



**Our Reference : D4030-L-01**  
**Your Reference :**

**20<sup>th</sup> February 2023**

Richard Maudsley  
Sunderland Peacock and Associates Ltd.  
Hazelmere  
Pimlico Road  
Clitheroe  
Lancashire  
BB7 2AG

Dear Richard,

**Land adjacent to 8 Brookes Lane, Whalley, BB7 9RG**  
**Proposed new dwelling within residential curtilage to replace existing garage.**  
**Flood Risk Assessment.**

### **Introduction**

PSA Design Ltd has been commissioned by Sunderland Peacock & Associates (on behalf of the Client) to prepare a Flood Risk Assessment (FRA) in support of an application for “proposed new dwelling within residential curtilage to replace existing garage” at 8 Brookes Lane, Whalley, BB7 9RG. A pre-application enquiry was undertaken with Ribble Valley Borough Council, reference number RV/2020/ENQ/00116.

The site is located at national grid reference 373510E 436440N. The site location has can be seen on the Architects plans (Appendix A) and Flood Maps (Appendix B) included at the end of this assessment.

Reference to the flood map for planning indicates the site is located on the cusp of Flood Zone 2/3a. This is best illustrated on the aerial extract below.



Flood Zone 3 Boundary on Aerial Imagery

### Existing Site

The site comprises the property of 8 Brookes Lane with its associated garage and garden. Brookes Lane runs to the north of the property. The existing setting can be seen on the aerial above and to give context the google street scene below. The existing garage together with its position in relation to Brookes Lane can be clearly seen.



Google Street View showing existing property (RHS) and Garage (LHS)

A small brook runs along the southern boundary of the plot with existing dwellings to the east and west.

The topography of the land generally falls from North to South (towards the brook) and from East to West. Levels are shown on the survey plan, included within Appendix A.

### Development Proposals

The proposal is to replace the existing detached garage with a new 2 storey dwelling on the same site with slightly larger footprint. Access will be via a driveway immediately east to the existing one.

The Architects existing and proposed plans are included for reference in Appendix A.

### Flood Risk Assessment

It has been established that the site is located on the edge of Flood Zone 2/3a

Planning Policy Guidance (PPG) has been reviewed and assessed as below.

With reference to PPG, the proposed dwelling would be fall within the “More Vulnerable” category.

PPG indicates that More Vulnerable development is required to pass the exception test when located within Flood Zone 3a.

It is important to account for climate change when making assessment of flood risk. NPPF guidance indicates that for when using peak river flow allowances for flood risk assessments, more vulnerable developments withing flood zones 2 and 3a (as is this site) should use the “central allowance”.

This development site is located within the Ribble Management Catchment area. Reference to the peak flow allowance map sets out the allowances below:

	Central	Higher	Upper
2020s	16%	19%	27%
2050s	23%	29%	44%
2080s	36%	46%	71%

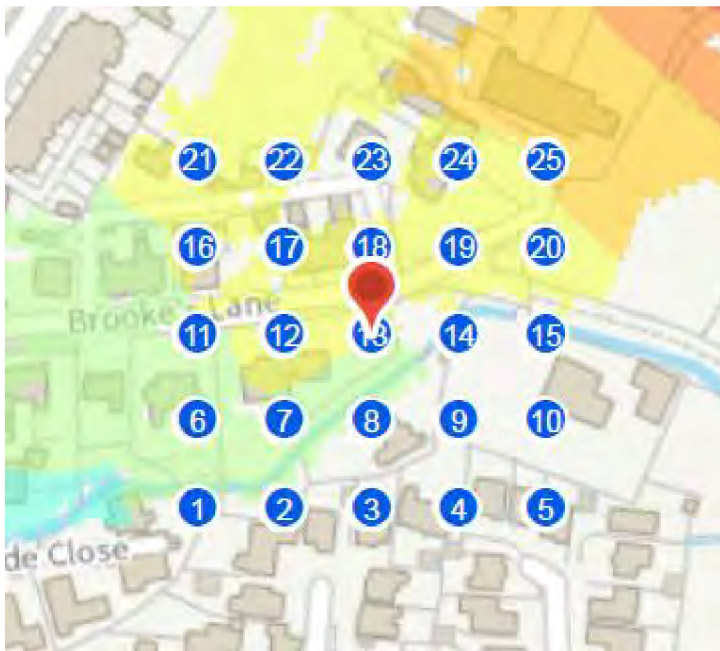
Ribble Management Catchment Climate Change Allowances Table

Therefore, a 36% allowance should be applied to the peak river flow to account for climate change.

To make a site-specific assessment of flood risk, Product 4 data has been acquired from the Environment Agency. This data is included as Appendix B and discussed below.

To allow for an accurate assessment a, finished floor level needs to be established. With reference to the Architects proposed elevation drawing, the **proposed finished floor level will be 53.26mAOD.**

The flood map extract below shows the Environment Agencies site specific node points. It is clear from the map below that Node 13 is located immediately over the proposed location of the existing garage and thus proposed dwelling.



Environment Agency Node Location Map

The levels associated with Node 13 for the various scenarios have been extracted and set out within the table below:

Scenario	Event	Flood Depth (m)	Flood Level (mAOD)
Defences removed fluvial	1.33% AEP	0.07	52.63
	1.0% AEP	0.08	52.65
	0.5% AEP	0.10	52.67
	0.1% AEP	0.15	52.71
Defences removed fluvial (including climate change)	1.0% AEP (+15%)	0.10	52.66

Flood Model Data extracted from Product mapping

## **Fluvial Flood Risk Conclusion**

The table above sets out two headline figures:

0.1% AEP Event – This represents the boundary of Flood Zone 1, i.e. anything above this is not considered to be in a flood zone. This figure is 52.71mAOD

1.0% AEP (+15%) – This represents the Flood Zone 3 level including an allowance for climate change of 15%. This figure is important as it is a defining figure set out within NPPF when making assessment of flood risk. This level is 52.66mAOD. It is noted that the recommended climate change allowance for this area is +35%, however, it is also noted that the +15% allowance made an impact of +0.01m compared to the base 0.1% AEP event.

As previously set out, the proposed FFL has been set at 53.26mAOD, this represents a figure 600mm above the 1.0% (+15%) level and 550mm above the 0.1% (flood zone 1) level.

Whilst an assessment hasn't been made against the recommended 35% climate change event (as data isn't readily available, it is considered that the above facts indicated that the proposed property will be located well above the predicted flood event level and within flood zone 1.

## **Flood Risk from other sources**

Reference to Environment Agency surface water and reservoir flood maps shows the site to be outwith an area at risk of flooding from those sources.

Given the sloping nature of the site, it is evident that any flood water would continue to pass unhindered around the proposed dwelling just the same as it did the existing garage. Hence the effect on flood flow path routes would at worst be marginal.

## **Resistance and Resilience Measures**

Whilst the flood risk assessment above indicates not strictly necessary, it is recommended that the following construction measures are built into the proposed outbuilding: -

- the construction of the new ground floor should be of solid construction and incorporate a damp proof membrane under; connected to the damp proof course in the walls.
- the external walls to be constructed in low permeability materials

- all electrical sockets and switches to be positioned at a minimum of 600mm above ground floor level and electrical supply feeds to come down from ceiling level.
- use sealed uPVC external framed doors, adequately sealed to the surrounding masonry.
- no low level air vents (underfloor or cavity) to be incorporated in the design.
- non return flap valves to be fitted to all foul sewer IC's

### Surface Water Management Strategy

With respect to dealing with surface water, NPPF requires that, for the range of annual flow rate probabilities, up to and including the 1% annual probability (1 in 100-year event) the developed rate of run-off from a proposed site should be no greater than the undeveloped rate of run-off for the same event. Even when the site is brownfield, the site should be treated as greenfield.

It is also important to account for climate change (CC) when making assessment of surface water run-off. As the development site is located within the Ribble Management Catchment area, reference to the peak rainfall allowance map sets out the allowances below:

Scenario	Event	Central Allowance	Upper End Allowance
3.3% annual exceedance rainfall event	2050s	25%	35%
	2070s	30%	40%
3.3% annual exceedance rainfall event	2050s	25%	40%
	2070s	35%	50%

Catchment Peak Rainfall Allowances - Use '2050s' for development with a lifetime up to 2060 and use the 2070s epoch for development with a lifetime between 2061 and 2125.

Therefore CC should also be taken into account by increasing the proposed rainfall intensity by 40% when assessing against the 3.3% (1 in 33) storm event and 50% when assessing against the 1% (1 in 100) storm event.

Notwithstanding the above, it is important to note that there is an existing building on the site which is currently drained, together with its associated driveway. The existing area drained is circa 100m<sup>2</sup>.

**Proposed Outline SuDS solution.**

In accordance with the hierarchical SuDS approach, the preferred surface water drainage solution is to discharge to ground via soakaways. Even when there are alternative sewer connections or watercourses available, infiltration must still be utilised unless it is proved unfeasible.

Reference to “Soilscapes Mapping” also indicates the soil is “Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils with impeded drainage”. Similarly, BGS mapping indicates “Till” (i.e clay). This indicates that drainage via infiltration is very unlikely to be possible. With reference to the proposed site plan, it would also be impossible to install soakaways while complying with minimum Building Regulation prescribed offset distances. Therefore, drainage via infiltration is not considered appropriate at this site.

Whilst we don’t know for certain at this stage, engineering judgement would suggest that the existing property surface water (including the garage) drains directly to the existing brook (watercourse) running along the southern boundary of the site. Regardless of the existing regime, it is recommended that the proposed dwelling drains this way, thus following the next preferred hierarchical approach.

It is recommended that all external surfacing be permeable and/or allowed to drain to surrounding lawns and landscaped areas and not positively drained into a piped system.

The proposed roof area measures circa 100m<sup>2</sup>. The equivalent greenfield run-off rate from this area would be <1l/s. It is generally accepted that restricting run-off rates to any less than 2l/s can be counter productive and actually increase flood risk due to the inherent nature of the throttle size required to achieve the desired flow rate. It is therefore proposed that the maximum surface water flow should be restricted to 2l/s.

Storage Estimate

Return Period (years)	<input type="text" value="100"/>
Climate Change (%)	<input type="text" value="50"/>
Impermeable Area (ha)	<input type="text" value="0.010"/>
Peak Discharge (l/s)	<input type="text" value="2.000"/>
Infiltration Coefficient (m/hr) (leave blank if no infiltration)	<input type="text"/>
Required Storage (m <sup>3</sup> )	<input type="button" value="Calc"/>
from	<input type="text" value="1"/>
to	<input type="text" value="3"/>

A storage estimate has been calculated in Causeway Flow software for the 1 in 100yr + 50% CC event. The results show a storage requirement of between 1 and 3m<sup>3</sup>.

There are numerous ways this could be built into the drainage system. It is recommended that a

“Raintaina FC” cellular storage unit is used with inbuilt flow control office. These units, supplied and

manufactured by SEL Environmental are compact and can be installed at very low invert levels and a particularly suited to single dwellings such as this.

Therefore, the surface water drainage (SuDS) strategy is set out below:-

- Proposed flows to be restricted to 2l/s
- Attenuated surface water drainage system to be designed to accommodate the 1 in 100yr + 50% CC event.
- All external surfacing to be constructed from a porous solution and not formally drained into the piped system.
- Surface Water to outfall direct to watercourse (via existing drains serving 8 Brookes Lane or new connection) subject to detailed design.

Should for any reason a connection into the adjoining watercourse not be possible then the final option available would be to drain into the existing adopted combined sewer running along Brookes Lane. However, this would only be considered should all other means of draining surface water be formally ruled out and the connection would be subject to the agreement of United Utilities.

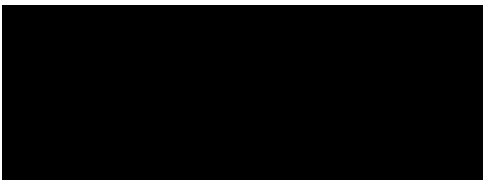
The final surface water drainage system will be subject to detailed design and the delivery of a compliant solution can be secured by suitably worded planning condition. It is however clear that there is a compliant solution available to drain the surface water in a sustainable manner should permission be granted.

### **Conclusion**

The application is for a proposed single dwelling. The assessment above has systematically addressed associated flood risk issues in relation to NPPF guidance.

It is concluded that subject to the design criteria and recommendation set out within this assessment, the development would not be at adverse risk from flooding and would not increase flood risk elsewhere.

Yours sincerely,

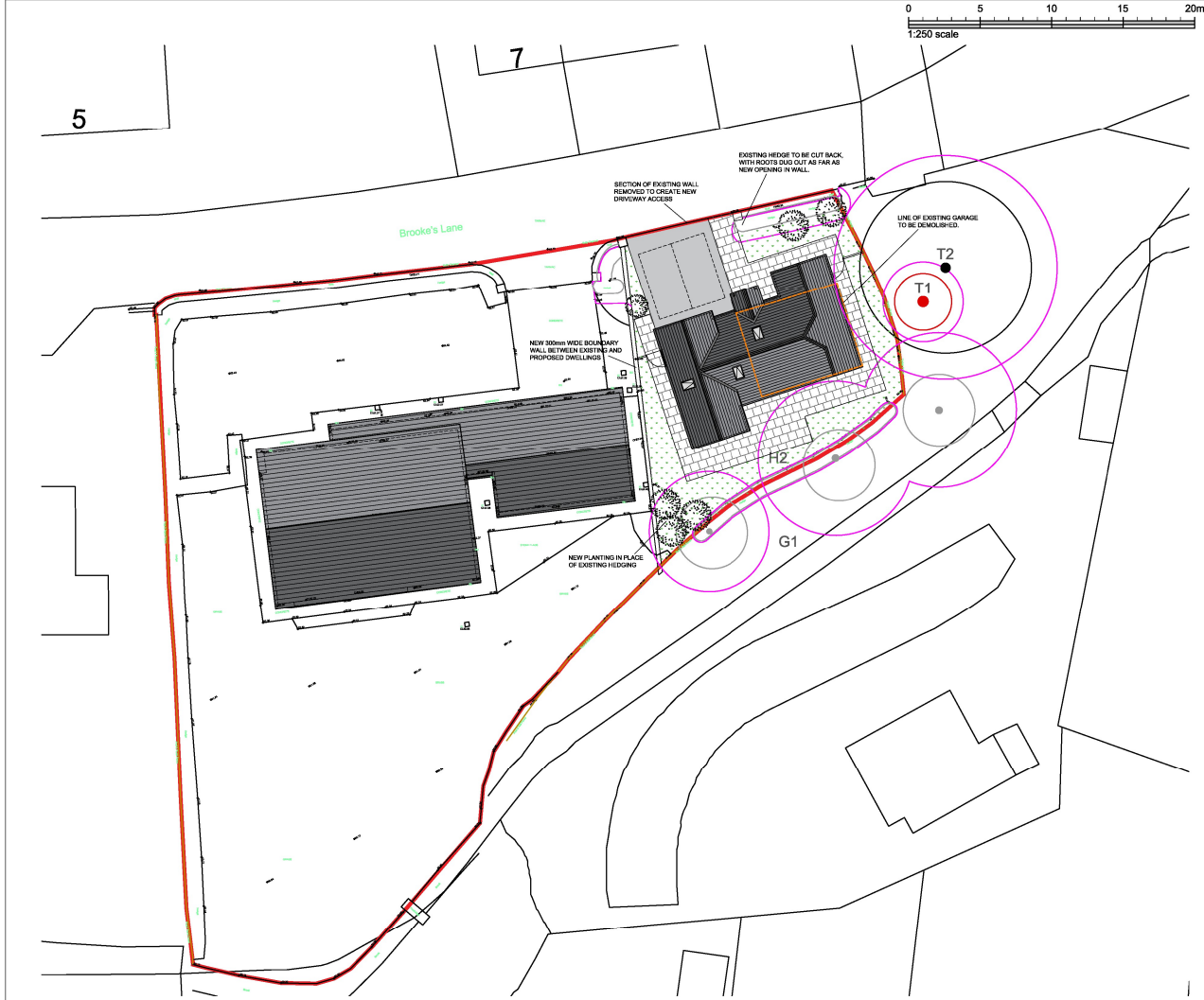


**Graham Sanderson**  
PSA Design Ltd

# Appendix A

## Drawings





This drawing is to be read in conjunction with all relevant Architect, consultant and specialist drawings and specifications. The Architect is to be notified of any discrepancies before proceeding. Do not scale from this drawing. All dimensions and levels are to be checked on site. This drawing is subject to copyright. All work carried out before Planning and Building Permission has been granted is at the contractor's risk. None proposed drawing based on OS map information. All illustrated dimensions are approximate and all site dimensions are to be checked on site and subject to site survey.



A RS Amendments to scheme design proposals 08/12/2020

Client  
Mr P Bradley

Job Title  
Proposed New Dwelling at  
8 Brooke's Lane,  
Whalley

Drawing Title  
Proposed Site Plan

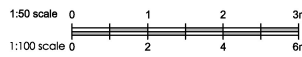
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1:250 @ A3	Nov 2020	BT

**spa**  
SUNDERLAND PEACOCK ARCHITECTS

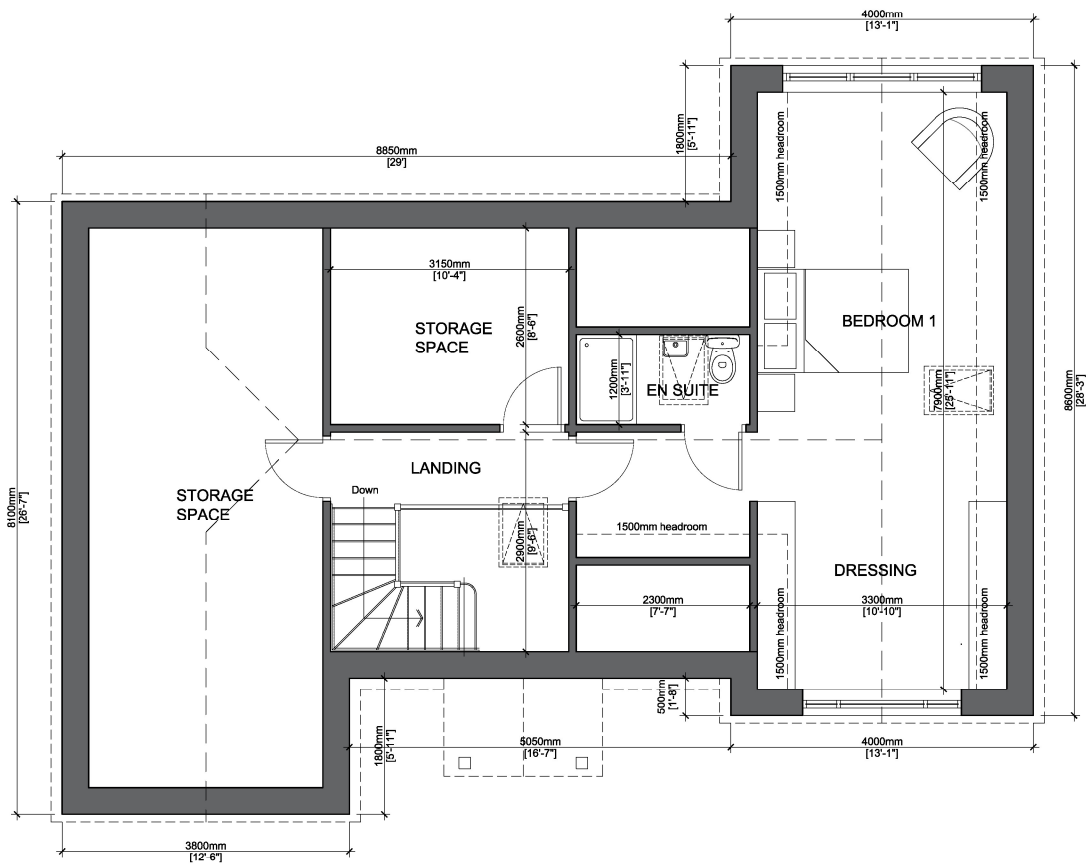
SUNDERLAND PEACOCK & ASSOCIATES LTD  
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6194 - SK01 REV A





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 Note: Proposed drawing based on OS map information. All horizontal dimensions are approximate and all site dimensions are to be checked on site and subject to site survey.



PROPOSED FIRST FLOOR PLAN SCALE 1:50

Client  
 Mr P Bradley

Job Title  
 Proposed New Dwelling at  
 8 Brooke's Lane,  
 Whalley

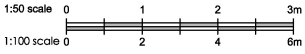
Drawing Title  
 Proposed First Floor Plan

Scale	Date	Drawn
Various @ A3	Nov 2020	BT

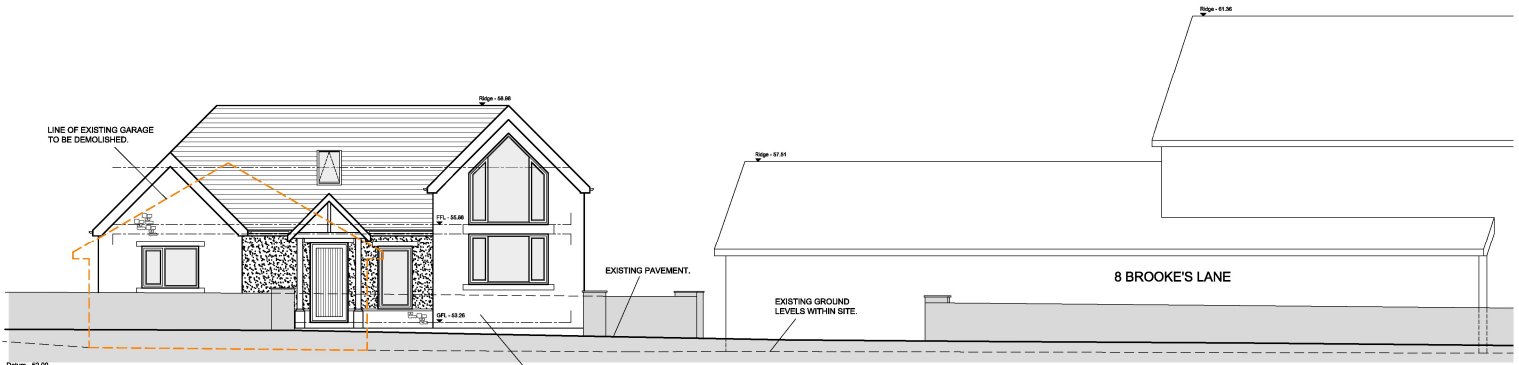
**spa**  
 SUNDERLAND PEACOCK ARCHITECTS

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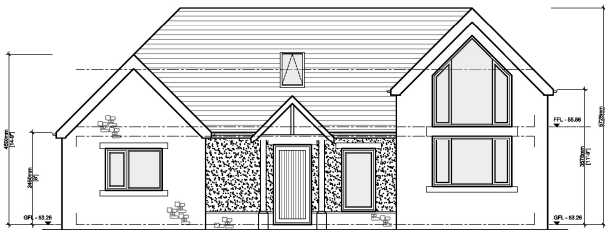


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Note: Proposed drawing based on OS map information. All horizontal dimensions are approximate and all site dimensions are to be checked on site and subject to site survey.



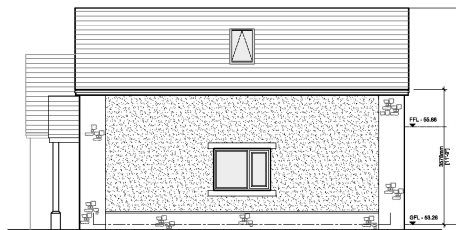
PROPOSED STREETSCENE ELEVATION SCALE 1:50

SECTION OF EXISTING WALL REMOVED TO CREATE NEW DRIVEWAY ACCESS

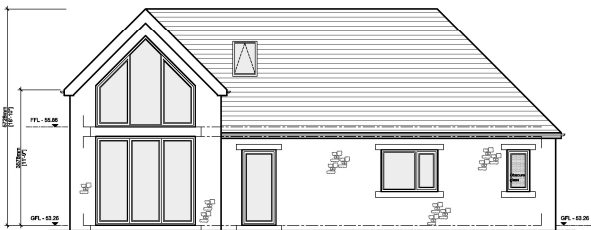


PROPOSED NORTH ELEVATION SCALE 1:100

Datum - 52.00



PROPOSED WEST ELEVATION SCALE 1:100



PROPOSED SOUTH ELEVATION SCALE 1:100



PROPOSED EAST ELEVATION SCALE 1:100

Client  
**Mr P Bradley**

Job Title  
**Proposed New Dwelling at 8 Brooke's Lane, Whalley**

Drawing Title  
**Proposed Elevations**

Scale	Date	Drawn
Various @ A3	Dec 2022	RS

**spa**  
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**6194 - SK04** - REV

# Appendix B

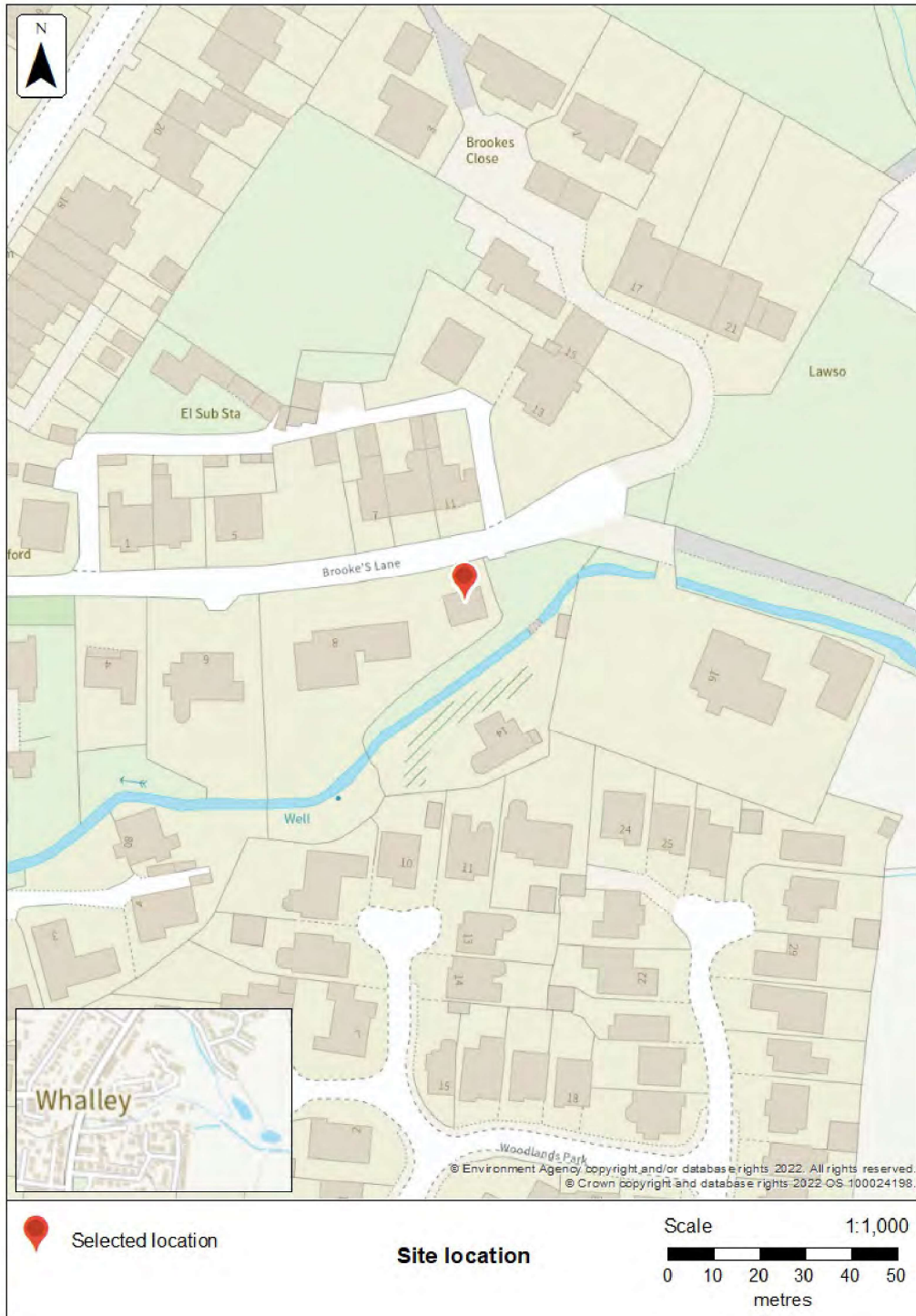
## EA Flood Mapping

# Flood risk assessment data



**Location of site:** 373510 / 436441 (shown as easting and northing coordinates)  
**Document created on:** 8 November 2022  
**This information was previously known as a product 4.**  
**Customer reference number:** U4XW6H52V6JC

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
- 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

## 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: Whalley 2017

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

Date: 11 August 2017

This model contains 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

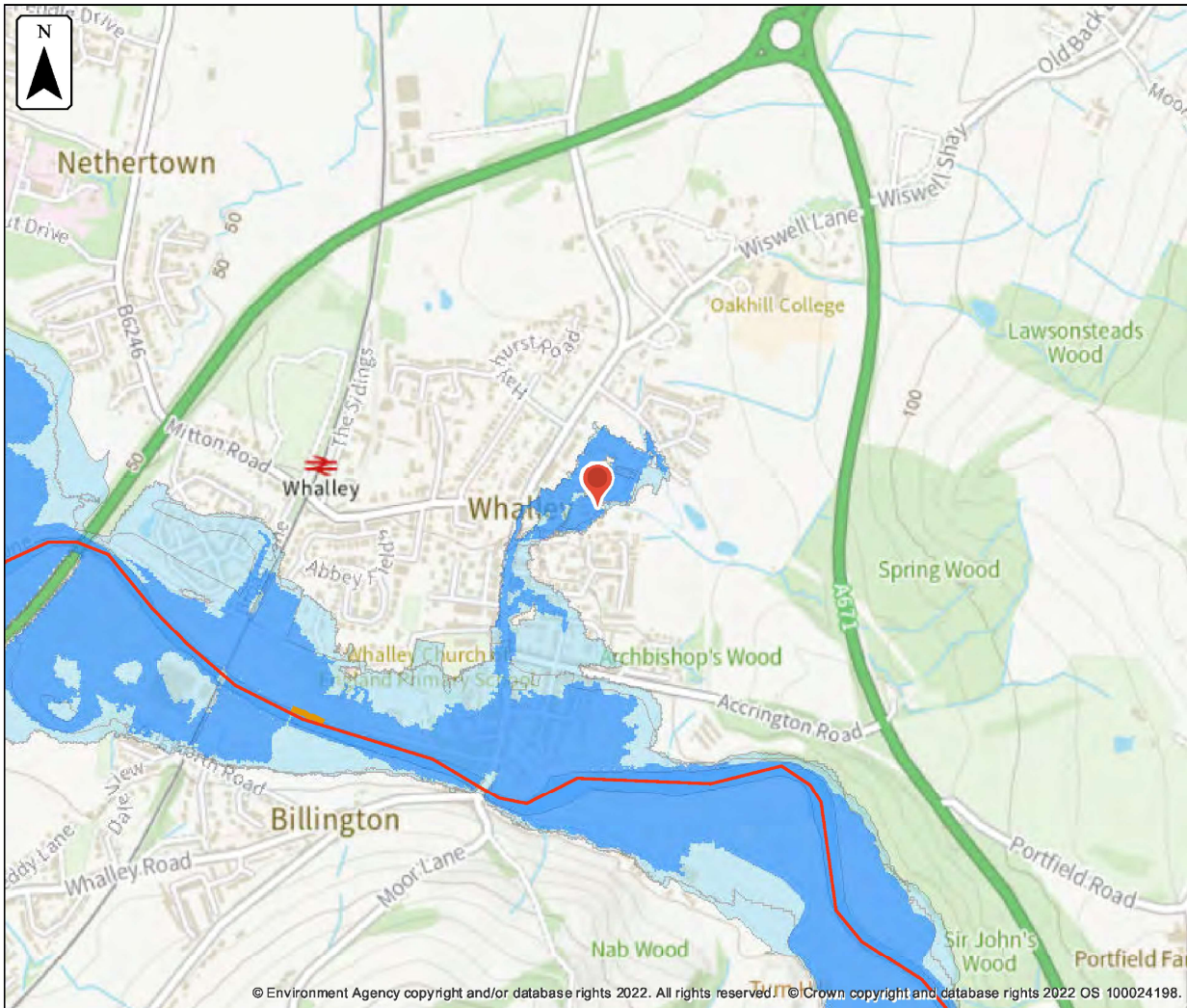
Flood zone 2 shows the area at risk of flooding for an undefended flood event with:

- 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.








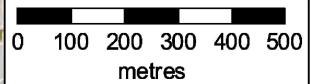
**Flood map for planning**

Location (easting/northing)  
**373510/436441**

Scale  
**1:10,000**

Created  
**8 Nov 2022**

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



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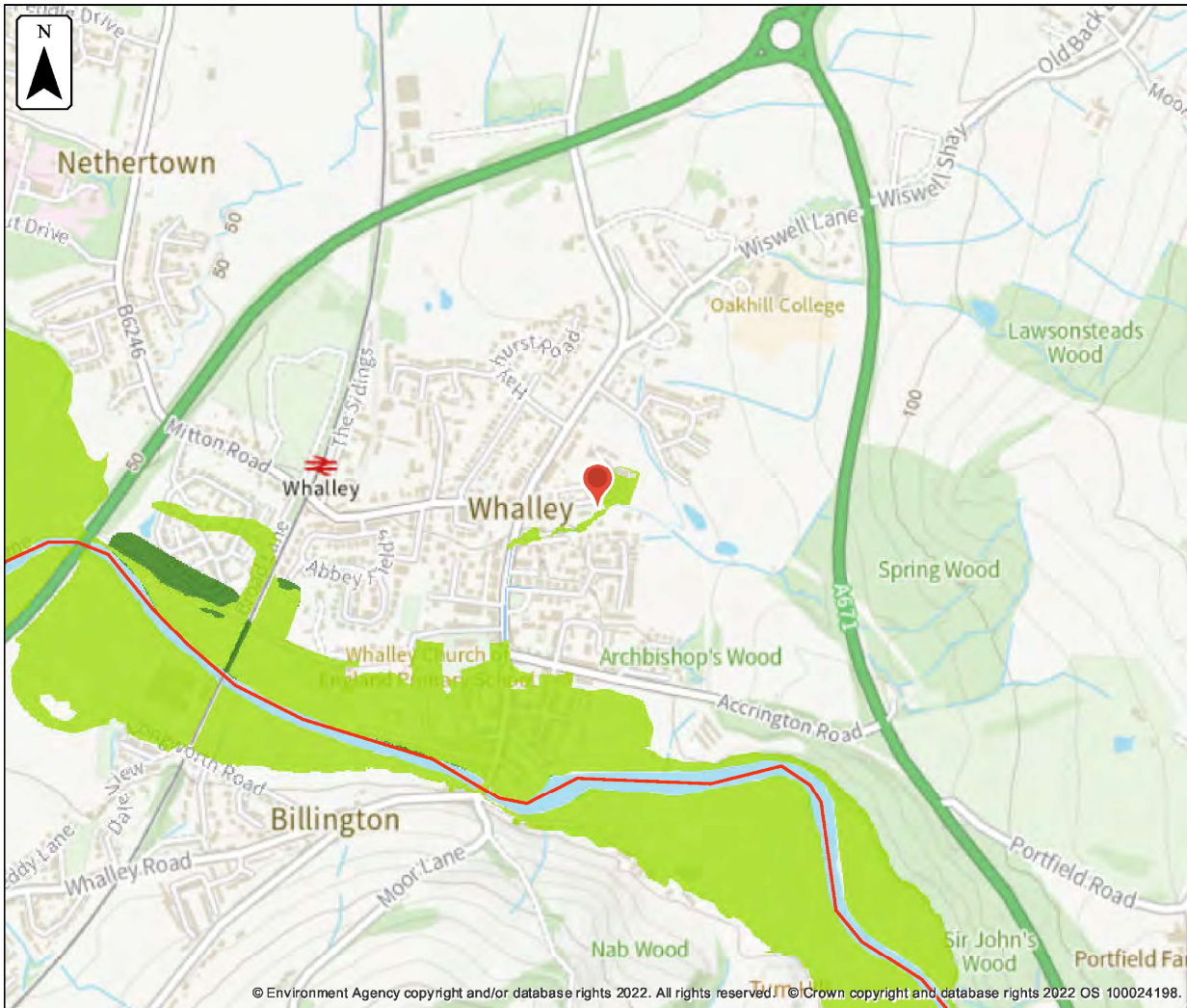
## Historic flooding

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](#)









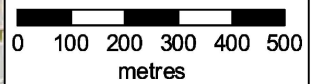
**Historic flood map**

Location (easting/northing)  
**373510/436441**

Scale  
**1:10,000**

Created  
**8 Nov 2022**

-  Selected location
-  Main river
- Date of flood event
-  December, 2015
-  June, 2012
-  October, 2000
-  December, 1999



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## Historic flood event data

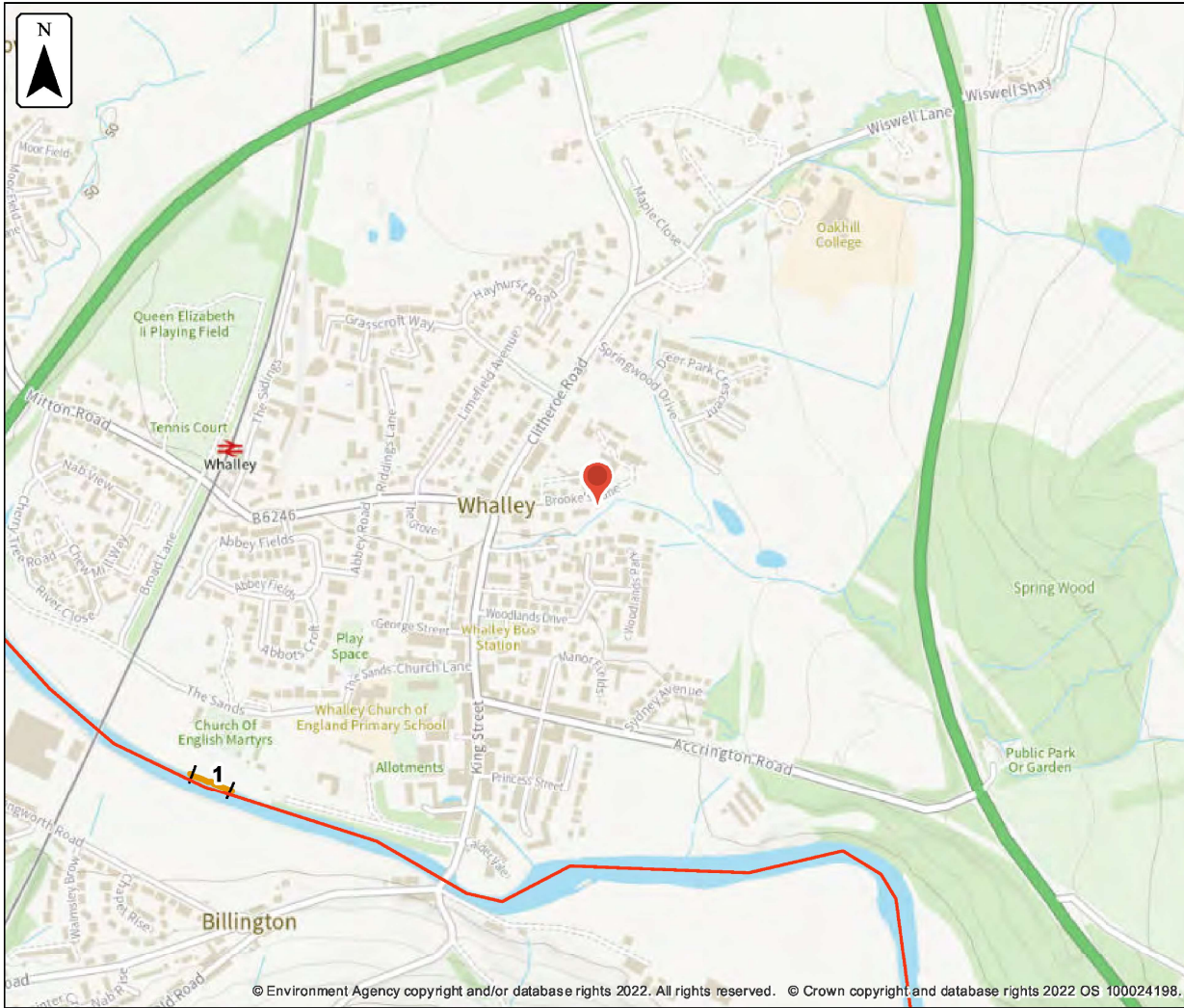
Start date	End date	Source of flood	Cause of flood	Affects location
26 December 2015	27 December 2015	main river	channel capacity exceeded (no raised defences)	No
22 June 2012	23 June 2012	main river	channel capacity exceeded (no raised defences)	No
26 October 2000	27 October 2000	main river	channel capacity exceeded (no raised defences)	No
11 December 1999	12 December 1999	ordinary watercourse	obstruction/blockage - debris screen	No


## **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.

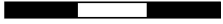
It's important to remember that flood defence data may not be updated on a regular basis. The information here is based on the best available data.



 Environment Agency

**Flood defences**  
 Location (easting/northing)  
**373510/436441**  
 Scale  
**1:7,500**  
 Created  
**8 Nov 2022**

 Selected location  
 Main river  
 Flood defence

 0 100 200 300  
 metres

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## 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	64827	Embankment	5	Poor	43.90	43.90	43.90

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

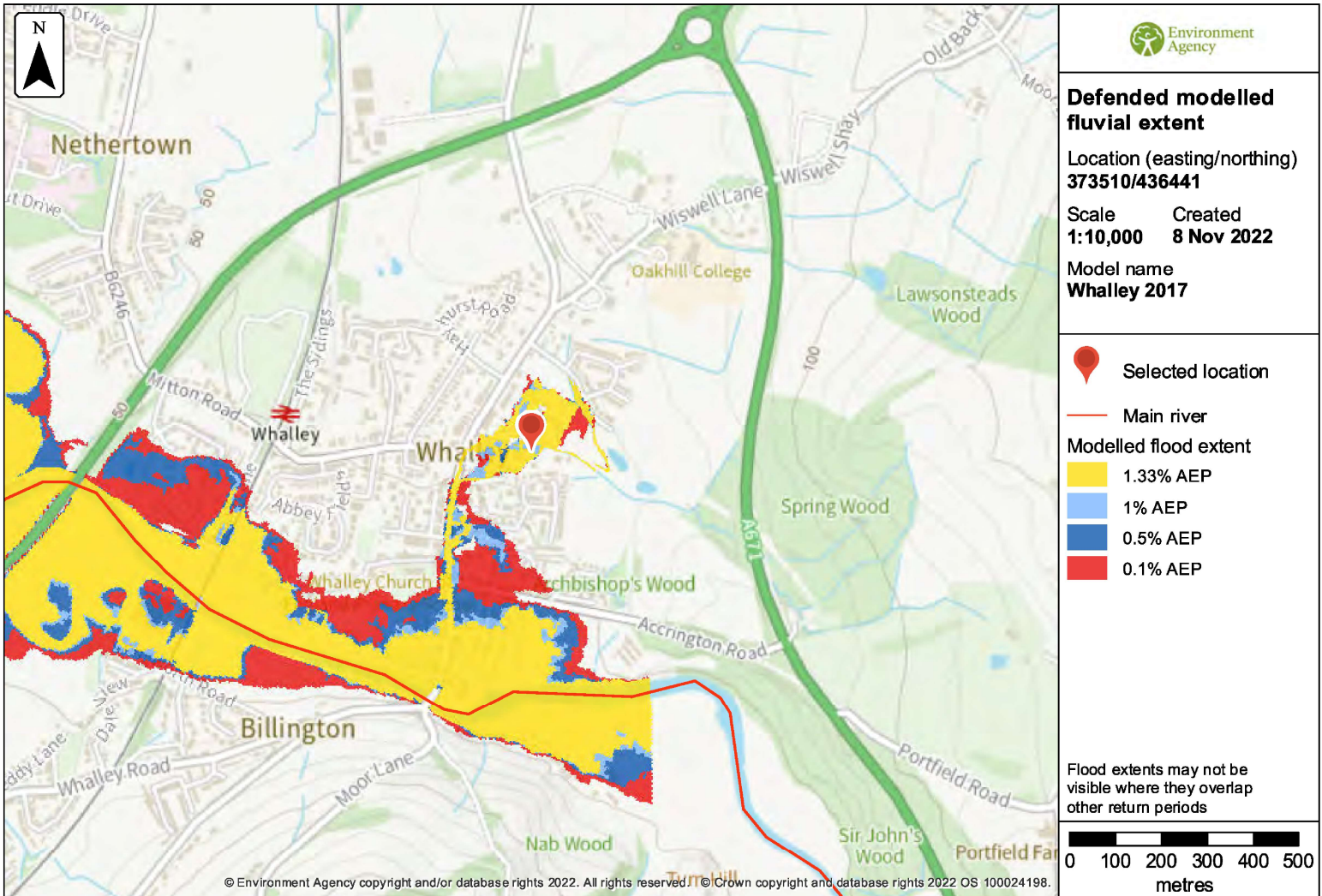
The climate change data included in the models may not include the latest [flood risk assessment climate change allowances](#). Where the new allowances are not available you will need to consider this data and factor in the new allowances to demonstrate the development will be safe from flooding.

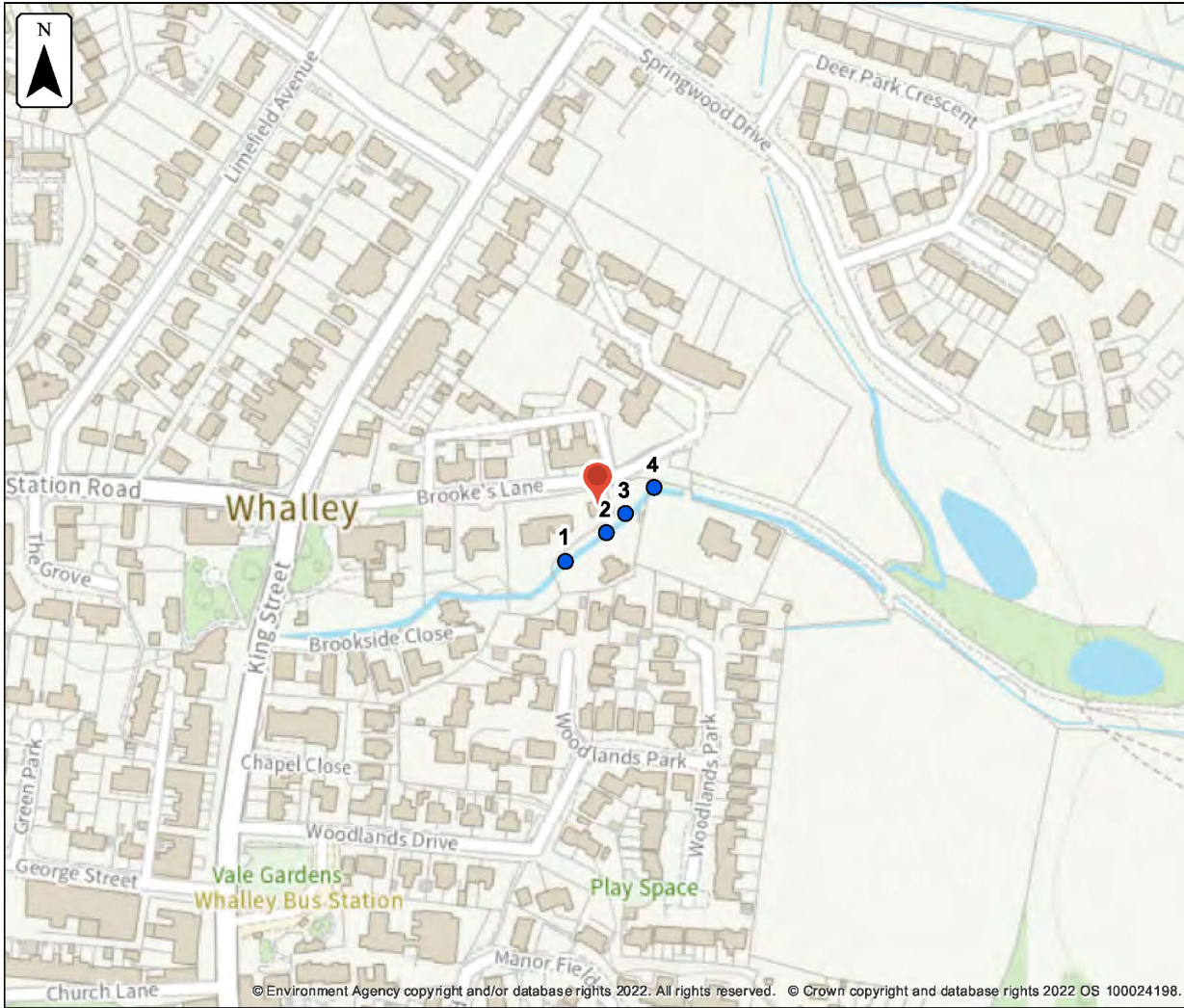
The Environment Agency will incorporate the new allowances into future modelling studies. For now, it's your responsibility to demonstrate that new developments will be safe in flood risk terms for their lifetime.

## 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 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







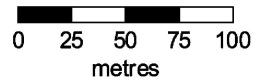
**Defended modelled fluvial node locations**

Location (easting/northing)  
**373510/436441**

Scale      Created  
**1:2,500      8 Nov 2022**

Model name  
**Whalley 2017**

-  Selected location
-  Modelled location



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## Modelled node locations data

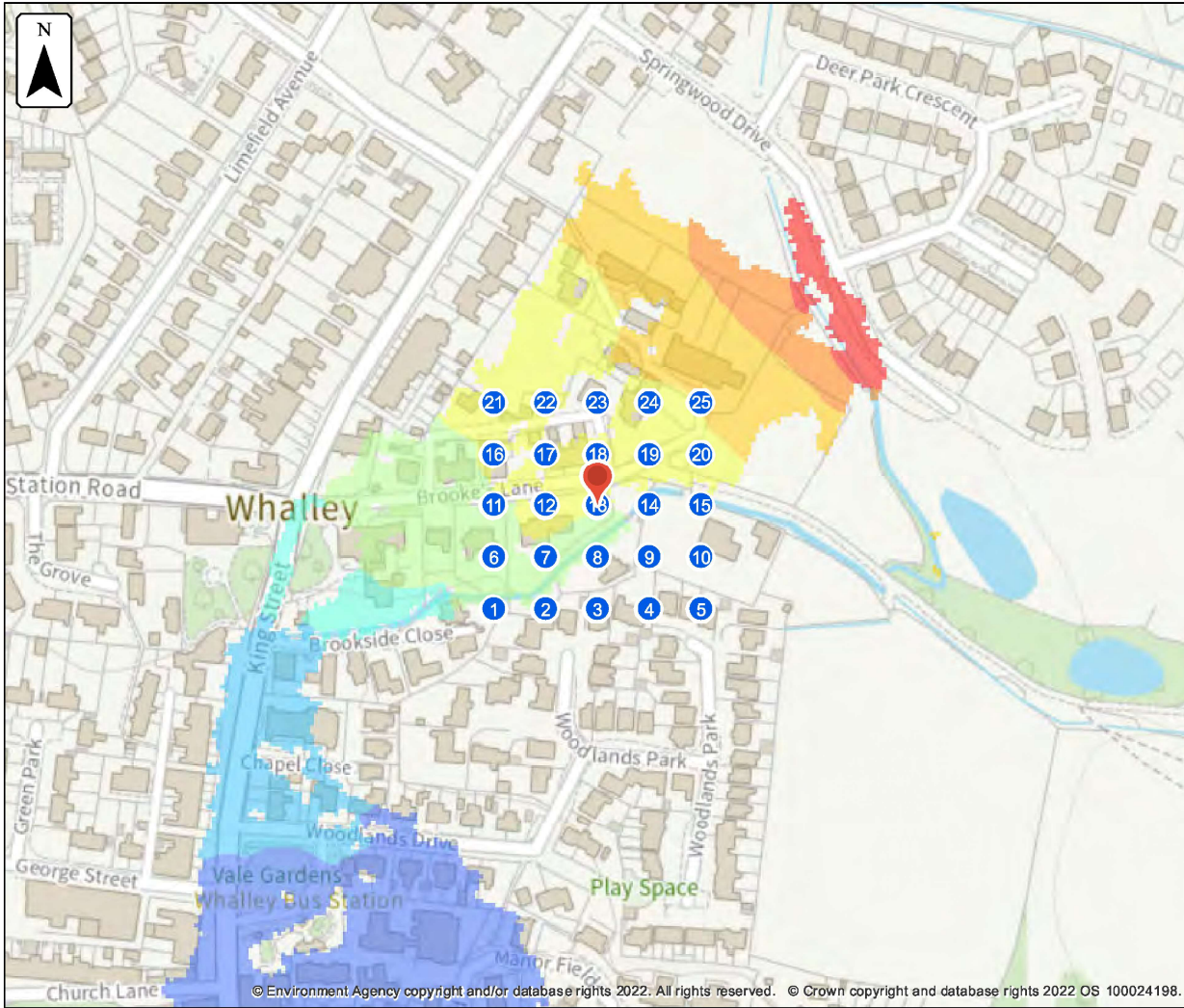
### Defended

Label	Modelled location ID	Easting	Northing	4% AEP		2% AEP		1.33% AEP		1% AEP		0.5% AEP		0.1% AEP	
				Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow
1	931661	373494	436413	50.97	2.14			51.07	2.66	51.10	2.81	51.20	3.31	51.36	4.63
2	931646	373514	436427	51.24	2.03			51.38	2.50	51.42	2.64	51.53	3.07	51.83	4.04
3	931622	373523	436436	52.06	1.97			52.15	2.42	52.17	2.54	52.23	2.93	52.34	4.25
4	931671	373538	436449	52.17	1.97			52.27	2.41	52.29	2.54	52.37	2.89	52.56	4.19

Data in this table comes from the Whalley 2017 model.

Level values are shown in mAOD, and flow values are shown in cubic metres per second.

Any blank cells show where a particular scenario has not been modelled for this location.



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**Defended modelled fluvial extent and height**

Location (easting/northing)  
**373510/436441**  
 Scale **1:2,500** Created **8 Nov 2022**  
 Model name **Whalley 2017**

Selected location

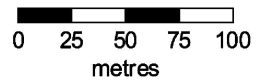
Main river

Modelled 2D grid

Water level in mAOD

- 0 - 46.0
- 46.0 - 47.625
- 47.625 - 49.25
- 49.25 - 50.875
- 50.875 - 52.5
- 52.5 - 54.125
- 54.125 - 55.75
- 55.75 - 57.375
- 57.375 - 59.0

This map shows the 0.1% AEP height data



## Sample point data

### Defended

Label	Easting	Northing	5% AEP		2% AEP		1.33% AEP		1% AEP		0.5% AEP		0.1% AEP	
			Depth	Height	Depth	Height	Depth	Height	Depth	Height	Depth	Height	Depth	Height
1	373460	436391					NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
2	373485	436391					NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
3	373510	436391					NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
4	373535	436391					NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
5	373560	436391					NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
6	373460	436416					0.03	52.02	0.04	52.03	0.05	52.04	0.07	52.06
7	373485	436416					0.03	51.48	0.03	51.48	0.05	51.50	0.10	51.55
8	373510	436416					NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
9	373535	436416					NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
10	373560	436416					NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
11	373460	436441					0	52.44	0	52.44	0	52.45	0.00	52.46
12	373485	436441					0.03	52.57	0.03	52.56	0.04	52.57	0.05	52.59
13	373510	436441					0.07	52.63	0.08	52.65	0.10	52.67	0.14	52.71
14	373535	436441					NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
15	373560	436441					NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
16	373460	436466					0.01	52.75	0.01	52.75	0.02	52.75	0.02	52.76

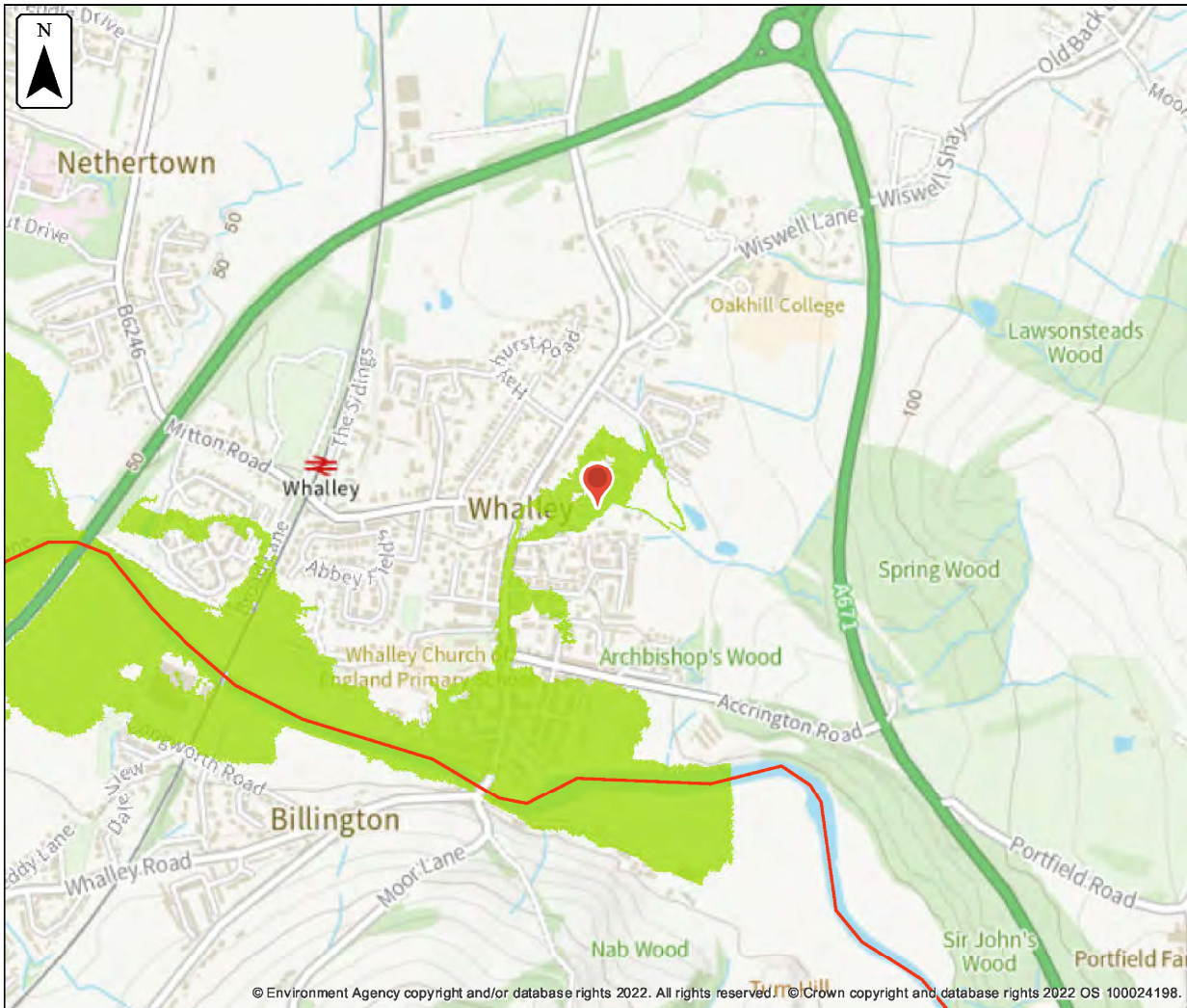
Label	Easting	Northing	5% AEP		2% AEP		1.33% AEP		1% AEP		0.5% AEP		0.1% AEP	
			Depth	Height	Depth	Height	Depth	Height	Depth	Height	Depth	Height	Depth	Height
17	373485	436466					NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
18	373510	436466					0.05	53.14	0.05	53.14	0.06	53.15	0.09	53.18
19	373535	436466					0.11	53.32	0.12	53.32	0.14	53.34	0.17	53.37
20	373560	436466					0.01	53.76	0.01	53.76	0.01	53.76	0.01	53.77
21	373460	436491					0.13	52.67	0.18	52.72	0.21	52.75	0.30	52.84
22	373485	436491					0.11	53.14	0.13	53.15	0.14	53.17	0.18	53.20
23	373510	436491					NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
24	373535	436491					0.01	53.70	0.01	53.71	0.01	53.72	0.02	53.77
25	373560	436491					0.19	54.18	0.20	54.19	0.22	54.21	0.25	54.25

Data in this table comes from the Whalley 2017 model.

Height values are shown in mAOD, and depth values are shown in metres.




Any blank cells show where a particular scenario has not been modelled for this location.

Cells which contain text 'NoData' for a scenario show that return period has been modelled but there is no flood risk for that return period for that location.

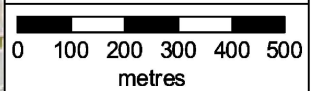


**Defended climate change modelled fluvial extent**

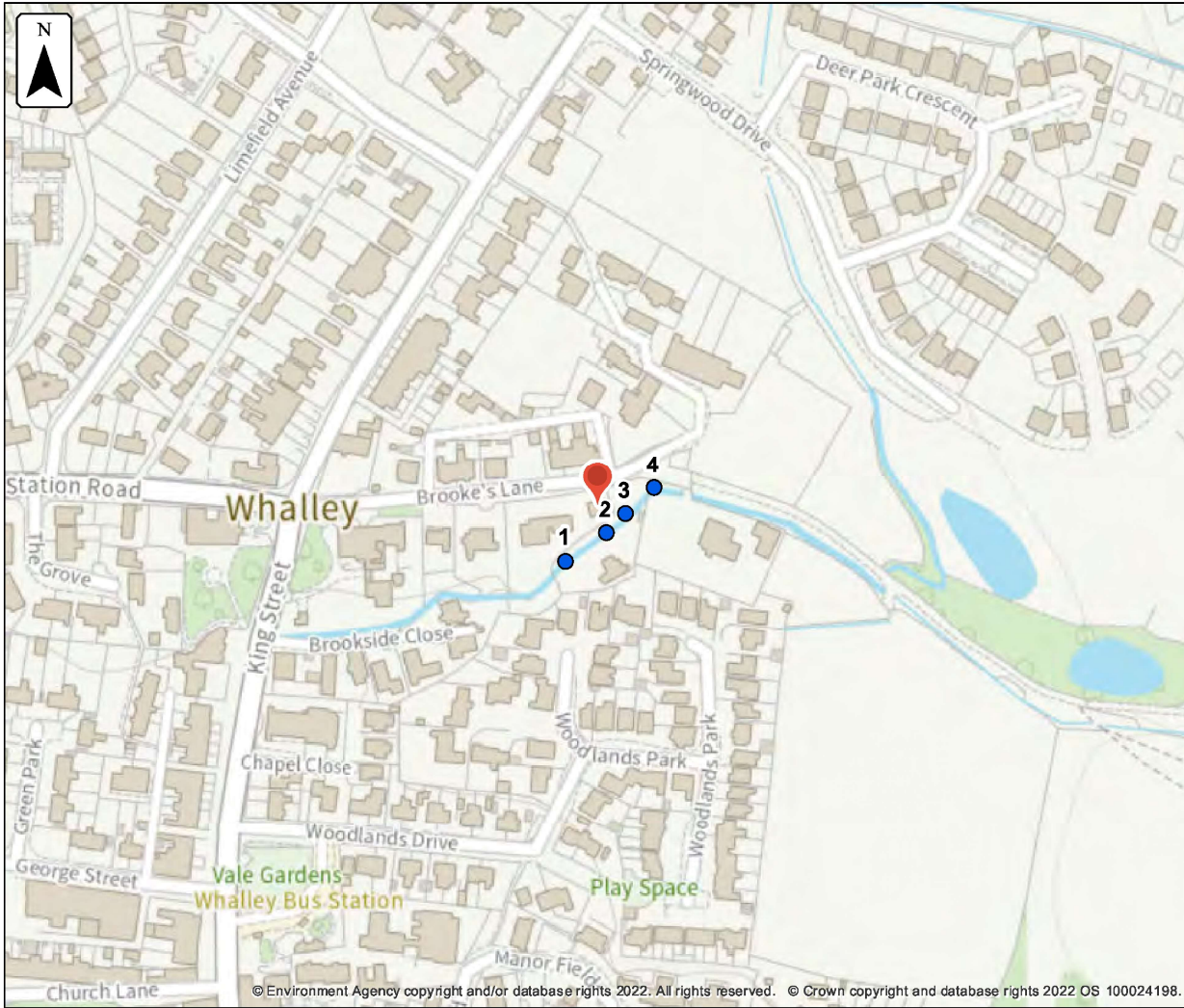
Location (easting/northing)  
**373510/436441**  
 Scale Created  
**1:10,000 8 Nov 2022**  
 Model name  
**Whalley 2017**

-  Selected location
-  Main river
- Modelled flood extent**
-  1.0% AEP (+15%)

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



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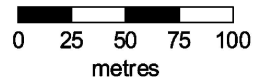
**Defended climate change modelled fluvial node locations**

Location (easting/northing)  
**373510/436441**

Scale Created  
**1:2,500 8 Nov 2022**

Model name  
**Whalley 2017**

-  Selected location
-  Modelled location



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## Modelled node locations data

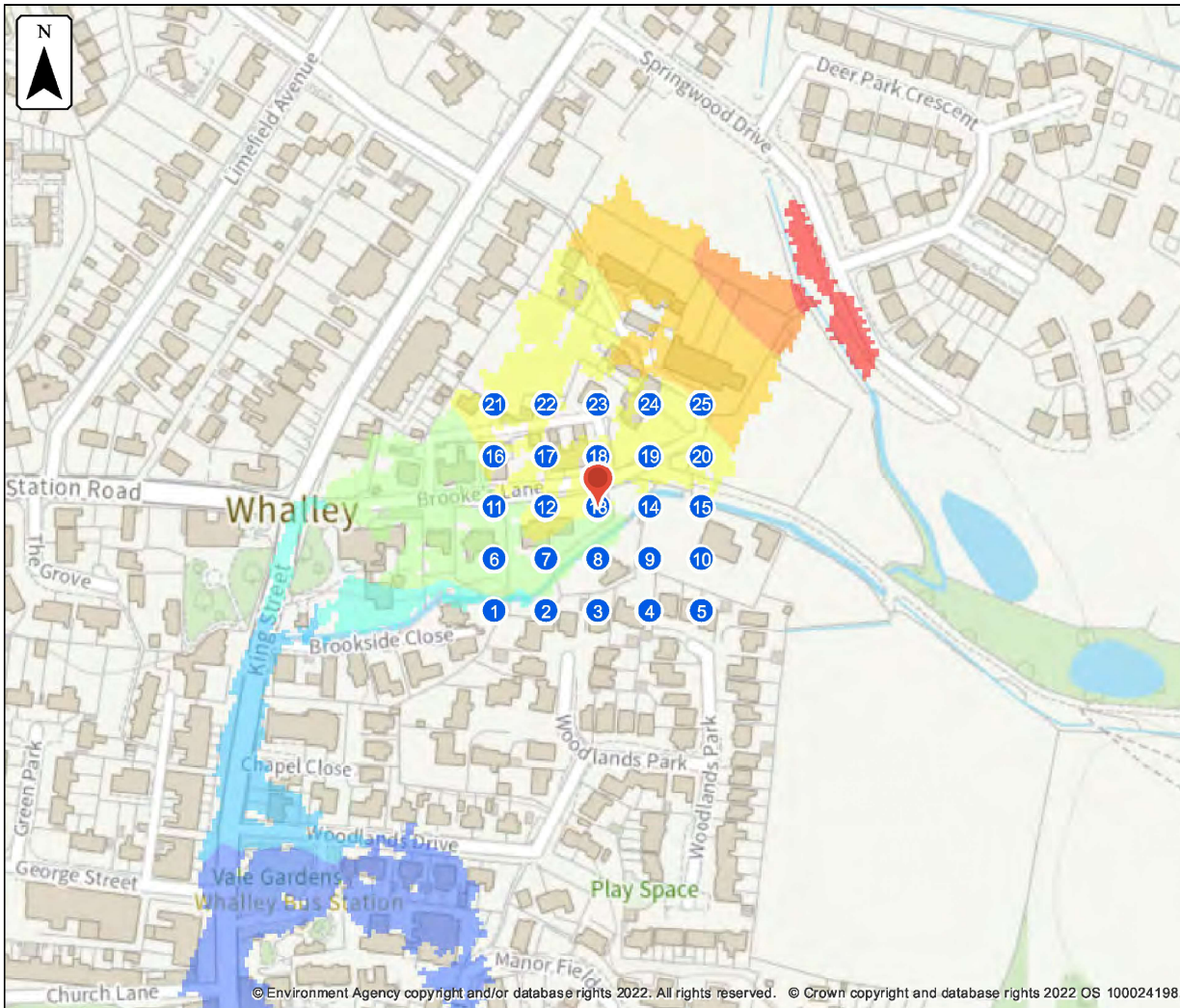
### Defended climate change

Label	Modelled location ID	Easting	Northing	1.0% AEP (+15%)	
				Level	Flow
1	931661	373494	436413	51.19	3.21
2	931646	373514	436427	51.52	3.01
3	931622	373523	436436	52.23	2.89
4	931671	373538	436449	52.36	2.85

Data in this table comes from the Whalley 2017 model.

Level values are shown in mAOD, and flow values are shown in cubic metres per second.

Any blank cells show where a particular scenario has not been modelled for this location.



**Defended climate change modelled fluvial extent and height**

Location (easting/northing)  
**373510/436441**  
 Scale **1:2,500** Created **8 Nov 2022**  
 Model name **Whalley 2017**

Selected location

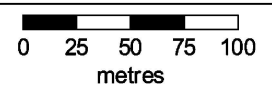
Main river

Modelled 2D grid

Water level in mAOD

- 0 - 46.0
- 46.0 - 47.625
- 47.625 - 49.25
- 49.25 - 50.875
- 50.875 - 52.5
- 52.5 - 54.125
- 54.125 - 55.75
- 55.75 - 57.375
- 57.375 - 59.0

This map shows the 1.0% AEP +15% height data



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## Sample point data

### Defended climate change

Label	Easting	Northing	1% AEP (+15%)	
			Depth	Height
1	373460	436391	NoData	NoData
2	373485	436391	NoData	NoData
3	373510	436391	NoData	NoData
4	373535	436391	NoData	NoData
5	373560	436391	NoData	NoData
6	373460	436416	0.05	52.04
7	373485	436416	0.05	51.49
8	373510	436416	NoData	NoData
9	373535	436416	NoData	NoData
10	373560	436416	NoData	NoData
11	373460	436441	0	52.45
12	373485	436441	0.04	52.57
13	373510	436441	0.10	52.66
14	373535	436441	NoData	NoData
15	373560	436441	NoData	NoData
16	373460	436466	0.02	52.75

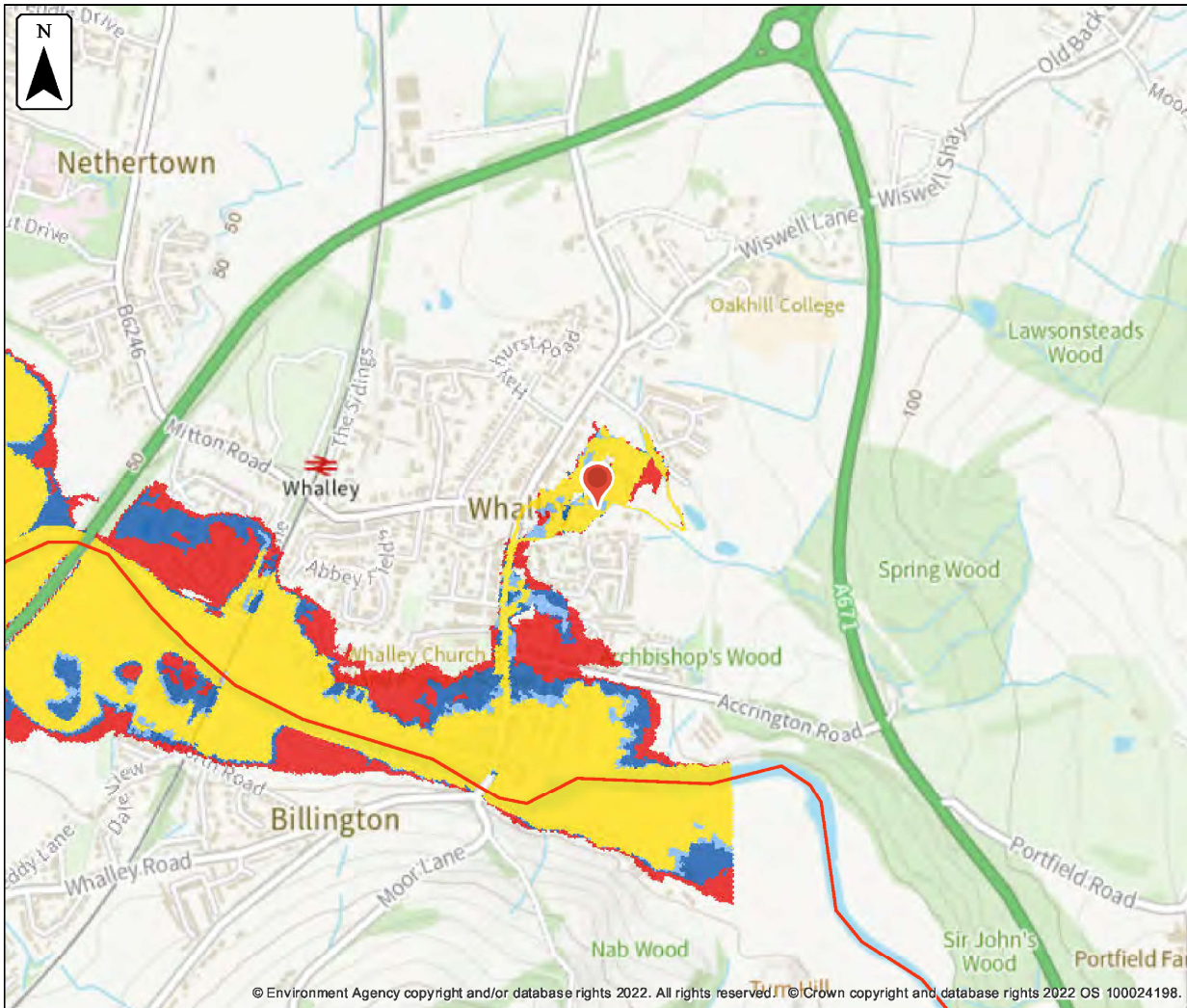
Label	Easting	Northing	1% AEP (+15%)	
			Depth	Height
17	373485	436466	NoData	NoData
18	373510	436466	0.06	53.15
19	373535	436466	0.13	53.34
20	373560	436466	0.01	53.76
21	373460	436491	0.21	52.75
22	373485	436491	0.14	53.17
23	373510	436491	NoData	NoData
24	373535	436491	0.01	53.72
25	373560	436491	0.22	54.21

Data in this table comes from the Whalley 2017 model.

Height values are shown in mAOD, and depth values are shown in metres.

Any blank cells show where a particular scenario has not been modelled for this location.

Cells which contain text 'NoData' for a scenario show that return period has been modelled but there is no flood risk for that return period for that location.

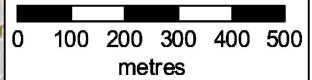


**Defences removed modelled fluvial extent**

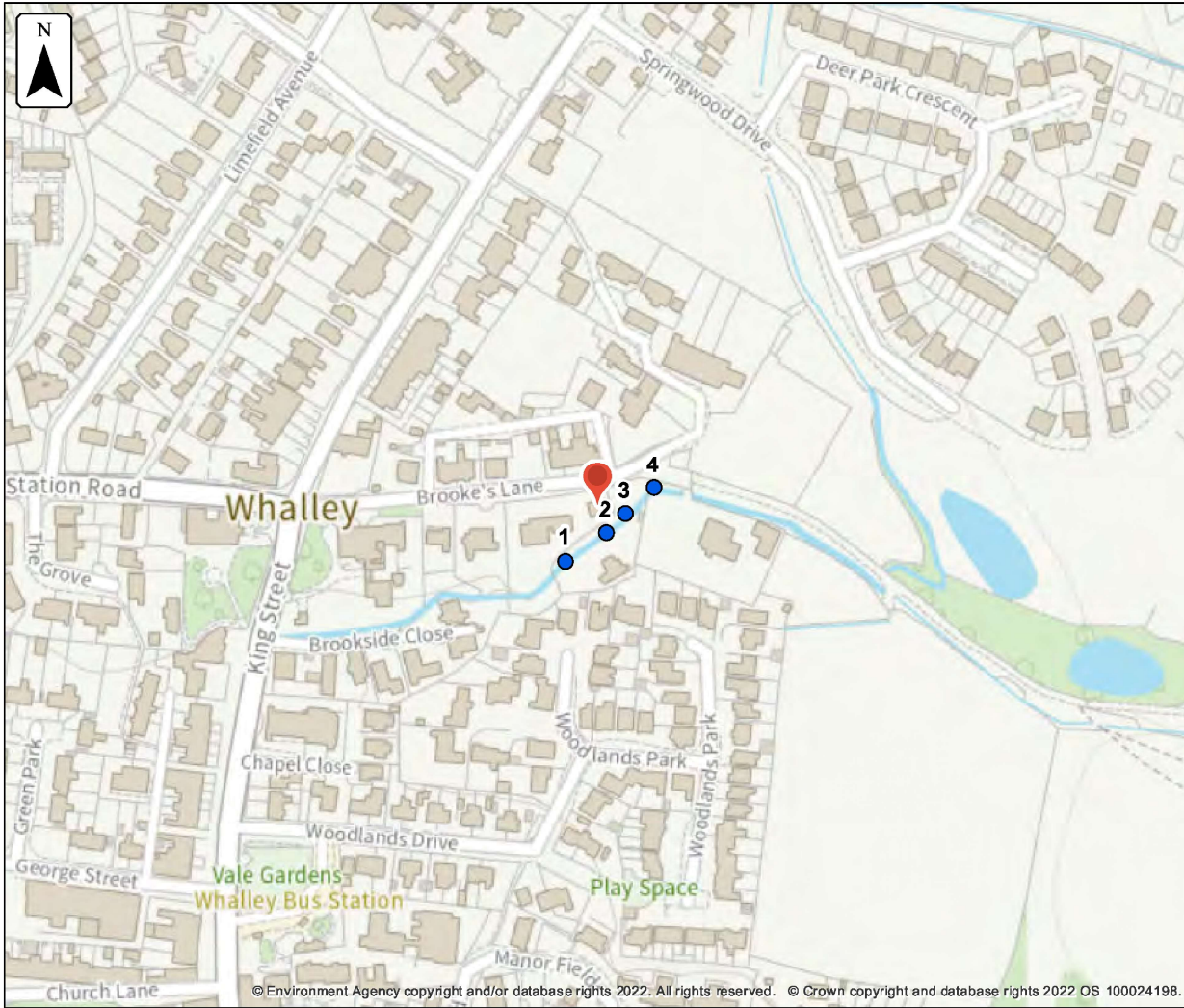
Location (easting/northing)  
**373510/436441**  
 Scale **1:10,000** Created **8 Nov 2022**  
 Model name  
**Whalley 2017**

- Selected location
- Main river
- Modelled flood extent**
- 1.33% AEP
- 1% AEP
- 0.5% AEP
- 0.1% AEP

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



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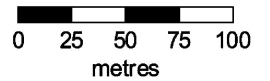
**Defences removed modelled fluvial node locations**

Location (easting/northing)  
**373510/436441**

Scale Created  
**1:2,500 8 Nov 2022**

Model name  
**Whalley 2017**

-  Selected location
-  Modelled location



## Modelled node locations data

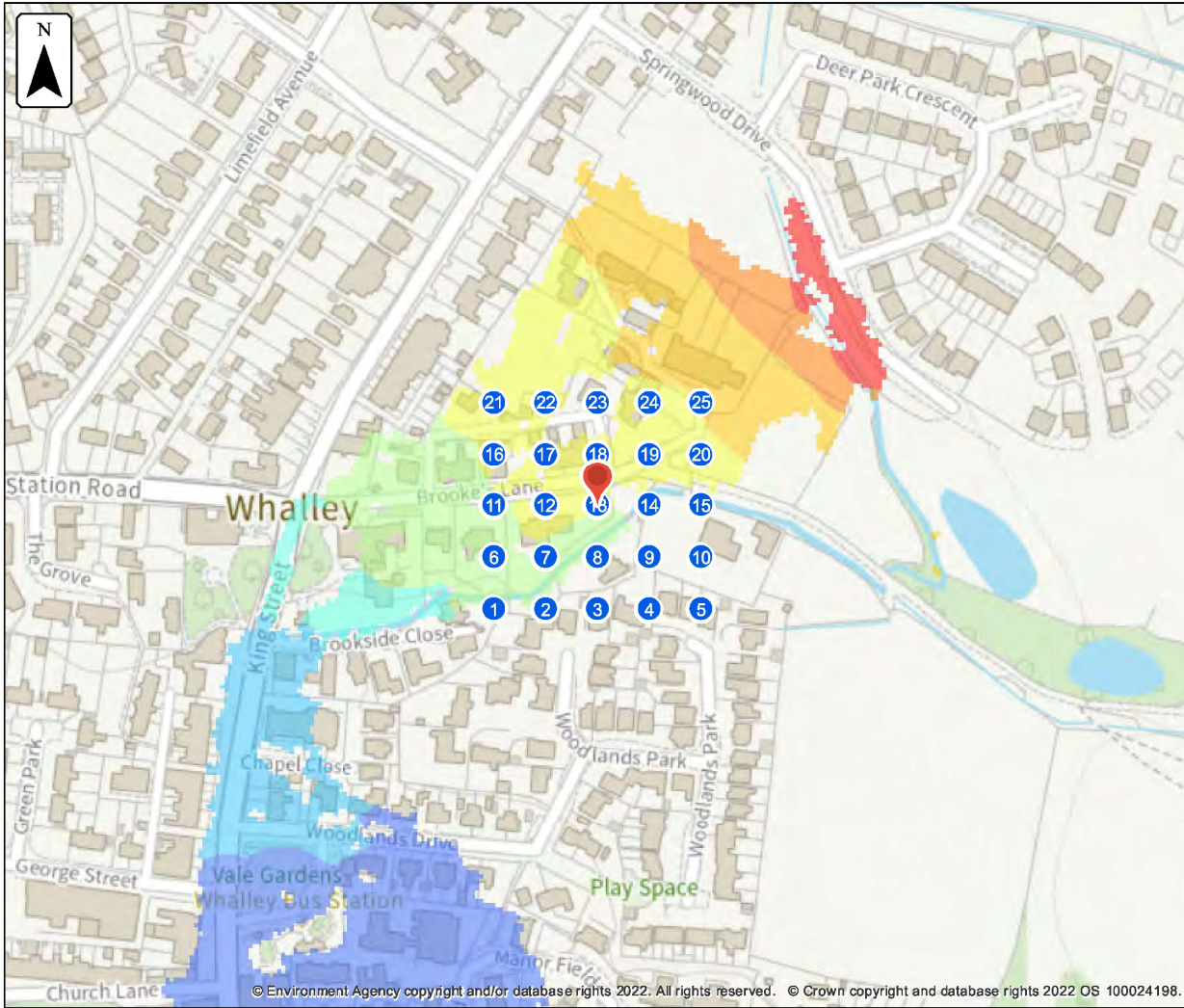
### Defences removed

Label	Modelled location ID	Easting	Northing	4% AEP		2% AEP		1.33% AEP		1% AEP		0.5% AEP		0.1% AEP	
				Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow
1	931661	373494	436413	50.97	2.14			51.07	2.66	51.10	2.81	51.20	3.31	51.36	4.65
2	931646	373514	436427	51.25	2.02			51.38	2.50	51.42	2.64	51.53	3.04	51.83	4.08
3	931622	373523	436436	52.06	1.97			52.15	2.42	52.17	2.55	52.23	2.92	52.34	4.26
4	931671	373538	436449	52.17	1.97			52.27	2.41	52.29	2.54	52.37	2.89	52.56	4.19

Data in this table comes from the Whalley 2017 model.

Level values are shown in mAOD, and flow values are shown in cubic metres per second.

Any blank cells show where a particular scenario has not been modelled for this location.



**Defences removed  
modelled fluvial  
extent and height**

Location (easting/northing)  
**373510/436441**  
Scale **1:2,500** Created **8 Nov 2022**  
Model name  
**Whalley 2017**

Selected location

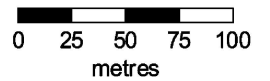
Main river

Modelled 2D grid

Water level in mAOD

- 0 - 46.0
- 46.0 - 47.625
- 47.625 - 49.25
- 49.25 - 50.875
- 50.875 - 52.5
- 52.5 - 54.125
- 54.125 - 55.75
- 55.75 - 57.375
- 57.375 - 59.0

This map shows the 0.1% AEP height data



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## Sample point data

### Defences removed

Label	Easting	Northing	5% AEP		2% AEP		1.33% AEP		1% AEP		0.5% AEP		0.1% AEP	
			Depth	Height	Depth	Height	Depth	Height	Depth	Height	Depth	Height	Depth	Height
1	373460	436391					NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
2	373485	436391					NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
3	373510	436391					NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
4	373535	436391					NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
5	373560	436391					NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
6	373460	436416					0.03	52.02	0.04	52.03	0.05	52.04	0.07	52.06
7	373485	436416					0.03	51.48	0.03	51.48	0.05	51.50	0.10	51.55
8	373510	436416					NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
9	373535	436416					NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
10	373560	436416					NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
11	373460	436441					0	52.44	0	52.44	0	52.45	0.00	52.46
12	373485	436441					0.03	52.56	0.03	52.56	0.04	52.57	0.06	52.59
13	373510	436441					0.07	52.63	0.08	52.65	0.10	52.67	0.15	52.71
14	373535	436441					NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
15	373560	436441					NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
16	373460	436466					0.01	52.75	0.01	52.75	0.02	52.75	0.02	52.76

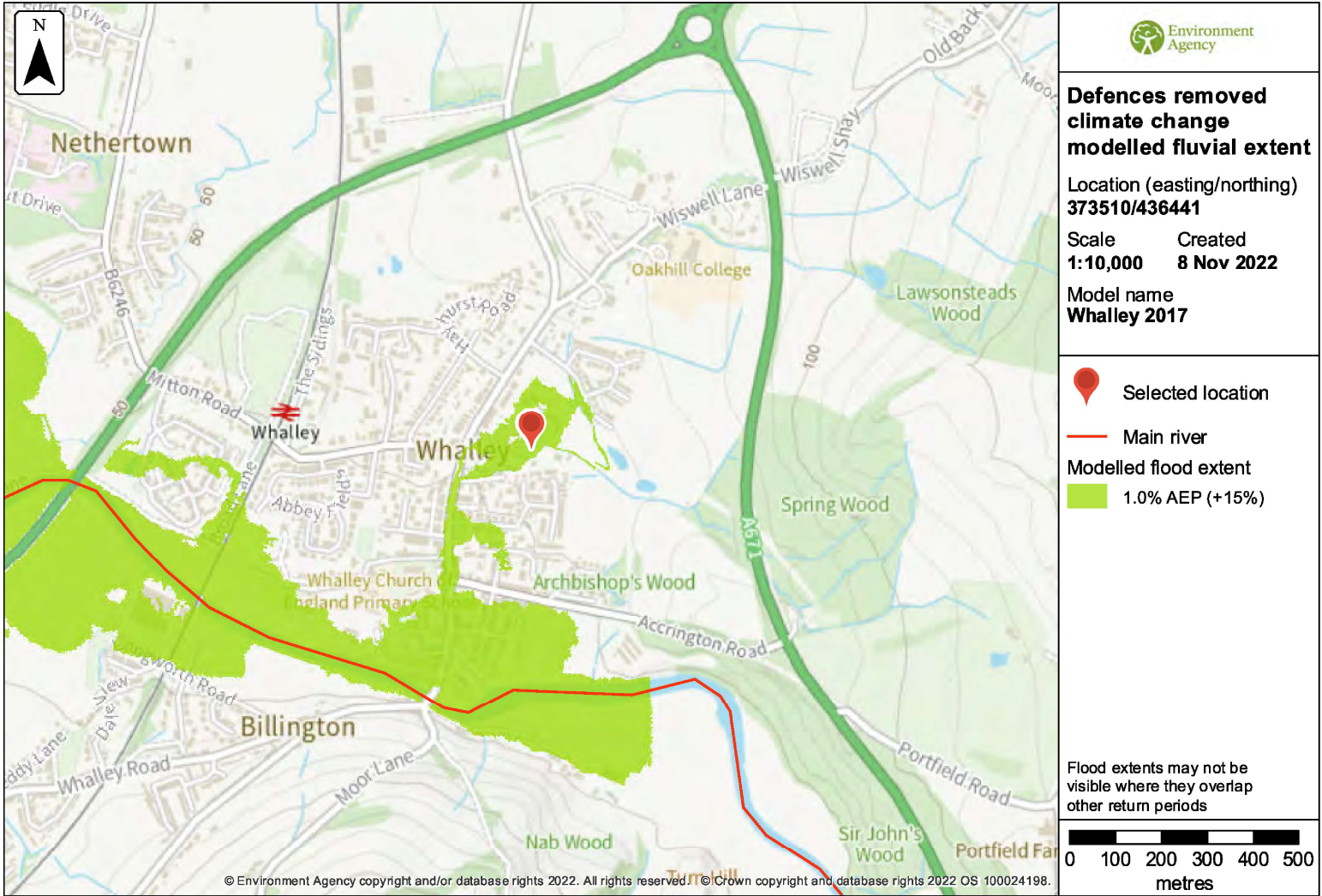
Label	Easting	Northing	5% AEP		2% AEP		1.33% AEP		1% AEP		0.5% AEP		0.1% AEP	
			Depth	Height	Depth	Height	Depth	Height	Depth	Height	Depth	Height	Depth	Height
17	373485	436466					NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
18	373510	436466					0.05	53.14	0.05	53.14	0.06	53.15	0.09	53.18
19	373535	436466					0.12	53.32	0.12	53.32	0.14	53.34	0.17	53.37
20	373560	436466					0.01	53.76	0.01	53.76	0.01	53.76	0.01	53.77
21	373460	436491					0.13	52.67	0.18	52.72	0.21	52.75	0.30	52.84
22	373485	436491					0.11	53.14	0.13	53.15	0.14	53.17	0.17	53.20
23	373510	436491					NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
24	373535	436491					0.01	53.70	0.01	53.71	0.01	53.72	0.02	53.77
25	373560	436491					0.19	54.18	0.20	54.19	0.22	54.21	0.26	54.25

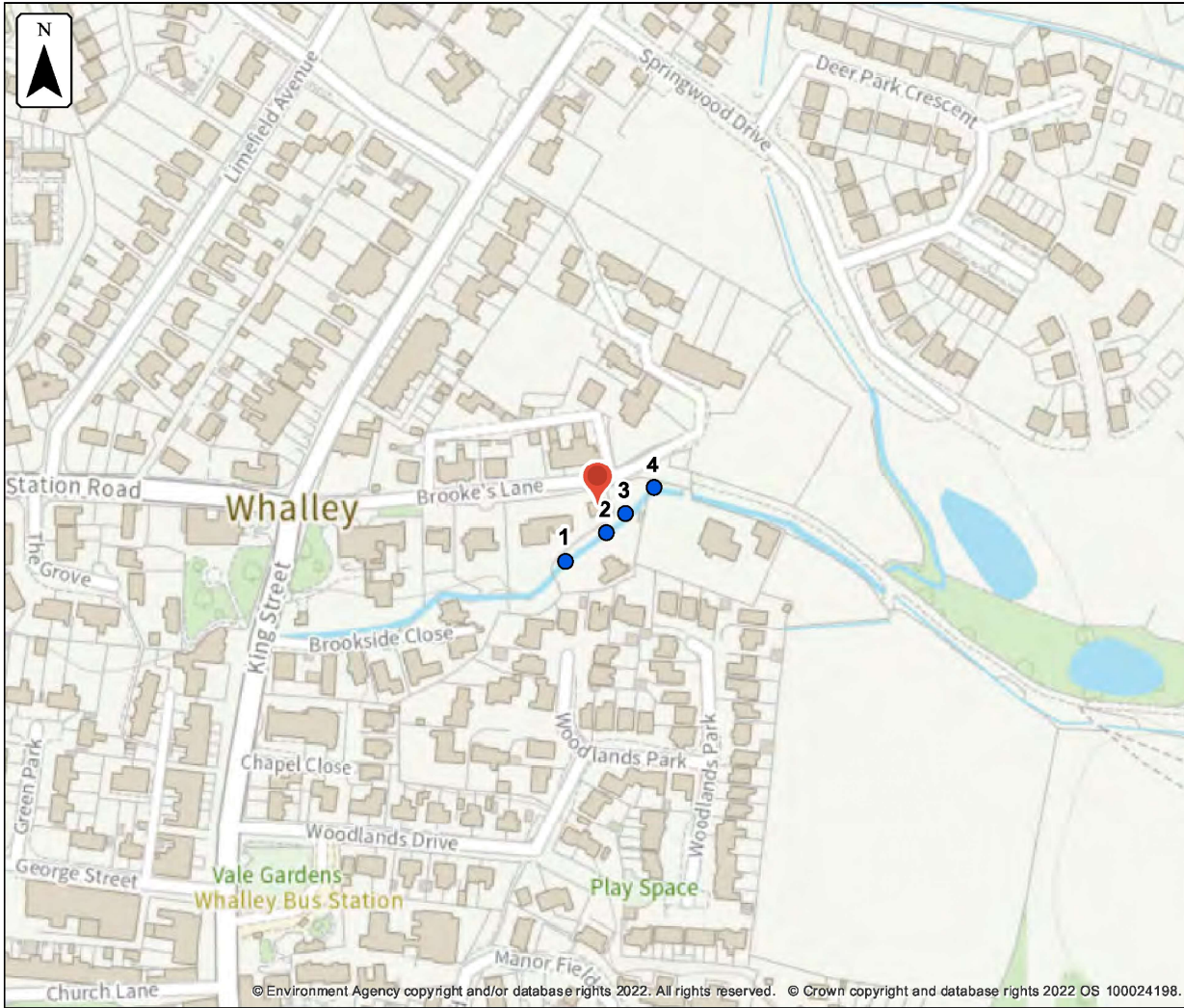
Data in this table comes from the Whalley 2017 model.

Height values are shown in mAOD, and depth values are shown in metres.

Any blank cells show where a particular scenario has not been modelled for this location.

Cells which contain text 'NoData' for a scenario show that return period has been modelled but there is no flood risk for that return period for that location.







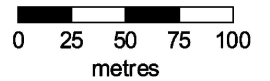
**Defences removed  
climate change  
modelled fluvial  
node locations**

Location (easting/northing)  
**373510/436441**

Scale Created  
**1:2,500 8 Nov 2022**

Model name  
**Whalley 2017**

-  Selected location
-  Modelled location



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## Modelled node locations data

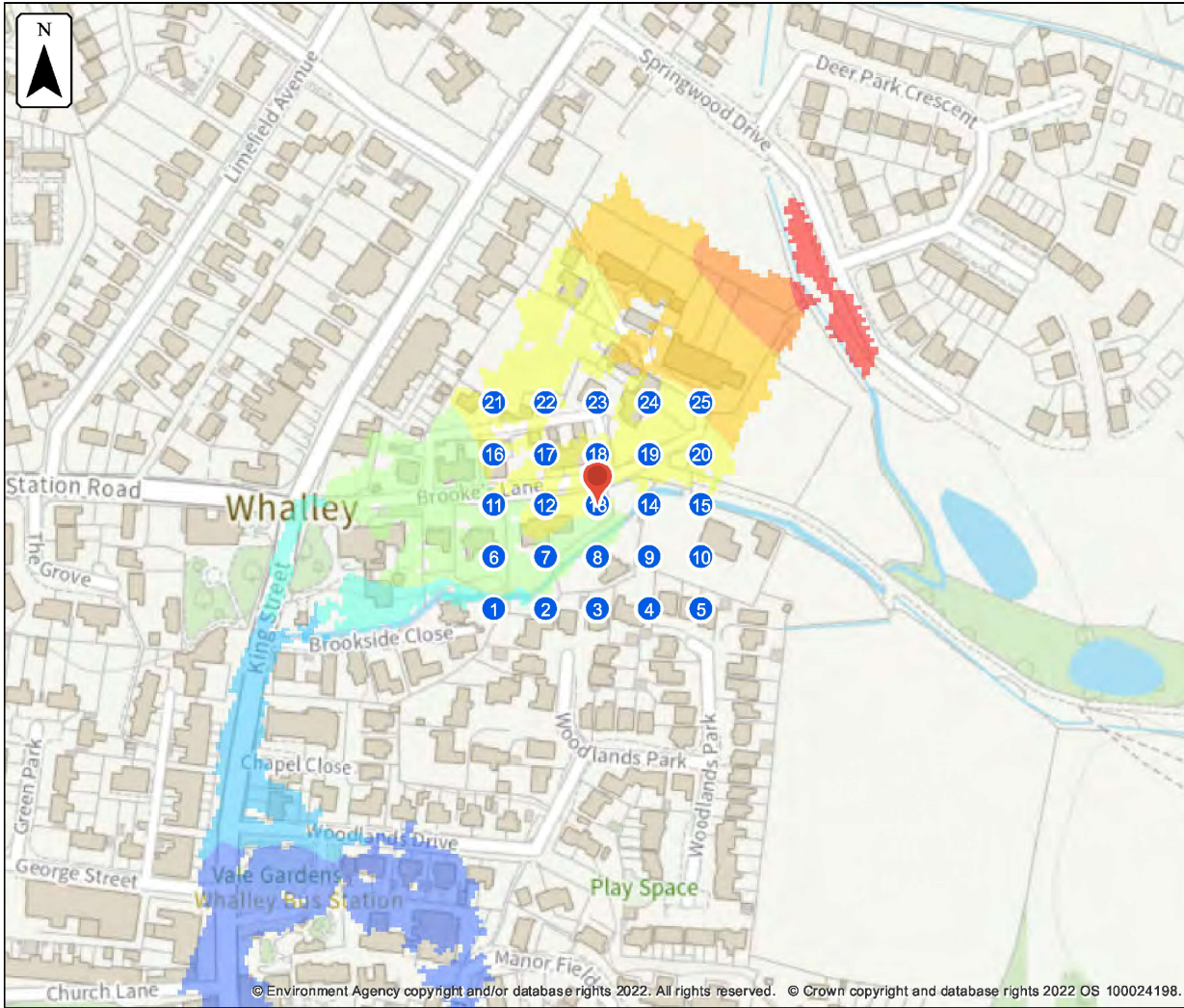
### Defences removed climate change

Label	Modelled location ID	Easting	Northing	1.0% AEP (+15%)	
				Level	Flow
1	931661	373494	436413	51.19	3.23
2	931646	373514	436427	51.52	3.0
3	931622	373523	436436	52.23	2.89
4	931671	373538	436449	52.36	2.85

Data in this table comes from the Whalley 2017 model.

Level values are shown in mAOD, and flow values are shown in cubic metres per second.

Any blank cells show where a particular scenario has not been modelled for this location.



**Defences removed  
climate change  
modelled fluvial  
extent and height**

Location (easting/northing)  
**373510/436441**

Scale Created  
**1:2,500 8 Nov 2022**

Model name  
**Whalley 2017**

Selected location

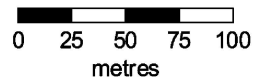
Main river

Modelled 2D grid

Water level in mAOD

- 0 - 46.0
- 46.0 - 47.625
- 47.625 - 49.25
- 49.25 - 50.875
- 50.875 - 52.5
- 52.5 - 54.125
- 54.125 - 55.75
- 57.375 - 59.0

This map shows the  
1.0% AEP +15% height data



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## Sample point data

### Defences removed climate change

Label	Easting	Northing	1% AEP (+15%)	
			Depth	Height
1	373460	436391	NoData	NoData
2	373485	436391	NoData	NoData
3	373510	436391	NoData	NoData
4	373535	436391	NoData	NoData
5	373560	436391	NoData	NoData
6	373460	436416	0.05	52.04
7	373485	436416	0.05	51.49
8	373510	436416	NoData	NoData
9	373535	436416	NoData	NoData
10	373560	436416	NoData	NoData
11	373460	436441	0	52.45
12	373485	436441	0.04	52.57
13	373510	436441	0.10	52.66
14	373535	436441	NoData	NoData
15	373560	436441	NoData	NoData
16	373460	436466	0.02	52.75

Label	Easting	Northing	1% AEP (+15%)	
			Depth	Height
17	373485	436466	NoData	NoData
18	373510	436466	0.06	53.15
19	373535	436466	0.13	53.34
20	373560	436466	0.01	53.76
21	373460	436491	0.21	52.75
22	373485	436491	0.14	53.17
23	373510	436491	NoData	NoData
24	373535	436491	0.01	53.72
25	373560	436491	0.22	54.21

Data in this table comes from the Whalley 2017 model.

Height values are shown in mAOD, and depth values are shown in metres.

Any blank cells show where a particular scenario has not been modelled for this location.

Cells which contain text 'NoData' for a scenario show that return period has been modelled but there is no flood risk for that return period for that location.

## 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