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ENVIRONMENTAL CONSULTING , SOFTWARE & TRAINING

FLOOD RISK ASSESSMENT

Site Address

2 Woodville Gardens
Ruislip
HA4 7ND

Client

Renata Studzinska

Date

03/10/2024

1 Document Control

FLOOD RISK ASSESSMENT

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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
LBH	London Borough of Hillingdon
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

This report and any information or advice which it contains, is provided by STM Environmental Consultants Ltd (STM) and can only be used and relied upon by Renata Studzinska (Client). Any party other than the Client using or placing reliance upon any information contained in this report, do so at their own risk.

STM has exercised such professional skill, care and diligence as may reasonably be expected of a properly qualified and competent consultant when undertaking works of this nature. However, STM gives no warranty, representation or assurance as to the accuracy or completeness of any information, assessments or evaluations presented within this report.

5 Executive Summary

SECTION	SUMMARY
Location	2 Woodville Gardens, Ruislip HA4 7ND Grid Reference: 508352, 187738
Area	371m^2
Proposed Development	Side, front and rear extensions to existing residential dwelling.
Flood Zone	The site is located in Flood Zone 3b.
Topography	The ground level at the site ranges from 38.47mAOD (NW) to 40.17mAOD (SE). The average ground level of the proposed extension is approximately 40.02mAOD.
Sequential and Exception Tests	The development is classified as a minor development and therefore Sequential and Exception Tests should not be required.
Main Sources of Flooding	The River Pinn, which is located approximately 3m northwest of the site and 29m northwest of the proposed extension.
Flood Defences	High Ground along the River Pinn.
Records of Historic Flooding	The EA Historic Flood Map contains 1no. recorded incident of fluvial flooding, which impacted the site, in August 1977.
Fluvial (River) and Tidal (Sea) Flood Risk	High - During the 5% AEP and 1% AEP scenarios, flood levels of 40.12mAOD and 40.42mAOD (to maximum depths of 0.28m and 0.58m respectively) are witnessed at the existing and proposed buildings. Flood levels of 40.59mAOD are witnessed during the 1% AEP + 25% CC scenario, with maximum depths of 1.11m in the rear garden and 0.75m at the existing and proposed buildings. During the 0.1% AEP scenario, a maximum flood level of 41.24mAOD is witnessed with flood depths up to 1.39m in the location of the the proposed.
Pluvial (Surface Water) Flood Risk	Medium – The proposed development is not impacted during the 1 in 30-year scenario, but may witness flood depths of up to 300mm during the 1 in 100-year scenario. A larger flood extent is witnessed in the rear garden. The majority of the site is affected during the 1 in 1000-year scenario, with depths of up to 600mm at the located of the proposed.
Flood Risk from Artificial (Canals and Reservoirs) Sources	Low - No significant artificial sources identified.
Groundwater Flood Risk	Low – The site is not indicated as being susceptible to groundwater flooding; no recorded incidents have been identified.
Development Impacts on Local Flood Risk	The development will not alter the impermeable area of the site and is therefore unlikely to impact upon surface water runoff rates.

SECTION	SUMMARY
	The development will increase the built-up area by approximately 59m^2 and is therefore likely to impact upon local flood storage and flood flow paths.
Proposed Flood Risk Mitigation Measures	• Finished floor levels will be set to match existing levels at approximately 40.12mAOD (100mm above ground level) • Construction will utilise flood resistant materials and services will be placed as high as practicable to reduce impact of flooding; • Occupants will sign up for EA Emergency Flood Warning Direct Service; • Flood Zone 1 is accessible via a 1-minute walk southeast on Woodville Gardens and Westcote Rise; safe refuge is available on upper floors.
Surface Water Management (SuDS)	Given the small size of the site, it is considered that there is limited potential for SuDS implementation. Consideration should be given to green roofs, rainwater harvesting and infiltration techniques (permeable paving, rain gardens) 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.

6 Introduction

STM Environmental Consultants Limited (STM) were appointed by Renata Studzinska (Client) to provide a Flood Risk Assessment (FRA) at a site located at 2 Woodville Gardens, Ruislip HA4 7ND.

7 Development Proposal

The FRA is required to support a planning application for the construction of side, front and rear extensions to the existing residential dwelling.

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 165 – 179.

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.

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 approach should be used in areas known to be at risk now or in the future from any form of flooding.

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.

Paragraph 173 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.

Applications for some minor development and changes of use (See Note.2) 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 (See Note 1).

Paragraph 175 states that:

Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:

- take account of advice from the lead local flood authority;
- have appropriate proposed minimum operational standards;
- have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and
- where possible, provide multifunctional benefits.

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.

Note. 1 - 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.

Note. 2 - This includes householder development, small non-residential extensions (with a footprint of less than 250m^2) 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.

Coastal Change Management Areas should only be considered appropriate where it is demonstrated that:

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

- it will be safe over its planned lifetime and will not have an unacceptable impact on coastal change;
- the character of the coast including designations is not compromised;
- the development provides wider sustainability benefits;
- the development does not hinder the creation and maintenance of a continuous signed and managed route around the coast.

10.2.2 Local Planning Policy – Hillingdon Council

Policy EM6: Flood Risk Management

The Council will require new development to be directed away from Flood Zones 2 and 3 in accordance with the principles of the National Planning Policy Framework (NPPF).

The subsequent Hillingdon Local Plan: Part 2 -Site Specific Allocations LDD will be subjected to the Sequential Test in accordance with the NPPF. Sites will only be allocated within Flood Zones 2 or 3 where there are overriding issues that outweigh flood risk. In these instances, policy criteria will be set requiring future applicants of these sites to demonstrate that flood risk can be suitably mitigated.

The Council will require all development across the borough to use sustainable urban drainage systems (SUDS) unless demonstrated that it is not viable. The Council will encourage SUDS to be linked to water efficiency methods. The Council may require developer contributions to guarantee the long-term maintenance and performance of SUDS is to an appropriate standard

Also relevant are the London Plan (2020) policies S1 12 ‘Flood Risk Management’; Policy SI 13 ‘Sustainable Drainage’ and the London Regional Flood Risk Appraisal (2018).

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 2 Woodville Gardens, Ruislip HA4 7ND and is centred at national grid reference 508352, 187738. The site has an area of 371m^2.

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

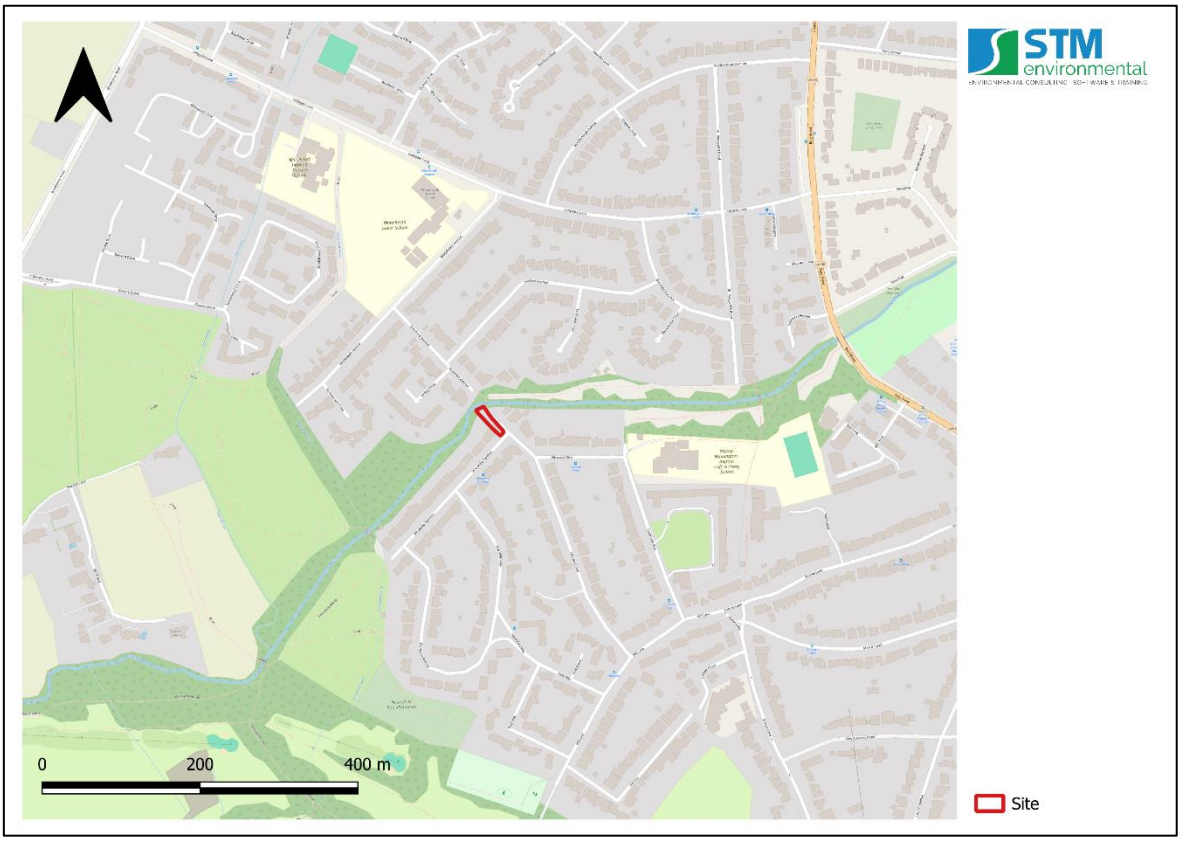


Figure 1: Site Location Map

Figure 2: Site Aerial Map

11.2 Site Access

The site is accessed via Woodville Gardens.

11.3 Local Planning Authority

The site falls within the jurisdiction of the London Borough of Hillingdon (LBH) in terms of the planning process.

11.4 Lead Local Flood Authority

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

11.5 Flood Zone

For planning purposes, the site is located in Flood Zone 3b as defined by the EA and LLFA. The maps of the Flood Zones are available in Appendix 5.

11.6 Site and Surrounding Land Uses

11.6.1 Site Current Land Use

The site is currently used as a residential dwelling.

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	River Pinn	Residential
Eastern	River Pinn	Residential/River Pinn
Southern	Residential	Residential
Western	River Pinn	Park

11.7 Hydrology

The nearest main watercourse is the River Pinn which is located approximately 3m northwest of the site and 28m northwest of the proposed extension. A map of the nearby hydrological features is present in Appendix 2.

11.8 Geology

Data from the British Geological Survey indicates that the underlying superficial geology is characterised as Alluvium along the rear boundary of the site (there are no superficial deposits elsewhere on the site). The underlying bedrock geology is characterized as the Lambeth Group.

11.9 Hydrogeology

The site lies upon Secondary A superficial (along the rear boundary of the site) and bedrock aquifers.

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.

The ground level at the site ranges from 38.47mAOD (northwest) to 40.17mAOD (southeast). The highest elevations are found in the area of the existing building and proposed development. Elevations are lowest along the northeastern, rear boundary. The site is located adjacent to the River Pinn, which forms the lowest point of the surrounding area.

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

The development is considered to be minor and, as such, national guidance indicates that the Sequential Test should not be required.

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.

As the proposal is a minor household development, the Exception Test is not be required.

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

13.1.3 Main Potential Sources of Local Fluvial Flooding

The nearest potential source of fluvial flooding to the site is considered to be the River Pinn.

13.1.4 Records of Historic Fluvial Flooding Incidents

The EA's historic and recorded flood outline maps show the locations and extents of historic flooding. These maps indicate that there has been 1no. recorded incident historic flooding at the site, which took place in August 1977. Copies of these maps are available in Appendix 4.

13.1.5 Designated Fluvial Flood Risk Zone for the Site

The site is considered to be located within Flood Zone 3b as defined by the Environment Agency and the LLFA indicating that it has a greater than 5% annual probability of fluvial flooding.

13.1.6 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.

13.1.7 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.

13.1.8 Potential Sources of Tidal Flooding

The area in which the site is located is considered unlikely to be affected by tidal flooding.

13.1.9 Flood Defences

The EA's flood defence map which is available in Appendix 7 shows that the site benefits from flood defences, including High Ground along the River Pinn.

13.1.10 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 Colne Management Catchment. The climate change allowances for this catchment are available in Appendix 11.

The central allowance for "more vulnerable" developments indicates that a climate change allowance of 21% should be used.

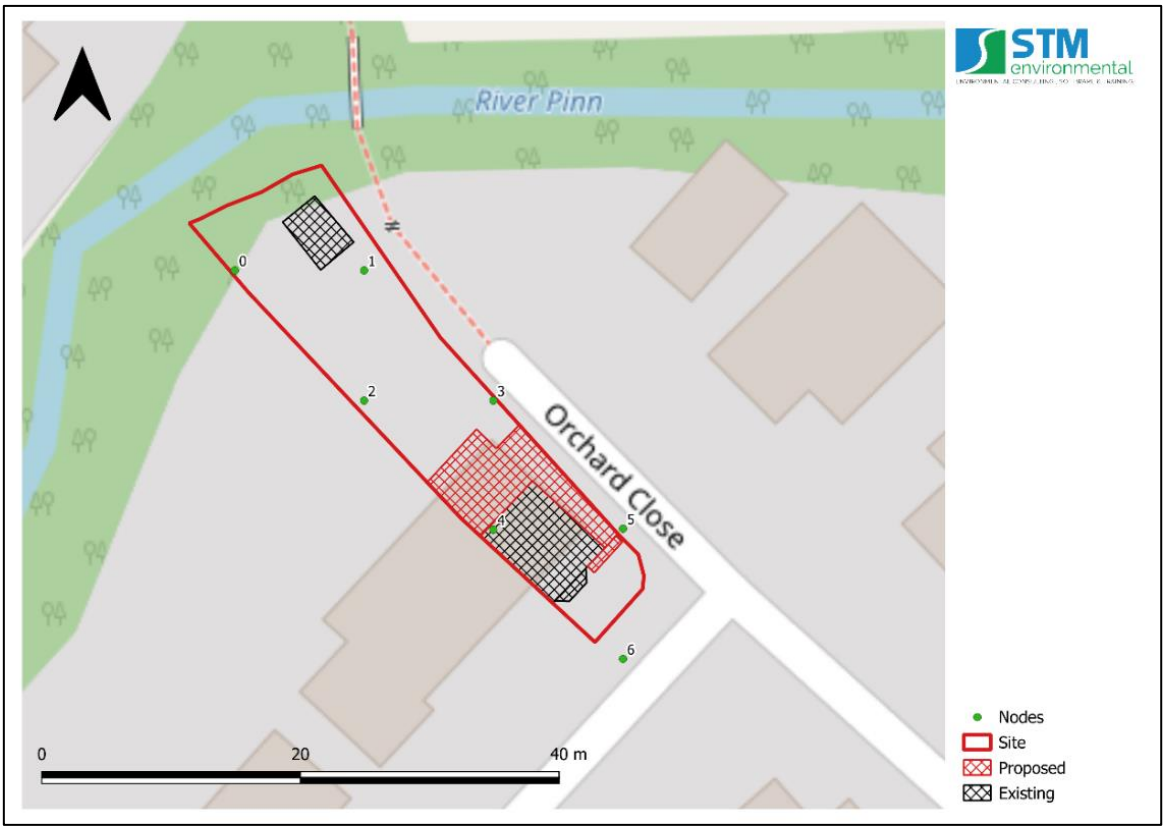
The modelled data provides the 1% AEP + 25% CC, which has been used in this assessment. This ensures the adequate climate change allowance has been applied without further modelling.

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

The EA Product 6 dataset which is presented in Appendix 11 provides modelled flood levels for model node points on and in the vicinity of the site. These are summarised in Table 2 below.

Table 2: EA modelled expected flood depths (m) and levels (mAOD) for different scenarios.

Ruislip - Park Wood and Pinn Meadows FAS (Jacobs, 2021)										
Node	Easting	Northing	LIDAR DTM (mAOD)	5% AEP		1% AEP		1% AEP + 25% CC		0.1% AEP	
				Depth (m)	Level (mAOD)	Depth (m)	Level (mAOD)	Depth (m)	Level (mAOD)	Depth (m)	Level (mAOD)
0	508325	187767	39.47	0.59	40.06	0.93	40.4	1.11	40.58	1.75	41.22
1	508335	187767	39.89	0.19	40.08	0.51	40.4	0.69	40.58	1.33	41.22
2	508335	187757	39.64	0.43	40.07	0.76	40.4	0.94	40.58	1.59	41.23
3	508345	187757	40.01	0.1	40.11	0.41	40.42	0.58	40.59	1.23	41.24
4	508345	187747	39.97	0.14	40.11	0.45	40.42	0.62	40.59	1.27	41.24
5	508355	187747	39.84	0.28	40.12	0.58	40.42	0.75	40.59	1.39	41.23
6	508355	187737	39.92	0.2	40.12	0.49	40.41	0.66	40.58	1.32	41.24



The data shows that the site is impacted by flood levels of up to 40.12mAOD during the 5% AEP scenario. Flood depths of up to 0.59m are witnessed at the rear boundary of the site, while the existing building and proposed development may see depths of up to 0.28m.

During the 1% AEP scenario, flood levels may reach 40.42mAOD with a maximum depth of 0.93m. Depths of up to 0.58m may be witnessed at the existing building and proposed development.

Flood levels of 40.59mAOD are witnessed during the 1% AEP + 25% CC scenario, with maximum depths of 1.11m in the rear garden and 0.58m at the existing building and proposed development.

During the 0.1% AEP scenario, a maximum flood level of 41.24mAOD is witnessed. This implies flood depths of up to 1.75m in the rear garden and up to 1.39m at the existing and proposed buildings.

13.1.12 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 high.

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

The main potential source of pluvial flooding to the site is considered to be surface water ponding and flooding associated with heavy rainfall.

13.2.3 Records of Historic Pluvial Flooding Incidents

Examination of the West London 1 SFRA revealed no evidence of pluvial flooding on or in the vicinity of the site.

A map showing the location of surface water flooding incidents is available in Appendix 4 .

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

An examination of OS mapping and the EA's mapping revealed no indications of significant reservoirs or canals in the area of the site.

The EA's reservoir flood risk map indicates that the site lies within an area that is at risk of reservoir flooding when river levels are normal. Reservoirs that could affect the area include the Ruislip Lido (which is located approximately 1.17km northeast of the site) and George V FSA (no information available).

13.2.5 Sewer Flooding

Examination of the West London SFRA revealed evidence of sewer flooding on or in the vicinity of the site.

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.

During the 1 in 30-year scenario, the site is affected by small flood extents in the rear garden and at the entrance to the existing building, with depths of up to 300mm. The proposed extension remains dry.

Somewhat larger flood extents are witnessed in the same areas during the 1 in 100-year scenario, with the entrance of the site flooding to depths of up to 600mm. A very minor section of the proposed development is also affected by a depth of up to 300mm.

The majority of the site is affected during the 1 in 1000-year scenario. The entrance and rear of the proposed development witnesses flood depths of up to 600mm; the remainder of the development is floods up to 300mm. The existing building remains

mostly dry. The entire rear garden is flooded with depths of up to 1200mm along the rear boundary adjacent to the River Pinn.

13.2.7 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 high.

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 West London SFRA revealed no records of groundwater flooding at or within 500m of the site.

13.3.2 Susceptibility to Groundwater Flooding

The Groundwater Flood Susceptibility Map provided by BGS and presented in Appendix 10 indicates that the site is not susceptible to groundwater flooding. The Groundwater Depth map also provided by BGS indicates that the groundwater level may be 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.

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 **Error! Reference source not found.** and Table 5 below.

Table 3: Existing and proposed site ground cover.

	Impermeable Area (m^2)	Permeable Area (m^2)	Total Area (m^2)
Existing	164	207	371
Proposed	164	207	371

Table 4: Break down of existing and proposed site uses

Use	Existing (m^2)	Proposed (m^2)	Difference (m^2)
Building	64	123	59
Impermeable Paving	100	41	- 59
Permeable Paving	0	0	0
Garden	207	207	0
Total	371	371	-

As the proposed development will be built on impermeable paving, it will not alter the impermeable area of the site. It is therefore considered unlikely that it will impact upon flood flow rates.

14.2 Impacts on Flood Storage and Flood Flow Routes

As the development will increase the site's built-up area by approximately 59m^2, it is may have an impact on local flood storage and flood flow paths.

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 5: 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.

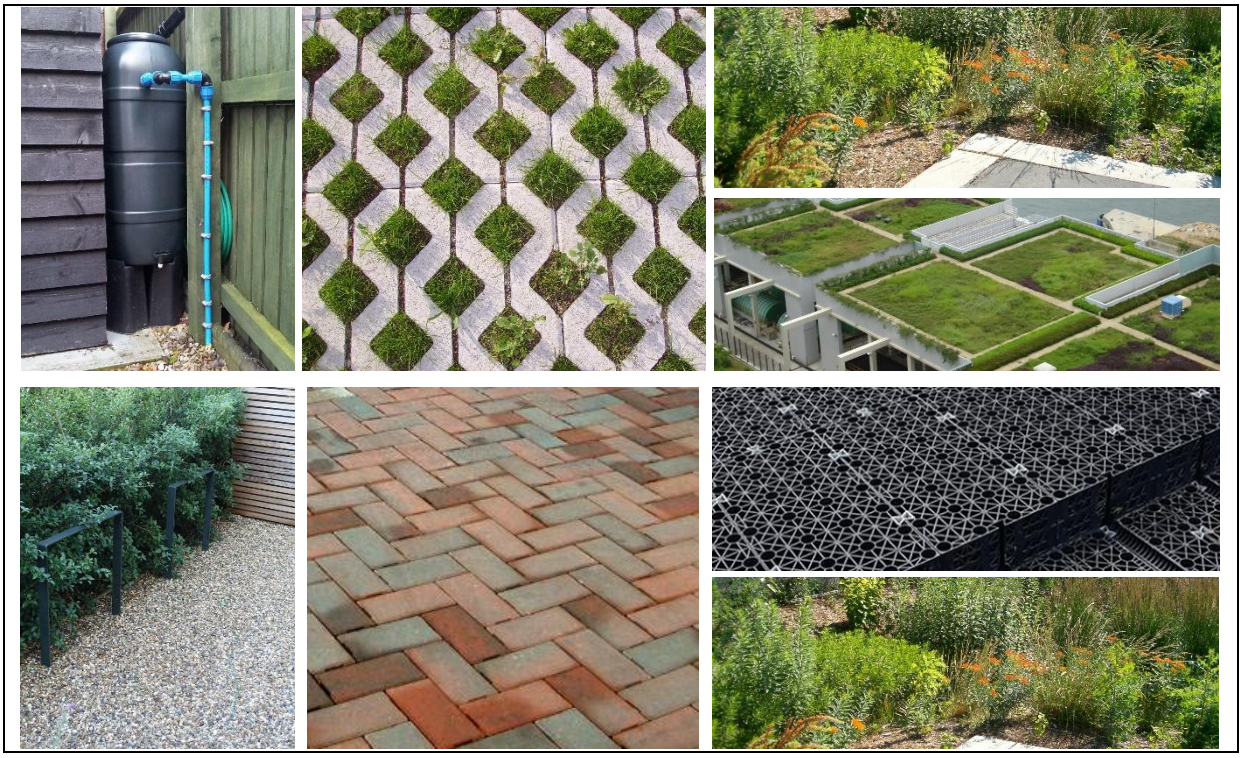


Figure 3: Surface water storage facilities and potential SuDS features - rainwater harvesting, on-site tank storage, rain garden soak-away and green roofs. (Source: UK SuDS Manual)

Given the nature of the development and the size of the site, it is considered that there are limited opportunities for implementing SuDS. Measures such as green roofs, rainwater harvesting and infiltration techniques (permeable paving, rain gardens) 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

Advice for minor extensions

The EA's Standing Advice states that the Finished Floor Level should be at least 600 millimetres (mm) above the estimated flood level.

- Fluvial - 1 in 100 AEP + Climate Change; 41.19mAOD

This can be reduced to 300mm if there is a high level of certainty about your estimated flood level. If there is a particularly high level of uncertainty it may need to be increased.

You will also need to use flood resistant materials up to at least 600mm above the estimated flood level.

If you cannot raise the floor levels in this way, you will also need to include extra flood resistance and resilience measures. These measures should protect the property to at least 600mm above the estimated flood level.

The average ground level of the proposed development is 40.02mAOD.

During the 1% AEP + 25% CC, the site floods to a maximum level of 40.59mAOD. The proposal should therefore be raised 600mm above this to approximately 41.19mAOD.

However, as all vulnerable uses will be situated on the upper floors, setting the FFL to match existing levels at 40.03mAOD (100mm above ground level) is considered to be acceptable.

If you cannot raise floor levels to meet the minimum requirement, you will need to:

- raise them as much as possible
- consider moving vulnerable uses to upper floors
- include extra flood resistance and resilience measures
- Internal flooding of new vulnerable development like residential dwellings is unlikely to be considered appropriately flood resistant and resilient.

If you cannot raise the floor levels in this way, you will also need to include extra flood resistance and resilience measures. These measures should protect the property to at least 600mm above the estimated flood level.

15.2.2 Resilience Construction Measures

15.2.3 Water Exclusion and Water Entry Strategy

There are two main strategies, whose applicability is dependent on the water depth the property is subjected to and the potential for structural damage it may cause.

- Water Exclusion (Flood Resistance) Strategy - should be employed where predicted flood depths are less than 0.3m and are likely to be for short duration. Emphasis is placed on minimising water entry and giving occupants time to relocate ground floor contents, maintaining structural integrity, and on using materials and construction techniques to facilitate drying and cleaning;
- Water Entry (Flood Resilience) Strategy - Flood resilience measures are designed to allow water in but to limit damage and allow rapid re-occupancy. Resilience measures should be employed where flood depths are greater than 0.6m and where it is likely that structural damage will occur due to excessive water pressure.

Flood water can put pressure on buildings, causing structural issues. If your design aims to keep out a depth of more than 600mm of water, you should get advice from a structural engineer.

Only use resistance measures that will not cause structural stability issues during flooding. It may not be possible to safely exclude the full estimated flood level. If this is the case, you will need to exclude it to the structural limit then allow additional water to flow through the property.

The design should be appropriately flood resistant and resilient by:

- You should also use construction materials that have low permeability up to at least the same height as finished floor levels;

- Using flood resistant materials that have low permeability to at least 600mm above the estimated flood level;
- Making sure any doors, windows or other openings are flood resistant to at least 600mm above the estimated flood level;
- Using flood resilient materials (for example lime plaster) to at least 600mm above the estimated flood level;
- Raising all sensitive electrical equipment, wiring and sockets to at least 600mm above the estimated flood level;
- Making it easy for water to drain away after flooding such as installing a sump and a pump
- Making sure there is access to all spaces to enable drying and cleaning
- Making sure that soil pipes are protected from back-flow such as by using non-return valves;

As the indicative flood depths are greater than 0.6m; as such preventing water levels up to 600mm should be implemented, assuming the existing development is structurally sound; this should be reviewed by a structural engineer.

Water Entry Strategy:

There are a range of options for implementing the Water Entry Strategy including:

- Use materials with either good drying and cleaning properties, or, sacrificial materials that can easily be replaced;
- Designing for water to drain away;
- Designing access to all spaces to permit drying and cleaning;
- Raising the level of electric wiring, appliances and utility metres (0.1m above flood level);
- Ground supported floors with concrete slabs coated with impermeable membrane;
- Tank basements, cellars and ground floors with water resistant membranes;
- Plastic water-resistant internal doors.

15.2.4 Flood resilience design and measures

Flood resilience design and measures that may be implemented are outlined below. Water-resistant and resilient materials that should be utilized throughout the construction to minimize the flood risk and potential impacts.

Floor construction:

- Use of resilient flooring materials as ceramic tiles or stone floor finishes;
- Use of a concrete slab 150mm thick;
- Use of ceramic tiles or stone floor finishes is recommended;
- Maintain existing under floor ventilation by UPVC telescopic vents above 400 mm to external face of extension;
- Damp proof membrane of impermeable polythene at least 1200 gauge;
- Avoid the use of MDF carpentry.

Wall construction:

- Include in the external face of the extension a damp – proof course, 250 mm above ground level, to prevent damp rising through the wall;
- Use rigid closed – cell material for insulation above the DPC;
- Spread hardcore over the site within the external walls of the building to such thickness as required to raise the finished surface of the site concrete. The hardcore should be spread until it is roughly level and rammed until it forms a compact bed for the oversite concrete. This hardcore bed will be 100 mm thick and composed by well compacted inert material, blinded with fine inert material.

Doors:

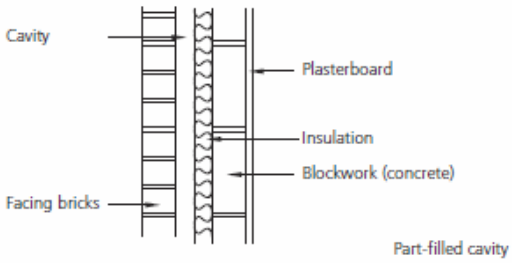
- Seal doors around edges and openings. UPVC or composite material will be used with passive protection meaning that minimal intervention will be required in the event of flooding.

Underground drainage:

- Avoid use of metal for any underground piping;
- Use closed cell insulation for pipes that are below the predicted flood level;
- Provide non – return valves for the drainage system to prevent back water flow;
- Use UPVC or clay pipework for fouls and surface water drainage.

Figure 4: Cavity External Walls

Figure 6.10 Cavity External Walls – Part-filled cavity with sacrificial plasterboard



Part-filled cavity

- External face consisting of engineering bricks up to required level for flood protection (up to d.p.c.). Other external facing materials can be used above this level, but ensure transition is watertight.
- Rigid insulation
- Internal cement based render, preferably with lime content. Composition depends on masonry; the following mix is effective:

  1 cement : 6 sand: 1 lime on concrete blocks.
- Stainless steel wall ties should be used to minimise corrosion and consequent staining.
- Sacrificial plasterboard can be used, but it needs to be removed between ground floor to flood level. The board should be laid horizontally to make removal easier.

As well as the above the following flood resilience features should be applied as part of the development:

- Electrical sockets should be installed above flood level for the ground floor;
- Utility services such as fuse boxes, meters, main cables, gas pipes, phone lines and sockets will be positioned as high as practicable;
- All external openings for pipes or vents below 400mm to be sealed around pipe or vent with expanding foam and mastic.

15.2.5 Compensatory Flood Storage (CFS)

All new development within Flood Zone 3 must not result in a net loss of flood storage capacity. Where possible, opportunities should be sought to achieve an increase in the provision of floodplain storage.

Where proposed development results in a change in building footprint, the developer must ensure that it does not impact upon the ability of the floodplain to store water, and should seek opportunities to provide a betterment with respect to floodplain storage.

CFS is not considered to be suitable, given the nature of the development as a minor development and the topography of the site.

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 EA Product 6 dataset contains no information on flood velocities, it was not possible to estimate the hazard rating at the site.

The key elements of the flood emergency plan are described below.

16.1.2 EA Flood Warnings Direct Service Subscription

The occupants will subscribe to the EA Flood Warnings Direct Service which is a free service offered by the EA providing flood warnings direct to people by telephone, mobile, email, SMS text message and fax. The EA aims to provide 2 hours' notice of flood, day or night, allowing timely evacuation of the site.

The agency operates a 24-hour telephone service on 0345 988 1188 that provides frequently updated flood warnings and associated floodplain information. In addition, this information can also be found at https://fwd.environment-agency.gov.uk/app/olr/home along with recommendations on what steps should be taken to prepare for floods, what to do when warnings are issued, and how best to cope with the aftermath of floods.

16.1.3 Access and Safe Egress

Flood Zone 1 is available via a 50m walk southeast on Woodville Gardens and Westcote Drive. It was not possible to determine the flood hazard of the route. Directions of this route are presented in Appendix 12 .

16.1.4 Safe Refuge

The proposed development will have internal connections to upper floors in the property which will act to provide sufficient safe refuge in the event 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 site is classified as a minor development and, as such, Sequential and Exception Tests should not be required;
- The main source of potential flooding to the site is the River Pinn;
- The EA define the site as being within Flood Zone 3b;
- The finished floor level will be set at 100mm above the ground level at a minimum of 40.12mAOD;
- EA mapping indicates that the site benefits from flood defences, including High Ground along the River Pinn;
- 1no. record of fluvial flooding was identified at the site, which took place in 1977. No other records of historic flooding were identified;
- The site is not within a CDA;
- The development will not alter the impermeable area of the site and is therefore unlikely to increase surface water runoff rates. It will increase the built-up area of the site by 59m^3 and is therefore likely to impact upon local flood storage and flood flow paths;
- There are limited opportunities for implementing SuDS mitigation measures. Consideration should be given to use of green roofs, rainwater harvesting and infiltration techniques (permeable paving, rain gardens)
- Flood resilient materials and construction methods will be used so as to ensure that the impacts of any potential flooding are minimised as much as possible;
- Occupants will subscribe to the EA Flood Warnings Direct Service;
- Flood Zone 1 is available via a 50m walk southeast on Woodville Gardens and Westcote Drive. It was not possible to determine the flood hazard of the route.

- In the event that evacuation is not possible, safe refuge is available in the upper floors of the building which are accessible via an internal staircase.

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.

18 References

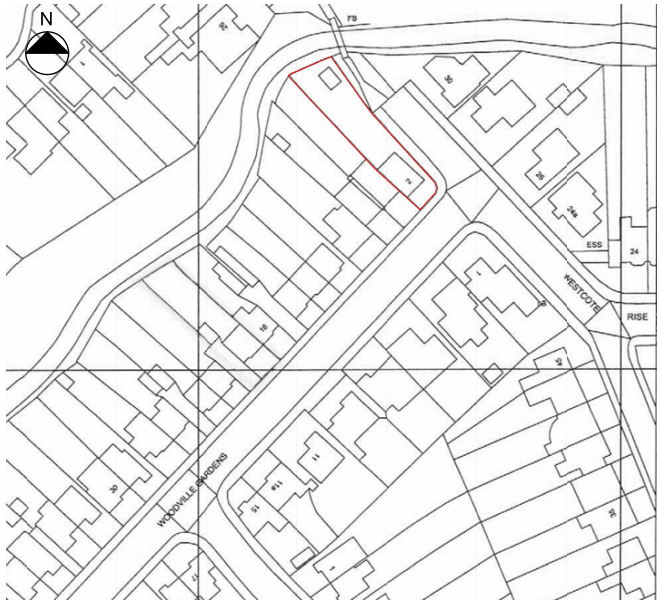
1. Communities and Local Government - National Planning Policy Framework NPPF, July, 2021.
2. Communities and Local Government - Planning Practice Guidance: Flood Risk and Coastal Change, Updated 06 March 2014.
3. Strategic Flood Risk Assessment, West London Alliance, 2024. https://westlondonsfra.london/ (accessed 16/09/2024)
4. Local Plan, LBH, 2012.
5. CIRIA, Defra, Environment Agency – UK SuDS Manual, 2015.
6. Greater London Authority – London Sustainable Drainage Action Plan, 2015.
7. London Plan (2021) - Mayor of London
8. 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 LOCATION PLAN
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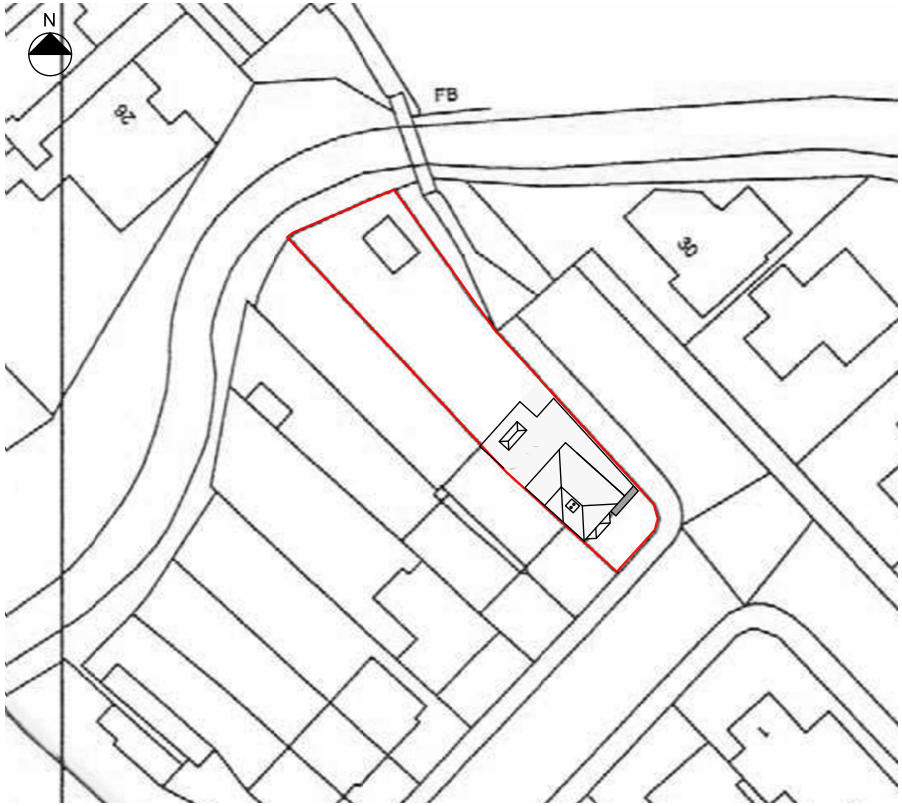

PROPOSED BLOCK PLAN
SCALE 1:500 @ A3

GENERAL NOTES

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Party Wall etc.Act 1996 would apply and contractor is to assure that no work is commenced until this formality is completed.

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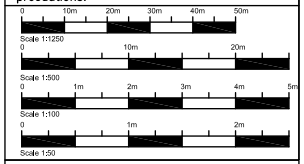

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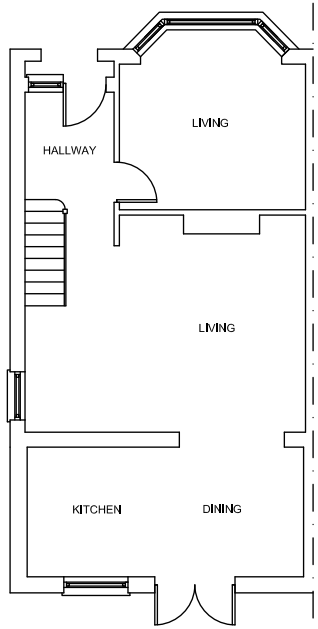
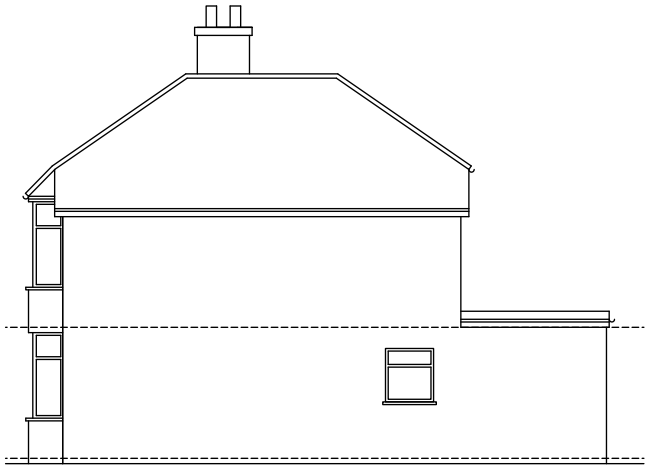
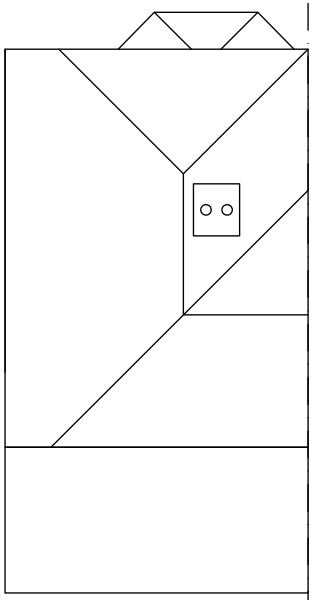


EXISTING GROUND FLOOR PLAN

EXISTING FRONT ELEVATION

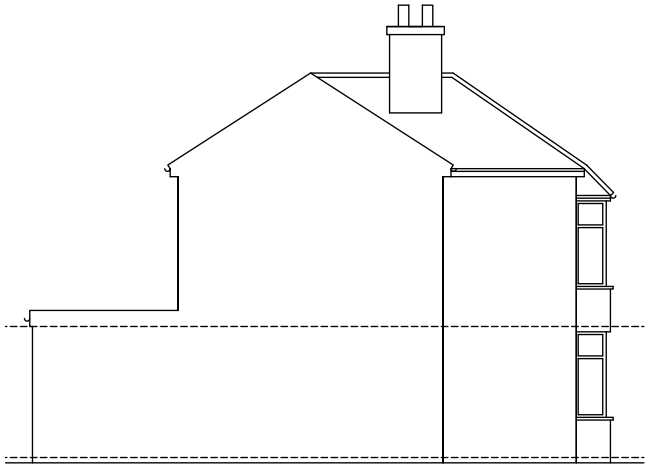


EXISTING SIDE ELEVATION



EXISTING ROOF PLAN

EXISTING REAR ELEVATION



EXISTING SECTIONAL SIDE ELEVATION

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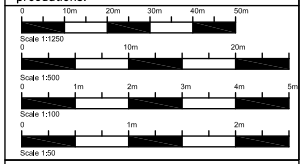

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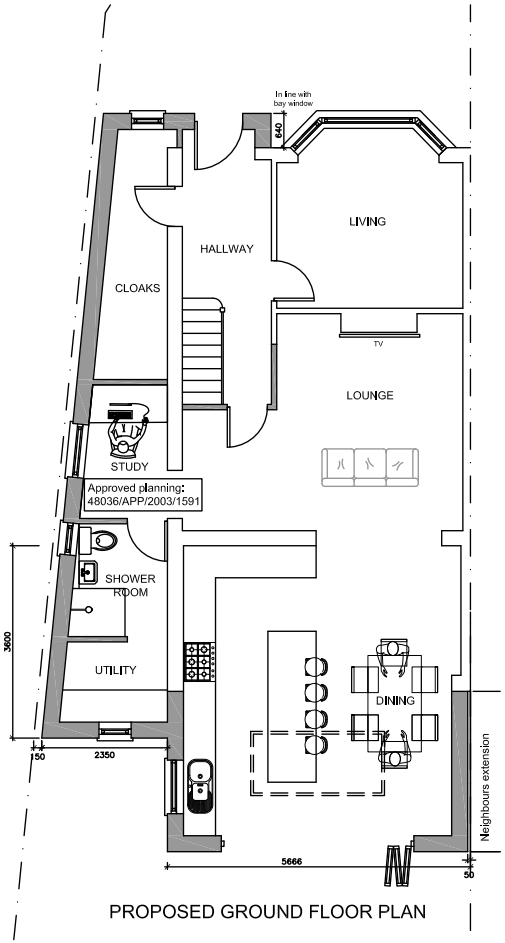
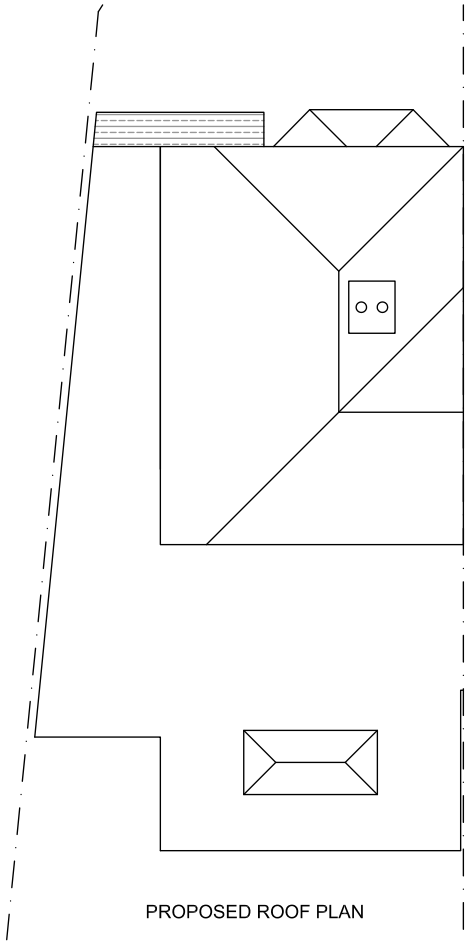


PROPOSED GROUND FLOOR PLAN



PROPOSED ROOF PLAN

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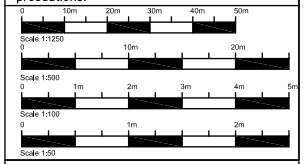

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SCALE 1:100 @ A3	CHECKED BY

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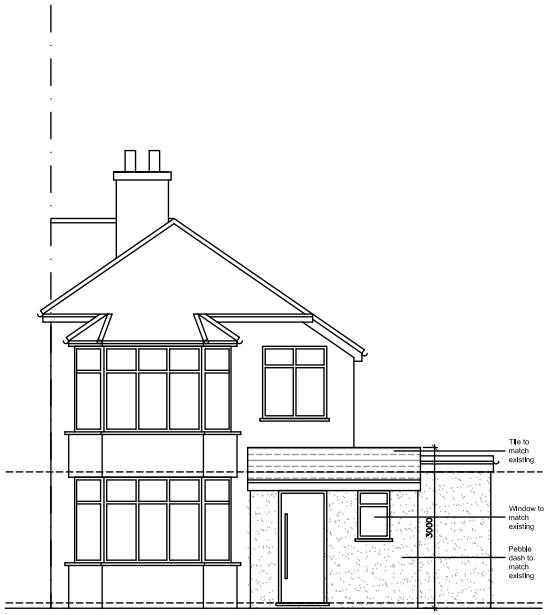
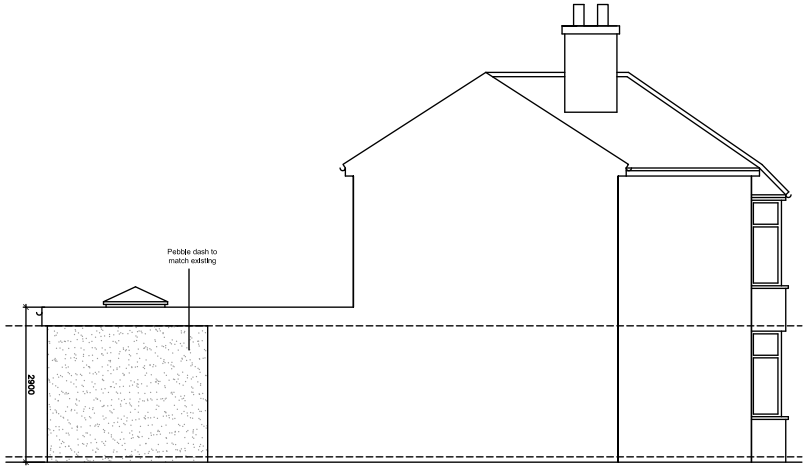
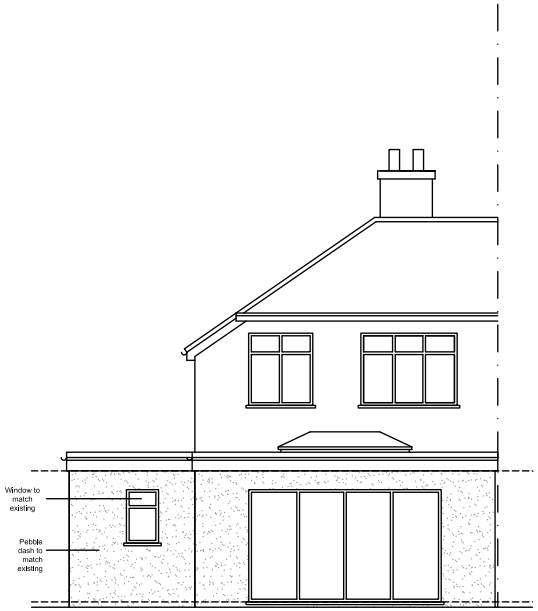


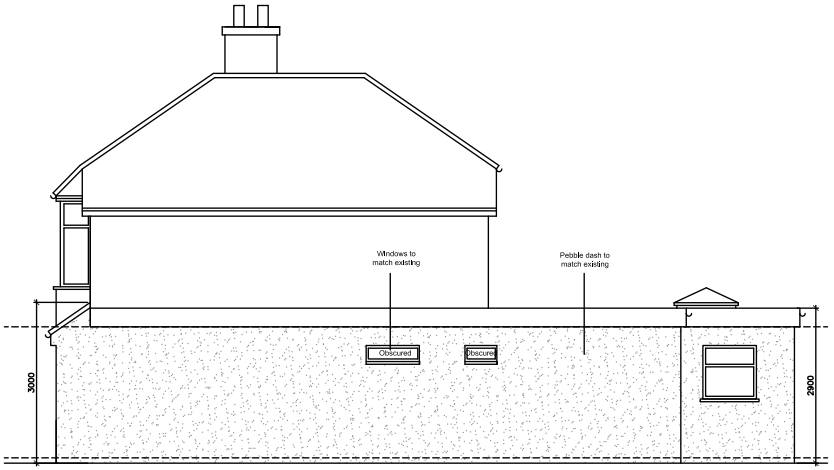
PROPOSED FRONT ELEVATION



PROPOSED SECTIONAL SIDE ELEVATION



PROPOSED REAR ELEVATION



PROPOSED SIDE ELEVATION

GENERAL NOTES

All dimensions, levels, sizes, positions and locations of particulars as indicated on drawings are to be verified by the appointed contractor on site prior to engaging in works.

Any discrepancies must be reported to the Designer/Engineer/Surveyor or responsible person/s immediately.

No dimension to be scaled from the drawings for construction purposes unless otherwise indicated. All work is to comply with current Building Regulations.

Party Wall etc.Act 1996 would apply and contractor is to assure that no work is commenced until this formality is completed.

The sole purpose of this drawing is the procurement of Planning Permission and Building regulation approval and work is NOT to commence before such approvals.

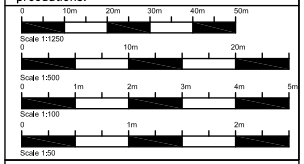
Where the drawing is used for the works, contractors should request at the time of tender, form the tenderer, full specification and schedule of work. To avoid any disputes, this schedule of works in conjunction with the drawings would be used to resolve matters.

Contractors to assure and satisfy himself that necessary Planning permission and Building Regulations are approved before tendering or commencement if works.

The competent person is to send to the local authority via the scheme provider a self certification certificate within 30 days of the electrical works completion. The client must receive both a copy of the self certificate and a BS7671 Electrical Installation Test Certificate (Reg.P1)

The Gas and Boiler installations will be carried out by a suitably qualified CORGI registered gas engineer or equal approved.

The contractor is responsible for ensuring compliance with the CDM Regulations and appropriate Health & Safety on site precautions.



DHIVA Designs
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REVISION	DESCRIPTION	BY	DATE
P1	MINOR AMENDMENTS	NP	28.06.24

SITE ADDRESS

2 WOODVILLE GARDENS
RUISLIP
HA4 7ND

DRAWING TITLE

PROPOSED ELEVATIONS

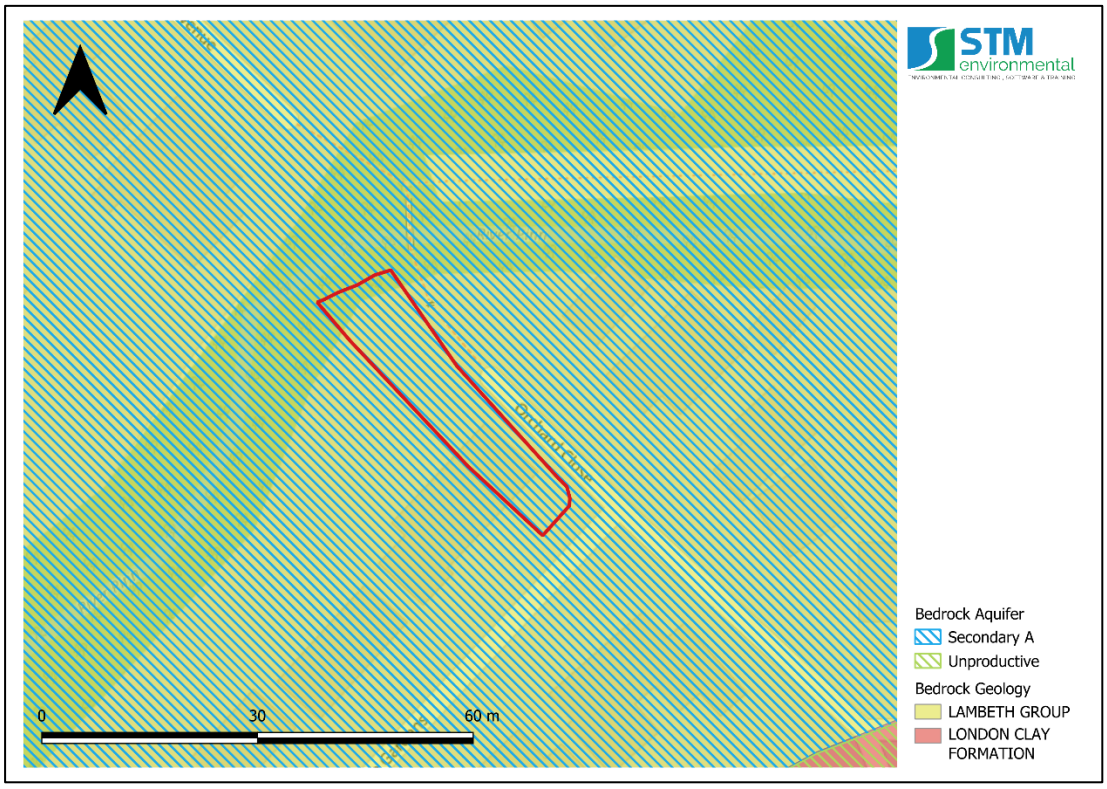
DATE	DRAWN BY
JUNE 2024	NP
SCALE 1:100 @ A3	CHECKED BY

DRAWING NO. DD371-04-P1 REVISION

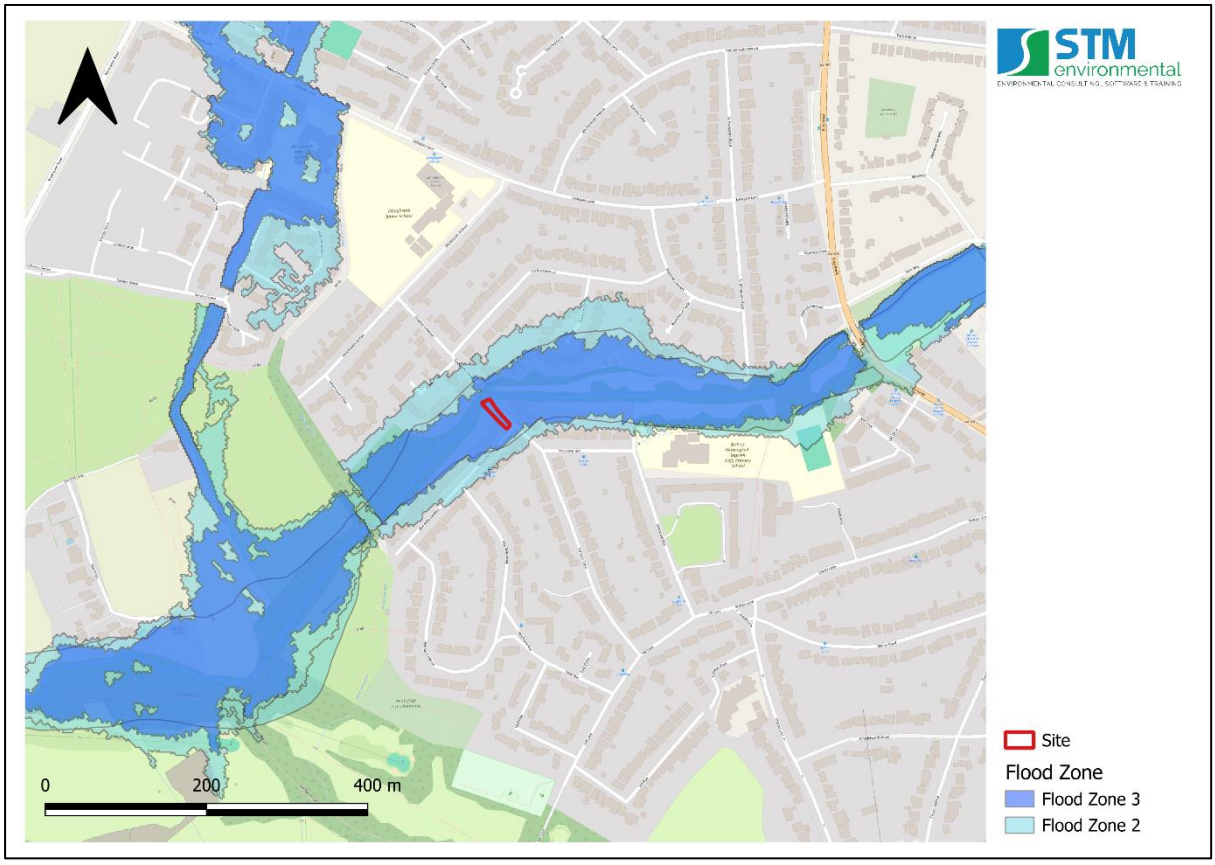
19.3 Appendix 3 – Environmental Characteristics

19.3.1 Superficial Hydrogeology Map

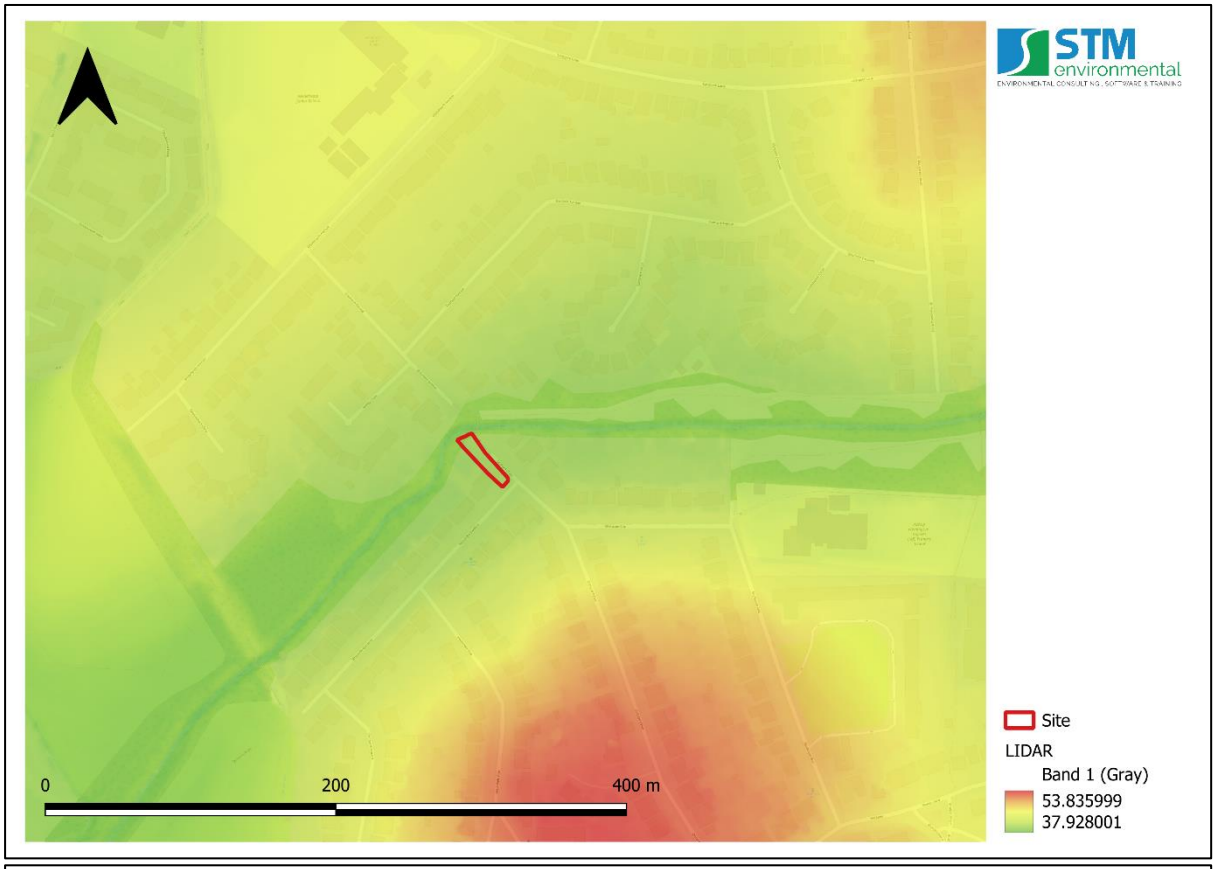
19.3.2 Bedrock Hydrogeology Map

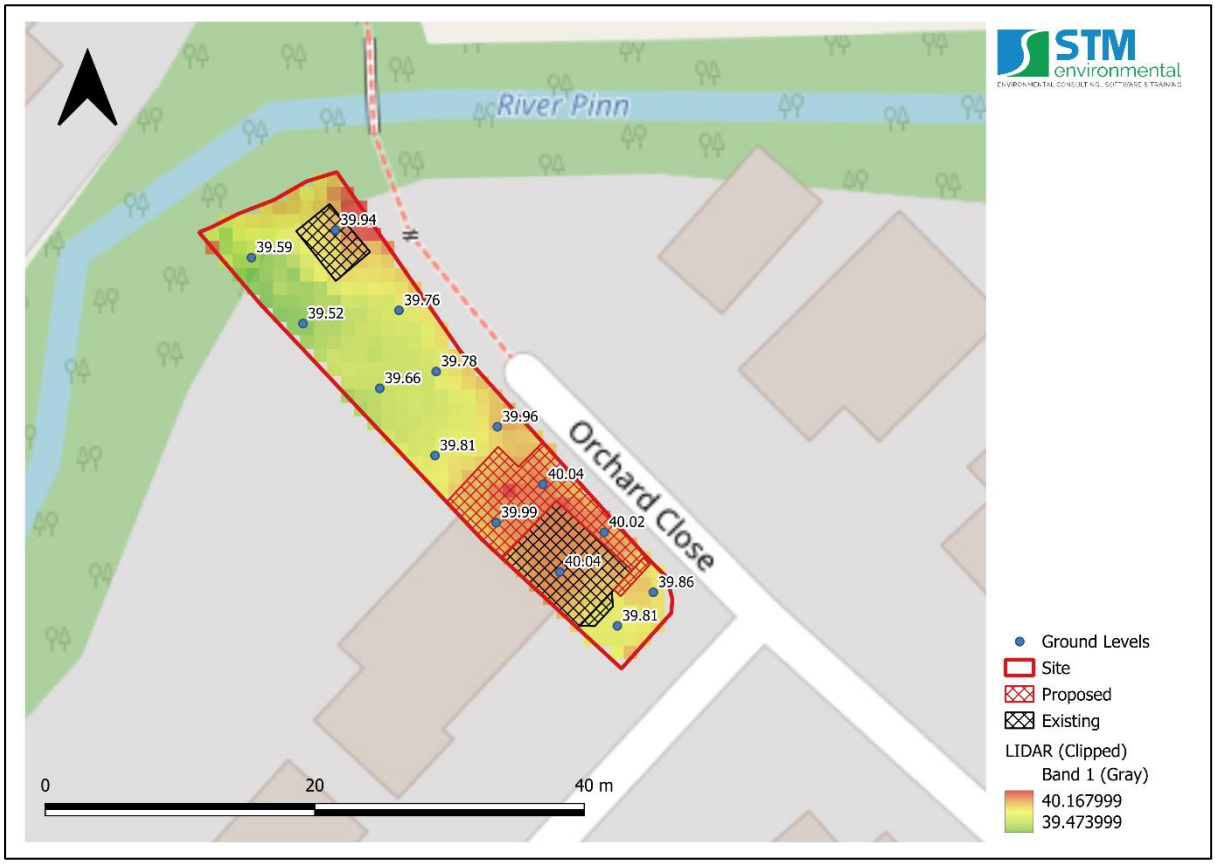


19.3.3 Hydrology Map



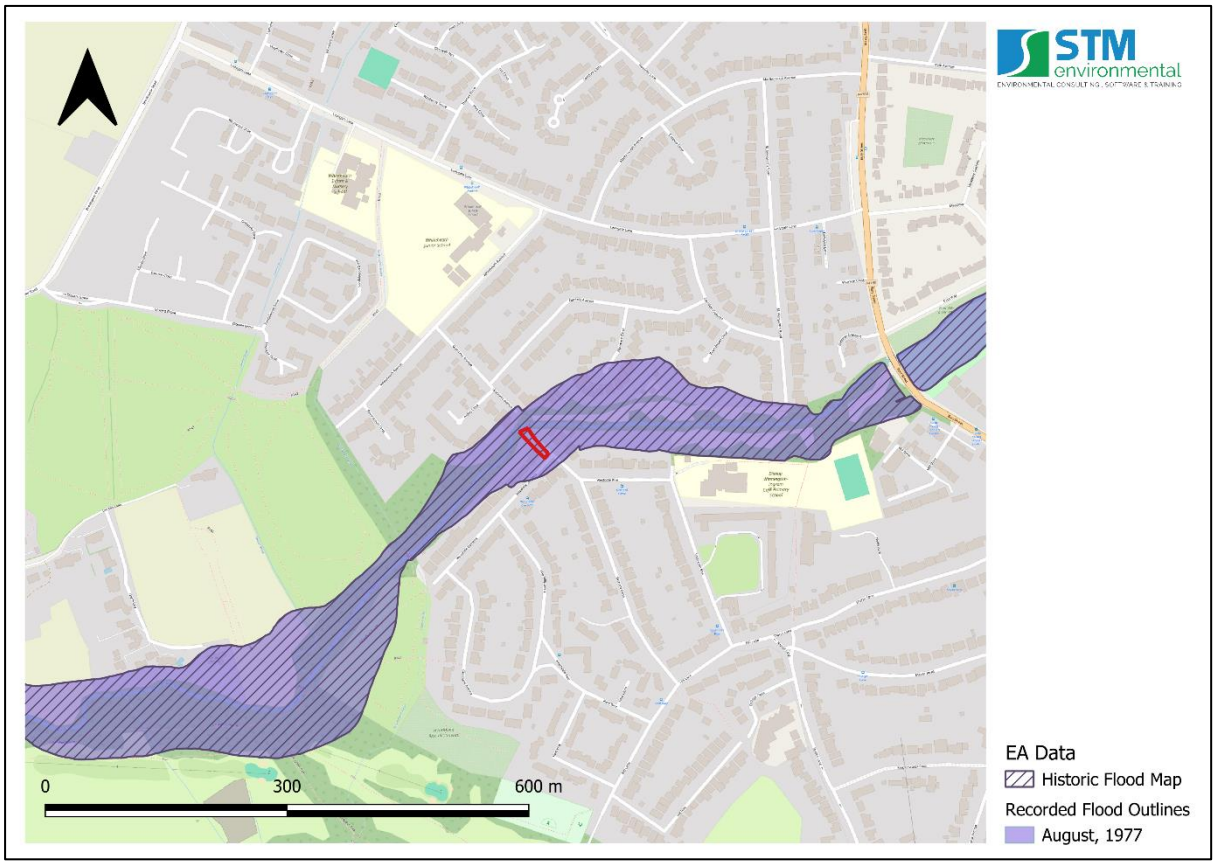
19.3.4 Topography Map





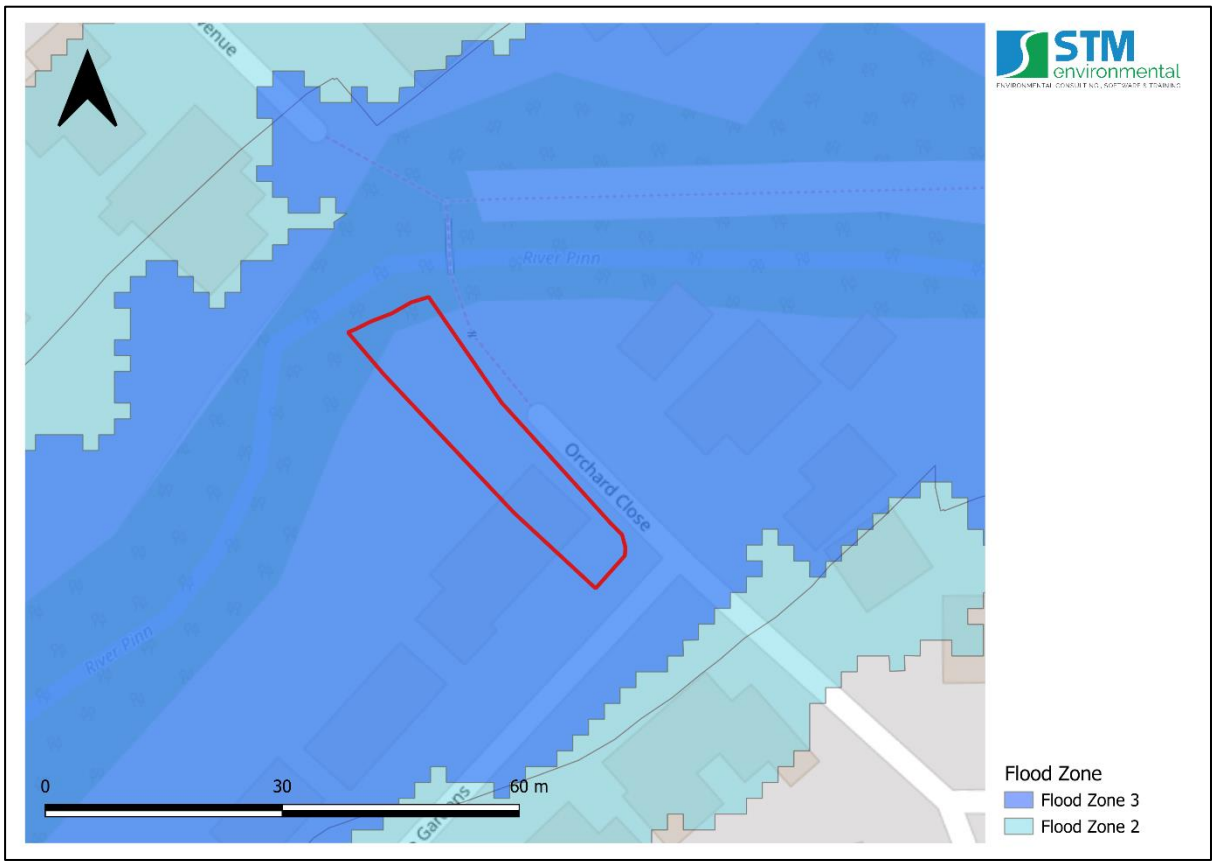
19.4 Appendix 4 – Historical Flood Incident Maps

19.4.1 EA Historic and Recorded Flood Outlines



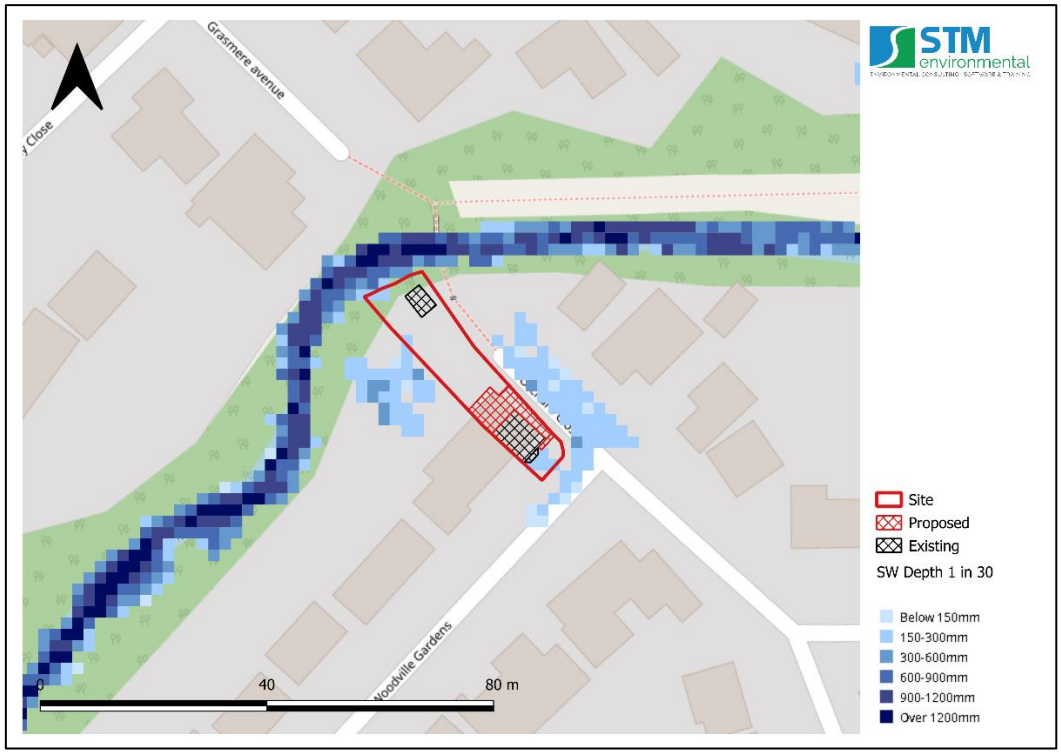
19.4.2 Map of Recorded Sewer Flooding

19.5 Appendix 5 - EA Flood Zone Map

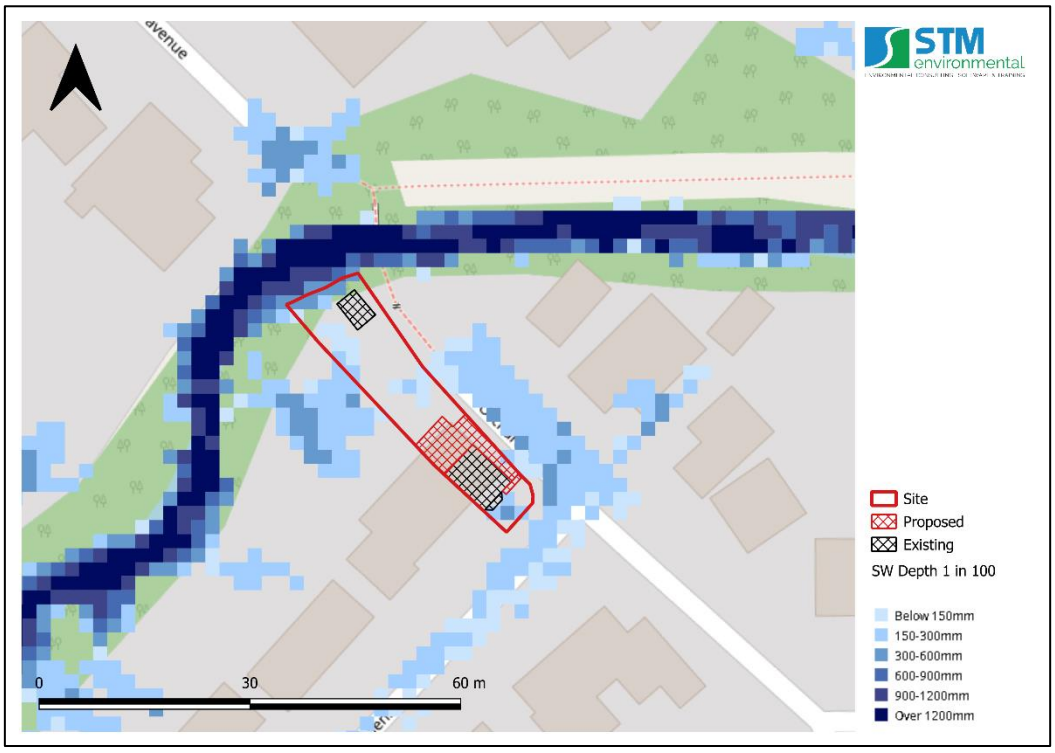


19.6 Appendix 6 – Surface Water Flood Extent and Depth Maps

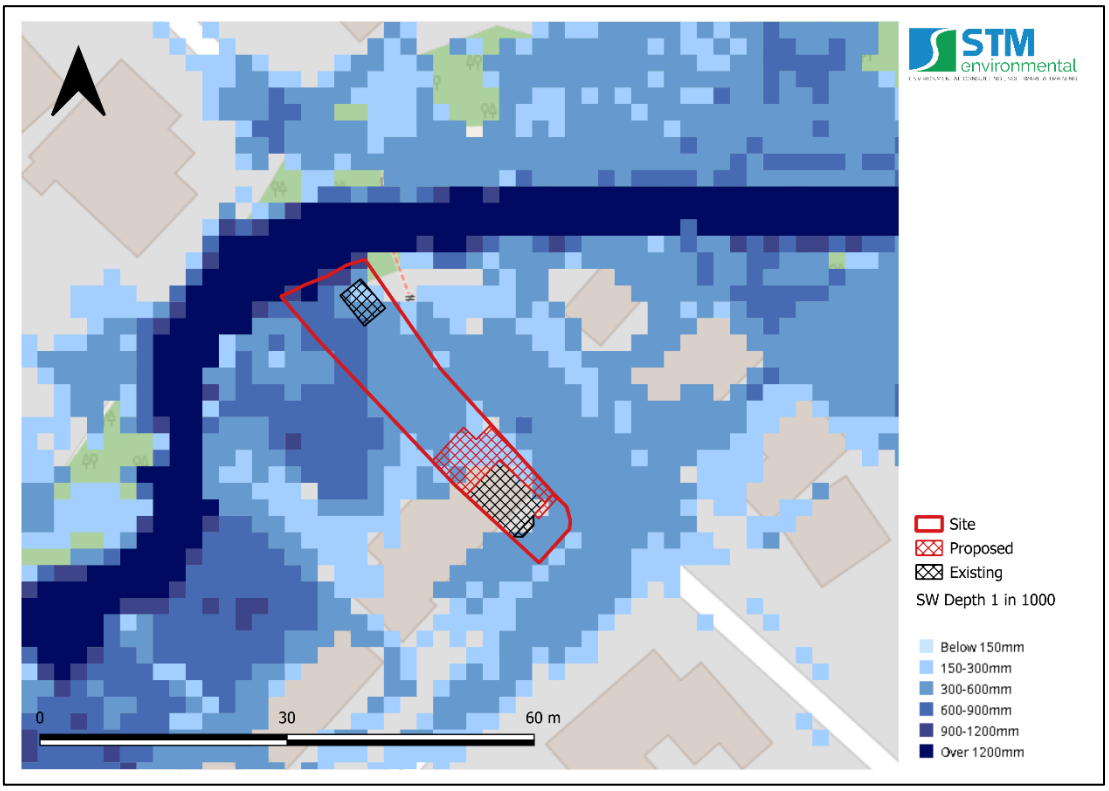
19.6.1 Predicted surface water flood depth for the 1 in 30-year return period (Source: EA, 2016).



19.6.2 Predicted surface water flood depth for the 1 in 100-year return period (Source: EA, 2016).

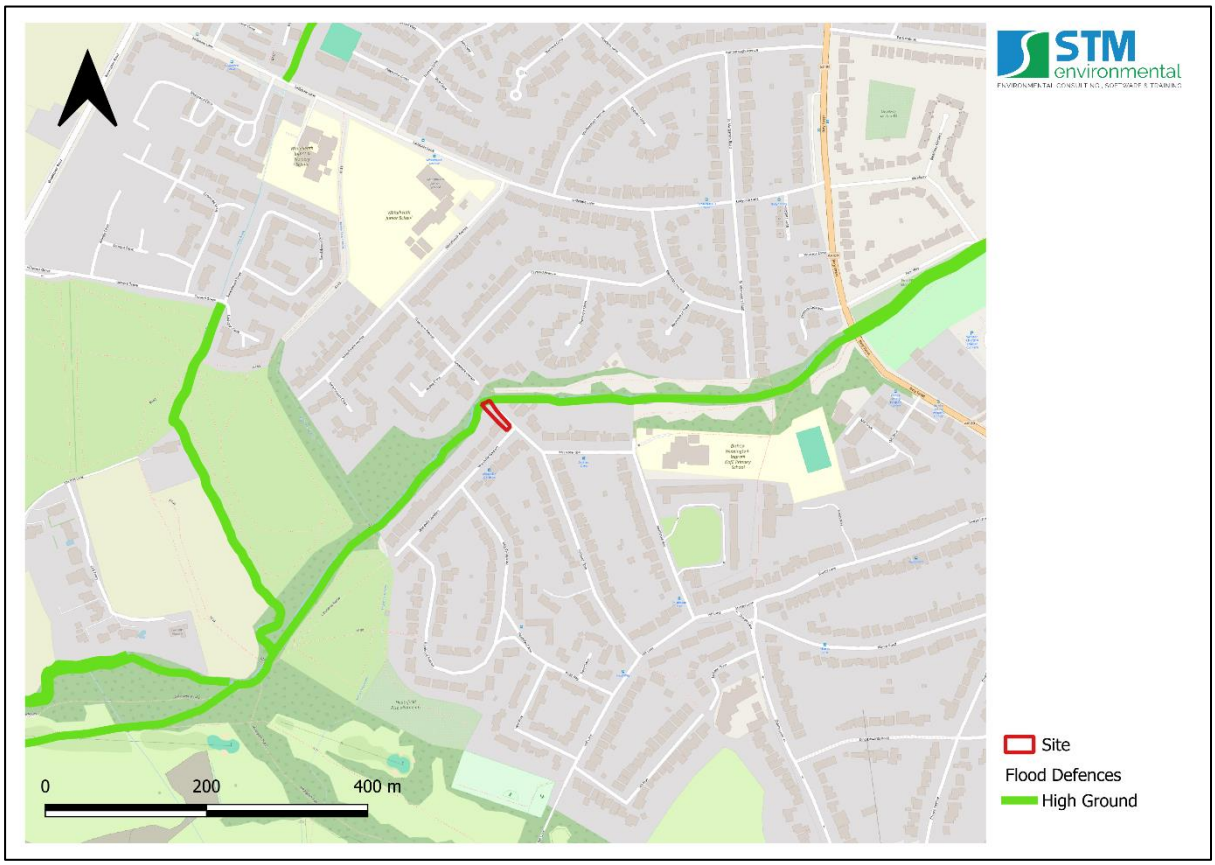


19.6.3 Predicted surface water flood depth for the 1 in 1000-year return period (Source: EA, 2016).



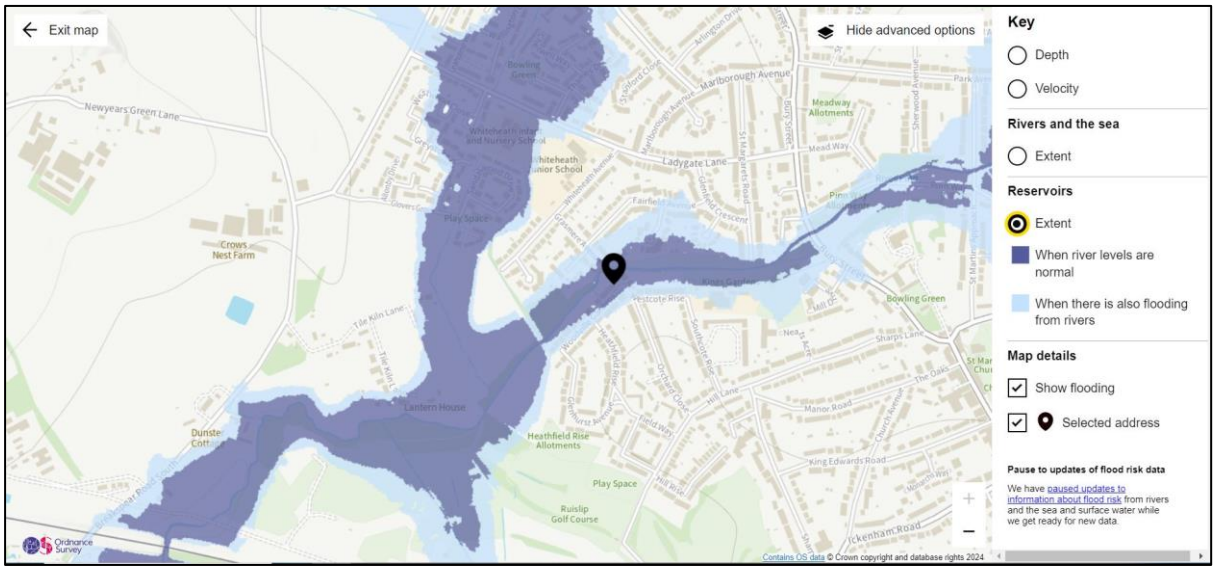
19.7 Appendix 7 – Flood Defence Mapping

19.7.1 EA flood defence map

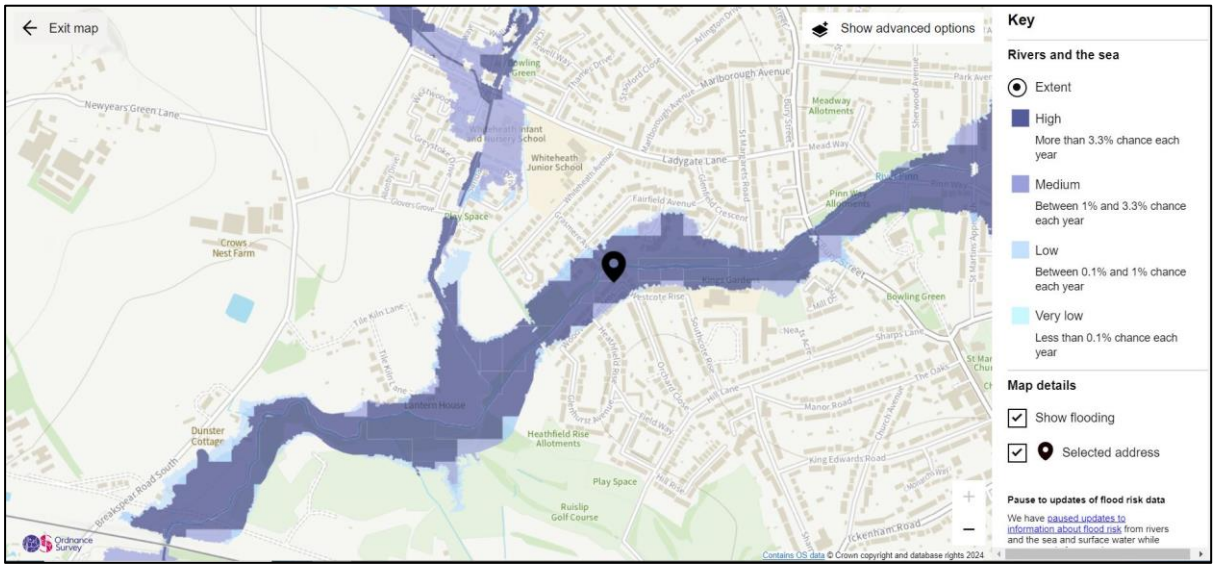


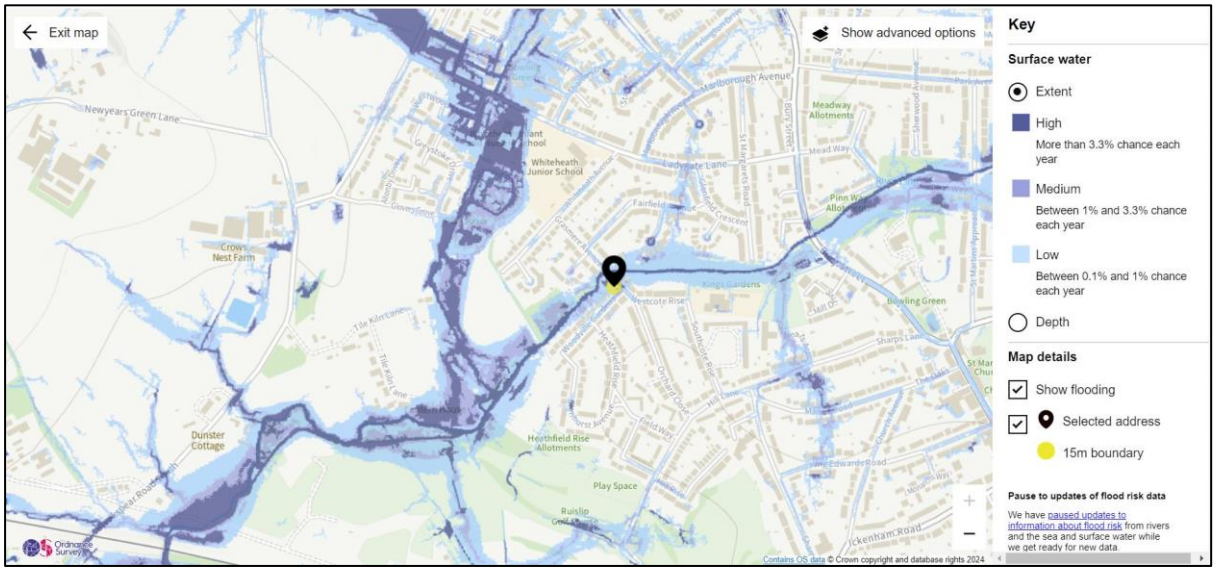
19.8 Appendix 8 – Risk of Flooding from Artificial Sources

19.8.1 Reservoir Flood Risk Map



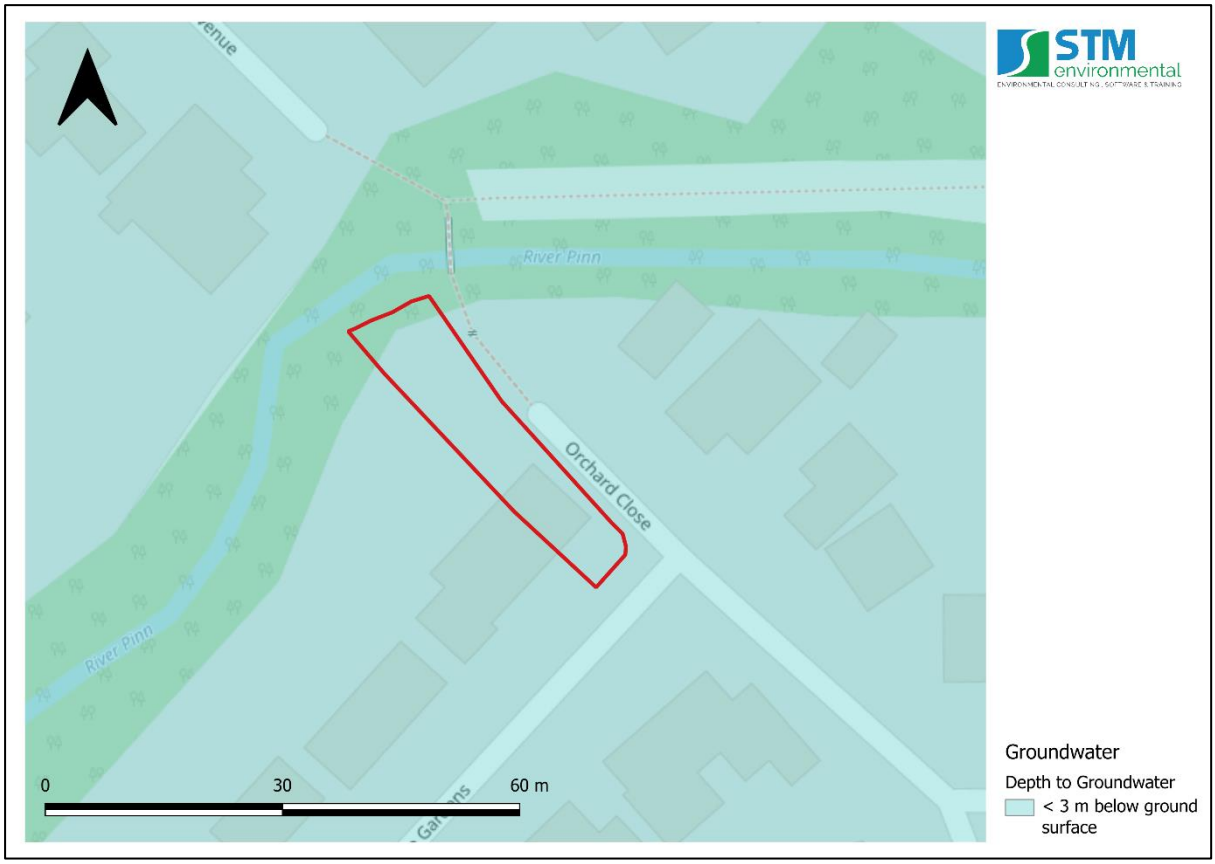
19.9 Appendix 9 – EA's Long Term Flood Risk Maps





19.10 Appendix 10 – Groundwater Flood Maps

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



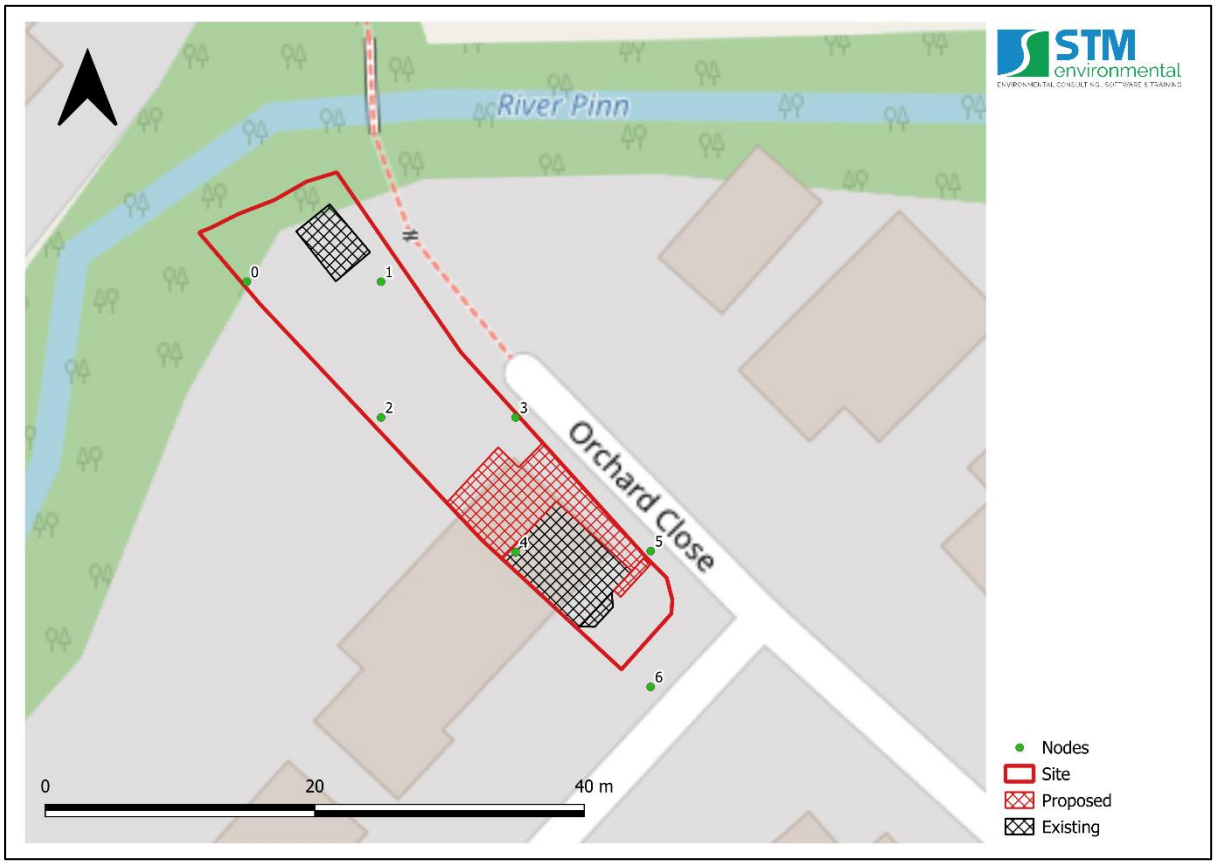
19.11 Appendix 11 - EA Product 6 (Detailed Flood Risk) Data

19.11.1 EA Climate Change Allowances for Peak River Flow

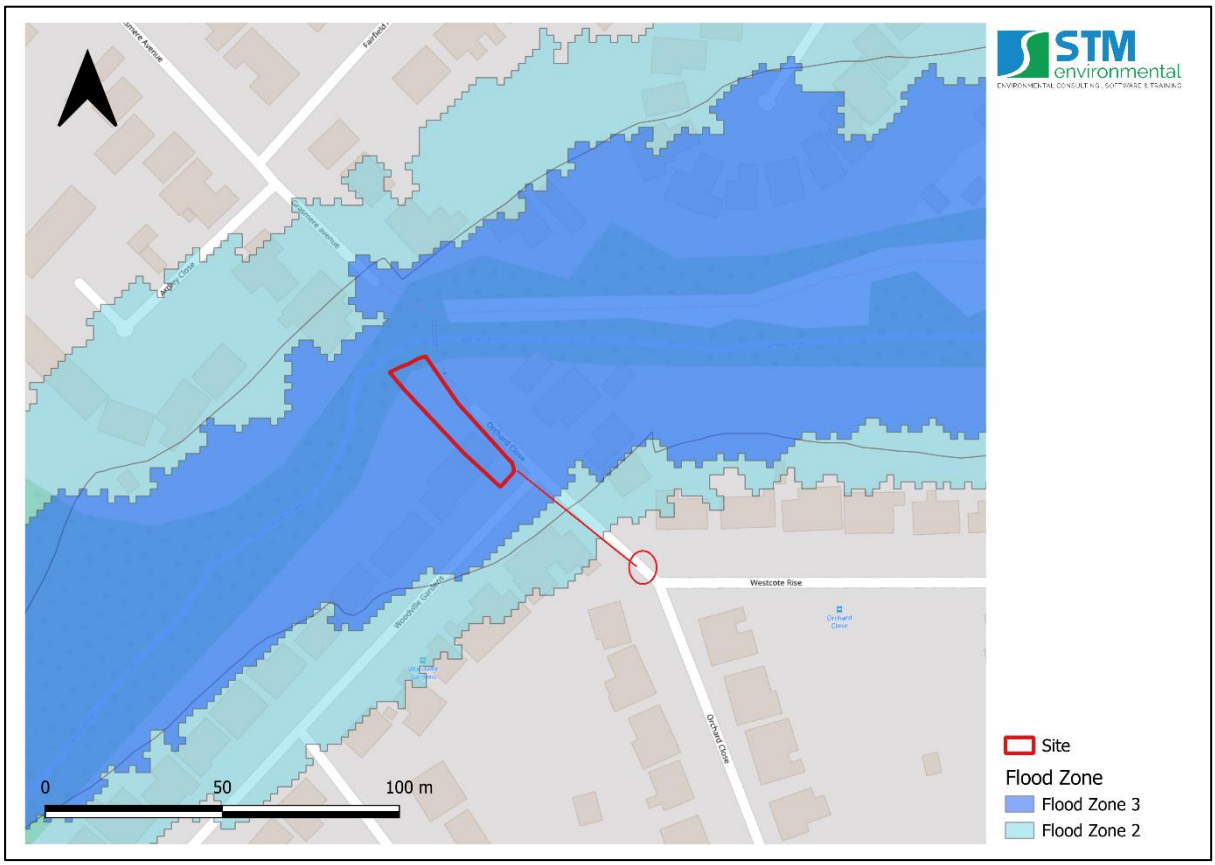
Colne Management Catchment peak river flow allowances

	Central	Higher	Upper
2020s	10%	16%	30%
2050s	8%	16%	38%
2080s	21%	35%	72%

19.11.2 Node Location Map



19.12 Appendix 12 – Safe Egress to Flood Zone 1 Map



19.13 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”.