46 Cobhorn Drive
Bishops Worth
BS13 9DJ

51.406090 -2.619801

Flood Risk Assessment

S21-646/FRA
May 2021

Prepared by :

Southwest Environmental Limited
80-83 Long Lane
London
EC1A 9ET

On behalf of :

Coldstar Developments Limited
Unit 29
Old Mills Industrial Estate
Paulton
Bristol
BS39 7SU

46 Cobhorn Drive
Bishops Worth
BS13 9DJ

51.406090 -2.619801

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1.0 Introduction

Acting on instructions from Coldstar Developments Limited a Flood Risk Assessment is to be conducted in connection with the proposed development at 46 Cobhorn Drive. A site location plan is included within **Appendix 1**.

This FRA presents a review of the existing available flood-related information and sets out the requirements of The Planning Practice Guidance and those of the Environment Agency (EA) and the Local Planning Authority (LPA) in relation to flood risk and drainage

2.0 Scope

This FRA is prepared for the purposes of providing an indication of the site specific flood risk, and to identify whether there are any flooding or surface water management issues relating to the development site that may warrant further consideration.

The report is based on information including Strategic Flood Risk Assessments (SFRA), EA Flood Maps, and consultations with the EA and LPA. A comprehensive third party data set (EA Corporate Services Data Pack) is also used.

March 2012 saw the introduction of The Planning Practice Guidance, which contains guidance formal contained with the NPPF and TGNPPF.

3.0 Site Summary

3.1 Site Location

Site Address	46 Cobhorn Drive Bishops Worth BS13 9DJ
Grid Reference	51.406090 -2.619801
Roof Area	40m2 approx.

3.2 Proposed Development

The proposed development consist of a newly built end of terrace dwelling.

4.0 National and Local Policy

4.1 The Planning Practice Guidance Requirements

The Planning Practice Guidance (PPG) referred to in this report was issued in March 2014.

The stated aim of PPG is to ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas at highest risk.

4.1.1 Flood Risk Vulnerability

The Flood Risk Vulnerability Classification for the proposed development has been determined in accordance with Table 2 in PPG. The proposed development is classified as a '*More Vulnerable'* development.

4.1.2 Flood Risk Vulnerability and Flood Zone 'Compatibility'

Table 2 in TGPPG states that developments deemed as '*Less Vulnerable'* are appropriate for areas classified as within Flood Zone 3a. We have adopted worst case a site is within Zone 2 and Zone 3a.

For the development in Flood Zone 3a, TGPPG guidance in Table 1 states that;

> *"In this zone, 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 systems;*
> - *relocate existing development to land in zones with a lower probability of flooding; and;*
> - *create space for flooding to occur by restoring functional floodplain and flood flow pathways and by identifying, allocating and safeguarding open space for flood storage."*

4.2 Environment Agency Flood Risk Standing Advice

Environment Agency Flood Risk Standing Advice is designed to help:

- find out whether an application is lower risk
- decide when to consult EA
- determine what the consultation should contain
- understand how to make a decision on lower-risk sites
- know what information is required to make an assessment of flood risk

4.3 SFRA Principals

The SFRA includes details of policy considerations and sets out flood risk management objectives.

i) The management of Surface Water via SUDs;

> *"The management of rainfall (surface water) is considered an essential element for reducing future flood risk to both the site and it surroundings, The Environment Agency expect attenuation of runoff from development sites to be restricted to green field rates and SUDs provide an opportunity for achieving this."*

ii) Improve Flood Awareness and Emergency Planning;

> *"Flood warnings are issued using a set of four codes, each indicating the level of risk with respect to flooding."*

In addition the SFRA includes guidance for the application of SUDS for new developments, and recommends that the future ownership and management is addressed at an early stage.

5.0 Climate Change

Additional considerations incorporated on the migration of policy from PPS25 to PPG includes quantitative considerations for the effects of climate change.

> *"In preparing . . . . a site-specific flood risk assessment, the allowances for the rates of relative sea level rise shown[1]"*

The changing climate should be viewed in relation to the project's design life;

> "*Category 1 – Temporary structures, not including structures or parts of structures that can be dismantled with a view to being re-used – 10 years*
>
> *Category 3 – Agricultural and similar buildings – 15 to 30 years*
>
> *Category 4 – Building structures and other common structures – 50 years*
>
> *Category 5 – Monumental building structures, bridges and other civil engineering structures – 100 years*[2]"

5.1 Sea Level Change

FCDPAG3 - Flood and Coastal Defence Appraisal Guidance gives guidance on the application of sea level changes to projects. Forecasted rises over the project's design life are in the order of 349 mm. These projected sea level changes are accounted for in modelled data.

Table 4: Recommended contingency allowances for net sea level rises

	Net sea level rise (mm per year) relative to 1990			
	1990 to 2025	2025 to 2055	2055 to 2085	2085 to 2115
East of England, east midlands, London, south-east England (south of Flamborough Head)	4.0	8.5	12.0	15.0
South-west England	3.5	8.0	11.5	14.5
North-west England, north-east England (north of Flamborough Head)	2.5	7.0	10.0	13.0

Figure 1 - Climate Change adaption for Sea Levels

5.2 Climatic Conditions

FCDPAG3 - Flood and Coastal Defence Appraisal Guidance gives guidance on the application of climatic conditions.

[1] TGNPPF - 11
[2] BS EN 1990, Eurocode - Basis of structural design

Table 5: Recommended national precautionary sensitivity ranges for peak rainfall intensities, peak river flows, offshore wind speeds and wave heights

Parameter	1990 to 2025	2025 to 2055	2055 to 2085	2085 to 2115
Peak rainfall intensity	*+5%*	*+10%*	*+20%*	*+30%*
Peak river flow	*+10%*	*+20%*		
Offshore wind speed	*+5%*		*+10%*	
Extreme wave height	*+5%*		*+10%*	

Figure 2 - Climate Change adaption for Climate

These climatic conditions should be taken in to account in Surface Water Management features, such as attenuation tanks and SUDs. They should also be applied when considering fluvial flooding depths.

6.0 Flood Depths & Flood Zones

6.1 Strategic Flood Risk Assessment (SFRA)

Bristol City Council Flood Risk Assessment; Level 2 Strategic Flood Risk Assessment (SFRA) referred to in this report is that issued in November 2020 and is made available for public access on the Bristol City Council Website.

The SFRA includes Flood Maps based on assessment of fluvial flood risk. These maps illustrate the level of predicted flood risk both now and in the future, taking account of the likely impacts of climate change.

6.2 Flood Risk Maps

Maps in **Appendix 2** are based on the Flood Zone classifications given in TGPPG. The available maps indicate that the proposed development at Aviation Way is within. Flood Zone 3a is defined in TGPPG – Table 1.

> *"This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.."*

6.3 Flood Level Data

We have received product 4 data from the Environment Agency. Which show flood depth from the River Magalo, as:

UNDEFENDED

1% (1 in 100) AEP Fluvial Depth	0.25m
0.1% (1 in 1000) AEP Fluvial Depth	0.40m

Surface water flooding under moderate risk scenarios shows nil depth on site.

6.4 Sources of Flood Risk

It is confirmed that the site is within flood zone 2 and 3a. Flood Risk comes from fluvial and surface water; sewer flooding should also be taken in to account.

6.5 Location of Existing Flood Defences

The site is not protected by flood defences.

7.0 Surface Water Management

To account for 40m2 of additional impermeable area (roof), we have calculated a required attention volume (CIRIA 697) after 1:100 year rainfall event of 2.0m3.

This will be provided via inclusion of an over specified sub-base beneath permeably paved driveway. With a void ration of 30% and a volume of 6.0m3.

The driveway area is approx. 15m2, requiring a subbase of approx. 0.3m thickness. Down pipes from roof water should be fed to this area via surface water drains.

8.0 The Sequential Test

We have made searches within the Bristol City Council administrative boundary to search fro reasonably alternative sites.

As suggested in Bristol City Planning Practice Note, we have used criteria to assess sites as reasonably alternative, based on size, type, flood risk, and approximate value.

We have searched available land for sale commercially via right move, which lists approx. 15 local estate agents. We have also searched BCC SHLAA documents.

We did not encounter any alternative sites, and as such we consider the sequential test passed.

9.0 Exceptions Test

The development represents a "*more vulnerable"* development situated in Flood Zone 3a and as such **is not** subject to the exceptions test. See Figure 3.

Table 3: Flood risk vulnerability and flood zone 'compatibility'

Flood risk vulnerability classification (see table 2)		Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Flood zone (see table 1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	×	Exception Test required	✓
	Zone 3b functional floodplain	Exception Test required	✓	×	×	×

Key: ✓ Development is appropriate.
× Development should not be permitted.

Figure 3 - Exception Test Required?

9.1 Wider Sustainability Benefits

The construction of the building will see the addition of a new high specification energy efficient building. Energy efficiency is one of the key measures used in reducing operational CO2 emissions. CO2 emission accelerate climate change, Climate change exacerbates flooding.

The plot is also a infill plot, and as such will increase housing density. There is a direct correlation between increased housing density and decreased carbon emissions from transport.

9.2 Use of Brownfield Land

The development does occupy a previously developed site.

9.3 Flood Safety

The development is situated within Flood Zone 3a it is fair to assume that it will be at some risk from flooding. The site operators should produce and maintain a Flood Warning and Evacuation Plan, this should include a migration route in the event of flood, a convenient route to the north, as per Appendix 1. Site contractors and residents should also subscribe to EA flood warning text messaging services on 0845 988 1188. A copy of Environment Agency Guide: "What to do before, during and after a flood" should be provided to each occupant. This guidance includes details of how to take refuge on first floor of buildings during a flood.

10.0 Building Design

The 1:1000 year flood depth on site is 0.4m, we have adopted this as design flood depth. With shallow flood depth such as these it is applicable that water resistant strategy be adopted.

Water resistant materials should be utilised up to 0.4m above ground level. Cavity weeps and vents should not be installed below 0.4m.

Flood board brackets should be fitted over ground floor opening such as doorways, or patio doors, and flood boards provided, with instruction on how to use them.

Table 6.1 Flood resilience characteristics of building materials (based on laboratory testing)			
Material	Resilience characteristics*		
	Water penetration	Drying ability	Retention of pre-flood dimensions, integrity
Bricks			
Engineering bricks (Classes A and B)	Good	Good	Good
Facing bricks (pressed)	Medium	Medium	Good
Facing bricks (handmade)	Poor	Poor	Poor
Blocks			
Concrete (3.5N, 7N)	Poor	Medium	Good
Aircrete	Medium	Poor	Good
Timber board			
OSB2, 11mm thick	Medium	Poor	Poor
OSB3, 18mm thick	Medium	Poor	Poor
Gypsum plasterboard			
Gypsum Plasterboard, 9mm thick	Poor	Not assessed	Poor
Mortars			
Below d.p.c. 1:3(cement:sand)	Good	Good	Good
Above d.p.c. 1:6(cement:sand)	Good	Good	Good
* Resilience characteristics are related to the testing carried out and exclude aspects such as ability to withstand freeze/thaw cycles, cleanability and mould growth			

Figure 4 - Flood Resilience of Common Building Materials

11.0 Conclusions

The development is acceptable within the context of the current regulatory frame work.

12.0 Certification

For the avoidance of doubt, the parties hereby expressly agree that the Consultant takes no liability for and gives not warranty against actual flooding of The Client's property or damages material or personal in relation to the performance of the service.

Guidance given on building flood resistance / resilience is given as example only. Responsibility for building design / services and resulting levels of resistance resilience rests with the client and or developer.

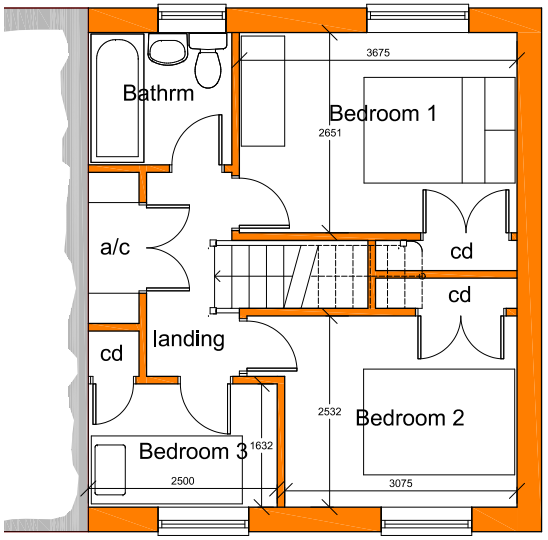
This report is produced for the sole use of the Client, and no responsibility of any kind, whether for negligence or otherwise, can be accepted for any Third Party who may rely upon it.

The conclusions and recommendations given in this report are based on our understanding of the future plans for the site.

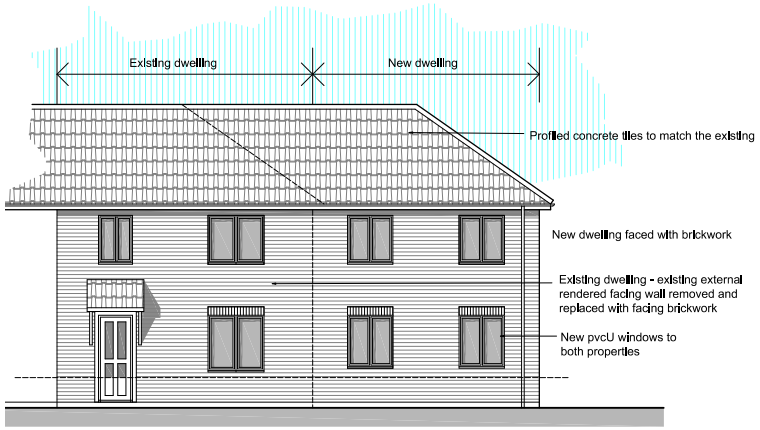
The scope of this FRA was discussed and agreed with the Client. No responsibility is accepted for conditions not encountered, which are outside of the agreed scope of work.

Appendix 1

Plans

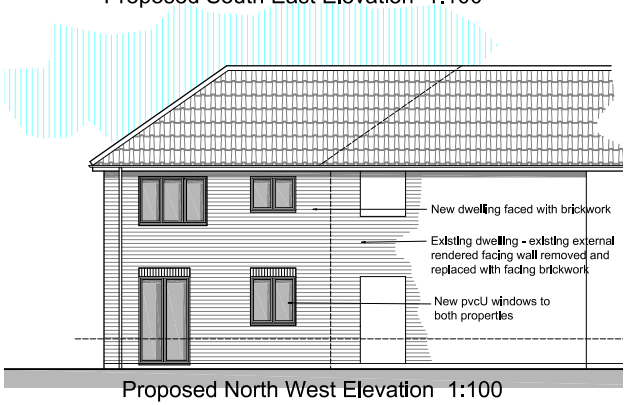


Proposed First Floor Plan 1:50



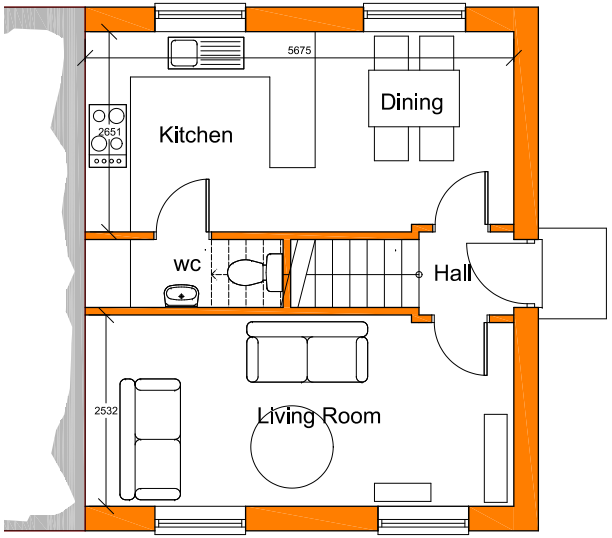
Proposed South East Elevation 1:100

Proposed North East Elevation 1:100

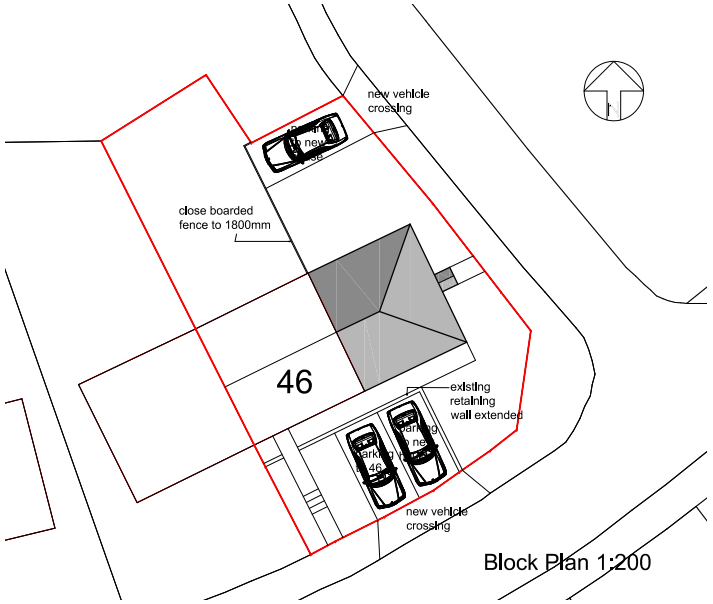


Proposed North West Elevation 1:100

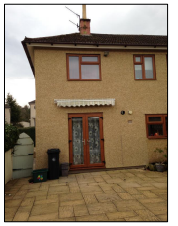
Location Plan 1:1250



Proposed Ground Floor Plan 1:50



Block Plan 1:200



Photographs as Existing

Ian Collier Architects
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Client Mr L. Bryant

Project Proposed New Dwelling on land at 46 Cobhorn Drive

Title Proposal Drawing

Scale 1:50, 1:100,1:200, 1:1250

Date March 2016

J153/01

Drawing Number

Appendix 2

Flood Data

creating a better place

Environment Agency

Will Thorpe
SW Environmental
swenviro@gmail.com

Our ref: 214250-WX
Your ref:
Date: 12 May 2021

Dear Will

Thank you for your enquiry which was received on 13 April 2021.

Abstract

Name	Product 4
Description	Detailed Flood Risk Assessment Map for **46 Cobhorn Drive, Bishopsworth, Bristol, BS13 9DW**
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 2019 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 link 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 (Rives 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 download from: https://data.gov.uk/publisher/environment-agency

Strategic Flood Risk Assessment (SFRA)

Planning
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 Levels
Fluvial flood levels and depths
The attached map contains a set of modelled fluvial flood level node locations/unique identifiers, for the main river Malago, taken from our Malago & Brislington Flood Map Improvements (2010) model. A sheet is also attached providing the associated flood levels, NGRs and further information for the river channel relating to each of these nodes. Please note that the labels annotated to the Node Location Map are unique node identifiers and not the associated flood levels.

Node type information:

- 1D_fluvial
  - In channel nodes, no 2D element to the modelling
- 2D_fluvial
  - In channel nodes, 2D data available from the modelling
- Interpolated sections
  - Calculated weighted averages of the river or conduit section properties upstream and downstream to produce a hybrid section according to the location of the interpolated section. They are used to ensure a smooth gradation or transition between cross sections to avoid sudden variations which can cause instability in a model. This may be where the distance between surveyed cross sections is large and there is a steep gradient to the channel or other distinct changes between the two sections.
- Replicate sections
  - Used to copy the preceding river or conduit section at a distance further along the reach and at a lower level. The Replicated Section is a quick method for adding a cross-section which has exactly the same dimensions as the cross-section immediately upstream.
- Reservoir
  - Modelled measurements outside the boundary of the river channel

Interpolated and Replicate sections are not surveyed sections, however they are based on surveyed section data and the results from them can be used as long as their limitations are understood.

Please be aware that this model did not include data for climate change allowances or contain any level information.

If you intend undertaking a FRA for a planning application, you should consider whether it is appropriate in light of a range of potential allowances for fluvial flood flow now advised in curent planning guidance on 'Flood risk assessments: climate change allowances'. The relevant guidance is available at the following website address: https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

Customer & Engagement, Wessex
Rivers House, East Quay, Bridgwater, Somerset, TA6 4YS
Phone: 02030 250 376
Email: wessexenquiries@environment-agency.gov.uk
www.environment-agency.gov.uk

We have included a briefing note that refers to the 2018 Climate Change projections. Our Sustainable places team would be happy to discuss the issues around Climate Change and how this should be used.

Please see the table below for maximum 2D depth and level information for your site for a range of return periods. Please note that the maximum flood depths include all low points within your site of interest, which include watercourses, ditches, rhynes and low ground spots.

UNDEFENDED

1% (1 in 100) AEP Fluvial Depth	0.25m
0.1% (1 in 1000) AEP Fluvial Depth	0.40m

The modelled extent of the River Malago is from upstream at ST 57239 69009 to downstream at ST 57371 68610.

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

Flood Defences
Please find enclosed details of Flood Defences within the vicinity of the site boundary. This information has been taken from our Asset Information Management System database(AIMS).

Please note that flood defences can increase water levels elsewhere eg through channels being restricted by defences, or because defences prevent flood water flowing back into the river channel.

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, on 01179 223206, or by email, flood.data@bristol.gov.uk , at Bristol City Council, City Hall, PO Box 3399, Bristol BS1 9NE. For an interactive webmap showing flood risk information in Bristol please visit http://maps.bristol.gov.uk/bfrm/ as they may be able to provide further advice with respect to localised flooding and drainage issues.

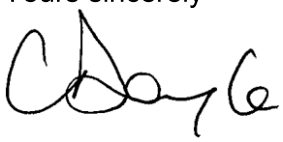
Further details about the Environment Agency information supplied can be found on our website:
https://www.gov.uk/browse/environment-countryside/flooding-extreme-weather

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

Customer & Engagement, Wessex
Rivers House, East Quay, Bridgwater, Somerset, TA6 4YS
Phone: 02030 250 376
Email: wessexenquiries@environment-agency.gov.uk
www.environment-agency.gov.uk

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

Yours sincerely



Chris Doyle
Customer & Engagement, Wessex
Rivers House, East Quay, Bridgwater, Somerset, TA6 4YS
Email: wessexenquiries@environment-agency.gov.uk
Telephone number: 03708 506 506

Enc: Use of Environment Agency Information for Flood Risk Assessments (below)
UKCP18 Climate Change Briefing Note
214250-WX Node Location Map
214250-WX Node Data
214250-WX Defence Map
214250-WX Defence Data

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:

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Email: wessexenquiries@environment-agency.gov.uk
www.environment-agency.gov.uk

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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