STM environmental

ENVIRONMENTAL CONSULTING , SOFTWARE & TRAINING

FLOOD RISK ASSESSMENT

Site Address

55 High Street
Hampton
TW12 2SX

Client

Nick and Justine Blanchard

Date

20/12/2024

1 Document Control

FLOOD RISK ASSESSMENT

Site Address:	55 High Street Hampton TW12 2SX
National Grid Reference:	514145, 169776
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2 Contents

3 Abbreviations

Abbreviation	Description
STM	STM Environmental Consultants Limited
BGS	British Geological Survey
EA	Environment Agency
OS	Ordnance Survey of Great Britain
FRA	Flood Risk Assessment
NPPF	National Planning Policy Framework
FWD	Floodline Warning Direct
FRMS	Flood Risk Management Strategy
LBRT	London Borough of Richmond Upon Thames
SWMP	Surface Water Management Plan
SFRA	Strategic Flood Risk Assessment
CDA	Critical Drainage Area
AEP	Annual Exceedance Probability
CC	Climate Change
SuDS	Sustainable Urban Drainage Systems
GWSPZ	Groundwater Source Protection Zone
LLFA	Lead Local Flood Authority
mbgl	metres below ground level
DCLG	Department for Communities and Local Government
PPGPS	Planning practice guidance and Planning system

4 Disclaimer

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5 Executive Summary

SECTION	SUMMARY
Location	55 High Street, Hampton, TW12 2SX Grid Reference: 514145, 169776
Area	293m^2
Proposed Development	Single-storey rear extension.
Flood Zone	The site is located in Flood Zone 1.
Topography	The ground level at the site ranges from 12.79mAOD (centre) to 12.38mAOD (east).
Sequential and Exception Tests	The development is considered to be minor. As such, Sequential and Exception Tests should not be required by the LLFA.
Main Sources of Flooding	No main potential source of flooding to the site was identified.
Flood Defences	EA mapping shows no indication of any flood defences in the vicinity of the site.
Records of Historic Flooding	EA mapping revealed a total of 4no. of fluvial and between 0no. and 10no. sewer flooding incidents in the vicinity of the site. The site was not impacted by any fluvial event, it is not known whether the site was impacted by sewer flooding.
Fluvial (River) and Tidal (Sea) Flood Risk	Very Low – The site remains dry during all modelled fluvial events.
Pluvial (Surface Water) Flood Risk	Very Low – The site remains dry during all modelled pluvial events.
Flood Risk from Artificial (Canals and Reservoirs) Sources	Low – A total of 10no. reservoirs and 2no. canals were identified within 5km of the site. EA mapping indicates that the site does not lie within an area that is at risk of reservoir flooding. The LLFA's Level 1 SFRA indicates that the risk of reservoir flooding is low.
Groundwater Flood Risk	Low – BGS mapping indicates that the site has potential for groundwater flooding of property situated below ground level. The groundwater level may be approximately less than 3mbgl
Development Impacts on Local Flood Risk	The development will not change the impermeable area of the site, but increases the built-up area by 14m^2. However, it is unlikely to increase local flood risk as it is not impacted by any modelled fluvial or pluvial events.
Proposed Flood Risk Mitigation Measures	• The finished floor level will be set no lower than the existing finished floor level, 340mm above the garden ground level at approximately 12.82mAOD; • Safe egress to Flood Zone 1 is available on site; • The proposed development will provide sufficient safe refuge in the event of an extreme flood event.
Surface Water Management (SuDS)	SuDS would reduce current surface water run off rates however, given the size of the site, there is potential for implementation. Consideration should be given to rainwater butts, rainwater harvesting, infiltration (soakaways, permeable paving, rain gardens) or attenuation storage tanks where possible.
Conclusions	Based on the information reviewed and taking into account the proposed mitigation measures, it is considered that overall flood risk to the proposed development is acceptable and that it will not increase local flood risk. As such, the development is considered to be in compliance with local planning policy and the NPPF.

6 Introduction

STM Environmental Consultants Limited (STM) were appointed by Nick and Justine Blanchard (Client) to provide a Flood Risk Assessment (FRA) at a site located at 55 High Street, Hampton, TW12 2SX.

7 Development Proposal

The FRA is required to support a planning application for a rear extension and side clerestory glazing to end of terrace residential property in Hampton Village Conservation Area.

Further details including drawings of the development plans are available in Appendix 2.

8 Report Aims and Objectives

The purpose of this report is to establish the flood risk to the site from all potential sources and, where possible, to propose suitable mitigation methods to reduce any risks to an acceptable level. It aims to make an assessment of whether the development will be safe for its lifetime, taking into account climate change and the vulnerability of its users, without increasing flood risk elsewhere.

The FRA assesses flood risk to the site from tidal, fluvial, surface water, groundwater, sewers and artificial sources. The FRA has been produced in accordance with the National Planning Policy Framework (NPPF) and its supporting guidance.

9 Summary of Data Review Undertaken

The following research has been undertaken as part of the FRA:

- Desktop assessment of topographical, hydrological and hydrogeological settings through review of the information sourced from the British Geological Survey (BGS), the Environment Agency (EA) and the Ordnance Survey (OS);
- Review of publicly available flood risk mapping provided by the EA;
- Review of the Preliminary Flood Risk Assessment (PFRA) and Level 1 Strategic Flood Risk Assessment (SFRA) produced by the LLFA outlining flood risk from various sources within the borough.

10 Legislative and Policy Context

10.1 Legislative Context

The Flood and Water Management Act was introduced in 2010. The Act defines the role of lead local flood authority (LLFA) for an area. All LLFA are required to develop, maintain, apply and monitor a strategy for local flood risk management in its area, called “local flood risk management strategy”.

Alongside the Act, Flood Risk Regulations (2009) outline the roles and responsibilities of the various authorities, which include preparing Flood Risk Management Plans and identifying how significant flood risks are to be mitigated.

10.2 Policy Context

10.2.1 National Planning Policy Framework (NPPF)

The National Planning Policy Framework (NPPF) sets out the Government's economic, environmental and social planning policies for England. The policies set out in this framework apply to the preparation of local and neighbourhood plans and to decisions on planning applications.

The latest version of the NPPF can be view online here. The below text it extracted from the online document from paragraphs 170 – 186.

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.

Strategic policies should be informed by a strategic flood risk assessment, and should manage flood risk from all sources. They should consider cumulative impacts in, or affecting, local areas susceptible to flooding, and take account of advice from the Environment Agency and other relevant flood risk management authorities, such as lead local flood authorities and internal drainage boards.

All plans should apply a sequential, risk-based approach to the location of development – taking into account all sources of flood risk and the current and future impacts of climate change – so as to avoid, where possible, flood risk to people and property. They should do this, and manage any residual risk, by:

- Applying the sequential test and then, if necessary, the exception test as set out below;
- Safeguarding land from development that is required, or likely to be required, for current or future flood management;
- Using opportunities provided by new development and improvements in green and other infrastructure to reduce the causes and impacts of flooding, (making as much use as possible of natural flood management techniques as part of an integrated approach to flood risk management); and
- Where climate change is expected to increase flood risk so that some existing development may not be sustainable in the long-term, seeking opportunities to relocate development, including housing, to more sustainable locations.

A sequential risk-based approach should also be taken to individual applications in areas known to be at risk now or in future from any form of flooding, by following the steps set out below.

Within this context the aim of the sequential test is to steer new development to areas with the lowest risk of flooding from any source. Development should not be allocated

or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower risk of flooding. The strategic flood risk assessment will provide the basis for applying this test.

The sequential test should be used in areas known to be at risk now or in the future from any form of flooding, except in situations where a site-specific flood risk assessment demonstrates that no built development within the site boundary, including access or escape routes, land raising or other potentially vulnerable elements, would be located on an area that would be at risk of flooding from any source, now and in the future (having regard to potential changes in flood risk).

Applications for some minor development and changes of use (62) should also not be subject to the sequential test, nor the exception test set out below, but should still meet the requirements for site-specific flood risk assessments set out in footnote (63).

Having applied the sequential test, if it is not possible for development to be located in areas with a lower risk of flooding (taking into account wider sustainable development objectives), the exception test may have to be applied. The need for the exception test will depend on the potential vulnerability of the site and of the development proposed, in line with the Flood Risk Vulnerability Classification set out in Annex 3.

The application of the exception test should be informed by a strategic or site-specific flood risk assessment, depending on whether it is being applied during plan production or at the application stage. To pass the exception test it should be demonstrated that:

- a) the development would provide wider sustainability benefits to the community that outweigh the flood risk; and
- b) 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.

Both elements of the exception test should be satisfied for development to be allocated or permitted.

Where planning applications come forward on sites allocated in the development plan through the sequential test, applicants need not apply the sequential test again. However, the exception test may need to be reapplied if relevant aspects of the proposal had not been considered when the test was applied at the plan-making stage, or if more recent information about existing or potential flood risk should be taken into account.

Paragraph 181 of the National Planning Policy Framework (NPPF) states that:

> 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 (See Note 1)
> 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:
>
> - 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
> - 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;
> - it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;
> - any residual risk can be safely managed; and
> - safe access and escape routes are included where appropriate, as part of an agreed emergency plan.

Paragraph 182 states that:

Applications which could affect drainage on or around the site should incorporate sustainable drainage systems to control flow rates and reduce volumes of runoff, and which are proportionate to the nature and scale of the proposal. These should provide multifunctional benefits wherever possible, through facilitating improvements in water quality and biodiversity, as well as benefits for amenity. Sustainable drainage systems provided as part of proposals for major development should:

- a) take account of advice from the Lead Local Flood Authority;
- b) have appropriate proposed minimum operational standards; and
- c) have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development.

A major development is defined as:

- a residential development: 10 dwellings or more or residential development with a site area of 0.5 hectares or more where the number of dwellings is not yet known
- a non-residential development: provision of a building or buildings where the total floor space to be created is 1000 square metres or more or where the floor area is not yet known, a site area of 1 hectare or more.

Coastal Change

In coastal areas, planning policies and decisions should take account of the UK Marine Policy Statement and marine plans. Integrated Coastal Zone Management should be pursued across local authority and land/sea boundaries, to ensure effective alignment of the terrestrial and marine planning regimes.

Plans should reduce risk from coastal change by avoiding inappropriate development in vulnerable areas and not exacerbating the impacts of physical changes to the coast. They should identify as a Coastal Change Management Area any area likely to be affected by physical changes to the coast, and:

- a) be clear as to what development will be appropriate in such areas and in what circumstances; and
- b) make provision for development and infrastructure that needs to be relocated away from Coastal Change Management Areas.

- Development in a Coastal Change Management Area will be appropriate only where it is demonstrated that:
- a) it will be safe over its planned lifetime and not have an unacceptable impact on coastal change;
- b) the character of the coast including designations is not compromised;
- c) the development provides wider sustainability benefits; and
- d) the development does not hinder the creation and maintenance of a continuous signed and managed route around the coast (64).

Local planning authorities should limit the planned lifetime of development in a Coastal Change Management Area through temporary permission and restoration conditions, where this is necessary to reduce a potentially unacceptable level of future risk to people and the development.

Local planning authorities should limit the planned lifetime of development in a Coastal Change Management Area through temporary permission and restoration conditions, where this is necessary to reduce a potentially unacceptable level of future risk to people and the development.

Footnote 62 - This includes householder development, small non-residential extensions (with a footprint of less than 250m2) and changes of use; except for changes of use to a caravan, camping or chalet site, or to a mobile home or park home site, where the sequential and exception tests should be applied as appropriate.

Footnote 63 - 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.

Footnote 64 - As required by the Marine and Coastal Access Act 2009.

10.2.2 Regional Planning Policy – The London Plan

Policy SI 12 Flood risk management

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 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 49 and creating recreational areas and habitat.

Policy SI 13 Sustainable drainage

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 50 enhanced biodiversity, urban greening, amenity and recreation.

Policy LP 21 - Flood Risk and Sustainable Drainage

A. All developments should avoid, or minimise, contributing to all sources of flooding, including fluvial, tidal, surface water, groundwater and flooding from sewers, taking account of climate change and without increasing flood risk elsewhere. Development will be guided to areas of lower risk by applying the 'Sequential Test' as set out in national policy guidance, and where necessary, the 'Exception Test' will be applied. Unacceptable developments and land uses will be refused in line with national policy and guidance, the Council's Strategic Flood Risk Assessment (SFRA) and as outlined in the table below.

In Flood Zones 2 and 3, all proposals on sites of 10 dwellings or more or 1000sqm of non-residential development or more, or on any other proposal where safe access/egress cannot be achieved, a Flood Emergency Plan must be submitted.

Where a Flood Risk Assessment is required, on-site attenuation to alleviate fluvial and/or surface water flooding over and above the Environment Agency's floodplain compensation is required where feasible.

	Land uses and developments – restrictions	**Sequential Test**	**Exception Test**	**Flood Risk Assessment**
Zone 3b	The functional floodplain as identified in the Council's Strategic Flood Risk Assessment will be protected by not permitting any form of development on undeveloped sites unless it: • is for Water Compatible development; • is for essential utility infrastructure which has to be located in a flood risk area and no alternative locations are available and it can be demonstrated that the development would be safe, without increasing flood risk elsewhere and where possible would reduce flood risk overall.	Required for essential utility infrastructure	Required for essential utility infrastructure	Required for all development proposals

	Redevelopment of existing developed sites will only be supported if there is no intensification of the land use and a net flood risk reduction is proposed; any restoration of the functional floodplain will be supported. Proposals for the change of use or conversion to a use with a higher vulnerability classification will not be permitted.			
Zone 3a	Land uses are restricted to Water Compatible, Less Vulnerable and More Vulnerable development. Highly Vulnerable developments will not be permitted. Self-contained residential basements and bedrooms at basement level will not be permitted.	Required for all developments unless exceptions outlined in the justification apply	Required for more vulnerable development	Required for all development proposals
Zone 2	No land use restrictions Self-contained residential basements and bedrooms at basement level will not be permitted.	Required for all developments unless exceptions outlined in the justification apply	Required for highly vulnerable development	Required for all development proposals unless for change of use from water compatible to less vulnerable
Zone 1	No land use restrictions	Not applicable	Not applicable	A Drainage Statement is required for sites all major developments. Required for all other development proposals where there is evidence of a risk from other sources of flooding, including surface water, ground water and sewer flooding.

Basements and subterranean developments

B. Basements within flood affected areas of the borough represent a particularly high risk to life, as they may be subject to very rapid inundation. Applicants will have to demonstrate that their proposal complies with the following:

Flood Zone 3b (Functional Floodplain)	Basements, basement extensions, conversions of basements to a higher vulnerability classification or self-contained units will not be permitted.
Flood Zone 3a (Tidal / Fluvial)	**In areas of Extreme, Significant and Moderate Breach Hazard** (as set out in the Council's SFRA):

	• **New basements:** o restricted to Less Vulnerable / Water Compatible use only. o 'More Vulnerable' uses will only be considered if a site-specific Flood Risk Assessment demonstrates that the risk to life can be managed. Bedrooms at basement levels will not be permitted. o 'Highly Vulnerable' such as self-contained basements/bedrooms uses will not be permitted. • **Existing basements:** o No basement extensions, conversions or additions for 'Highly Vulnerable' uses. o 'More Vulnerable' uses will only be considered if a site-specific Flood Risk Assessment demonstrates that the risk to life can be managed. **In areas of Low or No Breach Hazard** (as set out in the Council's SFRA): • **New basements:** if the Exception Test (where applicable) is passed, basements may be permitted for residential use where they are not self-contained or used for bedrooms. • **Existing basements:** basement extensions, conversions or additions may be permitted for existing developments where they are not self-contained or used for bedrooms. If a basement, basement extension or conversion is acceptable in principle in terms of its location, it must have internal access to a higher floor and flood resistant and resilient design techniques must be adopted.
Flood Zone 2	**In areas of Extreme, Significant and Moderate Breach Hazard** (as set out in the Council's SFRA): • **New Basements:** if the Exception Test (where applicable) is passed, basements may be permitted for residential use where they are not self-contained or used for bedrooms. • **Existing Basements:** basement extensions, conversions or additions maybe permitted for existing developments where they are not self-contained or used for bedrooms. If a basement, basement extension or conversion is acceptable in principle in terms of its location, it must have internal access to a higher floor and flood resistant and resilient design techniques must be adopted.
Flood Zone 1	No restrictions on new or extensions to existing basements

Sustainable drainage

C. The Council will require the use of Sustainable Drainage Systems (SuDS) in all development proposals. Applicants will have to demonstrate that their proposal complies with the following:

1. A reduction in surface water discharge to greenfield run-off rates wherever feasible.
2. Where greenfield run-off rates are not feasible, this will need to be demonstrated by the applicant, and in such instances, the minimum requirement is to achieve at least

a 50% attenuation of the site's surface water runoff at peak times based on the levels existing prior to the development.

Flood defences

E. Applicants will have to demonstrate that their proposal complies with the following:

1. Retain the effectiveness, stability and integrity of flood defences, river banks and other formal and informal flood defence infrastructure.
2. Ensure the proposal does not prevent essential maintenance and upgrading to be carried out in the future.
3. Set back developments from river banks and existing flood defence infrastructure where possible (16 metres for the tidal Thames and 8 metres for other rivers).
4. Take into account the requirements of the Thames Estuary 2100 Plan and the River Thames Scheme, and demonstrate how the current and future requirements for flood defences have been incorporated into the development.
5. The removal of formal or informal flood defences is not acceptable unless this is part of an agreed flood risk management strategy by the Environment Agency.

10.3 EA Standing Advice on Flood Risk

The Environment Agency's standing advice lays out the process that must be followed when carrying out flood risk assessments for developments.

Flood Risk Assessments are required for developments within one of the Flood Zones. This includes developments:

- 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.

11 Site Description and Environmental Characteristics

11.1 Site Location and Area

The site is located at 55 High Street, Hampton, TW12 2SX and is centred at national grid reference 514145, 169776. The site has an area of 293m^2.

A site location map and aerial photo are shown below. Photographs of the site are available in Appendix 1.

11.2 Site Access

The site is accessed via High Street Hampton.

11.3 Local Planning Authority

The site falls within the jurisdiction of the London Borough of Richmond Upon Thames (LBRT) in terms of the planning process.

11.4 Lead Local Flood Authority

LBRT is also the Lead Local Flood Authority (LLFA).

11.5 Flood Zone

For planning purposes, the site is located in Flood Zone 1 as defined by the EA and LLFA. The maps of the Flood Zones are available in Appendix 5.

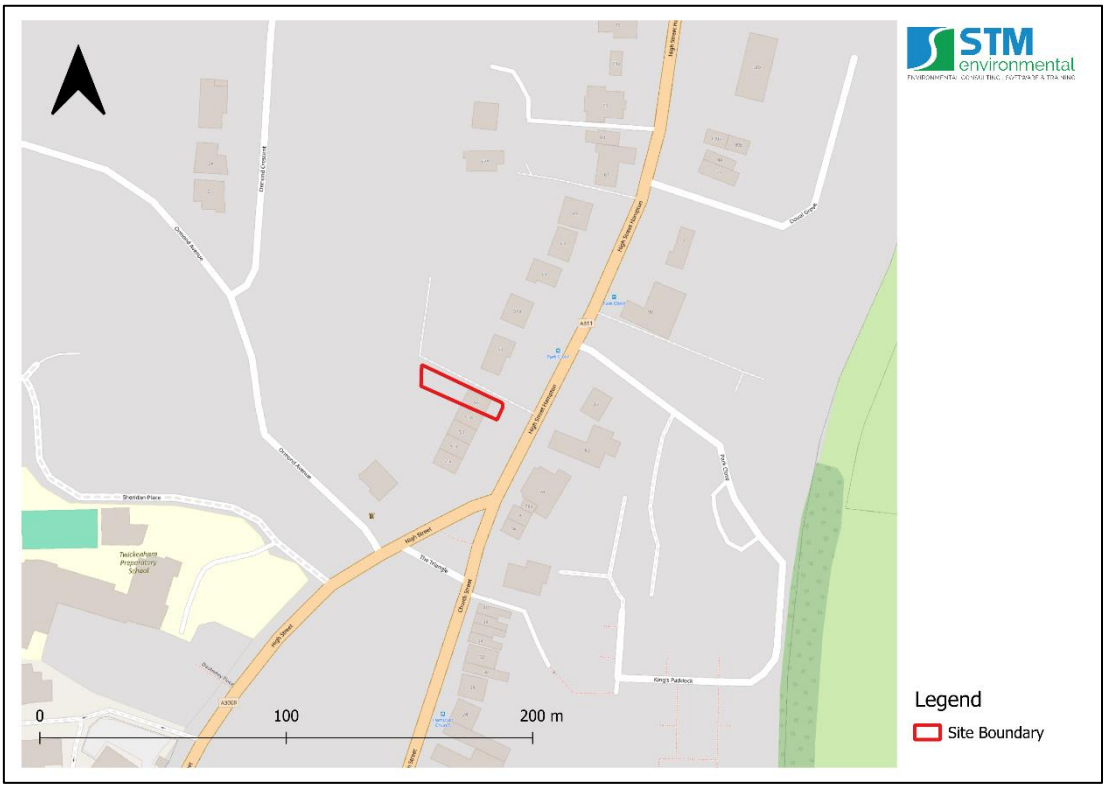


Figure 1 Site Location Map

Figure 2 Site Aerial Map

11.6 Site and Surrounding Land Uses

11.6.1 Site Current Land Use

The site is currently used as residential property.

11.6.2 Surrounding Land Uses

A description of the current and surrounding land uses of the site is given in Table 1.

Table 1 Summary of surrounding land uses

Boundary	Land Use Description	
	Immediately Adjacent (Within 0 – 25m)	**General Local Area (Within 25 – 250m)**
Northern	Road (Private Drive), Residential	Residential
Eastern	Road (High Street), Residential	Residential, Road, Parkland
Southern	Residential	Residential, Road
Western	Residential	Residential, Road, Sports Ground

11.7 Hydrology

The nearest main watercourse is the River Thames located approximately 347m south of the site. A map of the nearby hydrological features is present in Appendix 2.

It should be noted that the site is also located approximately 528m west of the Longford River and that there are 12no. ponds within 1km of the site

It should also be noted that the site is located approximately 655m northeast of the Hampton Water Works and 2.76km northwest of the Walton Advanced Water Treatment Works.

11.8 Geology

Data from the British Geological Survey indicates that the underlying superficial geology is characterised as Kempton Gravel Formation (unlithified Sand and Gravel). The underlying bedrock geology is characterized as London Clay Formation (Clay and Silt).

11.9 Hydrogeology

The site lies upon a Principal superficial aquifer and an Unproductive bedrock aquifer.

Appendix 3 provides BGS mapping showing the hydrogeology at the site location.

11.10 Topography

A LIDAR DTM map showing the topography of the site and surrounding area is available in Appendix 3. As a topographic survey was not available, site levels were estimated using this. All values are approximate.

There is an overall change in topography of 0.41m within the red line boundary. Traversing from High Street Hampton, the topography increases from a low of 12.38mAOD, to a high of 12.79mAOD at the rear of the existing property, before decreasing again toward the end of the garden.

In the wider area the topography decreases from a high of 17.70mAOD at the Beveree Wildlife Site, west of the site, to a low of 2.81mAOD at the Hampton Water Works Treatment Ponds southwest of the site.

12 The Sequential and Exception Tests

12.1 The Sequential Test

The Sequential Test aims to steer developments and redevelopments to areas of lower flood risk. The test compares the proposed development site with other available sites, in terms of flood risk, to aid the steering process.

The Sequential Test is not required if the proposed development is a minor development or if it involves a change of use unless the development is a caravan, camping chalet, mobile home or park home site.

Based on Government Guidance, Minor Development means:

- development of an existing dwellinghouse, or development within the curtilage of a dwellinghouse, for any purpose incidental to the enjoyment of the dwellinghouse
- an extension to an existing building used for non-domestic purposes where the floor space created by the development does not exceed 250 square metres
- alterations to an existing building which do not increase the size of the building

With regard to residential and commercial developments, major development, as defined by the Town and Country Planning (Development Management Procedure) means one or more of the following:

- Providing 10 or more dwellinghouses defined in article 2 of the DMPO or, where the number of dwellinghouses is not known, the site area is 0.5 hectares or more;
- Providing a building or buildings where the floor space to be created by the development will be 1,000 square metres or more;
- Development on a site of 1 hectare or more;
- The winning and working of minerals or the use of land for mineral - working deposits;
- Waste development

When development is exempt from the sequential test:

Development is exempt from the sequential test if it is a:

- householder development like residential extensions, conservatories or loft conversions
- small non-domestic extensions with a footprint of less than 250 square metres
- change of use (except changes of use to a caravan, camping or chalet site, or to a mobile home or park home site)

Development is also exempt from the sequential test if it is a development on a site allocated in the development plan through the sequential test and:

- the proposal is consistent with site's allocated use

- there have been no significant changes to the known level of flood risk to the site, now or in the future, which would have affected the outcome of the test

You may not need a sequential test if development can be laid out so that only elements such as public open space, biodiversity and amenity areas are located in areas at risk of any source of current or future flooding.

The development is considered to be minor and located in Flood Zone 1. As such, the Sequential Test should not be required by the LLFA.

12.2 The Exception Test

Where the Sequential Test is undertaken and alternative sites of lower flood risk are not available, then the proposed development may require an Exception Test in order to be granted planning permission.

Where the exception test is required, it should be applied as soon as possible to all local development document allocations for developments and all planning applications other than for minor developments. All three elements of the exception test have to be passed before development is allocated or permitted. For the exception test to be passed, it should be demonstrated that:

- development that has to be in a flood risk area will provide wider sustainability benefits to the community that outweigh 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.

The requirements for an Exception Test are given in Table 2 and are defined in terms of Flood Zone and development vulnerability classification.

Table 2 NPPF Flood Zone vulnerability compatibility (source: NPPF)

Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a	Exception Test required	✗	Exception Test required	✓	✓
Zone 3b	Exception Test required	✗	✗	✗	✓

Key:

✓ Development is appropriate

✗ Development should not be permitted.

The Exception Test should also not be required by the LLFA.

13 Site Specific Flood Risk Analysis

The PFRA and Level 1 SFRA produced by the LLFA and maps from the EA provide information regarding historic flooding events and incidents as well as predictions of flood extents and depths during extreme rainfall events.

13.1 Fluvial (River) and Tidal (Sea) Flood Risk

13.1.1 Mechanisms for Fluvial Flooding

Fluvial, or river flooding, occurs when excessive rainfall over an extended period of time or heavy snow melt causes a river to exceed its capacity. The damage from a fluvial flood can be widespread as the overflow may affect downstream tributaries, overtopping defences and flooding nearby inhabited areas. Fluvial flooding consists of two main types:

- Overbank flooding – this occurs when water rises steadily and overflows over the edges of a river or stream;
- Flash flooding – this is characterized by an intense, high velocity torrent of water that occurs in an existing river channel with little to no notice. Flash floods are very

dangerous and destructive not only because of the force of the water, but also the hurtling debris that is often swept up in the flow.

13.1.2 Definition of EA Modelled Fluvial Flood Risk Zones

Fluvial flood risk is assessed using flooding maps produced by the Environment Agency. These maps use available historic data and hydraulic modelling to define zones of flood risk. The maps allow a site to be defined in terms of its flood zone (e.g. 1, 2, 3) and in terms of the overall flood risk (very low, low, medium or high). It is important to note that existing flood defences are not taken into account within the models or the maps. The EA fluvial flood zones are defined as follows:

- Flood zone 1: Less than 1 in 1000 (0.1%) annual probability of flooding;
- Flood zone 2: Between 1 in 100 (1%) and 1 in 1000 (0.1%) annual probability of flooding;
- Flood zone 3: Greater than 1 in 100 (1%) annual probability of fluvial flooding.

Flood zone 3 is split into two sub-categories (3a and 3b) by LLFAs depending on whether the land is considered to be a functional flood plain (i.e. an important storage area for flood waters in extreme events).

- Flood zone 3a: Greater than 1 in 100 (1%) annual probability of fluvial flooding and/or greater than 1 in 200 (0.5%) annual probability of tidal flooding;

Functional flood plain

- Flood zone 3b (definition specific to the LLFA). Less than a 1 in 20 (5%) annual probability of fluvial and/or tidal flooding.
- 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:

- land having a 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively; orland 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).
- 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)

13.1.3 Mechanisms for Tidal Flooding

Tidal flooding may be described simply as the inundation of low-lying coastal areas by the sea, or the overtopping or breaching of sea defences. Tidal flooding may be caused by seasonal high tides, storm surges and where increase in water level above the astronomical tide level is created by strong on shore winds or by storm driven wave action.

13.1.4 Definition of EA Tidal Flood Risk Zones

As with fluvial flood risk, tidal flood risk is assessed using flooding maps produced by the Environment Agency. The difference is in the probability return periods used to define tidal flood zones. The EA tidal Flood Zones are defined as:

- Flood zone 1: Less than 1 in 1000 (0.1%) annual probability of flooding;
- Flood zone 2: Between 1 in 200 (0.5%) and 1 in 1000 (0.1%) annual probability of tidal flooding;
- Flood zone 3: Greater 1 in 200 (0.5%) annual probability of tidal flooding.

13.1.5 Main Potential Sources of Local Fluvial and Tidal Flooding

No main potential sources of fluvial or tidal flooding to the site was identified.

13.1.6 Records of Historic Fluvial Flooding Incidents

The EA's historic and recorded flood outline maps indicate that there has been historic fluvial flooding in the vicinity of the site. A copy of this map is available in Appendix 4. A total of 4no. fluvial flood events were identified including March 1947, November 1974, December 2000 and January 2003 when channel capacity was exceeded. The site was not impacted.

It should also be noted that 2no. further events took place in the vicinity of the site in May 1988 and Winter 2013/2014, the reason for which is unknown. The site was not impacted.

13.1.7 Designated Fluvial and Tidal Flood Risk Zone for the Site

The site is considered to be located within Flood Zone 1 as defined by the Environment Agency and the LLFA indicating that it has a less than 1 in 1000 (0.1%) annual probability of flooding.

13.1.8 Flood Defences

The EA's flood defence map which is available in Appendix 7 shows no indication of any flood defences in the vicinity of the site.

13.1.9 Peak River Flow Climate Change Allowances

The EA's climate change allowances for peak river flow maps show that the site is considered to be in the Maidenhead and Sunbury Management Catchment.

In flood zones 2 or 3a for:

- essential infrastructure – use the higher central allowance
- highly vulnerable – use central allowance (development should not be permitted in flood zone 3a)
- more vulnerable – use the central allowance
- less vulnerable – use the central allowance

- water compatible – use the central allowance

In flood zone 3b for:

- essential infrastructure – use the higher central allowance
- highly vulnerable – development should not be permitted
- more vulnerable – development should not be permitted
- less vulnerable – development should not be permitted
- water compatible – use the central allowance

As the site is located in Flood Zone 1, Climate Change Allowances are not required.

13.1.10 Climate Change - EA Modelled Predictions of Fluvial and Tidal Flood Levels and Extents

As the site is located in Flood Zone 1, EA Product 4 and 6 model data for the site was not provided.

13.1.11 Long Term Fluvial/Tidal Flood Risk Considering Flood Defences

The EA's long term flood risk maps give an indication of the actual risk associated with flooding after taking into account the effect of any flood defences in the area. Copies of maps for the site which are available in Appendix 9 indicate that the long-term risk from fluvial flooding to the site is very low.

13.2 Pluvial (Surface Water) Flood Risk

A pluvial, or surface water flood, is caused when heavy rainfall creates a flood event independent of an overflowing water body. Surface water flooding occurs when high intensity rainfall leads to run-off which flows over the ground surface, causing ponding in low-lying areas when the precipitation rate or overland flow rate is greater than the rate of infiltration, or return into watercourses. Surface water flooding can be exacerbated when the underlying soil and geology is saturated (as a result of

prolonged precipitation or a high-water table) or when the drainage network has insufficient capacity.

13.2.1 Mechanisms of Pluvial Flooding

The chief mechanisms for surface water flooding can be divided into the following categories:

- Runoff from higher topography;
- Localised surface water runoff – as a result of localised ponding of surface water;
- Sewer Flooding – areas where extensive and deep surface water flooding is likely to be influenced by sewer flooding. Where the sewer network has reached capacity, and surcharged, this will exacerbate the flood risk in these areas;
- Low Lying Areas – areas such as underpasses, subways and lowered roads beneath railway lines are more susceptible to surface water flooding;
- Railway Cuttings –railway infrastructure cut into the natural geological formations can cause extra surface run off and pooling disrupting service and potentially affecting adjacent structures;
- Railway Embankments – discrete surface water flooding locations along the up-stream side of the raised network rail embankments where water flows are interrupted and ponding can occur;
- Failure of artificial sources (i.e. man-made structures) such as such as canals and reservoirs.

13.2.2 Main Potential Sources of Local Pluvial Flooding

No main potential source of pluvial flooding to the site was identified.

13.2.3 Records of Historic Pluvial Flooding Incidents

Examination of the LLFA's Level 1 SFRA revealed no evidence of pluvial flooding on or in the vicinity of the site was provided.

13.2.4 Surface Water Flood Risk from Artificial Sources (Reservoirs and Canals)

The EA's reservoir flood risk map indicates that the site does not lie within an area that is at risk of reservoir flooding.

An examination of OS mapping and the EA's mapping revealed that there are significant reservoirs or canals in the area of the site, the details of which are provided in Table 3 below.

Table 3 Significant Canals and Reservoirs within 5km of the site

Name	Distance (km)	Direction
Grand Junction Reservoirs	1.12	SW
Sunnyside Reservoir	1.49	SW
Stain Hill East Reservoir	1.66	SW
Molesey Reservoirs Nature Reserve	1.78	SW
Stain Hill West Reservoir	1.84	SW
Red House Reservoir	2.04	NW
North Canal	2.09	SE
Besborough Reservoir	2.20	SW
South Canal	2.28	SE
Island Barn Reservoir	2.42	S
Queen Elizabeth II Storage Reservoir	2.70	SW
Knight Reservoir	2.83	SW

Inspection of the LLFA's Level 1 SFRA indicates that the risk of reservoir flooding is low.

13.2.5 Sewer Flooding

Examination of the LLFA's Level 1 SFRA revealed evidence of sewer flooding in the vicinity of the site. The site is in an area that has between 0no. and 10no. reported incidents.

A map showing recorded incidents of sewer flooding is available in Appendix 4.

13.2.6 Climate Change - Modelled Predictions of Surface Water Run-off Flooding

Mapping of the predicted extent and depth of surface water flooding for the 1 in 30-year, 1 in 100-year, and 1 in 1000-year rainfall return periods provided by the EA are available in Appendix 6.

The site remains dry during all modelled pluvial events.

13.2.7 Surface Water Flood Flow Routes

Surface water along High Street appears to flow south from High Street and north from Church Street towards The Triangle and collects due to the lower elevation.

Similarly, along Ormond Avenue, surface water from High Street (beyond The Triangle), Ormond Avenue and Ormond Crescent collects at the intersection of Ormond Avenue and Ormond Crescent due to the lower elevation.

13.2.8 Long Term Surface Water Flood Risk

The EA's long term flood risk maps which are available in Appendix 9 indicate that the long term risk of flooding from surface water is considered to be very low.

13.3 Groundwater Flood Risk

Groundwater flooding occurs when water rises from an underlying aquifer (i.e. at the location of a spring) to such a level where it intersects the ground surface and inundates the surrounding land. Groundwater flooding tends to occur after long periods of intense precipitation, in often low-lying areas where the water table is likely to be at a shallow depth. Groundwater flooding is known to occur in areas underlain by principal aquifers, although increasingly it is also being associated with more localised floodplain sands and gravels. A high groundwater table also has the potential to exacerbate the risk of surface water and fluvial flooding by reducing rainfall infiltration capacity, and to increase the risk of sewer flooding through sewer/groundwater interactions.

13.3.1 Historic Records of Groundwater Flooding

Examination of the LLFA's Level 1 SFRA revealed that no records of groundwater flooding at or within 500m of the site were provided.

13.3.2 Susceptibility to Groundwater Flooding

The Groundwater Flood Susceptibility Map provided by BGS and presented in Appendix 10 indicates that the site has potential for groundwater flooding of property situation below ground level. The Groundwater Depth map also provided by BGS indicates that the groundwater level may be approximately less than 3mbgl.

13.4 Critical Drainage Area

A Critical Drainage Area (CDA) may be defined as "a discrete geographic area (usually a hydrological catchment) where multiple and interlinked sources of flood risk (surface water, groundwater, sewer, main river and/or tidal) cause flooding in one or more Local Flood Risk Zones during severe weather thereby affecting people, property or local infrastructure". A CDA is defined in the Town and Country Planning (General Development Procedure) (Amendment) (No. 2) (England) Order 2006 as "an area within Flood Zone 1 which has critical drainage problems and which has been notified to the local planning authority by the Environment Agency".

The site is not located within a Critical Drainage Area.

A CDA map is available in Appendix 10.

14 Potential Impacts of the Development on Local Flood Risk

14.1 Changes to Impermeable Area and Building Footprint

Changes in ground cover arising from the development are presented in Table 4 and Table 5 below.

Table 4 Existing and proposed site ground cover

	Impermeable Area (m^2)	Permeable Area (m^2)	Total Area (m^2)
Existing	293	0	293
Proposed	293	0	293

Table 5 Break down of existing and proposed site uses

Use	Existing (m^2)	Proposed (m^2)	Difference (m^2)
Building	59	73	14
Hardstanding	234	220	-14
Soft Landscaping	0	0	0
Total	293	293	-

The proposed development will not alter the impermeable area of the site. Therefore, it is considered unlikely that it will impact upon flood flow rates and surface water runoff rates.

14.2 Impacts on Flood Storage and Flood Flow Routes

Although the development will increase the site's built-up area by 14m^2, it unlikely to have an impact on local flood storage and flood flow paths as it is not impacted by any modelled fluvial or pluvial events.

15 Flood Risk Mitigation Measures

15.1 SuDS

Planning practice guidance (PPG) which is prepared by the Ministry of Housing, Communities and Local Government (DCLG) states that developers and Local Authorities should seek opportunities to reduce the overall level of flood risk in the area through the layout and form of the development, and the appropriate application of sustainable drainage techniques.

As such, the developer has the option to implement a SuDS strategy in line with the drainage hierarchy as outlined in Table 6 below to reduce surface water discharges from the site.

Table 6 SuDS Options

▪ Store rainwater for later use; ▪ Use infiltration techniques, such as porous surfaces in non-clay areas; ▪ Attenuate rainwater in ponds or open water features for gradual release; ▪ Attenuate rainwater by storing in tanks or sealed water features for gradual release; ▪ Discharge directly to a water course; ▪ Discharge rainwater directly to a surface water sewer/drain; ▪ Discharge to a combined sewer.

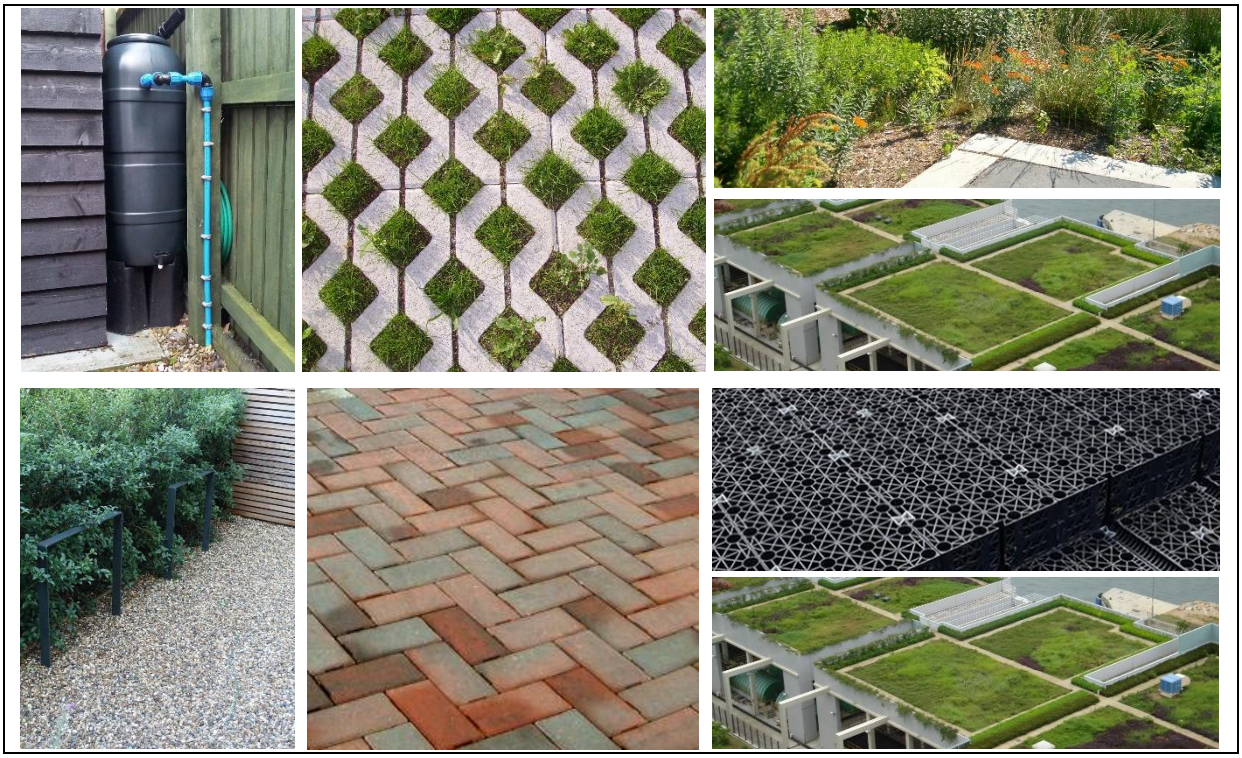


Figure 3 Surface water storage facilities and potential SuDS features - rainwater harvesting, on-site tank storage, rain garden soak-away and green roofs. (Source: UK SuDS Manual)

Given the nature of the development and the size of the site, it is considered that there are opportunities for implementing SuDS. Measures such as water butts, rainwater

harvesting, infiltration (soakaways, permeable paving, rain gardens) or attenuation storage tanks should be considered.

A full SuDS strategy is outside the scope of works of this FRA.

15.2 Flood Resilience

Flood resilient construction uses methods and materials that reduce the impact from a flood, ensuring that structural integrity is maintained, and the drying out and cleaning required, following inundation and before reoccupation, is minimised.

15.2.1 Finished Floor Levels

Given that the site remains dry during all modelled fluvial and pluvial events, the Finished Floor Level (FFL) can remain as existing, 340mm above the garden ground level at approximately 12.82mAOD.

15.2.2 Compensatory Flood Storage (CFS)

As the site is not impacted by any modelled fluvial or pluvial events, CFS is not required.

16 Emergency Plan

16.1.1 Assessment of Danger to People

The dangers associated with flood water to people are possible injury and/or death. This can occur as a result of drowning or being carried along by the waters into hard objects or vice versa. The risk to life is largely a function of the depth and velocity of the floodwater as it crosses the floodplain. Fast flowing deep water that contains debris would represent the greatest hazard.

The assessment of danger to people from walking in floodwater is described in the Flood Risks to People guidance documents (FD2321_TR1 and FD2321_TR2) by DEFRA/EA.

Danger can be estimated by the simple formula:

$$HR = d \times (v + 0.5) + DF$$

where, HR = (flood) hazard rating; d = depth of flooding (m); v = velocity of floodwaters (m/sec); and DF = debris factor.

The scoring methodology and calculation matrix for this is summarised in Appendix 13.

As the site it not impacted by any modelled fluvial or pluvial event, the Hazard Rating is determined to be very low.

16.1.2 Access and Safe Egress

Safe egress to Flood Zone 1 is available is available on site.

16.1.3 Safe Refuge

The proposed development will provide sufficient safe refuge in the case of an extreme flood event.

17 Conclusions and Recommendations

This assessment has considered the potential risks to the application site associated with flooding from fluvial, tidal, surface water, artificial and groundwater sources and the potential impacts of climate change.

A review of LLFA's PFRA and SFRA as well as data provided by the EA was undertaken. The main findings of the review and assessment are provided below:

- The development is considered to be minor and located in Flood Zone 1. As such, Sequential and Exception Tests should not be required by the LLFA;
- No main potential source of flooding to the site was identified;
- The EA define the site as being within Flood Zone 1;

- The finished floor level will be set no lower than the existing finished floor level, 340mm above the garden ground level at approximately 12.82mAOD;
- CFS is not required;
- EA mapping shows no indication of any flood defences in the vicinity of the site;
- EA mapping revealed a total of 4no. of fluvial flooding incidents in the vicinity of the site. The site was not impacted;
- The site is not within a CDA. It is in an area that has between 0no. and 10no. reported incidents;
- No records of groundwater flooding incidents at or in the vicinity of the site were provided;
- The development will not change the impermeable area of the site, but increases the built-up area by 14m^2. However, it is unlikely to increase local flood risk as it is not impacted by any modelled fluvial or pluvial events;
- There is good opportunity for implementing SuDS mitigation measures. Consideration should be given to use of water butts, rainwater harvesting, infiltration (soakaways, permeable paving, rain gardens) or attenuation storage tanks;
- Safe egress to Flood Zone 1 is available on site;
- The proposed development will provide sufficient safe refuge in the event of an extreme flood event.

The proposed development is considered to be in general compliance with local planning policy and the NPPF.

18 References

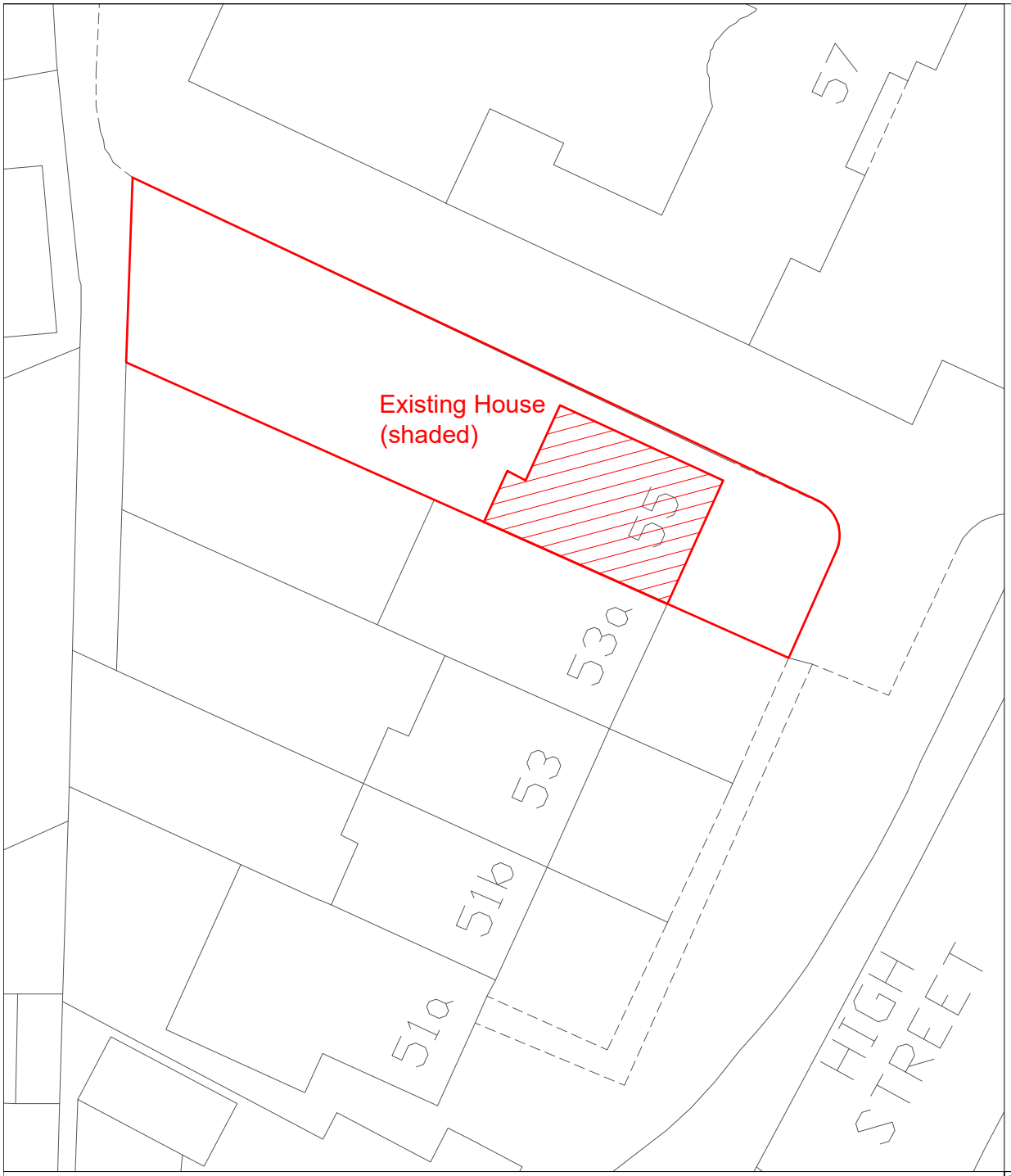
1. Communities and Local Government - National Planning Policy Framework NPPF, July, 2021.
2. Communities and Local Government - Planning Practice Guidance: Flood Risk and Coastal Change, Updated 06 March 2014.
3. London Borough of Richmond Upon Thames, Metis Consulting - Strategic Flood Risk Assessment – Level 1, March 2021.
4. London Borough of Richmond Upon Thames - Local Plan, July 2018.
5. London Borough of Richmond Upon Thames - Surface Water Management Plan, September 2011.
6. London Borough of Richmond Upon Thames, Metis Consulting - Surface Water Management Plan, December 2021.
7. London Borough of Richmond Upon Thames – Strategic Flood Risk Assessment – Fluvial and Tidal Flood Risk Map. Available at: https://mapping.richmond.gov.uk/map/Aurora.svc/run?script=%5CAurora%5Cpublic_SFRA_Fluvial_Tidal_LBRUT.AuroraScript%24&resize=always (Accessed: 18 December 2024).
8. CIRIA, Defra, Environment Agency – UK SuDS Manual, 2015.
9. Greater London Authority – London Sustainable Drainage Action Plan, 2015.
10. London Plan (2021) - Mayor of London
11. London Regional Flood Risk Appraisal (2018) - Mayor of London

19 Appendices

19.1 Appendix 1 – Site Photographs

19.2 Appendix 2 – Development Plans

See next page.



Site Plan 1:200

0 5 10 15 20 25m

Site Location Plan 1:1250

0 10 20 30 40 50 100m

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Date	Comments	Rev.	Date	Comments	Rev.
04.10.24	Issued for Planning Pre-Application	P1			

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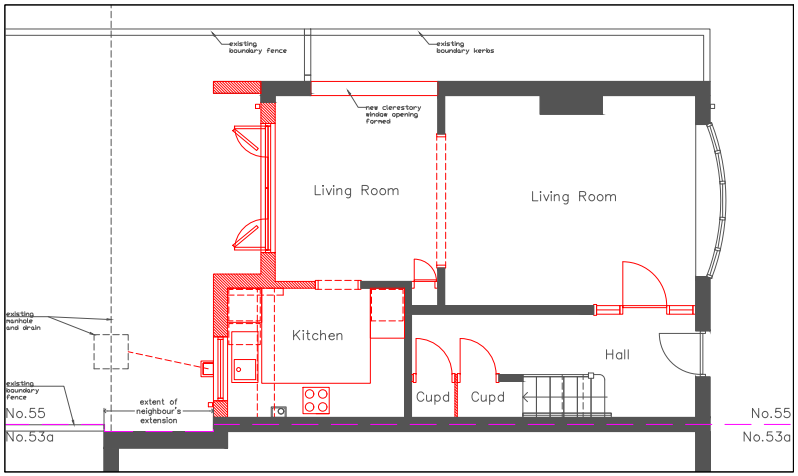
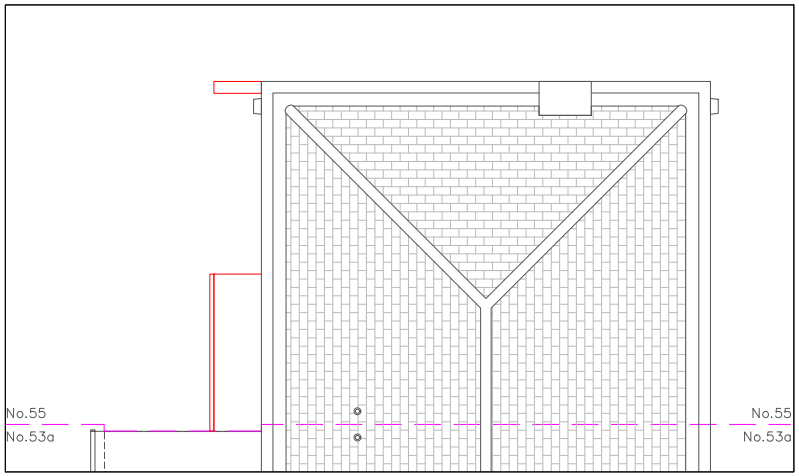
Project	Proposed Rear Single Storey Extension
Location	55 High Street, Hampton, TW12 2SX
Title	Location and Site Plans
Date	04/10/2024
Dwg No.	064 (LP) 01
Rev.	P1
Scale	1:1250 @ A3 & 1:200

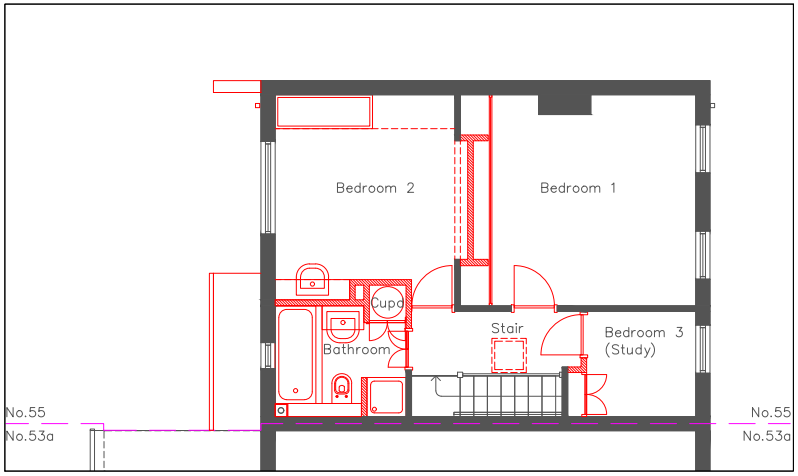
All removals are highlighted in red



Existing Ground Floor Plan



Existing Roof Plan



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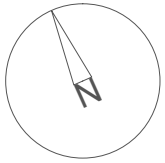

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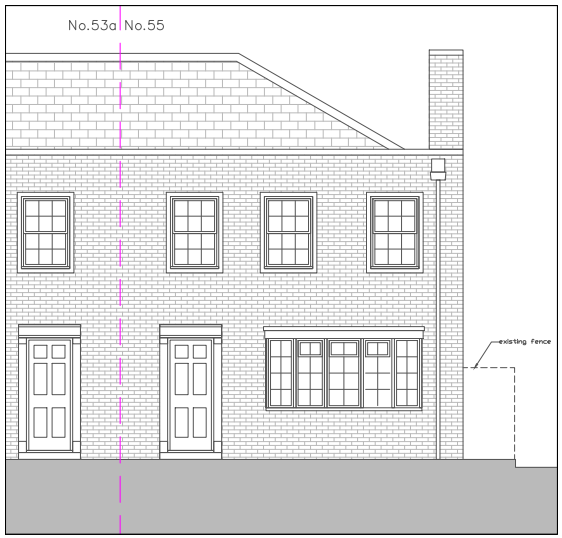
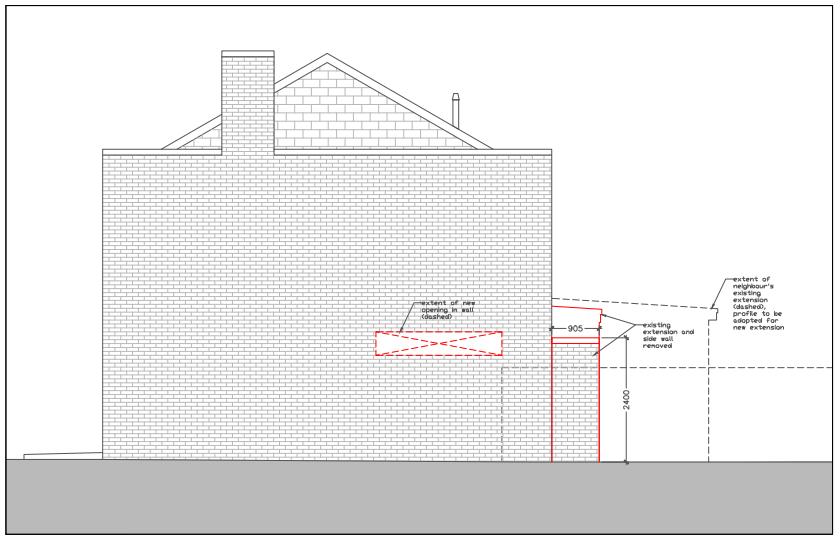
Dwg No.	:
Rev.	
Scale	1:50 @ A1 1:100 @ A3

064 (EX) 01 P1

All removals are highlighted in red



Existing East Elevation



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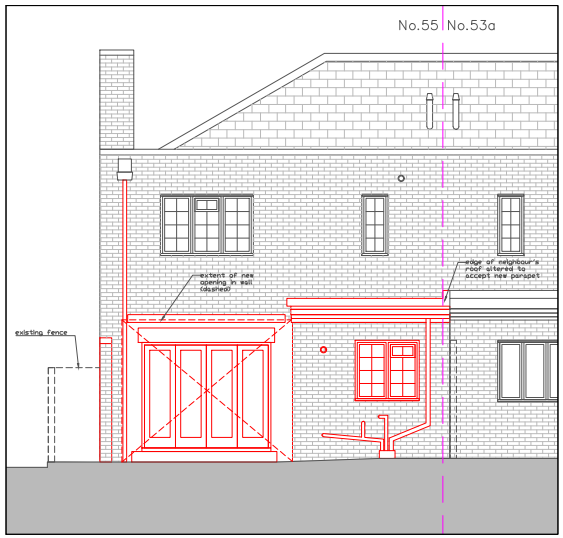

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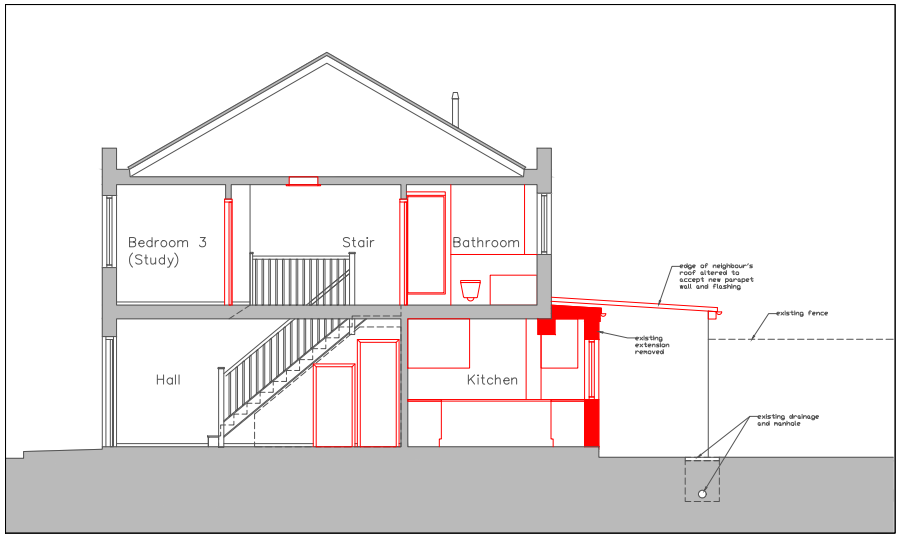
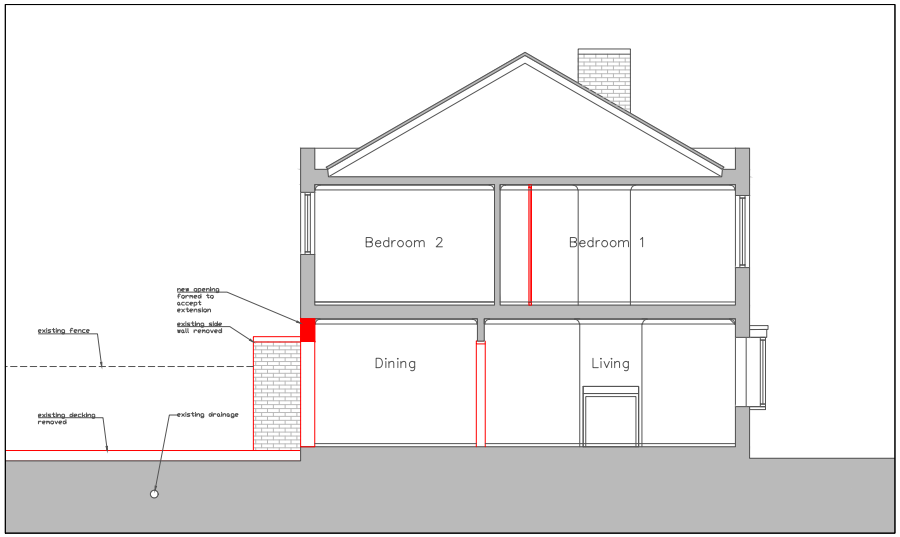


Existing Section; East-to-West



Existing Section; West-to-East

0 1 2 3 4 5 10m

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Dwg No. :	Rev.
Scale	1:50 @ A1 1:100 @ A3

064 (EX) 02 P1

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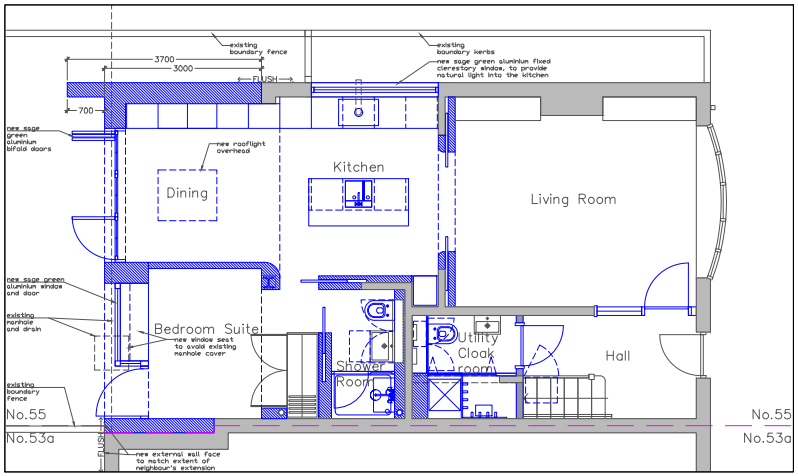
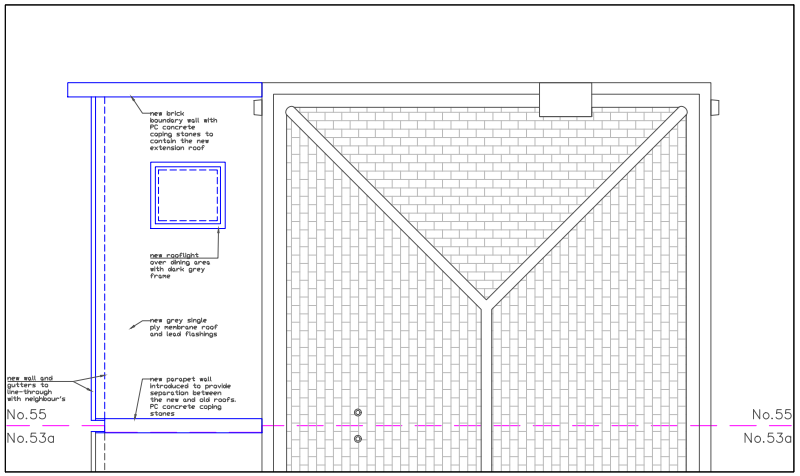
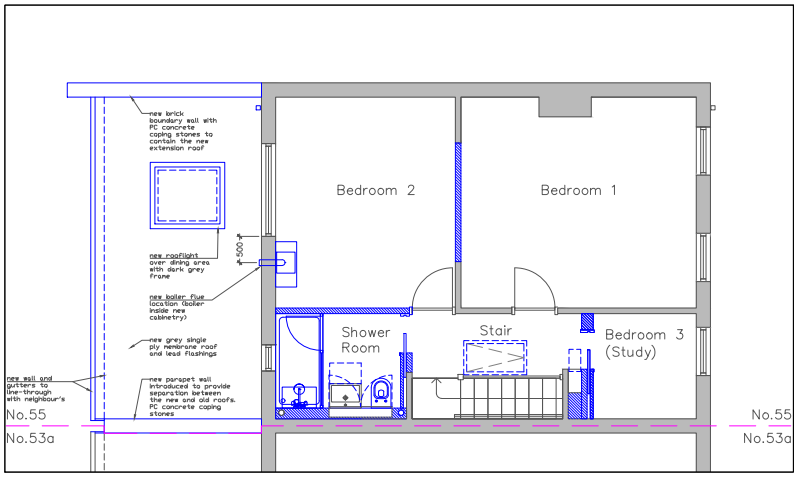


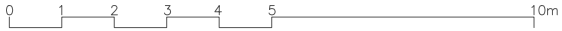
Proposed Ground Floor Plan

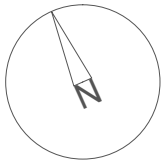


Proposed Roof Plan



Proposed First Floor Plan





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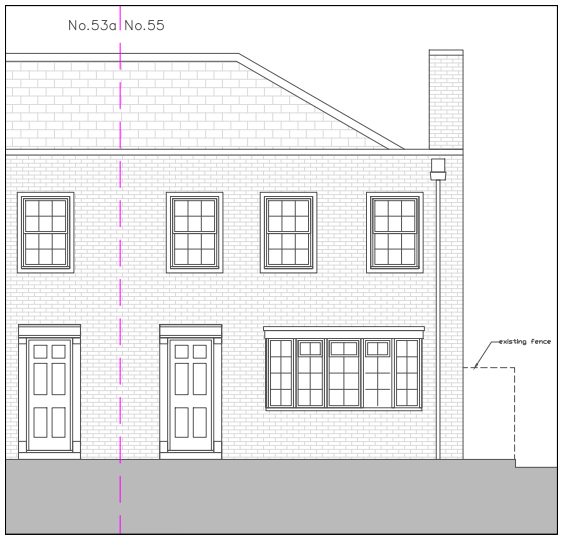

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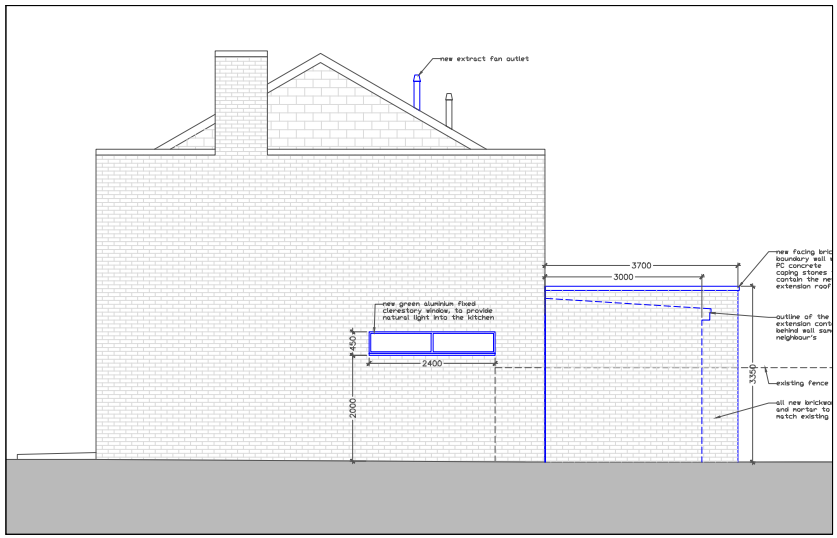
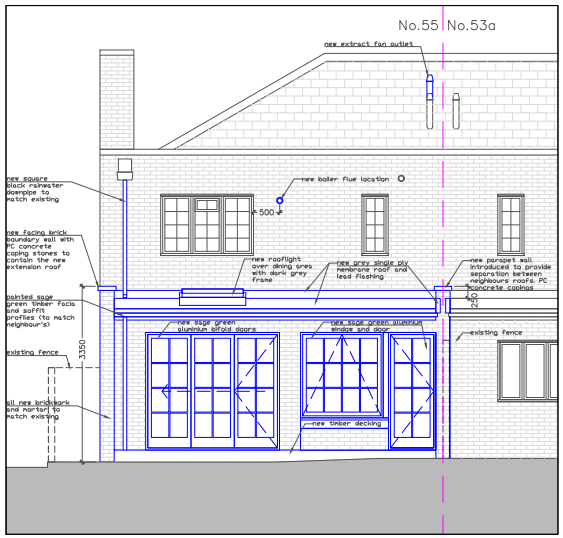
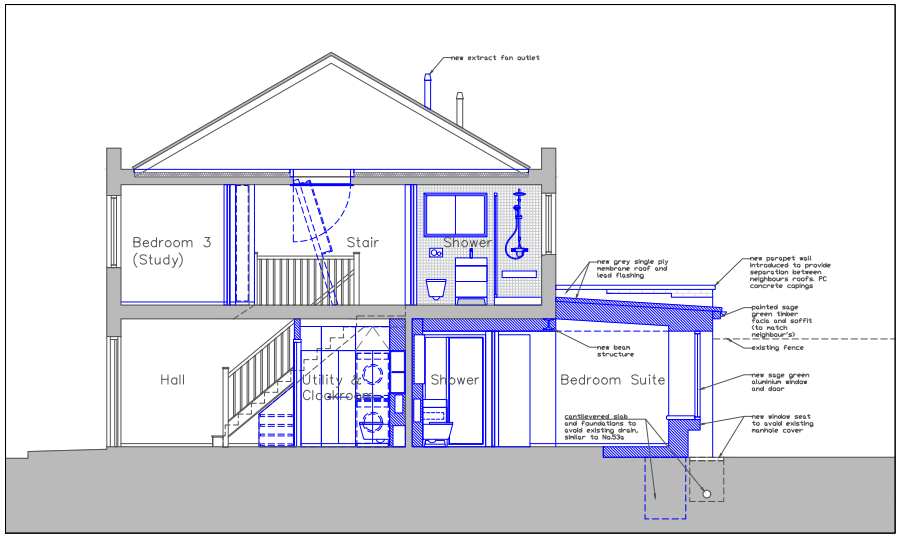


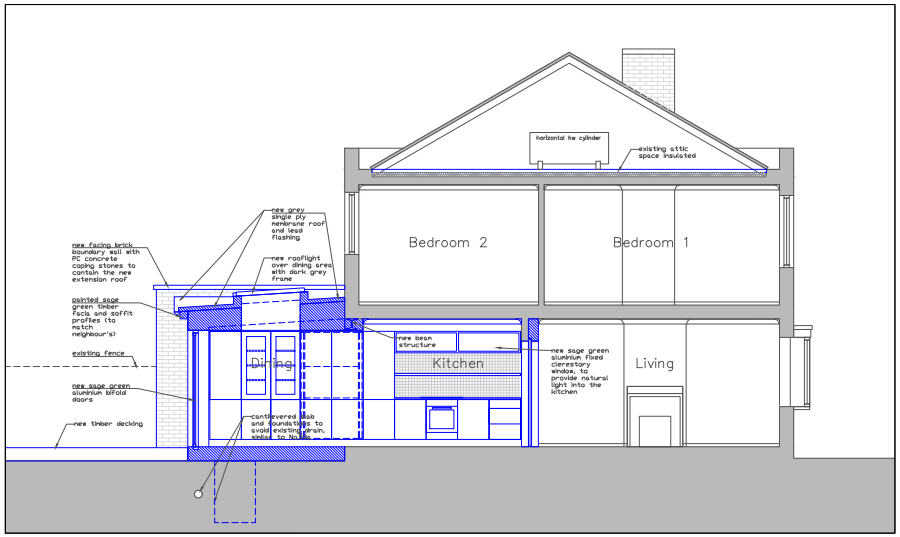
Proposed North Elevation



Proposed West Elevation



Proposed Section; East-to-West



Proposed Section; West-to-East

0 1 2 3 4 5 10m

Date	Comments	Rev.	Date	Comments	Rev.
04.10.24	Issued for Planning Pre-Application	P1			

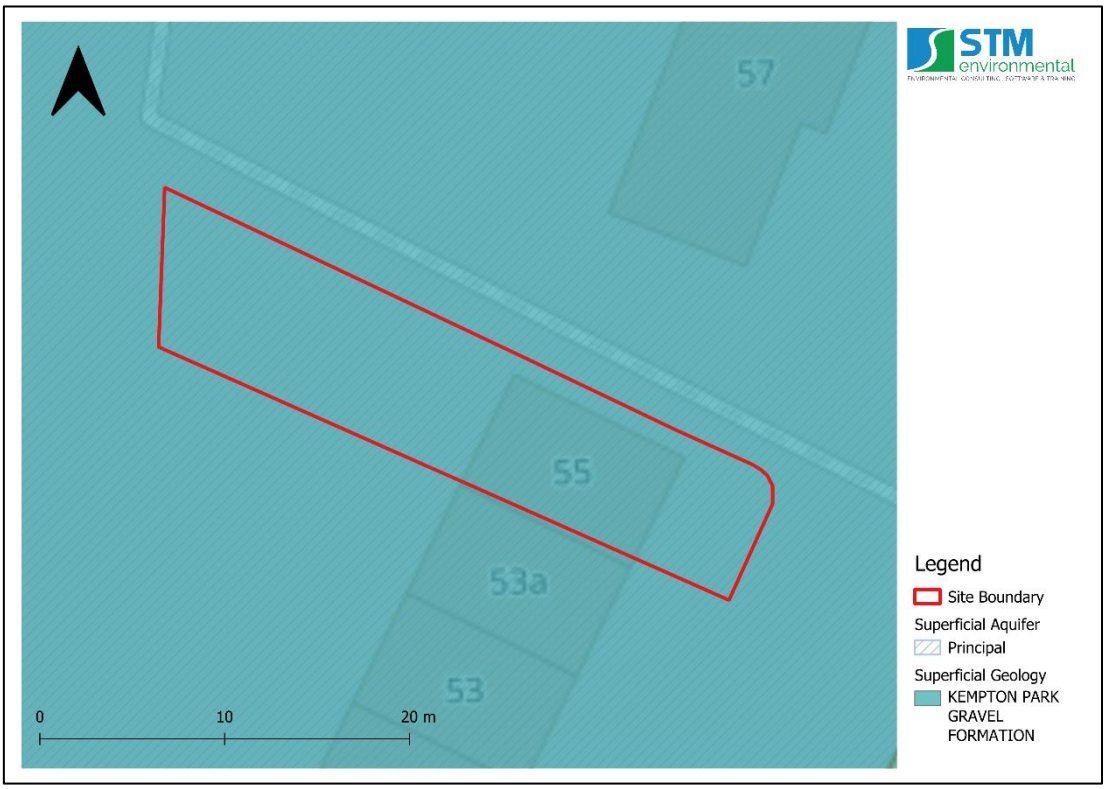
JACKSON OCONNOR
ARCHITECTURE
Tel: 07765 251066
Web: www.jacksonoconnor.com
Email: jane@jacksonoconnor.com

Project	Proposed Rear Single Storey Extension
Location	55 High Street, Hampton, TW12 2SX
Title	Proposed Elevations & Sections
Date	04/10/2024
Dwg No. :	Rev.
Scale	1:50 @ A1 1:100 @ A3

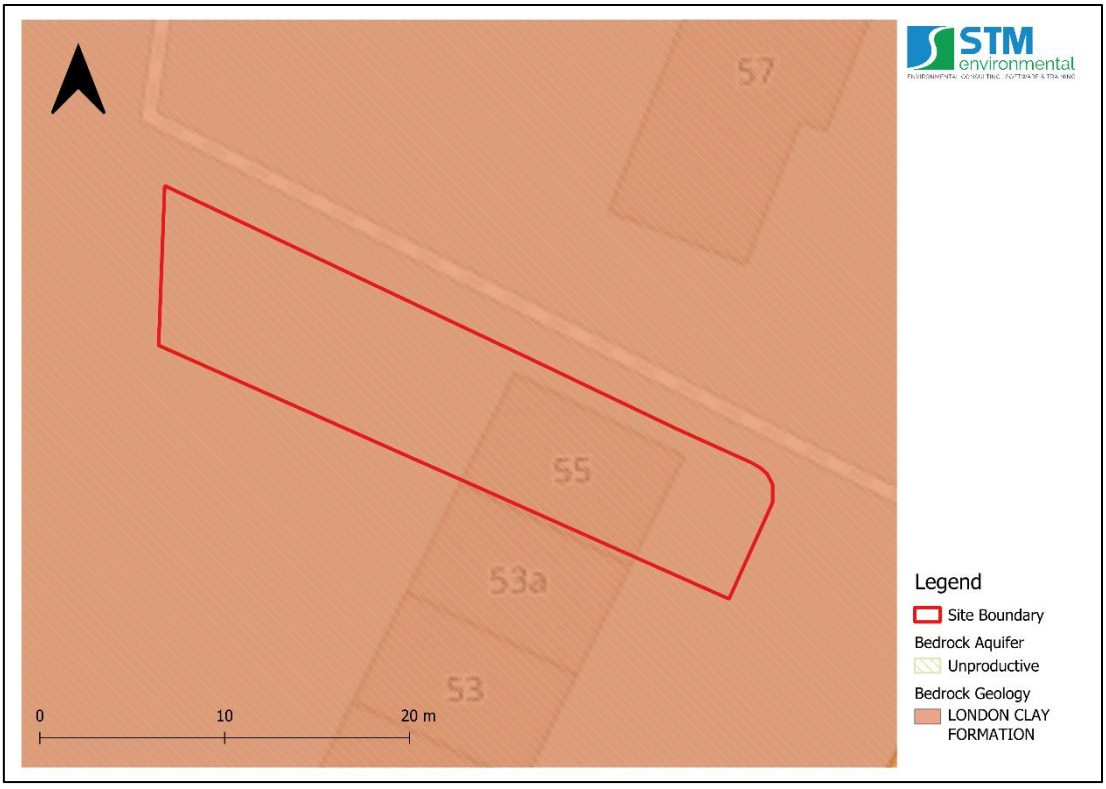
064 (GA) 02 P1

19.3 Appendix 3 – Environmental Characteristics

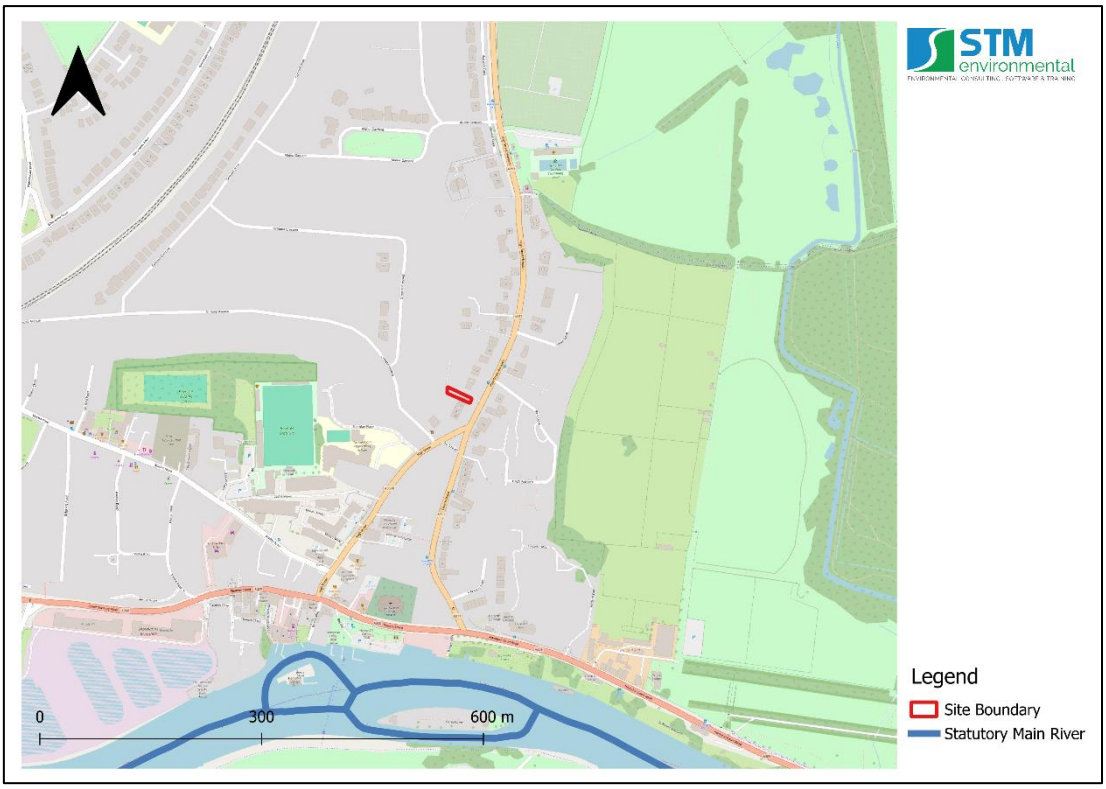
19.3.1 Superficial Hydrogeology Map



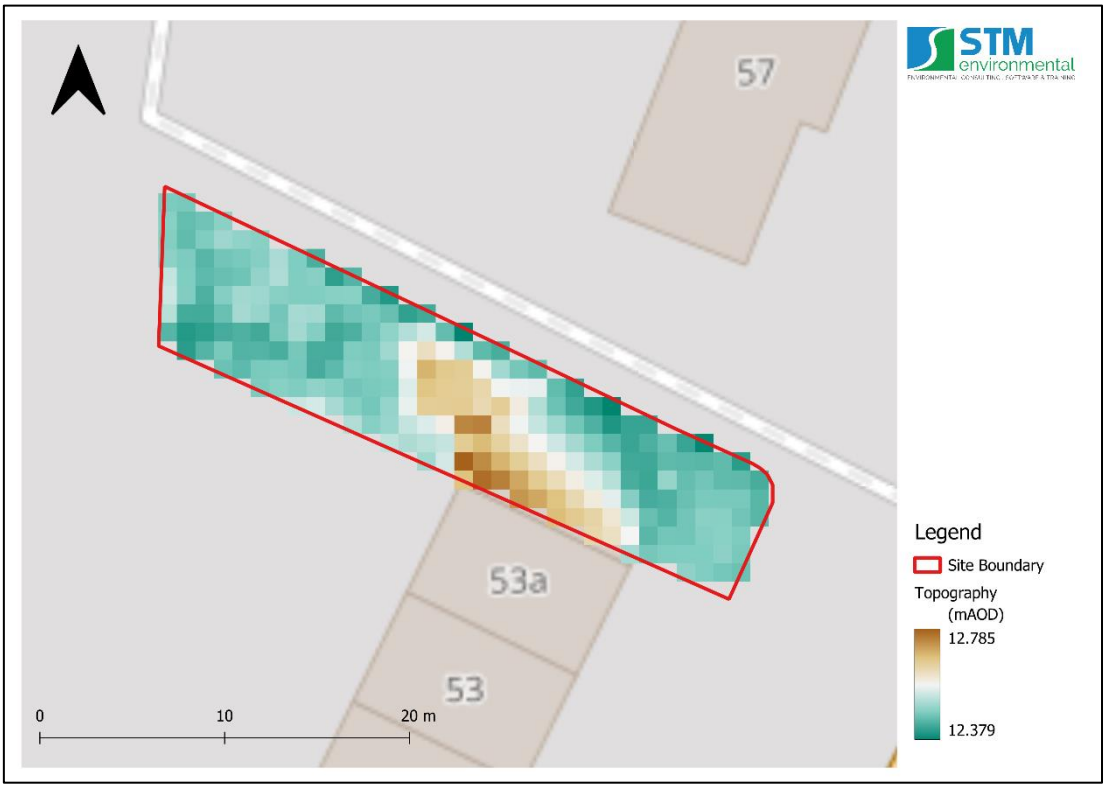
19.3.2 Bedrock Hydrogeology Map



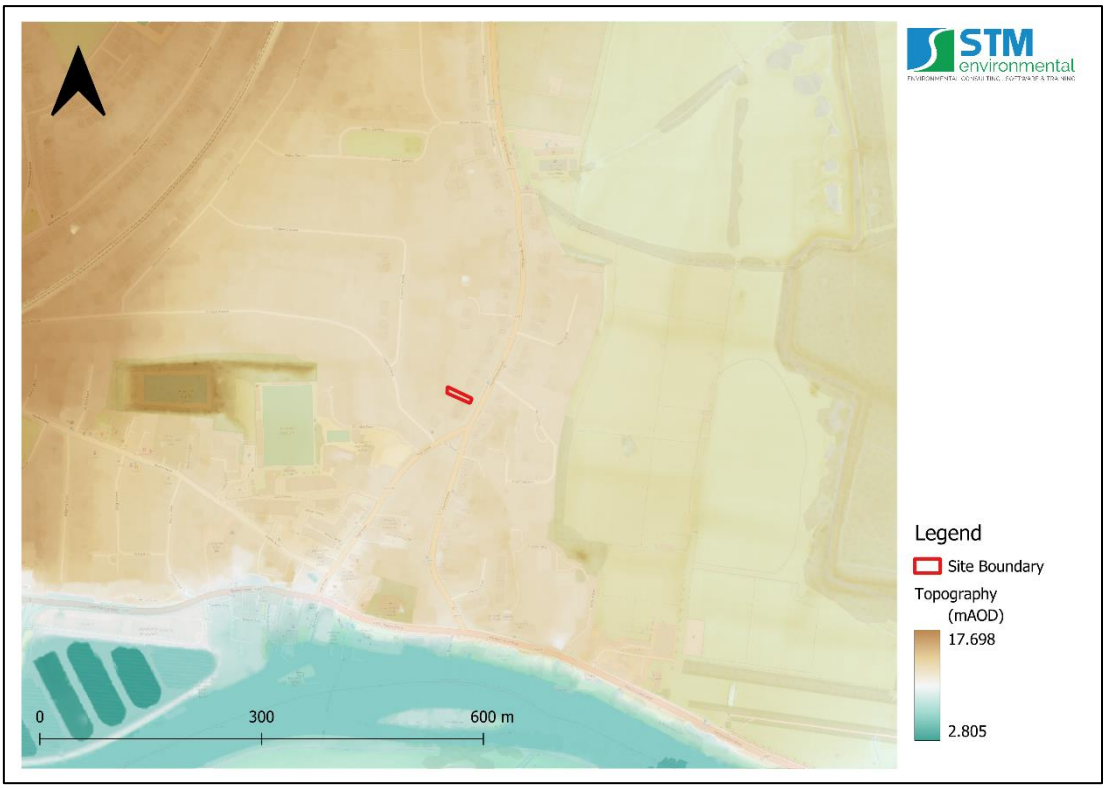
19.3.3 Hydrology Map



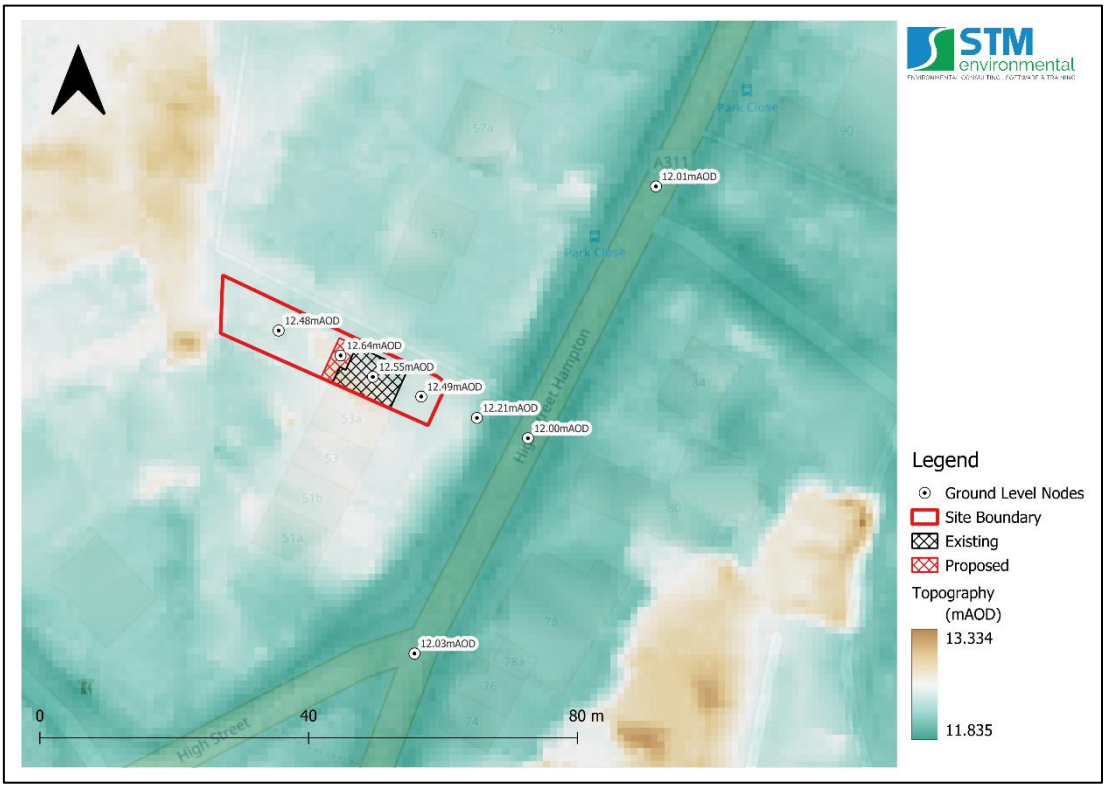
19.3.4 Topography Map – Site



19.3.5 Topography Map – Area

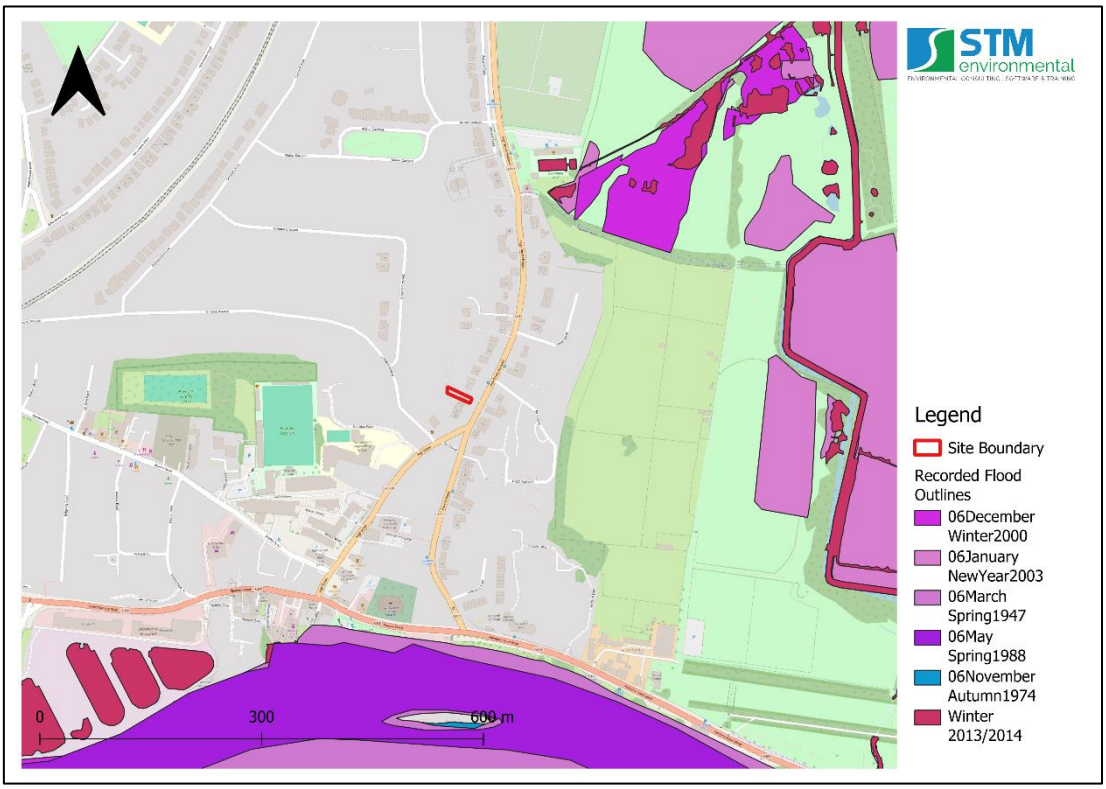


19.3.6 Topography Map – Nodes

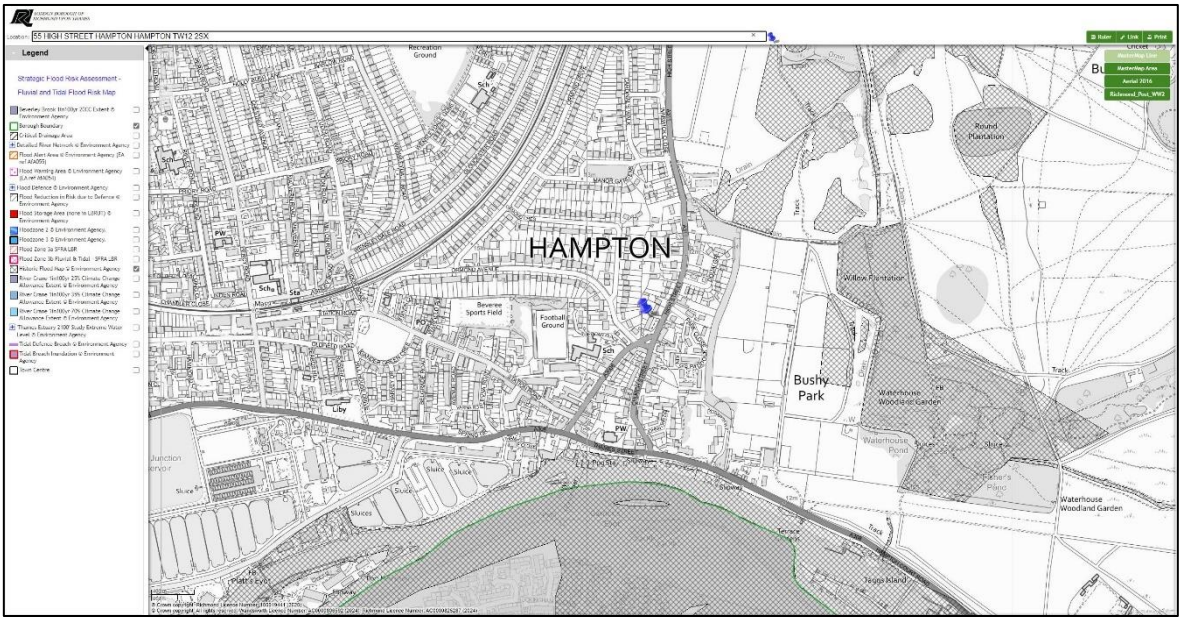


19.4 Appendix 4 – Historical Flood Incident Maps

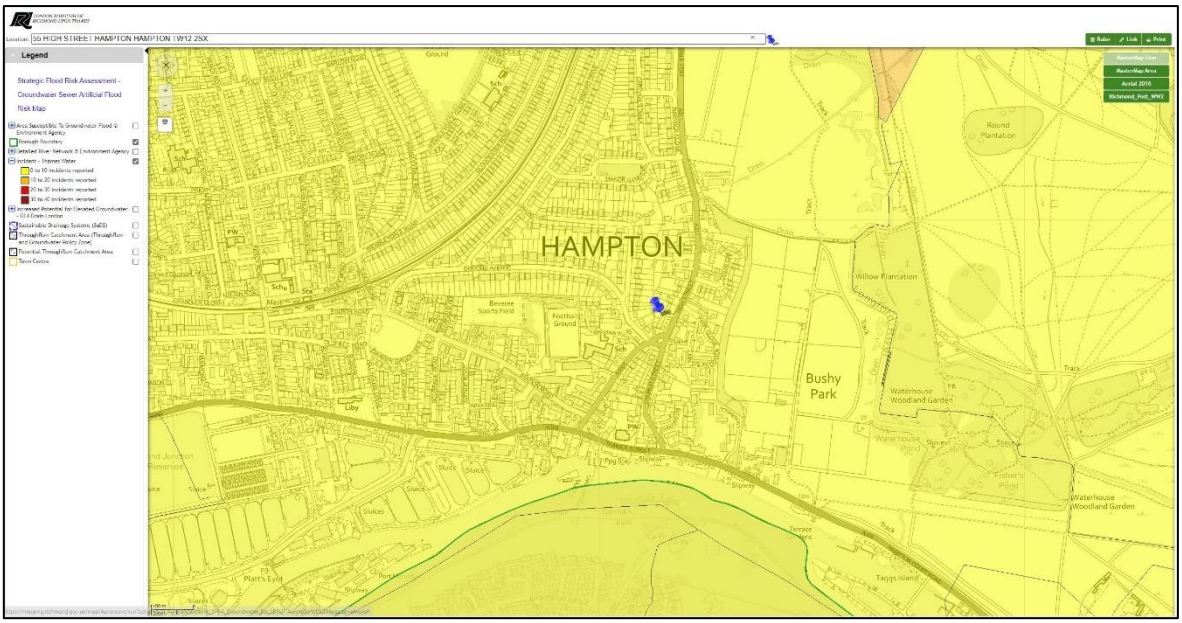
19.4.1 EA Historic and Recorded Flood Outlines



19.4.2 LLFA Map Recorded Historic Flooding

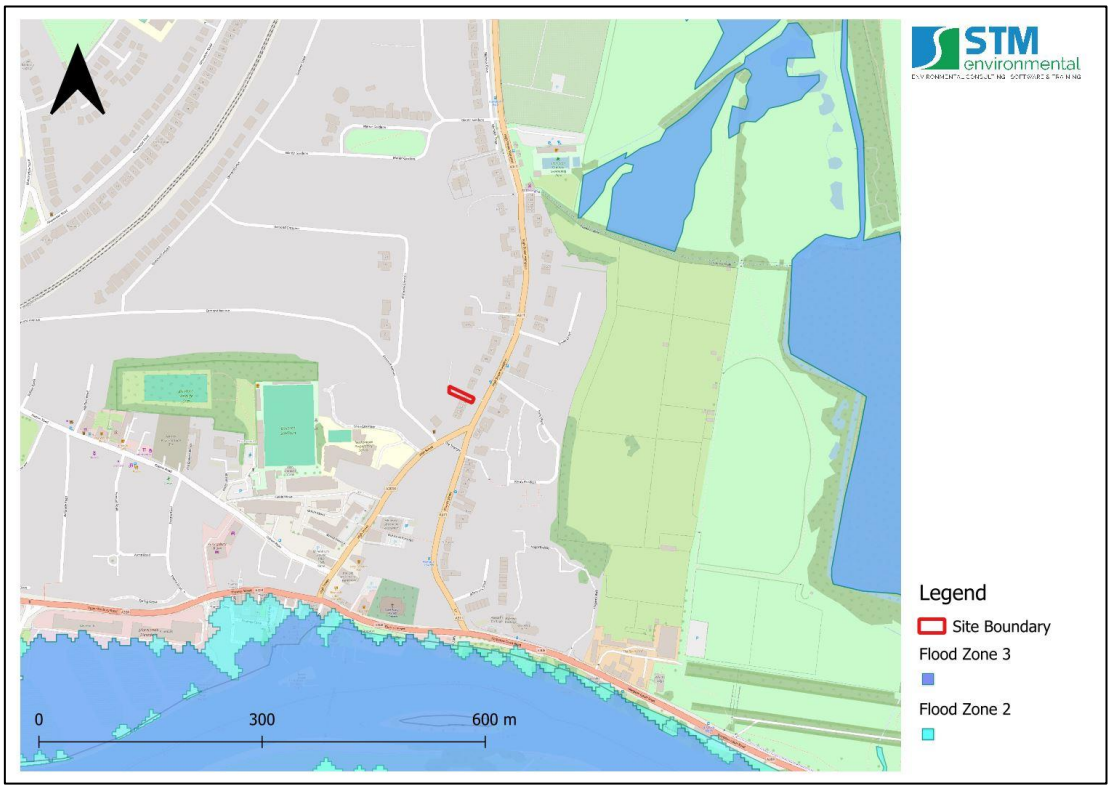


19.4.3 Map of Recorded Sewer Flooding

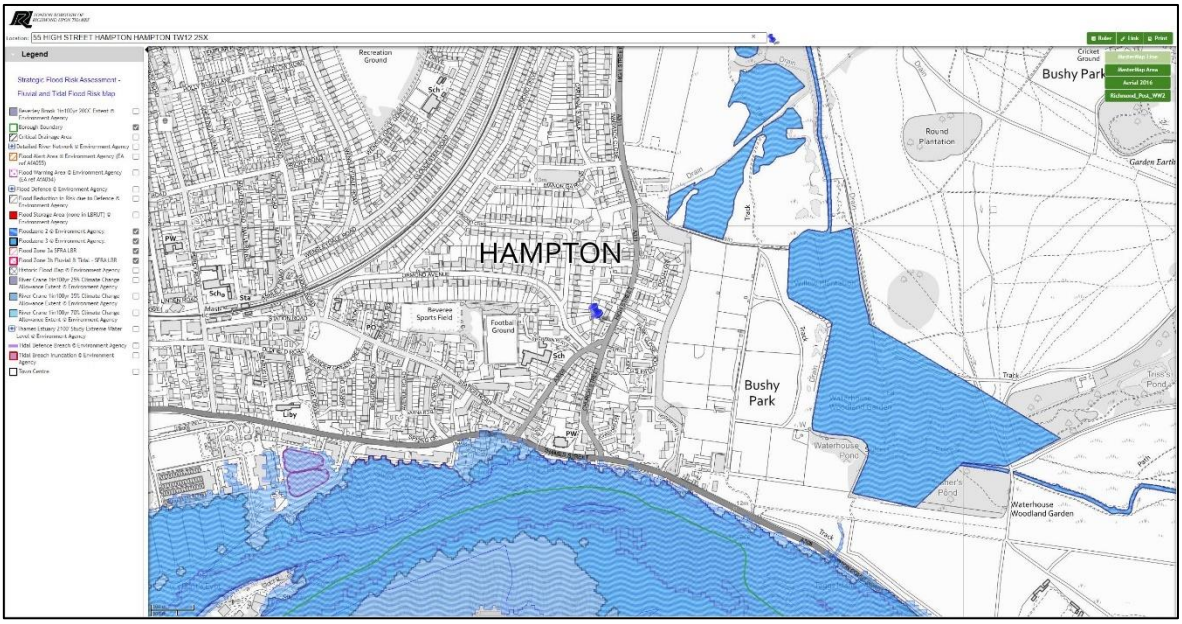


19.5 Appendix 5 - Flood Zone Maps

19.5.1 EA Flood Zones

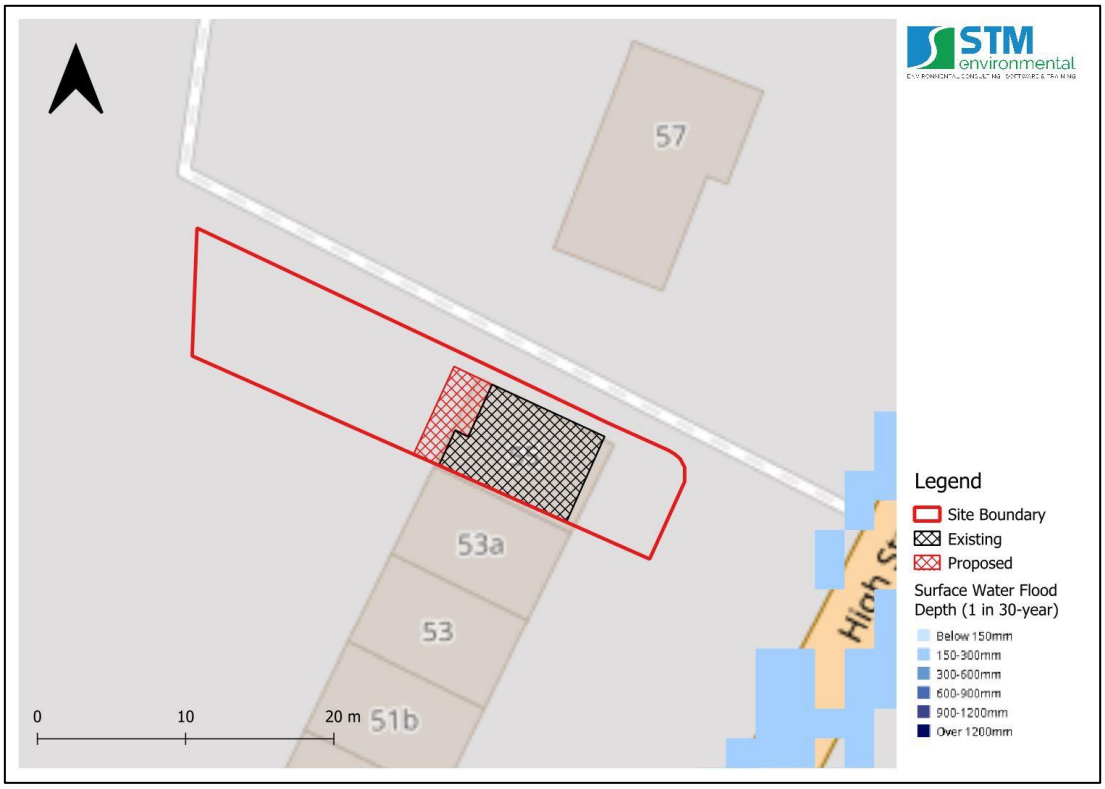


19.5.2 LLFA Flood Zone Map

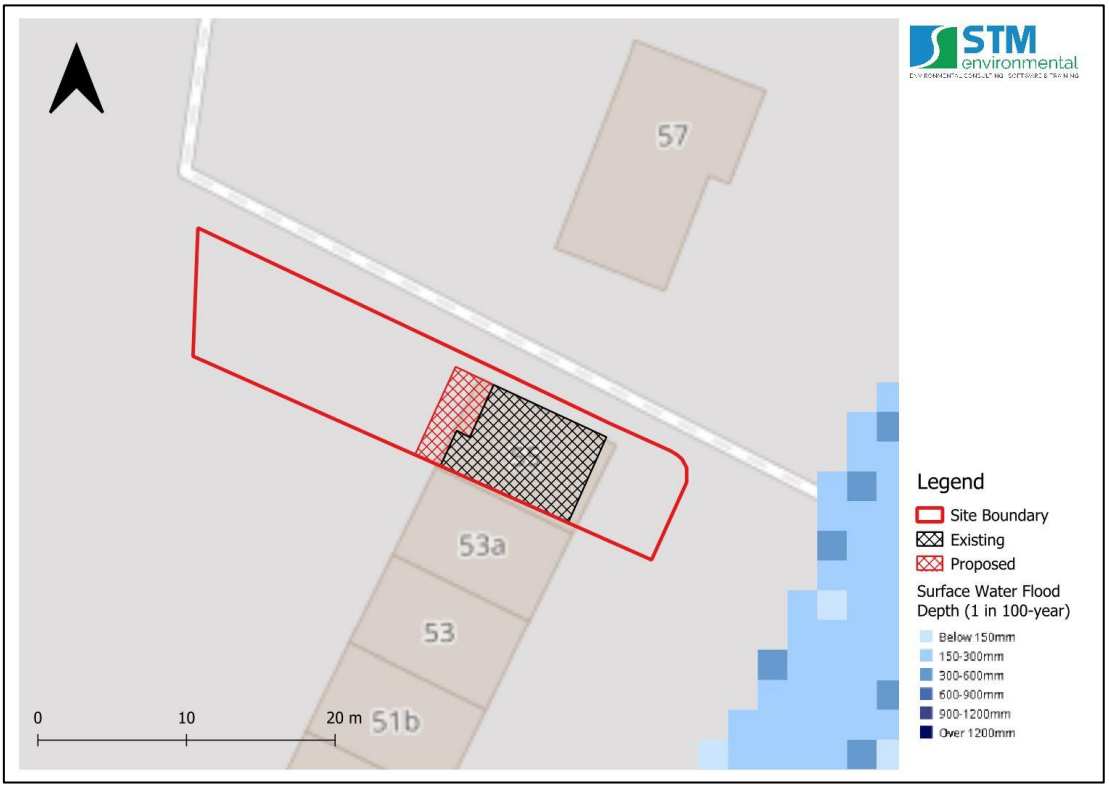


19.6 Appendix 6 – Surface Water Flood Extent and Depth Maps

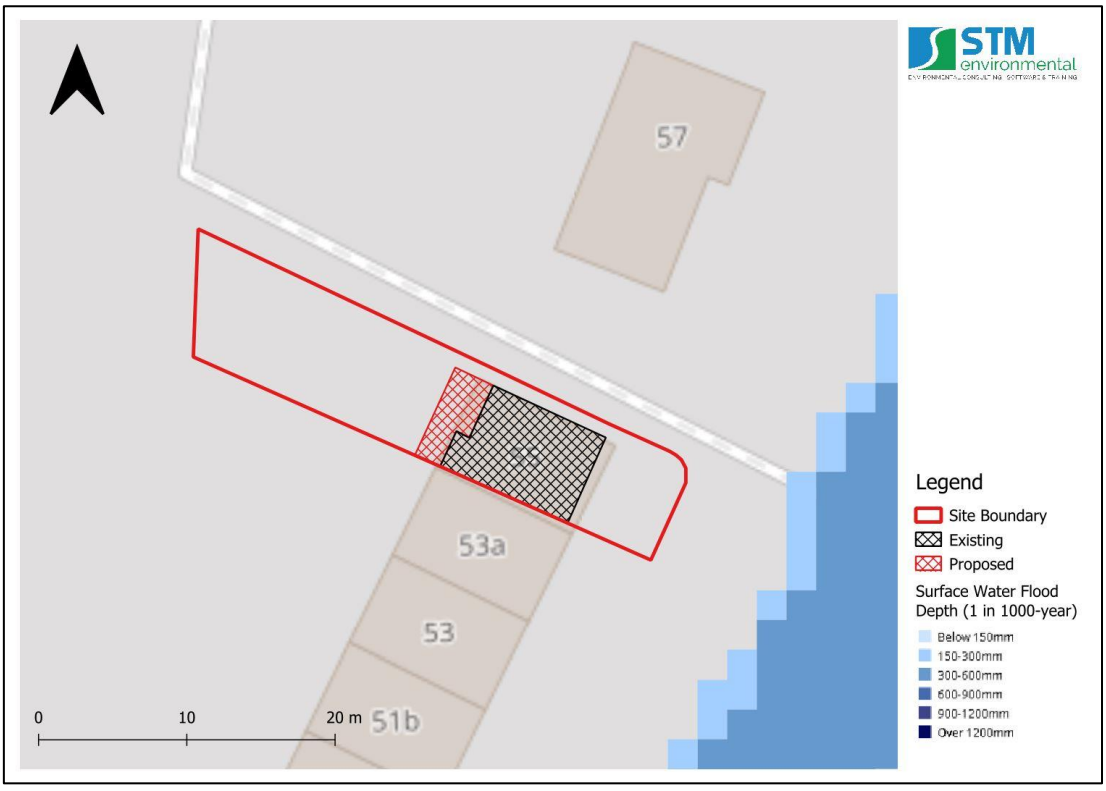
19.6.1 Predicted surface water flood depth for the 1 in 30-year return period (Source: EA, 2024).



19.6.2 Predicted surface water flood depth for the 1 in 100-year return period (Source: EA, 2024).

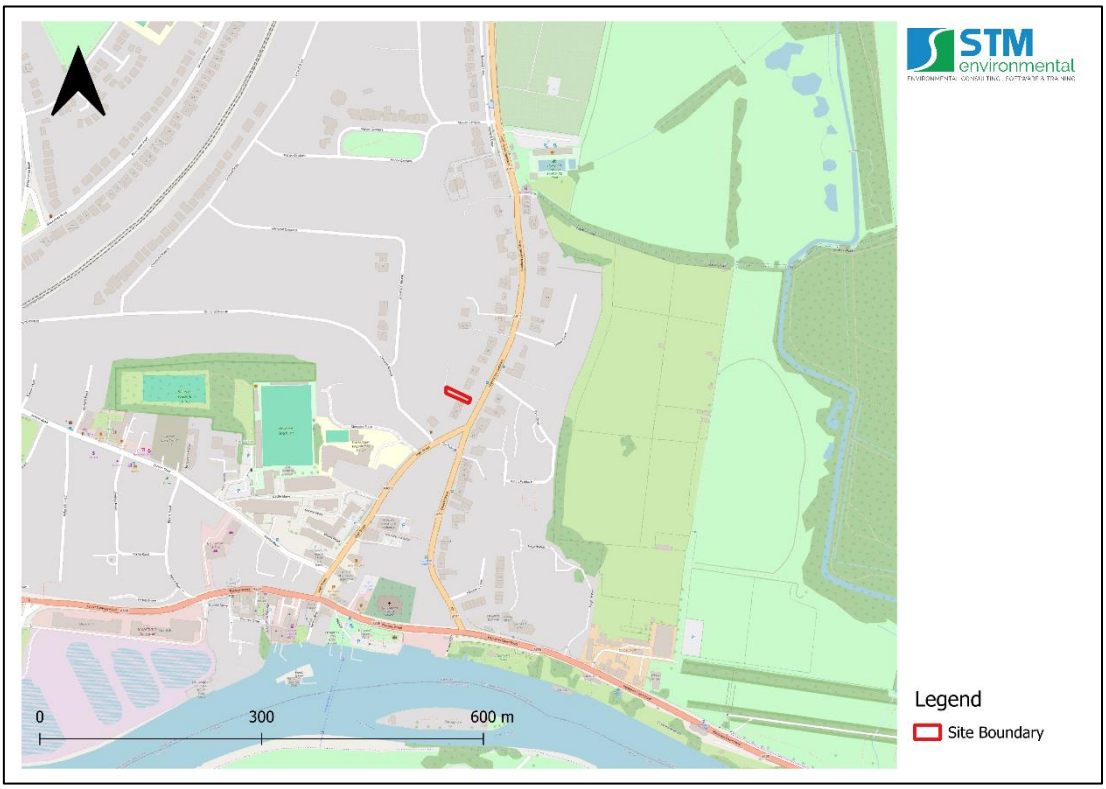


19.6.3 Predicted surface water flood depth for the 1 in 1000-year return period (Source: EA, 2024).



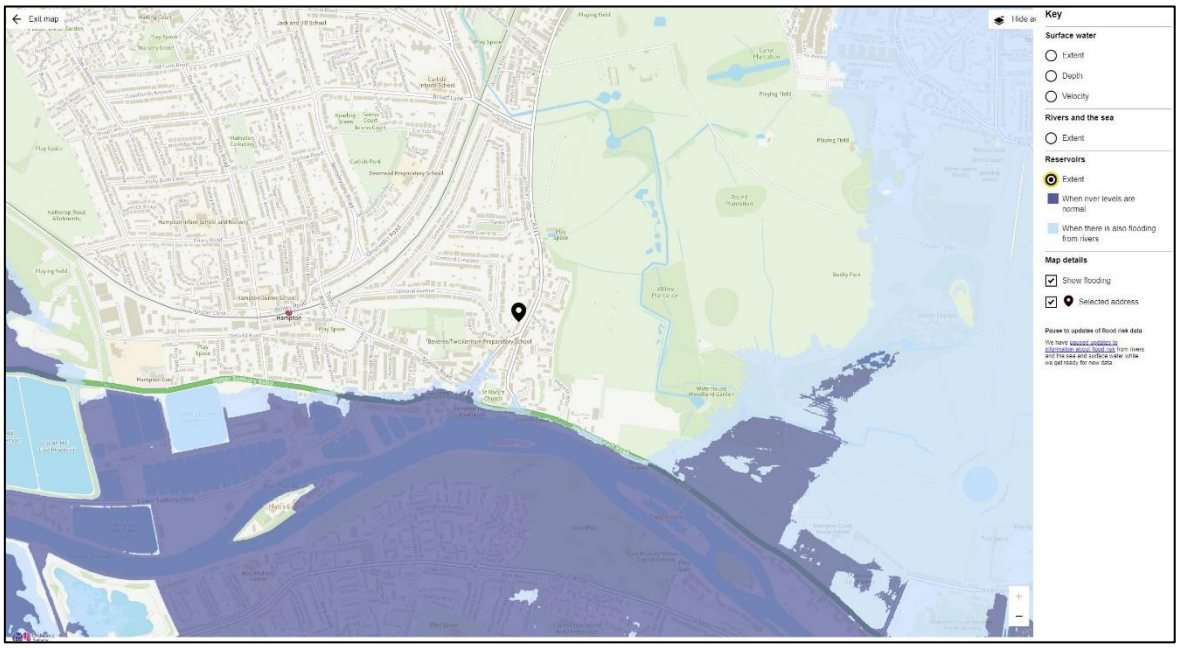
19.7 Appendix 7 – Flood Defence Mapping

19.7.1 EA flood defence map



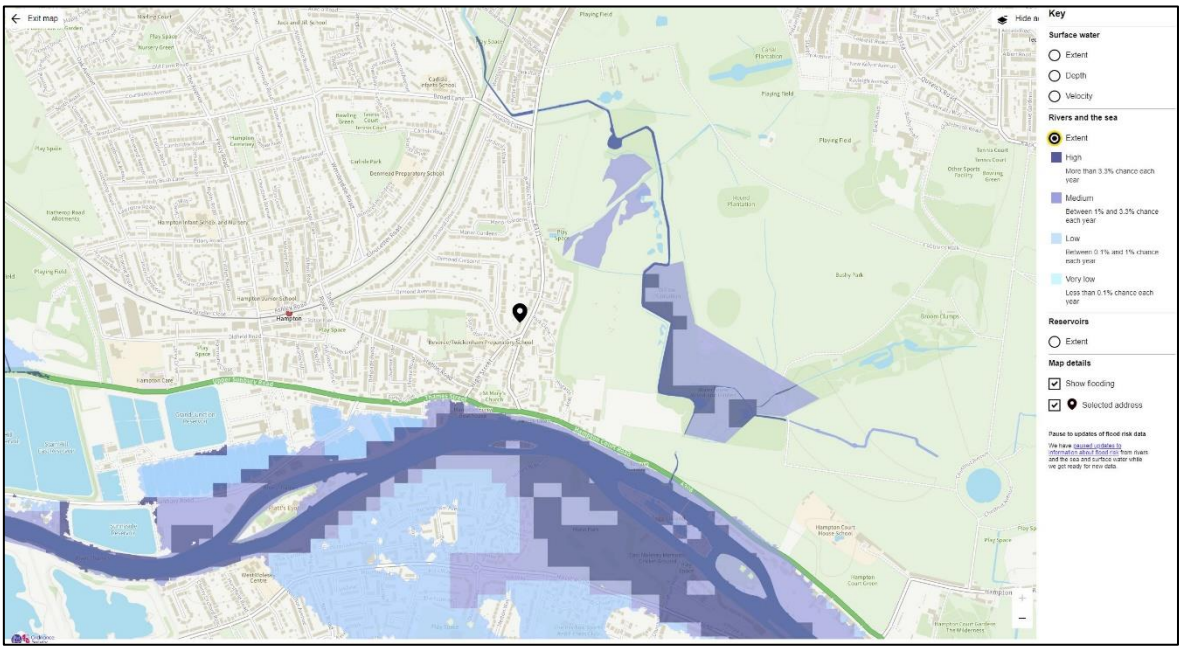
19.8 Appendix 8 – Risk of Flooding from Artificial Sources

19.8.1 Reservoir Flood Risk Map

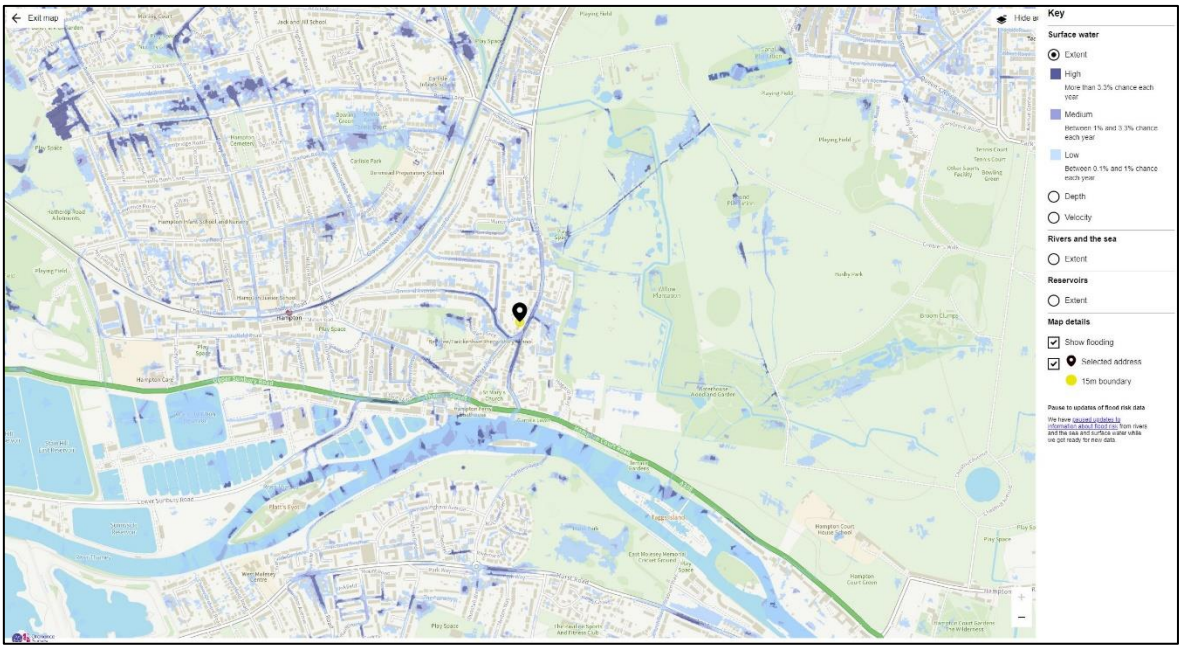


19.9 Appendix 9 – EA's Long Term Flood Risk Maps

19.9.1 Rivers and the Sea



19.9.2 Surface Water

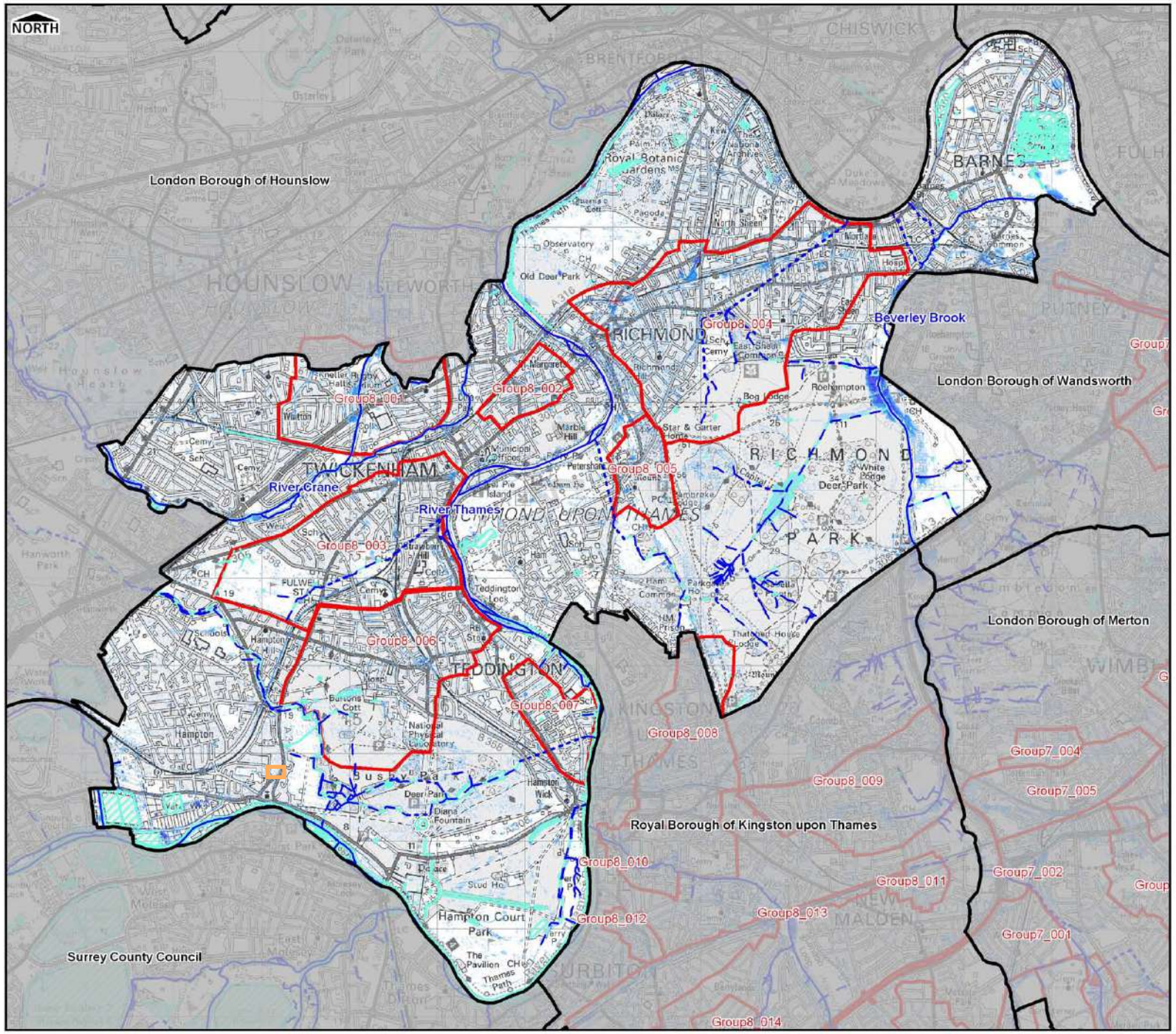


19.10 Appendix 10 – Groundwater Flood Maps

19.10.1 Groundwater Flooding (Susceptibility) Map (BGS) and Potential Depth to the Groundwater Water Map (BGS)

19.10.2 CDA Map

See next page.



THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED

- Borough Administrative Boundary
- Critical Drainage Area
- Permanent Water Body
- Main River
- Ordinary Watercourse
- Culverted Watercourse

Flood Depth

- <0.1m
- 0.1m to 0.25m
- 0.25m to 0.5m
- 0.5m to 1.0m
- 1.0m to 1.5m
- >1.5m

Notes

1. This map only shows the predicted likelihood of surface water flooding (this includes flooding from sewers, drains, small watercourses and ditches that occurs in heavy rainfall) for defined areas, and due to the coarse nature of the source data used, are not detailed enough to account for precise addresses.
2. Users of this map should refer to section 3.2 of the Surface Water Management Plan for a complete description of limitations and accuracy of the flood/hazard extents shown.
3. This map provides a strategic overview of surface water flood risk and may be subject to further analysis in the future.

London Borough of Richmond upon Thames

LONDON BOROUGH OF RICHMOND UPON THAMES

Surface Water Management Plan

Scale at A3	Date	Drawn by	Approved by
1:45,000	20/07/11	A.HARRIS	J.ROBINSON

Surface Water Depth (m)
1 in 100 Chance of rainfall event occuring in any given year (1% AEP)

Consultants
CAPITA SYMONDS
Flood Risk Management
Scott Wilson
URS / Scott Wilson
6 - 8 Greencoat Place
London
SW1P 1PL

Drain London Programme Board Members

Environment Agency · Thames Water · LONDON COUNCILS · GREATERLONDONAUTHORITY

FIGURE 1

Filepath: N:\Current Projects\D134785 D134786 DRAIN LONDON Tier 2\02 Group 8 (D134786)\05 GIS

19.11 Appendix 13 – Calculation of Flood Hazard Rating

Flood Hazard Rating Scores – based on DF score of 0

Velocity	Depth									
	0.25	**0.50**	**0.75**	**1.00**	**1.25**	**1.50**	**1.75**	**2.0**	**2.25**	**2.50**
0.0	0.13	0.25	0.38	0.50	0.63	0.75	0.88	1.00	1.13	1.25
0.5	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50
1.0	0.38	0.75	1.13	1.50	1.88	2.25	2.63	3.00	3.38	3.75
1.5	0.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00
2.0	0.63	1.25	1.88	2.50	3.13	3.75	4.38	5.00	5.63	6.25
2.5	0.75	1.50	2.25	3.00	3.75	4.50	5.25	6.00	6.75	7.50
3.0	0.88	1.75	2.63	3.50	4.38	5.25	6.13	7.00	7.88	8.75
3.5	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00
4.0	1.13	2.25	3.38	4.50	5.63	6.75	7.88	9.00	10.13	11.25
4.5	1.25	2.50	3.75	5.00	6.25	7.50	8.75	10.00	11.25	12.50
5.0	1.38	2.75	4.13	5.50	6.88	8.25	9.63	11.00	12.38	13.75

Summary of Scores

	Score From	Score To	Flood Hazard	Description
	<0.75	0.75	Low	Exercise Caution
Class 1	0.75	1.5	Moderate	Danger for some
Class 2	1.5	2.5	Significant	Danger for most
Class 3	2.5	20.0	Extreme	Danger for all

Values for Debris Factor for different flood depths

Depths	Pasture/Arable Land	Woodland	Urban
0 to 0.25	0	0	0
0.25 to 0.75	0.5	1	1
d>0.75 and/or v > 2	0.5	1	1

- The “danger to some” category includes vulnerable groups such as children, the elderly and infirm. “Danger: Flood zone with deep or fast
- flowing water”
- The “danger to most” category includes the general public.

- The danger to all category includes the emergency services.

A flood emergency plan is considered to be an acceptable way of managing flood risk where the flood hazard has been given a “very low hazard” rating. In some instances, flood emergency plans may also be acceptable where the rating is “danger for some”. However, it is unlikely to be an acceptable way of managing residual flood risk where the hazard to people classification is “danger for most” or “danger for all”.