FLOOD RISK ASSESSMENT

Site Address
Ashfield Barn
Pilning Street
Tockington
BS32 4LR

Client
Jonathan Tovey

Date
12/01/2024

1 Document Control

FLOOD RISK ASSESSMENT

Site Address:	Ashfield Barn Pilning Street Tockington BS32 4LR
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Contents

2 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
SGLC	South Gloucestershire Council
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

3 Disclaimer

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4 Executive Summary

SECTION	SUMMARY
Location	Ashfield Barn, Pilning Street, Tockington, BS32 4LR Grid Reference: 359139, 185809
Area	1956m^2
Proposed Development	The erection of a single storey rear extension to form additional living area – 'Garden Room'.
Flood Zone	The site is located in Flood Zone 3a.
Topography	The sites elevation ranges from 5.49mAOD to 7.07mAOD. The proposed sits at approximately 6.34mAOD.
Sequential and Exception Tests	Development is minor so Sequential and Exception Tests should not be required. LLFA to decide.
Main Sources of Flooding	Fluvial and tidal flooding from Gumhurn Rhine 42m South and an unnamed Rhine 40m north as well as minor influence from the River Severn and Bristol Channel.
Flood Defences	The Northwick wetland and Severn Beach defences are due to be completed this year (2024).
Records of Historic Flooding	EA Mapping revealed a flood event in the year 2000 in the vicinity which did not impact the site. The SFRA revealed 2no. flood events in the town of Pilning with an undefined source; exact locations were not specified.
Fluvial (River) and Tidal (Sea) Flood Risk	Low – During the Tidal 0.1% AEP 2076 event the site floods to a level of 6.99mAOD to a depth of 1.39m. During the Tidal 0.1% AEP 2098 event the site floods to a level of 7.83mAOD to a depth of 2.00m. These levels are pre defences. Post defences the site does not flood during the 0.5% Tidal event.
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 - No significant artificial sources identified.
Groundwater Flood Risk	Low – According to the BGS, the site is potentially susceptible to groundwater flooding, no recorded incidents have been identified.
Development Impacts on Local Flood Risk	Given that the development remains dry during the 0.5% AEP events and will take place on existing hard standing, its impact upon local flood risk will be negligible.
Proposed Flood Risk Mitigation Measures	• Finished floor levels will be no lower than existing ground floor levels at 6.64mAOD; • 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;

SECTION	SUMMARY
	• Safe egress routes to Flood Zone 1 are easily accessible by heading East along Pilning Street for approximately 370m taking 4 minutes; • CFS is not necessary;
Surface Water Management (SuDS)	There is good potential for implementation. Consideration should be given to rainwater harvesting and permeable paving 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.

5 Introduction

STM Environmental Consultants Limited (STM) were appointed by Jonathan Tovey (Client) to provide a Flood Risk Assessment (FRA) at a site located at Ashfield Barn, Pilning Street, Tockington, BS32 4LR.

6 Development Proposal

The FRA is required to support a planning application for the erection of a single storey rear extension to form additional living space – 'Garden Room'.

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

7 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.

8 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.

9 Legislative and Policy Context

9.1 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.

9.2 Policy Context

9.2.1 National Planning Policy Framework (NPPF)

The NPPF (updated July 2021) sets out the government’s planning policies for England and how these are expected to be applied. It also provides a set of guidelines and philosophy with which local planning authorities (LPAs) can build their own unique policies to appropriately regulate development within their jurisdictions.

Section 14 entitled “Meeting the challenge of climate change, flooding and coastal change” deals specifically with flood risk.

Paragraph 159 states that “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”.

In addition, Paragraph 161 outlines that “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);
- 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 NPPF then states in Paragraph 163 that “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”.

It further states that when determining any planning application, LPAs should "ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment[55]. 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;
- development is appropriately flood resilient and resistant;
- 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 minor development and changes of use should not be subject to the Sequential or Exception Tests but should still meet the requirements for site-specific flood risk assessments set out in footnote 55.

Footnote 55 states: "A site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use."

The NPPF also lays out requirements for how LPAs should deal with planning applications in coastal areas. They should ensure that should they "reduce risk from coastal change by avoiding inappropriate development in vulnerable areas or adding to the impacts of physical changes to the coast."

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

- 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.

9.2.2 Local Planning Policy – South Gloucestershire Council – Policy PSP20

- 1. Flood Risk and Surface Water Management

All development proposal(s) should follow the sequential approach to flood risk, for all potential flood risk sources.

Development proposal(s) will be expected to:

- (i) reduce surface water discharge from the site, wherever practicable and feasible on:
- a) previously developed land, by reducing post development runoff rates for events up to and including the 1 in 100 year return period, with an allowance for climate change, to that of a greenfield condition. Where it can be demonstrated that this is not practical or feasible, a 30% betterment to the existing condition will be required;
- b) greenfield sites, by restricting discharge to a watercourse or surface water sewer to the estimated mean Greenfield runoff rate (QBAR) by means of a controlled outflow. The drainage system should be designed so that flooding does not occur on any part of the development for the 3.33% (1 in 30 year) rainfall event other than in those areas/systems designated to store or convey water. Flooding within the development site should not occur in any part of a building or utility plant susceptible to water during a 1% (1 in 100 year) event, with an allowance for climate change; and;

- (ii) incorporate Sustainable Drainage Systems (SuDS) to reduce surface water runoff and minimise the flood risk, supported by an appropriate surface water drainage strategy; and
- (iii) ensure that surface water drainage proposals are designed to not increase off-site flood risk; an
- (iv) wherever practicable achieve the top tier of the following Surface Water Discharge Hierarchy, providing justification where lower tiers are considered appropriate:

1. infiltration
2. surface water body (watercourse/ditch) (non-infiltration)
3. surface water sewer (non-infiltration)
4. combined sewer (non-infiltration)

9.3 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.

10 Site Description and Environmental Characteristics

10.1 Site Location and Area

The site is located at Ashfield Barn, Pilning Street, Tockington, BS32 4LR and is centred at national grid reference 359139, 185809. The site has an area of 1956m^2.

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

10.2 Site Access

The site is accessed via Pilning street.

10.3 Local Planning Authority

The site falls within the jurisdiction of South Gloucestershire council in terms of the planning process.

10.4 Lead Local Flood Authority

South Gloucestershire council is also the Lead Local Flood Authority (LLFA).

10.5 Flood Zone

For planning purposes, the site is located in Flood Zone 3a as defined by the EA and LLFA.

Figure 1: Site Location Map

Figure 2: Site Aerial Map

10.6 Site and Surrounding Land Uses

10.6.1 Site Current Land Use

The site currently houses a residential property.

10.6.2 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	Unnamed watercourse	Agricultural land
Eastern	Residential	Agricultural land
Southern	Residential, Piling Street, Gumhurn Rhine Stream	Agricultural land
Western	Residential	Agricultural land

10.7 Hydrology

The nearest watercourse is Gumhurn Rhine 42m South and an unnamed Rhine 40m north. The Serven Estuary also has minor influence on the site. The site is in the Lower Severn IDB which is an area at risk of tidal flooding in combination with fluvial and surface water.

10.8 Geology

Data from the British Geological Survey indicates that the underlying superficial geology is characterised as Tidal Flat deposits. The underlying bedrock geology is characterized as Mercia Mudstone Group (Mudstone).

10.9 Hydrogeology

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

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

10.10 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 site slopes downwards from the driveway to the rear of the property, from south to north. The sites elevation ranges from 5.49mAOD to 7.07mAOD. The proposed sits at approximately 6.34mAOD.

11 The Sequential and Exception Tests

11.1 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:

- minor non-residential extensions: industrial/commercial/leisure etc extensions with a footprint less than 250 square metre.
- alterations: development that does not increase the size of buildings eg alterations to external appearance.
- householder development: For example; sheds, garages, games rooms etc within the curtilage of the existing dwelling, in addition to physical extensions to the existing dwelling itself. This definition excludes any proposed development that would create a separate dwelling within the curtilage of the existing dwelling eg subdivision of houses into flats.

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:

- c(i) - the number of dwelling houses to be provided is 10 or more; or
- c(ii) - the development is to be carried out on a site having an area of 0.5 hectares or more and it is not known whether the development falls within sub-paragraph (c)(i);
- the provision of a building or buildings where the floor space to be created by the development is 1,000 square metres or more;
- or development carried out on a site having an area of 1 hectare or more.

The development is considered to be minor and as such the Sequential Test should not be required by the LLFA.

11.2 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 must demonstrate that the development provides wider sustainability benefits to the community that outweigh the flood risk, informed by an SFRA, where one has been prepared;
- The development should be on developed land or on previously developed land;
- A flood risk assessment must demonstrate that the development will be safe without increasing flood risk elsewhere, and where possible will reduce the overall flood risk.

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.

Based on its scale and nature, as a small minor householder development, the Exception Test is not likely to be required by the LLFA.

12 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.

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

12.1.1 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.

12.1.2 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.

12.1.3 Main Potential Sources of Local Fluvial and Tidal Flooding

The nearest potential sources of fluvial flooding to the site are considered to be from the multiple unnamed drainage ditches “Rhines” located close to the property, these are fed from the Tockington Mill Rhine, 400m Southeast.

The nearest potential source of tidal flooding to the site is considered to be the River Severn/ Bristol Channel, 4km northwest.

12.1.4 Records of Historic Fluvial and Tidal Flooding Incidents

The EA’s historic and recorded flood outline maps indicate that there has been historic flooding 200m southeast of the site in the year 2000, it did not impact the site. Copies of these maps are available in Appendix 4

There has been no record of tidal flooding at the site since 1977.

12.1.5 Designated Fluvial and Tidal Flood Risk Zone for the Site

The site is considered to be located within Flood Zone 3a as defined by the Environment Agency and the LLFA indicating that it has greater than a 1% annual probability of fluvial flooding. The site is at 0.5% annual probability of tidal flooding. The site is located within the Lower Severn IDB (Internal Drainage Borad area).

12.1.6 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.

12.1.7 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 (300m).

The ASEA Project will provide 17km of flood defences to reduce flood risk and is due to be completed in 2027. The Northwick wetland and Severn Beach defences are due to be completed this year which will provide further tidal flood protection to the site.

Current identified defences which directly protect the site include a Flood Embankment, approximately 4km northwest. A map is available in Appendix 7.

12.1.8 Peak River Flow and Tidal Climate Change Allowances

The EA's climate change allowances for peak river flow maps show that the site is considered to be in the Avon Bristol and North Sommerset streams catchment. The climate change allowances for this catchment are available in Appendix 11.

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

The central allowance for more vulnerable indicates that a climate change allowance of 26% should be used for fluvial flooding.

Given that the site is minor and is located in the Severn district, the 'south west', higher central sea level allowance for tidal flooding should be used where feasible. This equates to 13.1mm/year.

The model used for this investigation is the 2018 Avonmouth/Severnside coastal inundation model.

The 2018 version of the model includes pre development (i.e. representing the defences as they were before work commenced in 2020) and post development (representing the impact of the defences currently in construction) scenarios, for both present day and future dates (2076 and 2098).

A scenario representing the breach of the proposed flood defences in 2098 was also modelled in 2018. However, the 2018 version of the model used UKCP09 sea level rise allowances, which have been superseded by UKCP18 allowances.

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

The EA Product 4 dataset which is presented in Appendix 11 states "Levels and depths have been extracted based upon the site boundary plan provided". The EA did not provide a map on where these nodes were located.

Pre-Development 2076 (with existing defences)

During the 0.5% undefended modelled event the site floods to a level of 6.99mAOD with a depth of 1.39m. During the 0.1% undefended modelled event the site floods to a level of 7.73mAOD with a depth of 2.13m.

Post-Development 2076 & 2098 (new defences in place)

Taking into consideration the current coastal flood defences, the site does not flood in either the 0.5% AEP 2076 & 2098 modelled scenarios. Given that the site remains dry during these events and thus a flood level was not provided as part of the EA dataset, it could not be determined whether the site would remain dry during the 0.5% AEP 2125 event.

During the 0.1% AEP 2076 event the site floods to a level of 6.99mAOD to a depth of 1.39m.

During the 0.1% AEP 2098 event the site floods to a level of 7.83mAOD to a depth of 2.00m.

In the most recent South Gloucestershire Level 1 SFRA Appendix C2 2021, JBA uses the following models:

Fluvial Flooding Models

Model name	Year	Software
Bath to Bristol	2017	Flood Modeller / TUFLOW
Bristol Frome	2014	Flood Modeller/ TUFLOW
Little Avon	2016	Flood Modeller / TUFLOW
Yate and Chipping Sodbury	2016	Flood Modeller / TUFLOW

Tidal Flooding Models

Model name	Year	Software
North Coast Tidal	2012	TUFLOW
Severn House Farm	2020	SWAN 1D / TUFLOW

See Appendix 11 for the mapping. The mapping shows the site does not flood in any of the models used in the SFRA.

12.1.10 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 low.

12.2 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.

12.2.1 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.

12.2.2 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 overtopping the Rhines adjacent to the site.

12.2.3 Records of Historic Pluvial Flooding Incidents

Examination of the LLFA's Level 1 SFRA revealed 2no. flood events in the town of Pilning. It does not detail the type of flood events or their location. A table showing the areas of flooding incidents is available in Appendix 4 .

12.2.4 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.

12.2.5 Sewer Flooding

Examination of the LLFA's Level 1 SFRA revealed no evidence of sewer flooding within the BS32 4 postcode area.

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

12.2.6 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 1000-year rainfall return period provided by the EA are available in Appendix 6.

The maps show that the site would remain dry during all precipitation events.

12.2.7 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 very low.

12.3 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.

12.3.1 Historic Records of Groundwater Flooding

Examination of the LLFA's Level 1 SFRA revealed 2no. flood events in the town of Pilning, the details were not known.

12.3.2 Susceptibility to Groundwater Flooding

The Groundwater Flood Susceptibility Map provided by BGS has no data for the site. The Groundwater Depth map also provided by BGS indicates that the groundwater level may be at approximately 3mbgl.

12.4 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 SFRA states that “no formal critical drainage areas have been identified within South Gloucestershire by the Environment Agency”. [3]

13 Potential Impacts of the Development on Local Flood Risk

13.1 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		Permeable Area		Total Area
	m^2	**%**	**m2**	**%**	**m^2**
Existing Site	804	41	1152	59	1956
Proposed Site	804	41	1152	59	1956
Difference	0	0	0	0	

Table 4: Break down of existing and proposed site uses

Ground Cover	Existing Development Area		Proposed Development Area		Difference (m2)
	m^2	**%**	**m^2**	**%**	
Buildings	213	11	229	12	16
Driveways/Patio	591	30	575	29	-16
Gardens/ Soft landscaping	1152	59	1152	59	0
Total	1956	100	1956	100	

The development will take place on existing hard standing. Therefore, its impact upon surface water runoff rates and flood flow routes will be negligible.

13.2 Impacts on Flood Storage and Flood Flow Routes

Even though the site increases the built-up area by 16m^2, given that the site does not flood during 0.5% AEP events, it will have a negligible impact upon flood storage or flow routes.

14 Flood Risk Mitigation Measures

14.1 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 good opportunities for implementing SuDS. Measures such as rainwater harvesting, infiltration (soakaways, permeable paving, rain gardens) should be considered. A full SuDS strategy is outside the scope of works of this FRA.

14.2 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.

14.2.1 Finished Floor Levels

The average ground level of the existing is 6.34mAOD.

For **vulnerable developments**, the EA's Standing Advice states that the finished floor level of the lowest habitable room in any building, Finished Floor Levels (FFL) should be a minimum of 300mm above one of the following, whichever is higher;

- Average Ground level; Or
- Estimated flood level 1% AEP plus CC; Or
- The Adjacent roadway;

The proposed remains dry during the 0.5% modelled event. Therefore, the FFL can remain as existing, at approximately 6.64mAOD.

14.2.2 Compensatory Flood Storage (CFS)

CFS is not necessary as the development results in no loss in floodplain storage.

14.2.3 Flood Resilience Construction Measures

In terms of achieving resilience, there are two main strategies, whose applicability is dependent on the water depth the property is subjected to. These are:

- 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.

Given that flood depths less than 0.3m are predicted in extreme scenarios, the water exclusion is considered most applicable for this site.

Water Exclusion Strategy:

There are a range of flood protection devices/methods that can be used in the Water Exclusion Strategy including:

- Using materials and construction with low permeability;
- Landscaping e.g. creation of low earth bunds (subject to this not increasing flood risk elsewhere);
- Raising thresholds and finished floor levels (e.g. porches with higher thresholds than main entrance);
- Flood gates with waterproof seals;
- Sump and pump for floodwater to remove waste water faster than it enters;
- Door guards and airbrick covers.

Flood resilience design and measures that will be implemented are outlined below. Water-resistant and resilient materials will 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.

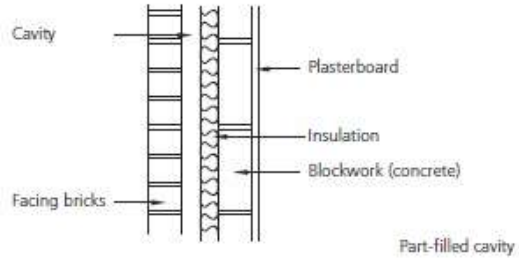
Underground drainage:

- 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.

14.3 Emergency Plan

14.3.1 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.

Given that the site remains dry during the 0.5% AEP events, the hazard rating is determined to be Very Low.

The use of a flood emergency plan is therefore sufficient for the proposed development. The key elements of the emergency plan are described below.

14.3.2 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.

14.3.3 Access and Safe Egress

Safe egress to Flood Zone 1 is available by heading East along Pilning Street for approximately 370m approximately 4 minutes. Directions of this route are presented in Appendix 12 .

14.3.4 Safe Refuge

The proposed development will not have internal connections to upper floors in the property, safe refuge cannot be provided.

15 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 should not require sequential and exception tests to be undertaken;
- Fluvial and tidal flooding from Gumhurn Rhine 42m South and an unnamed Rhine 40m north as well as minor influence from the River Severn and Bristol Channel;
- The EA define the site as being within Flood Zone 3a;
- Therefore, the FFL can remain as existing, at approximately 6.64mAOD.
- CFS is not required;
- EA mapping indicates that the site does benefit from flood defences, The Northwick wetland and Severn Beach defences being finished in 2024;

- Two flood events in the town of Pilning. It is not defined what type of flooding or where the exact location is;
- The site is not within a CDA. It is not in an area that has sewage flooding incidents;
- No records of groundwater flooding incidents were identified at or in the vicinity of the site;
- The development remains dry during the 0.5% AEP events and will take place on existing hard standing, its impact upon local flood risk will be negligible.
- There is good opportunity for implementing SuDS mitigation measures. Consideration should be given to use of rainwater harvesting, infiltration (soakaways, permeable paving, rain gardens) should be considered;
- 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;
- Safe egress routes to Flood Zone 1 are easily accessible by heading East along Pilning Street for approximately 370m talking 4 minutes;
- In the event that evacuation is not possible, safe refuge is not available in the upper floors of the building as the property is a bungalow;

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

16 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, South Gloucestershire council, 2021.
4. Local Plan, South Gloucestershire council, 2017.
5. Surface Water Management Plan, South Gloucestershire council, 2021.
6. CIRIA, Defra, Environment Agency – UK SuDS Manual, 2015.

17 Appendices

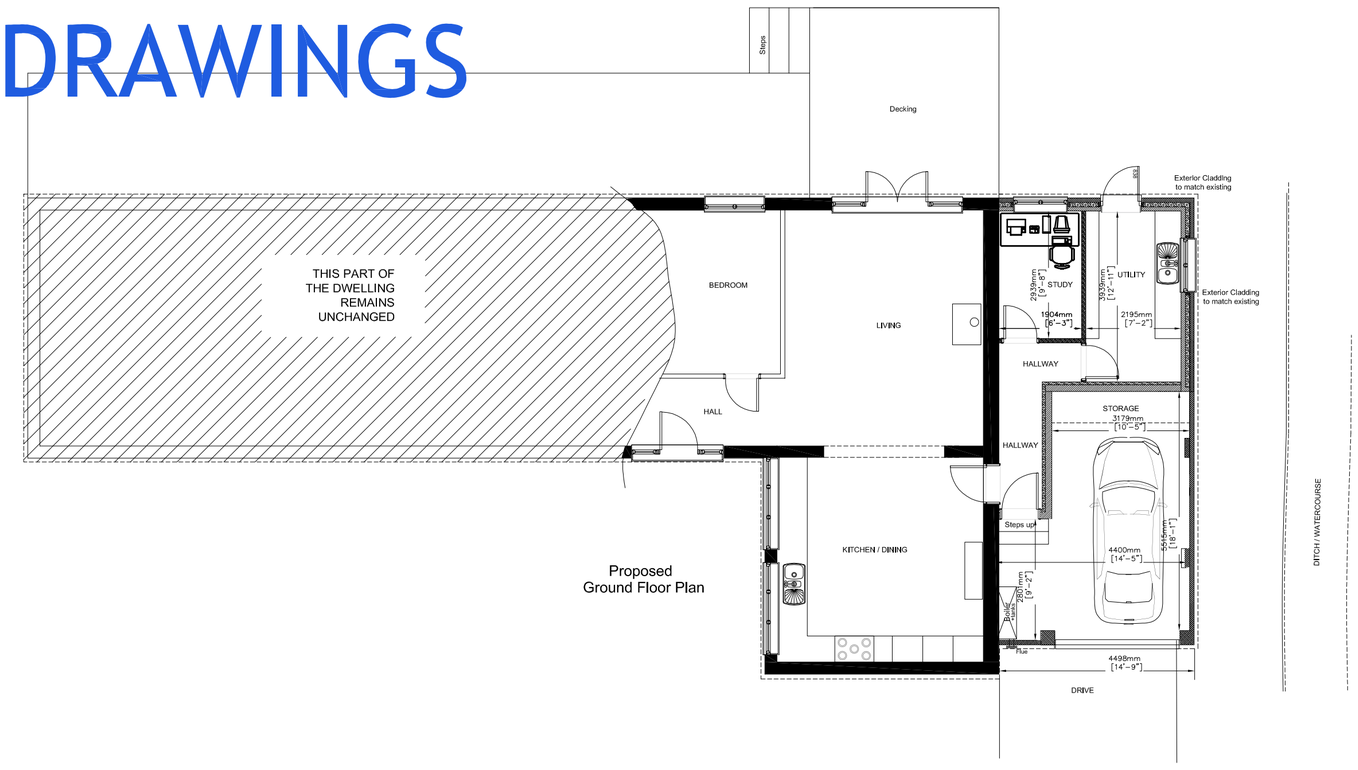
17.1 Appendix 1 – Site Photographs

17.2 Appendix 2 – Development Plans

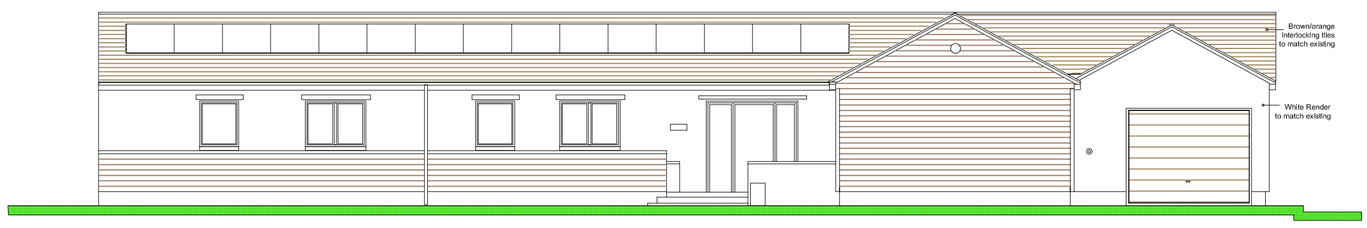
See next page.

PLANNING DRAWINGS

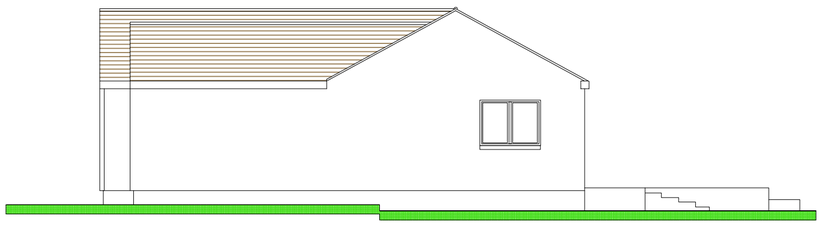
EXISTING
SCALE 1:100



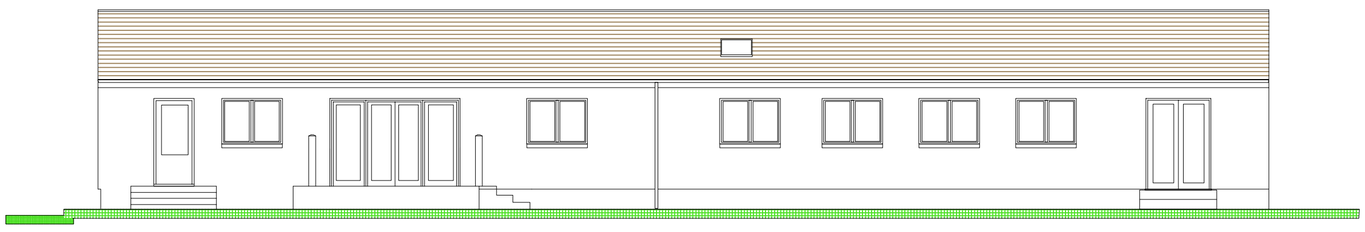
Proposed
Ground Floor Plan



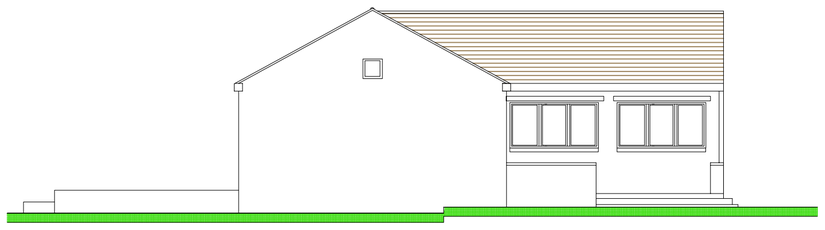
Existing Front Elevation



Existing Side Elevation

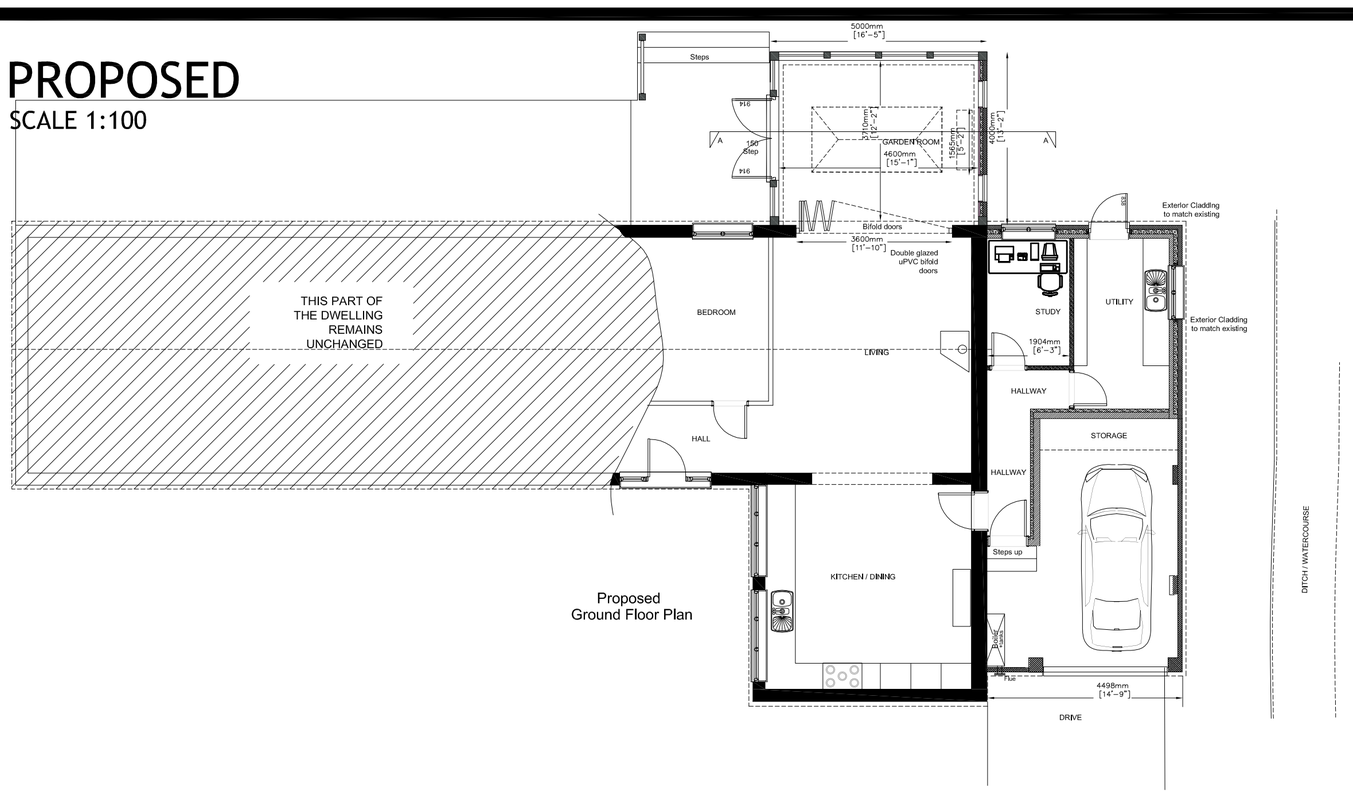


Existing Rear Elevation

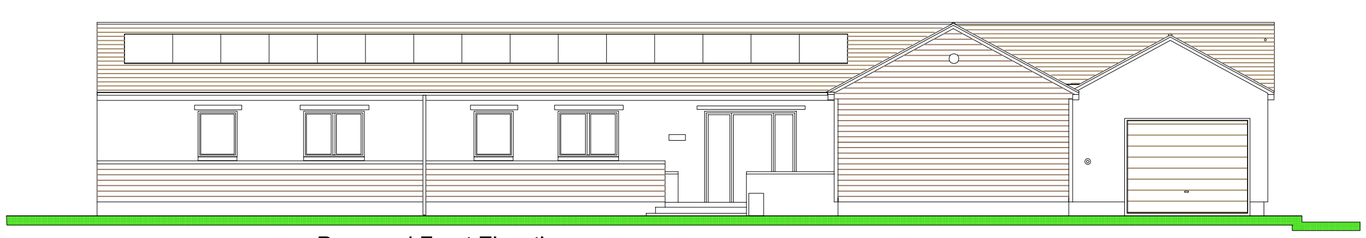


Existing Side Elevation

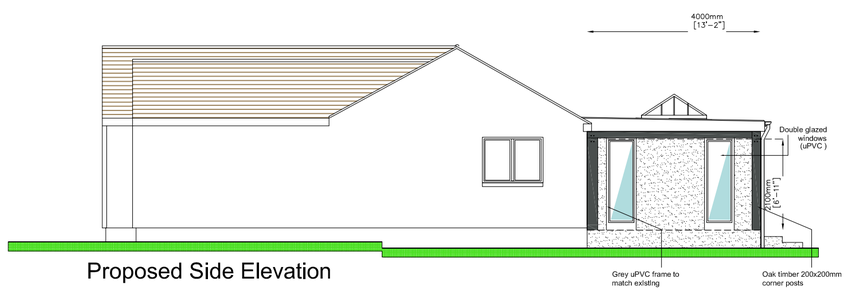
PROPOSED
SCALE 1:100



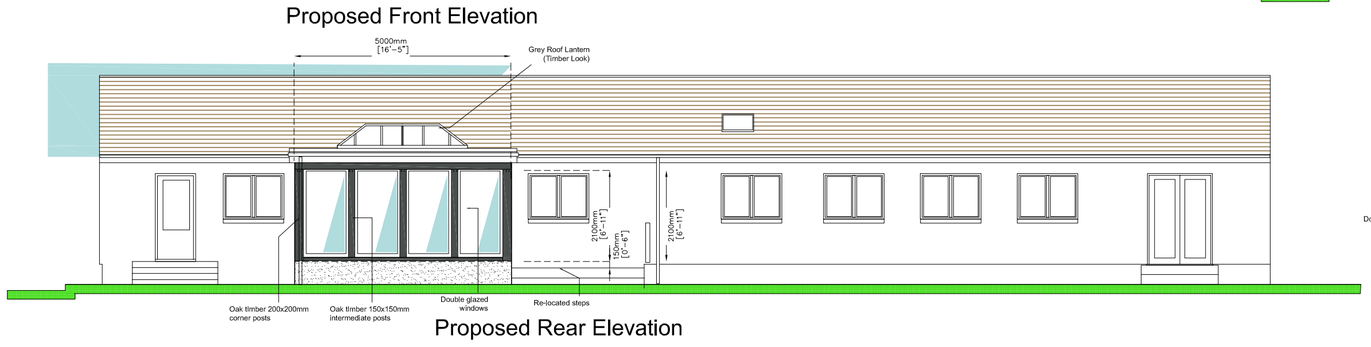
Proposed
Ground Floor Plan



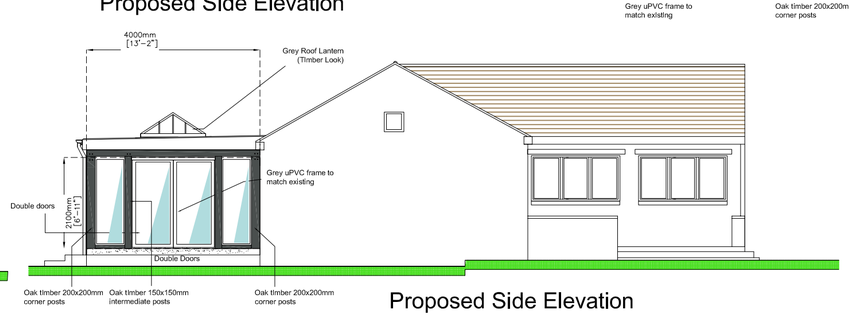
Proposed Front Elevation



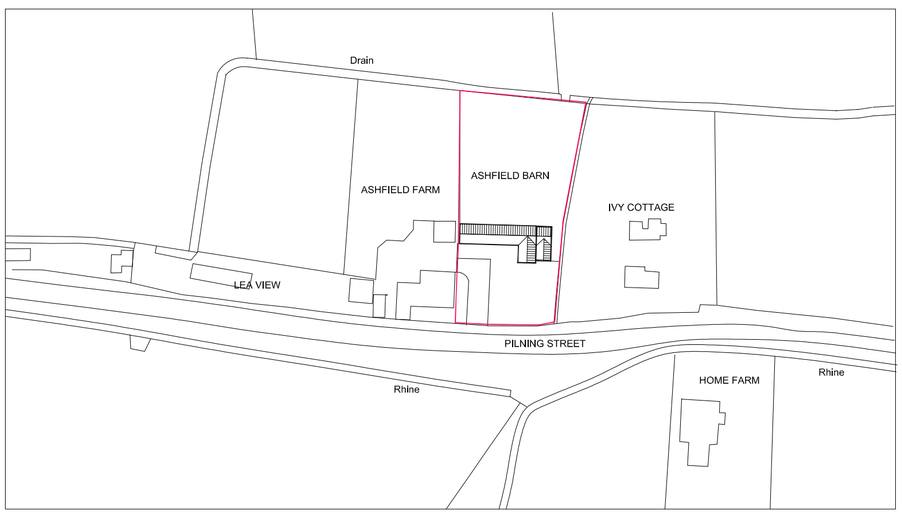
Proposed Side Elevation



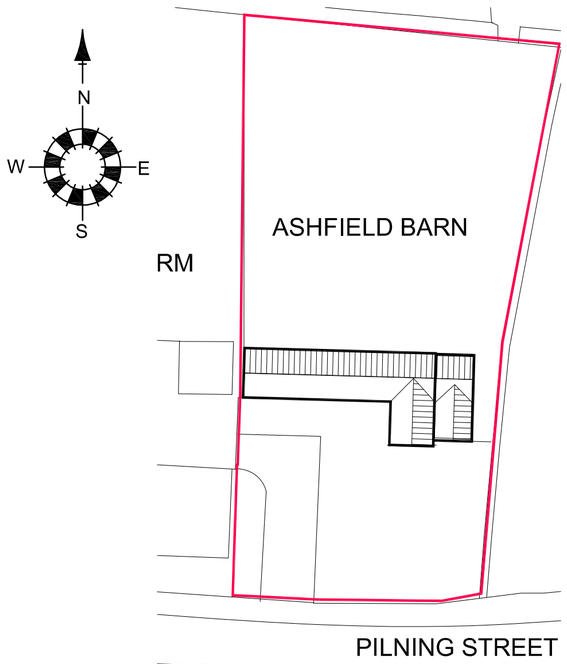
Proposed Rear Elevation



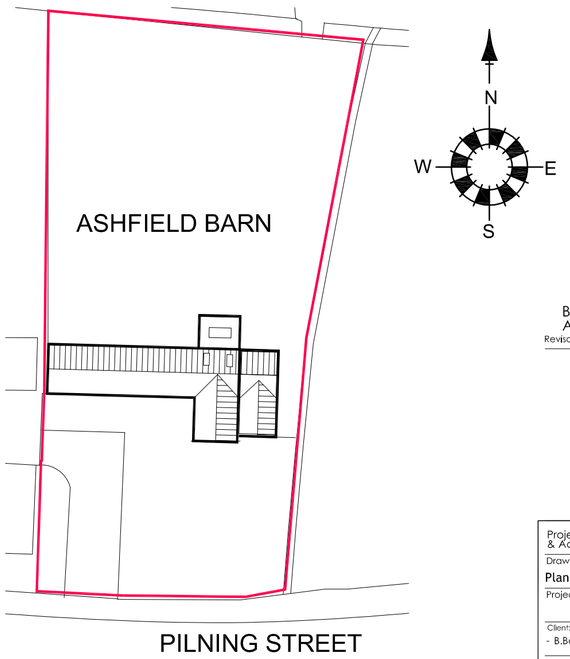
Proposed Side Elevation



LOCATION PLAN (EXISTING) SCALE 1:1250



BLOCK PLAN (EXISTING) SCALE 1:500



BLOCK PLAN (PROPOSED) SCALE 1:500

Revison:		
B	Roof updated lantern added	11.11.23
A	Double doors added to side	25.05.23

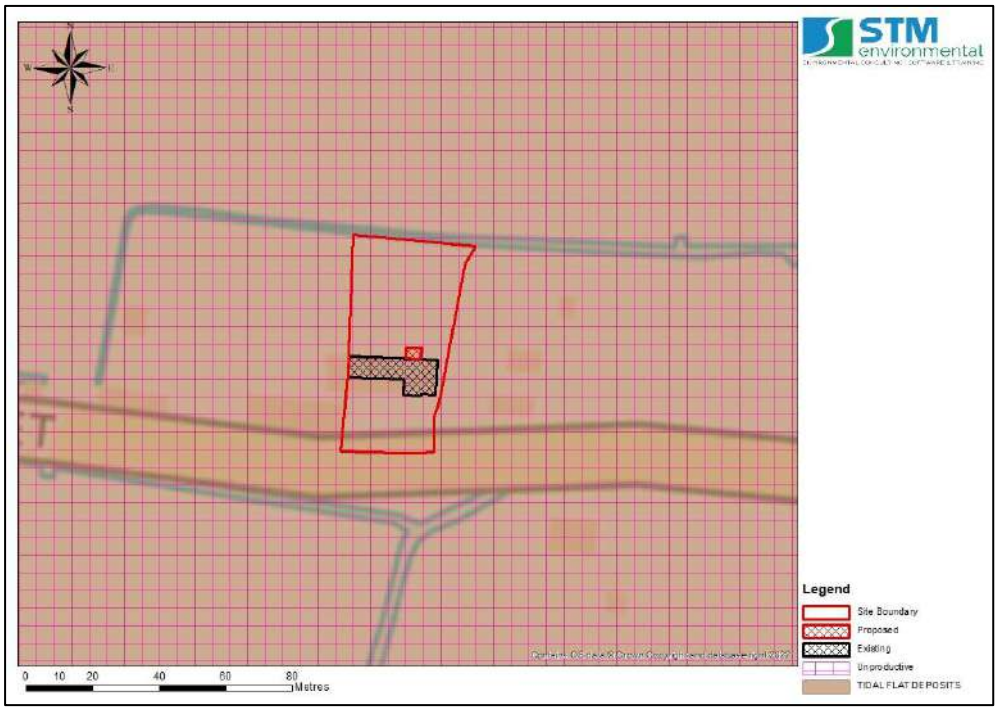
TOVEY
ARCHITECTURAL DESIGN
ARCHITECTURAL & PLANNING CONSULTANTS

Project Name & Address:	ASHFIELD BARN, TOCKINGTON, BS324LR		
Drawing Title:	PROPOSED GARDEN ROOM		
Planning Drawings			
Project No:	Drawing No: BB-101		Revision: B
Client: - B.Barnard	Date: 15.04.23	Scale: As Indicated	Drawn: JT

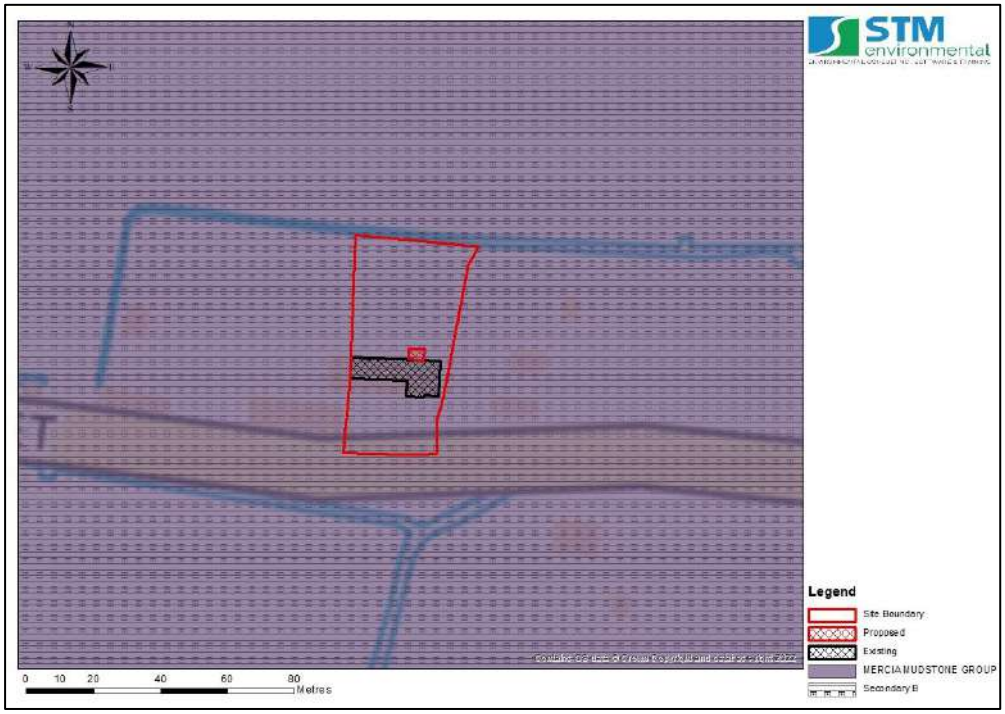
Any discrepancies between this drawing and other information should be reported to the Designer. Information and setting out to be checked on site prior to construction.All drawings are subject to copyright.

17.3 Appendix 3 – Environmental Characteristics

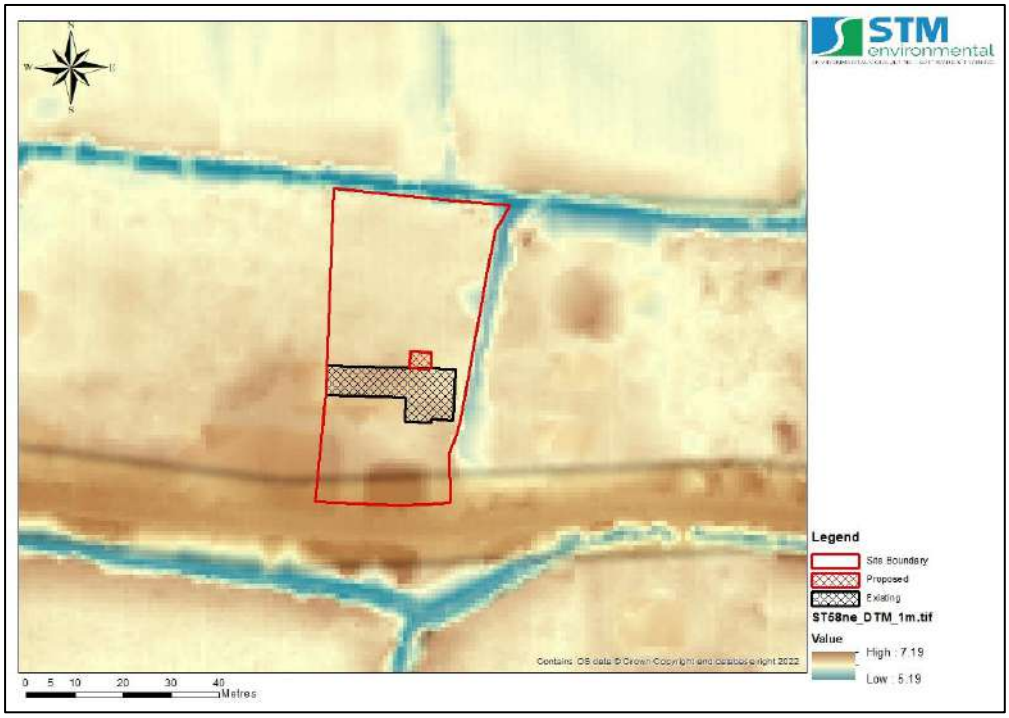
17.3.1 Superficial Hydrogeology Map

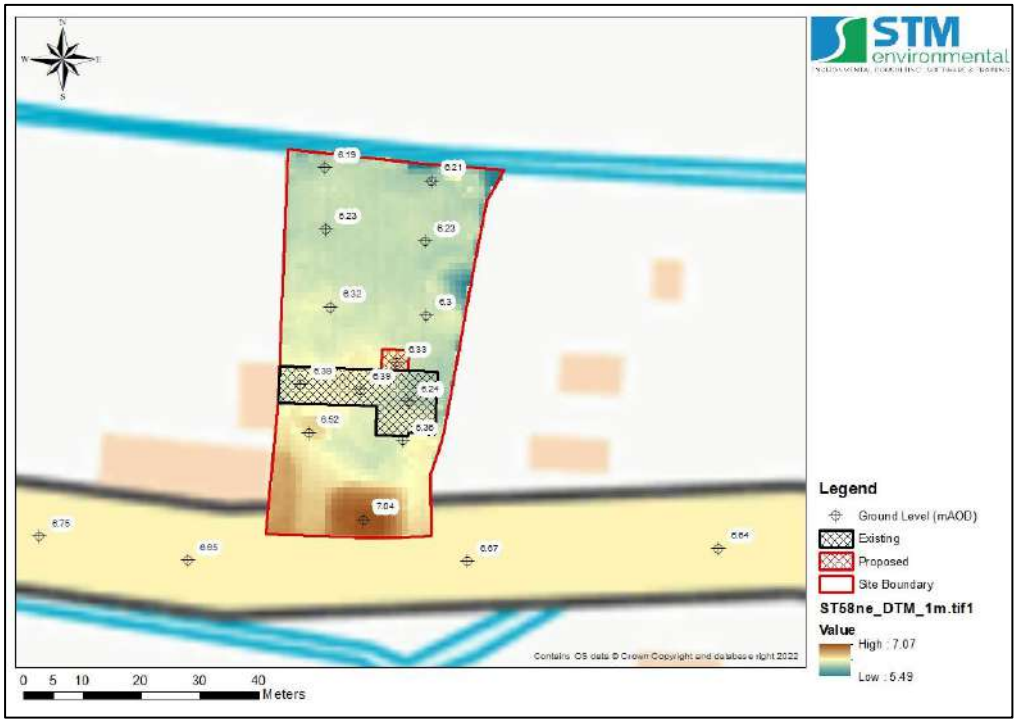


17.3.2 Bedrock Hydrogeology Map



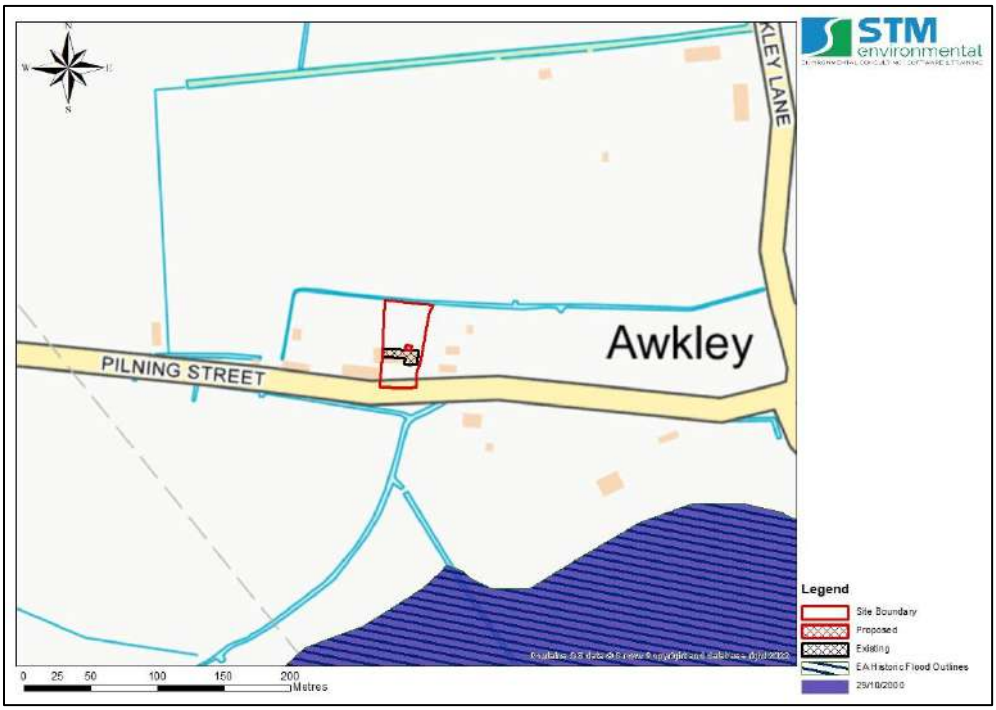
17.3.3 Topography Map





17.4 Appendix 4 – Historical Flood Incident Maps

17.4.1 EA Historic and Recorded Flood Outlines



17.4.2 Table of Recorded Historic Flooding

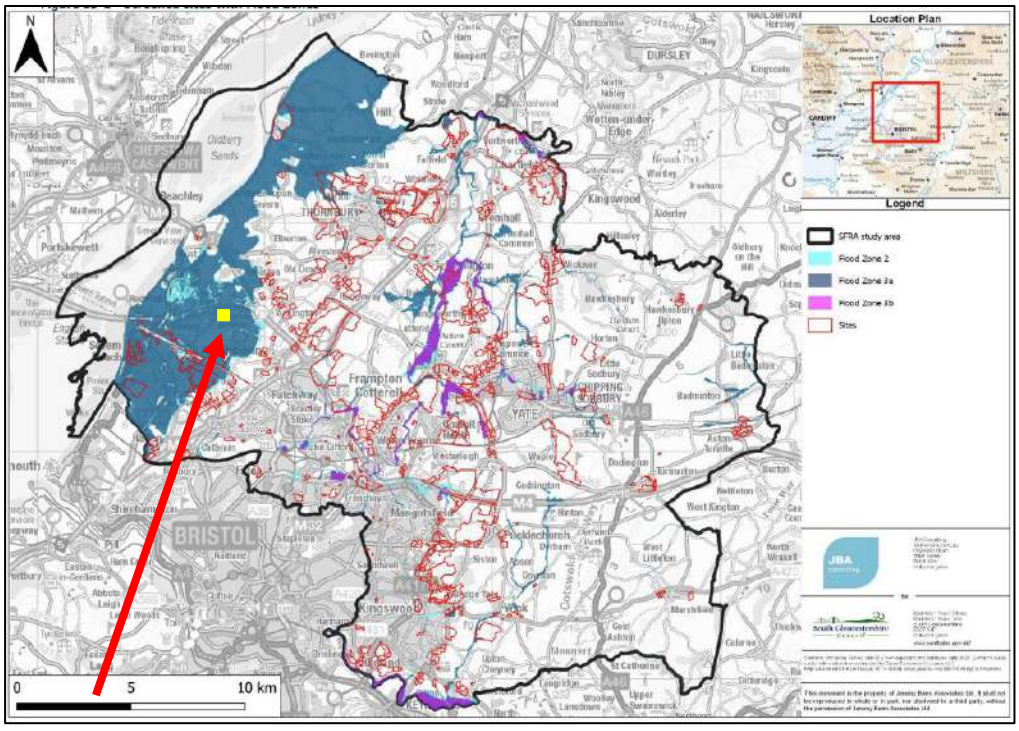
Community	Number of flood incidents
Easter Compton	1
Emersons Green	1
Falfield	1
Filton	15
Frampton Cotterell	8
Frenchay	5
Hambrook	4
Hanham	13
Iron Acton	5
Keynsham	1
Kingswood	6
Littleton-upon-Severn	1
Longwell Green	8
Mangotsfield	1
Marshfield	1
Oldbury-on-Severn	7
Oldland Common	4
Patchway	5
Pilning	2
Pucklechurch	9
Rangeworthy	2
Rockhampton	1
Severn Beach	2
Siston	3
Soundwell	2
Staple Hill	2
Swineford	11
Thornbury	7
Tomarton	1
Tytherington	1
Warmely	7
Wick	2
Wickwar	1
Willsbridge	2
Winterbourne	19
Yate	2

17.4.3 Table of Recorded Sewer Flooding

Table 7-3 - Sewer flooding incidents in South Gloucestershire from 2004-2020

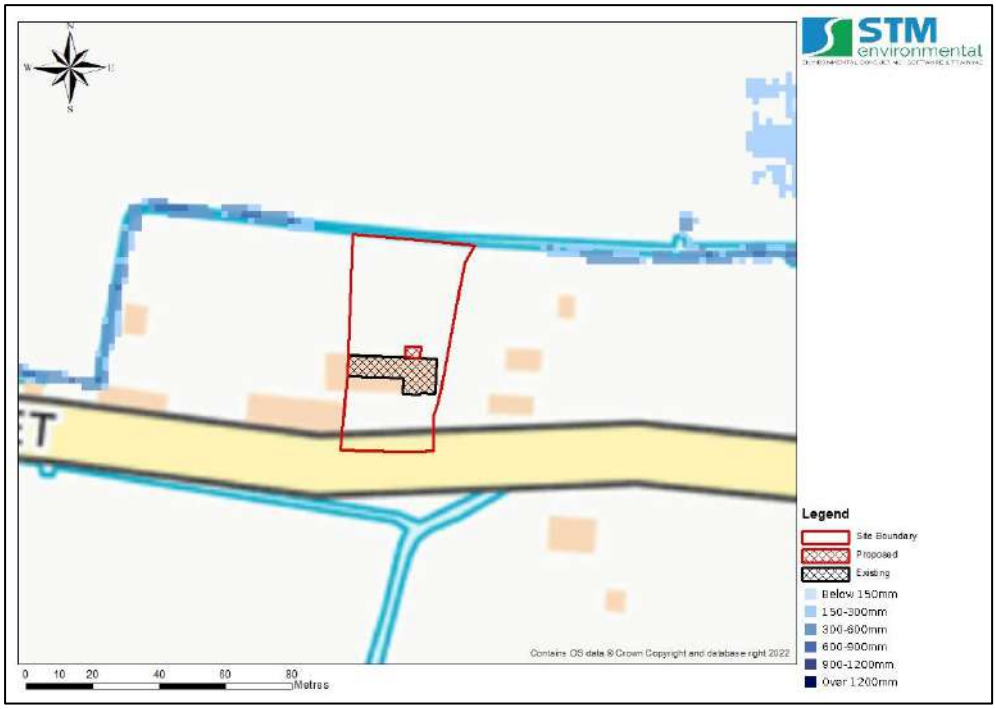
Postcode	2004	2005	2007	2009	2011	2012	2013	2014	2016	2019	2020	Total
BS10 7	0	0	1	0	0	0	0	0	0	1	0	2
BS11 9	0	0	0	0	0	0	0	0	0	0	1	1
BS15 4	1	0	0	0	0	0	0	0	0	0	0	1
BS15 8	0	0	0	0	1	2	0	0	0	0	0	3
BS15 9	0	0	0	0	0	0	0	0	0	0	2	2
BS16 1	0	0	0	0	0	0	1	0	0	0	0	1
BS16 6	1	0	0	0	0	0	0	0	0	0	0	1
BS34 5	0	0	0	0	0	0	0	1	0	0	0	1
BS34 7	0	0	0	0	0	0	0	0	0	1	0	1
BS34 8	2	0	0	0	0	0	0	0	0	0	0	2
BS36 2	1	0	0	0	0	0	0	0	0	0	0	1
BS37 5	1	0	0	0	0	3	0	1	0	0	0	5
BS37 7	0	0	0	0	0	0	0	0	0	2	0	2
BS7 0	0	1	0	0	0	1	2	0	0	1	0	5
GL12 8	0	0	0	1	1	1	1	0	0	0	0	4

17.5 Appendix 5 - EA Flood Zone Map



17.6 Appendix 6 – Surface Water Flood Extent and Depth Maps

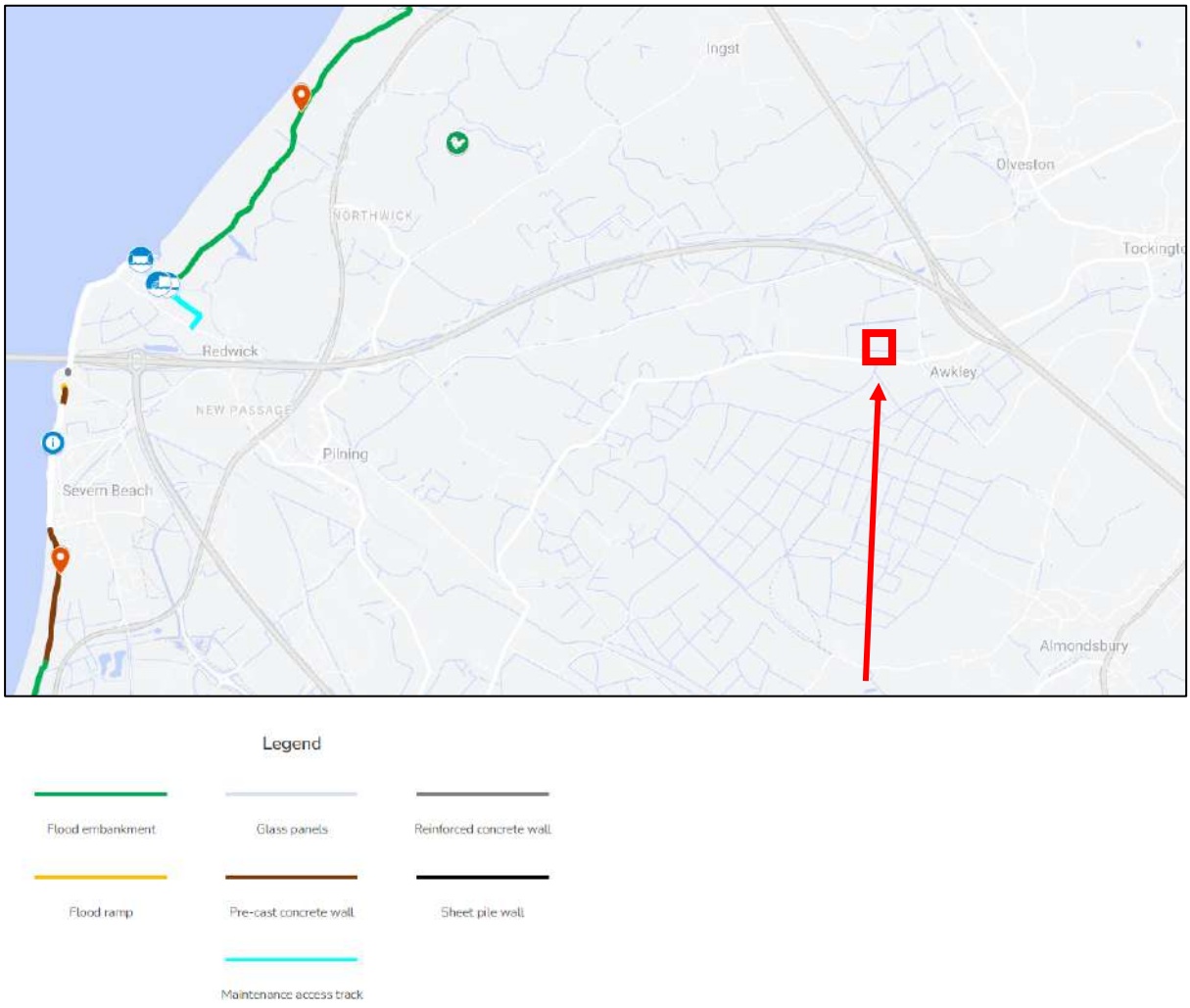
17.6.1 Predicted surface water flood depth for the 1 in 1000-year return period (Source: EA, 2016).



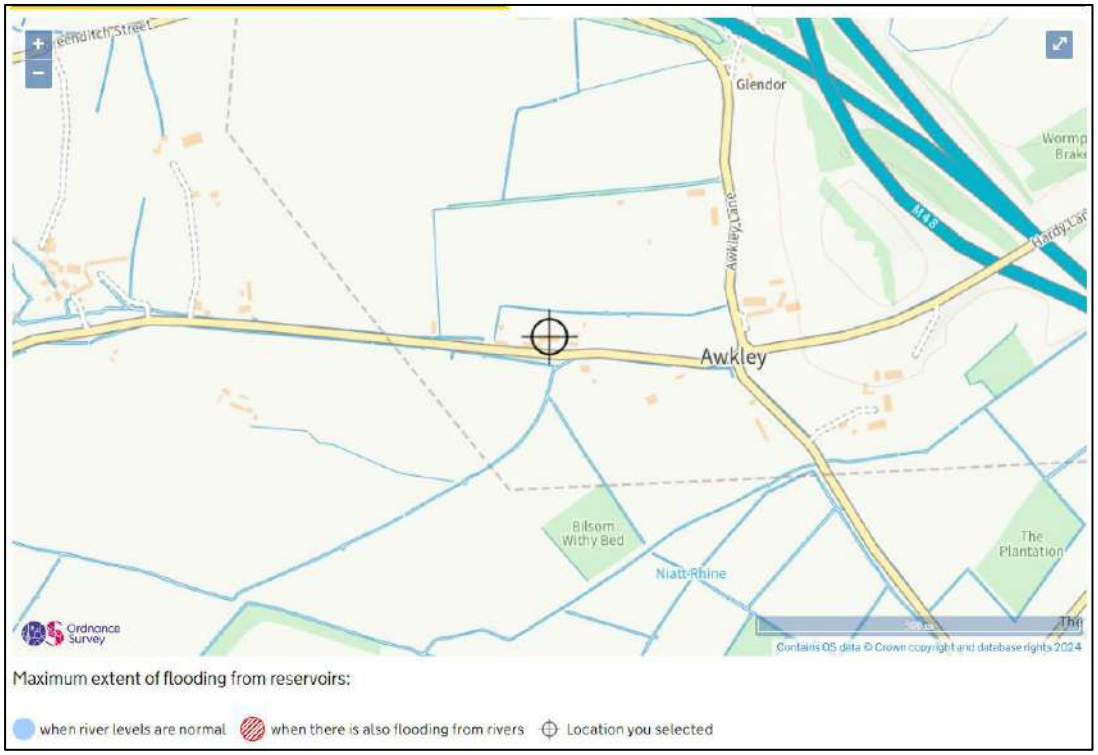
17.7 Appendix 7 –Flood Defence and Reservoir Flood Risk Maps

17.7.1 EA flood defence map

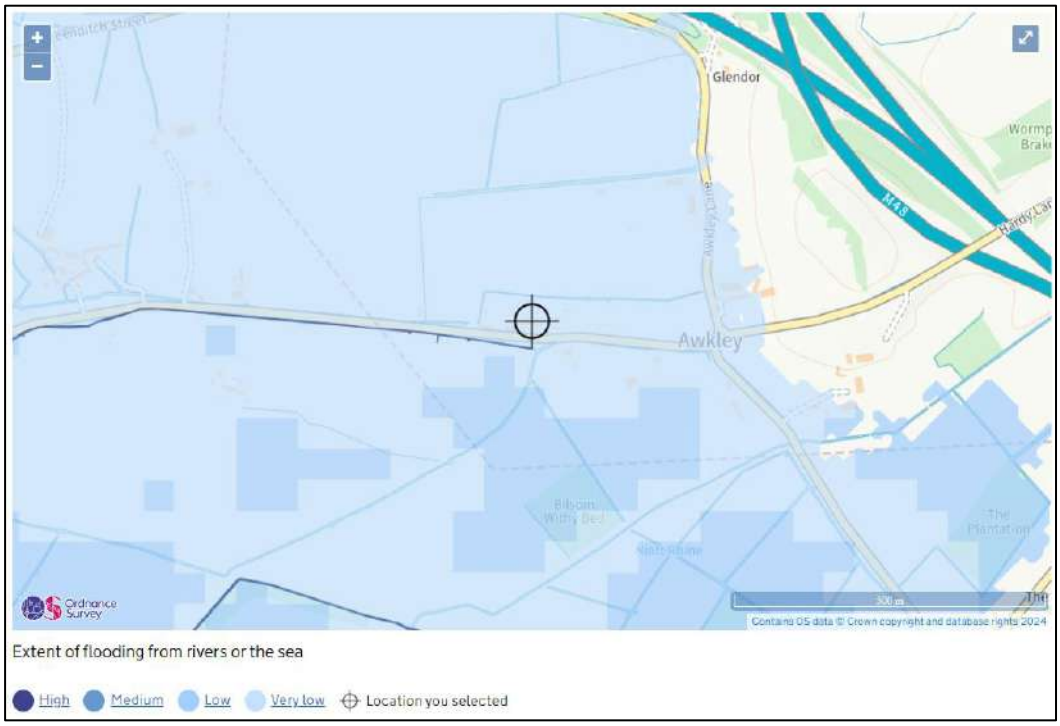
N/A

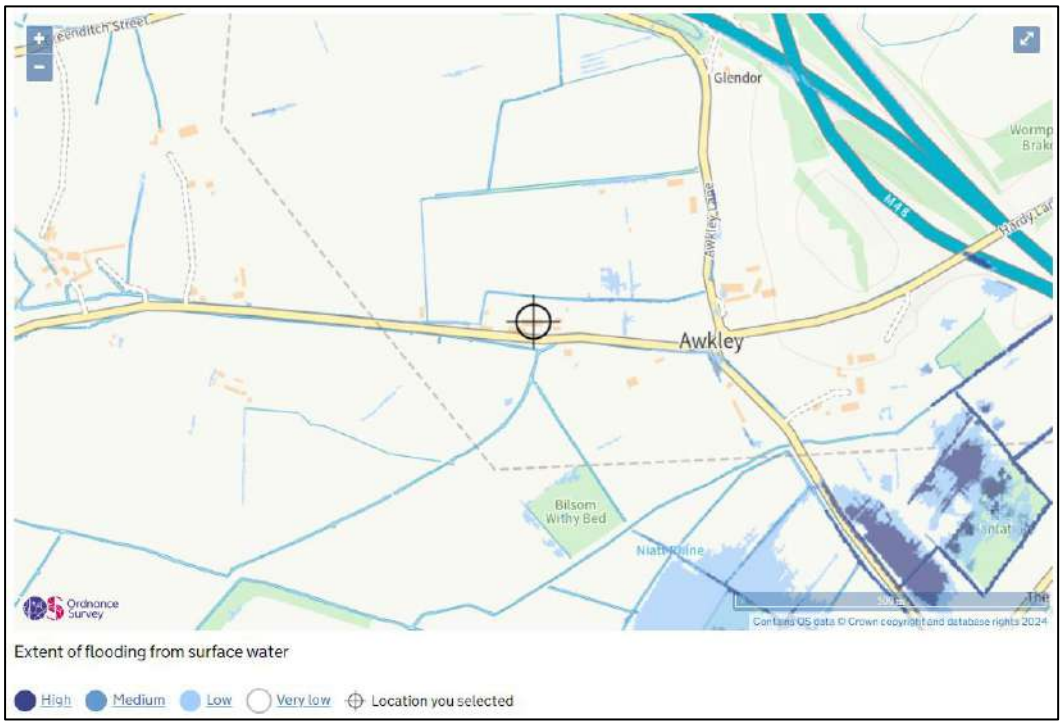


17.7.2 Reservoir Flood Risk Map



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



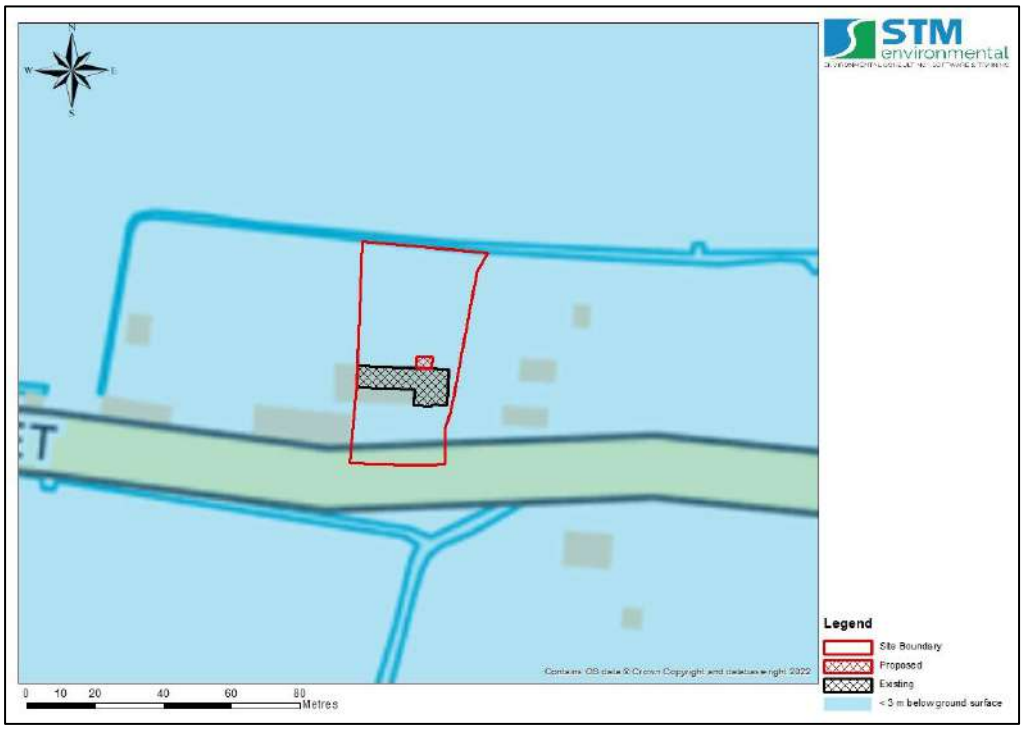


17.9 Appendix 10 – Groundwater Flood Maps

17.9.1 Groundwater Flooding (Susceptibility) Map (BGS)

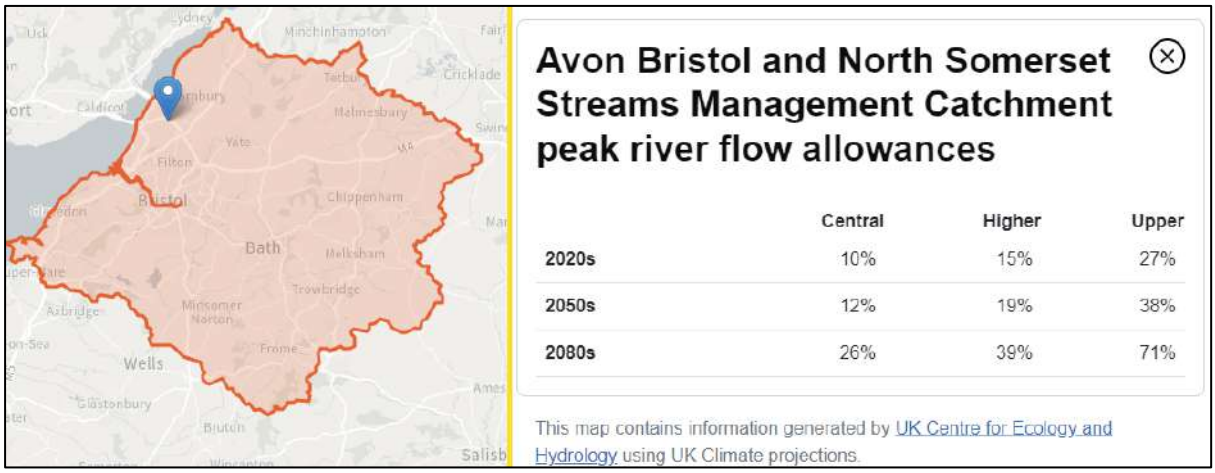
N/A

17.9.2 Potential Depth to the Groundwater Water Map (BGS)



17.10 Appendix 11 - EA Product 4 (Detailed Flood Risk) Data

17.10.1 EA Climate Change Allowances for Peak River Flow



17.10.2 EA Product 4 Data

See next page.

creating a better place

Environment Agency

Sam Allder
STM Environmental
info@stmenvironmental.co.uk

Our ref: 324095-WX
Date: 20th September 2023

Dear Sam Allder,

Thank you for your enquiry which was received on 29th August 2023. We respond to requests under the Freedom of Information Act 2000 and Environmental Information Regulations 2004.

Abstract

Name	Product 4
Description	Detailed Flood Risk Assessment Map for **Ashfield Barn, Pilning Street, Tockington, BS32 4LR** **NGR: ST5912585804**
Licence	Open Government Licence
Information Warnings	*The mapping of features provided as a background in this product is © Ordnance Survey. It is provided to give context to this product. The Open Government Licence does not apply.*
Attribution	Contains Environment Agency information © Environment Agency and/or database rights. Contains Ordnance Survey data © Crown copyright 2017 Ordnance Survey 100024198.

Flood Map for Planning
The Flood Map for Planning is now classed as Open Data. It can be downloaded free of charge under an open data licence from the following weblink:
https://data.gov.uk/publisher/environment-agency

If you search for the 'flood map for planning' in the search box the following datasets will be available for you select and download the data:

- Flood Map for Planning (Rivers and the Sea) – Flood Zones 2 and 3
- Flood Map for Planning (Rivers and Sea) – Areas Benefiting from Defences
- Flood Map for Planning (Rivers and Sea) Flood Storage Areas
- Flood Map for Planning – Spatial Flood Defences (without Standard attributes)
- Recorded Flood Outlines
- Historic Flood Map
- Risk of Flooding from Surface Water Extent for:
  - → 3 percent annual chance
  - → 1 percent annual chance
  - → 0.1 percent annual chance

If you have requested this information to help inform a development proposal, then you should also note the detail in the attached advisory text on the use of Environment Agency Information and Further Guidance for FRAs.

Flooding History

We no longer produce pdf copies of the Historic Flood Map. This information is available to search select, and download free of charge as part of the Government's 'open data' as

- Recorded Flood Outlines
- the Historic Flood Map

These are GIS layers and can be downloaded from: https://data.gov.uk/publisher/environment-agency

Please note: we cannot guarantee that this is an exhaustive list of all past flood events in this location. All reasonable care has been taken to ensure that the historical flood event data is as accurate as possible. The Environment Agency will update it's records if new evidence emerges.

ASEA Coastal Inundation model

South Gloucestershire Council, Bristol City Council and the Environment Agency are working together to improve flood defences and create new habitats for important wildlife species as part of the Avonmouth Severnside Enterprise Area (ASEA) Ecology Mitigation and Flood Defence Project. For further details about this project, including progress to date, please see the following link:
https://www.asea-flood-ecology.co.uk/

Contractors BMMjv have been on site since summer 2019 and have commenced work at each sub section area. Please refer to our website for the latest programme for completion dates.

As part of this project, a new coastal inundation model was produced in 2018 for the Avonmouth/Severnside area to represent the impact of the new flood defence.

The 2018 version of the model includes pre development (i.e. representing the defences as they were before work commenced in 2020) and post development (representing the impact of the defences currently in construction) scenarios, for both present day and future dates (2076 and 2098). A scenario representing the breach of the proposed flood defences in 2098 was also modelled in 2018. However, the 2018 version of the model used UKCP09 sea level rise allowances, which have been superseded by UKCP18 allowances.

Please let us know if you wish to obtain a copy of the modelling report or model.

Due to changes in the flood defence design and a need to re-run breach scenarios in the Bristol City Council local authority boundary, we are only supplying post development 2098 depths and levels and post development 2098 breach scenarios from the 2018 version of the model as this is currently the best available data.

A further update of the ASEA coastal inundation hydraulic model is underway with post-development scenarios (including 0.5% AEP / 1 in 200 year) representing the final detailed design of the flood defence scheme (Defended) in the present day and future epochs (2083, 2098 and 2123) and separate breach scenarios. The model will include the latest UKCP18 sea level rise guidance. The results from this modelling update are required later in 2023.

We understand that Bristol City Council are updating their SFRA Level 2 and it depends on timing as to whether the updated modelled results will be available or have to be added in at a later date.

Flood Levels

From the ASEA model we have provided the flood level and depth for the pre and post development 2076, post development 2098 and breach 2098 for your proposed site:

Pre-Development 2076 (with existing defences)

Pre-Development 2076 0.5% (1 in 200 year) AEP Depth	1.39m	Depth
Pre-Development 2076 0.1% (1 in 1000 year) AEP Depth	2.13m	Depth
Pre-Development 2076 0.5% (1 in 200 year) AEP Level	6.99mAOD	Level
Pre-Development 2076 0.1% (1 in 1000 year) AEP Level	7.73mAOD	Level

Post Development 2076 (new defences in place)

Post Development 2076 0.5% (1 in 200 year) AEP Depth	0.00m	Depth
Post Development 2076 0.1% (1 in 1000 year) AEP Depth	1.39m	Depth
Post Development 2076 0.5% (1 in 200 year) AEP Level	0.00mAOD	Level
Post Development 2076 0.1% (1 in 1000 year) AEP Level	6.99mAOD	Level

Post Development 2098 (new defences in place)

Post Development 2098 0.5% (1 in 200 year) AEP Depth	0.00m	Depth
Post Development 2098 0.1% (1 in 1000 year) AEP Depth	2.00m	Depth
Post Development 2098 0.5% (1 in 200 year) AEP Level	0.00mAOD	Level
Post Development 2098 0.1% (1 in 1000 year) AEP Level	7.83mAOD	Level

Post Development Breach of new defences 2098

Post Development 2098 0.5% (1 in 200 year) AEP Depth (Breach Composite)	0.00m	Depth

N.B. Levels and depths have been extracted based upon the site boundary plan provided.

Strategic Flood Risk Assessment (SFRA)
When preparing your Flood Risk Assessment (FRA) to support the planning application, you should also refer to South Gloucestershire's Level 1 SFRA available to download at the following link: https://www.southglos.gov.uk/documents/pte110277.pdf.

As outlined above we understand that in due course the SFRA Level 2 for Bristol will be updated by the Local Planning Authority but currently there are no timescales for this.

Planning

Customer & Engagement, Wessex
Rivers House, East Quay, Bridgwater, Somerset, TA6 4YS
Email: wessexenquiries@environment-agency.gov.uk
www.environment-agency.gov.uk
VAT No: **662 4901 34**

If you have questions regarding the planning nature of your enquiry, or require advice on floor levels, please contact our Sustainable Places team on NWX.SP@environment-agency.gov.uk. Please be aware that we now charge for planning advice when consulted on pre-application enquiries. This new approach provides advice to developers in two ways. Firstly, there is the provision of 'free' advice available to everyone where we give a preliminary opinion on a proposed development. This sets out the environmental constraints together with any issues this raises for us. Should you wish us to review in detail any of these issues then we can do this through a chargeable scheme aimed at recovering our costs.

Flood Defences
We can confirm that this site is not located within 1 kilometre of any formal flood defences. However, it *may* benefit from assets further afield.

Extreme Tide Level (Still Water) Information

IMPORTANT. If you are carrying out a Flood Risk Assessment you should also review the Still Water Tide Level data from the Coastal Flood Boundary Study 2018. You should be mindful that in some locations the predicted Still Water Tide Levels are higher than the locally modelled water levels provided above. When this is the case the higher water levels should be taken into account in your Flood Risk Assessment.

For more information on climate change allowances please see guidance on the Gov.UK website here: Flood risk assessments: climate change allowances - GOV.UK

The updated Still Water Tide Level Data (baseline 2017) from the Coastal Flood Boundary Study 2018 is also available to download from our data.gov.uk site. Please search for 'Coastal Design Sea Levels'.

For your information you can view the Coastal Flood Boundary Study 2018 technical summary report and the user guide below.
https://www.gov.uk/government/publications/coastal-flood-boundary-conditions-for-uk-mainland-and-islands-design-sea-levels

Environmental Permit for Flood Risk Activities
In addition to any other permission(s) that you may have already obtained e.g. planning permission, you may need an environmental permit for flood risk activities (formerly known as Flood Defence Consent prior to 06 April 2016) if you want to do work:

- in, under, over or near a main river (including where the river is in a culvert)
- on or near a flood defence on a main river
- in the flood plain of a main river
- on or near a sea defence

For further information and to check whether a permit is required please visit:
https://www.gov.uk/guidance/flood-risk-activities-environmental-permits.

For any further advice, please contact your local Environment Agency Office, at
bridgwater.frap@environment-agency.gov.uk.

Further Information

We advise that you also contact the Flood Risk Management Team, by email LeadLocalFloodAuthority@southglos.gov.uk, or by telephone, 01454 868000, at South Gloucestershire Council, Council Offices, Badminton Road, Yate, Bristol, BS37 5AF, as they may be able to provide further advice with respect to localised flooding and drainage issues.

Further details about the Environment Agency information supplied can be found on our website:
https://www.gov.uk/browse/environment-countryside/flooding-extreme-weather

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Rivers House, East Quay, Bridgwater, Somerset, TA6 4YS
Email: wessexenquiries@environment-agency.gov.uk
www.environment-agency.gov.uk

If you have requested this information to help inform a development proposal, then you should note the information on GOV.UK on the use of Environment Agency Information for FRAs:
https://www.gov.uk/planning-applications-assessing-flood-risk
https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion

We hope you find this information helpful, and it is provided subject to the guidance below, which we strongly recommend you read.

Yours sincerely

Dawn Fullthorpe

Customer & Engagement, Wessex
Rivers House, East Quay, Bridgwater, Somerset, TA6 4YS
Email: wessexenquiries@environment-agency.gov.uk

Enc: Use of Environment Agency Information for Flood Risk Assessments (below)

Use of Environment Agency Information for Flood Risk Assessments (FRAs)

Important
Use of Environment Agency data: you should note that

1. Information supplied by the Environment Agency may be used to assist in producing a Flood Risk Assessment (FRA) where one is required, but the use of Environment Agency information does not constitute such an assessment on its own.

2. As part of your data request, we have provided all of the modelled data we hold for your location. Please note that some of our modelled information may have been produced for purposes other than for flood zone generation. This may mean that some of the modelled data you have been provided with has a lower confidence level, and has not been used in producing our flood map, nor definitively reflects the predicted flood water level at the property/development site scale. To check the suitability of the use of this information in your FRA please contact your local Partnership & Strategic Overview (PSO) team.

3. This information covers flood risk from main rivers and the sea, and you will need to consider other potential sources of flooding, such as groundwater or surface water runoff. The information produced by the Local Planning Authority and the Lead Local Flood Authority (LLFA) may assist in assessing other sources of flood risk.

4. Where a planning application requires a FRA and this is not submitted or deficient, the Environment Agency may well raise an objection.

5. For more significant proposals in higher flood risk areas, we would be pleased to discuss details with you ahead of making any planning application, and you should also discuss the matter with your Local Planning Authority.

Pre-Planning Advice from the Environment Agency
If you have requested this information to help inform a development proposal, then we recommend that you undertake a formal pre-application enquiry using the form available from our website:

Pre-application Preliminary Opinion:
https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion

Pre-application Charged Service:
https://www.gov.uk/government/publications/planning-advice-environment-agency-standard-terms-and-conditions

Depending on the enquiry we may also provide advice on other issues related to our responsibilities, including flooding, waste, land contamination, water quality, biodiversity, navigation, pollution, water resources, foul drainage or Environmental Impact Assessment.

Flood Risk Assessment (FRA) Guidance
You should refer to the Planning Practice Guidance of the National Planning Policy Framework (NPPF) and the Environment Agency's Flood Risk Standing Advice for information about Flood Risk Assessment (FRA) for new development in the different Flood Zones. These documents can be accessed via:

National Planning Policy Framework Planning Practice Guidance:
http://planningguidance.planningportal.gov.uk/

Environment Agency advice on FRAs:

https://www.gov.uk/flood-risk-assessment-for-planning-applications#when-to-follow-standing-advice

https://www.gov.uk/government/publications/planning-applications-assessing-flood-risk

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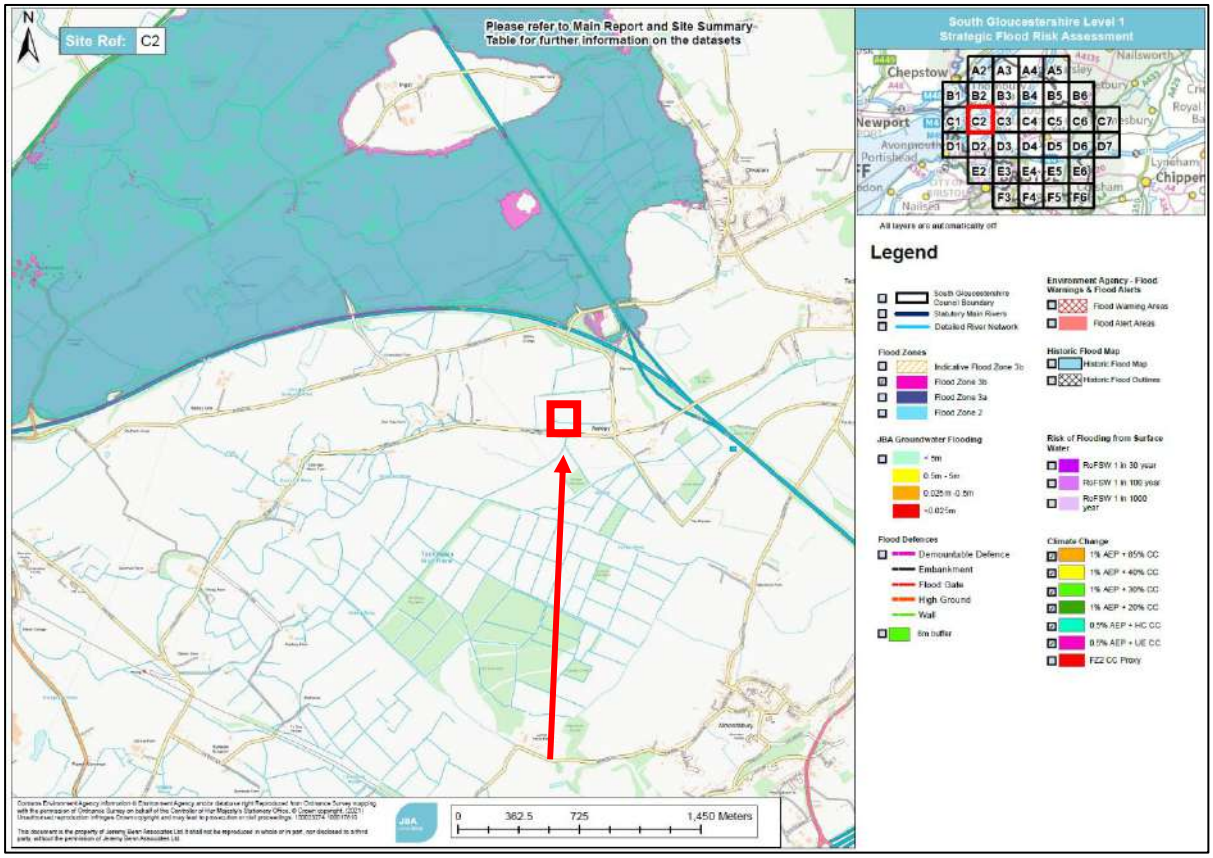
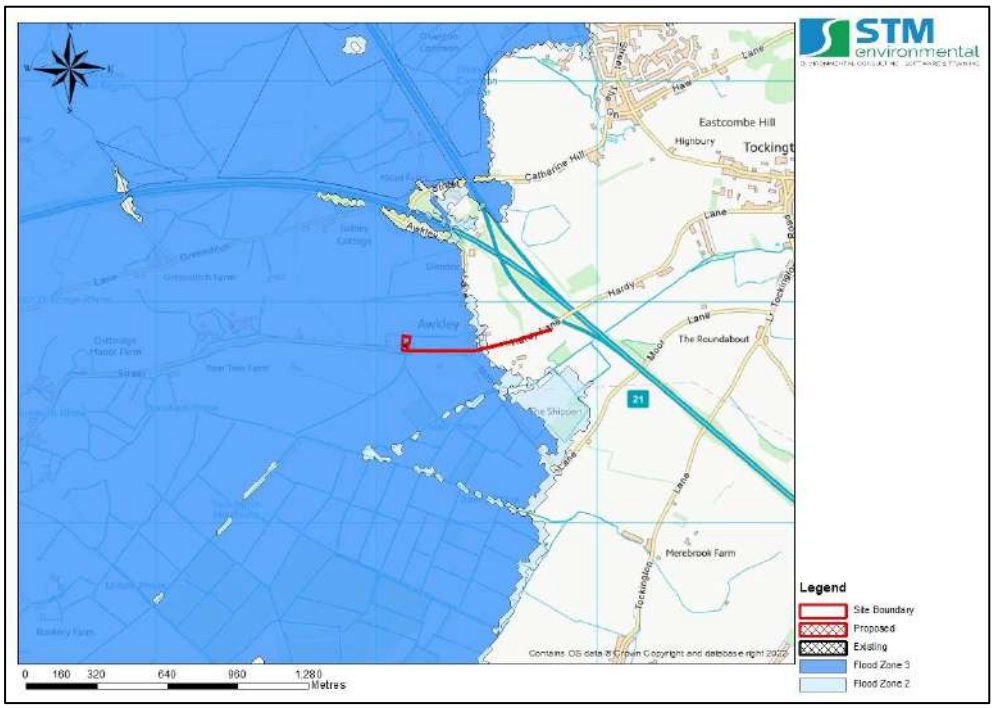
17.10.3 SFRA Level 1 South Gloucestershire 2021 Flood model mapping



17.11 Appendix 12 – Safe Egress to Flood Zone 1 Map



17.12 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”.