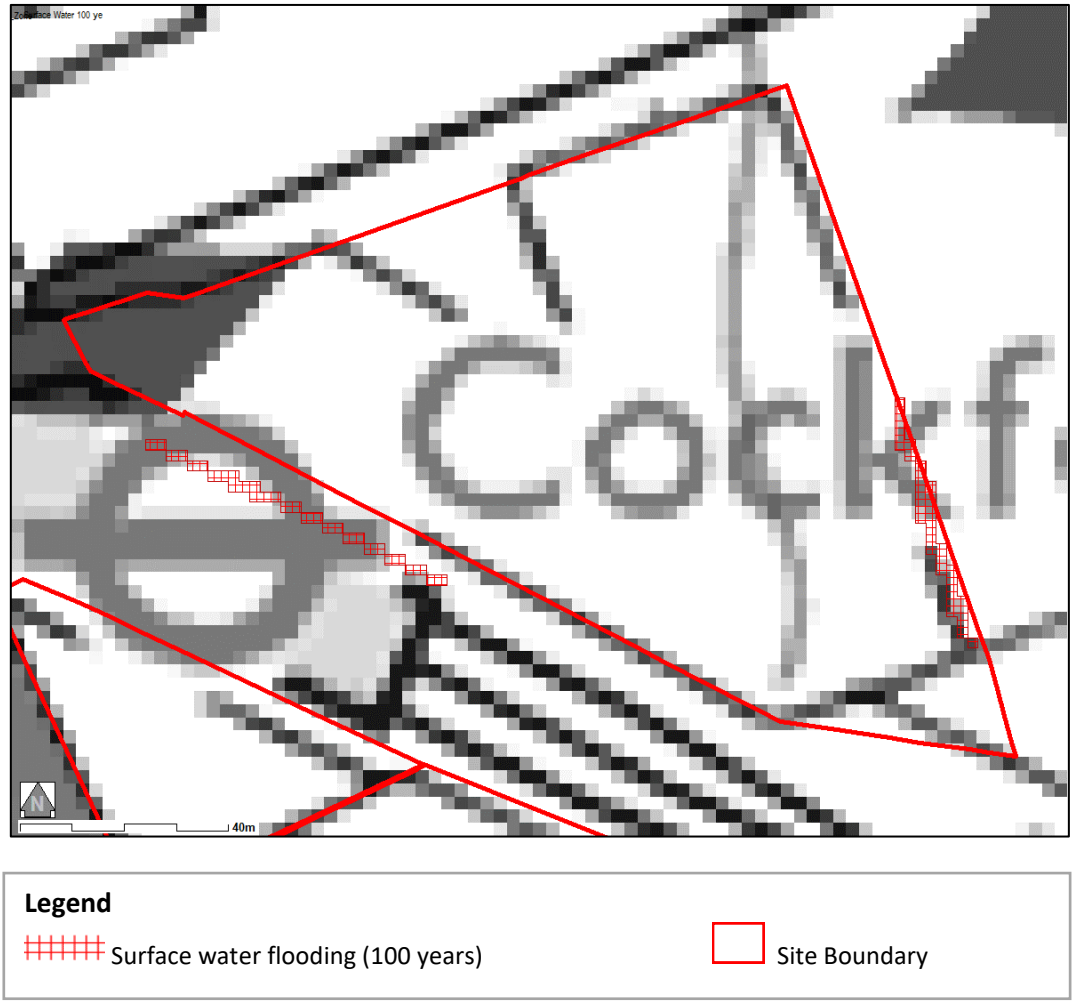


Figure 11 Site Area that has a Chance of Flooding of Between 1 in 100 (1%)

The mapping above shows that the site is within a surface flooding zone, although marginally.

LBE draft local plan SE10 requires the inclusion of Sustainable Drainage (SuDS) in all new developments, particularly major developments, to manage surface water. If located within the buffer zone of a surface water flooding zone, run-off from the site could exacerbate flooding in the vicinity. It is therefore important to consider and implement suitable SuDS, even in small-scale developments in these zones.

Surface Water Flooding – Climate Change

As per the impact of climate change on fluvial flooding, surface water flooding will happen with increased frequency and with greater magnitude. Climate change will also impact pluvial (surface water) flooding. This could be as a result of more intense rainfall, or ground which has less capacity to infiltrate due to the weather conditions. The results shown are for a 17% increase in pluvial rainfall. Depending upon the exact nature of the development, more extreme rainfall scenarios may need to be considered. Please refer to the EA guidance for further information.

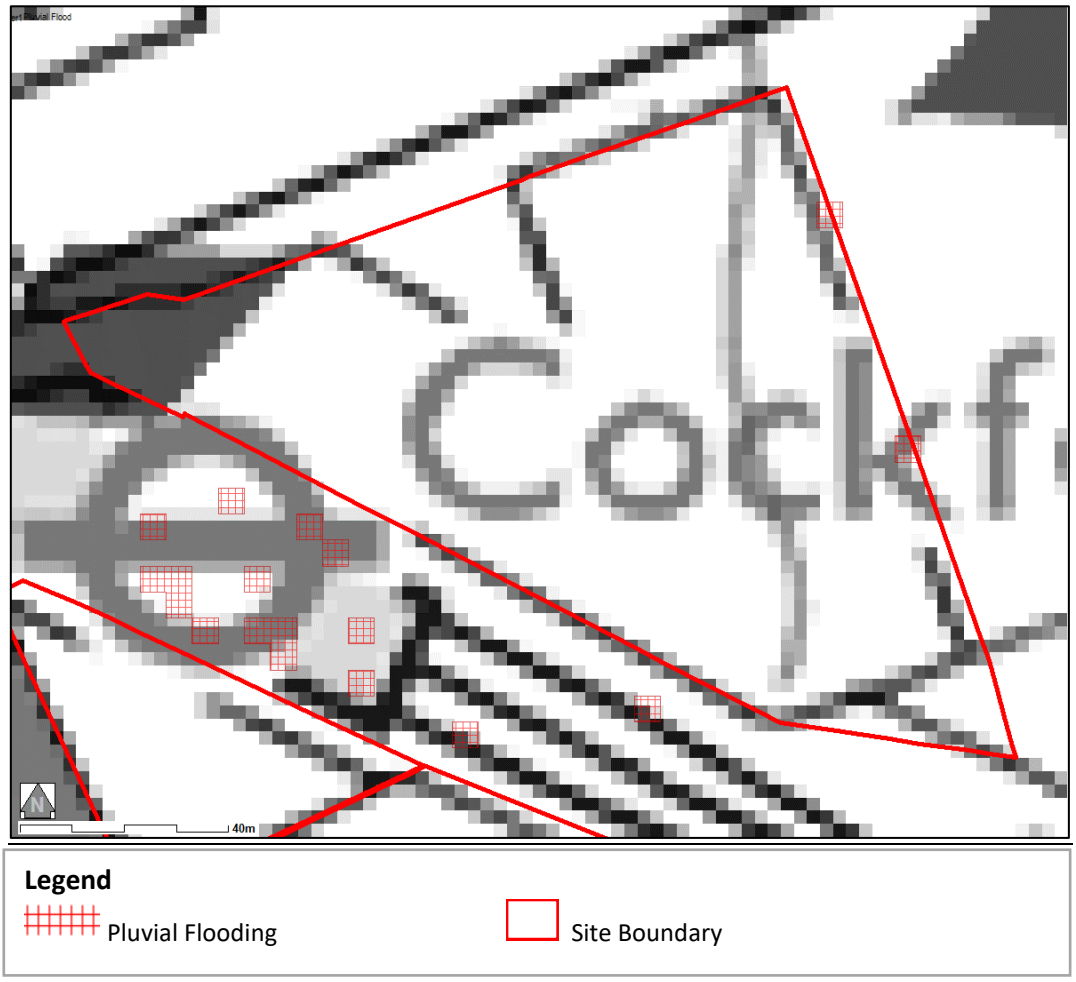


Figure 12 Pluvial Flooding (1 in 100 year + 17%CC)

The site is within surface flooding zone, although marginally, as shown in Figure 12.

Sewer Flooding History

Flooding from sewers is a risk for the majority of the borough. Where new development is proposed at basement or lower ground floor level and new bathrooms, kitchens, showers and/or utility rooms are proposed, the FRA should confirm the inclusion of a non-return valve or similar device to help protect against the risk of sewer surcharging.

The provided data states that within the same postcode as the development, there have been: 9(Internal:7; External:2) for (COC9a/EN4 0DZ) flooding records.

Risk of Flooding (Artificial Sources)

Reservoirs

Reservoir flood maps show where water may go in the unlikely event of a dam or reservoir failure. There are two flooding scenarios shown on the reservoir flood maps. They are a “dry-day” and a “wet-day”, Figure 13 (a) and Figure 13 (b) respectively. The “dry-day” scenario predicts the flooding that would occur if the reservoir failed when rivers are at normal levels. The “wet day” scenario predicts how much worse the flooding might be if a river is already experiencing an extreme natural flood. More than one reservoir could affect a location at the same time.

The ‘fluvial-only extent’ shown on Figure 13 (c) is the extent of the river flooding we used in the model for the “wet-day” scenario. It is not the same as Flood Zone 2 or 3 shown in the Flood Map for Planning on GOV.UK but is considered to be an extreme flood. You should only use the ‘fluvial-only extent’ to see the impact the reservoir flooding has.

For “dry-day” scenario please see Figure 13 (a) below:

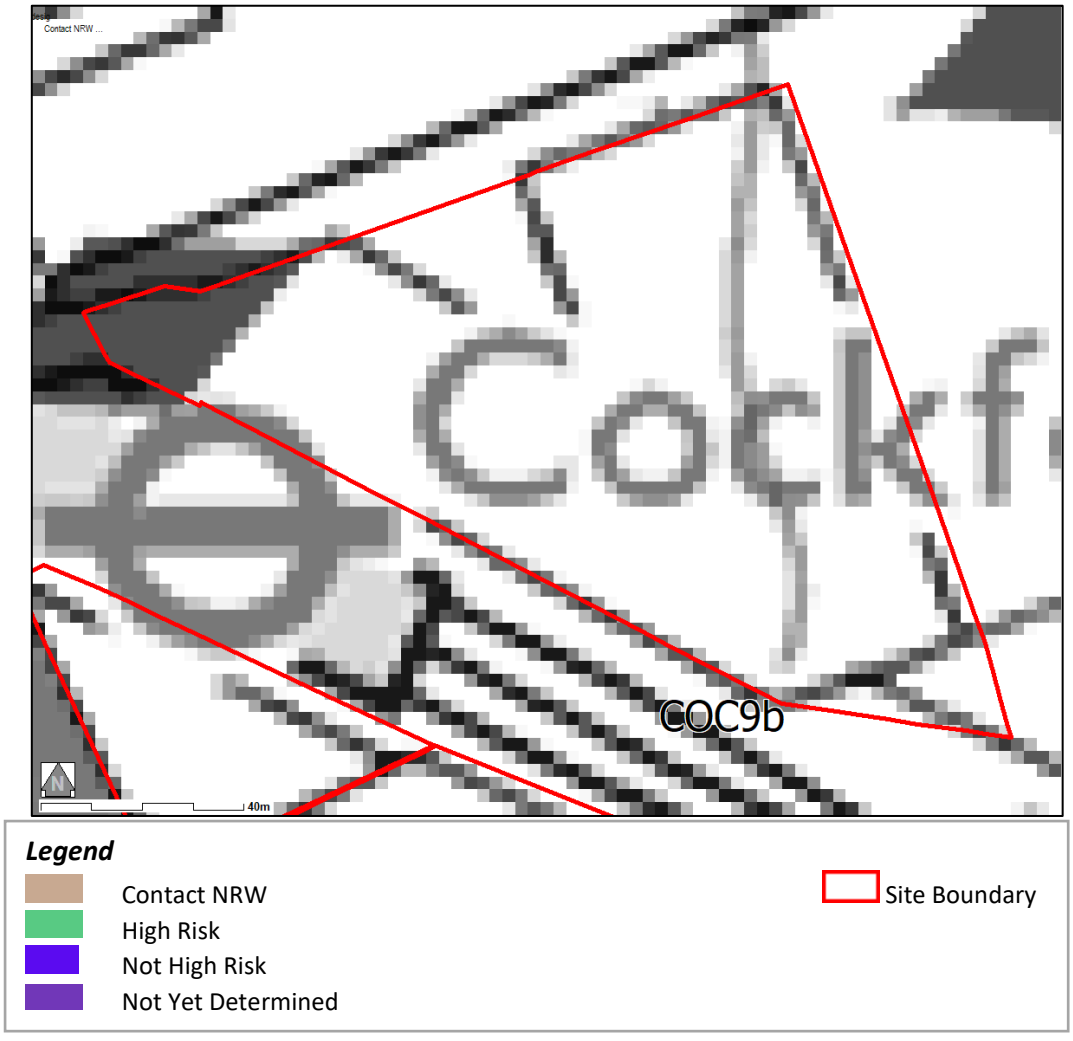


Figure 13 (a) Risk of Flooding from Reservoirs (Dry Day)

The above figure presents that the risk of flooding from reservoir (dry-day scenario) is: Minimal

For “wet-day” scenario please see Figure 13 (b) below:

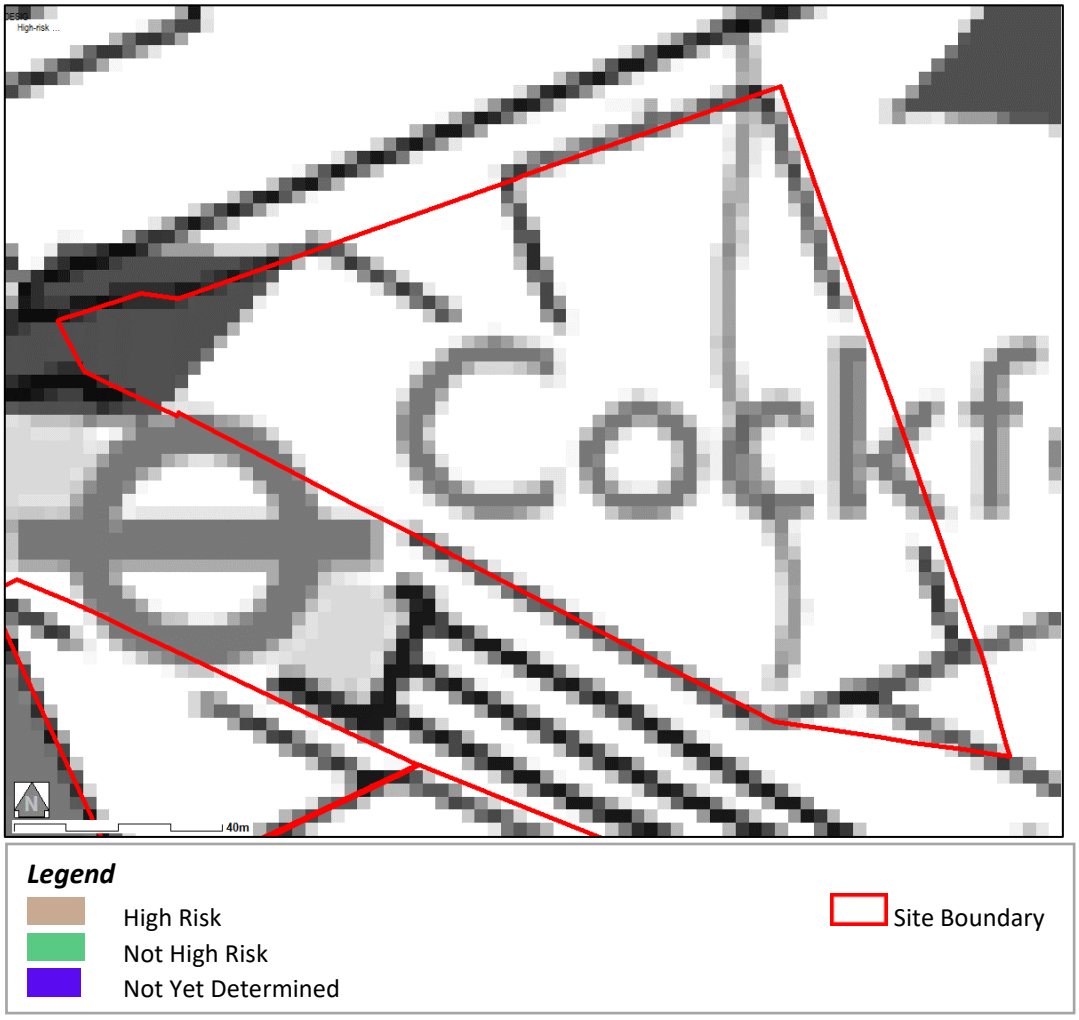


Figure 13 (b) Risk of Flooding from Reservoirs (Wet day)

The above figure presents that the risk of flooding from reservoir (dry-day scenario) is: Minimal

For “Fluvial Extent” flooding please see Figure 13 (c) below:

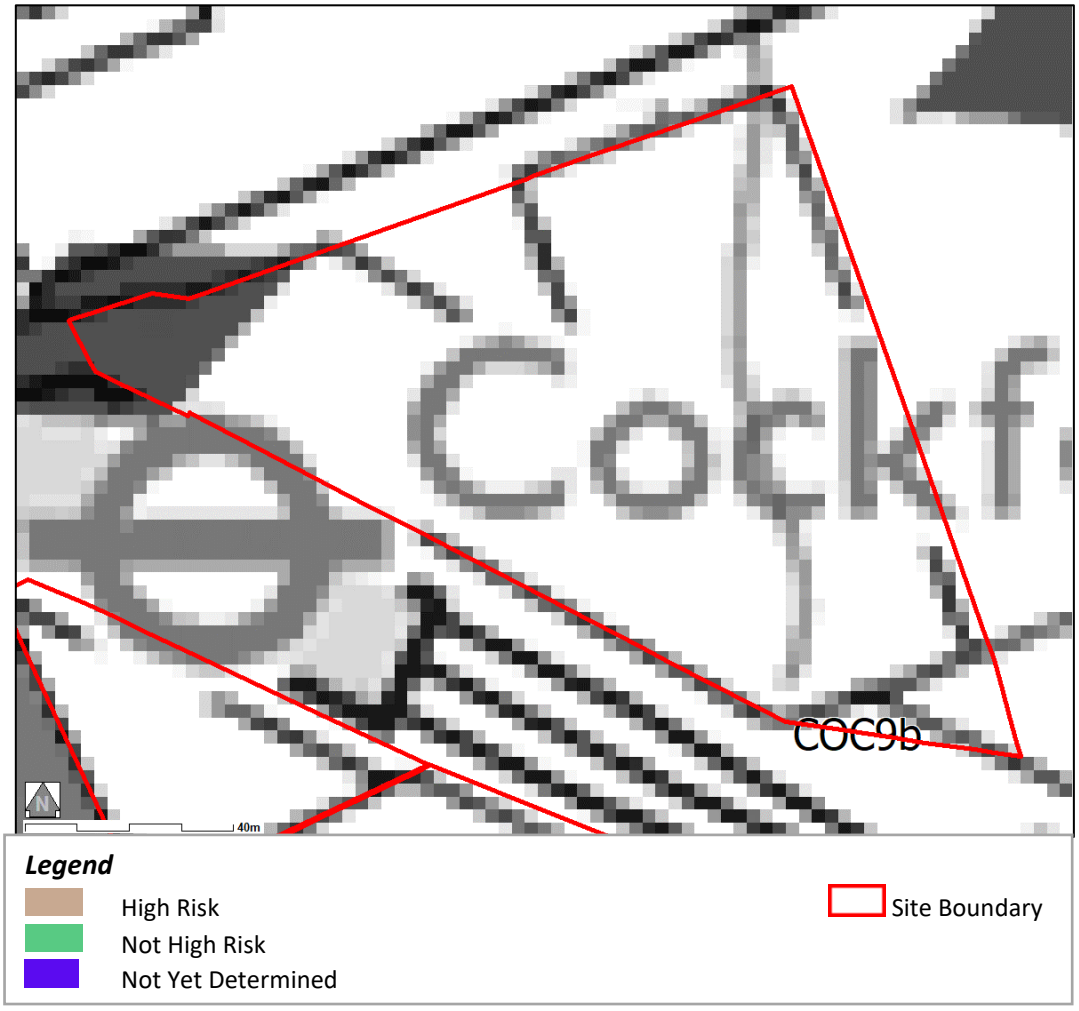


Figure 13 (c) Risk of Flooding from Reservoirs (Fluvial Extent)

The above figure presents that the risk of reservoir flooding (fluvial extent) is: Minimal

Historic Flood Risk Assessment

Environment Agency Records

Fluvial / Pluvial

The EA holds records of past flood events. Figure 14 shows whether the site is located close to an area where flooding has been recorded in the past. The Historic Flood Map shows the combined extents of known flooding from rivers, the sea, and groundwater.

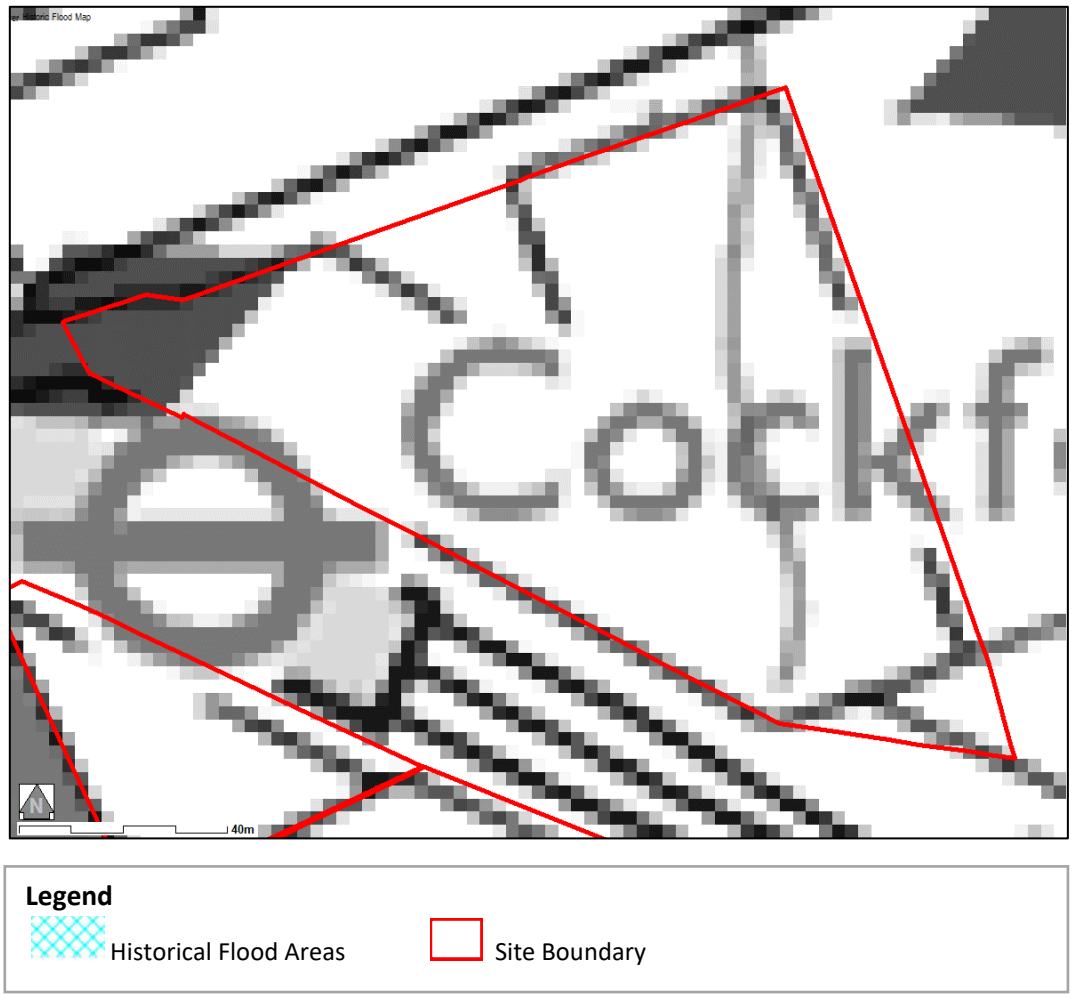


Figure 14 Areas Flooded in the Past

The Figure above presents that the site has not previously experienced any flooding.

Groundwater

There has been 6 records of groundwater flooding within the same postcode as the development.

Urban Drainage - Thames Water Records

Within the same postcode as the proposed development there are 9 records of sewer flooding.

Canals

Overtopping of a river levee occurs when the flood wave generates a water stage above the levee crest. The following Figure 15 presents if an overtopping event was recorded on the site.

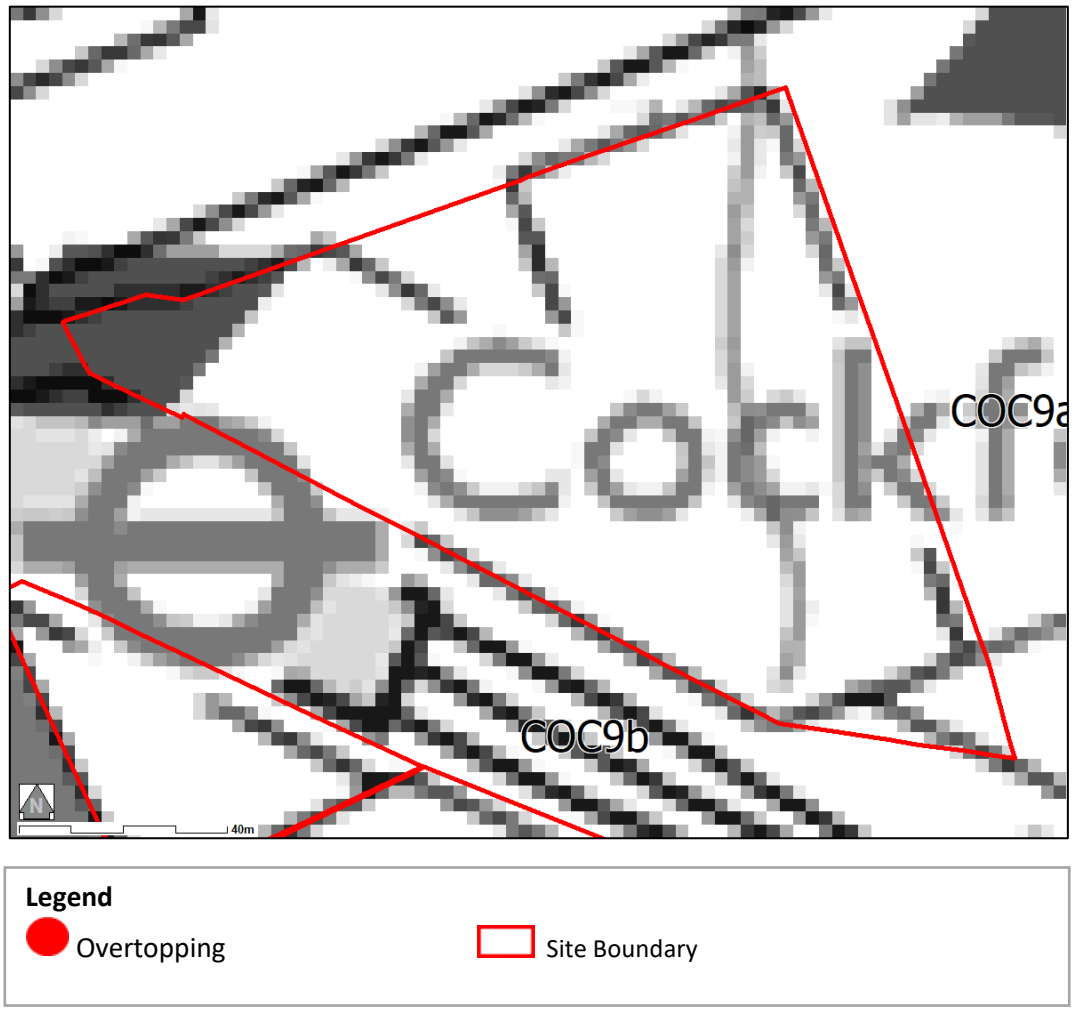


Figure 15 Overtopping

The above figure presents that no overtopping was recorded on the site.

Alerts/ Warning and Defences

Location of Nearest Flood Defence

Figure 16 shows if there are formal flood defences within the vicinity of the site and includes any that have permission to be constructed. Please refer to the EA recommendations for working on or near a defence. The Flood Map displays the location of linear raised flood defences such as embankments and walls.

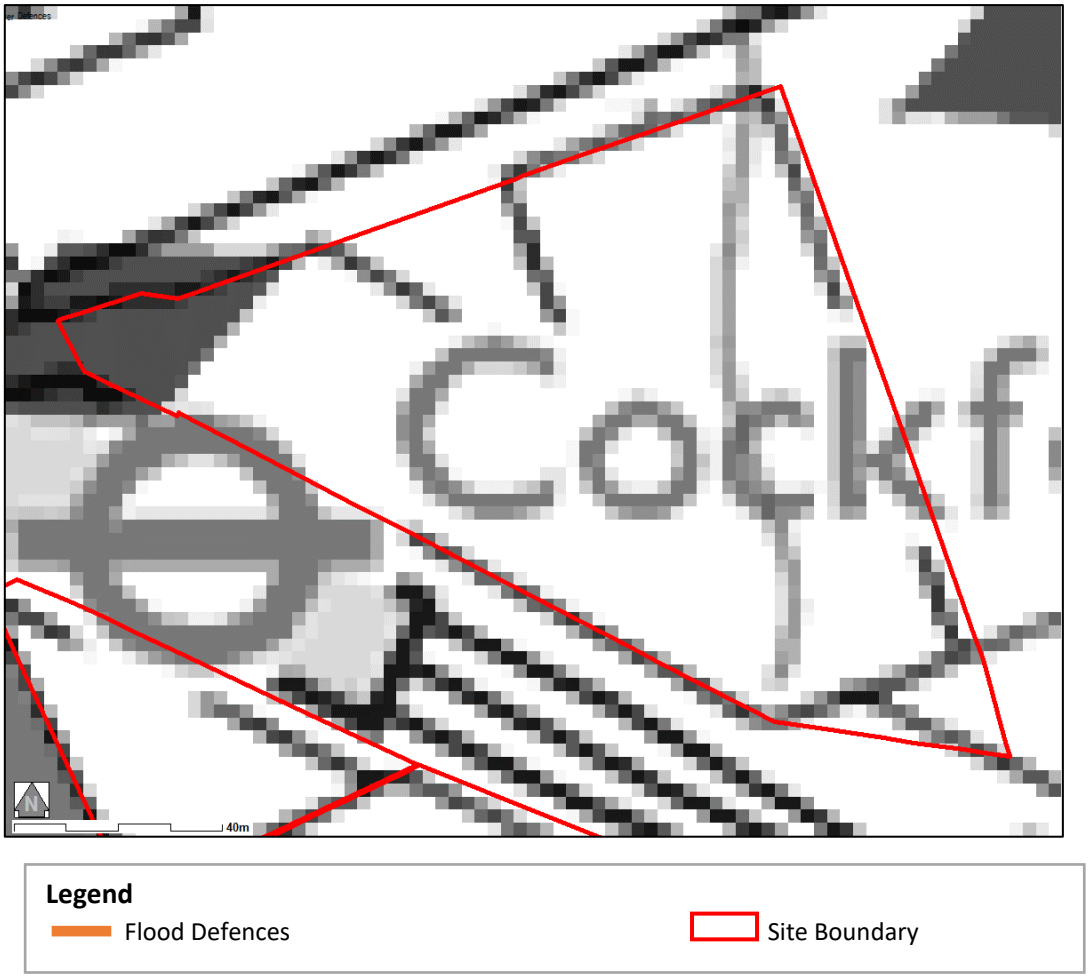


Figure 16 Flood Defences

The figure above shows that there are no formal flood defences within the vicinity of the site.

Flood Alert Areas

Flood Alert Areas are geographical areas where it is possible for flooding to occur from rivers, sea and, in some locations, groundwater.

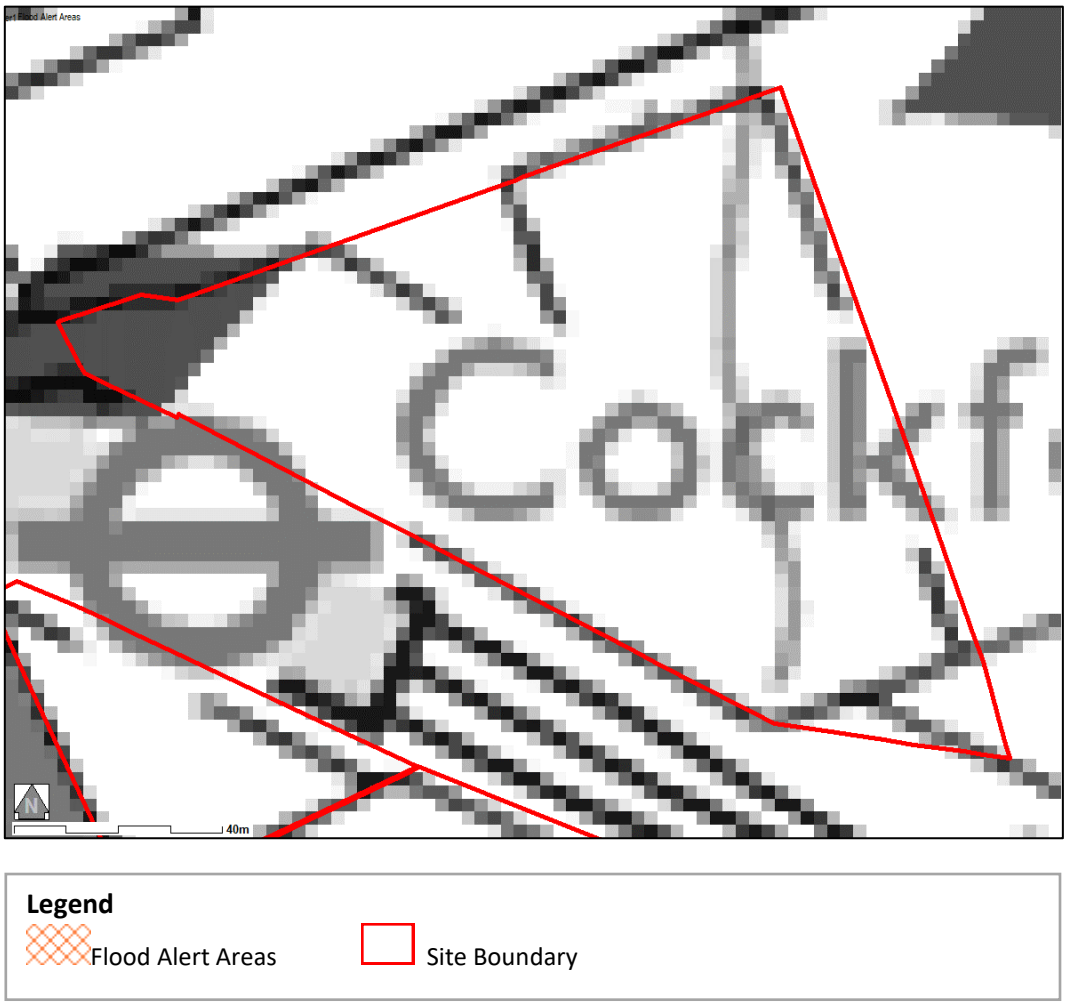


Figure 17 Flood Alert Areas

The Environment Agency map above presents that the site is not in an area covered by flood alerts.

Flood Warning Areas

Flood Warning Areas define locations within the Flood Warning Service Limit that represent a discrete community at risk of flooding.

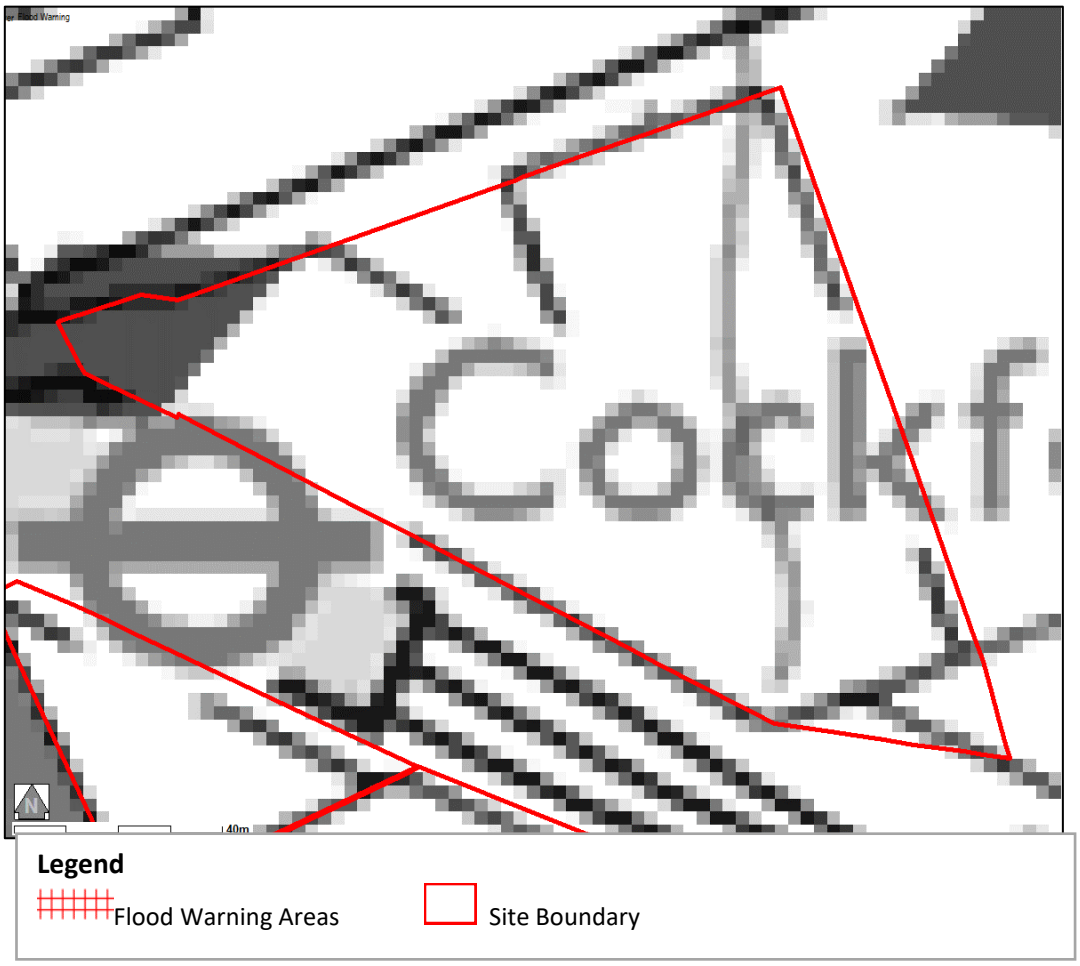


Figure 18 Flood Warning Areas

The above figure shows that the Environment Agency does not issue flood warnings on the site.

Flood Risk Area

Areas at risk of flooding from any source, now or in the future.

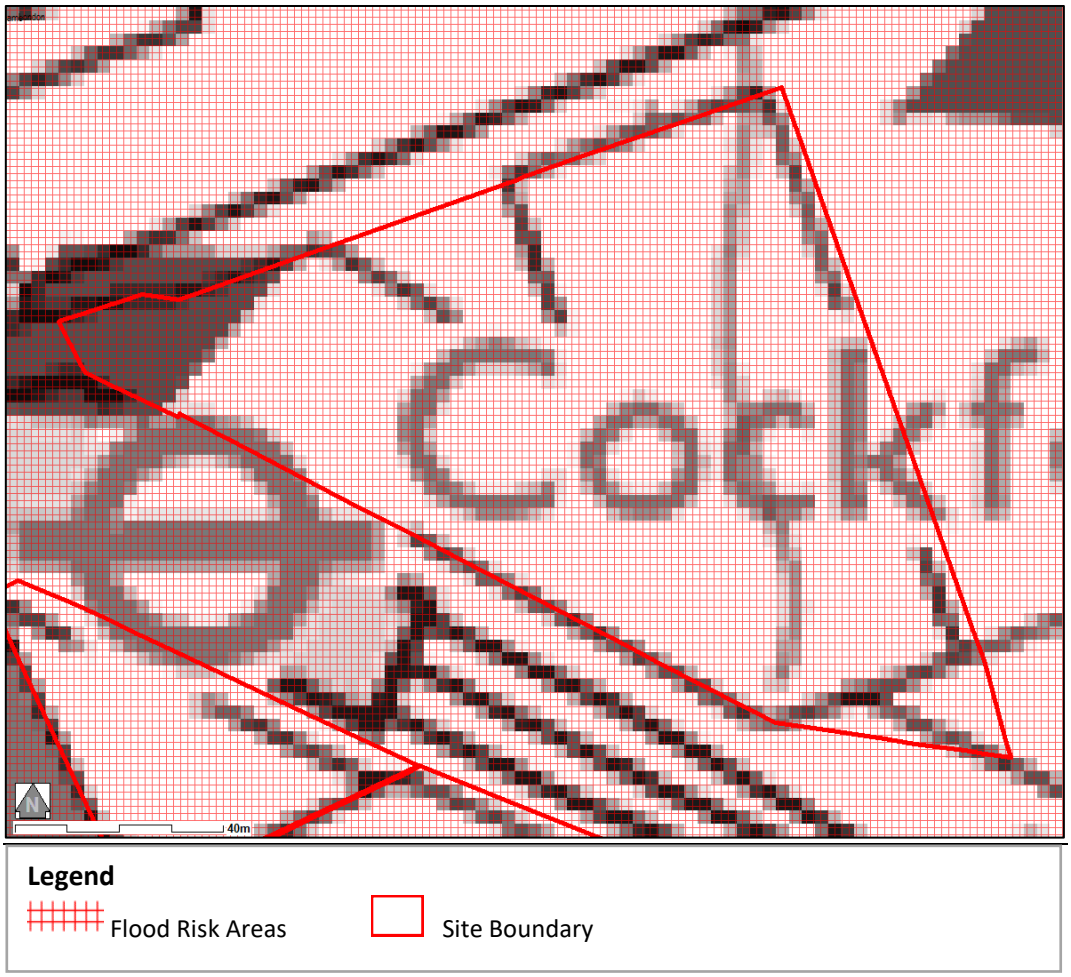


Figure 19 Flood Risk Areas

The mapping above presents that the site is in a flood risk area either now or in the future.

For guidance please visit: Flood management plan of Enfield Council and Flood Plan guidance for communities and groups of Environment Agency.

Summary

With minimal fluvial flood risk, this development does not technically need to be assessed via either the sequential or the exception test. However, this assessment has considered multiple flood sources and has treated them in the same manner. This is to highlight risk to the relevant stakeholders.

Sequential test

This development is above a low risk of flooding, however, based on the available information, it would have **Passed** the sequential testing, though there are some predictions/historic information to consider.

	Fluvial	Surface	Groundwater	Reservoir	Canal	Sewer
Predicted		X	x		Not Collected	Not collected
Historic			x	Not Collected		x

Exception test

If it is not possible to relocate a development to a lower flood risk zone, the exception test can be applied.

To pass the exception test it should be demonstrated that:

- the development would provide wider sustainability benefits to the community that outweigh the flood risk; and
- the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

This development is mixed use it would not be considered water compatible. As the Sequential test is likely to have passed, the exception test is not required.

Managing the Risk

Requirements

Regardless of the sequential and exception tests, the LBE draft local plan SE8 states that "Developments must prepare a site-specific FRA", this includes developments in Flood Zone 1, as the risk should include the 1% AEP + climate change and the risk of asset blockage/failure.

If the groundwater is identified as a risk, a specific groundwater FRA is also required.

The policy stipulates that all developments **MUST** be safe, to be classified as safe, the development must:

- Provide a dry access route in the 1% AEP + CC, or where can be demonstrated as a "very low hazard".
- Finished Floor Levels at least 300mm (fluvial) or 150mm (surface water) above the 1% AEP +CC flood level, with no loss of flood storage.
- Basements will not be allowed in areas of fluvial or surface water flood risk,

Actively managing the risk

In addition to a FRA, SE10 states a Sustainable Drainage Strategy will be required for all developments, this must follow the drainage hierarchy in the London Plan.

This hierarchy provides developers a simple to follow hierarchy to achieve their drainage obligations.

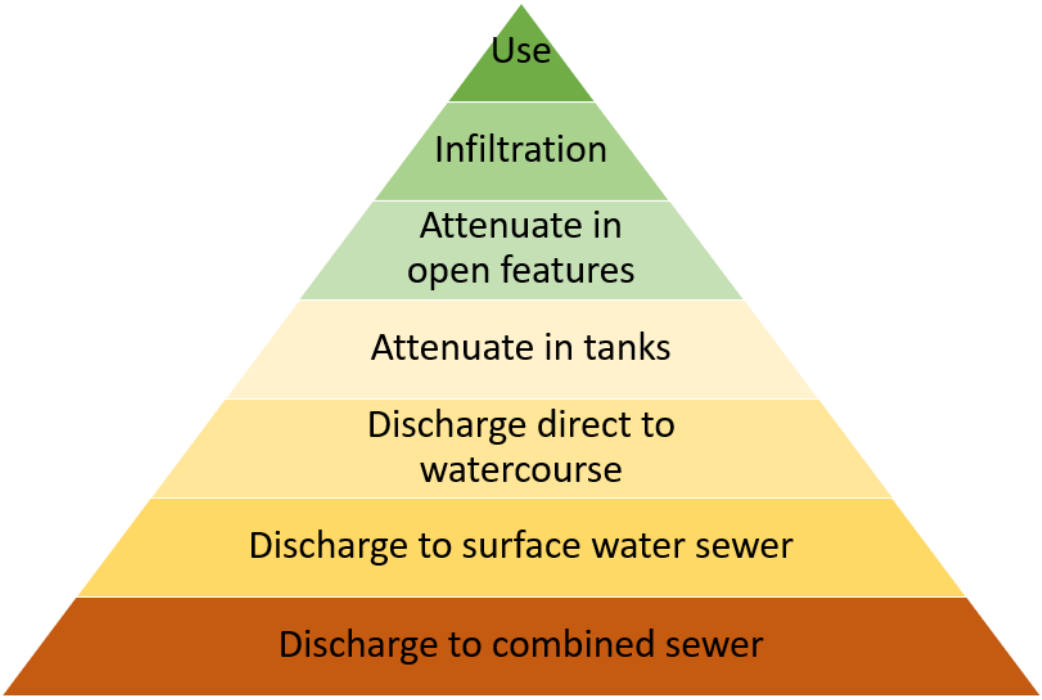
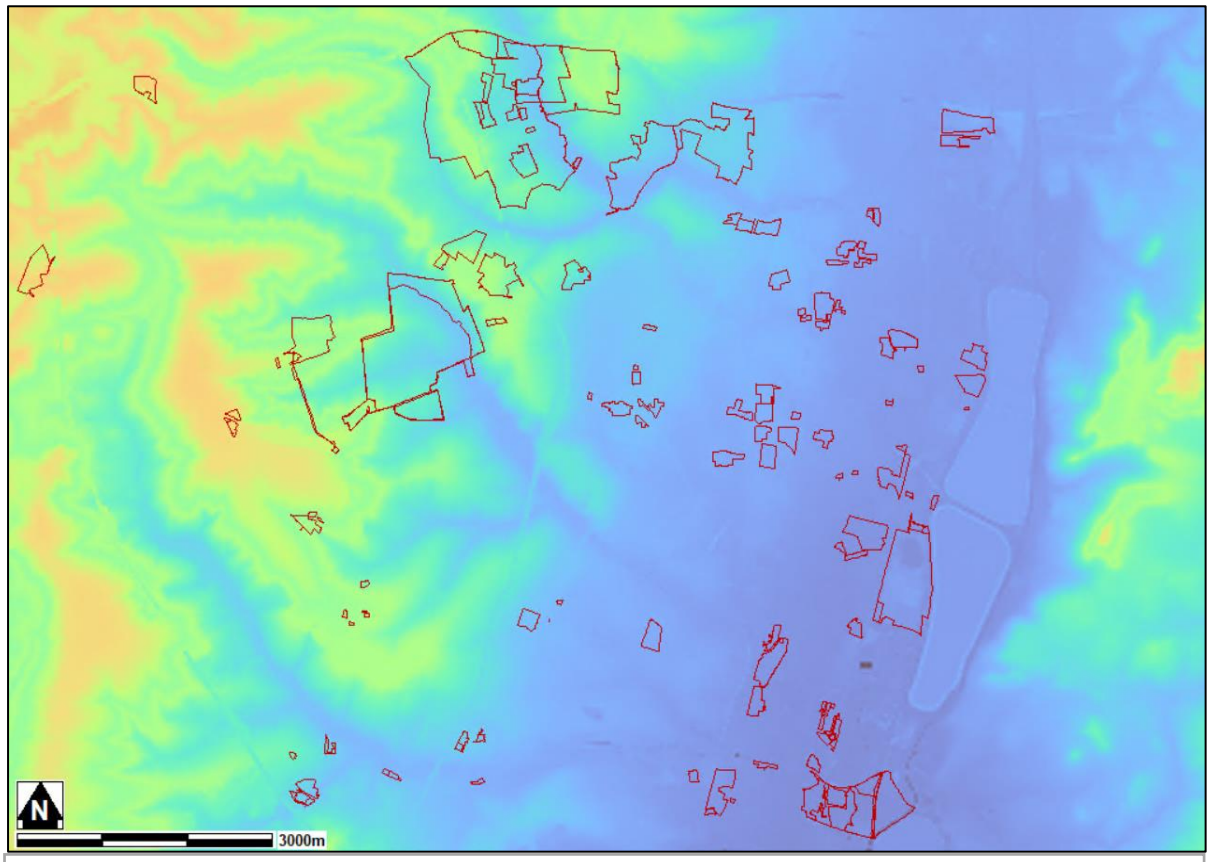


Figure 20: London Plan Hierarchy

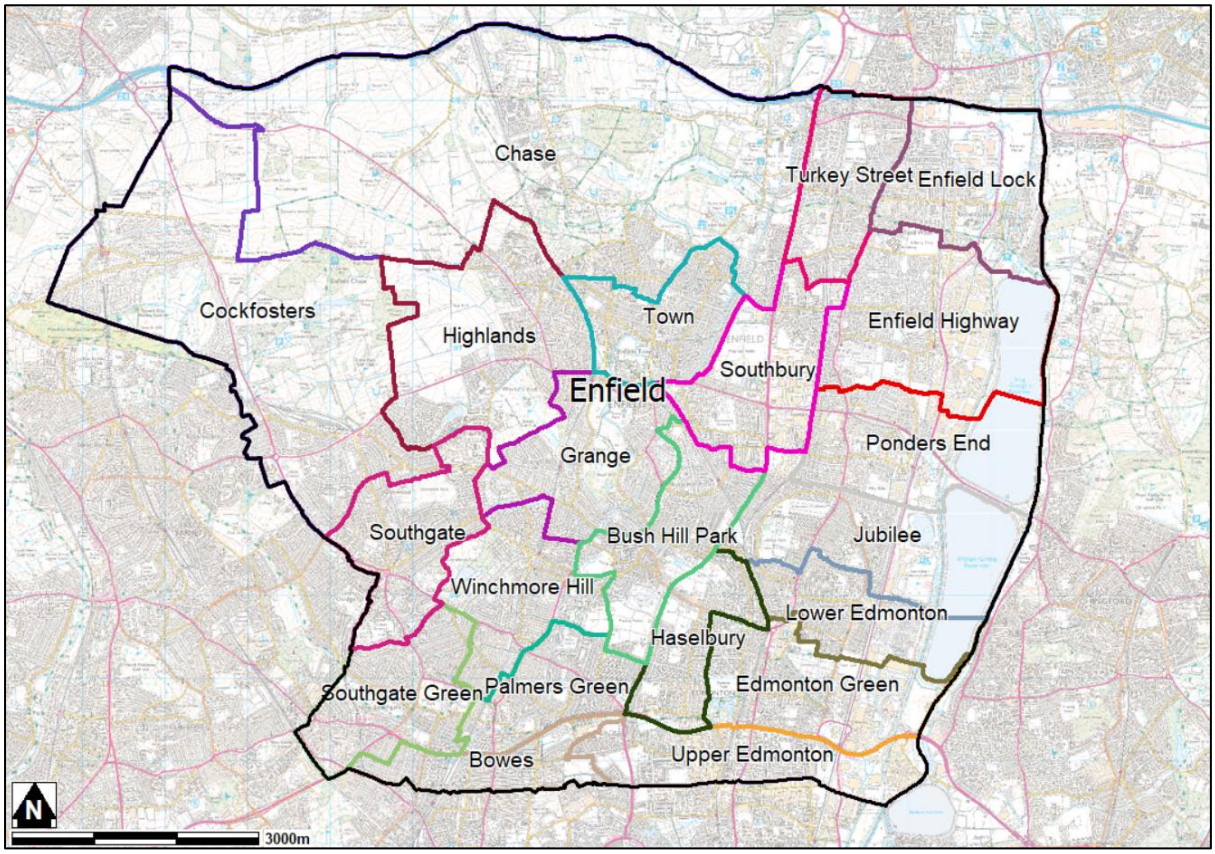
Appendix A



*Levels based on OS datum (Newlyn)

Figure A1 Enfield Topographic Map

Appendix B


Chase
Turkey Street
Enfield Lock
Cockfosters
Highlands
Town
Enfield Highway
Southbury
Enfield
Ponders End
Grange
Southgate
Bush Hill Park
Jubilee
Winchmore Hill
Lower Edmonton
Haselbury
Southgate Green
Palmers Green
Edmonton Green
Bowes
Upper Edmonton
N
3000m