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Flood risk, water and environment

## Flood Risk Assessment AEG02760\_PR26\_Croston\_01

Site Address: 15 Riverside Crescent

Croston

PR26 9RU

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

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Flood risk, water and environment

# Document Issue Record

**Project:** Flood Risk Assessment

**Prepared for:** Colin Harper-Penman

**Reference:** AEG02760\_PR26\_Croston\_01

**Site Location:** 15 Riverside Crescent, Croston, PR26 9RU

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# Summary

Development Description	Existing	Proposed
<b>Development Type</b>	A residential dwelling	Construction of a rear and side extension to the existing dwelling and construction of a standalone studio room within the site curtilage.
<b>EA Vulnerability Classification</b>	More Vulnerable	More Vulnerable
<b>Ground Levels</b>	Based on 1m LiDAR, levels vary between approximately 6.87m AOD and 7.63m AOD across the site	FFLs are to be set no lower than those of the existing ground floor level in accordance with the EA's standing advice for minor extensions
<b>Level of Sleeping Accommodation</b>	First Floor	No change
<b>Surface Water Drainage</b>	N/A <sup>1</sup>	Runoff to be discharged via the existing system. Small scale SuDS such as rainwater planters and water butts could be installed in outdoor areas to provide betterment
<b>Site Size</b>	Approximately 400m <sup>2</sup>	No change
<b>Risk to Development</b>	<b>Summary</b>	<b>Comment</b>
<b>EA Flood Zone</b>	Flood Zones 3	
<b>Flood Source</b>	Fluvial	River Yarrow
<b>SFRA Available</b>	Yes – Central Lancashire Strategic Flood Risk Assessment (2007)	
<b>Management Measures</b>	<b>Summary</b>	<b>Comment</b>
<b>Ground floor level above extreme flood levels</b>	No	FFLs are to be set no lower than those of the existing ground floor level in accordance with the EA's standing advice for minor extensions
<b>Safe Access/Egress Route</b>	N/A <sup>2</sup>	The proposal is for extension to existing dwelling and thus access/ egress

<b>Flood Resilient Design</b>		arrangements should not differ from existing scenario.
	Recommended	The proposed developments are not affected by flooding in the defended modelled 1.0%AEP+35%CC event (design event). As such, the risk is considered to be low and mitigation measures are not required.
	N/A <sup>1</sup>	Runoff to be discharged via the existing system. Small scale SuDS such as rainwater planters and water butts could be installed in outdoor areas to provide betterment
<b>Site Drainage Plan</b>	N/A <sup>1</sup>	Runoff to be discharged via the existing system. Small scale SuDS such as rainwater planters and water butts could be installed in outdoor areas to provide betterment
<b>Flood Warning &amp; Evacuation Plan</b>	Recommended	Sign up to the River Yarrow at Croston, between the railway and Home Farm Mews EA flood warning service
<b>Offsite Impacts</b>	<b>Summary</b>	<b>Comment</b>
<b>Displacement of floodwater</b>	Negligible	The proposed development is considered to be a minor development and as such should have a negligible impact on flood risk elsewhere in accordance with paragraph 051 of the PPG.
<b>Increase in surface run-off generation</b>	N/A <sup>1</sup>	Runoff to be discharged via the existing system. Small scale SuDS such as rainwater planters and water butts could be installed in outdoor areas to provide betterment
<b>Impact on hydraulic performance of channels</b>	Negligible	Proposed development located approximately 15m southwest of the EA main river

<sup>1</sup> not required for this assessment. <sup>2</sup> data not available.



# 1. Introduction

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

## Site Overview

- 1.3. The site of the proposed development is 15 Riverside Crescent, Croston, PR26 9RU (Figure 1). It is understood that the proposed development is for the construction of a rear and side extension to the existing dwelling and construction of a standalone studio room within the site curtilage. A full copy of the proposed developments can be found in Appendix A.

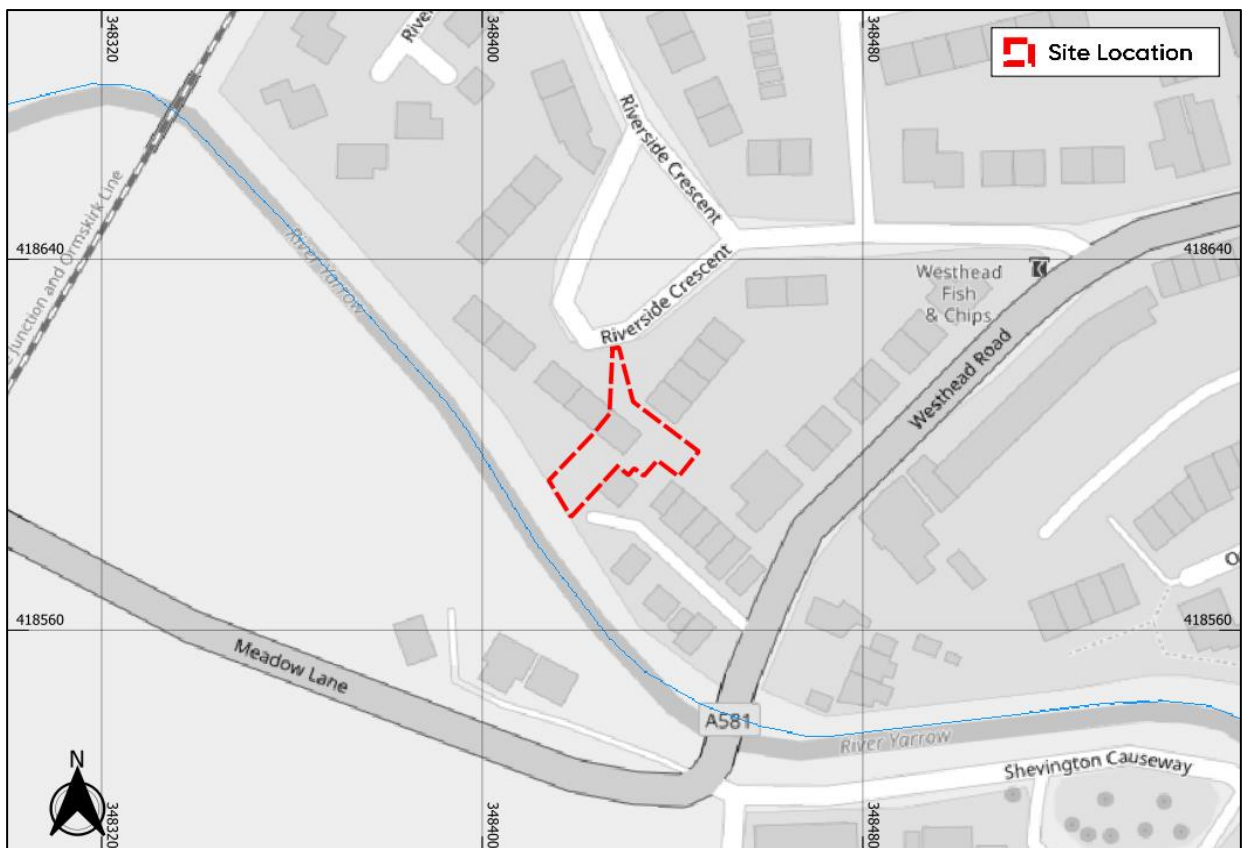


Figure 1: Site Location (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors)

- 1.4. In the absence of a topographical survey, Environment Agency Light Detection and Ranging (LiDAR) data Digital Terrain Model has been used to review the topography of the site (Figure 2). The LiDAR data shows that the ground elevations of the site vary between approximately 6.87 metres Above Ordnance Datum (m AOD) and 7.63m AOD (1m LiDAR data), with the site generally shown to slope toward the southwest and the watercourse channel located to the rear of the property.
- 1.5. At the location of the proposed extension, levels vary between approximately 7.30m AOD and 7.42m AOD, whilst at the location of the proposed studio room levels vary between approximately 7.17m AOD and 7.29m AOD.

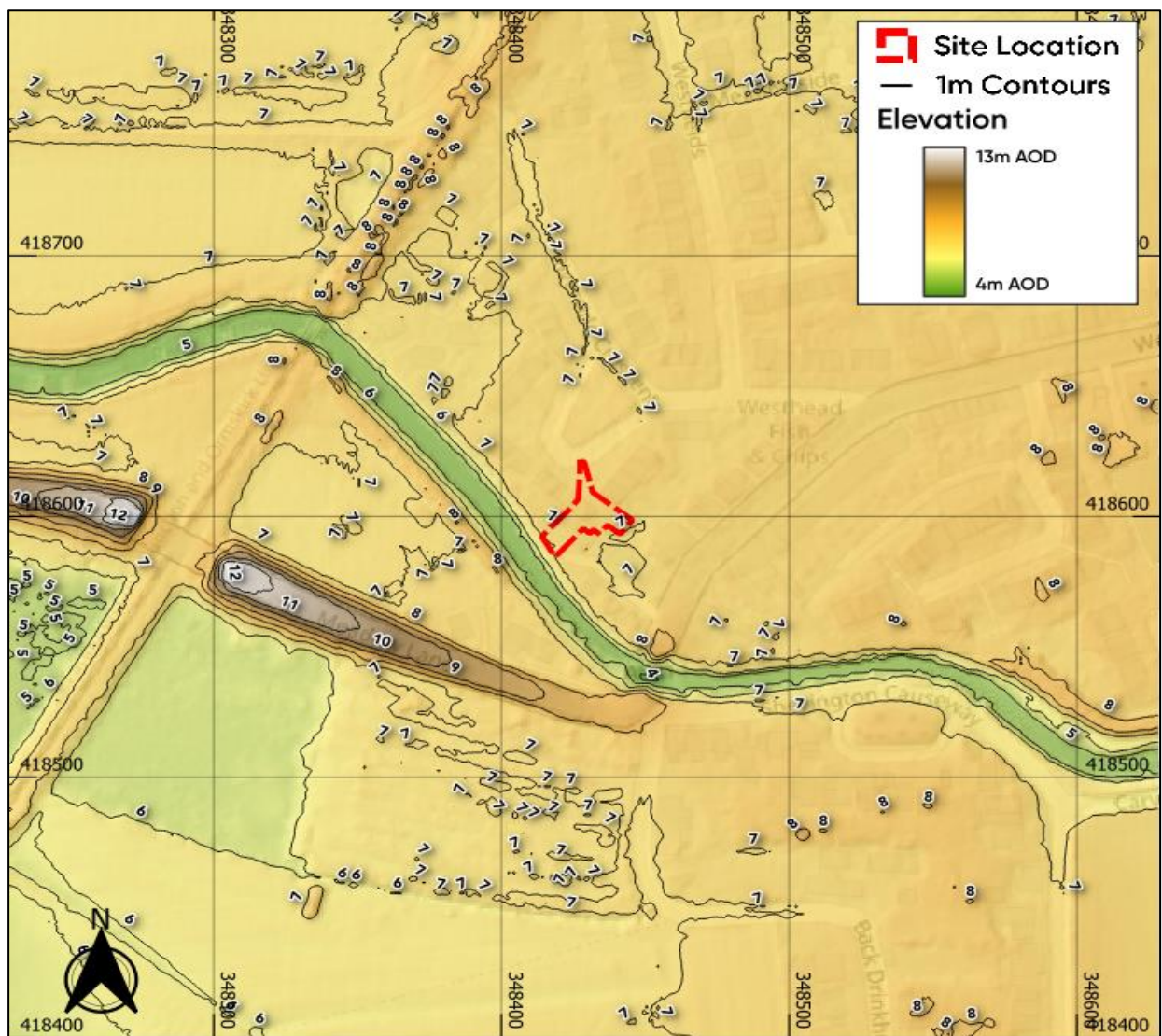


Figure 2: Site Topography (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors. Contains public sector information licensed under the Open Government Licence v3.0)



1.6. Chorley Council is the Local Planning Authority (LPA) for the site and is the designated Lead Local Flood Authority (LLFA). The site sits within the Environment Agency's Cumbria and Lancashire region.

## Planning Policy and Guidance

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

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

1.8. The site is located within Flood Zone 3. According to NPPF Footnote 55 an FRA is required.

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

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

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

## 2. Planning Policy

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

### National Planning Policy Framework (NPPF)

2.2. The National Planning Policy Framework<sup>2</sup> (NPPF) (DLUHC, 2021) which includes UK Government policy on development and flood risk states:

*“159. 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.*

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

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

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<sup>2</sup> <https://www.gov.uk/guidance/national-planning-policy-framework>, last updated July 2021

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

*168. Applications for some minor development and changes of use should not be subject to the sequential or exception tests but should still meet the requirements for site-specific flood risk assessments set out in footnote 55. "*

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

*Minor development means:*

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

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

2.5. Footnote 55 of the NPPF states:

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

2.6. Flood Zones in England are defined as follows:

Table 1: Flood Zone Definitions

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

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

## Local Planning Policy

- 2.9. The Local Plan prepared by the Local Planning Authority, Chorley Council, sets out the policies for development in the local area. The proposed site lies under the jurisdiction of this LPA and therefore will be required to adhere to the local plan policies. The Local Plan (2015)<sup>3</sup> document states the following in relation to flood risk management;

*'Managing Flood Risk*

*This Local Plan contributes to adapting to the effects of climate change, which includes increased summer temperatures and a higher risk of flooding or droughts, by directing development away from areas of high flood risk. Research has shown that, whilst flood risk is generally low in Central Lancashire, parts of Croston are at higher risk. The Core Strategy does not therefore encourage development in Croston or any other high flood risk areas.*

*There is also a risk of sewer flooding in areas of Euxton. This has been taken into account in deciding the amount of land allocated for development in the locality.'*

- 2.10. The Local Plan also refers to the Central Lancashire Core Strategy document<sup>4</sup> (2012) which is used to guide planning decisions within the Chorley District. This document sets out the vision, objectives and spatial strategy for Central Lancashire to 2026. The core strategy contains the following policy on water management within the county;

*Policy 29: Water Management*

*Improve water quality, water management and reduce the risk of flooding by:*

*(a) Minimising the use of potable mains water in new developments;*

*(b) Working with the regional water company and other partners to promote investment in sewage water treatment works to reduce the risk of river pollution from sewage discharges;*

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<sup>3</sup> [https://chorley.gov.uk/media/592/Chorley-Local-Plan-2012-2026-adopted-2015/pdf/Adopted\\_Chorley\\_Local\\_Plan\\_July\\_2015.pdf?m=637384447869670000](https://chorley.gov.uk/media/592/Chorley-Local-Plan-2012-2026-adopted-2015/pdf/Adopted_Chorley_Local_Plan_July_2015.pdf?m=637384447869670000)

<sup>4</sup> <https://centrallocalplan.lancashire.gov.uk/media/1032/central-lancashire-core-strategy-july-2012-v1.pdf>



*(c) Working with farmers to reduce run-off polluted with agricultural residues into watercourses;*

*(d) Appraising, managing and reducing flood risk in all new developments, avoiding inappropriate development in flood risk areas particularly in Croston, Penwortham, Walton-le-Dale and southwest Preston;*

*(e) Pursuing opportunities to improve the sewer infrastructure, particularly in Grimsargh, Walton-le-Dale and Euxton, due to the risk of sewer flooding;*

*(f) Managing the capacity and timing of development to avoid exceeding sewer infrastructure capacity;*

*(g) Encouraging the adoption of Sustainable Drainage Systems;*

*(h) Seeking to maximise the potential of Green Infrastructure to contribute to flood relief.*

- 2.11. Point (d) of the document, highlighted above, mentions the importance of managing flood risk in all new developments, with particular mention to Croston.

## Sequential and Exception Tests

- 2.12. The Sequential and Exception Tests are applied in specific cases defined by UK Government policy. Their purpose is to drive development to areas of low flood risk and to support developments which improve flood risk for developments in areas at risk of flooding.
- 2.13. Under the NPPF all new planning applications should undergo a Sequential Test unless a Minor Development or a change of use application in accordance with paragraph 168 and footnotes 55 and 56. This test should be implemented by local planning authorities with a view to location particularly vulnerable new developments outside of the flood plain.
- 2.14. Paragraph 168 of the 2021 NPPF states that:

*'168. Applications for some Minor Development and changes of use should not be subject to the sequential or exception tests but should still meet the requirements for site-specific flood risk assessments set out in footnote 55.'*

- 2.15. It is understood that the proposed development is for the construction of a rear and side extension to the existing dwelling and construction of a standalone studio room within the site curtilage. As such, the development could be considered a Minor Development and therefore

exempt from the exception or sequential test and exception test but should still meet the requirement for the site-specific flood risk assessments.

## Summary

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

## 3. Consultation and Review

### Consultation

3.1. The site is located within the Environment Agency's Cumbria and Lancashire region. Detailed modelling data was requested from the EA on 28<sup>th</sup> June 2023. In response, the EA provided Product 4 data from the Croston 2017 model relating to the site. This information will be used in Section 4 of this report in order to determine the flood risk to the site. A full copy of the Product 4 information will be provided in Appendix B of this report.

### Documents and Online Mapping

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

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

- Flood Map for Planning on the Environment Agency website <https://flood-map-for-planning.service.gov.uk/>
- Long Term Flood Risk Information on the Environment Agency website <https://www.gov.uk/check-long-term-flood-risk>
- National Planning Policy Framework (NPPF) (Department for Levelling Up, Housing and Communities, 2021)
- Planning Practice Guidance - Flood Risk and Coastal Change (Department for Levelling Up, Housing and Communities, 2022)
- Geoindex Onshore (British Geological Survey, 2022)

- Central Lancashire Adopted Core Strategy Local Development Framework<sup>5</sup> (Central Lancashire Authorities, 2012)
- Chorley Local Plan<sup>6</sup> (Chorley Council, 2015)
- Lancashire Preliminary Flood Risk Assessment<sup>7</sup> (PFRA), (2011)
- Central Lancashire Strategic Flood Risk Assessment<sup>8</sup> (SFRA), (2007)
- Local Flood Risk Management Strategy (LFRMS) for Lancashire<sup>9</sup> 2021-2027 (2021)

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

- 3.4. The PFRA, published in 2011, is a high-level appraisal of flood risk across Lead Local Flood Authority. The flood risk from all sources, including fluvial, surface water, groundwater and surcharged sewers is evaluated. It is the basis upon which the Local Flood Risk Management Strategy is produced.
- 3.5. The PFRA summarises historical flood incidents in Lancashire County Council.

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

- 3.6. The SFRA, published in 2007, provides the evidence base for the Local Planning Authority Chorley Council Local Plan and guidance for consideration when determining planning applications.

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<sup>5</sup> [https://www.preston.gov.uk/media/974/Adopted-Core-Strategy-Part-1/pdf/Adopted-Core-Strategy-July-2012-Part-1\\_1.pdf?m=636941232688970000#:~:text=The%20Core%20Strategy%20is%20a%20key%20document%20in,document%20and%20will%20encourage%20sustainable%20managed%20growth%2C%20whilst](https://www.preston.gov.uk/media/974/Adopted-Core-Strategy-Part-1/pdf/Adopted-Core-Strategy-July-2012-Part-1_1.pdf?m=636941232688970000#:~:text=The%20Core%20Strategy%20is%20a%20key%20document%20in,document%20and%20will%20encourage%20sustainable%20managed%20growth%2C%20whilst)

<sup>6</sup> [https://chorley.gov.uk/media/592/Chorley-Local-Plan-2012-2026-adopted-2015/pdf/Adopted\\_Chorley\\_Local\\_Plan\\_July\\_2015.pdf?m=637384447869670000](https://chorley.gov.uk/media/592/Chorley-Local-Plan-2012-2026-adopted-2015/pdf/Adopted_Chorley_Local_Plan_July_2015.pdf?m=637384447869670000)

<sup>7</sup> [https://webarchive.nationalarchives.gov.uk/ukgwa/20140328164233mp\\_/http://cdn.environment-agency.gov.uk/flho1211bvt-n-e-e.pdf](https://webarchive.nationalarchives.gov.uk/ukgwa/20140328164233mp_/http://cdn.environment-agency.gov.uk/flho1211bvt-n-e-e.pdf)

<sup>8</sup> [https://chorley.gov.uk/media/625/Central-Lancashire-Strategic-Flood-Risk-Assessment-2007/pdf/Strategic\\_Flood\\_Risk\\_Assessment\\_v1.pdf?m=637384552746000000&ccp=true#cookie-consent-prompt](https://chorley.gov.uk/media/625/Central-Lancashire-Strategic-Flood-Risk-Assessment-2007/pdf/Strategic_Flood_Risk_Assessment_v1.pdf?m=637384552746000000&ccp=true#cookie-consent-prompt)

<sup>9</sup> <https://www.lancashire.gov.uk/media/928565/lancashire-flood-risk-management-strategy-2021-2027-final-v2.pdf>

- 3.7. The SFRA seeks to place new development into areas of lower flood risk taking into account current flood risk, future flood risk, and the effect a proposed development would have on the risk of flooding.
- 3.8. The SFRA mapping provided by Chorley Council has been used throughout production of this report as a source of information, particularly pertaining to historical flood incidents.

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

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



## 4. Sources of Flood Risk

### Fluvial

- 4.1. Flooding from watercourses arises when flows exceed the capacity of the channel, or where a restrictive structure is encountered, resulting in water overtopping the banks into the floodplain.

#### Main Rivers and Ordinary Watercourses

- 4.2. The nearest EA main river to the proposed development is the River Yarrow located directly to the southwest of the site boundary.
- 4.3. There are no other ordinary watercourses within the vicinity of the site.

#### Historical Fluvial Flooding

- 4.4. The EA Recorded and Historical Flood Outlines show that the site lies within the extent of a recorded flood events (Figure 3). The event was recorded in August 1987 with the flood source stated as the River Yarrow.

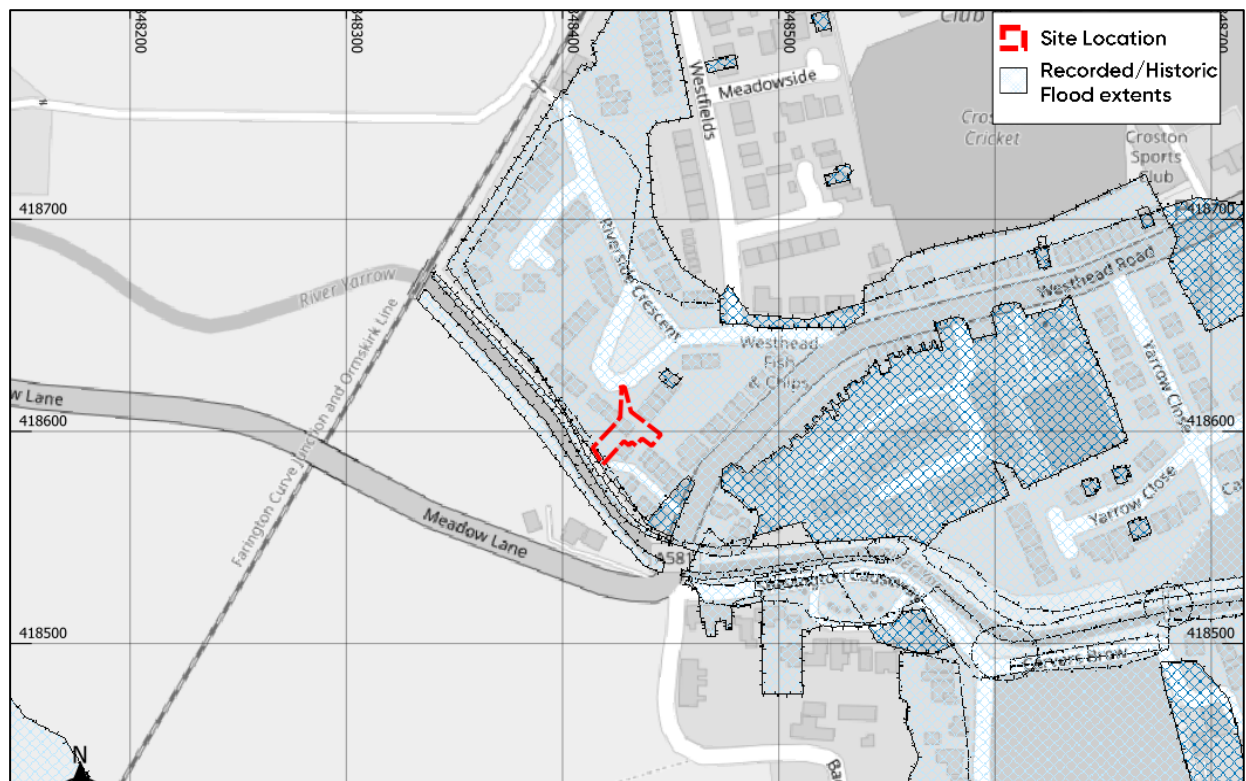


Figure 3: EA Historic Flood Mapping (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors. Contains public sector information licensed under the Open Government)

## EA Flood Map for Planning

- 4.5. The site is located wholly within Flood Zones 3 (Figure 4). Flood Zone 3 denotes a risk of flooding from fluvial sources greater than 1 in 100 (1%). It is understood that the Flood Zone at the site location is derived from fluvial models.

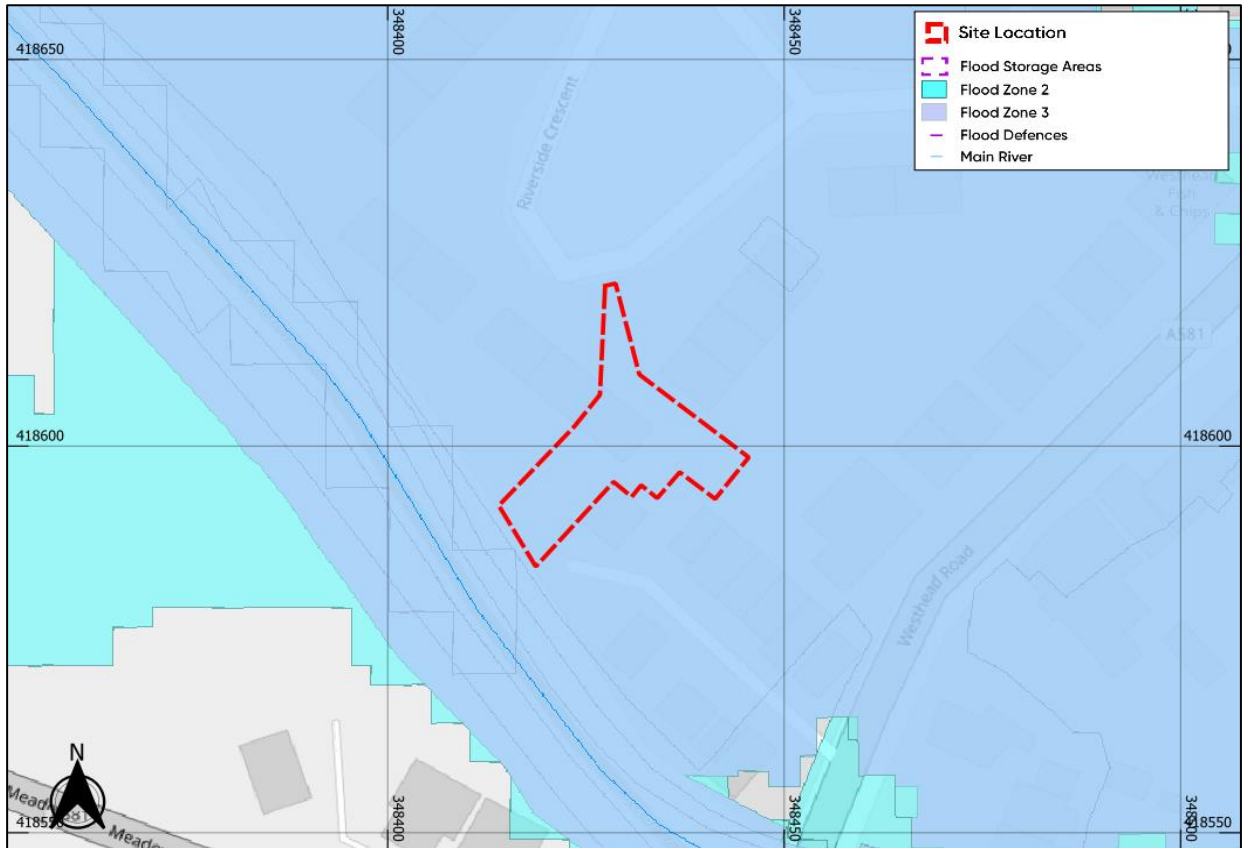


Figure 4: EA Flood Map for Planning (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors. Contains public sector information licensed under the Open Government Licence v3.0)

## Flood Defence Infrastructure

- 4.6. The site is also shown to lie within an area noted as benefitting from a 'Reduction in risk of flooding from rivers and sea due to defences' (previously called 'Areas benefiting from flood defences').

4.7. Details from the EA's Asset Management website<sup>10</sup> provides details on the flood defences infrastructure serving the site location. There is shown to be a flood wall directly to the rear of the site boundary with an effective crest height of 7.43m AOD. There is also shown to be a flood wall upstream of the site on the nearside riverbank with an effective crest height of 8.09m AOD (Figure 5).

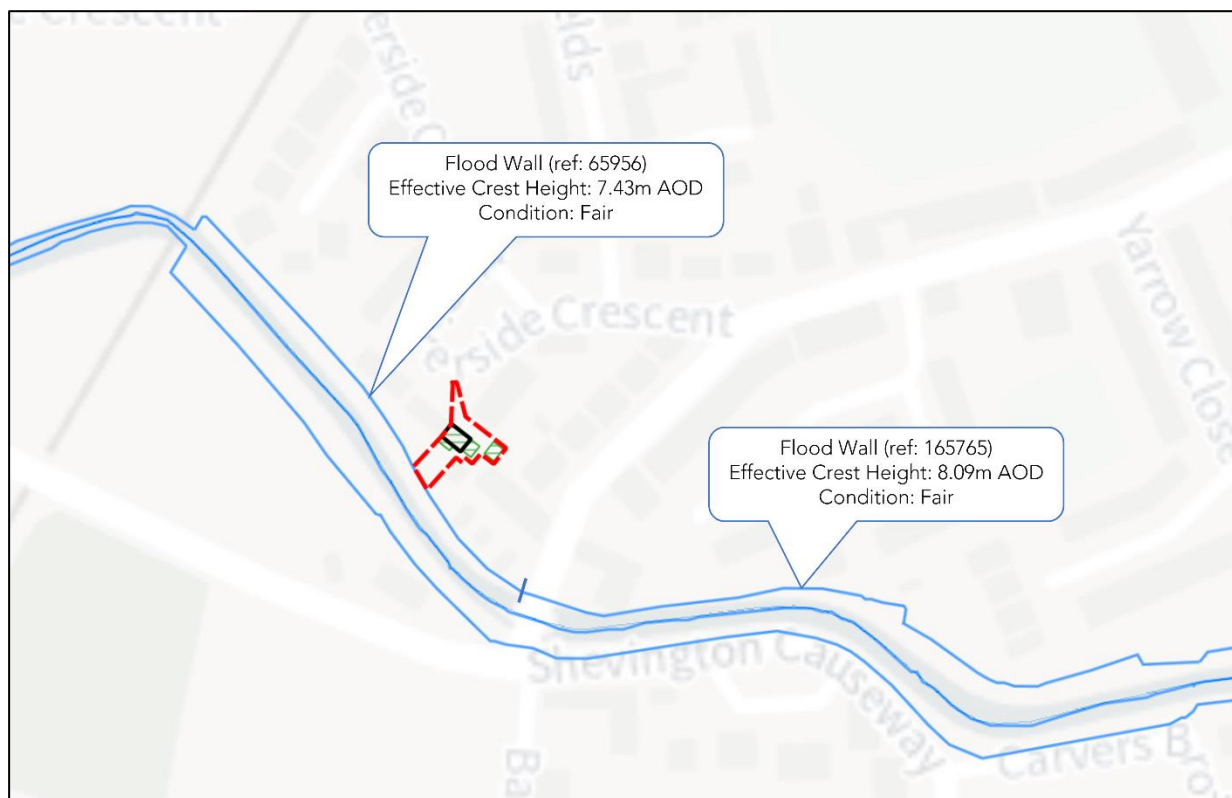


Figure 5: Flood Defences Serving the Site (EA Asset Management Tool, Accessed May 2023) (Site boundary shown in Red Line)

## Climate Change

4.8. The site is located within the Douglas Management Catchment, which has updated central peak flow river allowances of: 12% for the 2020s, 19% for the 2050s, and 35% for the 2080s. As the development is an extension to the residential property, the peak flow allowance of 35% for the 2080s would be required for fluvial flood flows.

<sup>10</sup> <https://environment.data.gov.uk/asset-management/index.html?element=http%3A%2F%2Fenvironment.data.gov.uk%2Fasset-management%2Fid%2Fasset%2F65956&layer=all-assets>

## EA Product 4 Data - Croston 2017 model

- 4.9. The EA have provided detailed modelling results for the site location in the form of Product 4 information extracted from the Croston 2017 model. The data included several maps and tables/datasets providing both flood levels and extents. Various return periods have been provided. The results have been used to determine the fluvial flood risk to the site.
- 4.10. Note that the flood levels data used are based on the nearest (approximately 24m west of the site) 1D level from Node Point YAR 01977.
- 4.11. Within the EA Product 4 data provided, a +35% climate change scenario was not provided. However, +20% event was given. However, based on an estimate calculation, a +35% CC was calculated as follows:

1.0%AEP flood level is 6.78m AOD

1.0%AEP+ 20%CC flood level is 6.96m AOD

that means 20% increase in flow = 0.18m increase in flood level

1% increase in flow (so 20% / 20) = 0.18m / 20 = 0.009m

35% increase in flow (0.009m x 35) = 0.315m

1.0%AEP flood level of 6.78m AOD + 35% (0.315m) = 7.10m AOD (rounded)

- 4.12. Figure 6 shows the proposed development lies within the extent of the defended modelled 0.1%AEP events.



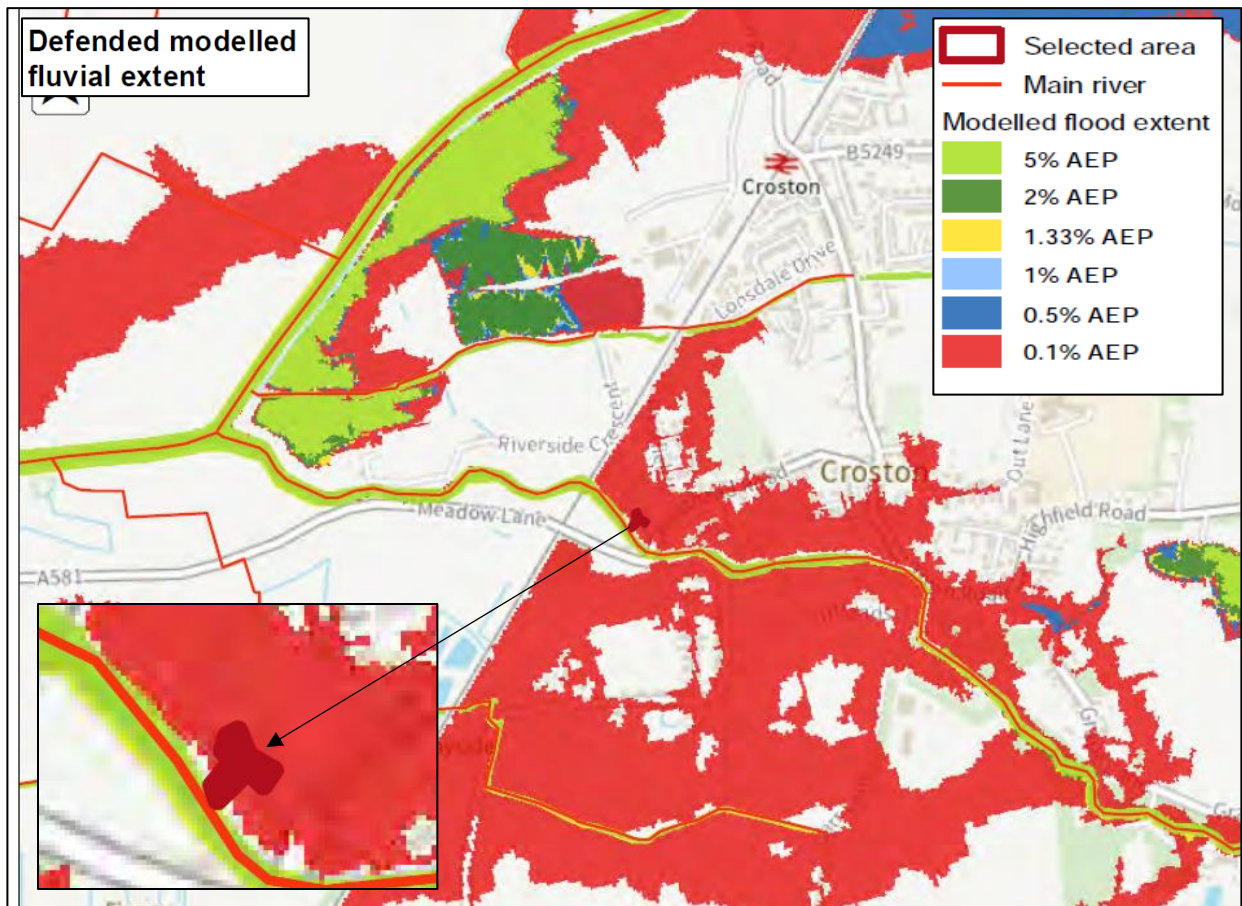


Figure 6: EA Product 4 – Croston 2017 model Outputs, defended events. Proposed Development located in red footprint.

- 4.13. The proposed development is benefiting from the presence of the defences (Figure 5), and thus the defended scenarios are considered more representative of the actual risk scenario. The defended scenario data indicates that the site would remain unaffected in the modelled 2.0%AEP event, and thus the site is not considered to be in Flood Zone 3b.
- 4.14. In the defended modelled 0.1%AEP event the maximum modelled flood level is 7.51m AOD (Figure 7). Based on the EA LiDAR topography, the lowest ground level at the location of the proposed extension is 7.30m AOD. As such, the proposed extension could experience flood depths of up to 0.21m in the defended modelled 0.1%AEP event.
- 4.15. Furthermore, the lowest ground level at the proposed studio room is 7.17m AOD, as such, the proposed studio room could experience flood depths of up to 0.34m in the defended modelled 0.1%AEP event.



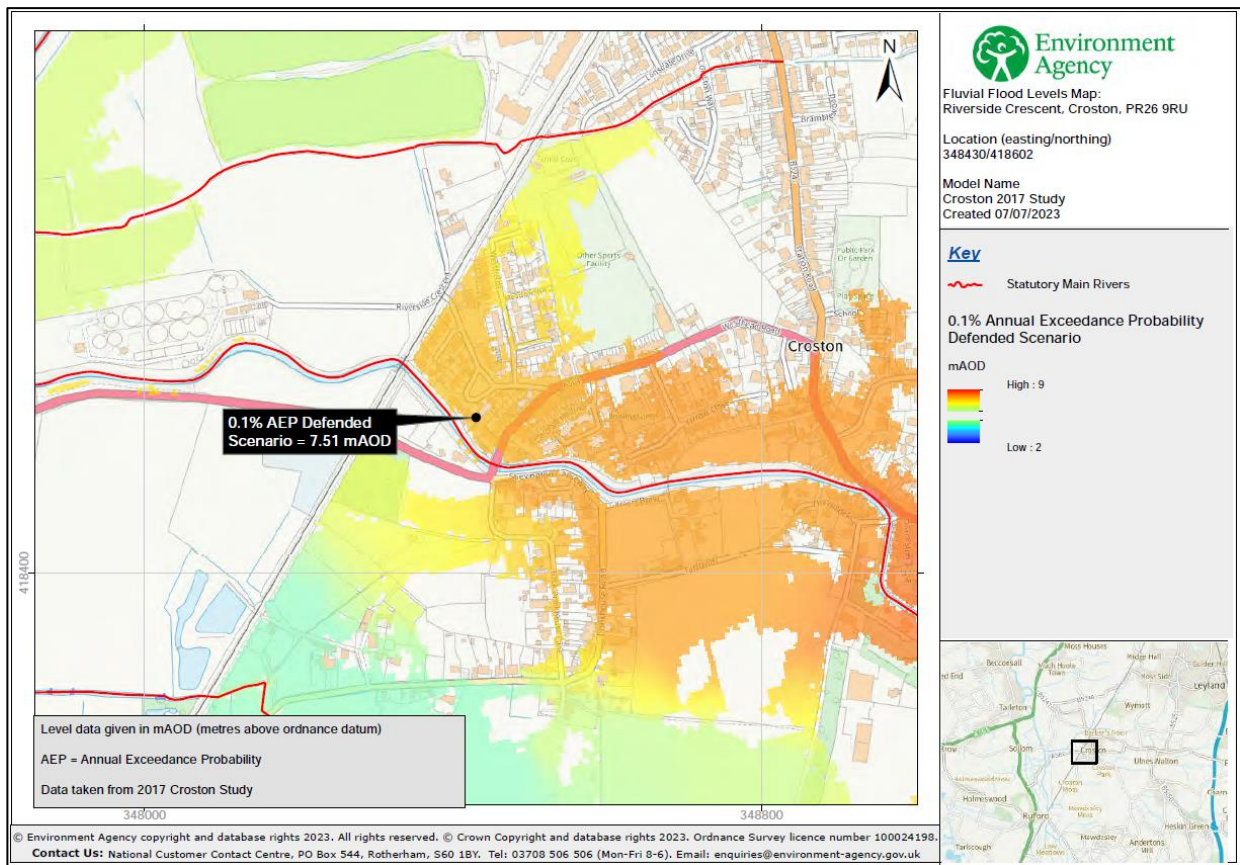


Figure 7: EA Product 4 – Croston 2017 model Outputs, defended 0.1%AEP flood level. Proposed Development located in red footprint.

- 4.16. Based on the estimated calculation presented in section 4.11, in the defended modelled 1.0%AEP+35%CC event, the estimated maximum flood level is 7.10m AOD. Based on the EA LiDAR topography, the lowest ground level at the location of the proposed extension is 7.30m AOD. This implies the ground levels are above the flood levels. As such the proposed extension remains unaffected by flooding in this event.
- 4.17. Furthermore, the lowest ground level at the proposed studio room is 7.17m AOD. This implies the ground levels are also above the flood levels. As such the proposed studio room remains unaffected by flooding in this event.

## Fluvial Flood Risk Summary

- 4.18. Based on the information above, the proposed development is considered to be at a moderate to high risk of fluvial flooding. However, based on an estimate calculation from EA Product 4 data, the proposed extension and proposed studio room are not affected in the defended modelled 1.0%AEP+35%CC event (design event). As such, the risk is considered to be low.

## Tidal

- 4.19. Tidal flooding occurs when a high tide and high winds combine to elevate sea levels. An area behind coastal flood defences can still flood if waves overtop the defences or break through them. Tidal flooding can also occur a long way from the coast by raising river levels. Water may overtop the riverbank or river defences when tide levels are high.
- 4.20. The site is a significant distance from any tidal source and above the anticipated extreme tidal levels, even when considering the impacts of climate change. The risk of flooding from tidal sources is low.

## Canals

- 4.21. The Canal and River Trust (CRT) generally maintains canal levels using reservoirs, feeders and boreholes and manages water levels by transferring it within the canal system.
- 4.22. Water in a canal is typically maintained at predetermined levels by control weirs. When rainfall or other water enters the canal, the water level rises and flows out over the weir. If the level continues rising it will reach the level of the storm weirs. The control weirs and storm weirs are normally designed to take the water that legally enters the canal under normal conditions. However, it is possible for unexpected water to enter the canal or for the weirs to become obstructed. In such instances the increased water levels could result in water overtopping the towpath and flowing onto the surrounding land.
- 4.23. Flooding can also occur where a canal is impounded above surrounding ground levels and the retaining structure fails.
- 4.24. The nearest canal to the proposed development is located at a distance of greater than 1km. Therefore, the site is considered to be at a low risk of canal flooding.

## Pluvial

- 4.25. Pluvial flooding can occur during prolonged or intense storm events when the infiltration potential of soils, or the capacity of drainage infrastructure is overwhelmed leading to the accumulation of surface water and the generation of overland flow routes.
- 4.26. Annual surface water flood risk is labelled by the EA as:
- 'High Risk'; >3.3% AEP (annual probability greater than 1 in 30).
  - 'Medium Risk'; 1.1% to 3.3% AEP (annual probability between 1 in 100 and 1 in 30).
  - 'Low Risk'; 0.1% to 1% AEP (annual probability between 1 in 1000 and 1 in 100).
  - 'Very Low Risk'; <0.1% AEP (annual probability less than 1 in 1000).
- 4.27. Examination of the EA's Flood Risk from Surface Water mapping (Figure 8) for High Risk, Medium Risk, and Low Risk AEP flood events shows the site boundary remains unaffected in each of the modelled surface water flood events.
- 4.28. Riverside Crescent to the north of the site is shown to be affected in each of the modelled Medium Risk and Low Risk surface water flood events.

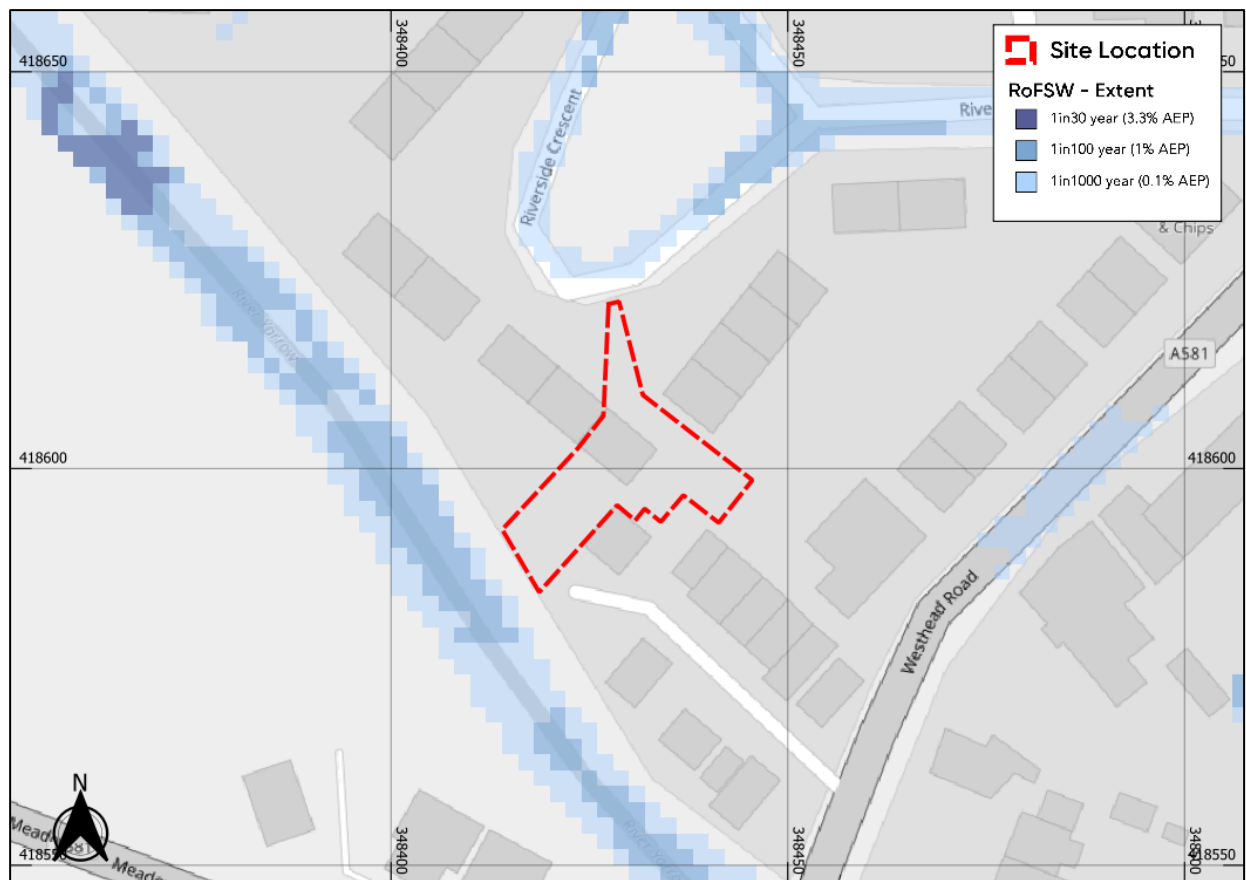


Figure 8: EA Surface Water Flood Risk Mapping (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors. Contains public sector information licensed under the Open Government Licence v3.0)

- 4.29. The Risk of Flooding from Surface Water (RoFSW) datasets provided by Defra have also been used to determine the pluvial flood risk to the site.
- 4.30. In the modelled 1.0%AEP event (Figure 9), the site is shown to remain unaffected by surface water flooding. Riverside Crescent to the north of the site is shown to be affected, with flood depths up to 300mm.
- 4.31. The EA hazard rating denoted to the flood extent on Riverside Crescent is shown to be 'Low'. As such, it is understood that safe access/egress from the site should be possible in the modelled 1.0%AEP event. Although, given that the proposed development is considered a Minor Development, access/egress arrangement should remain as per the existing scenario.

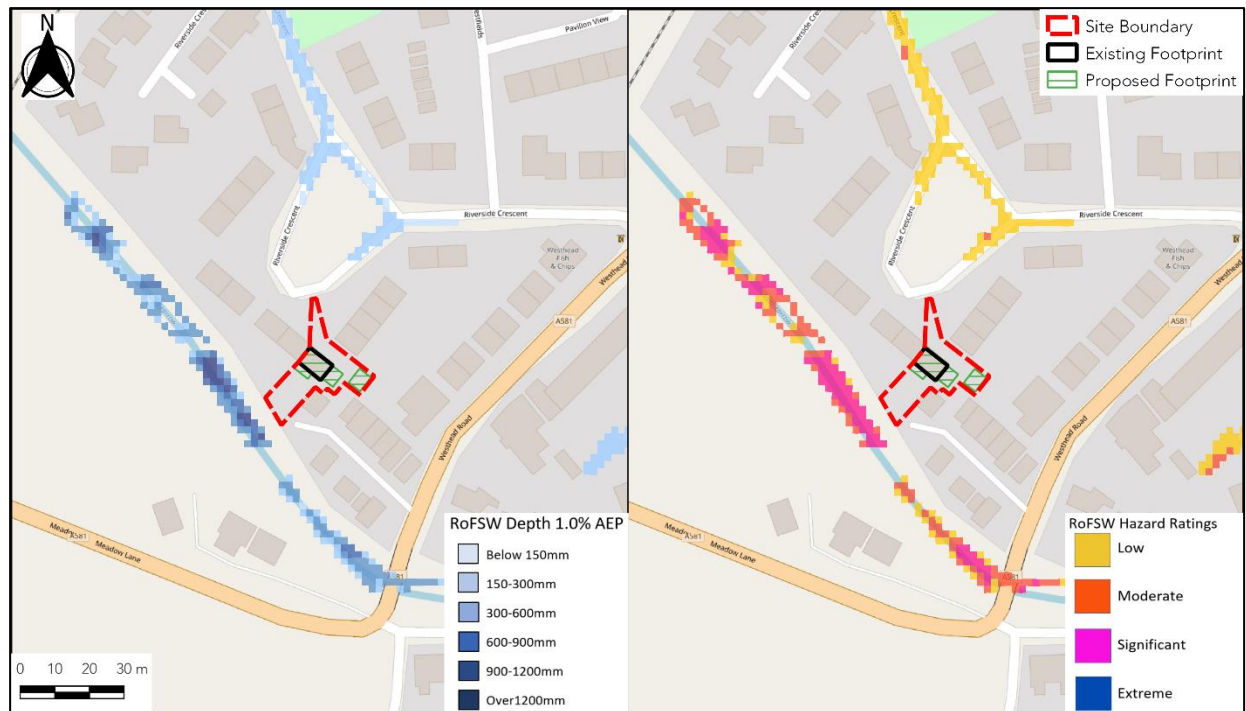


Figure 9: EA Surface Water Flood Risk Mapping 1.0% AEP (Source: Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors, © EA copyright and/or database right 2015)

- 4.32. In the modelled 0.1%AEP event (Figure 10), the site is shown to remain unaffected by surface water flooding. Riverside Crescent to the north of the site is shown to be affected, with flood depths up to 600mm.
- 4.33. The EA hazard rating denoted to the flood extent on Riverside Crescent is shown to be 'Low' to 'Moderate'. As such, it is understood that safe access/egress from the site may not be possible in the modelled 0.1%AEP event and refuge should be sought on site. Although, given that the proposed development is considered a Minor Development, access/egress arrangement should remain as per the existing scenario.



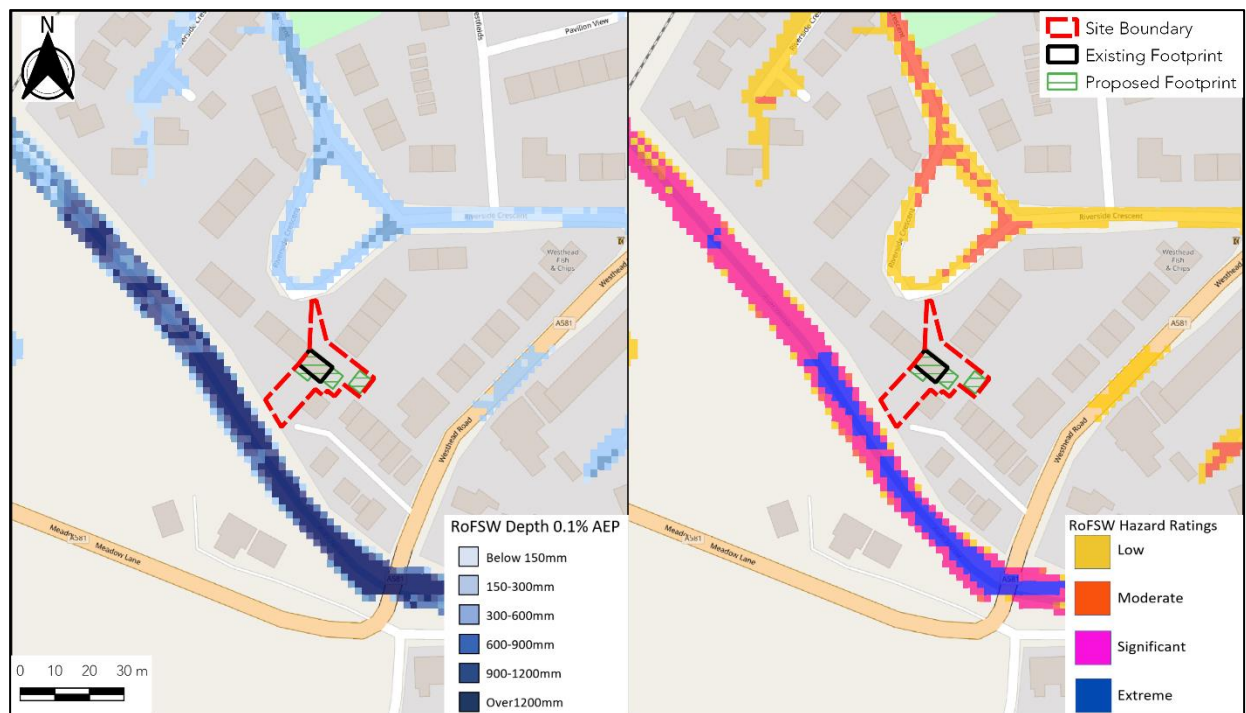


Figure 10: EA Surface Water Flood Risk Mapping 0.1% AEP (Source: Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors, © EA copyright and/or database right 2015)

4.34. Based on the information above, the proposed development is considered to be at a low risk of surface water flooding.

## Reservoirs

4.35. Flooding can occur from large waterbodies or reservoirs if they are impounded above the surrounding ground levels or are used to retain floodwater. Although unlikely, reservoirs and large waterbodies could overtop or breach leading to rapid inundation of the downstream floodplain.

4.36. According to the EA's Flood Risk from Reservoirs mapping (Figure 11) the site is at risk of flooding in the event of a breach at the Rivington Upper, Anglezarke, and Yarrow reservoirs. The worst reservoir failure model is a 'dry day' scenario meaning that it could be caused by reservoir walls failing due to old age, accident, or because excess flood water has been added to the reservoir.



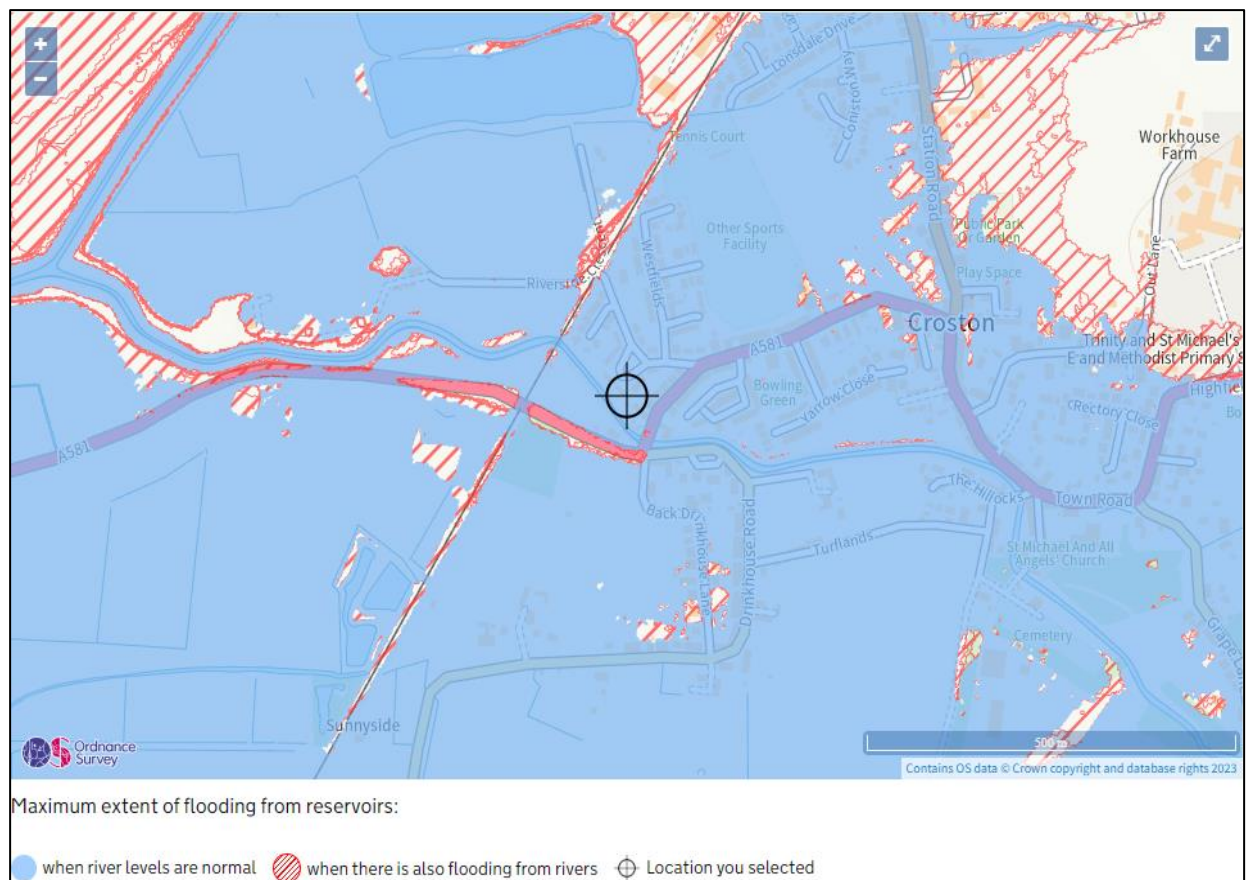


Figure 11: EA Reservoir Flood Risk Mapping (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). ©<https://www.openstreetmap.org> and contributors. Contains public sector information licensed under the Open Government Licence v3.0)

- 4.37. All large reservoirs must be inspected and supervised by reservoir panel engineers as detailed by the Reservoirs Act 1975 in England and Wales. The EA are responsible to ensure that reservoirs are inspected regularly, and essential safety work carried out. As reservoirs are highly managed the maximum flood extent provided in the EA Risk of Flooding from Reservoirs mapping is considered a worst-case scenario. As reservoir flooding is unlikely and the modelled flood depths are based on the worst-case scenario, flooding from this source may be considered as a relatively low risk.

## Groundwater

- 4.38. Groundwater flooding occurs in areas where underlying geology is permeable, and water can rise within the strata sufficiently to breach the surface.

- 4.39. The British Geological Survey's (BGS) mapping shows superficial deposits of Tidal Flat Deposits comprised of silt, clay, and sand underlying the site. The bedrock underlying the site is Sherwood Sandstone Group comprised of sandstone.
- 4.40. BGS borehole SD41NE40 located approximately 170m north of the site indicates that groundwater was struck at a depth of 1.70m below ground level and rose to 1.50m after 20 minutes.
- 4.41. The SFRA (2007) does not provide specific details on the risk of groundwater flooding within the district and no publicly available maps are provided to express this risk.
- 4.42. The Lancashire PFRA (2011) provides mapping to show the area's most susceptible to groundwater flooding within the county (Figure 12). The proposed site appears to lie within an area marked as 'most susceptible', however due to the large scale of the mapping it is difficult to determine whether the exact extents of the site are contained within this area.

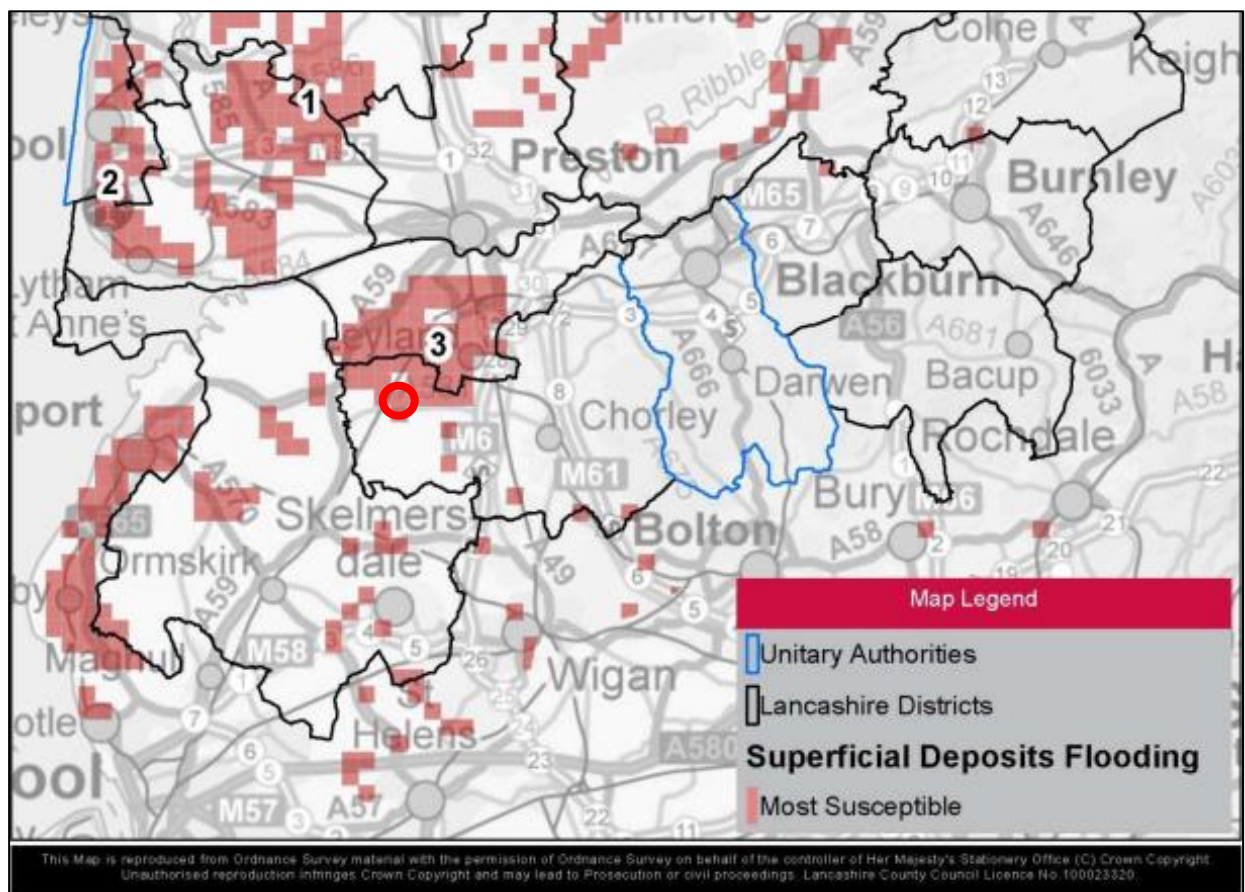


Figure 12: Lancashire PFRA (2011) Areas most susceptible to groundwater flooding

- 4.43. The DEFRA Magic Map service indicates that the site is underlain by an unproductive superficial drift deposit aquifer and a Secondary B bedrock aquifer.
- 4.44. No records have been found to indicate that groundwater flooding has been an issue within the Croston area historically. The SFRA (2007) references the presence of groundwater flooding in the study area;

*There are no reported occurrences of groundwater flooding from hard rock aquifers or superficial deposits in the Northwest EA region. The underlying geology varies and generally the geology in the northeast and southeast of the study area is classified as minor aquifers with the geology in the central and western parts of the site classified as major aquifers.*

- 4.45. Based on the information above, the proposed development is considered to be at a low risk of groundwater flooding.

## Sewers

- 4.46. Sewers can be a cause of flooding where the drainage network has become overwhelmed, either by blockage or due to local development beyond the designed capabilities of the drainage system.
- 4.47. The SFRA (2007) provides limited information on sewer flooding within the district. As a part of the production of the SFRA, UU provided sewer records between the period between October 2006 and April 2007. Figure 13 displays the number of external and internal sewer records for that period. The locations within the figure are subdivided into four digit post code areas. For the PR26 9 area, there were 3 to 4 external instances, and 1 to 2 internal sewer flooding instances.

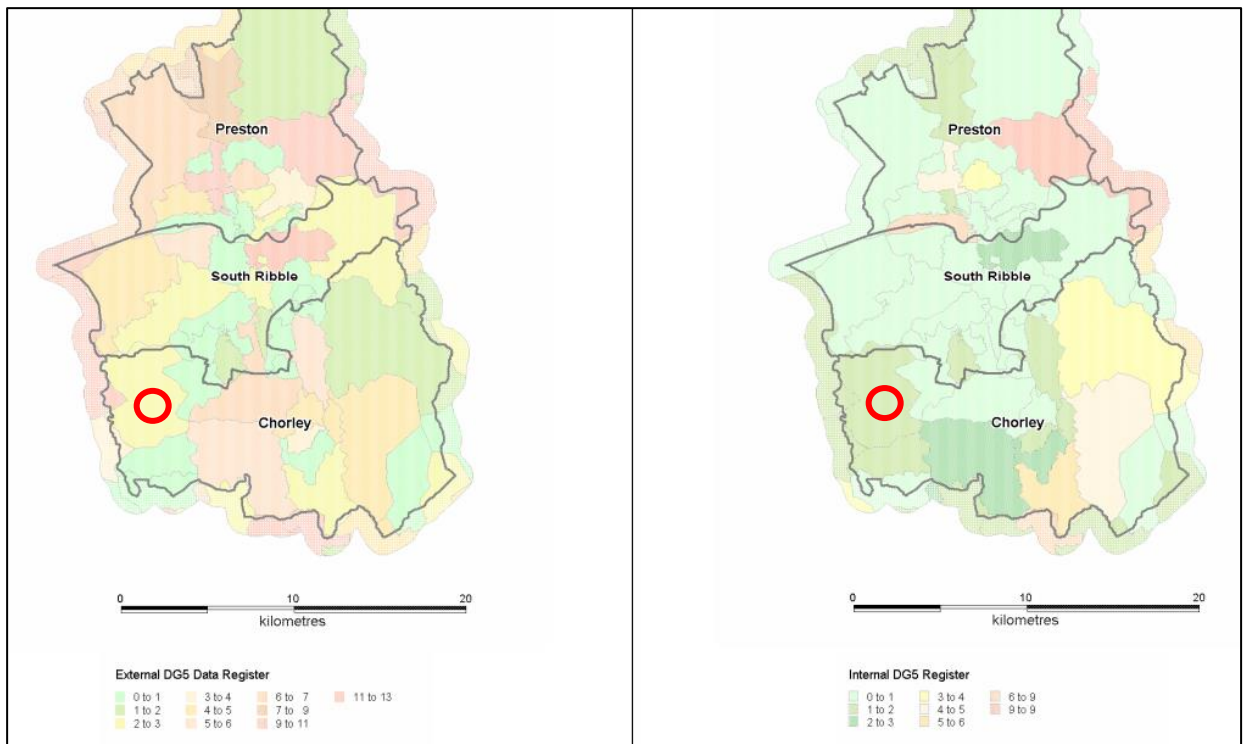


Figure 13: UU DG5 Data Register (SFRA, 2007) (Site Located within Red Circle)

- 4.48. Interrogation of the EA LiDAR data within the vicinity of the stie shows that Riverside Crescent lies at a level of circa 7.10m AOD, approximately 0.07m lower than the levels of the location of the proposed studio room and approximately 0.20m lower than the levels of the proposed extension. As such, any sewer flooding is expected to remain within the extent of the highway and may not affect the proposed development.
- 4.49. Based on the information above, the site is considered to be at a low risk of sewer flooding.



# 5. Flood Risk Mitigation

## Fluvial

- 5.1. Based on an estimate calculation, the proposed extension and proposed studio room are not affected by flooding in the defended modelled 1.0%AEP+35%CC event (design event). As such, the risk is considered to be low and mitigation measures are not required.
- 5.2. The proposed development is considered to be a minor development given that the proposals are for a *'household or non-domestic extensions with a floor space of no more than 250 square metres.'* As such, all FFLs are to be set no lower than those of the existing ground floor level in accordance with the EA's standing advice for minor extensions<sup>11</sup>.
- 5.3. As a further precaution and risk reduction, the residents of the site could sign up the River Yarrow at Croston, between the railway and Home Farm Mews EA flood warning service. This service allows residents to register an address, which is at risk of flooding, along with contact details so that in the event of a flood being forecast, the site owner will be sent an alert directly to their chosen method of contact.
- 5.4. Flood warnings/alerts can be enforced at any time of the day or night. Signing up for this service provides residents some notice before a flood event. The amount of time afforded before a flood occurs depends on the site-specific location (e.g. proximity to the source of flooding, topography of the surrounding area) and the flood mechanism (e.g. bank over topping versus a breach event). Flood alerts and warnings provide residents with time to take necessary action, e.g. communication of the risk of flooding to occupants/employees etc, evacuation of occupants offsite or to a safe level, removal of valuable items out of reach of flooding and the mounting of site-specific flood defences.

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<sup>11</sup> <https://www.gov.uk/guidance/flood-risk-assessment-standing-advice#advice-for-minor-extensions>

## Other Sources

- 5.5. Flood risk from pluvial, canals, reservoirs, tidal, groundwater and sewers sources are considered to be low, therefore no further specific mitigation is recommended.

## Increase to Flood Risk Elsewhere

- 5.6. It is understood that the proposed development is for the construction of a rear and side extension to the existing dwelling and construction of a standalone studio room within the site curtilage. As such, the proposal constitutes a Minor Development under the NPPF.
- 5.7. Paragraph 051 of the Flood Risk and Coastal Change Planning Practice Guidance (PPG) states:

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

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

- 5.8. Furthermore, based on the Product 4 data analysis, the site is above the modelled design flood level.
- 5.9. As such, the proposed development in isolation should have a negligible impact on flood risk elsewhere.



## 6. Conclusions

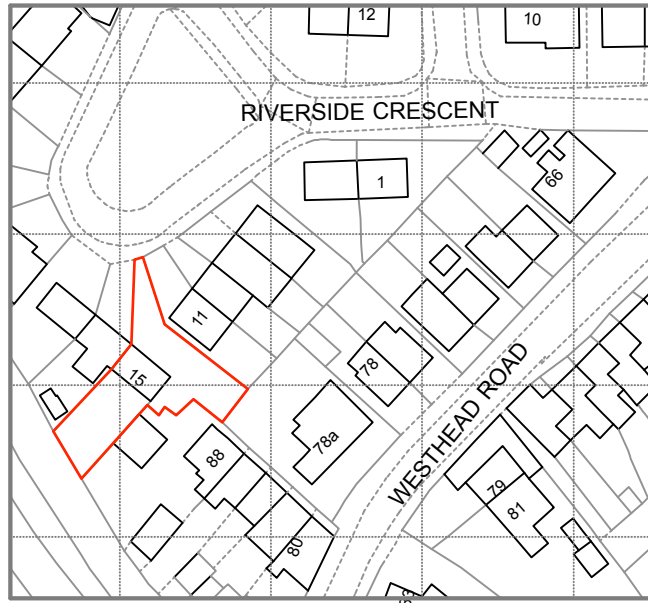
- 6.1. This FRA has been undertaken with reference to the requirements of NPPF and Planning Practice Guidance with respect to the development at 15 Riverside Crescent, Croston, PR26 9RU. It has been written to support a planning application and has been prepared with due consideration to the nature of the proposed development to provide the appropriate level of detail.
- 6.2. An assessment of the risk of flooding from all sources has been undertaken and is summarised in the table below:

Source of Flooding	Flood Risk Summary
Fluvial	<p>Based on an estimate calculation, the proposed development is not affected by flooding in the defended modelled 1.0%AEP+35%CC event (design event). As such, the risk is considered to be low and mitigation measures are not required.</p> <p>The proposed development is considered to be a minor development given that the proposals are for a 'household or non-domestic extensions with a floor space of no more than 250 square metres.' As such, all FFLs are to be set no lower than those of the existing ground floor level in accordance with the EA's standing advice for minor extensions.</p>
Pluvial Tidal Reservoirs Groundwater Sewers Canals	<p>The site is considered to be at low risk from other sources. Therefore, no further specific mitigation is recommended.</p>

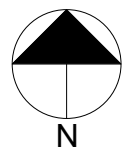
- 6.3. FFLs are to be set no lower than those of the existing ground floor level in accordance with the EA's standing advice for minor extensions.
- 6.4. The proposed development is considered to be a minor development and as such should have a negligible impact on flood risk elsewhere in accordance with paragraph 051 of the PPG.
- 6.5. Given that the proposed development is a minor development, existing access/egress arrangements are understood to remain as per the existing.

- 6.6. Residents are recommended to sign up to receive EA Flood Warnings (the River Yarrow at Croston, between the railway and Home Farm Mews).
- 6.7. This Flood Risk Assessment should be submitted as part of the planning application to satisfy the requirements under NPPF.

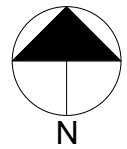
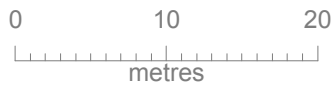
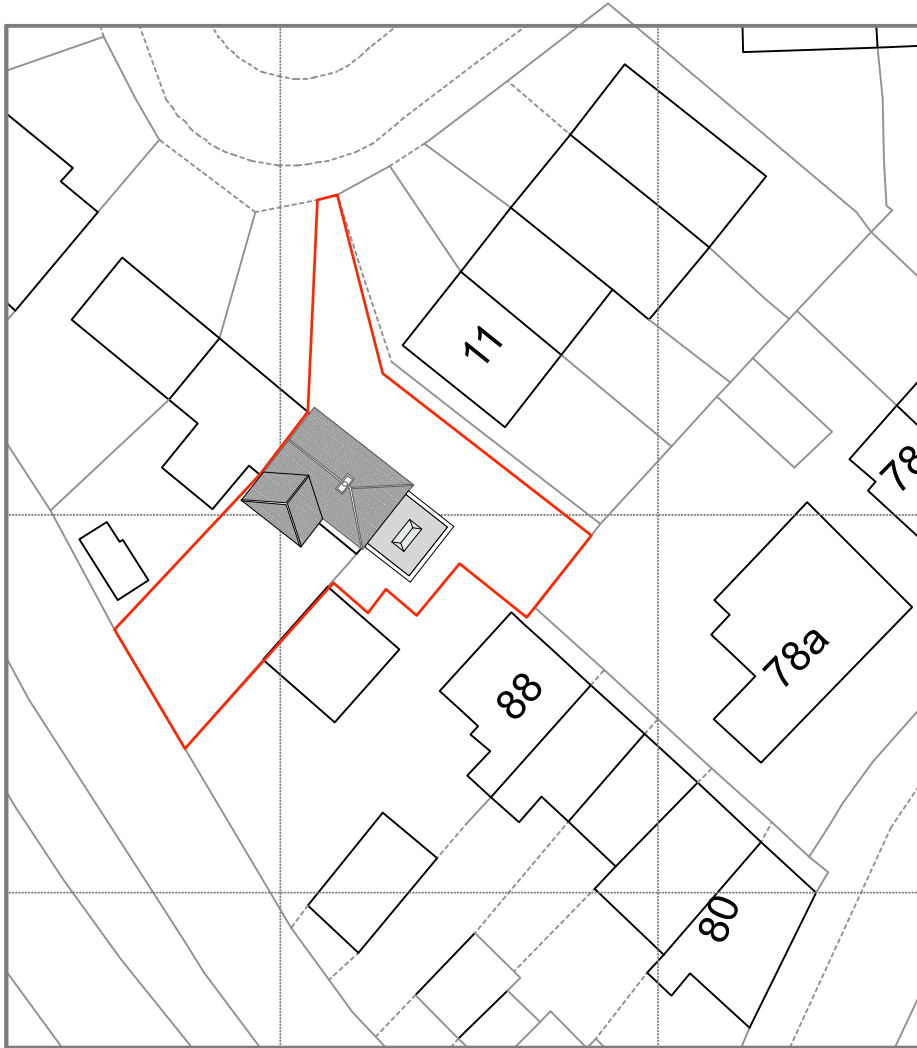
# Appendix A - Development Proposals



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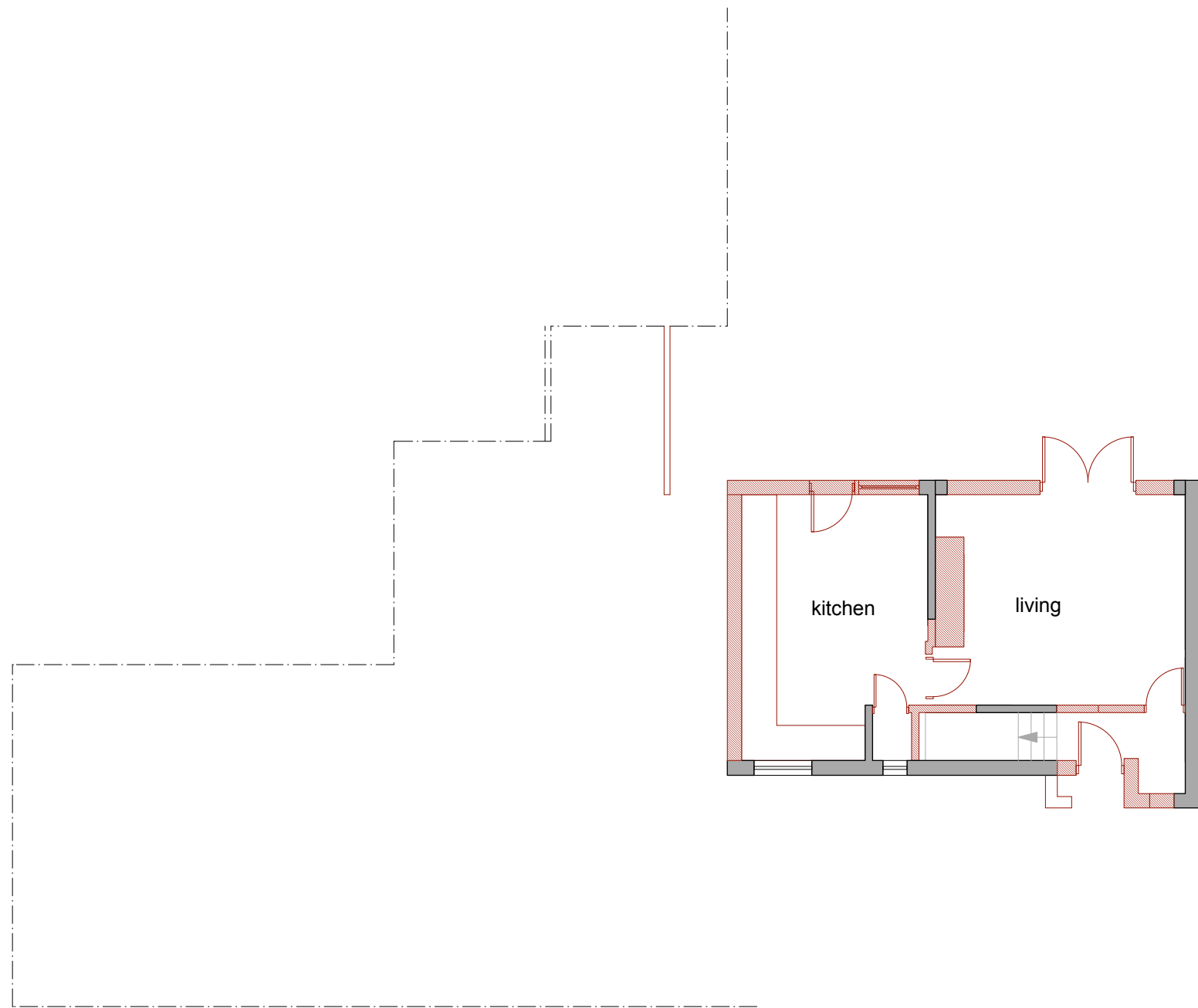


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	Site Add: 15 Riverside Crescent, Croston, PR26 9RU		
TITLE <b>Location Map</b>			
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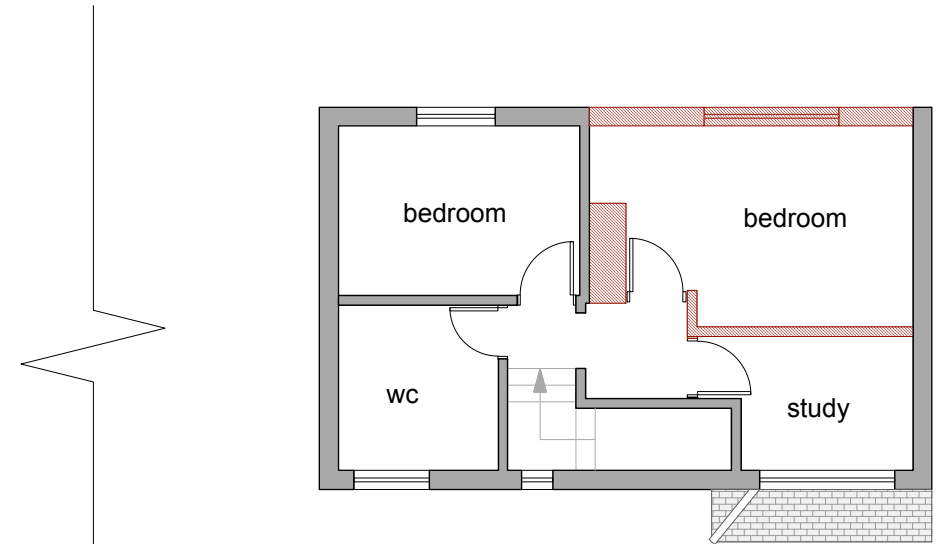


1 Block Plan  
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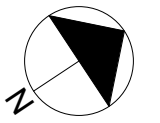
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	Site Add:	15 Riverside Crescent, Croston, PR26 9RU		
	TITLE	Block Plan		
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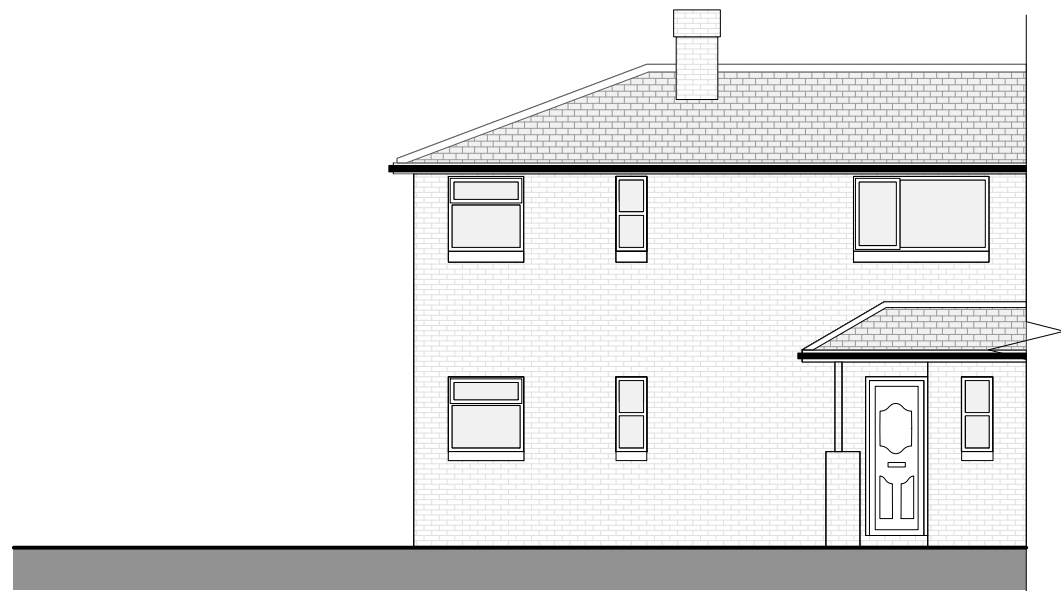


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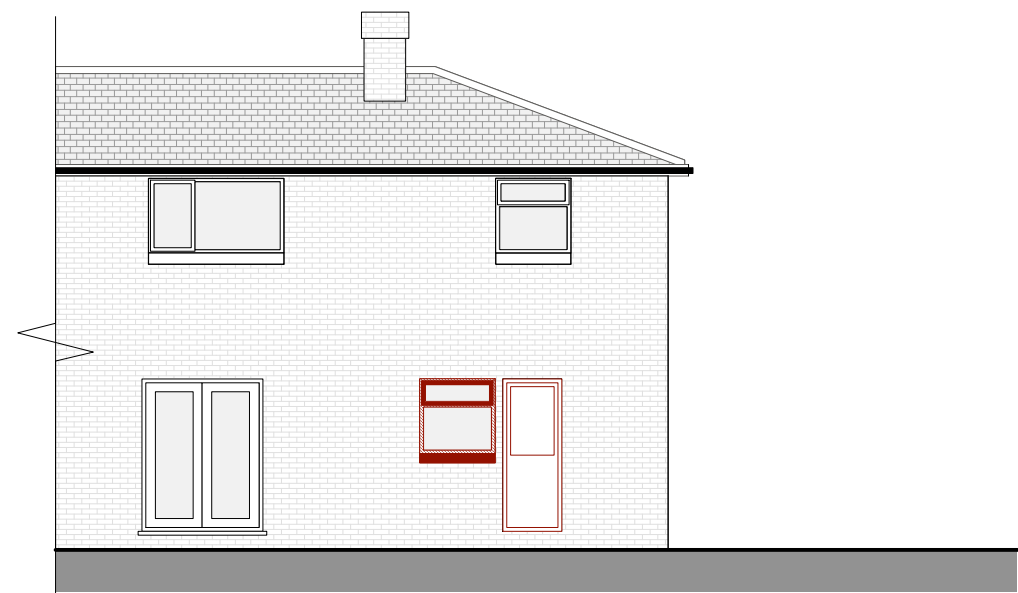


<b>CHP Consultants Ltd</b>	Client: Flynn/Cline		
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Colin Harper-Penman	TITLE: Existing Plans		
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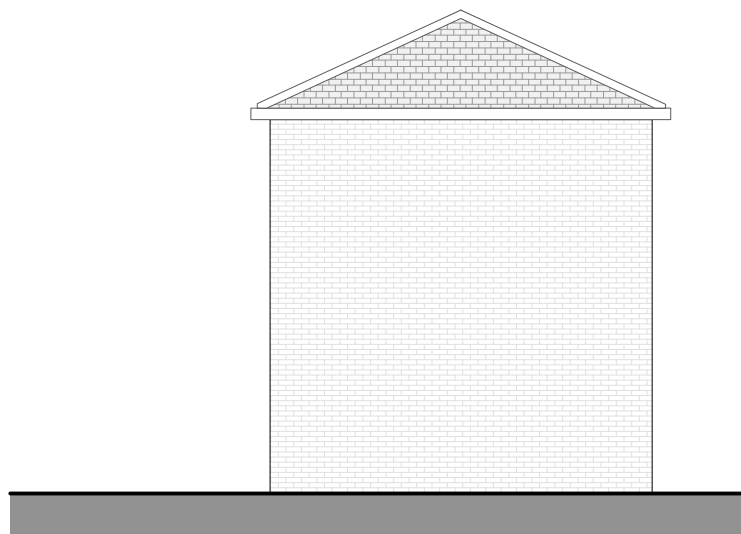




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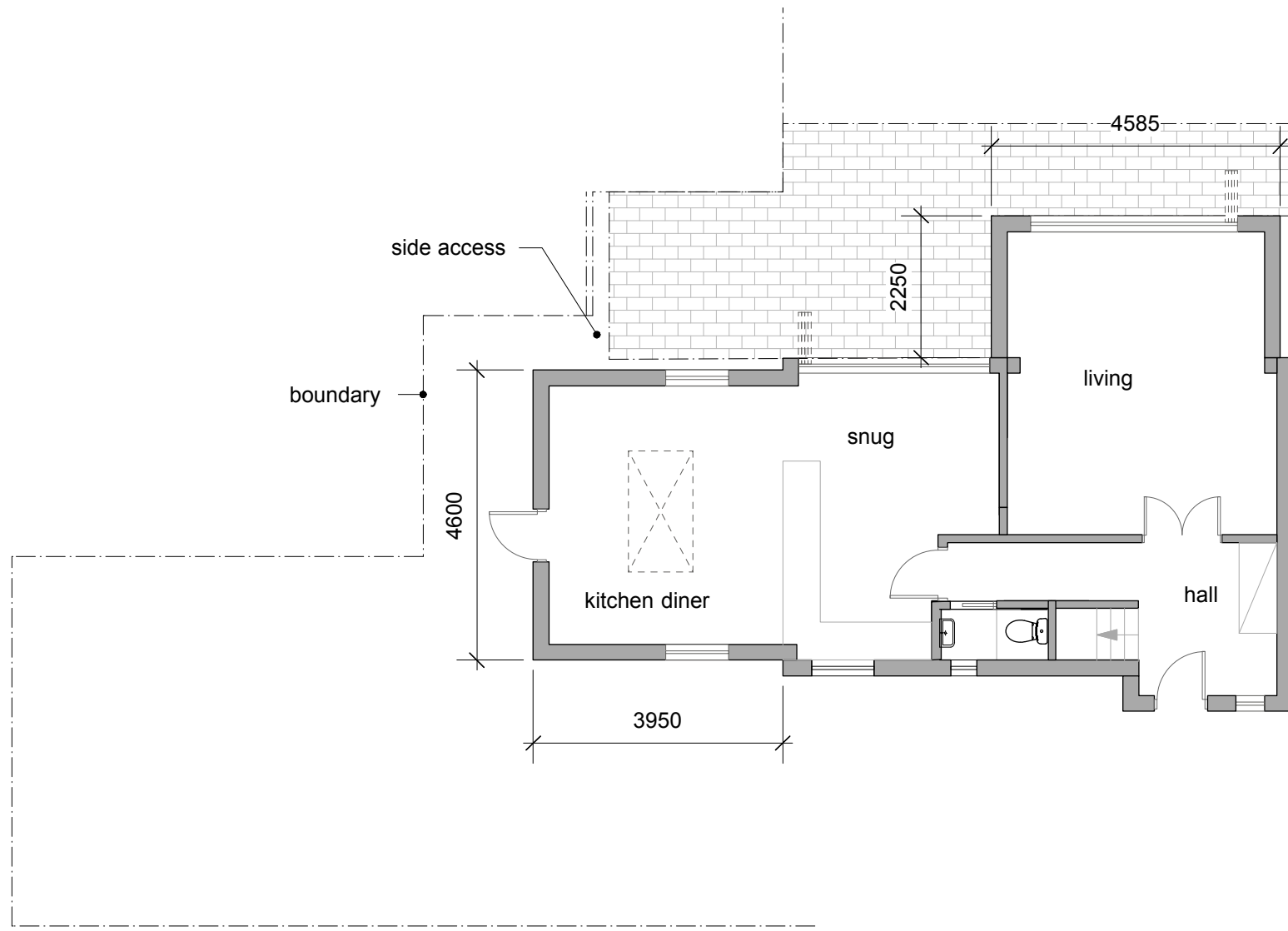
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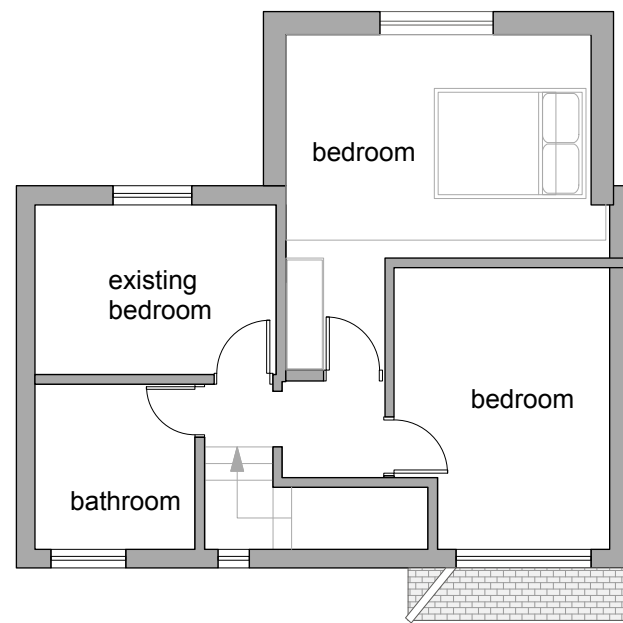
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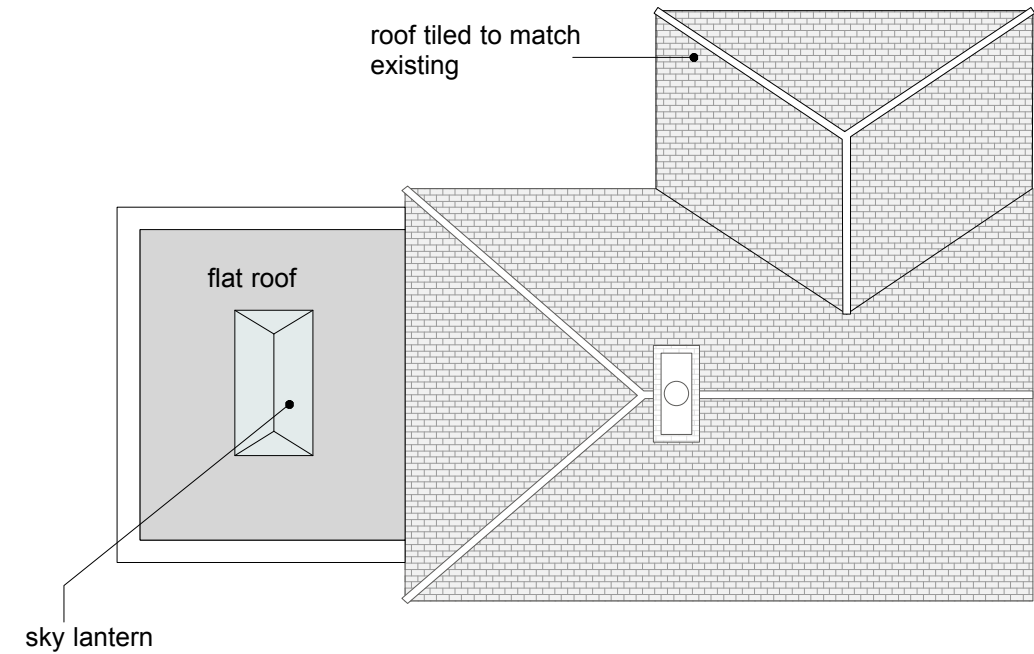
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	Site Add: 15 Riverside Crescent, Croston, PR26 9RU		
Colin Harper-Penman <i>The Studio, Warren Close, SS6 7BD</i>	TITLE <b>Existing Elevations</b>		
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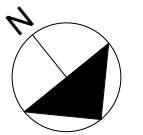
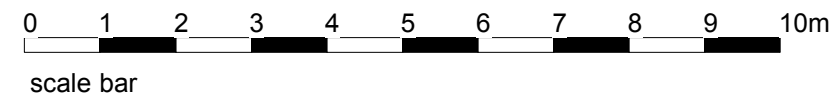
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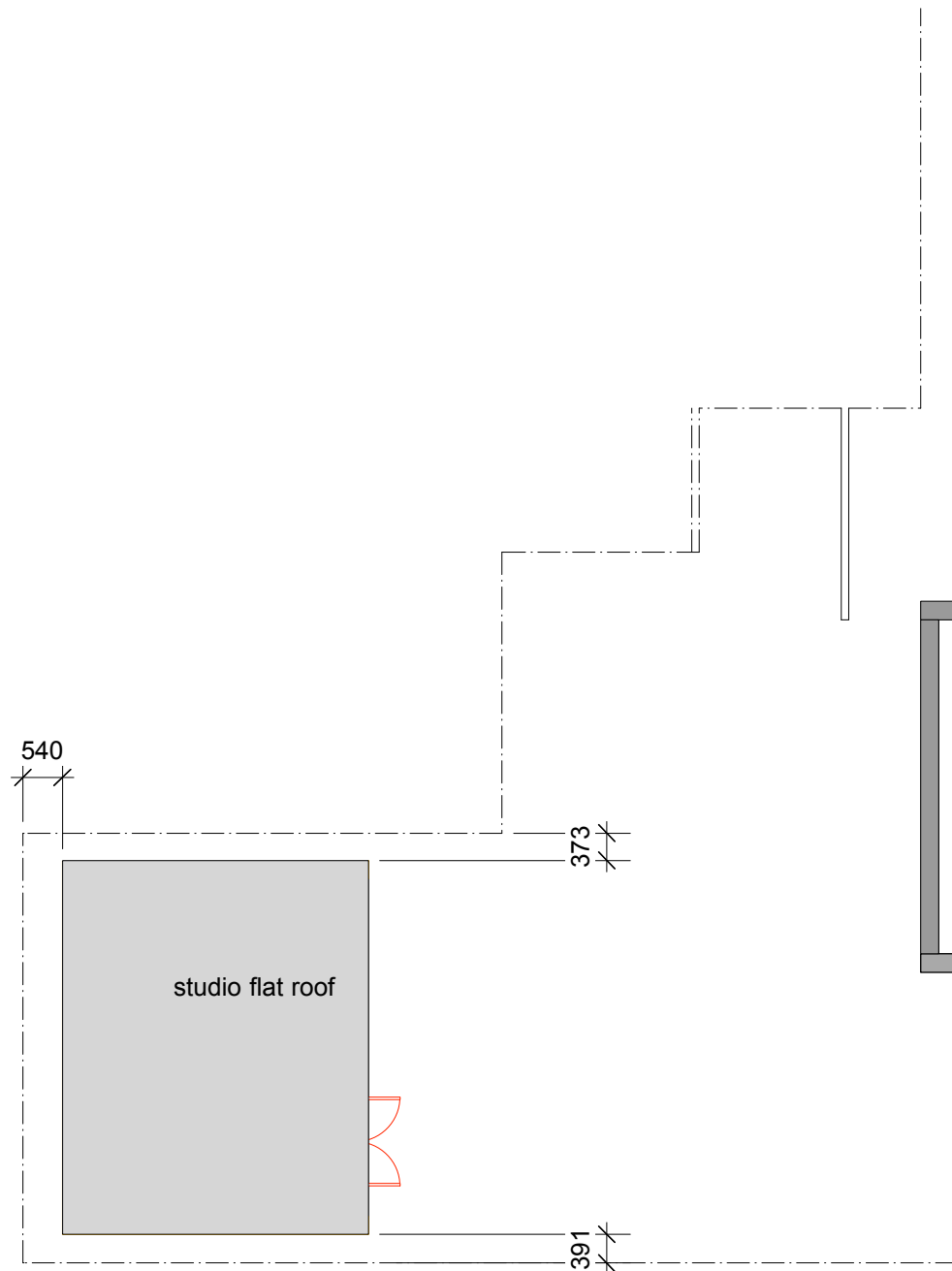
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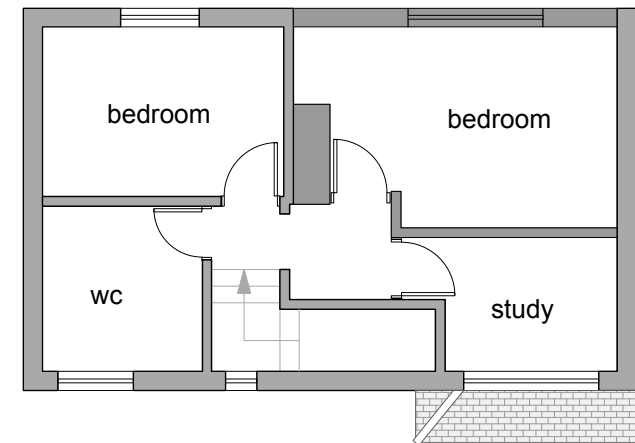
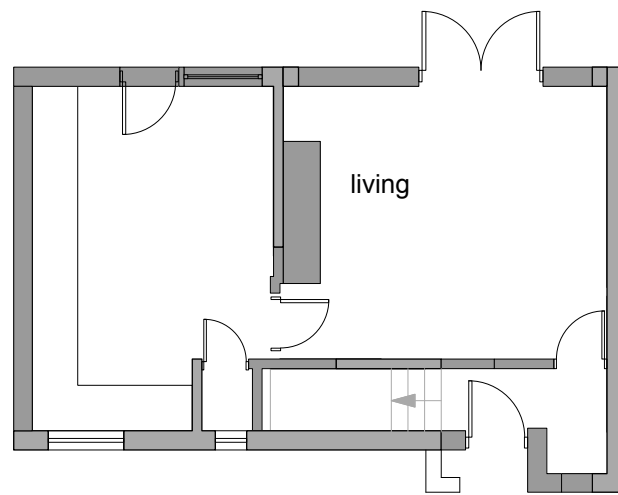
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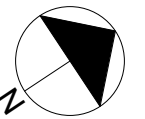
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Colin Harper-Penman	TITLE: Proposed Plans		
The Studio, Warren Close, SS6 7BD	DRAWING NO. 23-086-100	DRAWN BY: CHP	DATE: Mar 23
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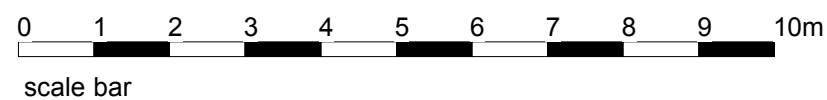
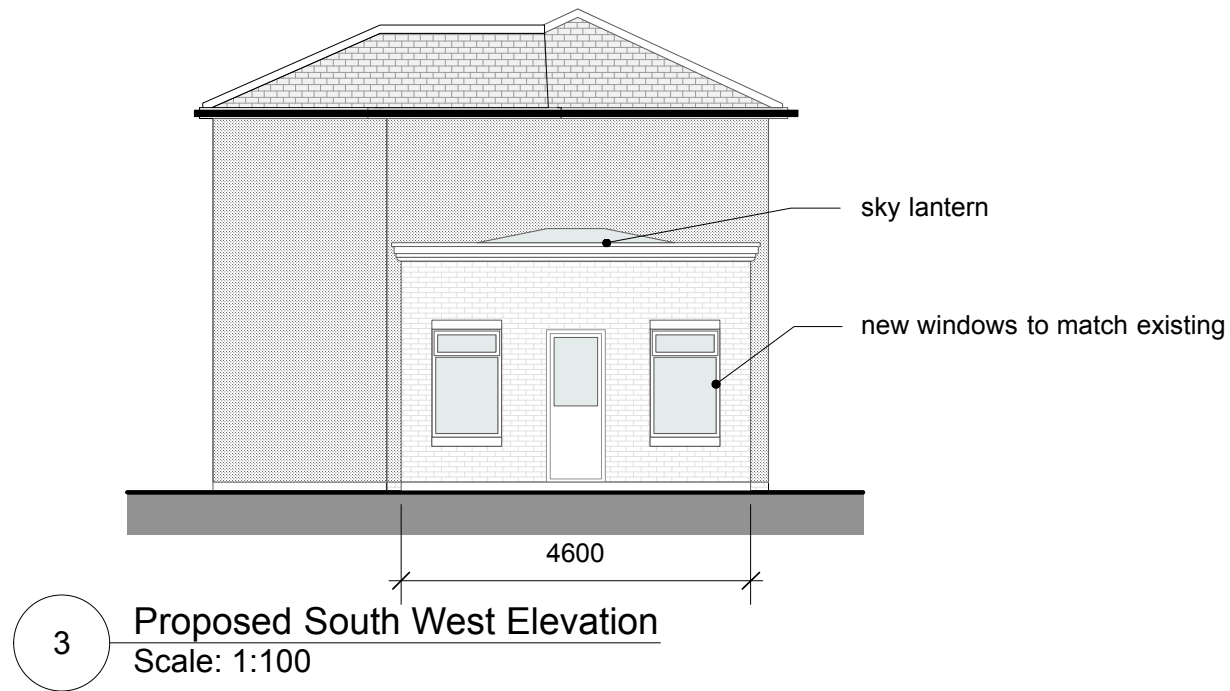
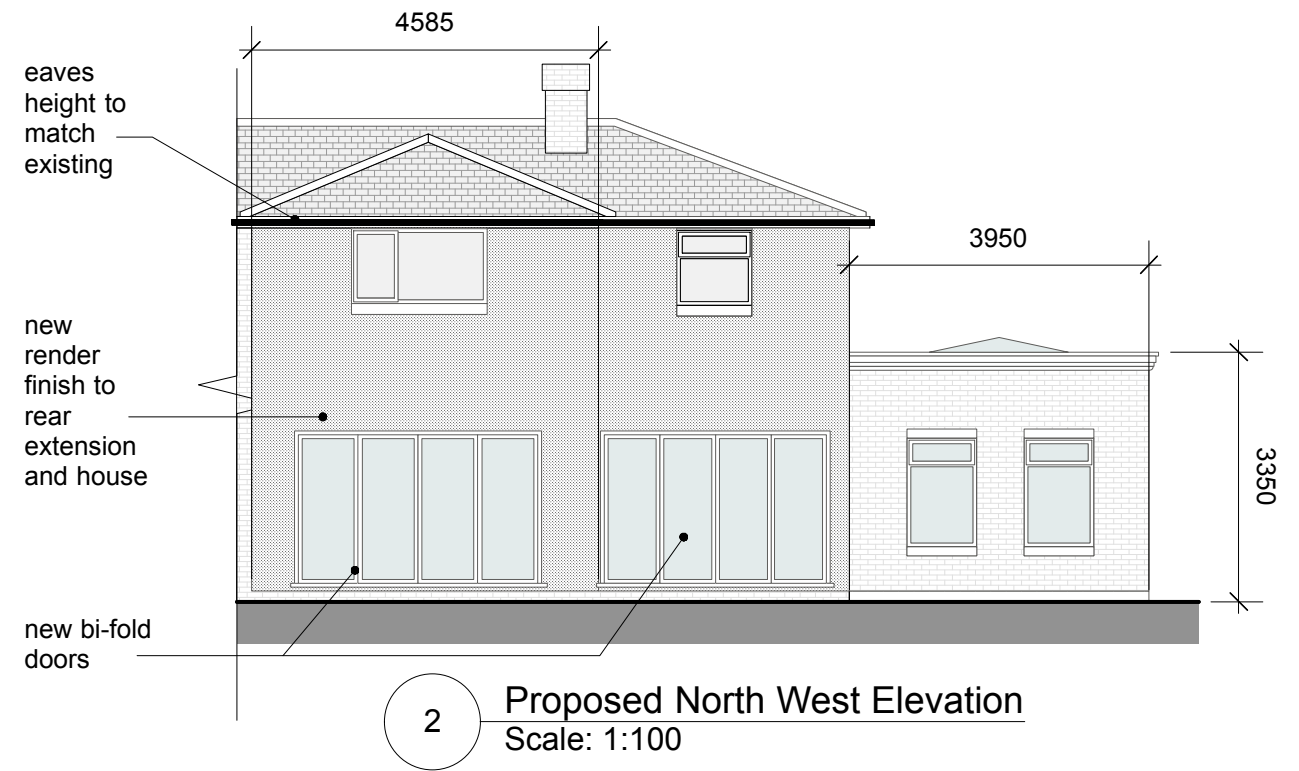
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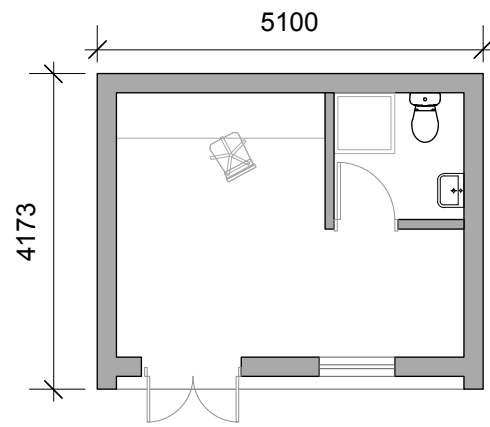
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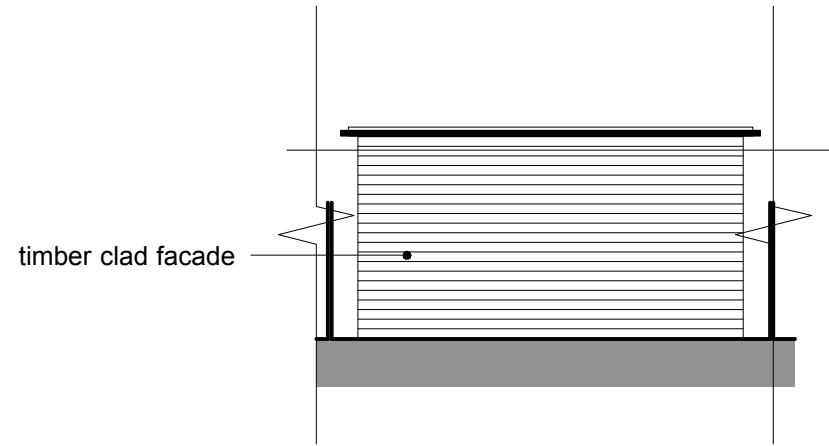
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	Site Add:	15 Riverside Crescent, Croston, PR26 9RU		
	TITLE	proposed ground floor with studio		
<p><small>All dimensions should be checked onsite</small></p> <p><small>All drawings and associated designs are solely owned by CHP Consultants Ltd and are not to be issued, printed or distributed without the prior consent of CHP Consultants Ltd.</small></p>	DRAWING NO.	23-086-105	DRAWN BY	CHP
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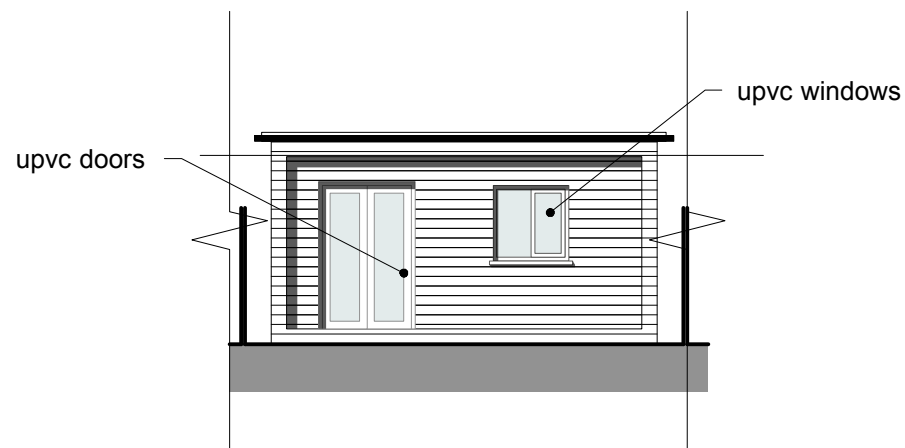
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Colin Harper-Penman	TITLE: Proposed Elevations		
The Studio, Warren Close, SS6 7BD	DRAWING NO. 23-086-120	DRAWN BY: CHP	DATE: Mar 23
<small>All dimensions should be checked onsite All drawings and associated designs are solely owned by CHP Consultants Ltd and are not to be issued, printed or distributed without the prior consent of CHP Consultants Ltd.</small>	SCALE 1:100	STAGE	



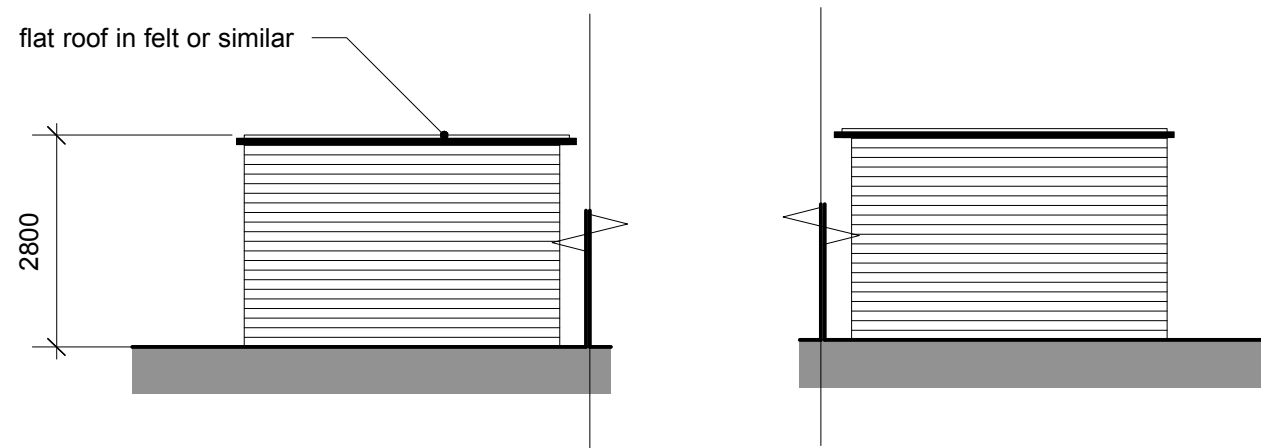
1 Proposed Studio plan  
Scale: 1:100



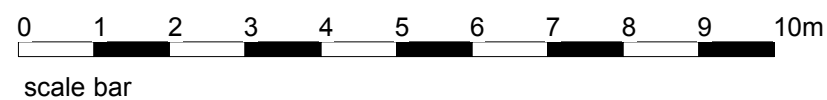
3 Proposed Rear elevation  
Scale: 1:100



2 Proposed Studio Front elevation  
Scale: 1:100



4 Proposed Side Elevations  
Scale: 1:100



	Client: Flynn/Cline	
	Site Add: 15 Riverside Crescent, Croston, PR26 9RU	
Colin Harper-Penman	TITLE: Proposed Studio	
The Studio, Warren Close, SS6 7BD	DRAWING NO. 23-086-130	DRAWN BY: CHP
<small>All dimensions should be checked onsite All drawings and associated designs are solely owned by CHP Consultants Ltd and are not to be issued, printed or distributed without the prio consent of CHP Consultants Ltd.</small>	SCALE 1:100	DATE Mar 23
	STAGE	

# Appendix B - Consultation (EA Product 4 Data)



# Flood risk assessment data



**Location of site:** 348428 / 418602 (shown as easting and northing coordinates)

**Document created on:** 7 July 2023

**This information was previously known as a product 4.**

**Customer reference number:** 33MC4HCUKFPA

Map showing the location that flood risk assessment data has been requested for.



## How to use this information

You can use this information as part of a flood risk assessment for a planning application. To do this, you should include it in the appendix of your flood risk assessment.

**We recommend that you work with a flood risk consultant to get your flood risk assessment.**

## Included in this document

In this document you'll find:

- how to find information about surface water and other sources of flooding
- information on the models used
- definitions for the terminology used throughout
- flood map for planning (rivers and the sea)
- historic flooding
- flood defences and attributes
- information to help you assess if there is a reduced flood risk from rivers and the sea because of defences
- modelled data
- climate change modelled data
- information about strategic flood risk assessments
- information about this data
- information about flood risk activity permits
- help and advice

## Not included in this document

This document does not include a Flood Defence Breach Hazard Map.

If your location has a reduced flood risk from rivers and sea because of defences, you need to request a Flood Defence Breach Hazard Map and information about the level of flood protection offered at your location from the Cumbria and Lancashire Environment Agency team at [inforequests.cblnc@environment-agency.gov.uk](mailto:inforequests.cblnc@environment-agency.gov.uk). This information will only be available if modelling has been carried out for breach scenarios.

Include a site location map in your request.

## Surface water and other sources of flooding

Use the [long term flood risk service](#) to find out about the risk of flooding from:

- surface water
- ordinary watercourses
- reservoirs

For information about sewer flooding, contact the relevant water company for the area.

## About the models used

Model name: Croston 2017

Scenario(s): Defended fluvial, defences removed fluvial, defended climate change fluvial

Date: 3 February 2017

These models contain the most relevant data for your area of interest.

## Terminology used

### Annual exceedance probability (AEP)

This refers to the probability of a flood event occurring in any year. The probability is expressed as a percentage. For example, a large flood which is calculated to have a 1% chance of occurring in any one year, is described as 1% AEP.

### Metres above ordnance datum (mAOD)

All flood levels are given in metres above ordnance datum which is defined as the mean sea level at Newlyn, Cornwall.

## **Flood map for planning (rivers and the sea)**

Your selected location is in flood zone 3.

Flood zone 3 shows the area at risk of flooding for an undefended flood event with a:

- 0.5% or greater probability of occurring in any year for flooding from the sea
- 1% or greater probability of occurring in any year for fluvial (river) flooding

Flood zone 2 shows the area at risk of flooding for an undefended flood event with:

- between a 0.1% and 0.5% probability of occurring in any year for flooding from the sea
- between a 0.1% and 1% probability of occurring in any year for fluvial (river) flooding

It's important to remember that the flood zones on this map:

- refer to the land at risk of flooding and do not refer to individual properties
- refer to the probability of river and sea flooding, ignoring the presence of defences
- do not take into account potential impacts of climate change

This data is updated on a quarterly basis as better data becomes available.










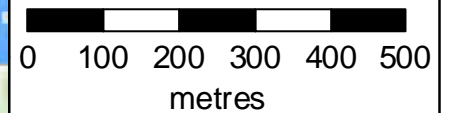
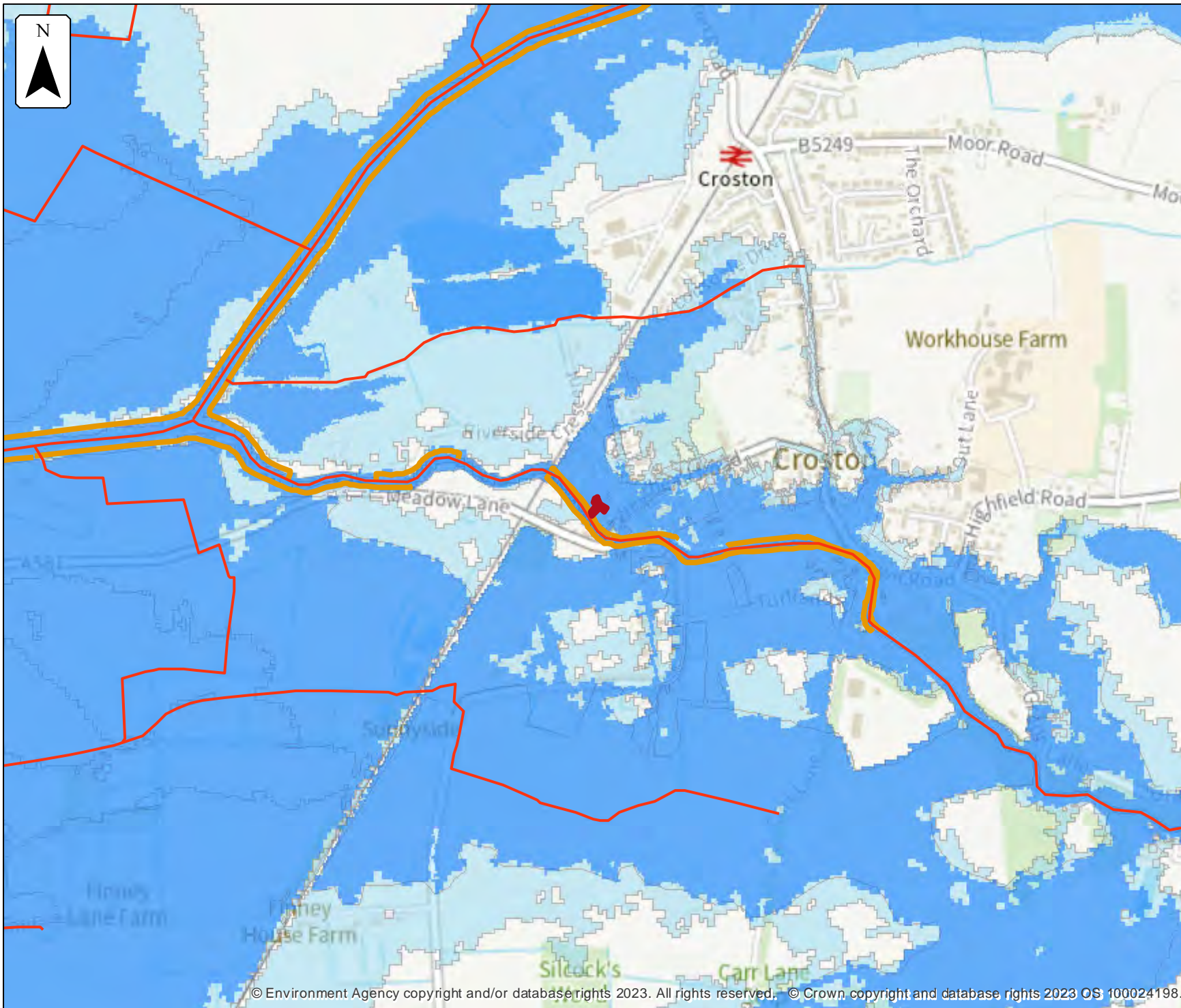
### Flood map for planning

Location (easting/northing)  
**348428/418602**

Scale  
**1:10,000**

Created  
**7 Jul 2023**

-  Selected area
-  Main river
-  Flood defence
-  Flood zone 3
-  Flood zone 2



## Historic flooding

This map is an indicative outline of areas that have previously flooded. Remember that:

- our records are incomplete, so the information here is based on the best available data
- it is possible not all properties within this area will have flooded
- other flooding may have occurred that we do not have records for
- flooding can come from a range of different sources - we can only supply flood risk data relating to flooding from rivers or the sea

You can also contact your Lead Local Flood Authority or Internal Drainage Board to see if they have other relevant local flood information. Please note that some areas do not have an Internal Drainage Board.

[Download recorded flood outlines in GIS format](#)







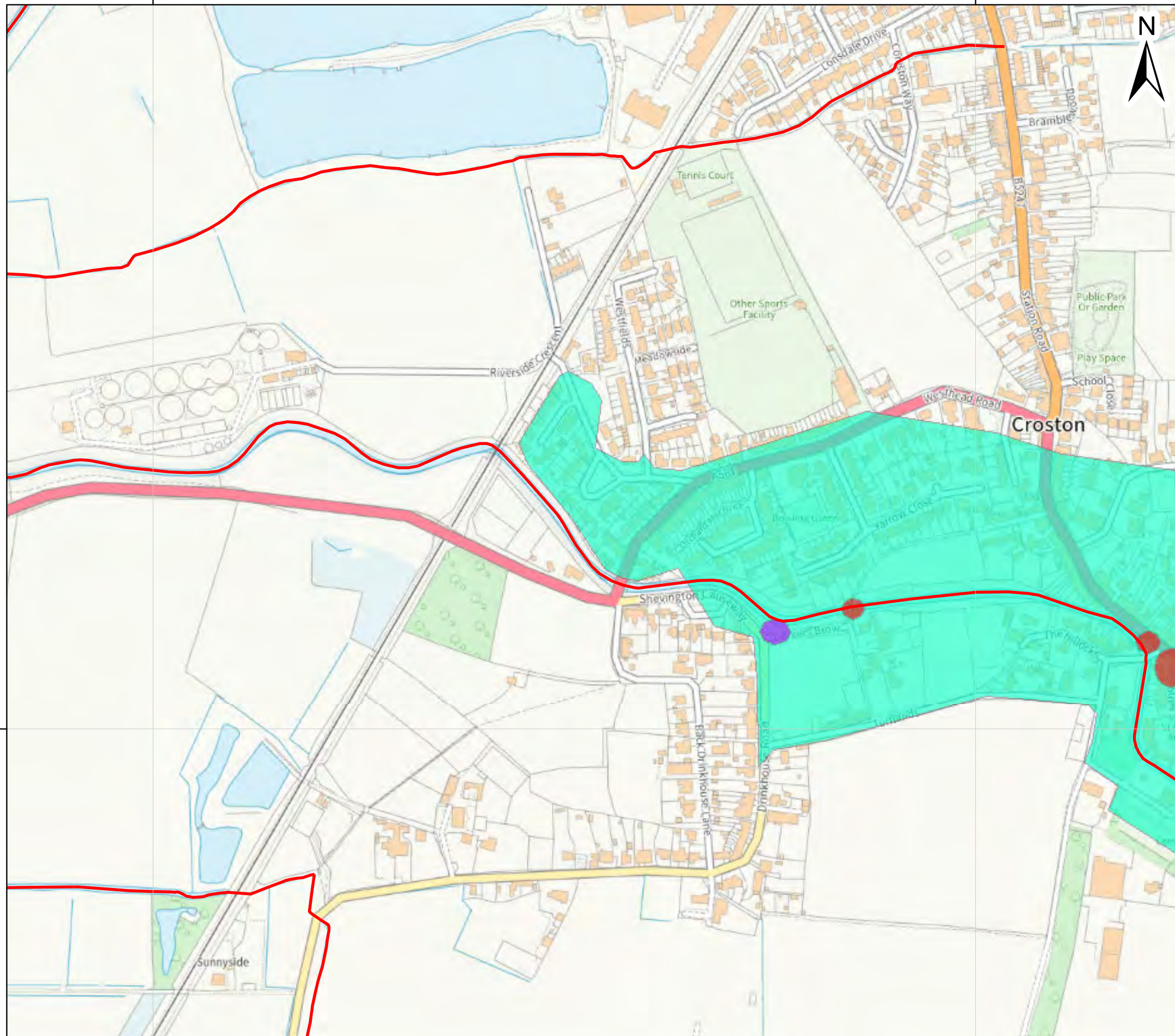
**Flood History Map:  
Riverside Crescent, Croston, PR26 9RU**

**Location (easting/northing)  
348430/418602**

**Created 07/07/2023  
Reference:CL316175**

**Key**

-  **Statutory Main Rivers**
-  **February 2011 Flooding**
-  **October 2000 Flooding**
-  **August 1987 Flooding**









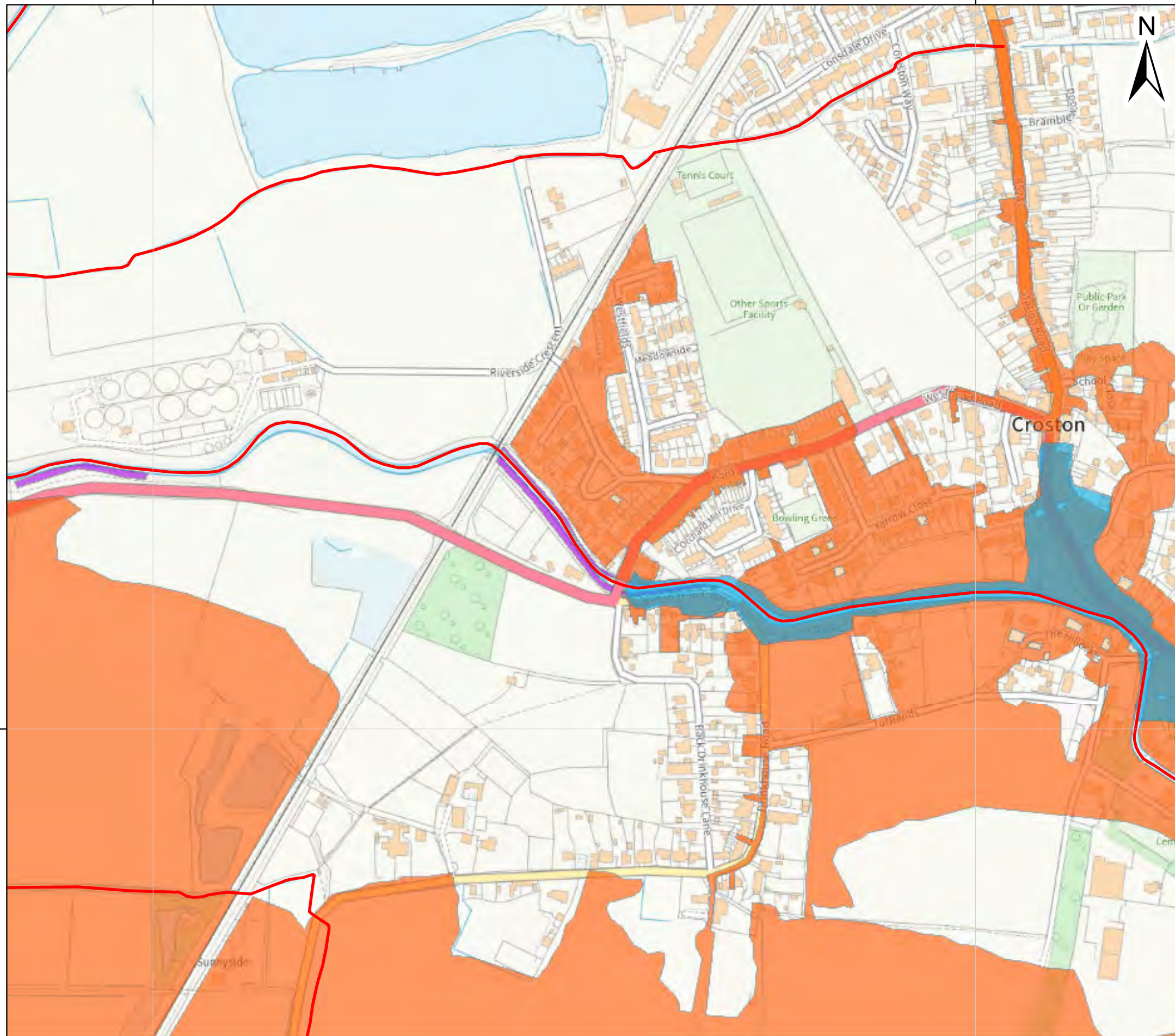
**Flood History Map:  
Riverside Crescent, Croston, PR26 9RU**

**Location (easting/northing)  
348430/418602**

**Created 07/07/2023  
Reference:CL316175**

**Key**

-  **Statutory Main Rivers**
-  **June 2012 Flooding**
-  **December 2015 Flooding**
-  **August 2016 Flooding**



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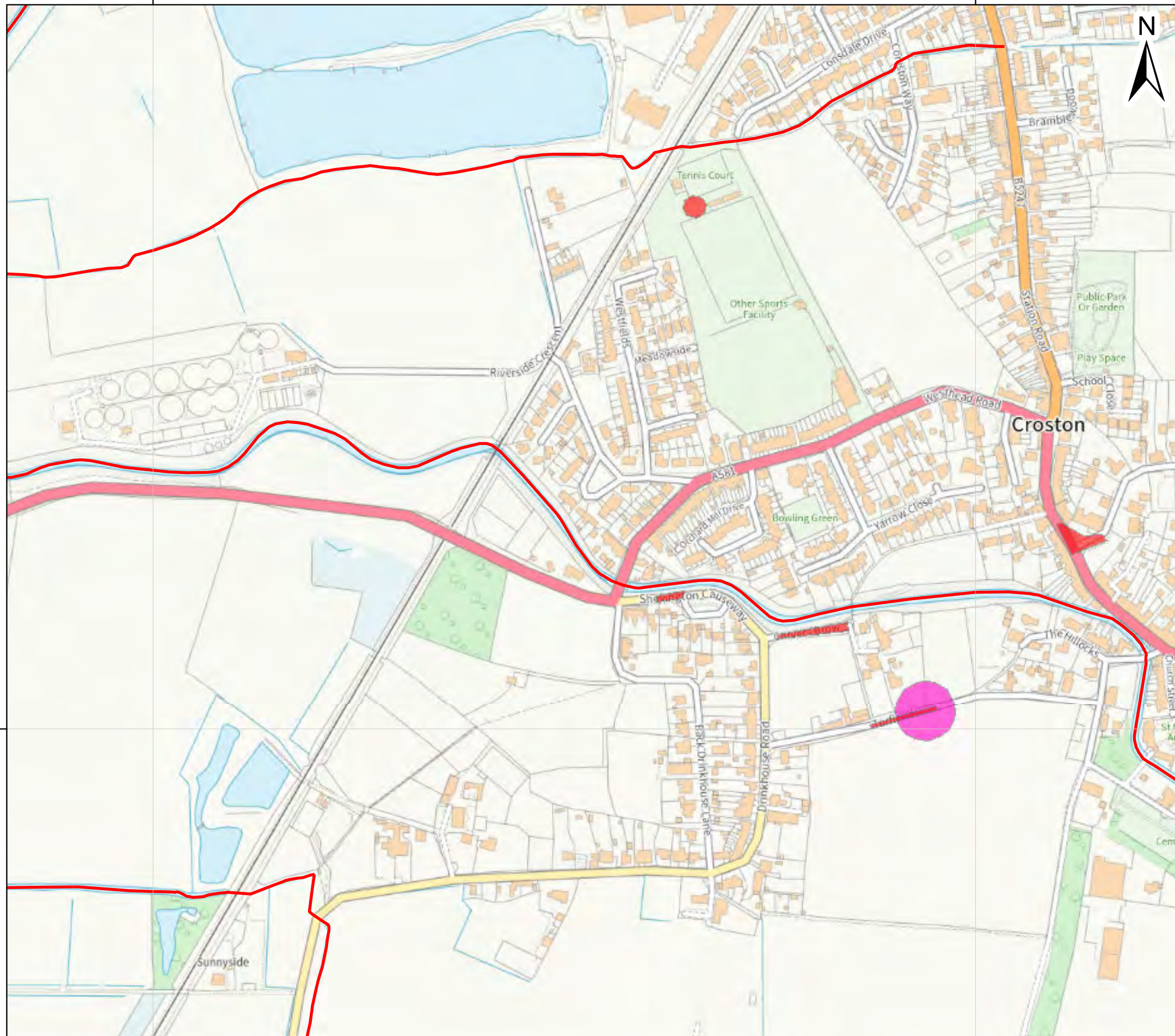
**Flood History Map:  
Riverside Crescent, Croston, PR26 9RU**

**Location (easting/northing)  
348430/418602**

**Created 07/07/2023  
Reference:CL316175**

**Key**

-  **Statutory Main Rivers**
-  **September 2019 Flooding**
-  **November 2017 Flooding**



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## **Flood defences and attributes**

The flood defences map shows the location of the flood defences present.

The flood defences data table shows the type of defences, their condition and the standard of protection. It shows the height above sea level of the top of the flood defence (crest level). The height is in mAOD which is the metres above the mean sea level at Newlyn, Cornwall.

It's important to remember that flood defence data may not be updated on a regular basis. The information here is based on the best available data.

Use this information:

- to help you assess if there is a reduced flood risk for this location because of defences
- with any information in the modelled data section to find out the impact of defences on flood risk








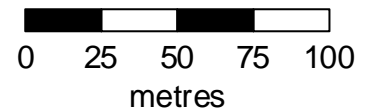
### Flood defences

Location (easting/northing)  
**348428/418602**

Scale  
**1:2,500**

Created  
**7 Jul 2023**

-  Selected area
-  Main river
-  Flood defence



## Flood defences data

Label	Asset ID	Asset Type	Standard of protection (years)	Current condition	Downstream actual crest level (mAOD)	Upstream actual crest level (mAOD)	Effective crest level (mAOD)
1	165763	Embankment	50	Fair	8.12	7.36	7.36
2	94882	Embankment	20	Fair	7.43	8.09	7.43
3	65956	Wall	25	Fair	7.43	8.09	7.43
4	165601	Wall	25	Fair	8.09	9.45	8.09
5	95082	Wall	20	Fair	9.45	8.94	8.94
6	165765	Wall	25	Fair	8.94	8.09	8.09
7	83799	Wall	25	Fair	8.94	8.11	8.11
8	95081	Embankment	25	Fair			
9	67808	Embankment	25	Fair	8.22	8.39	8.22
10	165602	Wall	25	Fair	8.11	8.11	8.11

Any blank cells show where a particular value has not been recorded for an asset.



## Modelled data

This section provides details of different scenarios we have modelled and includes the following (where available):

- outline maps showing the area at risk from flooding in different modelled scenarios
- modelled node point map(s) showing the points used to get the data to model the scenarios and table(s) providing details of the flood risk for different return periods
- map(s) showing the approximate water levels for the return period with the largest flood extent for a scenario and table(s) of sample points providing details of the flood risk for different return periods

## Climate change

The climate change data included in the models may not include the latest [flood risk assessment climate change allowances](#). Where the new allowances are not available you will need to consider this data and factor in the new allowances to demonstrate the development will be safe from flooding.

The Environment Agency will incorporate the new allowances into future modelling studies. For now, it's your responsibility to demonstrate that new developments will be safe in flood risk terms for their lifetime.

## Modelled scenarios

The following scenarios are included:

- Defended modelled fluvial: risk of flooding from rivers where there are flood defences
- Defences removed modelled fluvial: risk of flooding from rivers where flood defences have been removed
- Defended modelled tidal: risk of flooding from the sea where there are flood defences
- Defences removed modelled tidal: risk of flooding from the sea where flood defences have been removed
- Defended climate change modelled fluvial: risk of flooding from rivers where there are flood defences, including estimated impact of climate change
- Defences removed climate change modelled fluvial: risk of flooding from rivers where flood defences have been removed, including estimated impact of climate change
- Defended climate change modelled tidal: risk of flooding from the sea where there are flood defences, including estimated impact of climate change
- Defences removed climate change modelled tidal: risk of flooding from the sea where flood defences have been removed, including estimated impact of climate change











### Defended modelled fluvial extent

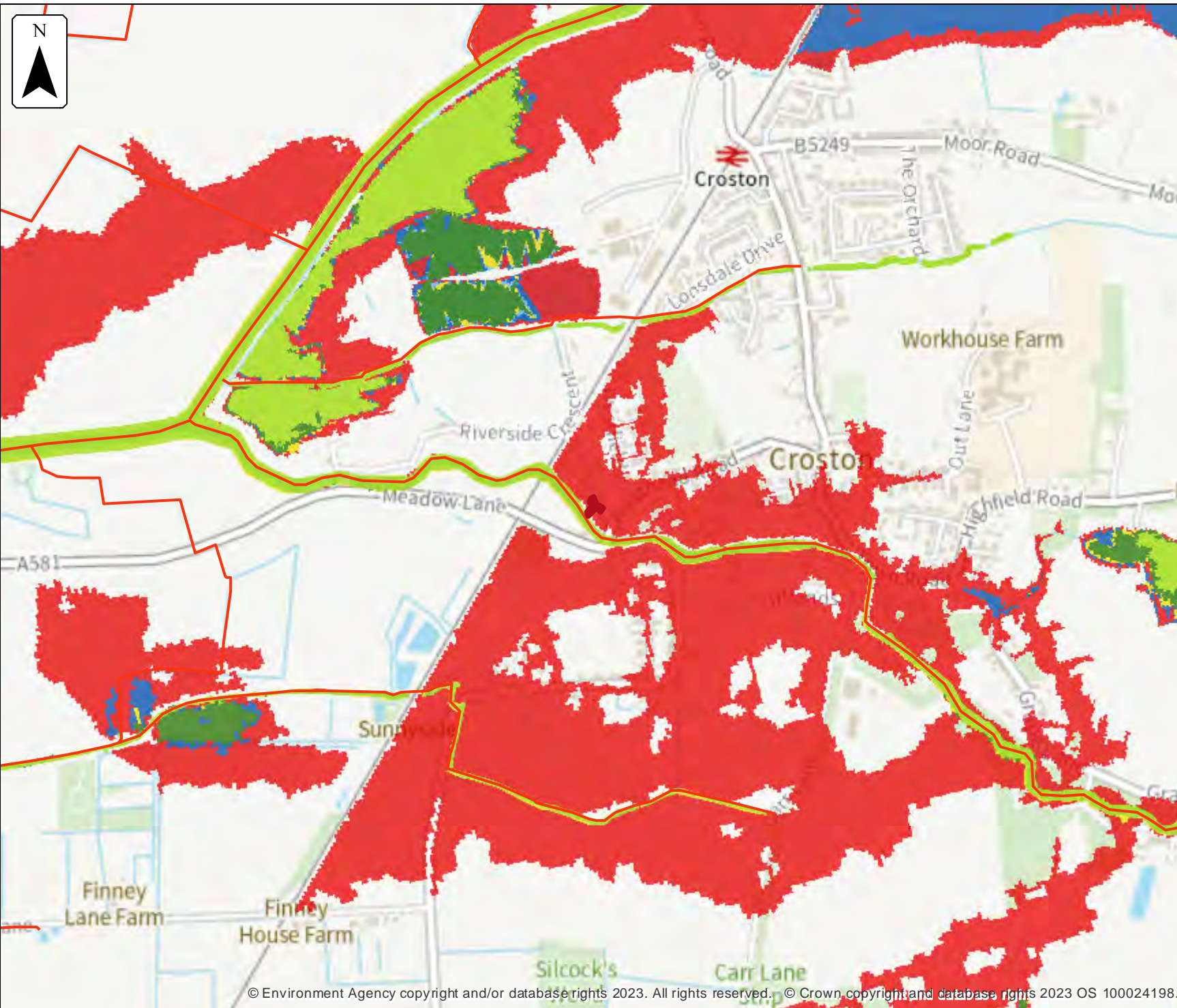
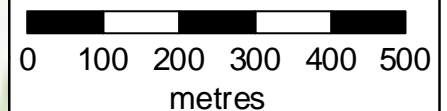
Location (easting/northing)  
**348428/418602**

Scale Created  
**1:10,000 7 Jul 2023**

Model name  
**Croston 2017**

-  Selected area
-  Main river
- Modelled flood extent**
-  5% AEP
-  2% AEP
-  1.33% AEP
-  1% AEP
-  0.5% AEP
-  0.1% AEP

Flood extents may not be visible where they overlap other return periods










### Defended climate change modelled fluvial extent

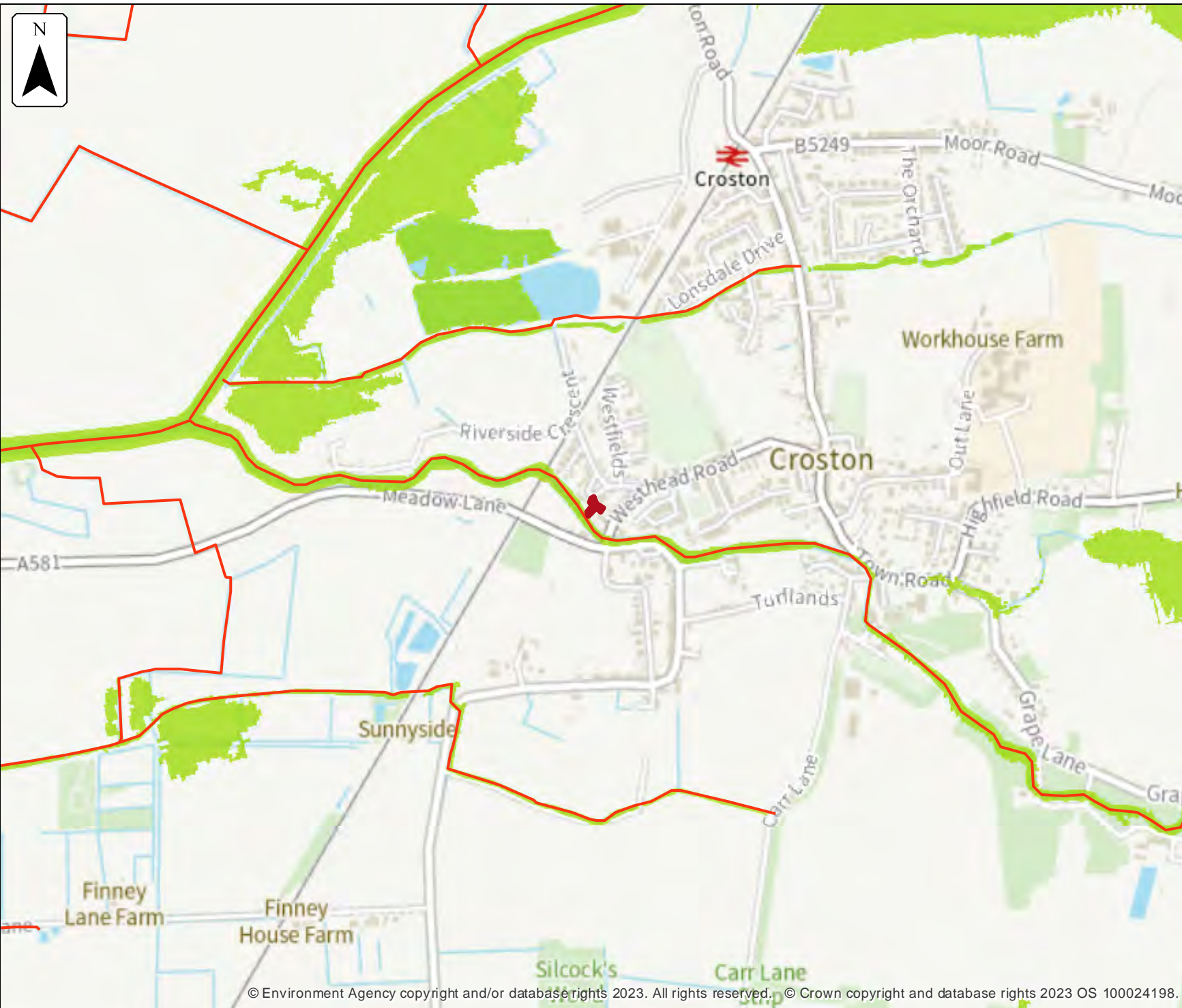
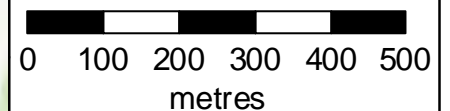
Location (easting/northing)  
**348428/418602**

Scale Created  
**1:10,000 7 Jul 2023**

Model name  
**Croston 2017**

-  Selected area
-  Main river
- Modelled flood extent
  -  1.0% AEP (+20%)

Flood extents may not be visible where they overlap other return periods















### Defences removed modelled fluvial extent

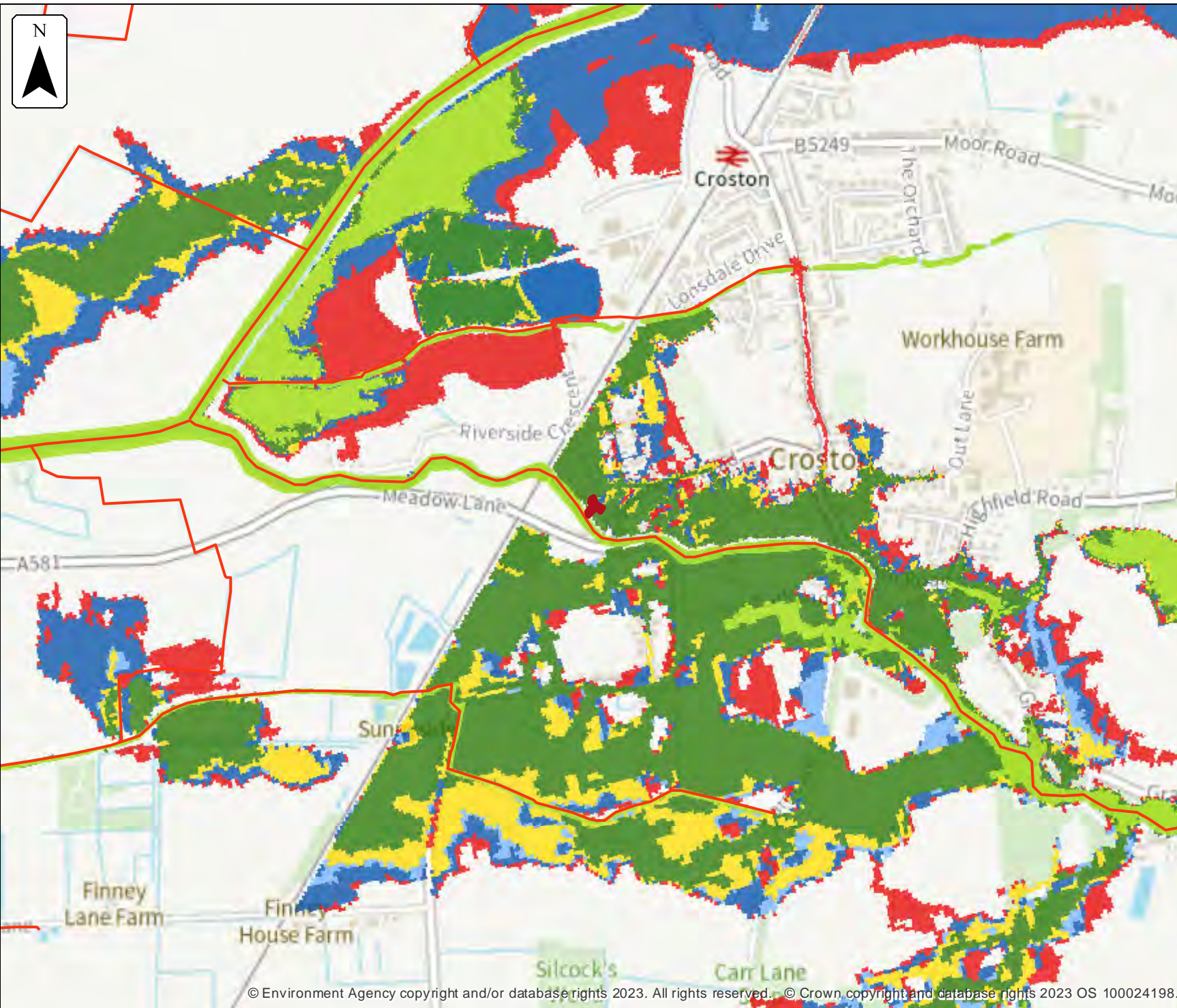
Location (easting/northing)  
**348428/418602**

Scale Created  
**1:10,000 7 Jul 2023**

Model name  
**Croston 2017**

-  Selected area
-  Main river
- Modelled flood extent**
-  5% AEP
-  2% AEP
-  1.33% AEP
-  1% AEP
-  0.5% AEP
-  0.1% AEP

Flood extents may not be visible where they overlap other return periods

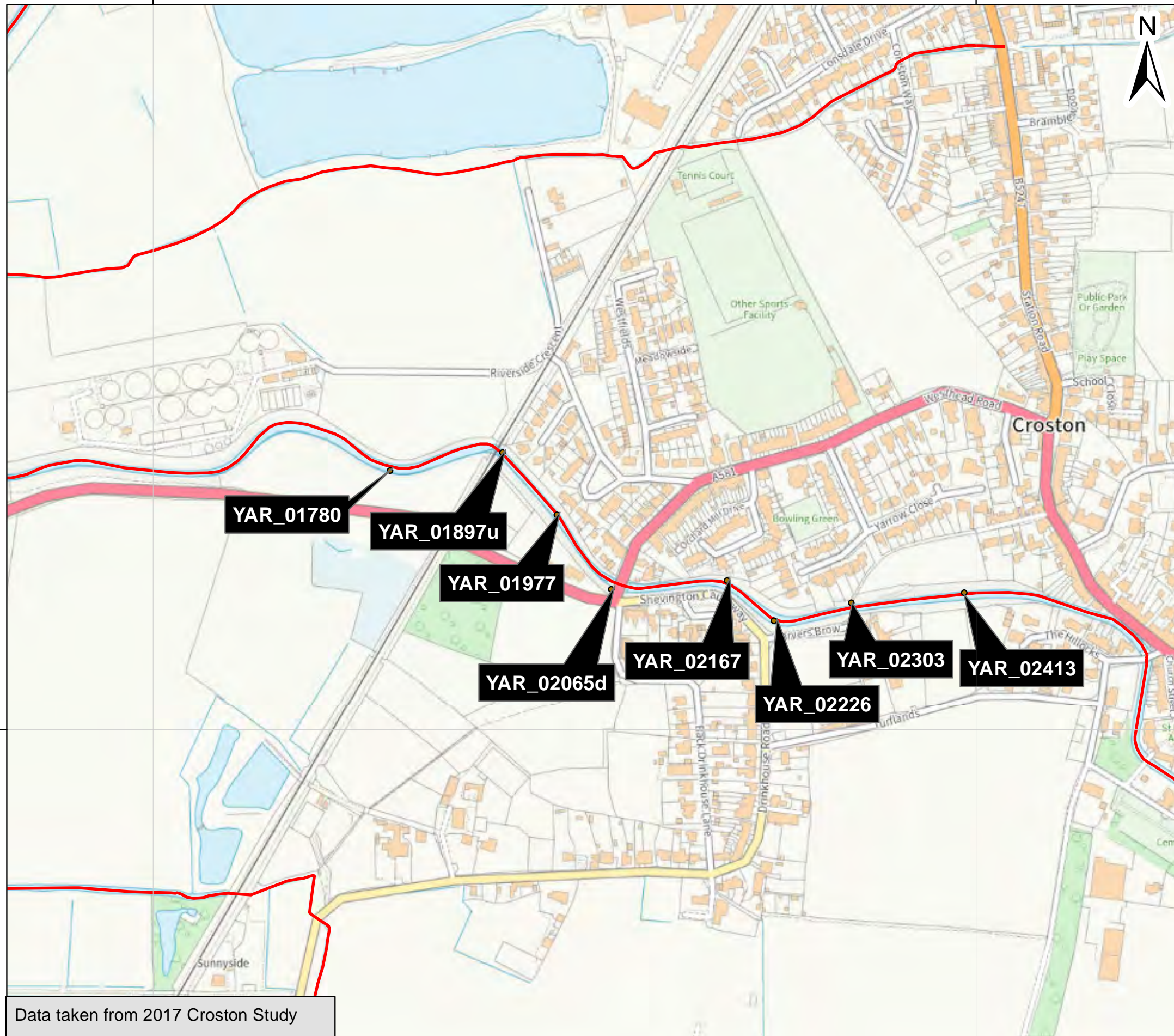




Key

● Node Points

~ Statutory Main Rivers



Data taken from 2017 Croston Study





NODE ID	DEFENDED (D)/ UNDEFENDED (U)/ CLIMATE CHANGE (CC)	AEP (%)	WATER LEVEL (mAOD)	FLOW (cumecs)
YAR_02413	Croston2017_D	5	7.06	38.67
YAR_02413	Croston2017_U	5	7.49	54.74
YAR_02413	Croston2017_D	1	7.08	38.12
YAR_02413	Croston2017_D_20%CC	1	7.28	43.68
YAR_02413	Croston2017_U	1	7.66	60.80
YAR_02413	Croston2017_D	0.1	7.76	62.71
YAR_02413	Croston2017_U	0.1	7.81	64.09
YAR_02303	Croston2017_D	5	6.98	38.66
YAR_02303	Croston2017_U	5	7.38	54.73
YAR_02303	Croston2017_D	1	7.00	38.12
YAR_02303	Croston2017_D_20%CC	1	7.19	43.67
YAR_02303	Croston2017_U	1	7.54	60.80
YAR_02303	Croston2017_D	0.1	7.64	62.69
YAR_02303	Croston2017_U	0.1	7.68	64.07
YAR_02226	Croston2017_D	5	6.93	38.66
YAR_02226	Croston2017_U	5	7.32	54.73
YAR_02226	Croston2017_D	1	6.96	38.12
YAR_02226	Croston2017_D_20%CC	1	7.15	43.66
YAR_02226	Croston2017_U	1	7.49	60.80
YAR_02226	Croston2017_D	0.1	7.59	62.78
YAR_02226	Croston2017_U	0.1	7.64	64.36
YAR_02167	Croston2017_D	5	6.83	38.65
YAR_02167	Croston2017_U	5	7.18	54.73
YAR_02167	Croston2017_D	1	6.86	38.12
YAR_02167	Croston2017_D_20%CC	1	7.05	43.66
YAR_02167	Croston2017_U	1	7.34	60.80
YAR_02167	Croston2017_D	0.1	7.45	62.77
YAR_02167	Croston2017_U	0.1	7.50	64.35
YAR_02065d	Croston2017_D	5	6.79	38.63
YAR_02065d	Croston2017_U	5	7.12	54.72
YAR_02065d	Croston2017_D	1	6.82	38.12
YAR_02065d	Croston2017_D_20%CC	1	7.00	43.65
YAR_02065d	Croston2017_U	1	7.26	60.79
YAR_02065d	Croston2017_D	0.1	7.38	62.77
YAR_02065d	Croston2017_U	0.1	7.42	64.33
YAR_01977	Croston2017_D	5	6.74	38.63
YAR_01977	Croston2017_U	5	7.05	54.72
YAR_01977	Croston2017_D	1	6.78	38.12
YAR_01977	Croston2017_D_20%CC	1	6.96	43.64
YAR_01977	Croston2017_U	1	7.20	60.81
YAR_01977	Croston2017_D	0.1	7.31	62.76
YAR_01977	Croston2017_U	0.1	7.35	64.33
YAR_01897u	Croston2017_D	5	6.70	38.62
YAR_01897u	Croston2017_U	5	6.98	54.71
YAR_01897u	Croston2017_D	1	6.74	38.12
YAR_01897u	Croston2017_D_20%CC	1	6.91	43.64



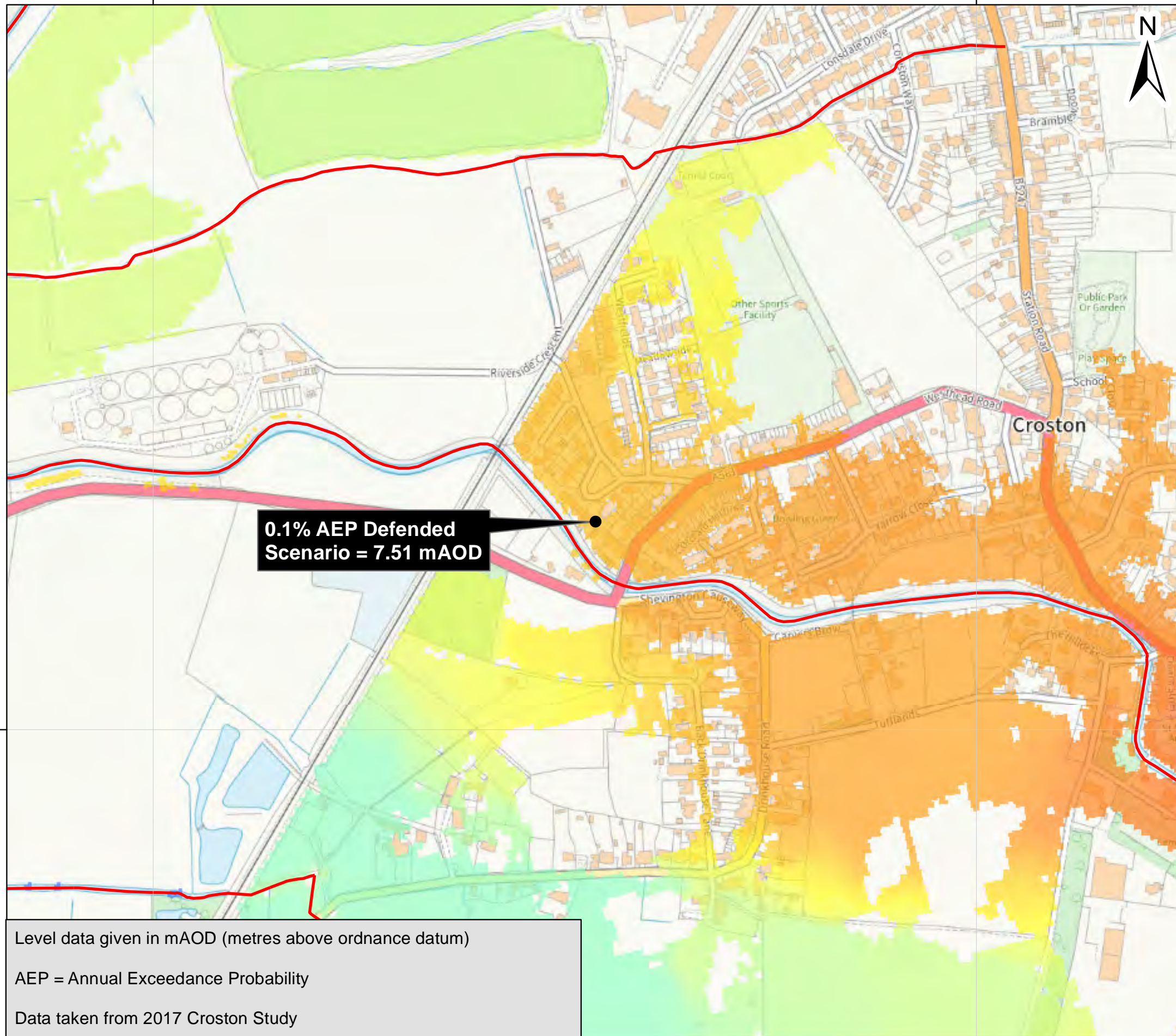
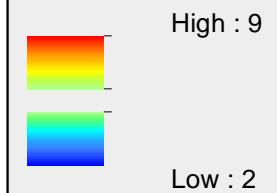
YAR_01897u	Croston2017_U	1	7.12	60.83
YAR_01897u	Croston2017_D	0.1	7.23	63.41
YAR_01897u	Croston2017_U	0.1	7.26	65.85
YAR_01780	Croston2017_D	5	6.67	38.62
YAR_01780	Croston2017_U	5	6.95	54.70
YAR_01780	Croston2017_D	1	6.72	38.13
YAR_01780	Croston2017_D_20%CC	1	6.89	43.63
YAR_01780	Croston2017_U	1	7.09	60.87
YAR_01780	Croston2017_D	0.1	7.20	63.41
YAR_01780	Croston2017_U	0.1	7.23	65.84

**Key**

 Statutory Main Rivers

**0.1% Annual Exceedance Probability  
Defended Scenario**

mAOD



**0.1% AEP Defended  
Scenario = 7.51 mAOD**

Level data given in mAOD (metres above ordnance datum)  
AEP = Annual Exceedance Probability  
Data taken from 2017 Croston Study



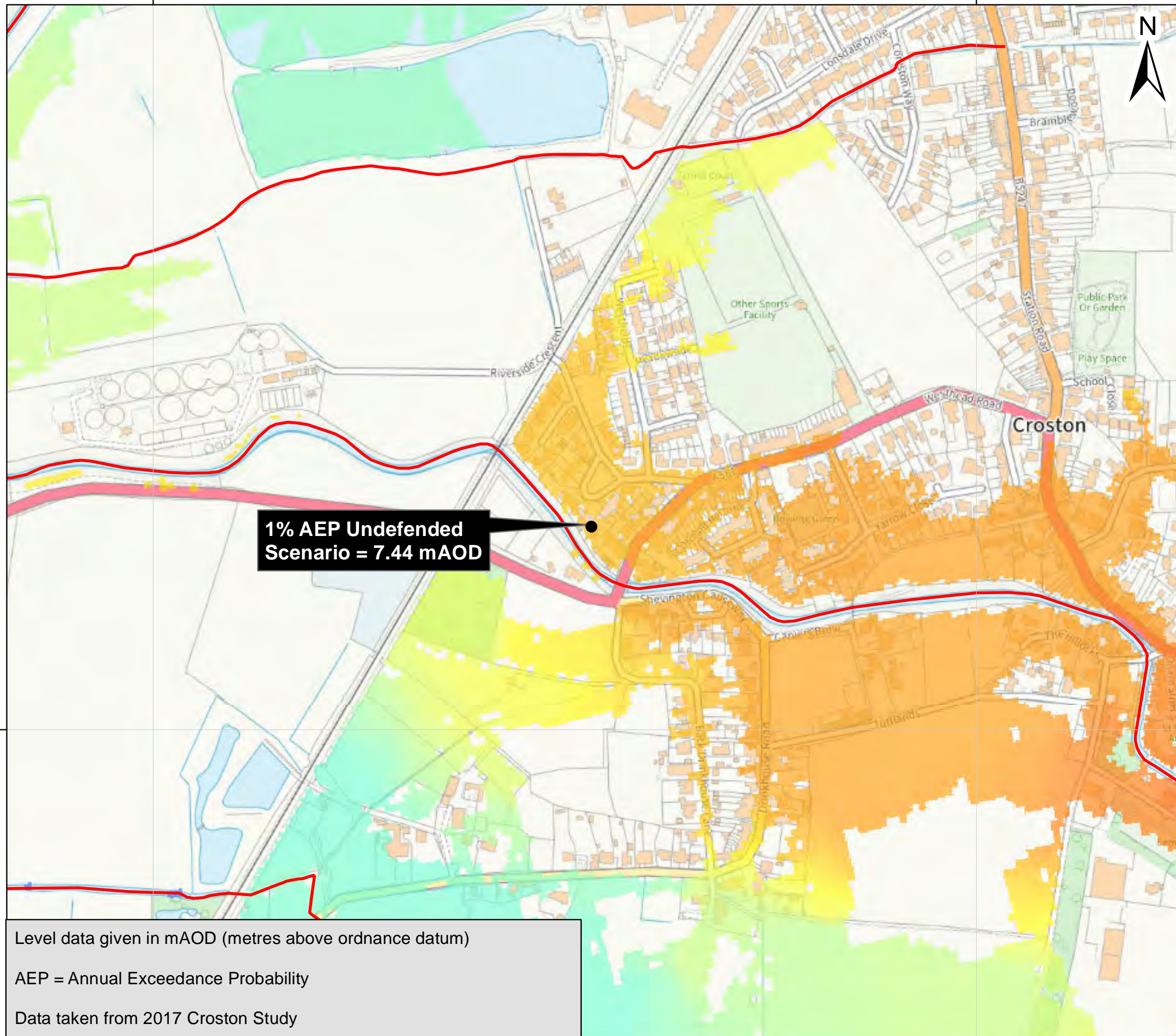
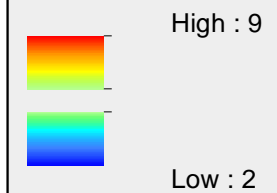


**Key**

 **Statutory Main Rivers**

**1% Annual Exceedance Probability  
Undefended Scenario**

**mAOD**



**1% AEP Undefended  
Scenario = 7.44 mAOD**

Level data given in mAOD (metres above ordnance datum)  
AEP = Annual Exceedance Probability  
Data taken from 2017 Croston Study



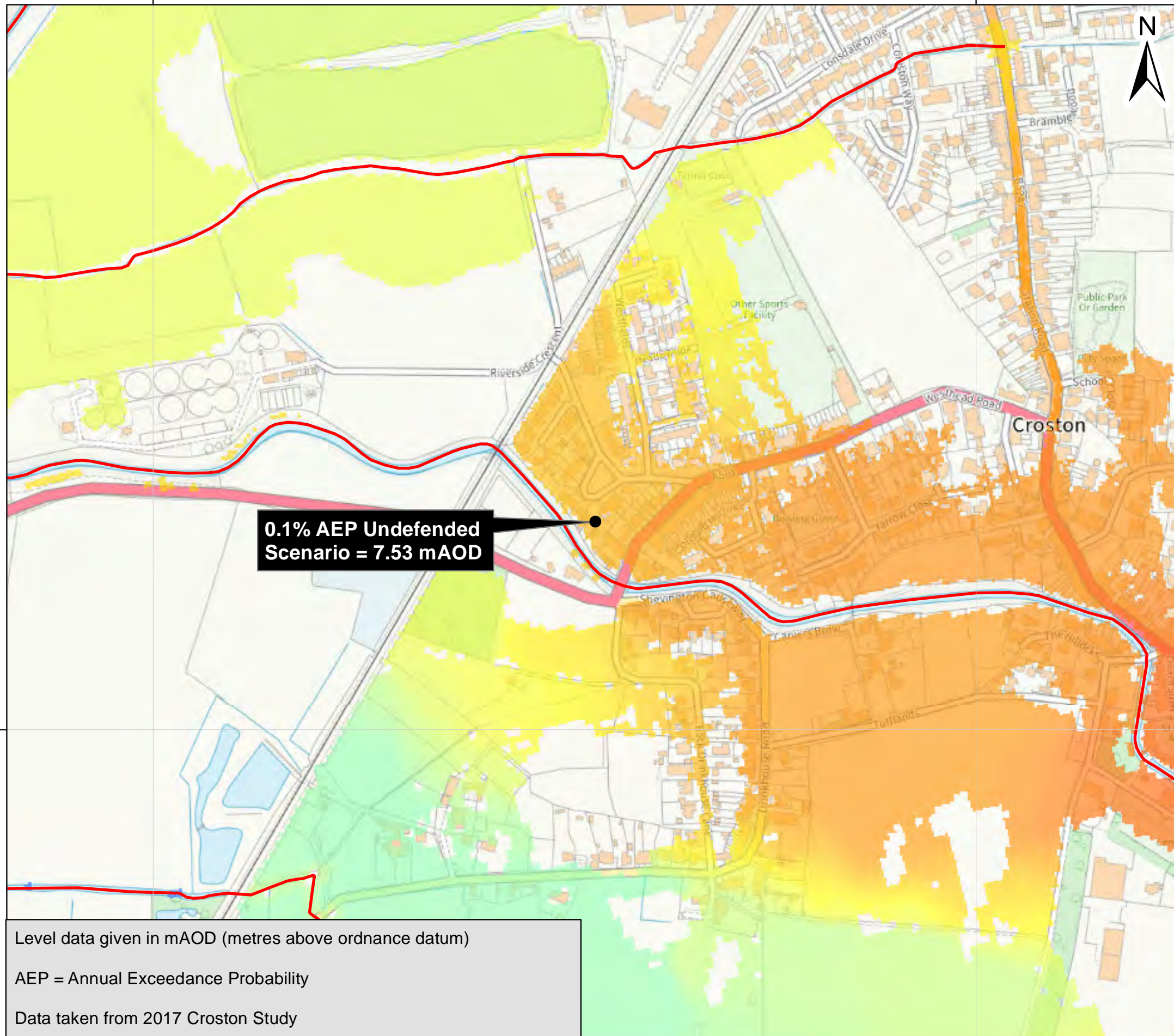
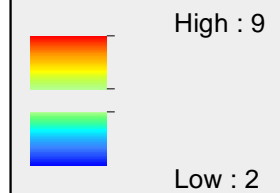


**Key**

 **Statutory Main Rivers**

**0.1% Annual Exceedance Probability  
Undefended Scenario**

**mAOD**



**0.1% AEP Undefended  
Scenario = 7.53 mAOD**

Level data given in mAOD (metres above ordnance datum)  
AEP = Annual Exceedance Probability  
Data taken from 2017 Croston Study



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## Strategic flood risk assessments

We recommend that you check the relevant local authority's strategic flood risk assessment (SFRA) as part of your work to prepare a site specific flood risk assessment.

This should give you information about:

- the potential impacts of climate change in this catchment
- areas defined as functional floodplain
- flooding from other sources, such as surface water, ground water and reservoirs

## About this data

This data has been generated by strategic scale flood models and is not intended for use at the individual property scale. If you're intending to use this data as part of a flood risk assessment, please include an appropriate modelling tolerance as part of your assessment. The Environment Agency regularly updates its modelling. We recommend that you check the data provided is the most recent, before submitting your flood risk assessment.

## Flood risk activity permits

Under the Environmental Permitting (England and Wales) Regulations 2016 some developments may require an environmental permit for flood risk activities from the Environment Agency. This includes any permanent or temporary works that are in, over, under, or nearby a designated main river or flood defence structure.

[Find out more about flood risk activity permits](#)

## Help and advice

Contact the Cumbria and Lancashire Environment Agency team at [inforequests.cmblnc@environment-agency.gov.uk](mailto:inforequests.cmblnc@environment-agency.gov.uk) for:

- [more information about getting a product 5, 6, 7 or 8](#)
- general help and advice about the site you're requesting data for