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Flood risk, water and environment

## Flood Risk Assessment AEG3319\_SM3\_Sutton\_01

Site Address: 22 Warner Avenue

North Cheam

Sutton

SM3 9RH

UK Experts in Flood Modelling, Flood Risk  
Assessments, and Surface Water Drainage Strategies

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Flood risk, water and environment

# Document Issue Record

**Project:** Flood Risk Assessment

**Prepared for:** Sam Loveless

**Reference:** AEG3319\_SM3\_Sutton\_01

**Site Location:** 22 Warner Avenue, North Cheam, Sutton, SM3 9RH

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# Summary

Development Description	Existing	Proposed
<b>Development Type</b>	Residential dwelling	Construction of a single storey rear extension on an existing residential dwelling.
<b>EA Vulnerability Classification</b>	More Vulnerable	More Vulnerable
<b>Ground Floor Level</b>	The LiDAR data shows the ground elevation of the site varies between approximately 22.65m AOD and 23.18m AOD.	Floor levels of the new extension will be set no lower than existing floor levels in accordance with EA Standing Advice for Minor Developments.
<b>Level of Sleeping Accommodation</b>	N/A <sup>2</sup>	No Change
<b>Surface Water Drainage</b>	N/A <sup>1</sup>	Proposed to manage runoff via existing surface water drains on site. Small scale SuDS such as rainwater butts are recommended in external areas due to the site being located in a Critical Drainage Area.
<b>Site Size</b>	Approximately 245m <sup>2</sup>	No change
<b>Development Size</b>	N/A	Approximately 12m <sup>2</sup>
<b>Risk to Development</b>	<b>Summary</b>	<b>Comment</b>
<b>EA Flood Zone</b>	Flood Zones 2 and 3	Northwest part of the site located in Flood Zone 3. Majority of the site and proposed development footprint is located in Flood Zone 2.
<b>Flood Source</b>	Fluvial/Pluvial	Pyl Brook
<b>SFRA Available</b>	Level 1 Strategic Flood Risk Assessment (Sutton Council, 2015)	

Management Measures	Summary	Comment
Ground floor level above extreme flood levels	N/A <sup>2</sup>	The development is a Minor Development in terms of flood risk and can adhere to the EA Standing Advice for such (FFLs to be set no lower than existing dwelling).
Safe Access/Egress Route	Yes	<p>Due to the proposed development being an extension to the existing dwelling, the access/ egress arrangements would remain unchanged compared to the existing situation.</p> <p>When flood depths exceed 250mm then refuge can be taken in the existing dwelling on the highest possible floor.</p>
Flood Resilient Design	Yes	Due to the site being at moderate risk from fluvial and pluvial flooding it is recommended that the guidance set out in 'Improving the Flood Performance of New Buildings' Flood Resilient Construction (2007) has been followed.
Site Drainage Plan	Drain as existing	Proposed to manage runoff via existing surface water drains on site. Small scale SuDS such as rainwater butts are recommended in external areas due to the site being located in a Critical Drainage Area.
Flood Warning and Evacuation Plan	Yes	Recommended to sign up to the Pyl Brook at North Cheam Environment Agency (EA) flood warning service.
Offsite Impacts	Summary	Comment
Displacement of floodwater	Negligible	Development is classified as minor development in terms of flood risk and therefore in isolation should not

<b>Increase in surface run-off generation</b>		result in increase in flood risk elsewhere.
	No	Proposed to manage runoff via existing surface water drains on site. Small scale SuDS such as rainwater butts are recommended in external areas due to the site being in a Critical Drainage Area.
<b>Impact on hydraulic performance of channels</b>	Negligible	Pyl Brook is approximately 60m from the site.

<sup>1</sup> not required for this assessment

<sup>2</sup> data not available.

# 1. Introduction

- 1.1. Aegaea were commissioned by Sam Loveless to undertake a Flood Risk Assessment (FRA) for the proposed development. This FRA has been prepared in accordance with the requirements set out in the National Planning Policy Framework (NPPF) and the associated Planning Practice Guidance.
- 1.2. This FRA is intended to support a full planning application and as such the level of detail included is commensurate and subject to the nature of the proposals.

## Site Overview

- 1.3. The site of the proposed development is 22 Warner Avenue, North Cheam, Sutton, SM3 9RH (Figure 1).



Figure 1: Site Location (Base map from Google Hybrid ©)

- 1.4. It is understood that the proposed development is for a single storey rear extension on an existing residential dwelling. The proposed development layout is shown in Appendix A.



- 1.5. In the absence of a topographical survey, Environment Agency Light Detection and Ranging (LiDAR) data Digital Terrain Model has been used to review the topography of the site (Figure 2). The LiDAR data shows the ground elevation of the site varies between approximately 22.65m AOD (metres Above Ordnance Datum) and 23.18m AOD.

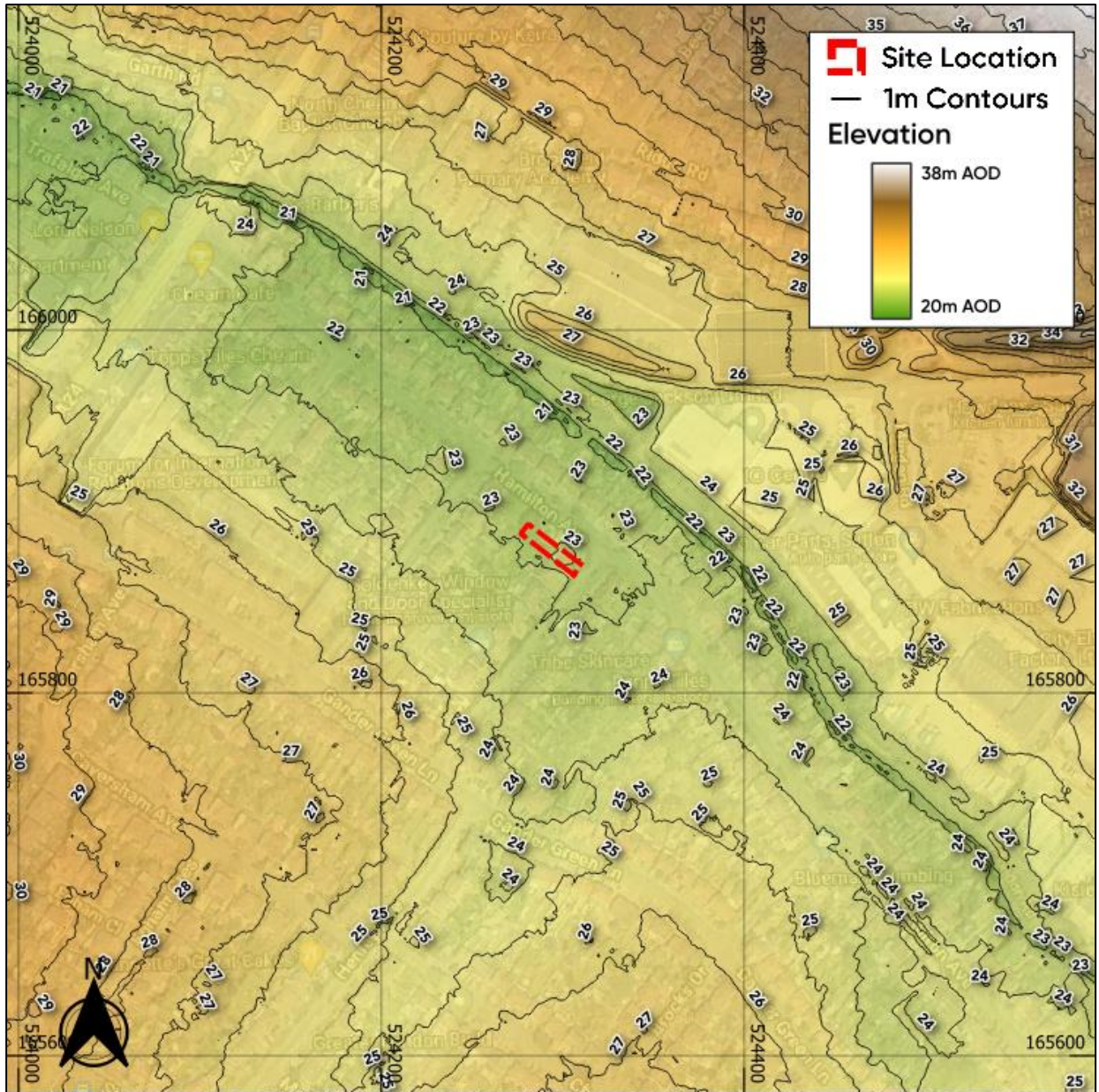


Figure 2: Site Topography(Base map from Google Hybrid © Contains public sector information licensed under the Open Government Licence v3.0)

- 1.6. Sutton Council is the Local Planning Authority (LPA) for the site and also the designated Lead Local Flood Authority (LLFA). The site sits within the Environment Agency's Kent South London and East Sussex region.



## Planning Policy and Guidance

1.7. UK government planning guidance states<sup>1</sup> that an FRA is required for developments which are:

- *in flood zone 2 or 3 including minor development and change of use*
- *more than 1 hectare (ha) in flood zone 1*
- *less than 1 ha in flood zone 1, including a change of use in development type to a more vulnerable class (for example from commercial to residential), where they could be affected by sources of flooding other than rivers and the sea (for example surface water drains, reservoirs)*
- *in an area within flood zone 1 which has critical drainage problems as notified by the Environment Agency*

1.8. The site is located within Flood Zones 2 and 3 and therefore an FRA is required in accordance with the NPPF.

1.9. The objective of this FRA is to demonstrate that the proposals are acceptable in terms of flood risk. This report summarises the findings of the study and specifically addresses the following issues in the context of the current legislative regime:

- Fluvial flood risk
- Surface water flood risk
- Risk of flooding from other sources

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<sup>1</sup><https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications#when-you-need-an-assessment>

## 2. Planning Policy

2.1. Inappropriate development in a flood risk area could pose significant risk in terms of personal safety and damage to property for the occupiers of the development or for people elsewhere. The approach taken in the assessment of flood risk at the planning stage is set out in national, regional, and local planning policy and associated guidance. This section summarises the key policies and guidance relevant to the proposed development.

### National Planning Policy Framework (NPPF)

2.2. The National Planning Policy Framework<sup>2</sup> (NPPF) (DLUHC, 2023) which includes UK Government policy on development and flood risk states:

*165. Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere.*

*173. When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:*

- a) within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;*
- b) the development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment;*
- c) it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;*

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<sup>2</sup><https://www.gov.uk/guidance/national-planning-policy-framework>, last updated Dec 2023

- d) *any residual risk can be safely managed; and*
- e) *safe access and escape routes are included where appropriate, as part of an agreed emergency plan.*

*174. Applications for some minor development and changes of use should not be subject to the sequential or exception tests but should still meet the requirements for site-specific flood risk assessments set out in footnote 59.*

2.3. Paragraph 051 of the Flood Risk and Coastal Change Planning Practice Guidance (PPG) states:

*Minor development means:*

- *minor non-residential extensions (industrial/commercial/leisure etc): extensions with a floorspace not in excess of 250 square metres.*
- *alterations: development that does not increase the size of buildings, e.g. alterations to external appearance.*
- *householder development: for example, sheds, garages, games rooms etc within the curtilage of the existing dwelling, in addition to physical extensions to the existing dwelling itself. This definition excludes any proposed development that would create a separate dwelling within the curtilage of the existing dwelling (eg subdivision of houses into flats) or any other development with a purpose not incidental to the enjoyment of the dwelling.*

2.4. As such, the proposal would be considered a Minor Development under the PPG.

2.5. Footnote 59 of the NPPF states:

*A site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use.*

2.6. Flood Zones in England are defined as follows:

Table 1: Flood Zone Definitions

Flood Zone	Definition
Zone 1 Low Probability	Land having less than 1 in 1,000 annual probability of river or sea flooding (all land outside Zones 2 and 3).
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding.
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding.
Zone 3b The Functional Floodplain	<p>This zone comprises land where water from rivers or the sea has to flow or be stored in times of flood. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. Functional floodplain will normally comprise:</p> <p>land having a 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively; or</p> <p>land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding).</p> <p>Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)</p>

- 2.7. An FRA should be appropriate to the scale, nature, and location of the development. It should identify and assess the risk from all sources of flooding to and from the development and demonstrate how any flood risks will be managed over the lifetime of the development.
- 2.8. An assessment of hydrological impacts should be undertaken, including to surface water runoff and impacts to drainage networks in order to demonstrate how flood risk to others will be managed following development and taking climate change into account.

2.9. The Planning Practice Guidance, which was substantially revised in March 2015 in relation to drainage, requires that sustainable drainage systems (SuDS) should be considered and included where practicable, in line with Defra Technical Standards<sup>3</sup>.

## The London Plan

2.10. The London Plan prepared by the Greater London Authority in 2021 sets out the policies for development in the region.

2.11. Policy SI 12 Flood risk management outlines the requirements for new development within the region. It states:

*- A. Current and expected flood risk from all sources (as defined in paragraph 9.2.12) across London should be managed in a sustainable and cost-effective way in collaboration with the Environment Agency, the Lead Local Flood Authorities, developers and infrastructure providers.*

*- B. Development Plans should use the Mayor's Regional Flood Risk Appraisal and their Strategic Flood Risk Assessment as well as Local Flood Risk Management Strategies, where necessary, to identify areas where particular and cumulative flood risk issues exist and develop actions and policy approaches aimed at reducing these risks. Boroughs should cooperate and jointly address cross-boundary flood risk issues including with authorities outside London.*

*- C. Development proposals should ensure that flood risk is minimised and mitigated, and that residual risk is addressed. This should include, where possible, making space for water and aiming for development to be set back from the banks of watercourses.*

*- D. Developments Plans and development proposals should contribute to the delivery of the measures set out in Thames Estuary 2100 Plan. The Mayor will work with the Environment Agency and relevant local planning authorities, including*

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<sup>3</sup> **Technical Standards Accessed Online**

[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/415773/sustainable-drainage-technical-standards.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/415773/sustainable-drainage-technical-standards.pdf)



authorities outside London, to safeguard an appropriate location for a new Thames Barrier.

- E. Development proposals for utility services should be designed to remain operational under flood conditions and buildings should be designed for quick recovery following a flood.

- F. Development proposals adjacent to flood defences will be required to protect the integrity of flood defences and allow access for future maintenance and upgrading. Unless exceptional circumstances are demonstrated for not doing so, development proposals should be set back from flood defences to allow for any foreseeable future maintenance and upgrades in a sustainable and cost-effective way.

- G. Natural flood management methods should be employed in development proposals due to their multiple benefits including increasing flood storage and creating recreational areas and habitat.

2.12. Policy SI 13 Sustainable drainage outlines the requirements for new development within the region. It states:

- A. Lead Local Flood Authorities should identify - through their Local Flood Risk Management Strategies and Surface Water Management Plans - areas where there are particular surface water management issues and aim to reduce these risks. Increases in surface water run-off outside these areas also need to be identified and addressed.

- B. Development proposals should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible. There should also be a preference for green over grey features, in line with the following drainage hierarchy:

1. rainwater use as a resource (for example rainwater harvesting, blue roofs for irrigation)

2. rainwater infiltration to ground at or close to source

3. rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens)

- 4. rainwater discharge direct to a watercourse (unless not appropriate)
  - 5. controlled rainwater discharge to a surface water sewer or drain
  - 6. controlled rainwater discharge to a combined sewer.
- C. Development proposals for impermeable surfacing should normally be resisted unless they can be shown to be unavoidable, including on small surfaces such as front gardens and driveways.
- D. Drainage should be designed and implemented in ways that promote multiple benefits including increased water use efficiency, improved water quality, and enhanced biodiversity, urban greening, amenity and recreation.

## Local Plan

- 2.13. The Local Plan prepared by the Local Planning Authority, Sutton Council, sets out the policies for development in the local area.
- 2.14. Policy 32 Flood Risk and Sustainable Drainage: Flood Risk Management outlines the requirements for new development within the area. It states:

- a) Proposed developments should avoid or minimise all sources of flood risk to people and property, taking account of climate change, without increasing flood risk elsewhere by:
- Preparing site-specific flood risk assessments (FRAs) in support of all proposals in Flood Zones 2 or 3, all major proposals in Flood Zone 1 over 1ha and any proposal in a critical drainage area. FRAs should assess all sources of flood risk to and from the development and show how these risks will be managed, taking climate change into account, in line with minimum requirements set out in national planning policy.
  - Avoiding inappropriate development in flood risk areas in line with the 'sequential' and 'exceptions tests', taking account of government vulnerability classifications and flood zone compatibility guidelines. Allocated sites in flood risk areas should be developed having regard to the recommendations in the SFRA Level 2 Report as amended.

- Applying a 'sequential approach' to site layout by locating the most vulnerable development within areas of lowest flood risk where possible. All buildings should be set back at least 8m from the banks of main rivers and 5m from the banks of ordinary watercourses to allow improvements and maintenance of land drainage, improve the ecological functioning of river corridors and enhance local amenity.
- Ensuring that all 'more vulnerable' and 'highly vulnerable' developments within Flood Zones 2 and 3 set finished floor levels a minimum of 300mm above the modelled 1 in 100 annual probability flood level including climate change in accordance with the latest guidance published by the Environment Agency.
- Ensuring that any residual risks are safely mitigated through the use of flood resistance or resilience measures, including safe access and escape routes where required.

2.15. Policy 32 Flood Risk and Sustainable Drainage: Sustainable Drainage (SuDS) outlines the requirements for new development within the area. It states:

*b) Proposed developments should incorporate effective sustainable drainage (SuDS) measures as part of the design and layout of the development in order to manage surface water run-off as close to its source as possible and achieve the following minimum SuDS performance standards through application of the Mayor's drainage hierarchy:*

- *Greenfield sites: ensure that peak run-off rates and volumes for the 1 in 100-year rainfall event never exceed greenfield run-off rates for the same event.*
- *Previously developed sites: ensure that peak run-off rates and volumes for the 1 in 100-year event achieve greenfield run-off rates for the same event, unless it can be demonstrated that all opportunities to minimise final site run-off, as close as reasonably practicable to greenfield runoff rates, have been taken in line with the Mayor's drainage hierarchy. In such cases, run-off rates must not exceed 3 times the calculated greenfield rate in accordance with the Mayor's Sustainable Design and Construction SPG; and*

- ensure that the site drainage strategy can contain the 1 in 30 year event (+ climate change) without flooding and that any flooding occurring between the 1 in 30 and 1 in 100 year event (+ climate change) will be safely contained on site.

c) All major development proposals should be accompanied by a Drainage Assessment Form and relevant surface water run-off calculations to demonstrate that the council's minimum SuDS performance standards in Part (b) have been met, having regard to national SuDS standards, London Plan Policy 5.13, the Mayor's Sustainable Design and Construction Supplementary Planning Guidance (SPG), Sutton's SFRA Level 1 Report and other sources of guidance and best practice.

d) All development proposals should include details of how each SuDS measure, and the site drainage strategy as a whole, will be managed and maintained throughout its lifetime, including proposed arrangements for adoption where relevant.

e) All proposed SuDS measures should be designed to contribute towards the aims of Policy 33 'Climate Change Adaptation', Policy 34 'Environmental Protection', Policy 26 'Biodiversity' with regard to urban cooling, biodiversity, water resources, air quality and creating linked networks of blue and green spaces. Developments adjacent to the Wandle should seek to contribute to the aims of: Policy 5 'Wandle Valley Renewal', the Wandle Catchment Plan, the Mayor's All London 'Green Grid' EA's Thames Basin Management Plan.

2.16. Policy 32 Flood Risk and Sustainable Drainage: Flood Alleviation Schemes and Retrofit SuDS Measures outlines the requirements for new development within the area. It states:

f) The council will seek to implement the following priority flood alleviation schemes in accordance with Sutton's Local Flood Risk Management Action Plan:

- Beddington Gardens
- Worcester Park
- Wallington Station and South Beddington.

g) The council will implement retrofit SuDS measures as part of the refurbishment or redevelopment of housing estates, schools, health facilities, transport schemes and parks.

## Sequential and Exception Tests

- 2.17. The Sequential and Exception Tests are applied in specific cases defined by UK Government policy. Their purpose is to drive development to areas of low flood risk and to support developments which improve flood risk for developments in areas at risk of flooding.
- 2.18. Under the NPPF all new planning applications should undergo a Sequential Test accordance with paragraph 168 and footnotes 59 and 60. This test should be implemented by local planning authorities with a view to location particularly vulnerable new developments outside of the floodplain.
- 2.19. Paragraph 174 of the NPPF states:

*"174. Applications for some **minor development** and changes of use should not be subject to the sequential or exception tests but should still meet the requirements for site-specific flood risk assessments set out in footnote 59."*

- 2.20. As such, a site-specific Sequential Test and Exception Test for the proposed developments is not considered necessary in line with the NPPF given that the proposal is for a minor development.

## Summary

- 2.21. This flood risk assessment has been prepared with due consideration to the above local and national policy.



## 3. Consultation and Review

### Consultation

3.1. The Environment Agency (EA) have provided Aegaea with outputs for the Beverley Brook Model (2009) and this is discussed further in Section 4 of this report.

### Documents and Online Mapping

3.2. Local Governments and Lead Local Flood Authorities provide documents which contain data and policies on flood risk and new development in their areas. These documents are introduced and briefly summarised below. For the purposes of this FRA, these documents have been reviewed for relevant information and any relevant data is discussed within the appropriate sub heading of this report.

3.3. The following sources of information have been reviewed for this assessment:

- Flood Map for Planning on the Environment Agency website <https://flood-map-for-planning.service.gov.uk/>
- Long Term Flood Risk Information on the Environment Agency website <https://www.gov.uk/check-long-term-flood-risk>
- National Planning Policy Framework (NPPF) (Department for Levelling Up, Housing and Communities, 2023)
- Planning Practice Guidance - Flood Risk and Coastal Change (Department for Levelling Up, Housing and Communities, 2022)
- Geoindex Onshore (British Geological Survey, 2023)
- The London Plan<sup>4</sup> (Greater London Authority, 2021) and Sutton Local Plan 2016-2031<sup>5</sup> (Sutton Council, 2018)

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<sup>4</sup> [https://www.london.gov.uk/sites/default/files/the\\_london\\_plan\\_2021.pdf](https://www.london.gov.uk/sites/default/files/the_london_plan_2021.pdf)

<sup>5</sup> <https://www.sutton.gov.uk/documents/20124/864129/1.+Sutton+Local+Plan+%28Adopted+2018%29.pdf/57903d66-57ad-bf28-857d-8c8e779fc3ce?t=1678268850847>

- Preliminary Flood Risk Assessment<sup>6</sup> (Sutton Council, 2011)
- Level 1 Strategic Flood Risk Assessment<sup>7</sup> (Sutton Council, 2015)
- Local Flood Risk Management Strategy<sup>8</sup> (Sutton Council, 2022)

## **Preliminary Flood Risk Assessment (PFRA)**

- 3.4. The PFRA, published in 2011, is a high-level appraisal of flood risk across Lead Local Flood Authority Sutton Council. The flood risk from all sources, including fluvial, surface water, groundwater, and surcharged sewers is evaluated. It is the basis upon which the Local Flood Risk Management Strategy is produced.
- 3.5. The PFRA summarises historical flood incidents in Sutton Council. The site is not recorded as having been affected by any flood event.

## **Strategic Flood Risk Assessment (SFRA)**

- 3.6. The SFRA, published in 2015, provides the evidence base for the Local Planning Authority Sutton Council Local Plan and guidance for consideration when determining planning applications. The SFRA seeks to place new development into areas of lower flood risk taking into account current flood risk, future flood risk, and the effect a proposed development would have on the risk of flooding.
- 3.7. The SFRA mapping provided by Sutton Council has been used throughout production of this report as a source of information, particularly pertaining to historical flood incidents.

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<sup>6</sup>[https://www.sutton.gov.uk/documents/20124/449629/preliminary\\_flood\\_risk\\_assessment.pdf/d6a9fb0e-6b9e-9c97-3270-0f41ffa4cc62](https://www.sutton.gov.uk/documents/20124/449629/preliminary_flood_risk_assessment.pdf/d6a9fb0e-6b9e-9c97-3270-0f41ffa4cc62)

<sup>7</sup>[https://www.sutton.gov.uk/documents/20124/1034671/SFRA+Level+1+Report\\_Dec+2015+Final.pdf/a5170227-c5aa-c1f2-4461-ebbe51aa253c?t=1678283019601](https://www.sutton.gov.uk/documents/20124/1034671/SFRA+Level+1+Report_Dec+2015+Final.pdf/a5170227-c5aa-c1f2-4461-ebbe51aa253c?t=1678283019601)

<sup>8</sup> [https://www.sutton.gov.uk/documents/20124/449617/Sutton\\_LFRMS\\_v2.1.pdf/7d945555-0f89-9c47-eff5-e0c648209fb4?t=1670604926714](https://www.sutton.gov.uk/documents/20124/449617/Sutton_LFRMS_v2.1.pdf/7d945555-0f89-9c47-eff5-e0c648209fb4?t=1670604926714)

## **Local Flood Risk Management Strategy (LFRMS)**

- 3.8. The Local Flood Risk Management Strategy published in 2022 sets out roles and responsibilities for flood risk management, assesses the risk of flooding in the area, where funding can be found to manage flood risk, and the policies, objectives, and actions of the Lead Local Flood Authority.
- 3.9. The Sutton Council LFRMS is used within this report to identify any flood management infrastructure and historical incidences of flooding.

## 4. Sources of Flood Risk

### Fluvial

- 4.1. Flooding from watercourses arises when flows exceed the capacity of the channel, or where a restrictive structure is encountered, resulting in water overtopping the banks into the floodplain.
- 4.2. The site is located within Flood Zones 2 and 3 (Figure 3). Flood Zone 2 denotes a risk of flooding from fluvial sources between a 1 in 100 (1%) and 1 in 1,000 (0.1%). Flood Zone 3 denotes a risk of flooding from fluvial sources greater than 1 in 100 (1%).
- 4.3. It is noted that the proposed development footprint is located wholly in Flood Zone 2, as shown in Figure 3.

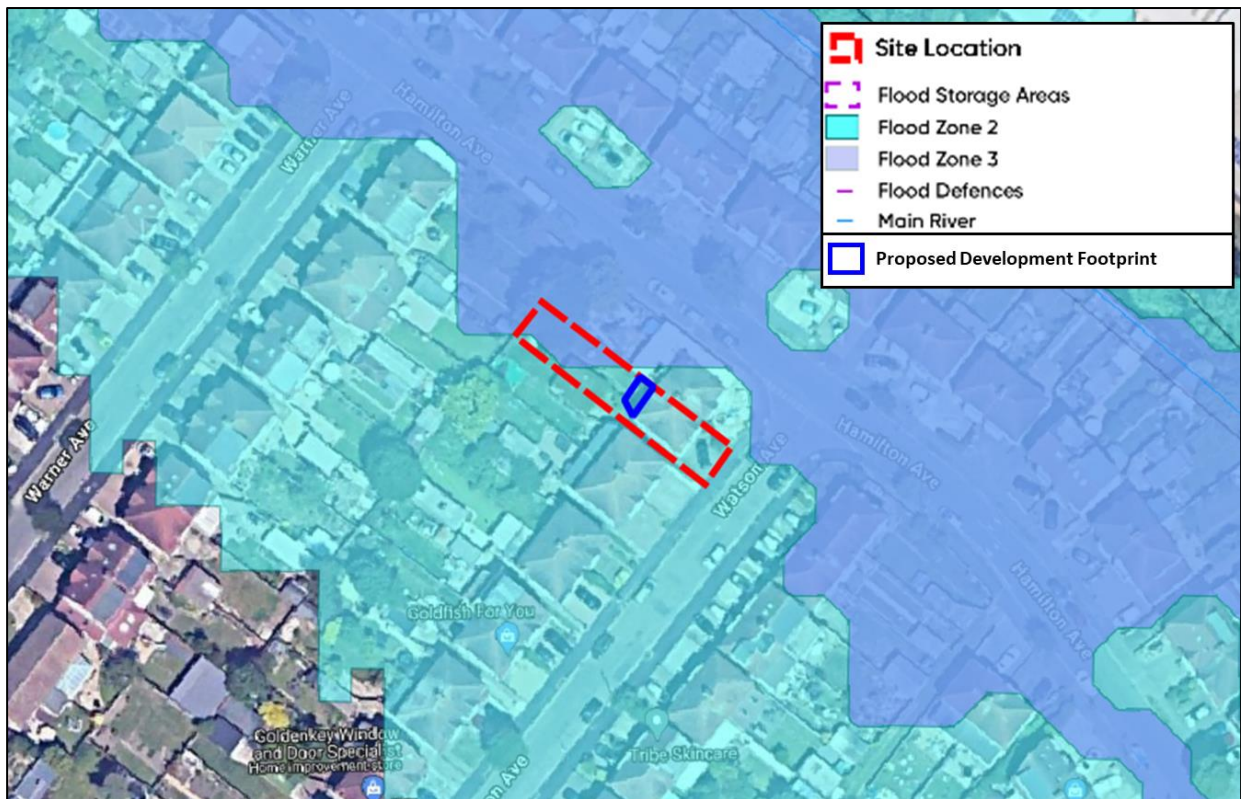


Figure 3: EA Flood Map for Planning (Base map from Google Hybrid © Contains public sector information licensed under the Open Government Licence v3.0)

### Main Rivers

- 4.4. The nearest main river is the Pyl Brook which is approximately 60m northeast of the site.



## Ordinary Watercourses

- 4.5. There are no other recorded watercourses in the vicinity of the site.

## Historical Fluvial Flooding

- 4.6. EA Recorded and Historical Flood Outlines indicates that the site is not within the recorded flood outline (Figure 4).

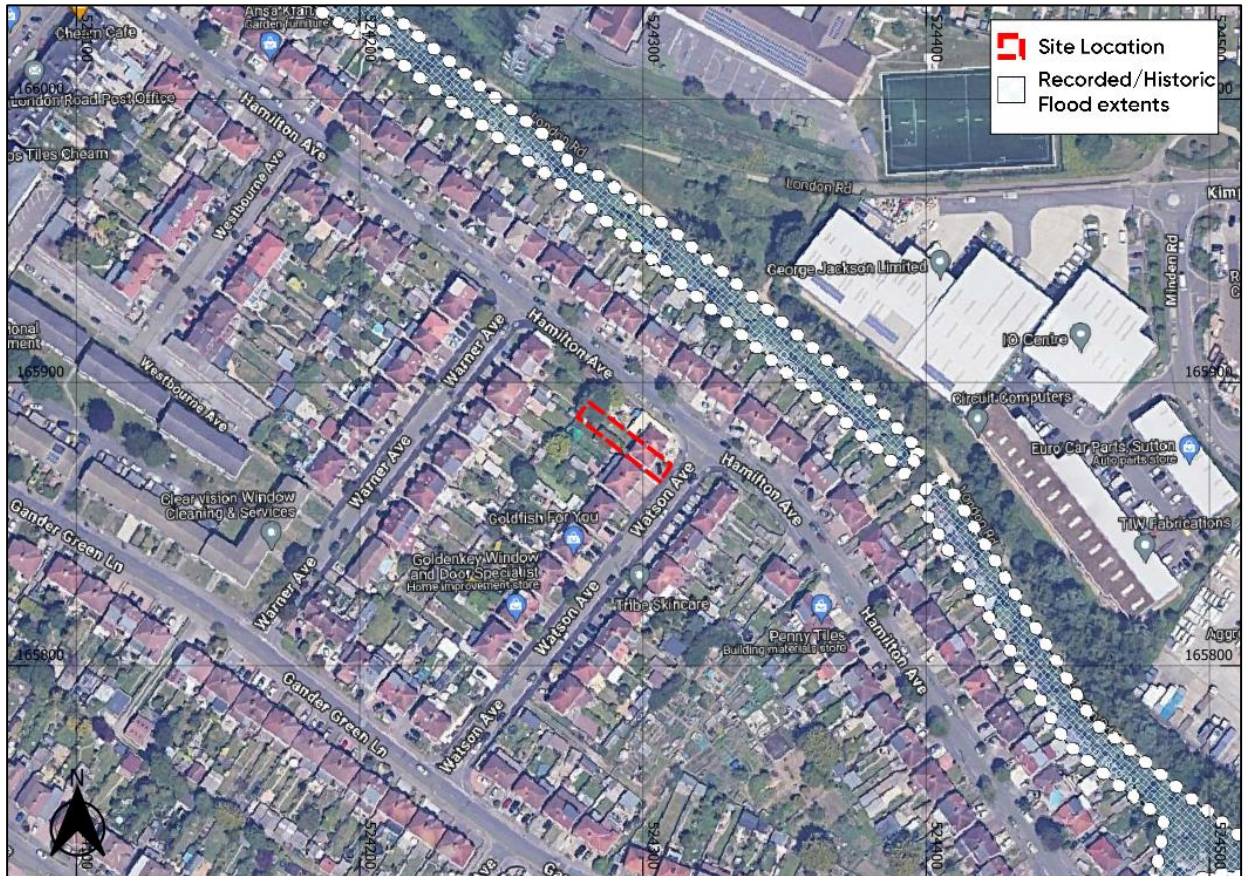


Figure 4: EA Historic Flood Mapping (Base map from Google Hybrid © Contains public sector information licensed under the Open Government Licence v3.0)

## EA Beverley Brook Model (2009)

- 4.7. The EA have provided Aegaea with outputs from the Beverley Brook Model (2009). The model included a range of defended and undefended flood scenarios, and the addition of a variety of climate change allowances. This is understood to be the best available information for this area.



4.8. Analysis of the model outputs indicate that the site would remain unaffected for all modelled events up to and including the 1 in 50 year event (Figure 5). As can be seen from Figure 5, safe access/egress should be possible via Watson Avenue in the 1 in 50 year event.

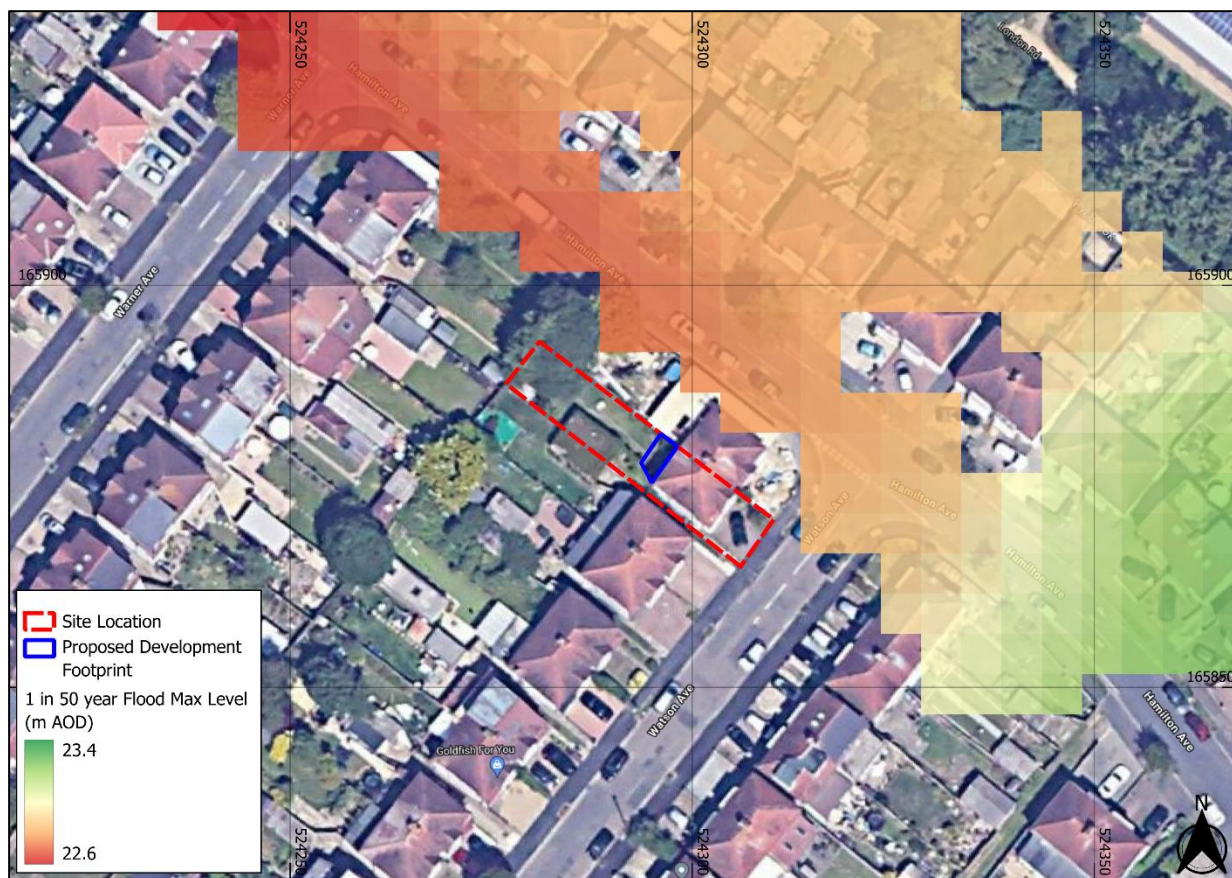


Figure 5: EA Modelled 1 in 50 Flood Levels (Base map from Google Hybrid © Contains public sector information licensed under the Open Government license v3.0)

4.9. Part of the site could be affected in the 1 in 100 year event. Interrogation of the flood level grids provided by the EA indicate flooding occurs in the northwest are of the site with a modelled maximum flood level of 22.87m AOD in the 1 in 100 year event (Figure 6). Analysis of the LiDAR data for the area that is within the flood extents shows that the minimum level ground level in the affected area of the site is 22.65m AOD. As such, the maximum flood depth within the site is 0.22m. However, the proposed footprint of the extension is not shown to be flooded in this scenario (Figure 6).



Figure 6: EA Modelled 1 in 100 Flood Levels (Base map from Google Hybrid © Contains public sector information licensed under the Open Government license v3.0)

4.10. As can be seen from Figure 6, safe access/egress should be possible via Watson Avenue in the 1 in 100 year event.

## Climate Change

4.11. The site is located in the London Management Catchment and is a development type classified as a 'more vulnerable' use. Due to the proposed development being an extension to a residential dwelling, the anticipated lifetime is a minimum of 100 years. As such, a climate change allowance of 17% should be applied. The Beverley Brook Model (2009) does not include a 1 in 100 year +17%CC event but does include a 1 in 100 year +20%CC event which is to be used as a conservative estimate for the former. This is henceforth referred to as the 'design event'.

4.12. The modelled flood extents provided by the EA show that part of the site could be affected in the 1 in 100 +20%CC event (Figure 7).



- 4.13. Interrogation of the flood level grids provided by the EA indicate that flooding occurs in the northwest and the southeast areas of the site in the 1 in 100 +20%CC event (Figure 7).
- 4.14. The northwest area has a maximum flood level of 22.95m AOD. Analysis of the LiDAR data for the northwest area, that is within the flood extents, shows that the minimum level ground level in that part of the site is 22.65m AOD. As such, the maximum flood depth within the northwest flood extent is 0.30m.
- 4.15. The southeast area has a maximum flood level of 22.99m AOD. Analysis of the LiDAR data for the southeast area, that is within the flood extents, shows that the minimum level ground level in that part of the site is 22.80m AOD. As such, the maximum flood depth within the northwest flood extent is 0.19m.
- 4.16. The proposed footprint of the extension is not shown to be flooded in any of the modelled events up to and including the design event.



Figure 7: EA Modelled 1 in 100 plus Climate Change (20%) Flood Levels (Base map from Google Hybrid © Contains public sector information licensed under the Open Government license v3.0)

4.17. Due to the low flood depth of 0.19m at the entrance of the site (south east area), it can be considered that safe access/egress could be achievable in the design 1 in 100 +20%CC flood event. However, if safe access/egress is not achievable then refuge can be taken in the existing building on the highest possible floor.

## Summary

4.18. Based on the data reviewed above, the risk of fluvial flooding to the overall site can be considered moderate due to it being flooded in the 1 in 100 year and the 1 in 100 +20% CC events. However, the proposed development footprint remains outside of the modelled flood extents in the design event meaning that the risk from fluvial flooding to the proposed development can be considered low. Safe access/egress should be possible in the design event.

4.19. Due to the proposed development being in close proximity to the flooding extent, mitigation measures will still be recommended.

## Tidal

4.20. Tidal flooding occurs when a high tide and high winds combine to elevate sea levels. An area behind coastal flood defences can still flood if waves overtop the defences or break through them. Tidal flooding can also occur a long way from the coast by raising river levels. Water may overtop the river bank or river defences when tide levels are high.

4.21. The site is a significant distance from any tidal source and above the anticipated extreme tidal levels, even when considering the impacts of climate change.

4.22. The risk of flooding from tidal sources is low.

## Canals

4.23. The Canal and River Trust (CRT) generally maintains canal levels using reservoirs, feeders, and boreholes and manages water levels by transferring it within the canal system.

4.24. No CRT canals were identified within 1000 m of the site.

4.25. The risk of flooding to this site from canals is considered to be low.

## Pluvial

- 4.26. Pluvial flooding can occur during prolonged or intense storm events when the infiltration potential of soils, or the capacity of drainage infrastructure is overwhelmed leading to the accumulation of surface water and the generation of overland flow routes.
- 4.27. Local policy documentation identifies the site as being in a Critical Drainage Area (CDA) (Group8\_023). Being inside a CDA means that there could be development restrictions to help prevent overloading the sewer system and causing flooding elsewhere.
- 4.28. The SFRA defined a CDA as:

*'a discrete geographic area (usually within an urban setting) where there may be multiple and interlinked sources of flood risk and where severe weather is known to cause flooding of the area thereby affecting people, property or local infrastructure'*

- 4.29. As such, the risk of flooding from pluvial sources has been assessed in further detail below.
- 4.30. Annual surface water flood risk is labelled by the EA as:
- 'High Risk'; >3.3% AEP (annual probability greater than 1 in 30).
  - 'Medium Risk'; 1.1% to 3.3% AEP (annual probability between 1 in 100 and 1 in 30).
  - 'Low Risk'; 0.1% to 1% AEP (annual probability between 1 in 1000 and 1 in 100).
  - 'Very Low Risk'; <0.1% AEP (annual probability less than 1 in 1000).
- 4.31. Examination of the EA's Flood Risk from Surface Water mapping shows the site is at risk of flooding in 'Medium' and 'Low' surface water flood events (Figure 8).

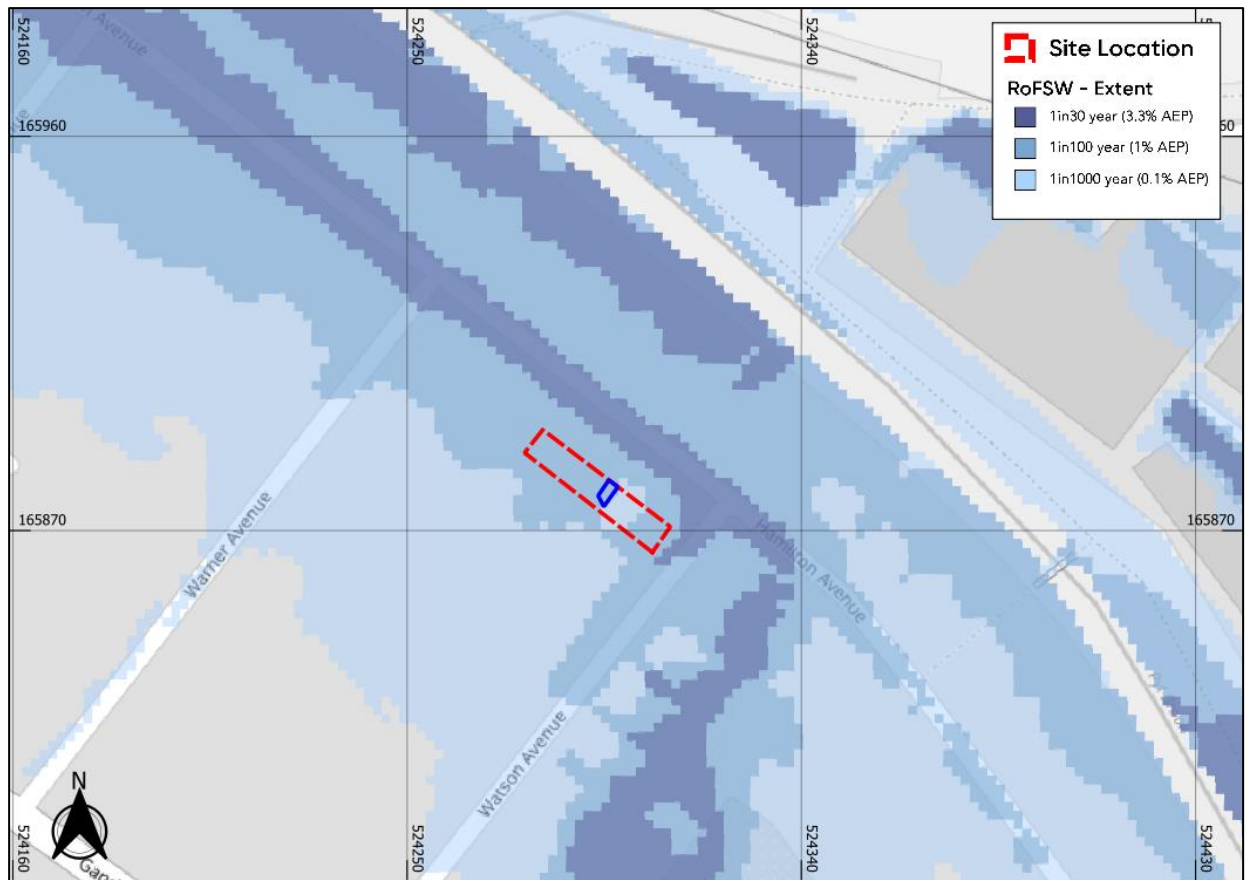


Figure 8: EA Surface Water Flood Risk Mapping (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors. Contains public sector information licensed under the Open Government Licence v3.0)

4.32. As can be seen in Figure 9, during the modelled 1 in 30 year event, surface water flooding depths could reach up to 150mm on Watson Avenue, east of the site. The site itself is not affected in this event. Access/egress should be possible via the pavement of Watson Avenue in a south-westerly direction.





Figure 9: EA Surface Water Flood Risk Mapping 1 in 30 Year Depth (Base map from Google Hybrid © Contains public sector information licensed under the Open Government Licence v3.0)

4.33. As can be seen in Figure 10, during the modelled 1 in 100 year event, surface water flooding depths could reach 300mm to 600mm on the Watson Avenue to the east and on the site itself.

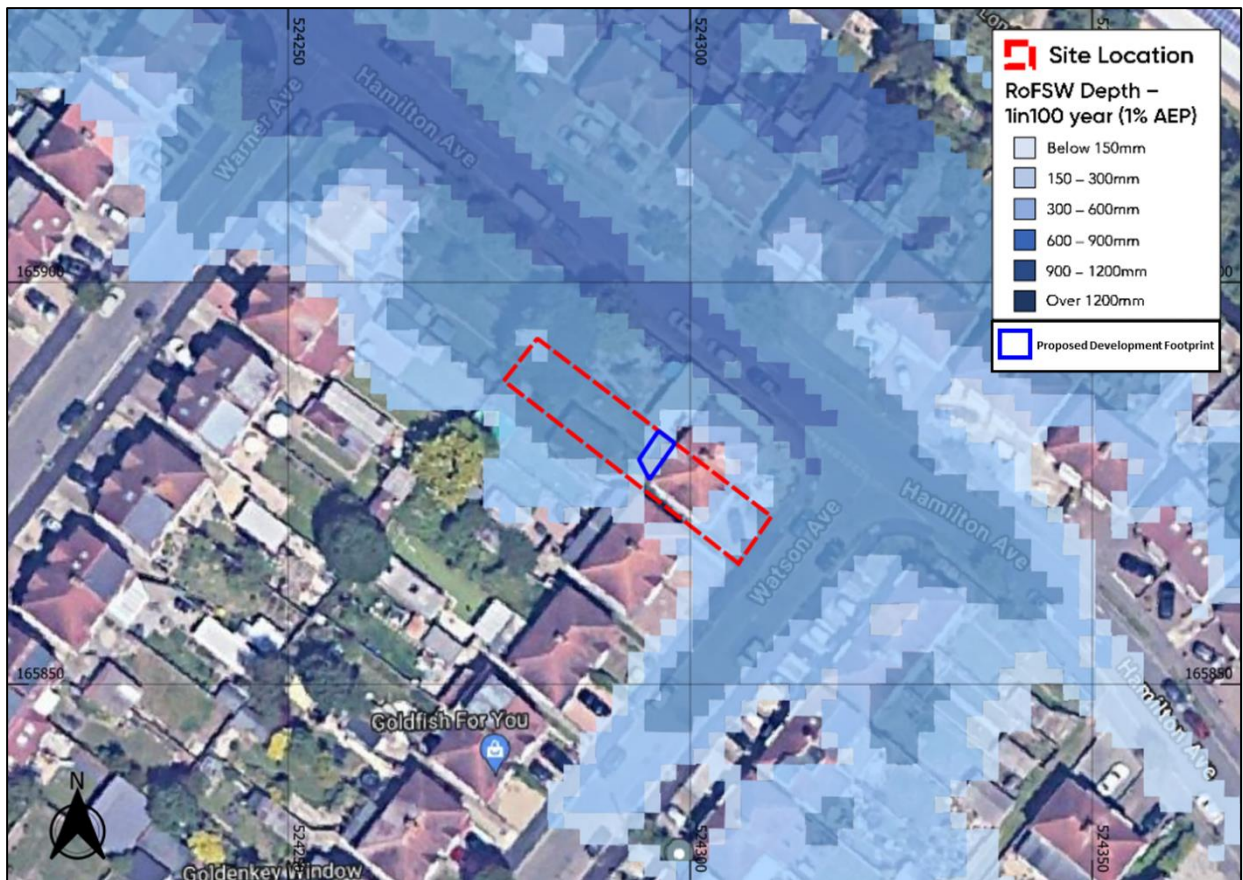


Figure 10: EA Surface Water Flood Risk Mapping 1 in 100 Year Depth (Base map from Google Hybrid © Contains public sector information licensed under the Open Government Licence v3.0)

4.34. The site and access road has a hazard rating of moderate to high (Figure 11), meaning access/egress could be affected in the 1 in 100 year event. Safe refuge should be taken on the highest possible floor of the existing building in this event.



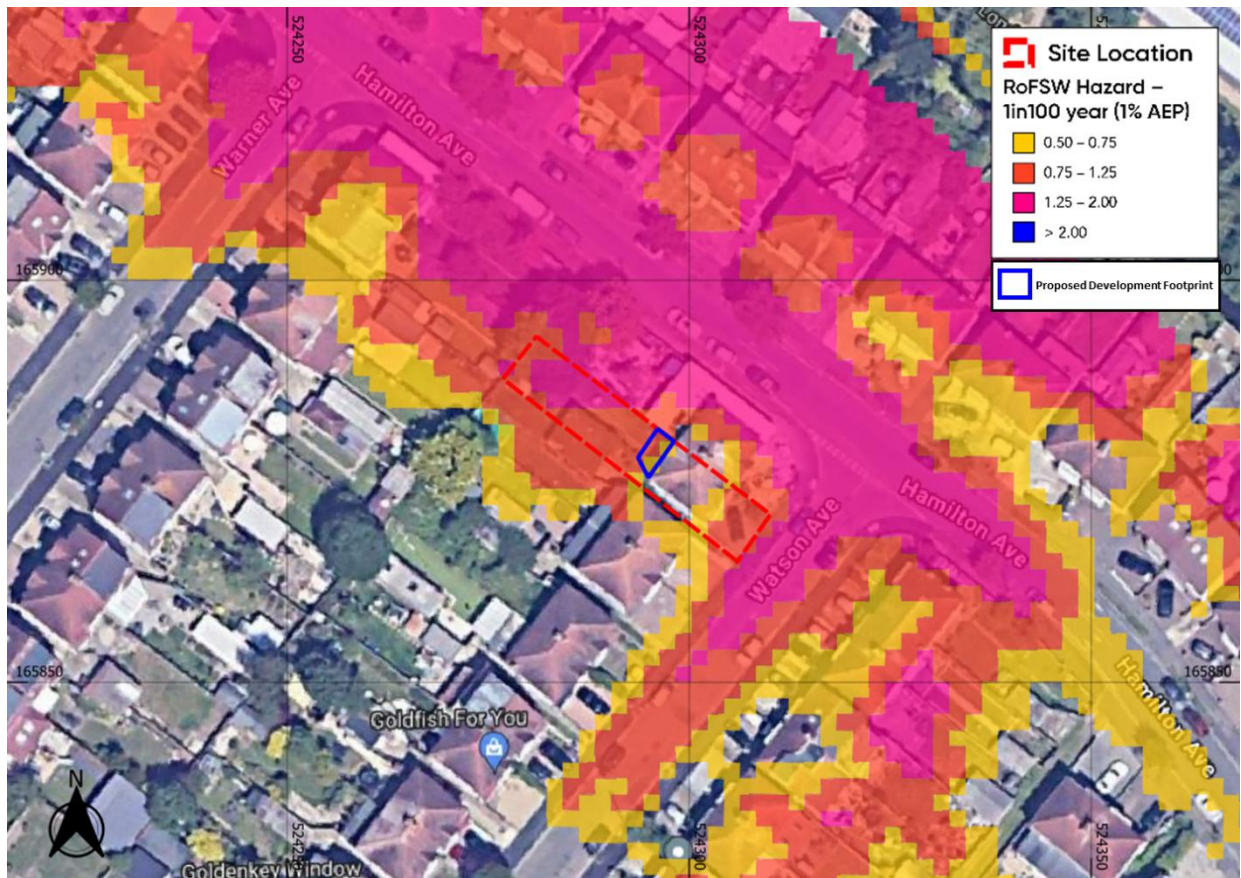


Figure 11: EA Surface Water Flood Risk Mapping 1 in 100 Year Hazard (Base map from Google Hybrid © Contains public sector information licensed under the Open Government Licence v3.0)

4.35. As can be seen in Figure 12, during the modelled 1 in 1000 year event, surface water flooding depths could reach over 1200mm on the Watson Avenue to the east and on the site itself.

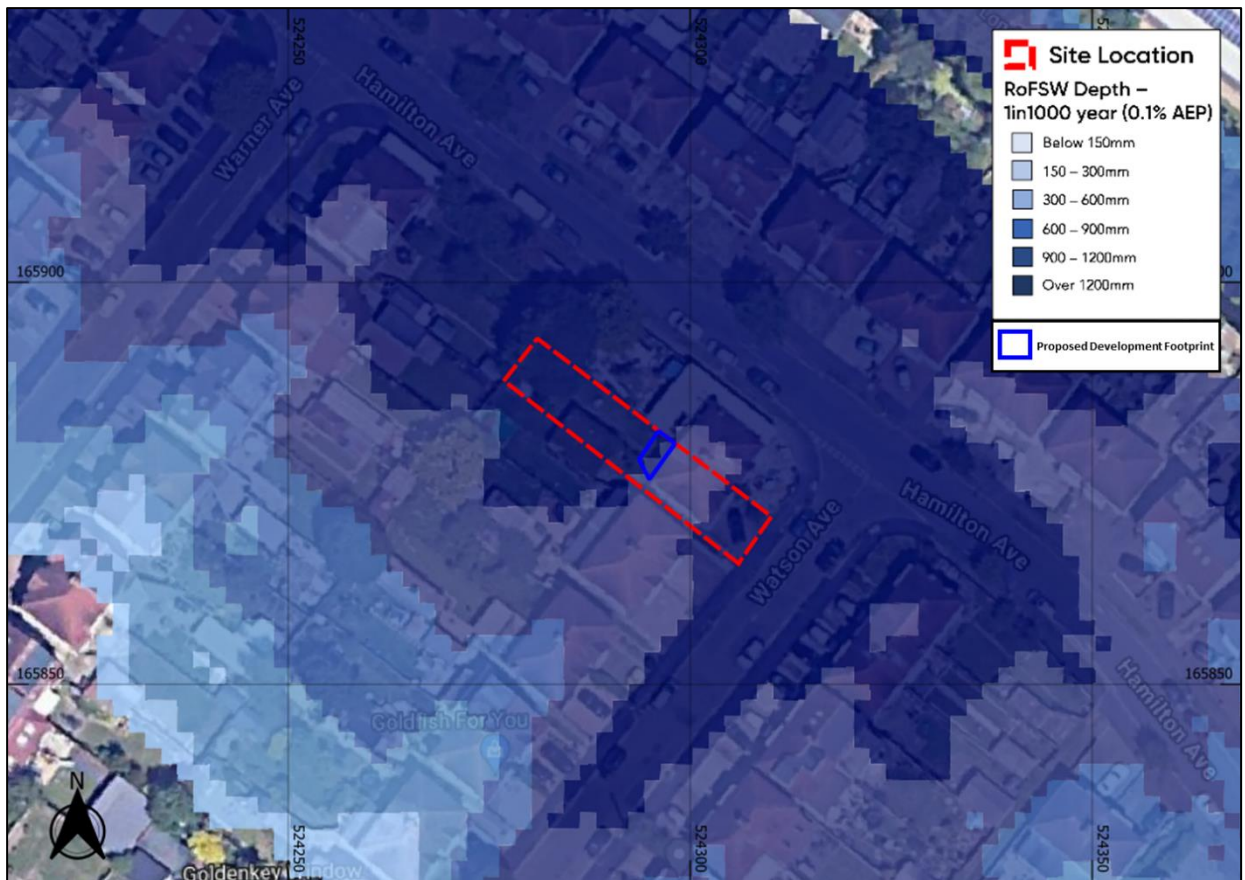


Figure 12: EA Surface Water Flood Risk Mapping 1 in 1000 Year Depth (Base map from Google Hybrid © Contains public sector information licensed under the Open Government Licence v3.0)

4.36. The site and access road has a hazard rating of moderate to high (Figure 13), meaning access/egress could be affected in the 1 in 1000 year event. Safe refuge should be taken on the highest possible floor of the existing building in this event.



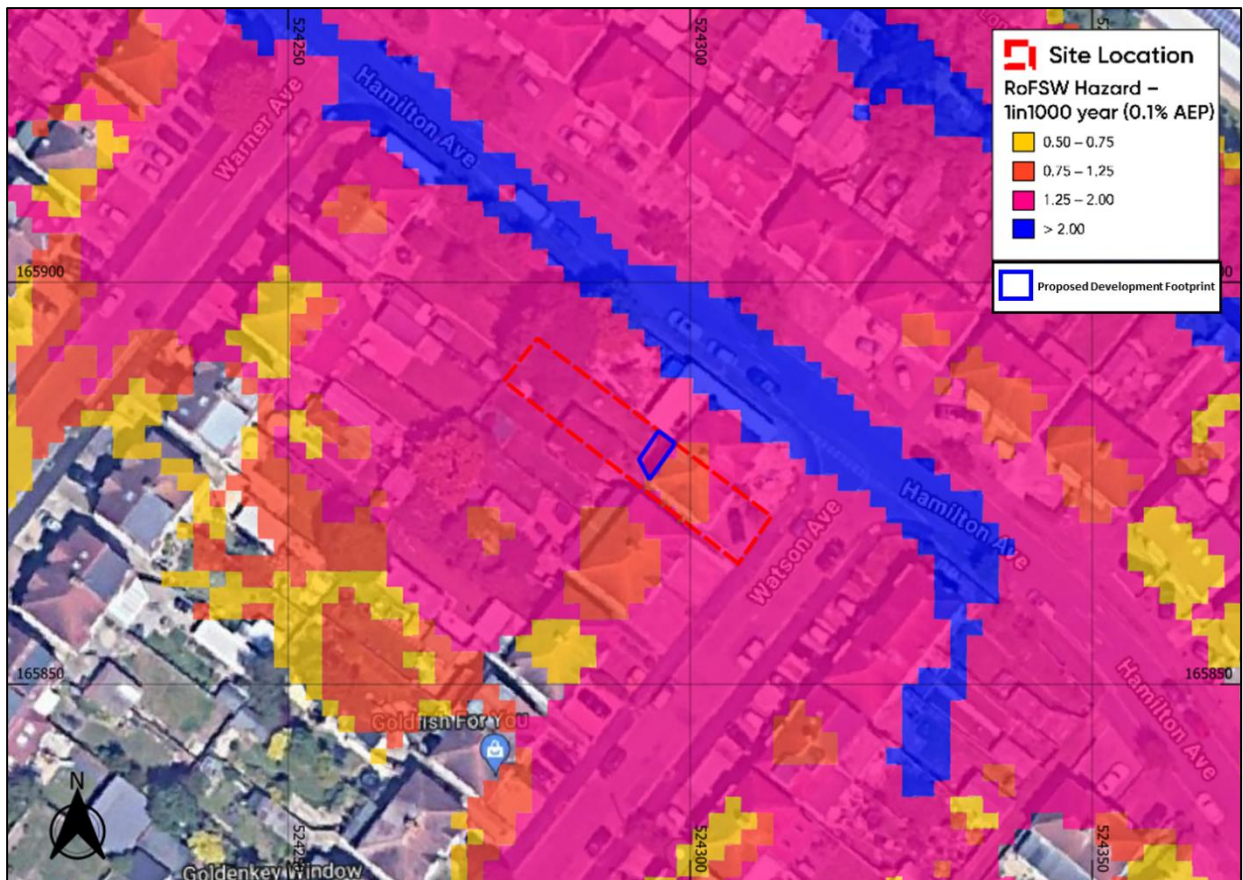


Figure 13: EA Surface Water Flood Risk Mapping 1 in 1000 Year Hazard (Base map from Google Hybrid © Contains public sector information licensed under the Open Government Licence v3.0)

- 4.37. Due to the moderate to high hazard rating present on the site and access road in the 'Medium' and 'Low' risk events, the risk to the site from pluvial sources can be considered as moderate to high. As such mitigation measures will be outlined in Section 5.

## Reservoirs

- 4.38. Flooding can occur from large waterbodies or reservoirs if they are impounded above the surrounding ground levels or are used to retain floodwater. Although unlikely, reservoirs and large waterbodies could overtop or breach leading to rapid inundation of the downstream floodplain.
- 4.39. According to the EA's Flood Risk from Reservoirs mapping the site is outside flood extents in the event of reservoir flooding (Figure 14).



Figure 14: EA Reservoir Flood Risk Mapping (Base map from Google Hybrid © Contains public sector information licensed under the Open Government Licence v3.0)

4.40. The risk from reservoir flooding for the site can be considered low.

## Groundwater

- 4.41. Groundwater flooding occurs in areas where underlying geology is permeable, and water can rise within the strata sufficiently to breach the surface.
- 4.42. The British Geological Survey's (BGS) mapping shows no superficial deposits underlying the site. The bedrock underlying the site is London Clay Formation comprised of clay and silt.
- 4.43. The closest Historical BGS borehole TQ26NW27 was approximately 251m east from the site and was bored to a depth of 9.32m. Water was encountered at a depth of 1.52m.
- 4.44. The SFRA presents the EA's Areas Susceptible to Groundwater Flooding mapping, which assesses the future risk of groundwater flooding. The site can be seen to be located outside of areas susceptible to groundwater flooding (Figure 15).



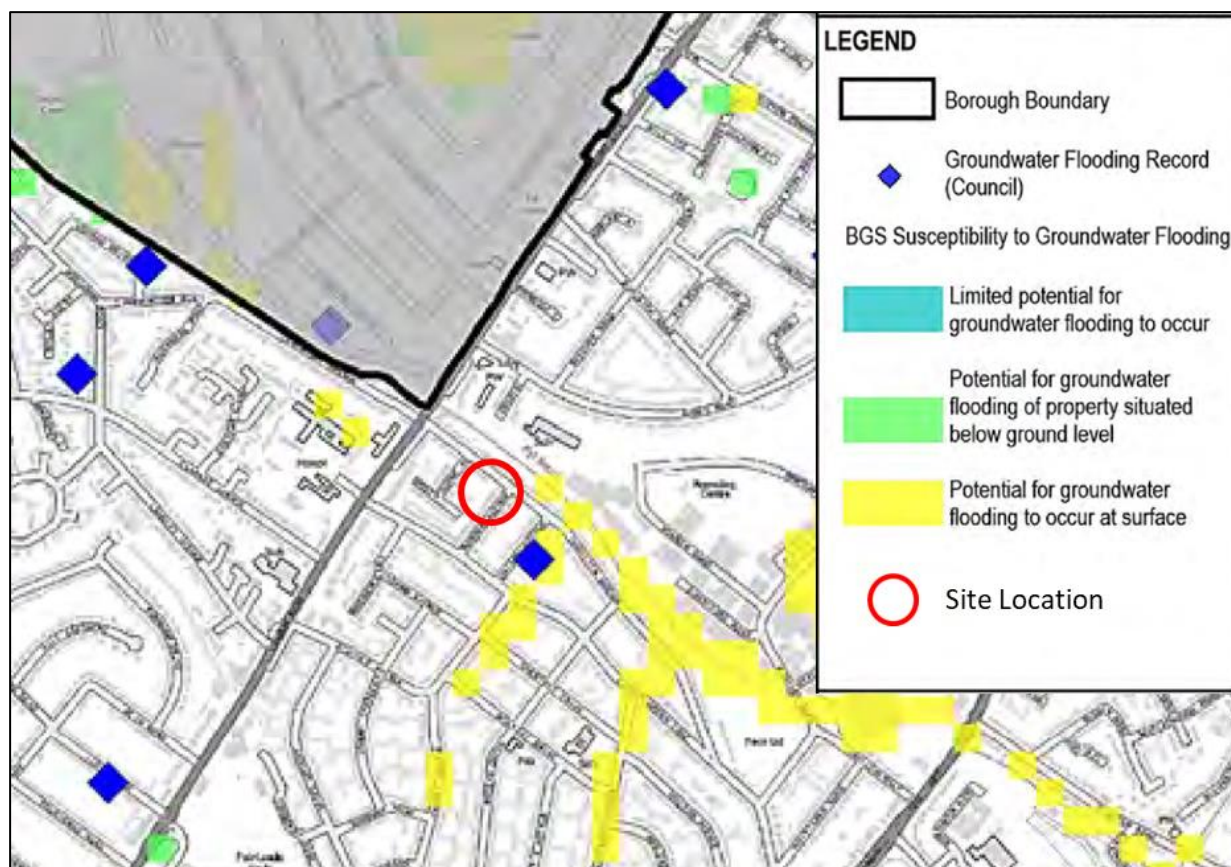


Figure 15: BGS Susceptibility to Groundwater Flooding in Sutton (Sutton Council SFRA, 2015)

4.45. As such, the risk from groundwater flooding can be considered to be low.

## Sewers

4.46. Foul or surface water sewers can be a cause of flooding if the drainage network becomes overwhelmed, either by blockage or due to local development beyond the designed capabilities of the drainage system.

4.47. The SFRA provides mapping of historical sewer flood incident records kept by the local authority (Figure 16). In the area of the site 4 incidents of sewer flood were recorded. These, however, cover a wide area and there is no evidence to suggest sewer flooding incidents have been recorded at the site.

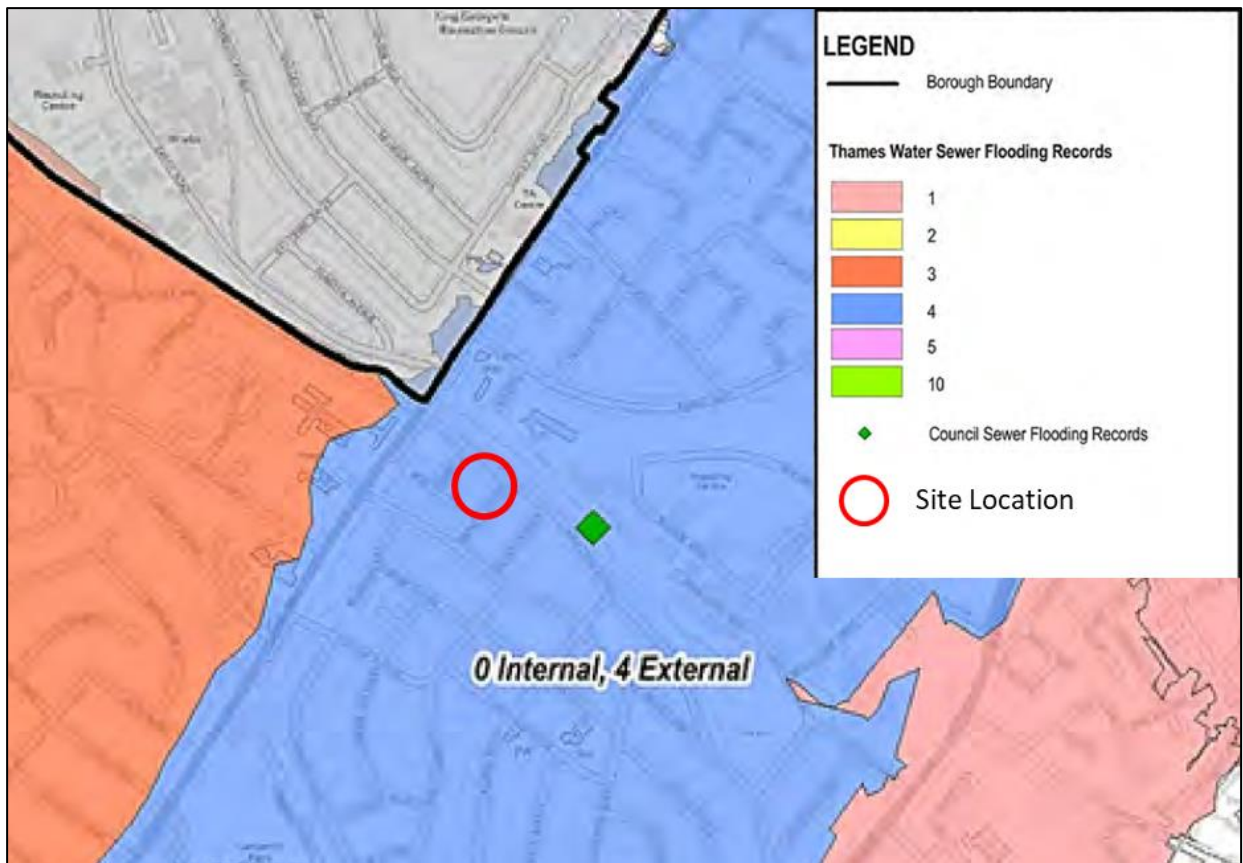


Figure 16: Thames Water Sewer Flooding Records (Sutton Council SFRA, 2015)

4.48. The development is therefore considered to be at low risk of flooding from sewers.

# 5. Flood Risk Mitigation

## Fluvial and Pluvial

- 5.1. Due to flooding occurring on the site in the design fluvial event, the proposed development footprint being in close proximity to the fluvial flooding extents, and the site having a moderate pluvial hazard rating, mitigation measures will be recommended.
- 5.2. Given that the proposed development is an extension to the existing dwelling and is therefore considered a Minor Development, it should adhere to the EA Standing Advice. A summary of additional mitigation measures is detailed below:
- As it is not possible to raise floor levels 300mm above the design flood level, finished floor levels of the proposed extension are to match the existing finished floor levels.
  - It is recommended that the guidance set out in 'Improving the Flood Performance of New Buildings' Flood Resilient Construction (2007)<sup>10</sup> is followed.
  - Non-return valves are to be installed on the new drainage systems throughout the basement level. It is also recommended that these valves are retrofitted on to any existing sewer connections to prevent back-flow of diluted sewage. Maintenance of these valves is important to ensure their continued effectiveness so should be maintained in line with manufacturers recommendations.
  - Damp Proof Membrane (d.p.m) should be included in any design to minimise the passage of water through ground floors. Impermeable polythene membranes should be at least 1200 gauge to minimise ripping. Effective methods of joining membrane section are overlaps of 300mm, and also taping (mastic tape with an overlap of 50mm minimum).
  - Special care should be taken to ensure adequate sealing of any PVC window/door sills to the fabric of the house.

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<sup>10</sup>[https://assets.publishing.service.gov.uk/media/602d673ee90e0709e8d085d8/Improving\\_the\\_Flood\\_Resilience\\_of\\_Buildings\\_Through\\_Improved\\_Materials\\_Methods\\_and\\_Details\\_Technical\\_Report.pdf](https://assets.publishing.service.gov.uk/media/602d673ee90e0709e8d085d8/Improving_the_Flood_Resilience_of_Buildings_Through_Improved_Materials_Methods_and_Details_Technical_Report.pdf)

## Other Sources

5.3. Flood risk from these sources is deemed to be low, therefore mitigation is not required.

## Increase to Flood Risk Elsewhere

5.4. It is understood that the proposed development is for a single storey rear extension on an existing residential dwelling. As such, the proposal constitutes a Minor Development under the NPPF.

5.5. Paragraph 051 of the Flood Risk and Coastal Change Planning Practice Guidance (PPG) states:

*Minor developments are unlikely to raise significant flood issues unless:*

- they would have an adverse effect on a watercourse, floodplain or its flood defences;*
- they would impede access to flood defence and management facilities, or;*
- where the cumulative impact of such developments would have a significant effect on local flood storage capacity or flood flows.*

5.6. As such, the proposed development in isolation should have a negligible impact on flood risk elsewhere.

5.7. However, the site is also located in Group8\_023 Critical Drainage Area (CDA). As outlined in the Sutton Council Surface Water Management Plan (2011)<sup>12</sup>, the preferred 'Quick Win' measures to implement in properties located in Group8\_023 CDA are:

- Rainwater Harvesting - the widespread installation of water butts for properties within this CDA could provide a significant volume of rainwater storage. This option would be particularly beneficial for events of a lower magnitude rather than the high order events.*
- Community Engagement & Emergency Planning - the Council could continue to engage with local residents to inform them of the risk and encourage residents to be pro-active*

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<sup>12</sup> [https://www.sutton.gov.uk/documents/20124/212406/SWMP\\_Final+2011.pdf/349bade6-8a18-5b61-409c-575db1fc1f28?t=1680009767441](https://www.sutton.gov.uk/documents/20124/212406/SWMP_Final+2011.pdf/349bade6-8a18-5b61-409c-575db1fc1f28?t=1680009767441)

*in maintenance of their properties with respect to preparation for flood events, including taking responsibility for property drainage.*

- 5.8. It is also recommended that small scale SuDS are implemented to increase rainwater storage.

## Flood Warnings

- 5.9. It has been identified that safe access/egress is possible in the design event. However, the site is in the Environment Agency (EA) 'Pyl Brook at North Cheam' flood warning service area. This service allows site owners to register an address along with contact details so that, in the event of a flood being forecast, they are sent an alert. As a further precaution and risk reduction, the owner of the site should sign up.
- 5.10. Flood warnings/alerts can be enforced at any time of the day or night. Signing up for this service provides site owners some notice before a flood event. The amount of time afforded before a flood occurs depends on the site-specific location (e.g. proximity to the source of flooding, topography of the surrounding area) and the flood mechanism (e.g. bank over topping versus a breach event). Flood alerts and warnings provide occupants with time to take necessary action, e.g. communication of the risk of flooding to occupants, evacuation of occupants offsite or to a safe level, removal of valuable items out of reach of flooding and the mounting of site-specific flood defences.
- 5.11. Due to safe access/egress being affected in the 'Medium' risk pluvial event, it is also advised that the occupant of the dwelling should monitor Met Office Weather Warnings to be prepared for extreme weather events.
- 5.12. Met Office is the national meteorological service for the UK; they issue weather warnings up to 5 days in advance, through the National Severe Weather Warning Service, when severe weather has the potential to bring impacts to the UK. It is also possible to stay up to date with weather warnings through the Met Office app (available on both android and apple), social media (twitter, Facebook) or email alerts.
- 5.13. During periods of bad weather, residents should monitor local weather reports and sign up for the Met Office UK weather warnings. Procedures should be formalised (if not done so already) in the event of a severe weather warning or flooding.



## 6. Conclusions

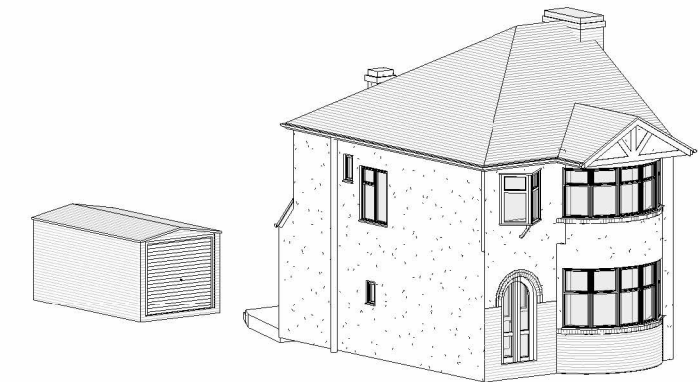
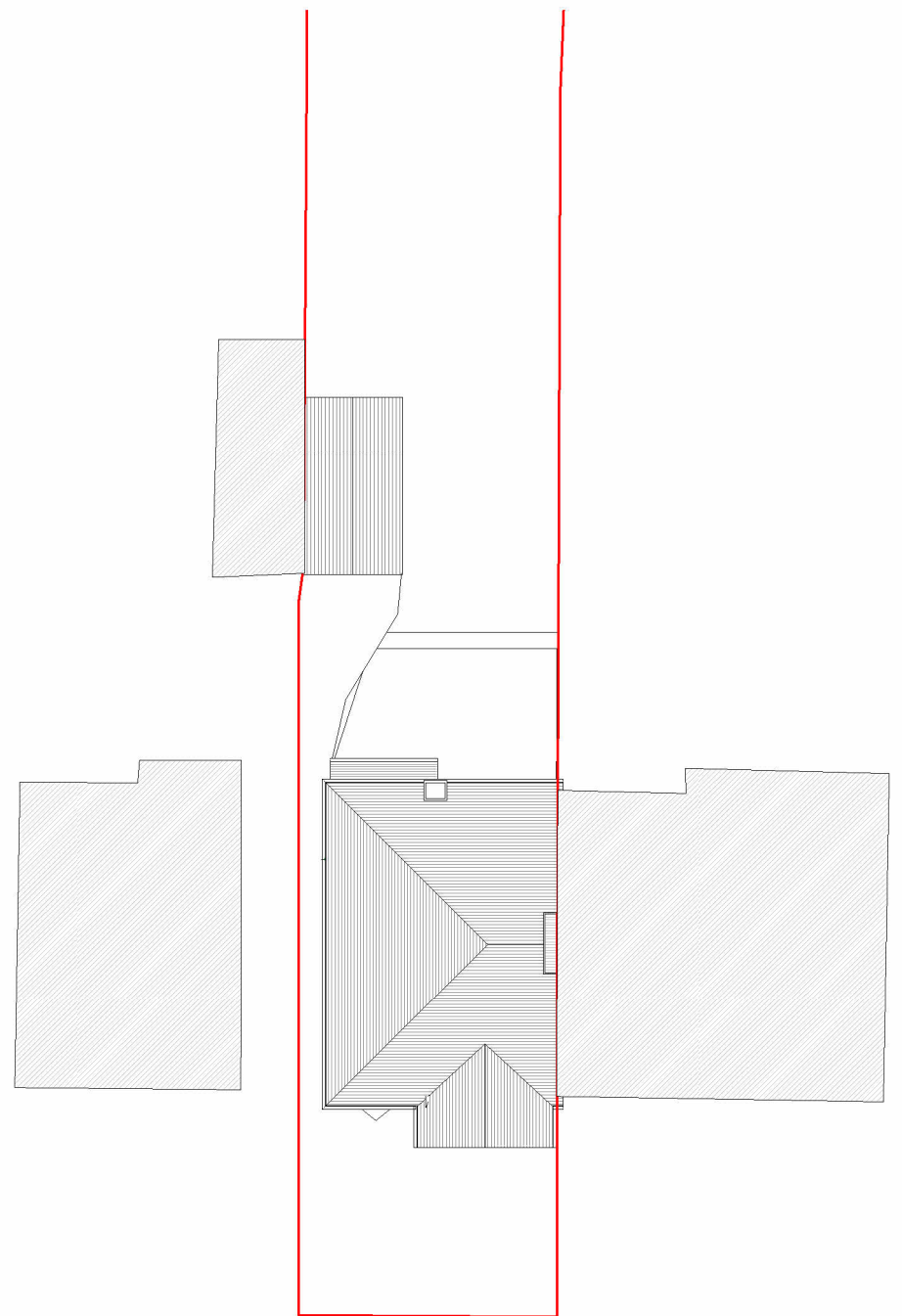
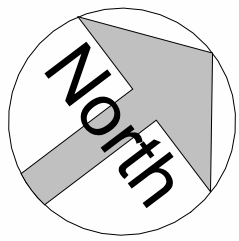
- 6.1. This FRA has been undertaken with reference to the requirements of NPPF and Planning Practice Guidance with respect to the development at 22 Warner Avenue, North Cheam, Sutton, SM3 9RH. It has been written and prepared with due consideration to the nature of the proposed development to provide the appropriate level of detail.
- 6.2. An assessment of the risk of flooding from all sources has been undertaken and is summarised in the table below:

Source of Flooding	Flood Risk Summary
Fluvial	<p>The site is located in Flood Zone 2 and 3. The proposed development footprint is located in Flood Zone 2. Based on the EA data provided, model outputs indicate that the proposed development footprint would remain unaffected for all fluvial modelled events up to and including the 1 in 100 +20%CC. Safe access/egress should be possible in the fluvial design event. As such the risk from fluvial sources to the site is considered moderate but the risk to the proposed development footprint is considered low.</p> <p>Due to flooding occurring on the site in the design fluvial event and the proposed development footprint being in close proximity to the fluvial flooding extents, mitigation measures are recommended.</p> <p>Given that the proposed development is considered a Minor Development, it should adhere to the EA Standing Advice for Minor Extensions and finished floor levels should be set no lower than the existing floor levels. It also is recommended that the guidance set out in 'Improving the Flood Performance of New Buildings' Flood Resilient Construction (2007) has been followed.</p>
Pluvial	<p>Due to the moderate to high hazard rating present on the site and access road in the 'Medium' and 'Low' risk pluvial events, the risk to the site from pluvial sources can be considered as moderate to high.</p> <p>Given that the proposed development is considered a Minor Development, it should adhere to the EA Standing Advice for Minor Extensions. It is recommended that the guidance set out in 'Improving the Flood Performance of New Buildings' Flood Resilient Construction (2007) has been followed.</p>

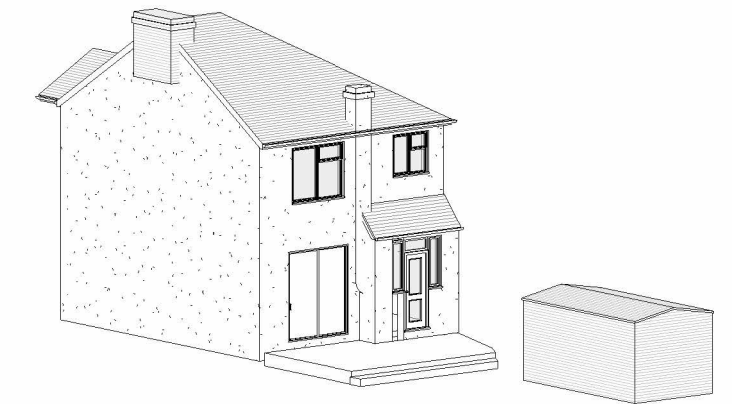
	If the Met Office Weather Warnings show flooding could occur and safe access/egress is not possible, refuge should be taken in the existing building on the highest possible floor.
Tidal Canals Reservoirs Groundwater Sewers	The site is considered to be at low risk from these sources.

- 6.3. Whilst the development is classified as Minor Development, and should have a negligible impact on flood risk elsewhere, the site is also located in Group8\_023 CDA. As outlined in the Sutton Council Surface Water Management Plan (2011) , the preferred 'Quick Win' measures to implement in properties located in Group8\_023 CDA are Rainwater Harvesting and Community Engagement & Emergency Planning. It is also recommended that small scale SuDS are implemented to increase rainwater storage.
- 6.4. The FRA supports the and demonstrates that there is an acceptable level of flood risk to the site if the mitigation strategies recommended are implemented in the scheme. The development does not increase flood risk off site or to the wider area.
- 6.5. This Flood Risk Assessment should be submitted as part of the planning application to satisfy the requirements under NPPF.

# Appendix A - Development Proposals



3D View 1

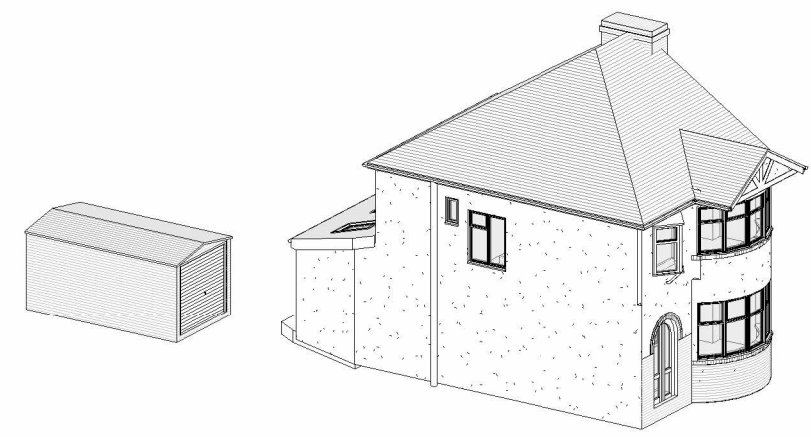
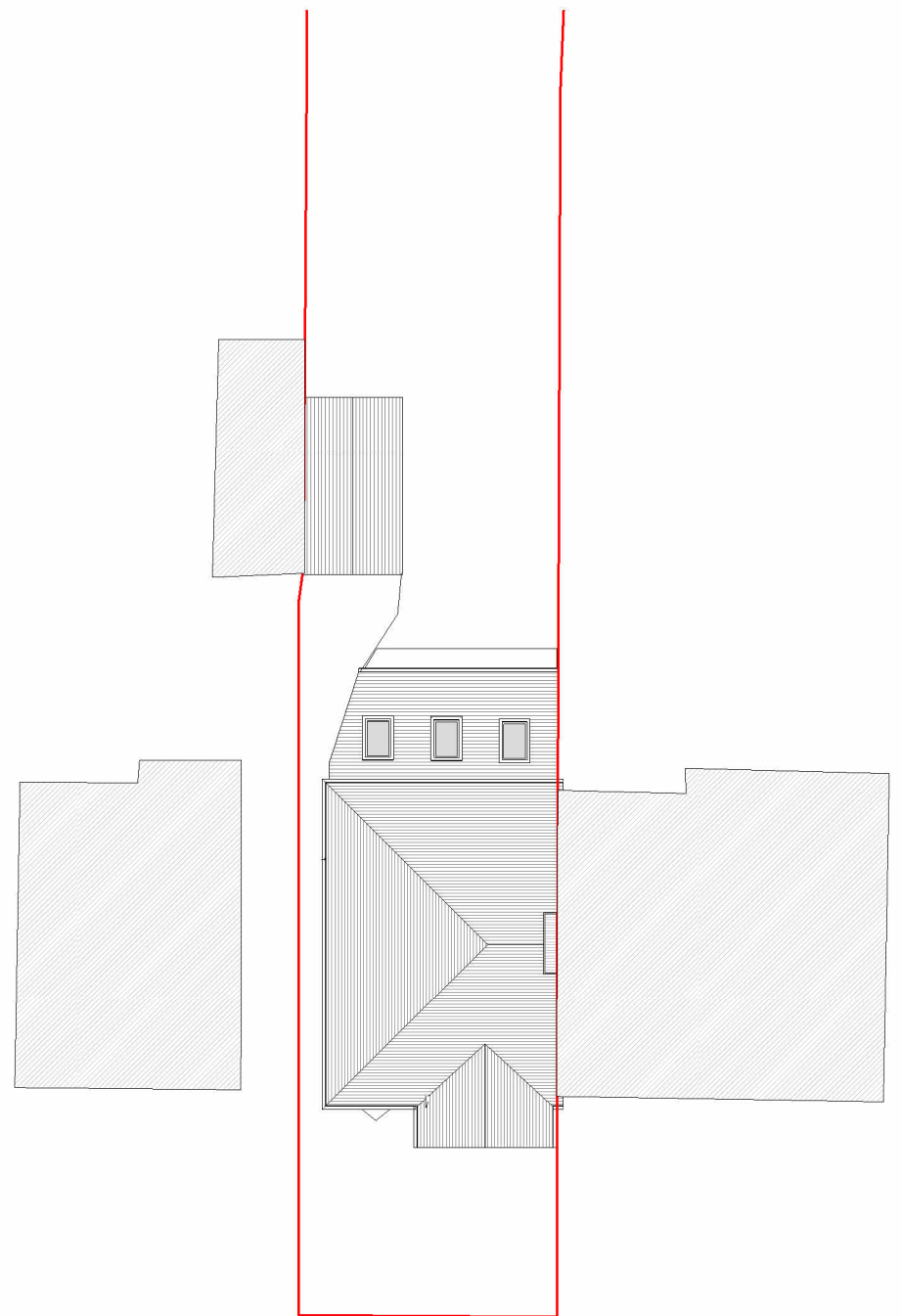
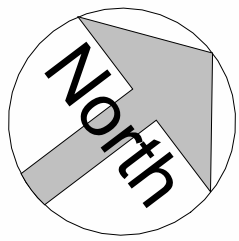


3D View 2

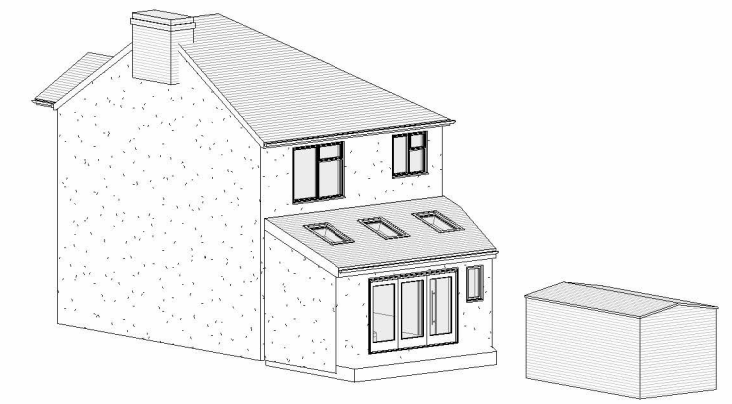
Site Plan

S- DESIGN PROCESS

<p>22 Warner Avenue, North Cheam</p>	<p>Scale @ A3 1 : 200</p>	<p>Drawing number P.100</p>	<p>Key:</p> <p>Existing Proposed SVP Boundary line</p> <p>Existing drainage Proposed drainage Overhead</p> <p>GRAPHIC SCALE: 1:200</p>	<p>No.</p>	<p>Description</p>	<p>Date</p>
	<p>Date 08.07.2022</p>	<p>Project number 0140</p>		<p></p>	<p></p>	<p></p>
	<p>Drawn by SZ</p>	<p>Rev</p>		<p></p>	<p></p>	<p></p>
<p>Existing Site Plan and 3D Views</p>						



Proposed 3D View 1



Proposed 3D View 2

### Proposed Site Plan

S- DESIGN PROCESS

22 Warner Avenue, North Cheam	Scale @ A3 1 : 200	Drawing number P.400	<b>Key:</b> 	<table border="1"> <thead> <tr> <th>No.</th> <th>Description</th> <th>Date</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>Client's comments (1)</td> <td>07.07.2022</td> </tr> <tr> <td>B</td> <td>Client's comments (2)</td> <td>28.07.2022</td> </tr> <tr> <td>C</td> <td>Client's comments (3)</td> <td>11.08.2023</td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	No.	Description	Date	A	Client's comments (1)	07.07.2022	B	Client's comments (2)	28.07.2022	C	Client's comments (3)	11.08.2023									
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Date 08.07.2022	Project number 0140																								
Drawn by SZ	Rev C																								

Proposed Site Plan and 3D Views

