Land Adjacent 17 Brookes Lane, Whalley, BB7 9RG

NPPF: Flood Risk Assessment

For Cathy Bolton

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May 2018

www.krsenvironmental.com

CONTACT DETAILS

KRS Environmental Ltd
The Media Centre
7 Northumberland Street
Huddersfield
West Yorkshire
HD1 1RL

Mob: 07857 264 376
Tel: 01484 437420
Email: keelan@krsenvironmental.com
Web: krsenvironmental.com

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Project	NPPF: Flood Risk Assessment
Client	Cathy Bolton
Status	Draft
Prepared by	Keelan Serjeant BSc (Hons), MSc, MCIWEM
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EXECUTIVE SUMMARY

A residential development, would be expected to remain dry in all but the most extreme conditions. Providing the recommendations made in this FRA are instigated, flood risk from all sources would be minimised, the consequences of flooding are acceptable, and the development would be in accordance with the requirements of the NPPF.

The site has been shown to be located outside of the 1 in 100 year, 1 in 100 year (+30%), 1 in 200 year and 1 in 1000 year flood outlines. This FRA demonstrates that the proposed development would be operated with minimal risk from flooding, would not increase flood risk elsewhere and is compliant with the requirements of the NPPF. The development should not therefore be precluded on the grounds of flood risk.

1.0 INTRODUCTION

1.1 Background

This Flood Risk Assessment (FRA) has been prepared by KRS Environmental Limited at the request of Cathy Bolton to support a planning application for the proposed development on Land Adjacent 17 Brookes Lane, Whalley, BB7 9RG.

This FRA has been carried out in accordance with guidance contained in the National Planning Policy Framework (NPPF)[1] and associated Planning Practice Guidance[2]. This FRA identifies and assesses the risks of all forms of flooding to and from the development and demonstrates how these flood risks will be managed so that the development remains safe throughout the lifetime, taking climate change into account.

It is recognised that developments which are designed without regard to flood risk may endanger lives, damage property, cause disruption to the wider community, damage the environment, be difficult to insure and require additional expense on remedial works. The development design should be such that future users will not have difficulty obtaining insurance or mortgage finance, or in selling all or part of the development, as a result of flood risk issues.

1.2 National Planning Policy Framework (NPPF)

One of the key aims of the NPPF is to ensure that flood risk is taken into account at all stages of the planning process; to avoid inappropriate development in areas at risk of flooding and to direct development away from areas of highest risk.

It advises that where new development is exceptionally necessary in areas of higher risk, this should be safe, without increasing flood risk elsewhere, and where possible, reduce flood risk overall.

A risk based approach is adopted at stages of the planning process, applying a source pathway receptor model to planning and flood risk. To demonstrate this, an FRA is required and should include:

- whether a proposed development is likely to be affected by current or future flooding from all source;
- whether it will increase flood risk elsewhere;
- whether the measures proposed to deal with these effects and risks are appropriate;
- if necessary provide the evidence to the Local Planning Authority (LPA) that the Sequential Test can be applied; and
- whether the development will be safe and pass part c) of the Exception Test if this is appropriate.

[1] Department for Communities and Local Government (2012) National Planning Policy Framework.
[2] Communities and Local Government (2014) Planning Practice Guidance - Flood Risk and Coastal Change.

1.3 Report Structure

This FRA has the following report structure:

- Section 2 details the sources of information that have been consulted;
- Section 3 describes the location area and the existing and proposed development;
- Section 4 outlines the flood risk to the existing and proposed development;
- Section 5 details the sequential and exception tests;
- Section 6 describes the risk manage methods used to mitigate all sources of flood risk; and
- Section 7 presents a summary and conclusions.

2.0 SOURCES OF INFORMATION

2.1 Discussion with Regulators

Consultation and discussions with the relevant regulators have been undertaken during this FRA including the Environment Agency, the Local Planning Authority (LPA), the Lead Local Flood Authority (LLFA), and Sewerage Undertakers.

2.1.1 Environment Agency

The Flood and Water Management Act 2010 gives the Environment Agency a strategic overview role for all forms of flooding and coastal erosion. They also have direct responsibility for the prevention, mitigation and remediation of flood damage for main rivers and coastal areas. The Environment Agency is the statutory consultee with regards to flood risk and planning.

Environment Agency Standing Advice and the NPPF has been consulted and reviewed during this FRA. This has confirmed the level of FRA required and that a surface water drainage assessment is to be undertaken. Information regarding the current flood risk at the application site, local flood defences and flood water levels has been obtained from the Environment Agency. The Environment Agency has confirmed that they hold no modelled information for this area (see Appendix 1).

2.1.2 Lancashire County Council

Lancashire County Council is the LLFA and has responsibilities for 'local flood risk', which includes surface runoff, groundwater and ordinary watercourse. Planning guidance written by Lancashire County Council regarding flood risk was consulted to assess the mitigation policies in place. The Lancashire County Council Preliminary Flood Risk Assessment (PFRA) which covers the site has been reviewed.

Correspondence has been received from Helen Lord Flood Risk Technical Support Officer at Lancashire County Council. It was confirmed that the LLFA would not be providing pre-planning advice for this site. (see Appendix 2).

2.1.3 Ribble Valley Borough Council

Ribble Valley Brough Council is the LPA. Planning guidance written by Ribble Valley Borough Council regarding flood risk was consulted to assess the mitigation policies in place. These documents include the Local Development Framework and the Local Plan. The Ribble Valley Borough Council Strategic Flood Risk Assessment (SFRA) which covers the site has been reviewed.

2.1.4 United Utilities

United Utilities is responsible for the disposal of waste water and supply of clean water for this area. Information with regards to sewer and water main flooding contained within the Ribble Valley Borough SFRA and the Lancashire County Council PFRA have been consulted as part of this FRA. All Water Companies have a statutory obligation to maintain a register of properties/areas which are at risk of flooding from the public sewerage system, and this is shown on the DG5 Flood Register.

A Pre-Planning Sewerage Enquiry has been undertaken with United Utilities to ascertain their views on the availability of the public sewer network and any restrictions which would be imposed on the proposed development and includes a sewer plan (see Appendix 3). United Utilities have made the following comments:

'We have carried out an assessment of your application which is based on the information provided; this pre development advice will be valid for 12 months.

Foul

Foul will be allowed to drain to the public combined/ foul sewer network. Our preferred point of discharge would be to the 225mm combined sewer crossing the site at an unrestricted rate.

Surface Water

Surface water from this site must drain to soak away or some other form of infiltration system but if ground conditions confirm that this is not a viable solution all surface water can drain to the 225mm surface water sewer on Clitheroe Road at a maximum pass forward flow of 5 l/s.

Connection Application

Although we may discuss and agree discharge points & rates in principle, please be aware that you will have to apply for a formal sewer connection. This is so that we can assess the method of construction, Health & Safety requirements and to ultimately inspect the connection when it is made. Details of the application process and the form itself can be obtained from our website by following the link below

http://www.unitedutilities.com/connecting-public-sewer.aspx

Sewer Adoption Agreement

You may wish to offer the proposed new sewers for adoption. United Utilities assess adoption application based on Sewers adoption 6th Edition and for any pumping stations our company addenda document. Please refer to link below to obtain further guidance and application pack:

http://www.unitedutilities.com/sewer-adoption.aspx

Existing Sewers Crossing the Site

A public sewer crosses this site and we will require unrestricted access to the sewer for maintenance purposes, we would ask that you maintain a minimum clearance of 6m which is measured 3m from the centre line of the pipe. If you cannot achieve this then you may wish to consider diverting the public sewer.

I suspect that the sewer will interfere with plot 3 on the site and a diversion may be necessary

Please refer to the link below to obtain full details of the processes involved in sewer diversion.

http://www.unitedutilities.com/sewer-diversion.aspx

Please be aware that on site drainage must be designed in accordance with Building Regulations, National Planning Policy, and local flood authority guidelines, we would recommend that you speak and make suitable agreements with the relevant statutory bodies.

Please note, if you intend to put forward your wastewater assets for adoption by United Utilities, the proposed detail design will be subject to a technical appraisal by an Adoption Engineer as we need to be sure that the proposals meets the requirements of Sewers for adoption and United Utilities Asset Standards. The proposed design should give consideration to long term operability and give United Utilities a cost effective proposal for the life of the assets. Therefore, further to this enquiry should you wish to progress a Section 104 agreement, we strongly recommend that no construction commences until the detailed drainage design, submitted as part of the Section 104 agreement, has been assessed

and accepted in writing by United Utilities. Any works carried out prior to the technical assessment being approved is done entirely at the developers own risk and could be subject to change'.

3.0 LOCATION & DEVELOPMENT DESCRIPTION

3.1 Site Location

The site is located on Land Adjacent 17 Brookes Lane, Whalley, BB7 9RG (see Figure 1). The National Grid Reference (NGR) of the site is 373508, 436556.

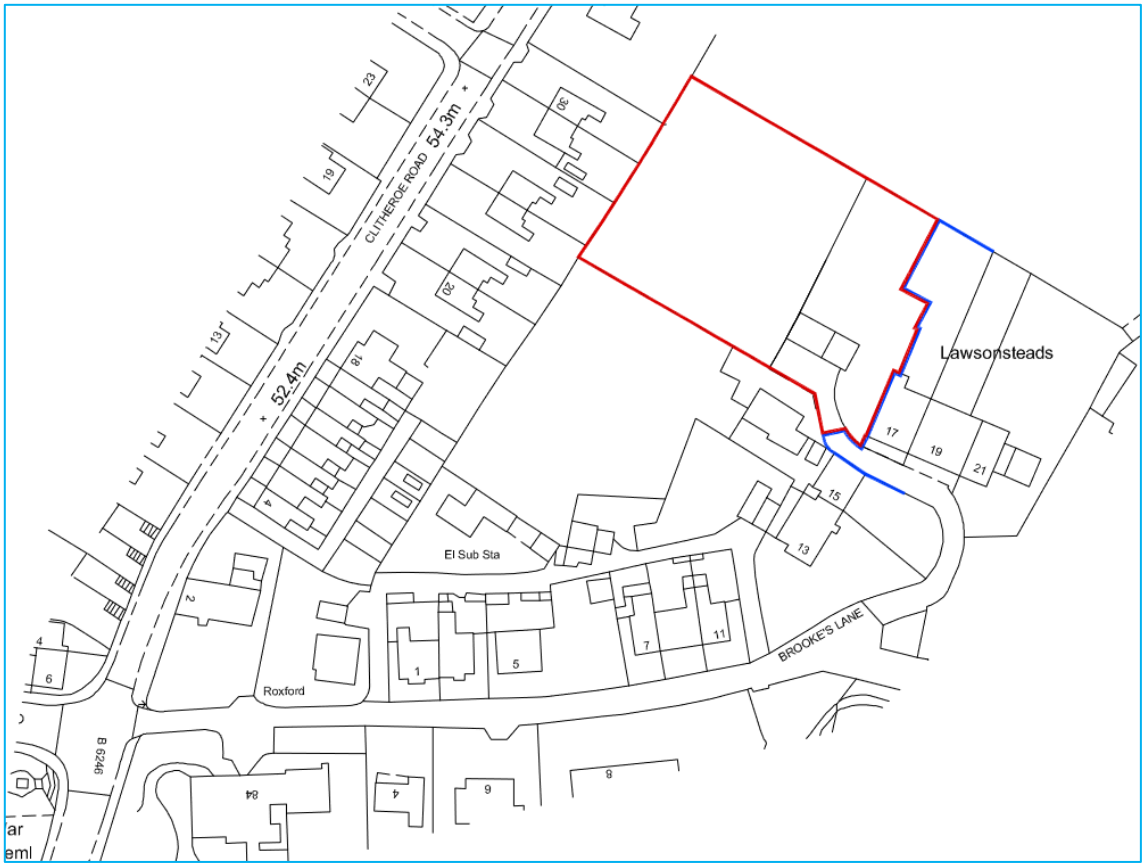


Figure 1 - Site Location

3.2 Existing Development

The site comprises a greenfield development and is currently vacant land.

3.3 Proposed Development

It is understood that the proposals are for a residential development of 3 units with gardens (see Appendix 4). Further details with regard to the proposed development can be found in the accompanying information submitted with the planning application.

3.4 Topographic Survey

A site topographic survey was undertaken in April 2018 (see Appendix 5). The site rises slightly from the south to the north. The minimum ground level is 53.38 above Ordnance Datum (mAOD) and the maximum ground level is 55.75mAOD.

3.5 Catchment Hydrology

A small drainage ditch is located approximately 60m to the north east of the site. There are no other watercourses located on, or within, the vicinity of the site.

3.6 Geology

The British Geological Survey (BGS) Map indicates that the bedrock underlying the site consists of the Bowland Shale Formation - mudstone. Sedimentary Bedrock formed approximately 319 to 337 million years ago in the Carboniferous Period in Local environment previously dominated by open seas with pelagite deposits.

The superficial deposits consist of Till, Devensian - diamicton. Superficial deposits formed up to 2 million years ago in the Quaternary Period in a local environment previously dominated by ice age conditions (U).

3.7 Groundwater

The Environment Agency aquifer designation data shows that the bedrock and superficial deposits are designated as Secondary Undifferentiated: In cases where it has not been possible to attribute either category A or B to a rock type.

3.8 Groundwater Source Protection Zones

The site is not located within an Environment Agency Groundwater Source Protection Zone.

3.9 Soil

Information from the National Soil Resource Institute[3] details the site area as being situated on slowly permeable seasonally wet acid loamy and clayey soils with impeded drainage. The Flood Studies Report WRAP soil map classification is type 4: clayey, or loamy over clayey soils with an impermeable layer at shallow dept

[3] https://www.landis.org.uk/soilscapes/

4.0 FLOOD RISK

4.1 Sources of Flooding

All sources of flooding have been considered, these are: fluvial (river) flooding, tidal (coastal) flooding, groundwater flooding, surface water (pluvial) flooding, sewer flooding and flooding from artificial drainage systems/infrastructure failure.

4.2 Environment Agency Flood Zones

A review of the Environment Agency's Flood Zones indicates that the site is located within Flood Zone 3 and therefore has a 'high probability' of fluvial flooding as shown in Figure 2. Flood Zone 3 has a 1 in 100 or greater annual probability of river flooding (>1%) in any year.

The Environment Agency Flood Zones are precautionary. They do not take account of flood defence infrastructure (which can be breached, overtopped or may not be in existence for the lifetime of the development). It therefore represents a worst-case scenario of flooding. The Flood Zones only represent fluvial and tidal flooding; they do not consider flooding from other sources. Nor do they take account of climate change.

The Flood Zones can be taken as a rough guide, until recently the site was identified as being located in Flood Zone 1 with a 'low probability' of fluvial flooding with less than 1 in 1000 annual probability of river any year (<0.1%).

The Environment Agency Flood Zones and acceptable development types are explained in Table 1. Table 1 shows that some development types are generally acceptable in Flood Zone 3.

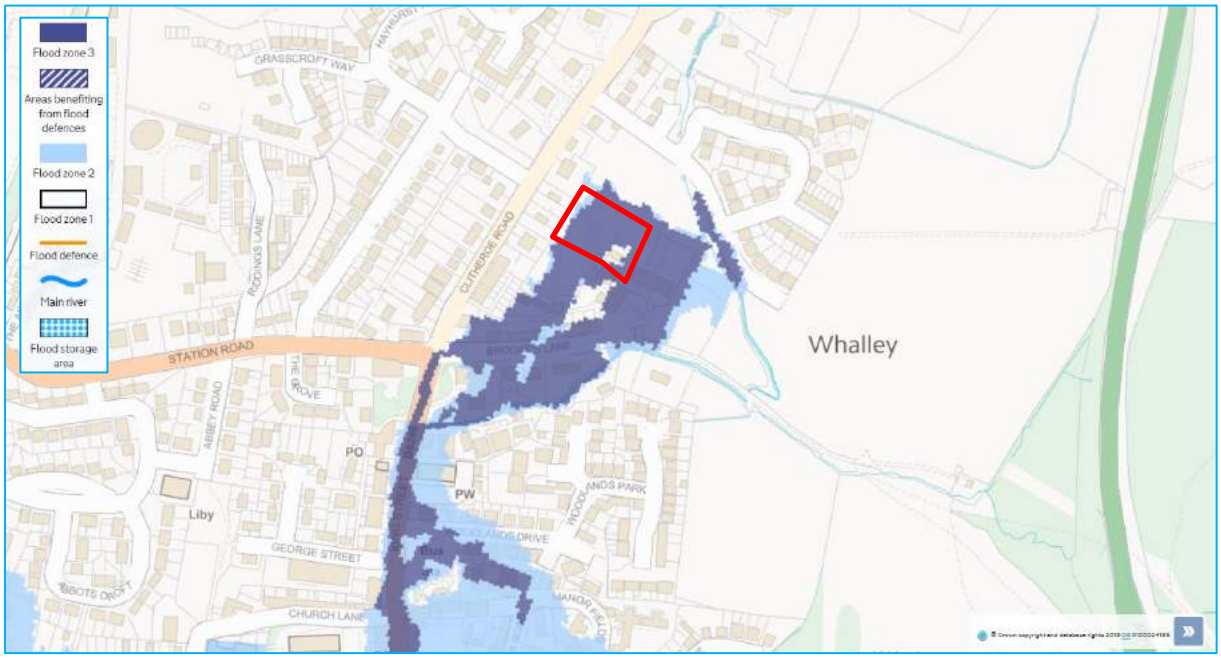


Figure 2 - Environment Agency Flood Zones

Table 1 - Environment Agency Flood Zones and Appropriate Land Use

Flood Zone	Probability	Explanation	Appropriate Land Use
Zone 1	Low	Less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%)	All development types generally acceptable
Zone 2	Medium	Between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% 0.1%) in any year	Most development type are generally acceptable
Zone 3a	High	A 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year	Some development types not acceptable
Zone 3b	'Functional Floodplain'	Land where water has to be flow or be stored in times of flood. SFRAs should identify this zone (land which would flood with an annual probability of 1 in 20 (5%) or greater in any year or is designed to flood in an extreme (0.1% flood, or at another probability to be agreed between the LPA and the Environment Agency, including water conveyance routes)	Some development types not acceptable

4.3 Ribble Valley Borough SFRA Flood Zones

The Ribble Valley Borough Level 1 SFRA from 2010 shows that the site is located within Flood Zone 1 and has a 'low probability' of fluvial flooding with less than 1 in 1000 annual probability of river flooding in any year (<0.1%).

4.4 Flood Risk Vulnerability

In the Planning Practice Guidance to the NPPF appropriate uses have been identified for the Flood Zones. Applying the Flood Risk Vulnerability Classification in the Planning Practice Guidance to the NPPF, the proposed development is classified as 'more vulnerable'.

Table 2 of this report and the Planning Practice Guidance to the NPPF state that 'more vulnerable' uses are appropriate within Flood Zone 3 after the completion of a satisfactory FRA.

Table 2 - Flood Risk Vulnerability and Flood Zone 'Compatibility'

Flood Risk Vulnerability Classification	Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	✓	Exception test required	✓	✓
Zone 3a	Exception test required	✓	×	Exception test required	✓
Zone 3b 'Functional Floodplain'	Exception test required	✓	×	×	×

Key:

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

4.5 Historic Flooding

The Environment Agency has confirmed that the site has not historically flooded and the Ribble Valley Borough Level 1 SFRA confirms that the site has not historically flooded. There are no records of anecdotal information of flooding at the site. The British Hydrological Society "Chronology of British Hydrological Events[4]" has no information on flooding within the vicinity of the site. No other historical records of flooding for the site have been recorded. Therefore, it has been assumed that the site has not flooded in the recent past.

However, it is understood that an area close to the site flooded on the 26th December 2015. Heavy rainfall and severe flooding occurred over Christmas 2015 as a result of Storm Eva. On Boxing Day residents in West Yorkshire and Lancashire were evacuated from their homes and flooding hit Leeds, Greater Manchester and York. The following day hundreds of people were evacuated from their homes in York when the Foss barrier was raised due to flooding of its electrical controls. Flood warnings were also issued in the Scottish borders and Tayside areas, as well as areas of north-west Wales including Capel Curig[5].

The Secretary of State made a statement on Flooding and the impact of Storm Eva on 5 January 2016 in which she confirmed that about 9,000 properties flooded as a result of Storm Eva which brought the total to about 16,000 properties flooded and 20,000 properties overall were protected by flood defences during December as a result of Storm Eva and Storm Desmond. In a subsequent debate on the impact of Storm Eva on 6 January, Flooding Minister Rory Stewart referred to flooding as 'perhaps one of the most serious crises of our generation'.

The December 2015 Hydrological Summary for the United Kingdom[6] describes the events as follows.

'December was an extraordinary month in both meteorological and hydrological terms, with some of the most widespread and severe flooding witnessed in the UK. It was remarkably mild throughout the UK, and the warmest December in the Central England Temperature series (from 1659) by a wide margin, ~5°C above the 1971-2000 average. Exceptionally stormy and wet conditions across the north contributed to the wettest calendar month on record for the UK (in a series from 1910)'.

[4] http://www.dundee.ac.uk/geography/cbhe/

[5] www.parliament.uk/commons-library | intranet.parliament.uk/commons-library

[6] Parry, Simon; Barker, Lucy; Prosdocimi, Ilaria; Lewis, Melinda; Hannaford, Jamie; Clemas, Sandie. 2016 Hydrological summary for the United Kingdom: December 2015. Wallingford, UK, NERC/Centre for Ecology & Hydrology, 12pp. (CEH Project no. C04954)

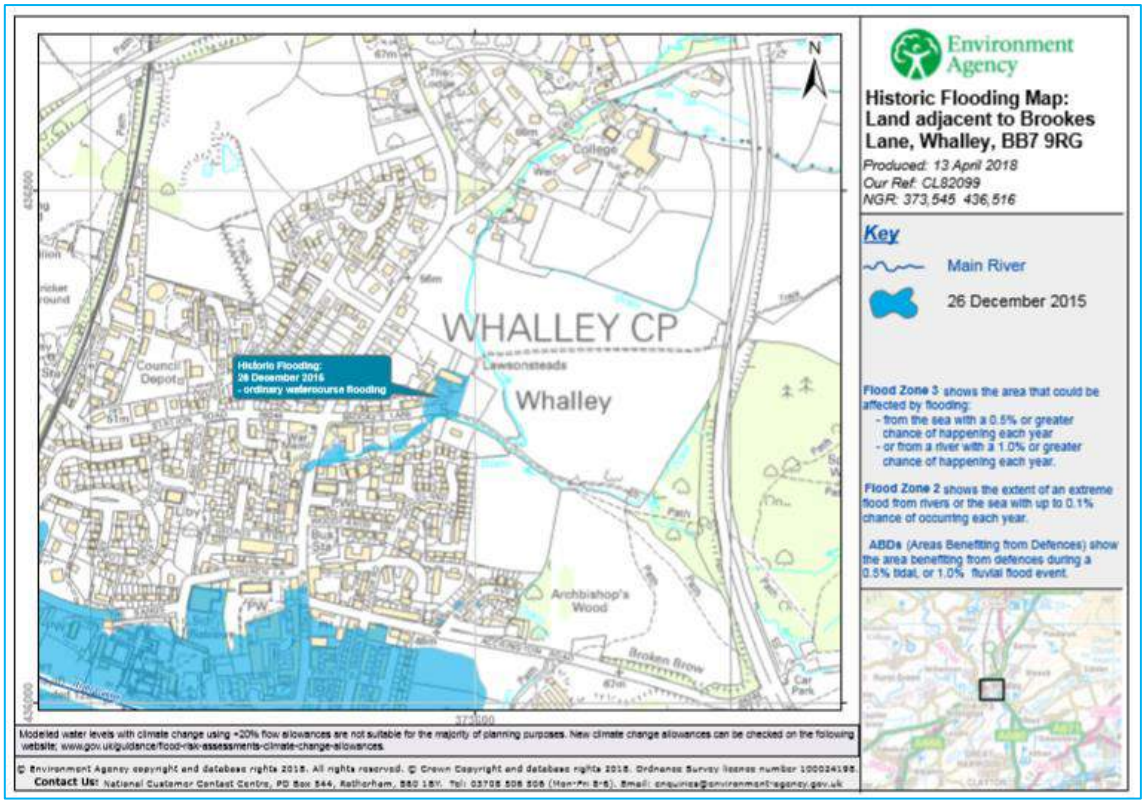


Figure 3 - Environment Agency Historic Flood Outline

'Many large catchments in northern Britain recorded their highest ever peak flows and/or monthly mean flows and across November and December 2015, many regions of northern Britain registered their wettest two-month periods on record by considerable margins'.

'On the 25th/26th, new peak flow maxima were established for many large rivers draining the Pennines with records longer than 50 years (e.g. the Nidd, Wharfe, Aire and Irwell). Thousands of homes flooded across northern England, including in York, Leeds and Greater Manchester'.

'Most northern and western parts of the UK registered more than double the average rainfall, and three times the average across some upland areas'.

'Following a wet November, soils in many northern and western catchments were saturated and river flows were rising entering December'.

Within the local press the flood event has been described as the 'Worst flooding for 70 years'. The River Calder in Whalley, was predicted by the Environment Agency to have reached 'record levels'.

4.6 Existing and Planned Flood Defence Measures

A review of the Environment Agency Flood Zone map confirms that the site is not protected by any formal or informal flood defence measures.

4.7 Climate Change

Projections of future climate change, in the UK, indicate more frequent, short-duration, high intensity rainfall and more frequent periods of long duration rainfall. Guidance included within the NPPF recommends that the effects of climate change are incorporated into FRA. Recommended

precautionary sensitivity ranges for peak rainfall intensities and peak river flows are outlined in the associated Planning Practice Guidance to the NPPF[7].

Table 3 show peak river flow allowances by river basin district. The flood risk assessments: climate change allowances guidance recommends that for 'more vulnerable' uses in Flood Zone 3 that the higher central and upper end allowances are used. Therefore, the 1 in 100 year (+35%) water level has been used as the design flood level.

Table 3 - Peak River Flow Allowances by River Basin District (use 1961 to 1990 baseline)

River basin district	Allowance category	2015 to 2039	2040 to 2059	2060 to 2115
North west	Upper end	+20%	+35%	+70%
	Higher central	+20%	+30%	+35%
	Central	+15%	+25%	+30%

4.8 Fluvial Flooding

A small drainage ditch is located approximately 60m to the north east of the site. This drainage ditch poses the primary flood risk to the site. The drainage ditch is classified as non-main river and OS Mapping shows that the catchment area is to the north east of the site. The drainage ditch upstream of the site has a catchment area of 0.86km² and is predominantly rural runoff (see Figure 4). The drainage ditch is a narrow channel varying from 1.00m to 2.00m wide and is approximately 0.70m deep however, there are several small bridges that span the drainage ditch (see Figures 5, 6 and 7).

Figure 4 - Catchment area of the drainage ditch

[7] https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances#high-allowances.

Figure 5 - Looking from the site to the drainage ditch

Figure 6 - Looking upstream from the east of the site

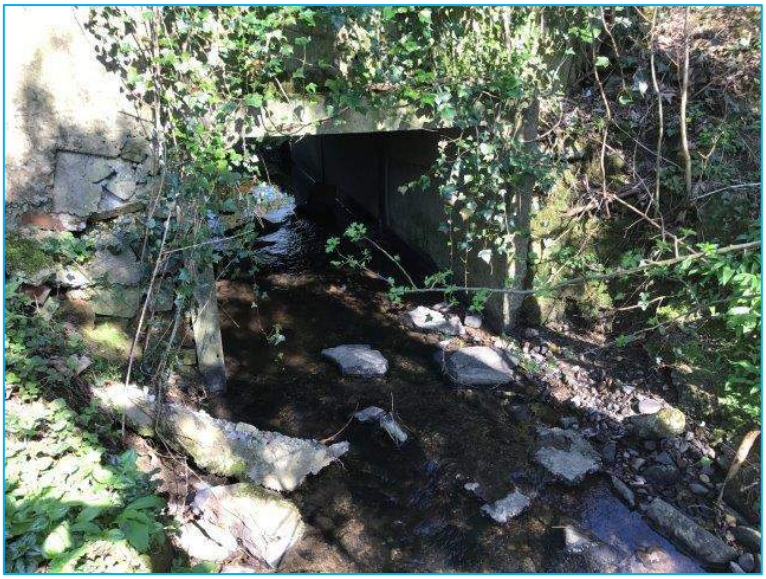


Figure 7 - Culvert on the Drainage Ditch

Table 4 shows the Environment Agency defended modelled water levels and flows for the site and Table 5 shows the Environment Agency undefended modelled water levels and flows for the site. The flow data has been taken from node 931611. The, 1 in 25, 1 in 100, 1 in 100 (+15%), 1 in 200 and 1 in 1000 year modelled water levels/flows have been provided. The existing modelled water levels and flow data has been used to construct a stage-discharge rating curve, from which a rating equation has been used to calculate the water levels for the climate change allowances (see Figure 7). The data from the 1 in 100 year (+15%) has not been used in the development of the stage-discharge rating curve as this over estimates the water levels based on flows i.e. for the 1 in 200 year event a flow of 1.45m^3/s results in a water level of 55.04mAOD whereas for the 1 in 100 year (+15%) event a flow of 1.43m^3/s results in a water level of 55.10mAOD, which is not correct and does not make hydrologic sense.

The modelled water levels have been compared to the ground levels of the site and areas within the vicinity of the site to assess the fluvial flood risk in detail.

The Environment Agency Flood Zone map shown in Figure 2 shows floodwater overtopping the right hand bank of the drainage ditch to the north east of the site and then flowing towards and then inundating the north eastern corner of the site. Once floodwater enters the site it is then shown flowing to the north west and south west.

The ground levels adjacent to where the drainage ditch is shown overtopping its right hand bank, are a minimum of 57.50mAOD as shown on the Environment Agency LiDAR 1m Digital Terrain Model (DTM) with ground levels of a minimum of 56.60mAOD between the north eastern corner of the site and the bank of the drainage ditch at 57.50mAOD.

The water levels for the drainage ditch to the north east of the site are shown to be below the minimum right hand bank ground level of 57.50mAOD, also the ground levels to the north east of the site at 56.60mAOD are shown to be above the water levels for this location for all events up to and including the 1 in 1000 year event. It is unlikely that the drainage ditch will overtop the right hand bank and inundate the site with floodwater during the 1 in 1000 year event, the floodwater would be contained within the drainage ditch channel. Therefore, the drainage ditch would not overtop its right hand bank to the north east of the site and would not result in floodwater flowing towards the site.

Furthermore, the ground levels of the site in the north eastern corner of the site, where the floodwater is shown entering the site, has a minimum ground level of 55.75mAOD, the water levels at this location will be less than the water levels shown for the area to the north east of the site and are unlikely to be above the minimum ground level of 55.75mAOD. To the north of the site the 1 in 1000 year water level is 55.07mAOD, well below the site ground level at this location. It is unlikely that any volume of floodwater would enter the site.

The DTM that the Environment Agency used within the model looks to be under estimating the ground levels. The actual ground levels from the topographical survey of the site are higher than those in the DTM used within the model.

Table 4 - Environment Agency Defended Modelled Water Levels (mAOD) and Flows (m^3/s)

Return Period (yrs)	Location								
	North on the site			South on the site			North east of the site		
	Ground Level	Water Level	Flow	Ground Level	Water Level	Flow	Ground Level	Water Level	Flow
25	54.95	54.91	1.07	54.04	53.96	1.07	56.60	56.24	1.07
100		55.04	1.31		54.12	1.31		56.29	1.31
100 +15%		55.10	1.43		54.14	1.43		56.34	1.43
100 +30%		55.09	1.70		54.15	1.70		56.30	1.70
100 +35%		55.10	1.77		54.16	1.77		56.30	1.77
100 +70%		55.18	2.23		54.24	2.23		56.33	2.23
200		55.04	1.45		54.10	1.45		56.27	1.45
1000		55.07	1.71		54.12	1.71		56.30	1.71

Table 5 - Environment Agency Undefended Modelled Water Levels (mAOD) and Flows (m^3/s)

Return Period (yrs)	Location								
	North			South			North west of the site		
	Ground Level	Water Level	Flow	Ground Level	Water Level	Flow	Ground Level	Water Level	Flow
25	54.95	54.95	1.07	54.04	53.90	1.07		56.24	1.07
100		55.01	1.31		53.93	1.31		56.24	1.31
100 +15%		55.10	1.43		54.14	1.43		56.48	1.43
100 +30%		55.08	1.70		53.97	1.70		56.38	1.70
100 +35%		55.09	1.77		53.98	1.77		56.40	1.77
100 +70%		55.18	2.23		54.04	2.23		56.51	2.23
200		55.04	1.45		53.93	1.45		56.34	1.45
1000		55.07	1.71		53.98	1.71		56.38	1.71

Furthermore, the JBA Comprehensive River Flood Map for the site confirms that the site is located outside of the drainage ditch flood outlines for all events up to and including the 1 in 1000 year event as shown in Figure 7. This flood map has been developed using an updated version of JFLOW and a LiDAR 5m resolution DTM for the undefended scenario and shows the flood risk posed to the site in more detail than the Environment Agency Flood Zones shown in Figure 2.

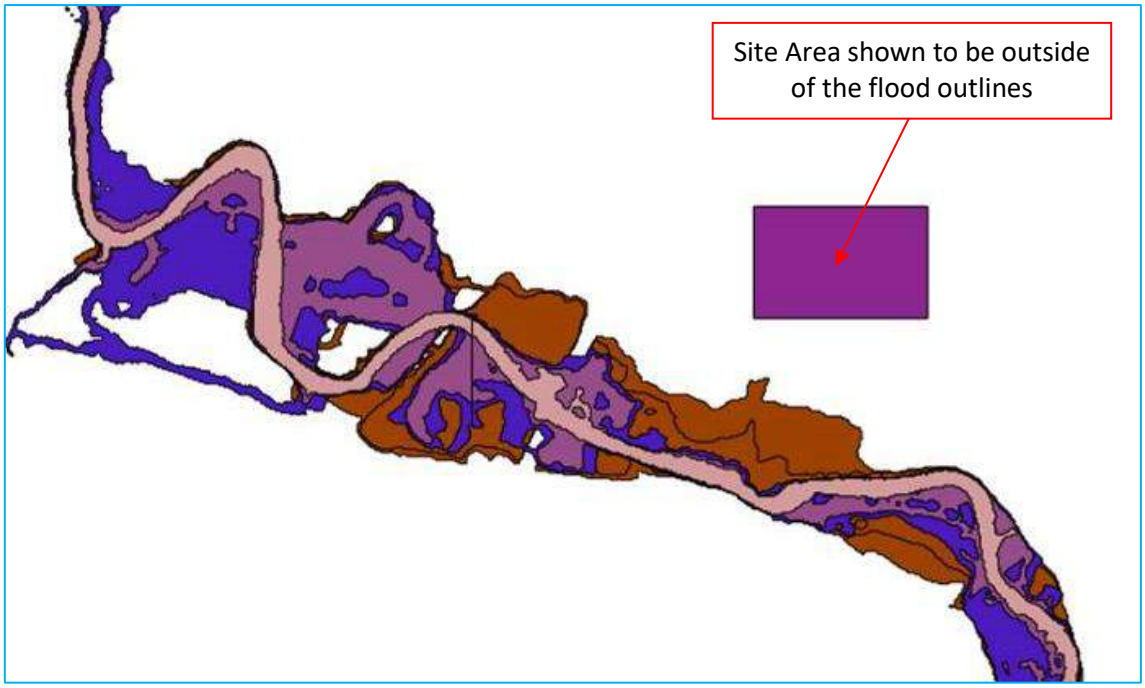


Figure 7 - JBA Comprehensive River Flood Map

The Environment Agency surface water flood map is representative of the fluvial flood risk from the drainage ditch. The medium risk surface water flood outline is representative of the 1 in 100 year flood event and the low risk surface water flood outline is representative of the 1 in 1000 year event as shown below in Figure 8. The surface water flood map assumes that the channel capacity of the beck is 1 in 2 years. Therefore, the flood map is highly conservative. The flood map shows that the site is not inundated with floodwater from the drainage ditch to the north east of the site.

The modelled water levels discussed above provide a much more robust estimate of the flood risk posed by the drainage ditch at this location than the Environment Agency Flood Zones shown in Figure 2. The actual risk of fluvial flooding is much reduced compared to the Environment Agency Flood Zones.

The site is located outside of the 1 in 100 year, 1 in 100 year (+30%) and 1 in 1000 year flood outlines, the ground levels of the site and the right hand bank of the drainage ditch are above the modelled water levels. Also, until recently the site was also identified as being located in Flood Zone 1 with a 'low probability' of fluvial flooding with less than 1 in 1000 annual probability of river any year (<0.1%).

Residual flood risk of failure or blockage (complete or partial) of New Bridge

An assessment of the residual flood risk of failure or blockage (complete or partial) of the culverts has been undertaken (see Figure 5). Blockage of such a feature can occur through a number of different mechanisms:

Large debris in watercourse

If large pieces of rubbish or natural debris are allowed to collect in the channel these can be washed downstream during episodes of high flow and then become lodged either in the bridge entrance of internally within a bridge. This in itself will reduce the bridge capacity but would also allow smaller pieces of debris to become trapped and then further reduce the bridge capacity.

The potential for this mechanism to be realised depends upon the availability of debris and the frequency with which the watercourse is cleared. In this case, there are similar sized bridges/culverts

upstream of the site on which any large debris is likely to become lodged and the availability of suitable sized debris is limited due to the nature of the catchment. Given this there is limited potential for a blockage of this type to occur at the bridges.

Sedimentation

Over long periods of natural sedimentation along with additional sediment loading and other geomorphological changes caused by human actions can result in siltation within bridges that will then reduce the bridge capacity. There is no reason to expect significant sediment loading. It should also be noted that such problems typically impact smaller bridges and it is unlikely that sedimentation will significantly impact conveyance in this case.

Bridge or channel collapse

A collapse of the bridges would block flows and could lead to water backing up and flooding areas of the site. This is likely to occur where bridges are old and in poor repair however, the bridges are not in need of repair and are regularly maintained. If a partial blockage or failure of the bridges were to occur the capacity of the bridges would be exceeded and localised flooding may occur. However, this will be of a minor nature due to the low flows and topography of the area.

The bridges are large, well maintained and is structurally sound therefore the probability of a bridge collapsing, and/or a blockage is low. Due to the large size of the bridges it is unlikely that the maximum flows for the drainage ditch will surcharge at the bridge entrances.

If a partial blockage or failure of the bridge were to occur, it is unlikely that the capacity of the bridges would be exceeded. If a complete blockage or failure of the bridge were to occur, which is highly unlikely, flooding of the drainage ditch would occur. However, this will be of a minor nature due to the low flows and topography of the area. Therefore, it can be seen that flooding of the site from surcharging of the bridges is unlikely especially. On the rare occasion that the capacity of the bridges is exceeded, the water then spills from the bridge inlet and follows the contours of the surrounding area.

Flood risk to the site from the drainage ditch can be considered to be limited. Any overbank flow would follow the contours of the surrounding area and would flow directly to the east rather than flowing towards the site. The flood risk can also be considered to be limited due to the difference in elevations. The ground levels of the site are located above the normal water level of the drainage ditch.

It can be concluded that fluvial flood risk from the drainage ditch poses a low risk to the site. Therefore, the risk of flooding from fluvial flooding is considered to be of **low significance**. The risk of fluvial flooding will be further managed and mitigated by using a number of property level protection measures to manage and reduce the overall flood risk at the site (see Section 6.0).

4.9 Tidal Flooding

The site is not located within the vicinity of tidal flooding sources and the risk of tidal flooding is considered to be **not significant**. Flooding from these sources has not been considered further within this FRA.

4.10 Groundwater Flooding

Groundwater flooding tends to occur sporadically in both location and time. When groundwater flooding does occur, it tends to mostly affect low-lying areas, below surface infrastructure and buildings (for example, tunnels, basements and car parks) underlain by permeable rocks (aquifers).

Site ground conditions confirm that the risk of groundwater flooding is low. No below surface infrastructure and buildings are proposed for the site, as such the site is not considered to be at risk of flooding from rising/high groundwater. Any risk would be mitigated by the adoption of the SUDS Strategy for the site and provided the buildings are set above the back of the footway of the adjacent carriageway to enable the full capacity of any secondary flood conveyance to be utilised, the risk of flooding from groundwater flooding is considered to be **not significant**.

4.11 Surface Water (pluvial) Flooding

The site is not situated near to large areas of poor permeability or areas with the geology and/or topography which may result in surface water flooding. The site surroundings are relatively flat and there are no large catchments that would tend to generate surface water runoff towards the site. Surface water flow flooding tends to occur sporadically in both location and time such surface water flows would tend to be confined to the streets around the development.

The Environment Agency Surface Water flood map shows that the site has a very low to high risk of surface water flooding (see Figure 8) with a chance of flooding of less than 1 in 1000 (0.1%) years to greater than 1 in 30 (3.3%) years. This is associated with low spots associated with the old channel location of the drainage ditch, which flowed down the western boundary of the site.

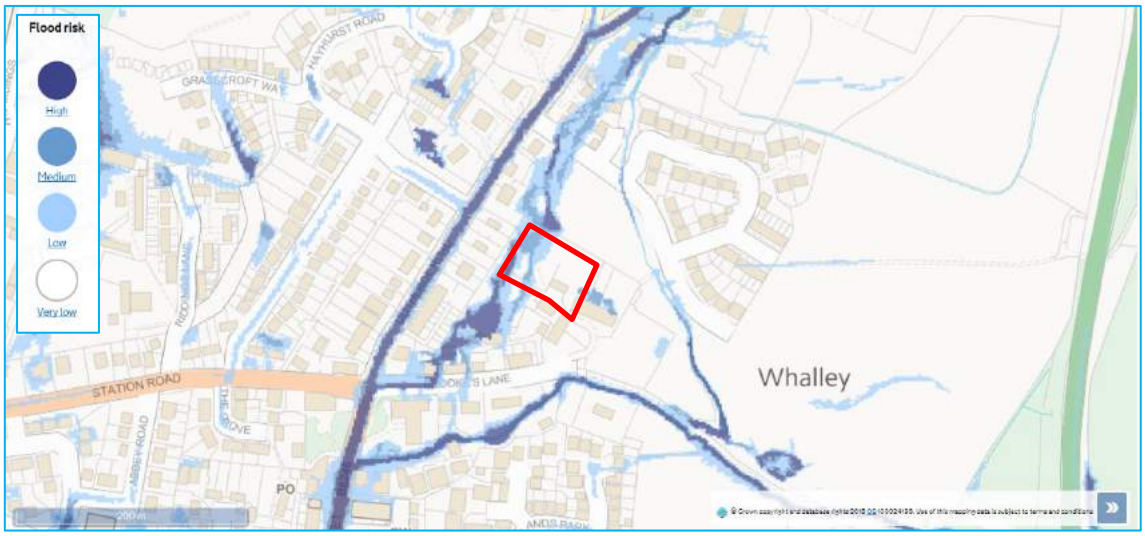


Figure 8 - Environment Agency Surface Water Flood Map

Any risk will be further mitigated by the adoption of the SUDS Strategy for the site and provided the buildings are set above the back of the footway of the adjacent carriageway to enable the full capacity of any secondary flood conveyance to be utilised. Therefore, the risk of flooding from surface water flooding is considered to be of **low significance**. The risk of flooding will be further managed and mitigated by using a number of property level protection measures to manage and reduce the overall flood risk at the site (see Section 6.0).

4.12 Sewer Flooding

Sewer flooding occurs when urban drainage networks become overwhelmed and maximum capacity is reached. This can occur if there is a blockage in the network causing water to back up behind it or if the sheer volume of water draining into the system is too great to be handled. Sewer flooding tends to occur sporadically in both location and time such flood flows would tend to be confined to the streets around the development.

Given the design parameters normally used for drainage design in recent times and allowing for some deterioration in the performance of the installed systems, which are likely to have been in place for many years, an appropriate flood risk probability from this source could be assumed to have a return period in the order of 1 in 10 to 1 in 20 years. The provision of adequate level difference between the ground floors and adjacent ground level would reduce the annual probability of damage to property from this source to 1 in 100 years or less.

Any risk will be further mitigated by the adoption of the SUDS Strategy for the site and provided the buildings are set above the back of the footway of the adjacent carriageway to enable the full capacity of any secondary flood conveyance to be utilised. Therefore, the risk of flooding from surface water flooding is considered to be **not significant**.

4.13 Flooding from Artificial Drainage Systems/Infrastructure Failure

There are no other nearby artificial water bodies, water channels and artificial drainage systems that could be considered a flood risk to the site. The Environment Agency Reservoir flood map shows that the site is not at risk of reservoir flooding (see Figure 9). The risk of flooding from artificial drainage systems/infrastructure failure is considered to be **not significant**.

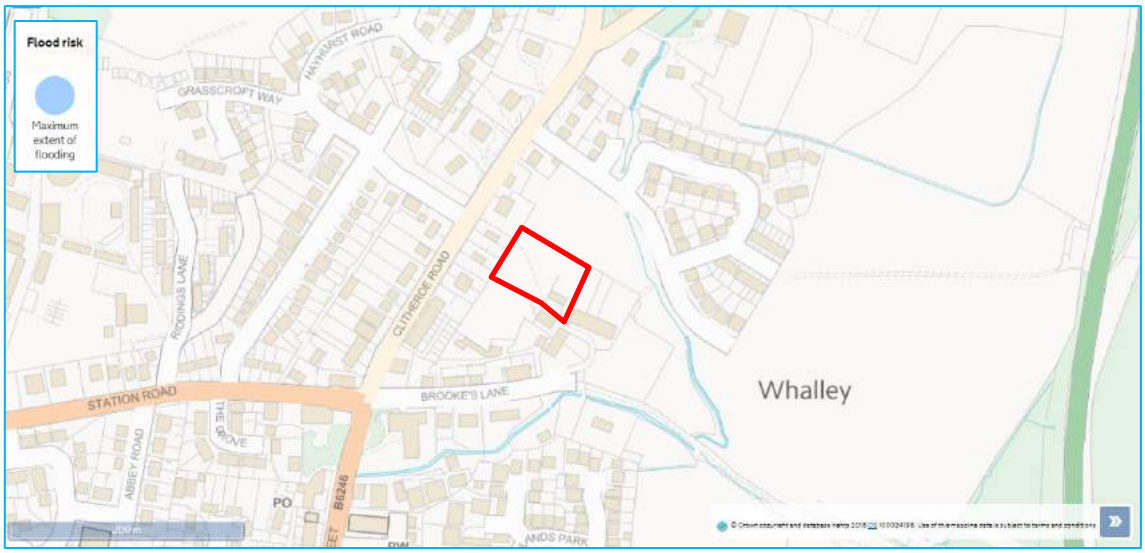


Figure 9 - Environment Agency Reservoir Flood Map

4.14 Effects of the Development on Flood Risk

The site has been shown to be located outside of the 1 in 100 year, 1 in 100 year (+30%) and 1 in 1000 year flood outlines. Therefore, there will be no net loss of floodplain storage capacity. The overall direction of the movement of water will be maintained within the developed site and surrounding area. The conveyance routes (flow paths) will not be blocked or obstructed. The topography of the site will not be altered therefore; the overland flow routes will not be altered. The proposed development proposes minimal new structures and will therefore allow floodwater to pass through the site with no effect on the conveyance routes.

4.15 Site Specific Flood Risk Assessment

A summary of the sources of flooding and a review of the risk posed by each source at the site is shown in Table 9.

Table 9 - Risk Posed by Flooding Sources

Sources of Flooding	Potential Flood Risk	Potential Source	Probability
Fluvial Flooding	Yes	Drainage Ditch	Low
Tidal Flooding	No	None Reported	None
Groundwater Flooding	No	None Reported	None
Surface Water Flooding	Yes	Poor Permeability	Low
Sewer Flooding	No	None Reported	None
Flooding from Artificial Drainage Systems/Infrastructure Failure	No	None Reported	None

The site is unlikely to flood except in extreme conditions. The primary, but unlikely, flood risk to the site is posed by fluvial flooding from the nearby drainage ditch however, the site has no history of flooding. The site is shown on the Environment Agency flood map as being located within Flood Zone 3 and therefore has a 'high probability' of fluvial flooding. Flood Zone 3 has a 1 in 100 or greater annual probability of river flooding (>1%) in any year. The Flood Zones can be taken as a rough guide, until recently the site was identified as being located in Flood Zone 1 with a 'low probability' of fluvial flooding with less than 1 in 1000 annual probability of river any year (<0.1%). However, the actual risk of fluvial flooding is much reduced compared to the Environment Agency Flood Zones.

The Environment Agency flood map shows floodwater overtopping the right hand bank of the drainage ditch to the north east of the site and then flowing towards and then inundating the north eastern corner of the site. However, the ground levels adjacent to where the drainage ditch is shown overtopping its right hand bank, are a minimum of 57.50mAOD as shown on the Environment Agency 1m DTM with ground levels of a minimum of 56.60mAOD between the north eastern corner of the site and the bank of the drainage ditch at 57.50mAOD.

The water levels for the drainage ditch to the north east of the site are shown to be below the minimum right hand bank ground level of 57.50mAOD, also the ground levels to the north east of the site at 56.60mAOD are shown to be above the water levels for this location for all events up to and including the 1 in 1000 year event.

It is unlikely that the drainage ditch will overtop the right hand bank and inundate the site with floodwater during the 1 in 1000 year event, the floodwater would be contained within the drainage ditch channel. Therefore, the drainage ditch would not overtop its right hand bank to the north east of the site and would not result in floodwater flowing towards the site.

Furthermore, the ground levels of the site in the north eastern corner of the site, where the floodwater is shown entering the site, has a minimum ground level of 55.75mAOD, the water levels at this location will be less than the water levels shown for the area to the north east of the site and are unlikely to be above the minimum ground level of 55.75mAOD. To the north of the site the 1 in 1000 year water level is 55.07mAOD, well below the site ground level at this location. It is unlikely that any volume of floodwater would enter the site.

the JBA Comprehensive River Flood Map for the site confirms that the site is located outside of the drainage ditch flood outlines for all events up to and including the 1 in 1000 year event. The Environment Agency surface water flood map is representative of the fluvial flood risk from the drainage ditch. The medium risk surface water flood outline is representative of the 1 in 100 year flood event and the low risk surface water flood outline is representative of the 1 in 1000 year event. The surface water flood map assumes that the channel capacity of the beck is 1 in 2 years. Therefore,

the flood map is highly conservative. The flood map shows that the site is not inundated with floodwater from the drainage ditch to the north east of the site.

The modelled water levels discussed above provide a much more robust estimate of the flood risk posed by the drainage ditch at this location than the Environment Agency Flood Zones. The actual risk of fluvial flooding is much reduced compared to the Environment Agency Flood Zones.

The site has been shown to be located outside of the 1 in 100 year, 1 in 100 year (+30%) and 1 in 1000 year flood outlines, the ground levels of the site and the right hand bank of the drainage ditch are above the modelled water levels. Also, until recently the site was also identified as being located in Flood Zone 1 with a 'low probability' of fluvial flooding with less than 1 in 1000 annual probability of river any year (<0.1%).

It can be concluded that fluvial flood risk from the drainage ditch poses a low risk to the site. Therefore, the risk of flooding from fluvial flooding is considered to be of **low significance**. A secondary flooding source has been identified which may pose a **low significant** risk to the site. This is:

- Surface Water Flooding

The flooding sources will only inundate the site to a relatively low water depth and water velocity, will only last a short period of time, in very extreme cases and will not have an impact on the whole of the proposed development site. The risk from this source will be further mitigated by using a number of property level protection measures to manage and reduce the overall flood risk at the site (see Section 9.0).

The application is for a new, suitable flood-resilient design. The exposure of people and property will be reduced and minimised compared to existing site conditions. The chance of flooding each year is low each year. This takes into account the effect of any flood defences that may be located within the vicinity of the site as well property level protection measures.

The proposed development will have no impact on flood risk and the overall direction of the movement of water will be maintained within the developed site and surrounding area. There will no net loss in flood storage capacity. The conveyance routes (flow paths) will not be blocked or obstructed. The topography of the site will not be altered therefore; the overland flow routes will not be altered.

In conclusion, the site has been shown to be located outside of the 1 in 100 year, 1 in 100 year (+30%) and 1 in 1000 year flood outlines and a 'more vulnerable' use is appropriate at this location.

5.0 SEQUENTIAL APPROACH

5.1 Sequential Test

The risk-based Sequential Test in accordance with the NPPF aims to steer new development to areas at the lowest probability of flooding (i.e. Flood Zone 1). The planning applicant should state why there is no alternative available to them to develop.

It is impractical to suggest that there are more suitable locations for this development elsewhere. This is the only site in the ownership of the client and therefore the only site available to them to develop. The cost of buying a similar site and the cost to construct a similar development would make it uneconomical. The site proposals cannot be located in another site elsewhere. There are no alternative sites available to develop with a comparable size for residential uses within Whalley.

No 'reasonably available' alternative sites have been identified within the sites identified for residential uses within the Whalley area. The sites are already developed and are not available to construct the site proposals.

The Council's objectives are to sustain and enhance the vitality and viability of the region, and to ensure a wide range of businesses to which people have easy access by a range of transport therefore, improving the overall quality of life. This is underpinned by the quality of the physical environment, social well-being and economic and environmental improvements. The Council seeks to grant permission for developments that add to the vitality and viability of the region.

This site will help to regenerate the region and will help to deliver these objectives. This will site will help encourage economic impetus that will in turn help deliver a stronger service function and mix of housing uses.

The site proposals remain consistent with the relevant planning policies and are not at odds with the current use of the site and can only enhance and preserve the residential base which currently exists. The wider area surrounding the proposed development site is affected by a very similar, and in many cases, higher risk of flooding. The application is for a new, suitable flood-resilient design. The exposure of people and property will be minimised.

Flood risk at the site will be further mitigated by using a number of property level protection measures to manage and reduce the overall flood risk at the site. The proposed development will improve the sites resilience, resistance to flooding and by using property level protection measures to protect the site from flooding the vulnerability of the site will be improved.

Incidentally, the level of identified need for houses means that it is not a simple case of development on this site or on an alternative site. The Council continues to assess potential sites, in addition to this site. Whilst flood risk is a significant material planning consideration and the LPA will continue to seek to minimise flood risk and identify development sites at the lowest risk of flooding - suitable, available and viable sites for housing is scarce. Those sites that meet the criteria, subject to gaining planning permission, need to be brought forward to help meet the identified need.

It can be seen that in the short term at least it will be difficult to achieve housing targets due to market conditions such that developers are unwilling to develop sites where the rate of house sales remain at relatively low levels. Additionally, in the present housing climate there is an increased risk of delays to building completions.

Historically, a significant proportion of housing development across the district has come forward on 'windfall' sites comprising small infill sites, changes of use and conversions. Given the compelling

evidence of historic completion rates and expected future trends of housing delivery sites suitable for 'windfall' sites, it is clear therefore that 'windfall' site such as this site will remain an important element of the provision of the required new houses. It is therefore clear that the subject site and many other 'windfall' sites will be required if the Council is to have any chance of meeting its 5 year land supply of housing.

Similar developments on any site outside a Flood Zone will not offer any advantage vis-a-vis flooding. Consequently, application of the Sequential Test demonstrates that there is no measurable advantage to constructing the proposed housing elsewhere.

Application of the Sequential Test requires that there are other suitable sites available that offer less risk in terms of flooding. Development of this site with the floor levels proposed provides greater safety for the occupants than a similar site immediately adjacent to the flood risk area with levels marginally above the design flood risk level.

Hence this proposal provides greater protection to occupants than might be afforded by another notional site. Consequently, the Sequential Test would suggest that this site is one to which development should be moved to, rather than one from which it should directed away from.

From the above it is shown that there are overriding sustainability reasons for the development to be granted planning permission. The development proposals should therefore be considered by the LPA to satisfy the Sequential Test as set out in the NPPF.

5.2 Exception Test

For the Exception Test to be passed:

a) It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a SFRA.

The key emphasis of the NPPF is to achieve sustainable development. The NPPF provides the following aims under the umbrella of sustainable development.

1. Building a strong, competitive economy
2. Ensuring the vitality of town centres
3. Supporting a prosperous rural economy
4. Promoting sustainable transport
5. Supporting high quality communications infrastructure
6. Delivering a wide choice of high quality homes
7. Requiring good design
8. Promoting healthy communities
9. Protecting Green Belt land
10. Meeting the challenge of climate change, flooding and coastal change
11. Conserving and enhancing the natural environment
12. Conserving and enhancing the historic environment
13. Facilitating the sustainable use of mineral

The site is sustainable and within walking distance of the local community and services. The development of the site will improve the appearance of the site and make a positive contribution to as well as providing much a needed home in a highly sustainable location well-served by public transport and close to local facilities including schools.

The Councils' policies make clear for the need to focus on new development in locations which are accessible and sustainable, making use of existing infrastructure and community facilities and services.

There is an important need within this area for affordable housing, which is suitable for a wide variety of people.

The added material benefit is the contribution that this site will make to the Councils' housing supply position in full compliance with the emerging strategic housing policy. There is an identified need for residential uses to meet future housing needs and accordingly there is a sound and strong planning reason for bringing the site forward.

These outcomes will provide wider sustainability benefits to the community that outweigh flood risk and will deliver considerably wider sustainability benefits than could conceivably only be achieved through use of the site for residential purposes. The development proposals should therefore be considered by the Council to satisfy the first condition of the Exceptions Test as set out in the NPPF.

b) A FRA must demonstrate that the development will be safe, without increasing flood risk elsewhere, and, where possible, reducing flood risk overall.

This FRA has demonstrated that the development will be safe, without increasing flood risk elsewhere.

The development proposals should therefore be considered by the LPA to satisfy the Exception Test as set out in the NPPF.

6.0 RISK MANAGEMENT

6.1 Introduction

The flood risk at this location is considered suitable for 'more vulnerable' developments within the NPPF. In this flood zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area through the layout, form of the development and the use of flood mitigation measures including SUDS techniques.

The flooding sources will be mitigated on the site by using a number of techniques, and mitigation strategies to manage and reduce the overall flood risk at the site. This will ensure the development will be safe and there is:

- Minimal risk to life;
- Minimal disruption to people living and working in the area;
- Minimal potential damage to property;
- Minimal impact of the proposed development on flood risk generally; and;
- Minimal disruption to natural heritage.

6.2 Sequential Approach

The sequential approach has been applied within the site by locating the most vulnerable elements of the development in the lowest risk areas. The most vulnerable use, the dwellings, are situated on the higher part of the site at a lower risk of flooding with the more flood-compatible uses such as the garden/landscaped areas being situated in the lower part of the site at a higher risk of flooding.

6.3 Finished Floor Level

The finished floor levels should be located 600mm above the 1 in 100 year (+35%) water level of 54.16mAOD at 54.76mAOD. It is recognised however that owing to limited headroom constraints, massing, planning policy and Building Regulations it is considered impractical to raise the finished floor levels further. Therefore, in order to mitigate against this, it is recommended that the occupants of the proposed dwelling sign up to receive flood warnings from the Environment Agency and implement a flood evacuation plan to a safe area away from the building during times of flood. It is also proposed that flood protection measures are employed within the building design to reduce the overall risk to the occupants. This is discussed below.

A combination of resistance (proofing) and resilience measures will be included to provide protection above the 1 in 100 year (+35%) event. This is discussed below.

6.4 First Floor Accommodation

Accommodation will be located on the first floor as well as the ground floor of the site. This will allow occupants to retreat to higher floor levels if needed. The levels of the first floor will be located a minimum of 2.50m above the ground floor finished floor level well above any flood water levels.

This provides a 'safe haven' above any flood water levels. This will enable rapid escape should flooding occur which is unlikely. The upper floors are accessed via internal stairs and are sufficient in size to safely house all occupants of the dwelling. The 'safe haven' will only be required in very extreme events or if a flood warning has not been received.

6.5 Sleeping Accommodation

All sleeping will be located on the first floor, the first floors will be located a minimum of 2.50m above the ground floor finished floor level well above any flood water levels.

6.6 Flood Resistance

Flood risk can be mitigated through the design of the building. Flood resistance measures are measures that help resist floodwaters entering a property (airbrick covers are an example of a flood resistance measure). Flood resistant measures will be used, including:

- The walls of the properties will be thick.
- Sealant will be used around external doors and windows.
- All windows will be located a minimum of 500mm above the ground levels.
- All external doors and windows will be constructed from hard wearing materials.

These factors will prevent water entering the properties and make the properties more resistant to seepage.

6.7 Flood Resilience

Flood resilience measures are designed in such a way as to reduce the cost and time required to reinstate the property should it be flooded (tiled floors are an example of a flood resilience measure).

The properties will be constructed in such a way that although floodwater may enter the building, elements that are damaged by flood water can be easily repaired or replaced. This is a form of flood resilience. They are suitable as no other measure is practicable. Robust materials and finishes will be used, including:

- all electrics wiring, switches, sockets, socket outlets etc. to be located a minimum of 450mm above the finished floor levels of 54.76mAOD at 55.21mAOD; and
- fit non-return valves/anti flow valves at last point of inspection chamber before connection to drains.

A proprietary damp-proof membrane system will be used that is bonded to the slab rather than below the insulation and installed in accordance with the manufacturer's requirements will be used. Cavity walls with polyisocyanurate (PIR) rigid closed-cell insulation that retains structural integrity and have low moisture take will be used. Plasterboard will be fixed horizontally, with water resistant plaster at lower levels.

Fixings will be galvanized/stainless steel/copper (no mild steel to be used - cause rust/staining or walls). Hardcore and binding will have good compaction to reduce the risk of settlement and consequential cracking.

6.8 Flood Warning and Evacuation Plan

A Flood Warning and Evacuation Plan will be developed. Sensible precautions would include raising electrical items, irreplaceable items and sentimental items off the ground or where possible moving them to a higher floor, rolling up carpets and rugs and turning off utilities. In addition, consider what actions you would take should the property need to be evacuated including access and egress routes

and preparing a flood kit in advance containing warm clothing, medication, a torch, food and wellingtons.

The Flood Warning and Evacuation Plan is a 'living' document and therefore should be periodically reviewed and updated to provide advice and guidance to occupants in the event of an extreme flood. The Flood Warning and Evacuation Plan will therefore reduce the vulnerability of the occupants to flooding and makes them aware of the mechanisms of flooding at the site.

The site is not located within the Environment Agency flood warning service area however, it is likely due to the close proximity to a flood waring area that the Environment Agency's flood warning service will provide an indication of flooding at this location and should be followed on the internet, Facebook etc.

The Environment Agency operate a free flood warning service providing alerts when flooding is anticipated providing an opportunity for owners to take necessary precautions, giving enough time for the building to be safely evacuated and mitigation measures to be put in place.

All occupants of the site will be made aware of the Environment Agency Floodline telephone number and the Flood Warning Codes and their meaning. The owner of the property will carry out the role of Flood Warden for the site and ensure they have an understanding of the flood mechanisms of the site and will ensure that the safety of the occupants and visitors will not be compromised.

The Environment Agency uses Flood Warnings Codes. They can be issued in any order, usually ending with an 'all clear'. They are issued by the Environment Agency through their website and Floodline. The flood warning will be passed onto the occupiers and visitors of the site verbally, by telephone and/or in person. It will be ensured that everyone receives the flood warnings when required.

The likelihood of a rapid river level rise and possible rapid inundation of urban areas posing a risk to life is considered to be minimal. In order for the following evacuation procedures to be effective:

- The dwellings will participate in the Environment Agency flood warning telephone service.
- The flood warning will be passed onto the occupants and visitors of the site verbally, by telephone and/or in person. It will be ensured that everyone receives the flood warnings when required.

6.9 Safe Access and Egress Routes

The NPPF requires that, where required, safe access and escape is available to/from new developments in flood risk areas. Access routes should be such that occupants can safely access and exit their dwellings in design flood conditions. These routes must also provide the emergency services with access to the development during a flood event and enable flood defence authorities to carry out any necessary duties during the period of flood.

The site has been shown to be located outside of the 1 in 100 year, 1 in 100 year (+30%) and 1 in 1000 year flood outlines therefore, safe access and egress can be maintained for all events up to and including the 1 in 100 year (+35%) event in accordance with the NPPF and Environment Agency guidance.

The Safe Access and Egress Routes shown in Figure 10 indicates the exit route that all people (i.e. occupants and visitors) on site should follow once a flood warning has been received. People should make their way to areas outside of the flood zone via the site entrance to the south east and then via Brookes to the south west to Clitheroe Road or via the public footpath to the north west to Clitheroe Road.

Facilities such as community centres, shops etc. are located within the vicinity of the site which may be used in the event of a flood event. There may also be large areas than those shown in Figure 8 that are flood free located nearer and within the vicinity of the site. In the event of a Flood Warning, vital belongings, including waterproof clothing, necessary medication and essentials for infants and children will be collected. It should be ensured that all occupiers and visitors to the site are accounted for, and then exit the site using the route shown in Figure 10.

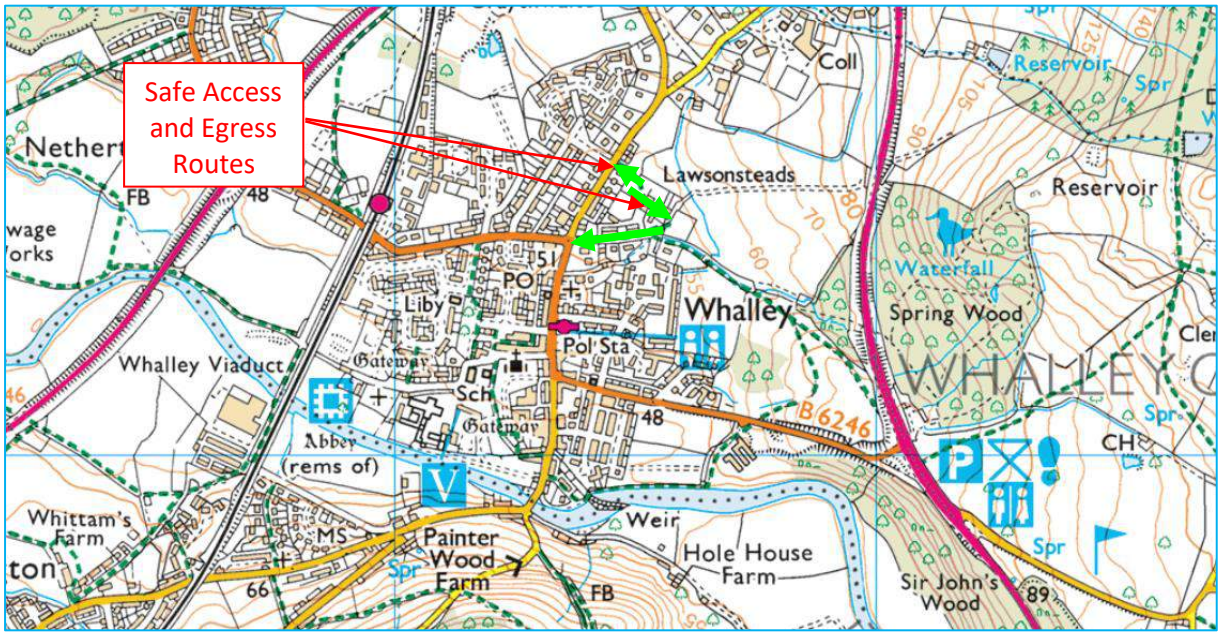


Figure 10 - Safe Access and Egress Route

6.10 Flooding Consequences

The mitigation measures detailed above show that the flood risk can be effectively managed and therefore the consequences of flooding are acceptable.

7.0 SUMMARY AND CONCLUSIONS

7.1 Introduction

This report presents an FRA in accordance with the NPPF for the proposed development on Land Adjacent 17 Brookes Lane, Whalley, BB7 9RG and includes an assessment of the existing and proposed surface and foul water drainage of the site.

This FRA identifies and assesses the risks of all forms of flooding to and from the development and demonstrates how these flood risks will be managed so that the development remains safe throughout the lifetime, taking climate change into account.

7.2 Flood Risk

The site is unlikely to flood except in extreme conditions. The primary, but unlikely, flood risk to the site is posed by fluvial flooding from the nearby drainage ditch however, the site has no history of flooding. The site is shown on the Environment Agency flood map as being located within Flood Zone 3 and therefore has a 'high probability' of fluvial flooding. Flood Zone 3 has a 1 in 100 or greater annual probability of river flooding (>1%) in any year. The Flood Zones can be taken as a rough guide, until recently the site was identified as being located in Flood Zone 1 with a 'low probability' of fluvial flooding with less than 1 in 1000 annual probability of river any year (<0.1%). However, the actual risk of fluvial flooding is much reduced compared to the Environment Agency Flood Zones.

The Environment Agency flood map shows floodwater overtopping the right hand bank of the drainage ditch to the north east of the site and then flowing towards and then inundating the north eastern corner of the site. However, the ground levels adjacent to where the drainage ditch is shown overtopping its right hand bank, are a minimum of 57.50mAOD as shown on the Environment Agency 1m DTM with ground levels of a minimum of 56.60mAOD between the north eastern corner of the site and the bank of the drainage ditch at 57.50mAOD.

The water levels for the drainage ditch to the north east of the site are shown to be below the minimum right hand bank ground level of 57.50mAOD, also the ground levels to the north east of the site at 56.60mAOD are shown to be above the water levels for this location for all events up to and including the 1 in 1000 year event.

It is unlikely that the drainage ditch will overtop the right hand bank and inundate the site with floodwater during the 1 in 1000 year event, the floodwater would be contained within the drainage ditch channel. Therefore, the drainage ditch would not overtop its right hand bank to the north east of the site and would not result in floodwater flowing towards the site.

Furthermore, the ground levels of the site in the north eastern corner of the site, where the floodwater is shown entering the site, has a minimum ground level of 55.75mAOD, the water levels at this location will be less than the water levels shown for the area to the north east of the site and are unlikely to be above the minimum ground level of 55.75mAOD. To the north of the site the 1 in 1000 year water level is 55.07mAOD, well below the site ground level at this location. It is unlikely that any volume of floodwater would enter the site.

the JBA Comprehensive River Flood Map for the site confirms that the site is located outside of the drainage ditch flood outlines for all events up to and including the 1 in 1000 year event. The Environment Agency surface water flood map is representative of the fluvial flood risk from the drainage ditch. The medium risk surface water flood outline is representative of the 1 in 100 year flood event and the low risk surface water flood outline is representative of the 1 in 1000 year event. The surface water flood map assumes that the channel capacity of the beck is 1 in 2 years. Therefore,

the flood map is highly conservative. The flood map shows that the site is not inundated with floodwater from the drainage ditch to the north east of the site.

The modelled water levels discussed above provide a much more robust estimate of the flood risk posed by the drainage ditch at this location than the Environment Agency Flood Zones. The actual risk of fluvial flooding is much reduced compared to the Environment Agency Flood Zones.

The site has been shown to be located outside of the 1 in 100 year, 1 in 100 year (+30%) and 1 in 1000 year flood outlines, the ground levels of the site and the right hand bank of the drainage ditch are above the modelled water levels. Also, until recently the site was also identified as being located in Flood Zone 1 with a 'low probability' of fluvial flooding with less than 1 in 1000 annual probability of river any year (<0.1%).

It can be concluded that fluvial flood risk from the drainage ditch poses a low risk to the site. Therefore, the risk of flooding from fluvial flooding is considered to be of **low significance**. A secondary flooding source has been identified which may pose a **low significant** risk to the site. This is:

- Surface Water Flooding

The flooding sources will only inundate the site to a relatively low water depth and water velocity, will only last a short period of time, in very extreme cases and will not have an impact on the whole of the proposed development site. The risk from this source will be further mitigated by using a number of property level protection measures to manage and reduce the overall flood risk at the site (see Section 9.0).

The application is for a new, suitable flood-resilient design. The exposure of people and property will be reduced and minimised compared to existing site conditions. The chance of flooding each year is low each year. This takes into account the effect of any flood defences that may be located within the vicinity of the site as well property level protection measures.

The proposed development will have no impact on flood risk and the overall direction of the movement of water will be maintained within the developed site and surrounding area. There will no net loss in flood storage capacity. The conveyance routes (flow paths) will not be blocked or obstructed. The topography of the site will not be altered therefore; the overland flow routes will not be altered.

In conclusion, the site has been shown to be located outside of the 1 in 100 year, 1 in 100 year (+30%) and 1 in 1000 year flood outlines and a 'more vulnerable' use is appropriate at this location.

7.3 Sequential Approach

The development proposals should be considered by the LPA to satisfy the Sequential and Exception Tests as set out in the NPPF.

7.4 Risk Management

The flooding sources will be managed and mitigated on the site by using a number of techniques, and mitigation strategies to manage and reduce the overall flood risk at the site, this will ensure the development will be safe. Measured used:

Sequential Approach: The sequential approach has been applied within the site by locating the most vulnerable elements of the development in the lowest risk areas. The most vulnerable use, the dwellings, are situated on the higher part of the site at a lower risk of flooding with the more flood-

compatible uses such as the garden/landscaped areas being situated in the lower part of the site at a higher risk of flooding.

Finished Floor Level: The finished floor levels should be located 600mm above the 1 in 100 year (+35%) water level of 54.16mAOD at 54.76mAOD. It is recognised however that owing to limited headroom constraints, massing, planning policy and Building Regulations it is considered impractical to raise the finished floor levels further. Therefore, in order to mitigate against this, it is recommended that the occupants of the proposed dwelling sign up to receive flood warnings from the Environment Agency and implement a flood evacuation plan to a safe area away from the building during times of flood. It is also proposed that flood protection measures are employed within the building design to reduce the overall risk to the occupants. This is discussed below.

A combination of resistance (proofing) and resilience measures will be included to provide protection above the 1 in 100 year (+35%) event. This is discussed below.

First Floor Accommodation: Accommodation will be located on the first floor as well as the ground floor of the site. This will allow occupants to retreat to higher floor levels if needed. The levels of the first floor will be located a minimum of 2.50m above the ground floor finished floor level well above any flood water levels.

This provides a 'safe haven' above any flood water levels. This will enable rapid escape should flooding occur which is unlikely. The upper floors are accessed via internal stairs and are sufficient in size to safely house all occupants of the dwelling. The 'safe haven' will only be required in very extreme events or if a flood warning has not been received.

Sleeping Accommodation: All sleeping will be located on the first floor; the first floors will be located a minimum of 2.50m above the ground floor finished floor level well above any flood water levels.

Flood Resistance: Flood risk can be mitigated through the design of the building. Flood resistance measures are measures that help resist floodwaters entering a property (airbrick covers are an example of a flood resistance measure). Flood resistant measures will be used, including:

- The walls of the properties will be thick.
- Sealant will be used around external doors and windows.
- All windows will be located a minimum of 500mm above the ground levels.
- All external doors and windows will be constructed from hard wearing materials.

These factors will prevent water entering the properties and make the properties more resistant to seepage.

Flood Resilience: Robust materials and finishes will be used, including:

- all electrics wiring, switches, sockets, socket outlets etc. to be located a minimum of 450mm above the finished floor levels of 54.76mAOD at 55.21mAOD; and
- fit non-return valves/anti flow valves at last point of inspection chamber before connection to drains.

A proprietary damp-proof membrane system will be used that is bonded to the slab rather than below the insulation and installed in accordance with the manufacturer's requirements will be used. Cavity walls with polyisocyanurate (PIR) rigid closed-cell insulation that retains structural integrity and have

low moisture take will be used. Plasterboard will be fixed horizontally, with water resistant plaster at lower levels.

Fixings will be galvanized/stainless steel/copper (no mild steel to be used - cause rust/staining or walls). Hardcore and binding will have good compaction to reduce the risk of settlement and consequential cracking.

A proprietary damp-proof membrane system will be used that is bonded to the slab rather than below the insulation and installed in accordance with the manufacturer's requirements will be used. Cavity walls with polyisocyanurate (PIR) rigid closed-cell insulation that retains structural integrity and have low moisture take will be used. Plasterboard will be fixed horizontally, with water resistant plaster at lower levels.

Fixings will be galvanized/stainless steel/copper (no mild steel to be used - cause rust/staining or walls). Hardcore and binding will have good compaction to reduce the risk of settlement and consequential cracking.

Flood Warning and Evacuation Plan: A Flood Warning and Evacuation Plan will be developed.

Safe Access and Egress Route: The site has been shown to be located outside of the 1 in 100 year, 1 in 100 year (+30%) and 1 in 1000 year flood outlines therefore, safe access and egress can be maintained for all events up to and including the 1 in 100 year (+35%) event in accordance with the NPPF and Environment Agency guidance.

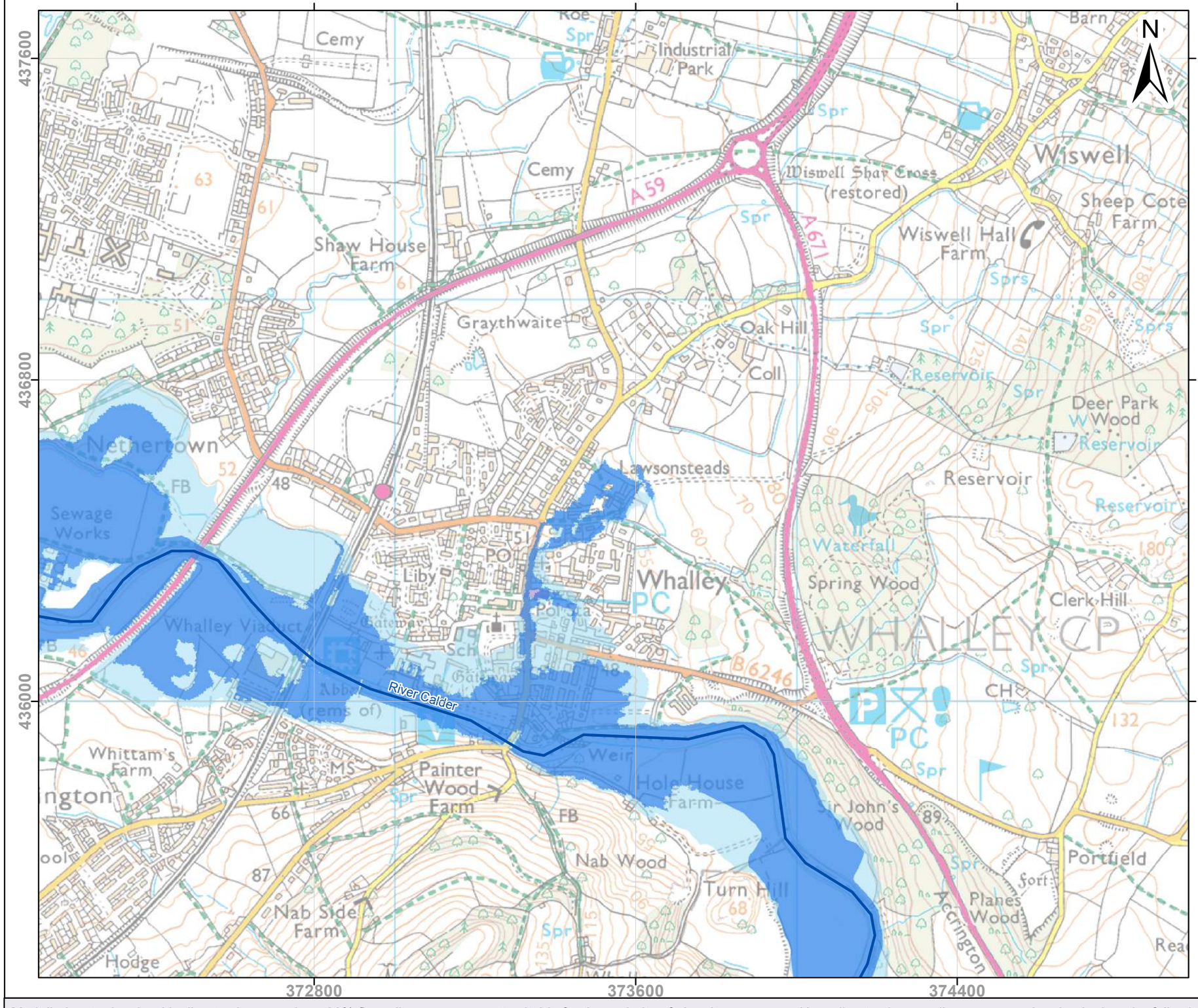
The Safe Access and Egress Routes indicates the exit route that all people (i.e. occupants and visitors) on site should follow once a flood warning has been received. People should make their way to areas outside of the flood zone via the site entrance to the south east and then via Brookes to the south west to Clitheroe Road or via the public footpath to the north west to Clitheroe Road.

7.5 Conclusion

In conclusion, a residential development, would be expected to remain dry in all but the most extreme conditions. Providing the recommendations made in this FRA are instigated, flood risk from all sources would be minimised, the consequences of flooding are acceptable, and the development would be in accordance with the requirements of the NPPF.

The site has been shown to be located outside of the 1 in 100 year, 1 in 100 year (+30%), 1 in 200 year and 1 in 1000 year flood outlines. This FRA demonstrates that the proposed development would be operated with minimal risk from flooding, would not increase flood risk elsewhere and is compliant with the requirements of the NPPF. The development should not therefore be precluded on the grounds of flood risk.

APPENDIX 1 – Environment Agency Correspondence



Modelled water levels with climate change using +20% flow allowances are not suitable for the majority of planning purposes. New climate change allowances can be checked on the following website; www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances.

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Environment Agency

Flood Zones Map: Land adjacent to Brookes Lane, Whalley, BB7 9RG

Produced: 13 April 2018
Our Ref: CL82099
NGR: 373,545 436,516

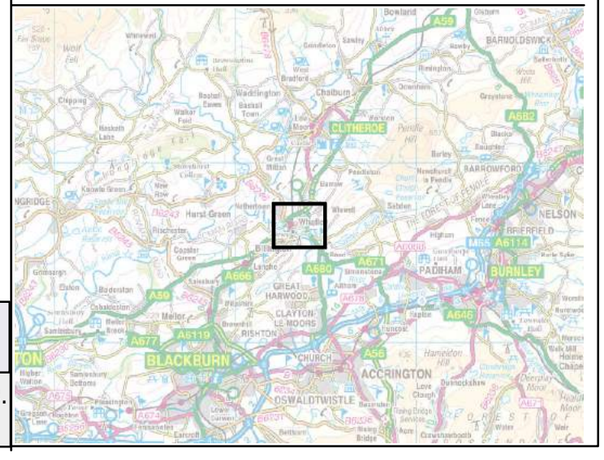
Key

- Main River
- Areas Benefitting from Defences
- Flood Zone 3
- Flood Zone 2

Flood Zone 3 shows the area that could be affected by flooding:
- from the sea with a 0.5% or greater chance of happening each year
- or from a river with a 1.0% or greater chance of happening each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to 0.1% chance of occurring each year.

ABDs (Areas Benefiting from Defences) show the area benefiting from defences during a 0.5% tidal, or 1.0% fluvial flood event.



Historic Flooding Map: Land adjacent to Brookes Lane, Whalley, BB7 9RG

Produced: 13 April 2018
Our Ref: CL82099
NGR: 373,545 436,516

Key

Main River

26 December 2015

Flood Zone 3 shows the area that could be affected by flooding:
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- or from a river with a 1.0% or greater chance of happening each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to 0.1% chance of occurring each year.

ABDs (Areas Benefiting from Defences) show the area benefiting from defences during a 0.5% tidal, or 1.0% fluvial flood event.

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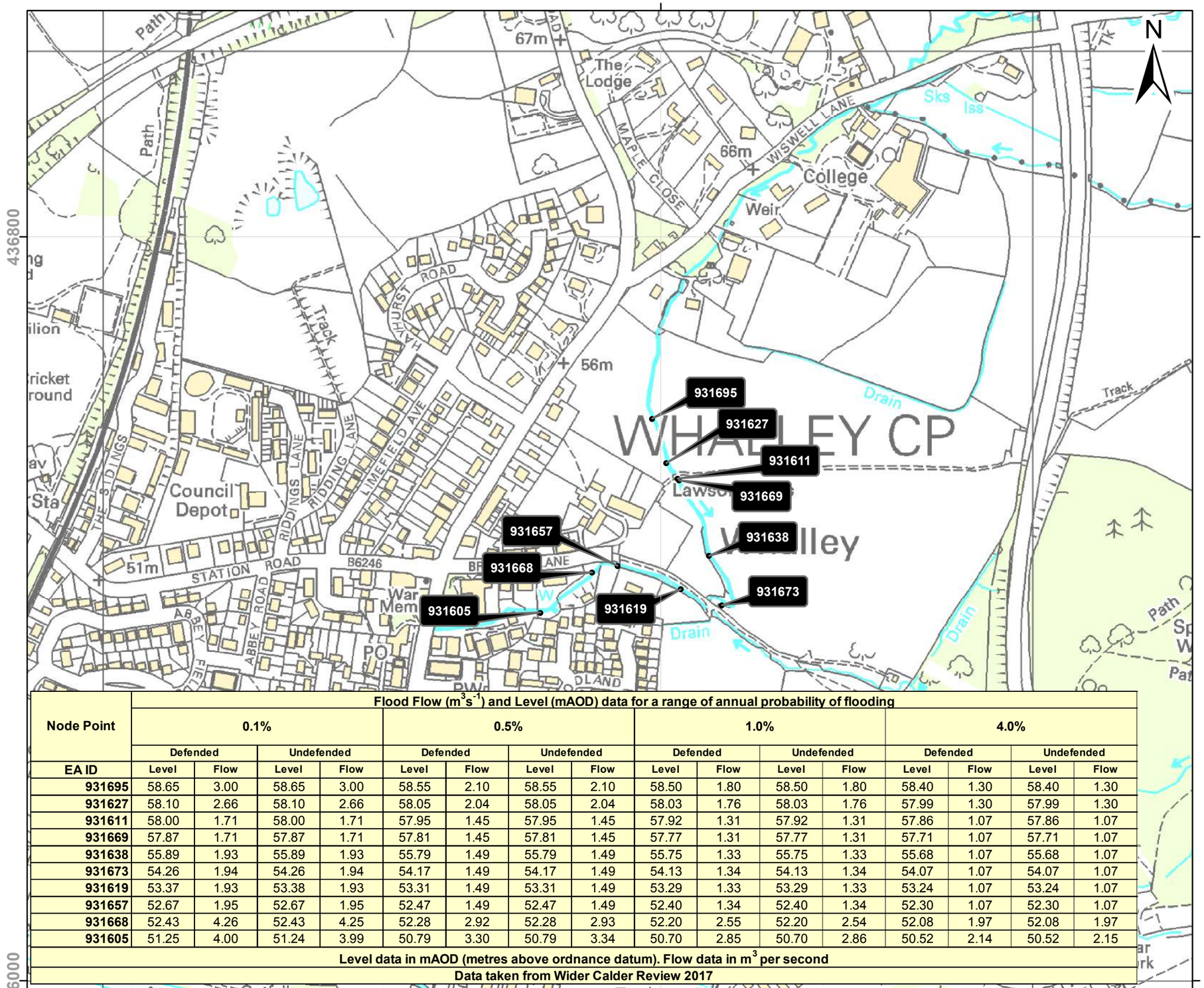

Node Point	Flood Flow (m^3s^{-1}) and Level (mAOD) data for a range of annual probability of flooding															
	0.1%				0.5%				1.0%				4.0%			
	Defended		Undefended		Defended		Undefended		Defended		Undefended		Defended		Undefended	
EA ID	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow
931695	58.65	3.00	58.65	3.00	58.55	2.10	58.55	2.10	58.50	1.80	58.50	1.80	58.40	1.30	58.40	1.30
931627	58.10	2.66	58.10	2.66	58.05	2.04	58.05	2.04	58.03	1.76	58.03	1.76	57.99	1.30	57.99	1.30
931611	58.00	1.71	58.00	1.71	57.95	1.45	57.95	1.45	57.92	1.31	57.92	1.31	57.86	1.07	57.86	1.07
931669	57.87	1.71	57.87	1.71	57.81	1.45	57.81	1.45	57.77	1.31	57.77	1.31	57.71	1.07	57.71	1.07
931638	55.89	1.93	55.89	1.93	55.79	1.49	55.79	1.49	55.75	1.33	55.75	1.33	55.68	1.07	55.68	1.07
931673	54.26	1.94	54.26	1.94	54.17	1.49	54.17	1.49	54.13	1.34	54.13	1.34	54.07	1.07	54.07	1.07
931619	53.37	1.93	53.38	1.93	53.31	1.49	53.31	1.49	53.29	1.33	53.29	1.33	53.24	1.07	53.24	1.07
931657	52.67	1.95	52.67	1.95	52.47	1.49	52.47	1.49	52.40	1.34	52.40	1.34	52.30	1.07	52.30	1.07
931668	52.43	4.26	52.43	4.25	52.28	2.92	52.28	2.93	52.20	2.55	52.20	2.54	52.08	1.97	52.08	1.97
931605	51.25	4.00	51.24	3.99	50.79	3.30	50.79	3.34	50.70	2.85	50.70	2.86	50.52	2.14	50.52	2.15

Level data in mAOD (metres above ordnance datum). Flow data in m^3 per second

Data taken from Wider Calder Review 2017

Modelled water levels with climate change using +20% flow allowances are not suitable for the majority of planning purposes. New climate change allowances can be checked on the following website; www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances.

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Environment Agency

Fluvial Flood Levels Map: Land adjacent to Brookes Lane, Whalley, BB7 9RG

Produced: 13 April 2018
Our Ref: CL82099
NGR: 373,545 436,516

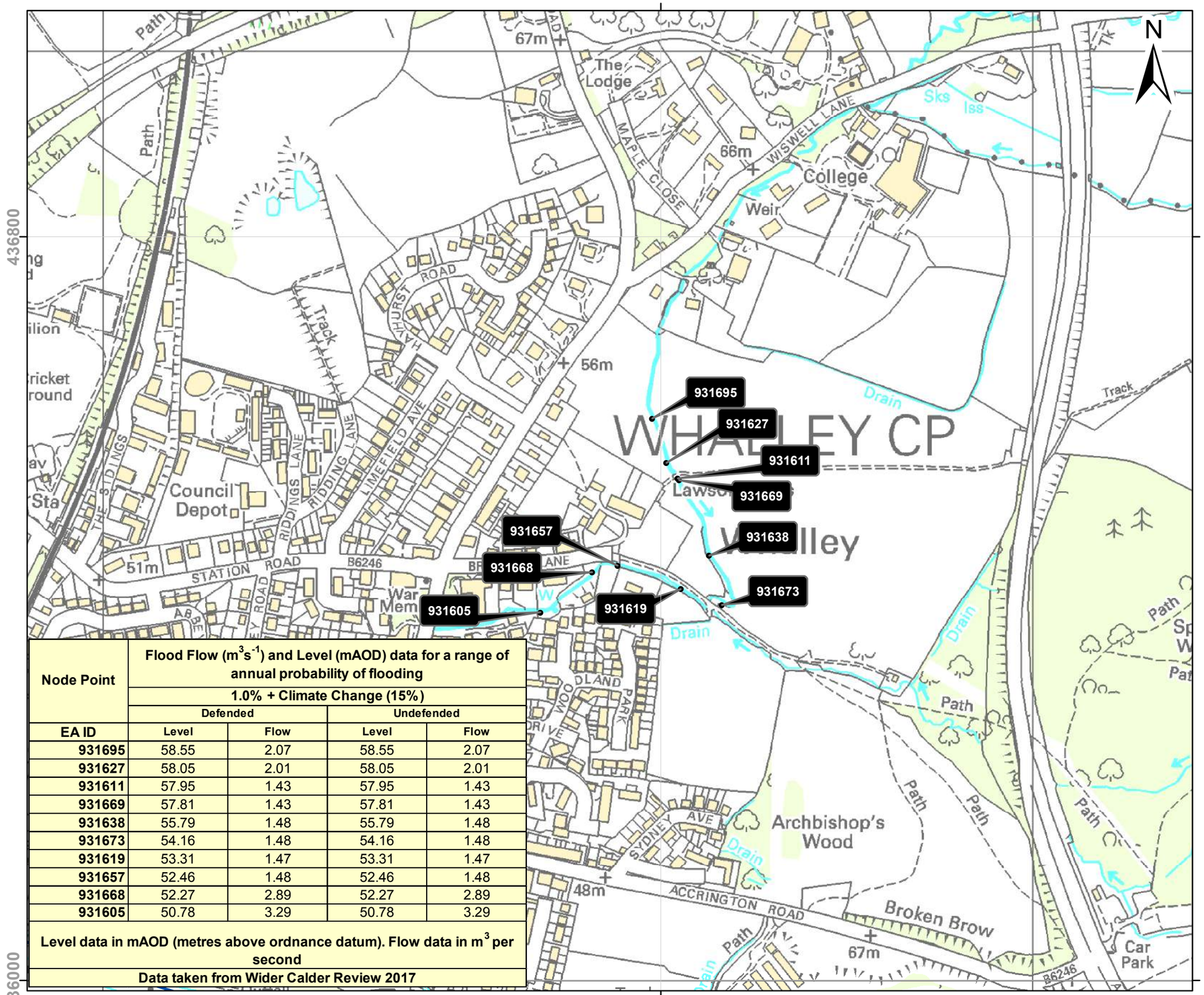
Key

- Node Points

Flood Zone 3 shows the area that could be affected by flooding:
- from the sea with a 0.5% or greater chance of happening each year
- or from a river with a 1.0% or greater chance of happening each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to 0.1% chance of occurring each year.

ABDs (Areas Benefiting from Defences) show the area benefiting from defences during a 0.5% tidal, or 1.0% fluvial flood event.



Node Point	Flood Flow (m^3s^{-1}) and Level (mAOD) data for a range of annual probability of flooding			
	1.0% + Climate Change (15%)			
	Defended		Undefended	
EA ID	Level	Flow	Level	Flow
931695	58.55	2.07	58.55	2.07
931627	58.05	2.01	58.05	2.01
931611	57.95	1.43	57.95	1.43
931669	57.81	1.43	57.81	1.43
931638	55.79	1.48	55.79	1.48
931673	54.16	1.48	54.16	1.48
931619	53.31	1.47	53.31	1.47
931657	52.46	1.48	52.46	1.48
931668	52.27	2.89	52.27	2.89
931605	50.78	3.29	50.78	3.29

Level data in mAOD (metres above ordnance datum). Flow data in m^3 per second

Data taken from Wider Calder Review 2017

Environment Agency

Fluvial Flood Levels Map: Land adjacent to Brookes Lane, Whalley, BB7 9RG

Produced: 13 April 2018
Our Ref: CL82099
NGR: 373,545 436,516

Key

- Node Points
- Main River

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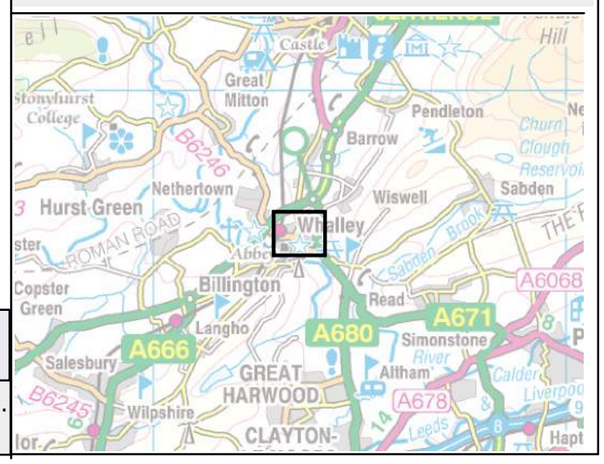

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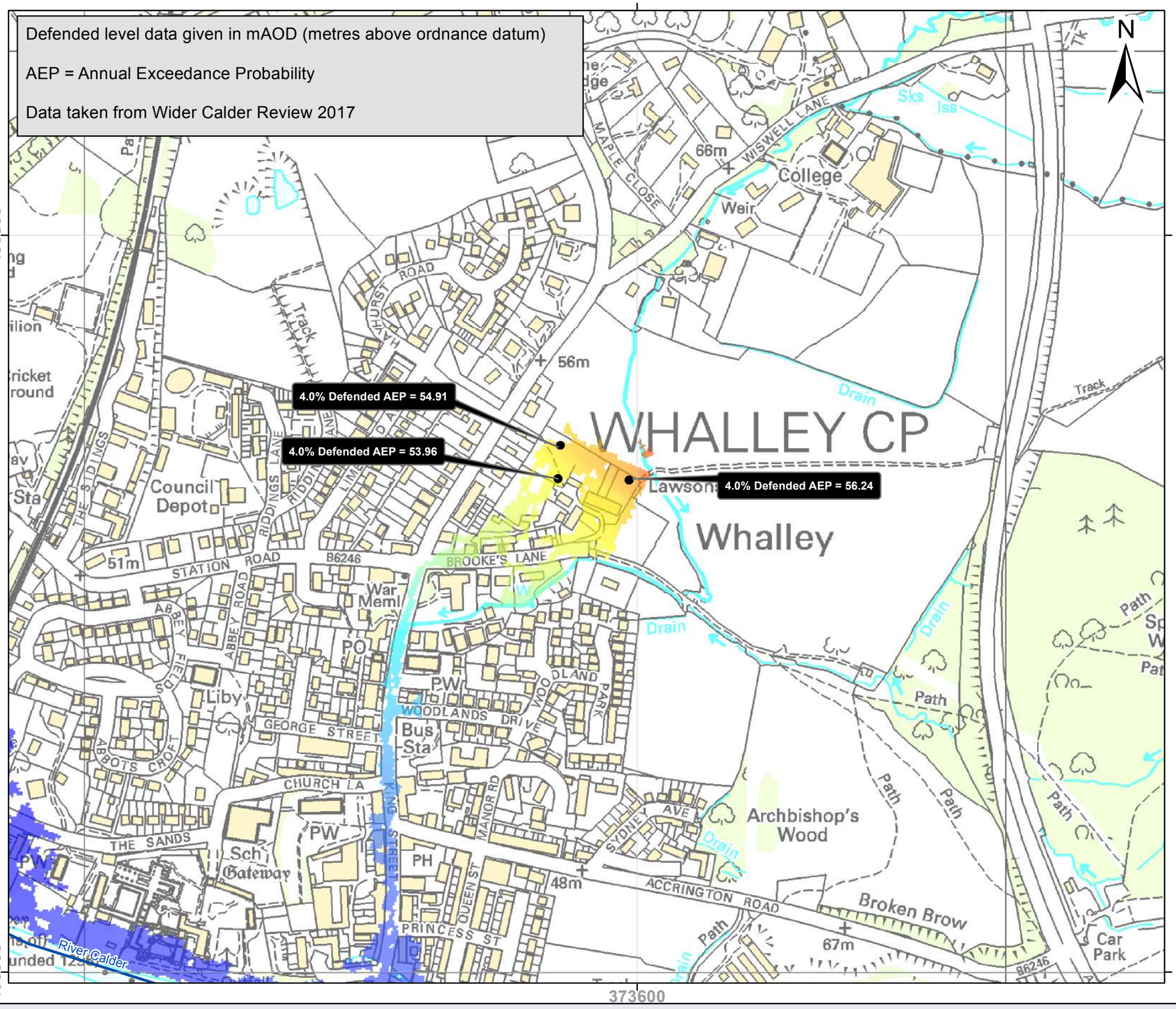
	Flood Flow (m^3s^{-1}) and Level (mAOD) data for a range of annual probability of flooding			
	1.0% + Climate Change (15%)			
	Defended		Undefended	
EA ID	Level	Flow	Level	Flow

Defended level data given in mAOD (metres above ordnance datum)

AEP = Annual Exceedance Probability

Data taken from Wider Calder Review 2017



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Environment Agency

Fluvial Flood Levels Map: Land adjacent to Brookes Lane, Whalley, BB7 9RG

Produced: 13 April 2018
Our Ref: CL82099
NGR: 373,545 436,516

Key

Main River

Fluvial Defended Scenario 4.0% Annual Probability of Flooding

mAOD

High : 59

Low : 43.6

Flood Zone 3 shows the area that could be affected by flooding:
- from the sea with a 0.5% or greater chance of happening each year
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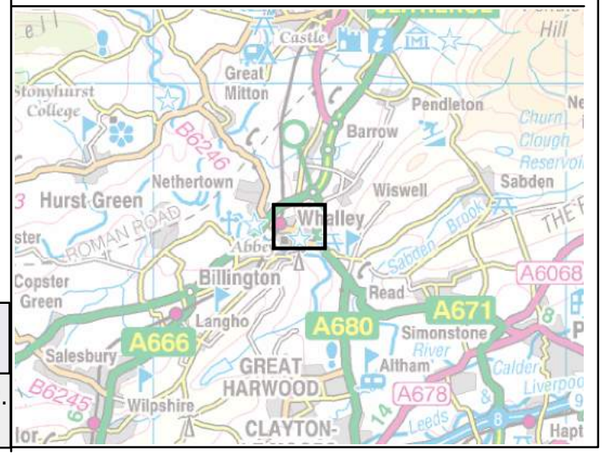
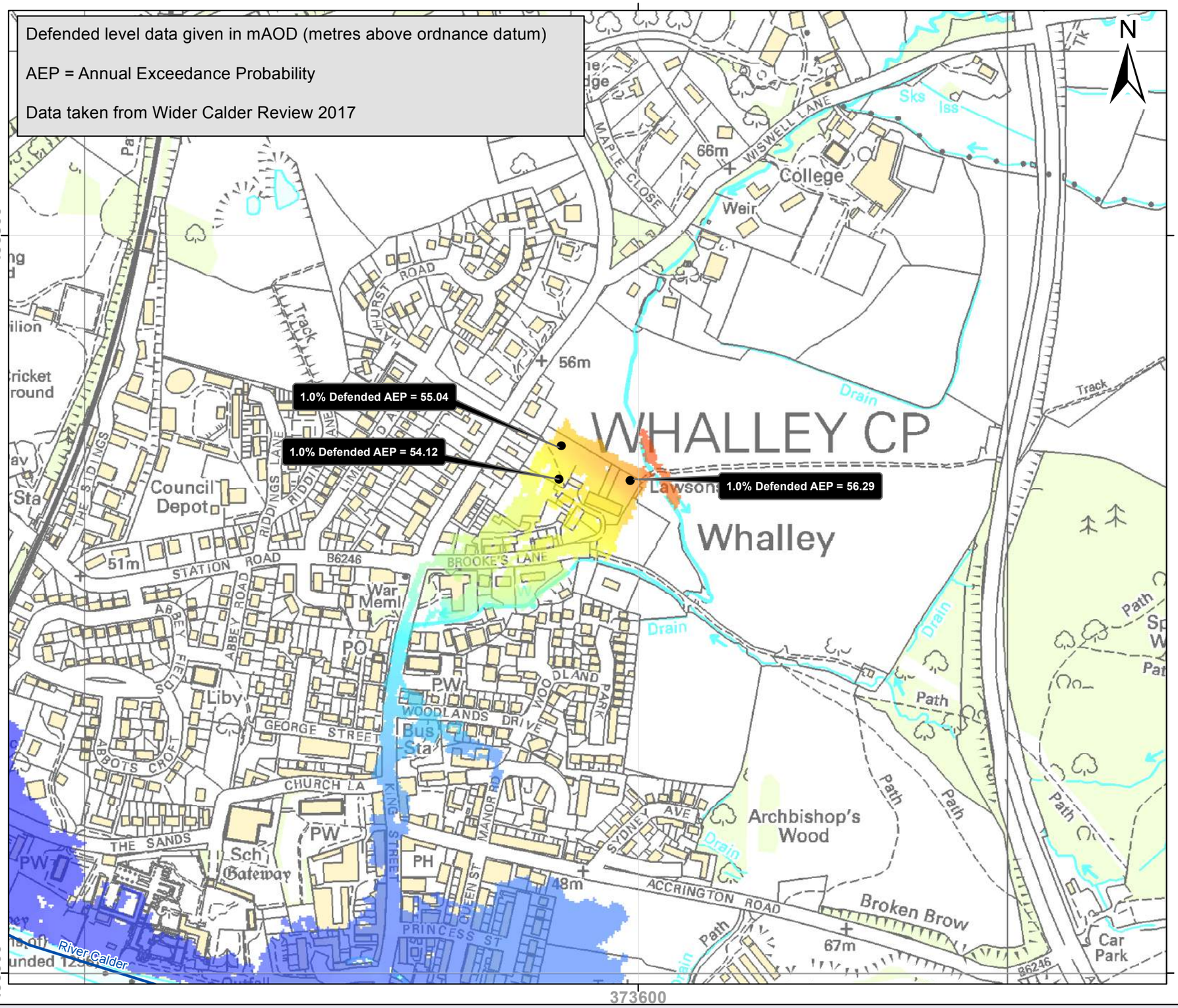


Defended level data given in mAOD (metres above ordnance datum)

AEP = Annual Exceedance Probability

Data taken from Wider Calder Review 2017



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Environment Agency

Fluvial Flood Levels Map: Land adjacent to Brookes Lane, Whalley, BB7 9RG

Produced: 13 April 2018
Our Ref: CL82099
NGR: 373,545 436,516

Key

Main River

Fluvial Defended Scenario 1.0% Annual Probability of Flooding

mAOD

High : 59

Low : 43.6

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- or from a river with a 1.0% or greater chance of happening each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to 0.1% chance of occurring each year.

ABDs (Areas Benefiting from Defences) show the area benefiting from defences during a 0.5% tidal, or 1.0% fluvial flood event.

Defended level data given in mAOD (metres above ordnance datum)

AEP = Annual Exceedance Probability

Data taken from Wider Calder Review 2017

1.0% + CC (15%) Defended AEP = 55.10

1.0% + CC (15%) Defended AEP = 54.14

1.0% + CC (15%) Defended AEP = 56.34

436800

436000

372800

373600

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Environment Agency

Fluvial Flood Levels Map: Land adjacent to Brookes Lane, Whalley, BB7 9RG

Produced: 16 April 2018
Our Ref: CL82099
NGR: 373,302 436,516

Key

Main River

Fluvial Defended Climate Change (+15%) Scenario 1.0% Annual Probability of Flooding

mAOD

High : 59

Low : 43.6

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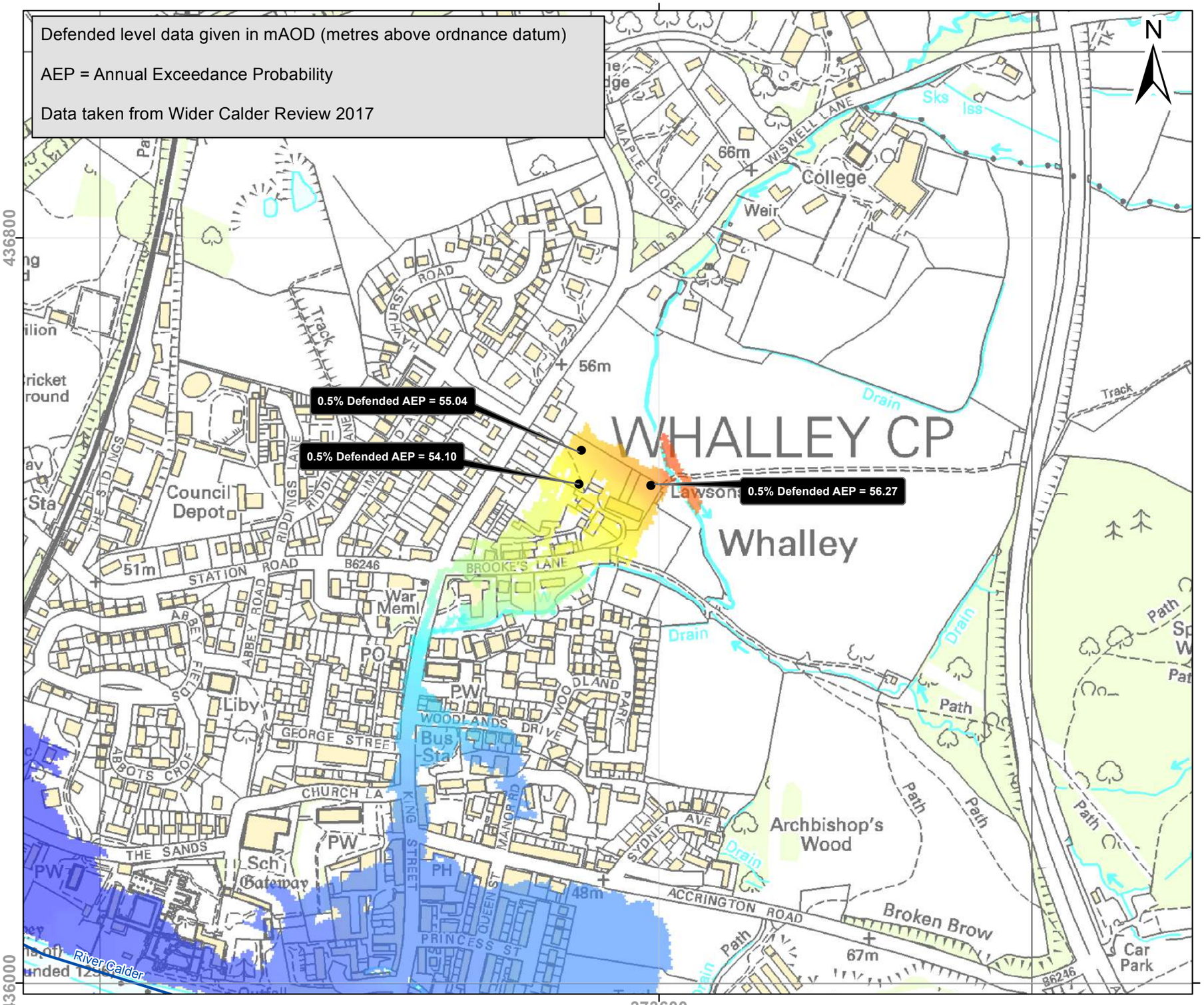
ABDs (Areas Benefiting from Defences) show the area benefiting from defences during a 0.5% tidal, or 1.0% fluvial flood event.

Defended level data given in mAOD (metres above ordnance datum)

AEP = Annual Exceedance Probability

Data taken from Wider Calder Review 2017



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Environment Agency

Fluvial Flood Levels Map: Land adjacent to Brookes Lane, Whalley, BB7 9RG

Produced: 13 April 2018
Our Ref: CL82099
NGR: 373,545 436,516

Key

Main River

Fluvial Defended Scenario 0.5% Annual Probability of Flooding

mAOD

High : 59

Low : 43.6

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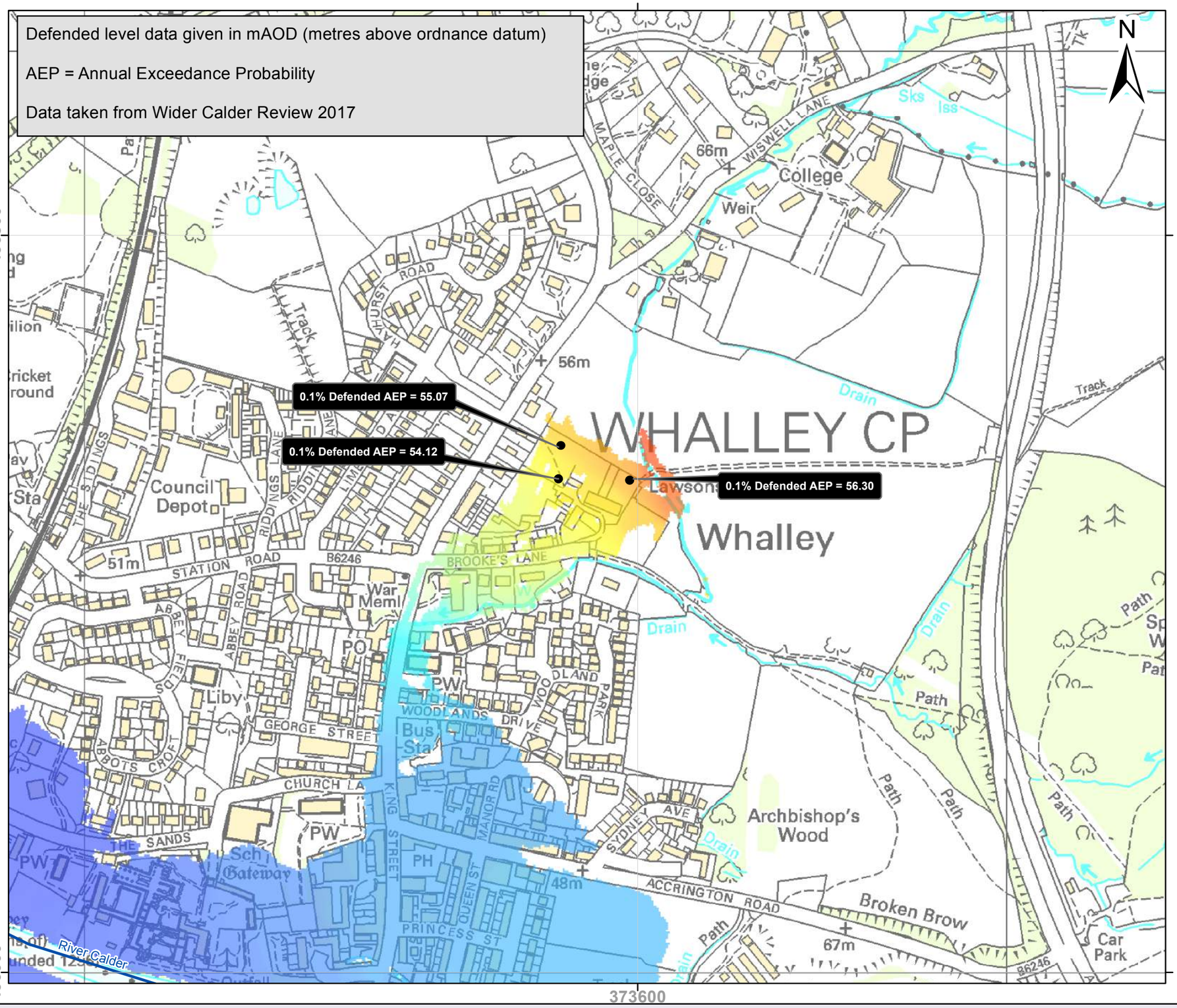
ABDs (Areas Benefiting from Defences) show the area benefiting from defences during a 0.5% tidal, or 1.0% fluvial flood event.

Defended level data given in mAOD (metres above ordnance datum)

AEP = Annual Exceedance Probability

Data taken from Wider Calder Review 2017



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Environment Agency

Fluvial Flood Levels Map: Land adjacent to Brookes Lane, Whalley, BB7 9RG

Produced: 13 April 2018
Our Ref: CL82099
NGR: 373,545 436,516

Key

Main River

Fluvial Defended Scenario 0.1% Annual Probability of Flooding

mAOD

High : 59

Low : 43.6

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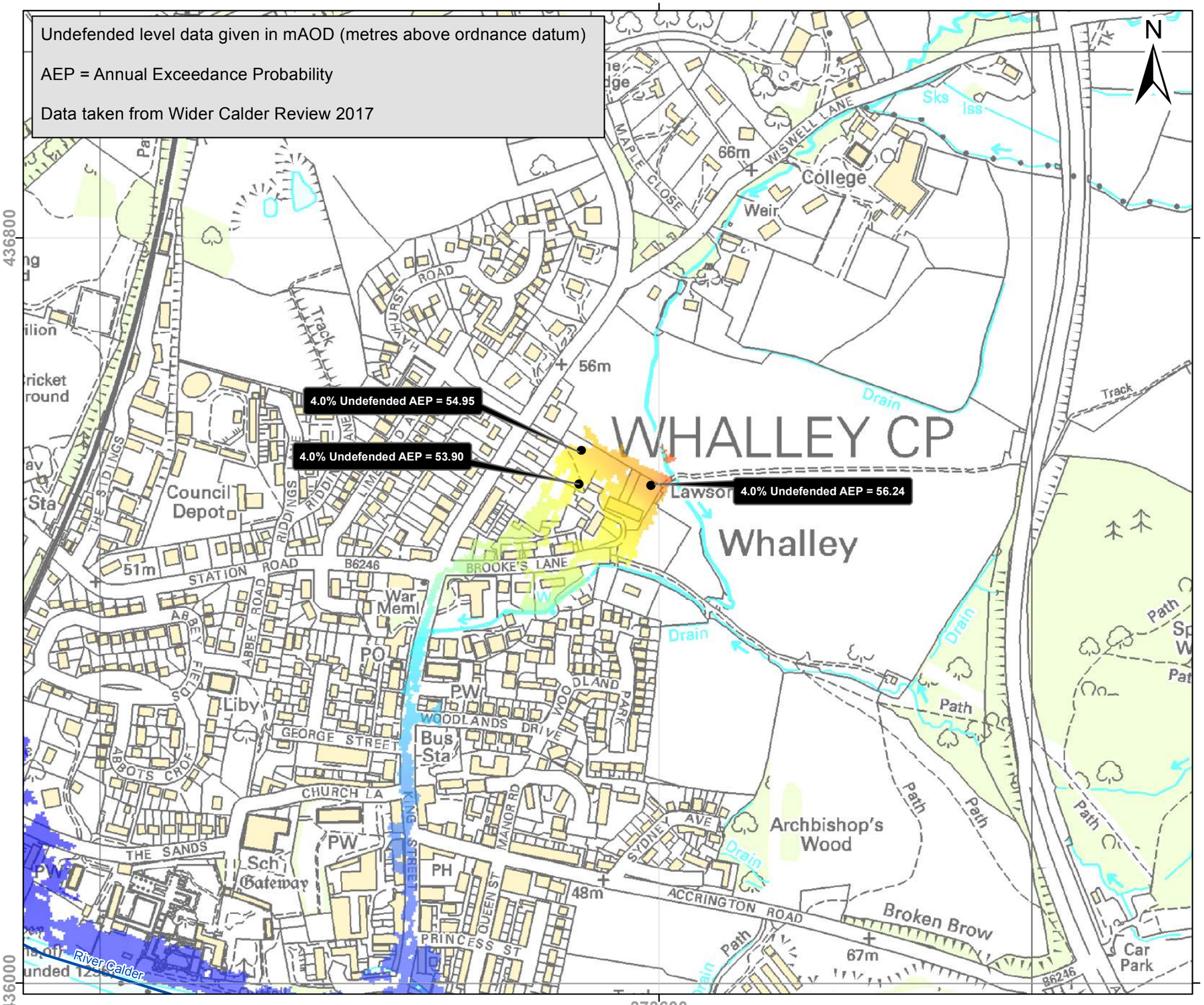
Undefended level data given in mAOD (metres above ordnance datum)

AEP = Annual Exceedance Probability

Data taken from Wider Calder Review 2017



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Environment Agency

Fluvial Flood Levels Map: Land adjacent to Brookes Lane, Whalley, BB7 9RG

Produced: 13 April 2018
Our Ref: CL82099
NGR: 373,545 436,516

Key

Main River

Fluvial Undefended Scenario 4.0% Annual Probability of Flooding

mAOD

High : 59

Low : 43.6

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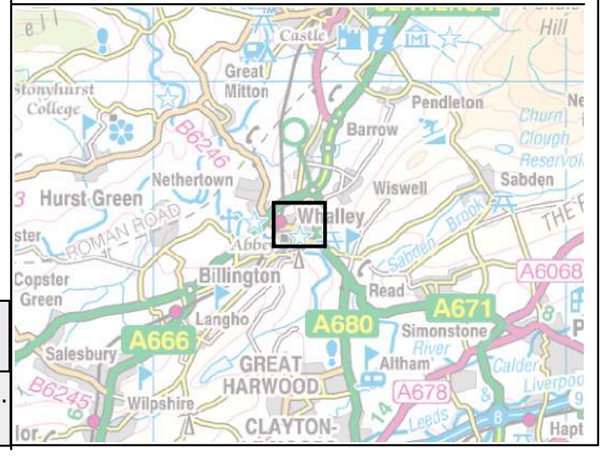
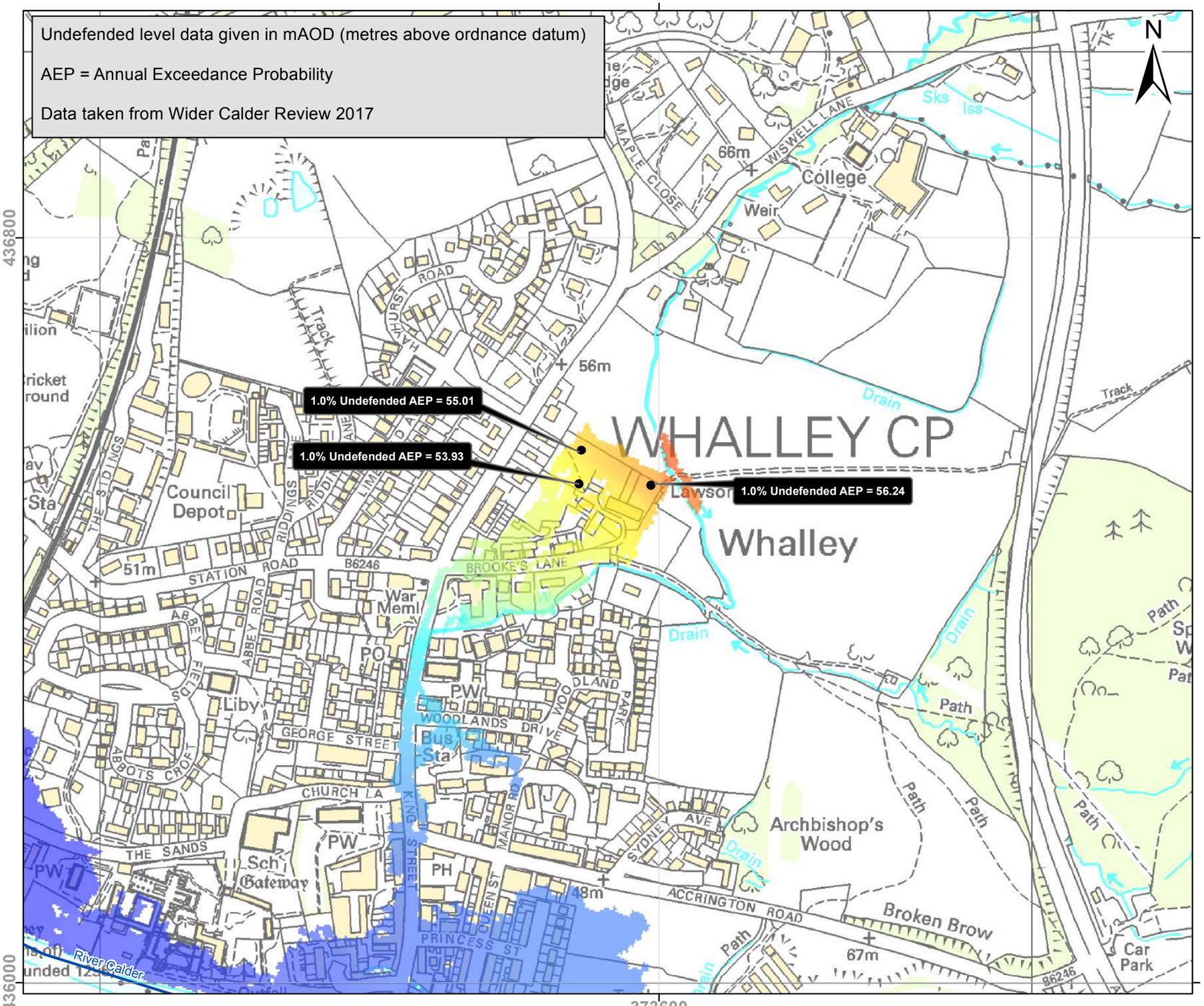


Undefended level data given in mAOD (metres above ordnance datum)

AEP = Annual Exceedance Probability

Data taken from Wider Calder Review 2017



Modelled water levels with climate change using +20% flow allowances are not suitable for the majority of planning purposes. New climate change allowances can be checked on the following website; www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances.

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Environment Agency

Fluvial Flood Levels Map: Land adjacent to Brookes Lane, Whalley, BB7 9RG

Produced: 13 April 2018
Our Ref: CL82099
NGR: 373,545 436,516

Key

Main River

Fluvial Undefended Scenario 1.0% Annual Probability of Flooding

mAOD

High : 59

Low : 43.6

Flood Zone 3 shows the area that could be affected by flooding:
- from the sea with a 0.5% or greater chance of happening each year
- or from a river with a 1.0% or greater chance of happening each year.

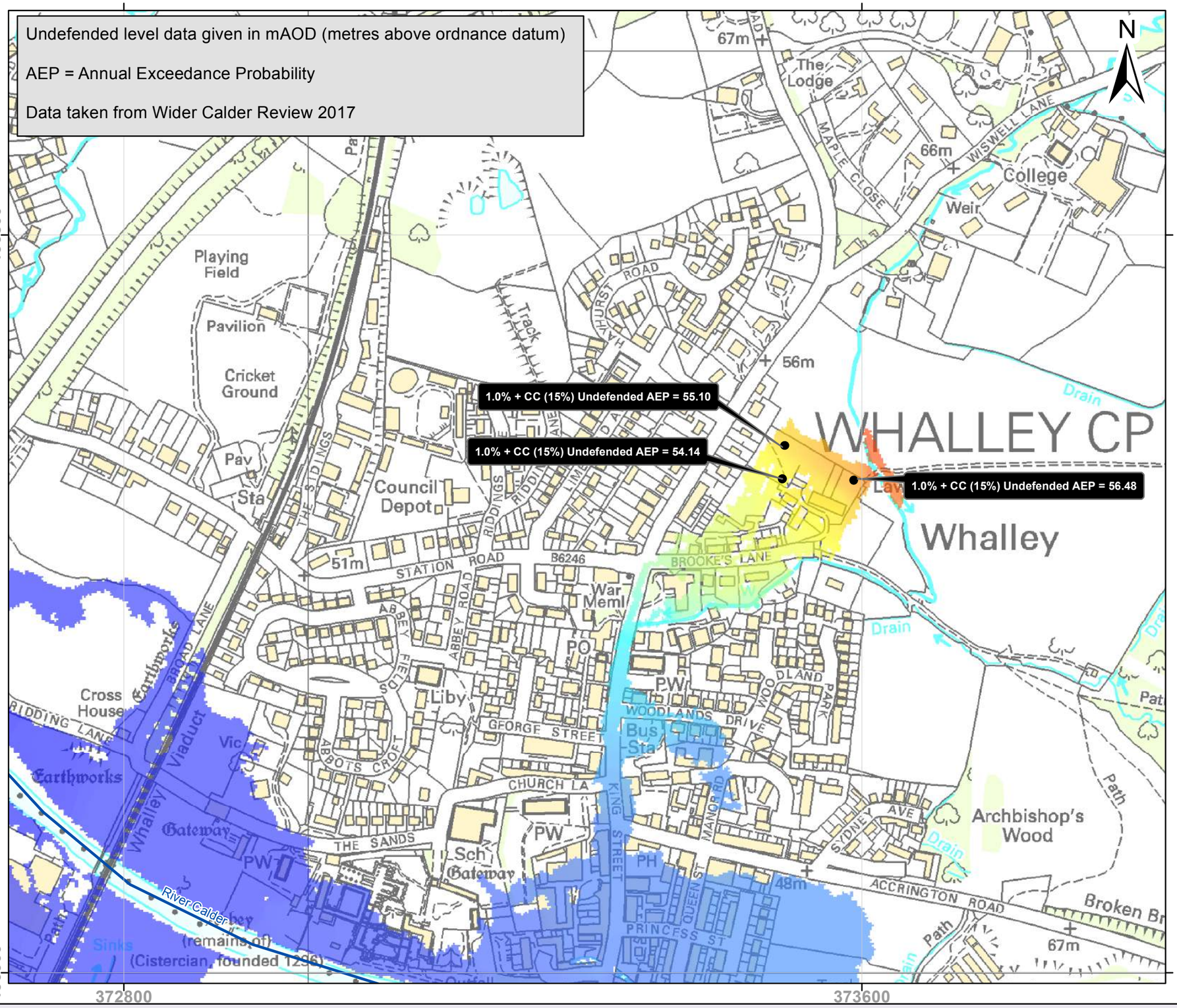
Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to 0.1% chance of occurring each year.

ABDs (Areas Benefiting from Defences) show the area benefiting from defences during a 0.5% tidal, or 1.0% fluvial flood event.

Undefended level data given in mAOD (metres above ordnance datum)

AEP = Annual Exceedance Probability

Data taken from Wider Calder Review 2017



Modelled water levels with climate change using +20% flow allowances are not suitable for the majority of planning purposes. New climate change allowances can be checked on the following website; www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances.

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Environment Agency

Fluvial Flood Levels Map: Land adjacent to Brookes Lane, Whalley, BB7 9RG

Produced: 16 April 2018
Our Ref: CL82099
NGR: 373,302 436,516

Key

Main River

Fluvial Undefended Climate Change (+15%) Scenario 1.0% Annual Probability of Flooding

mAOD

High : 59

Low : 43.6

Flood Zone 3 shows the area that could be affected by flooding:
- from the sea with a 0.5% or greater chance of happening each year
- or from a river with a 1.0% or greater chance of happening each year.

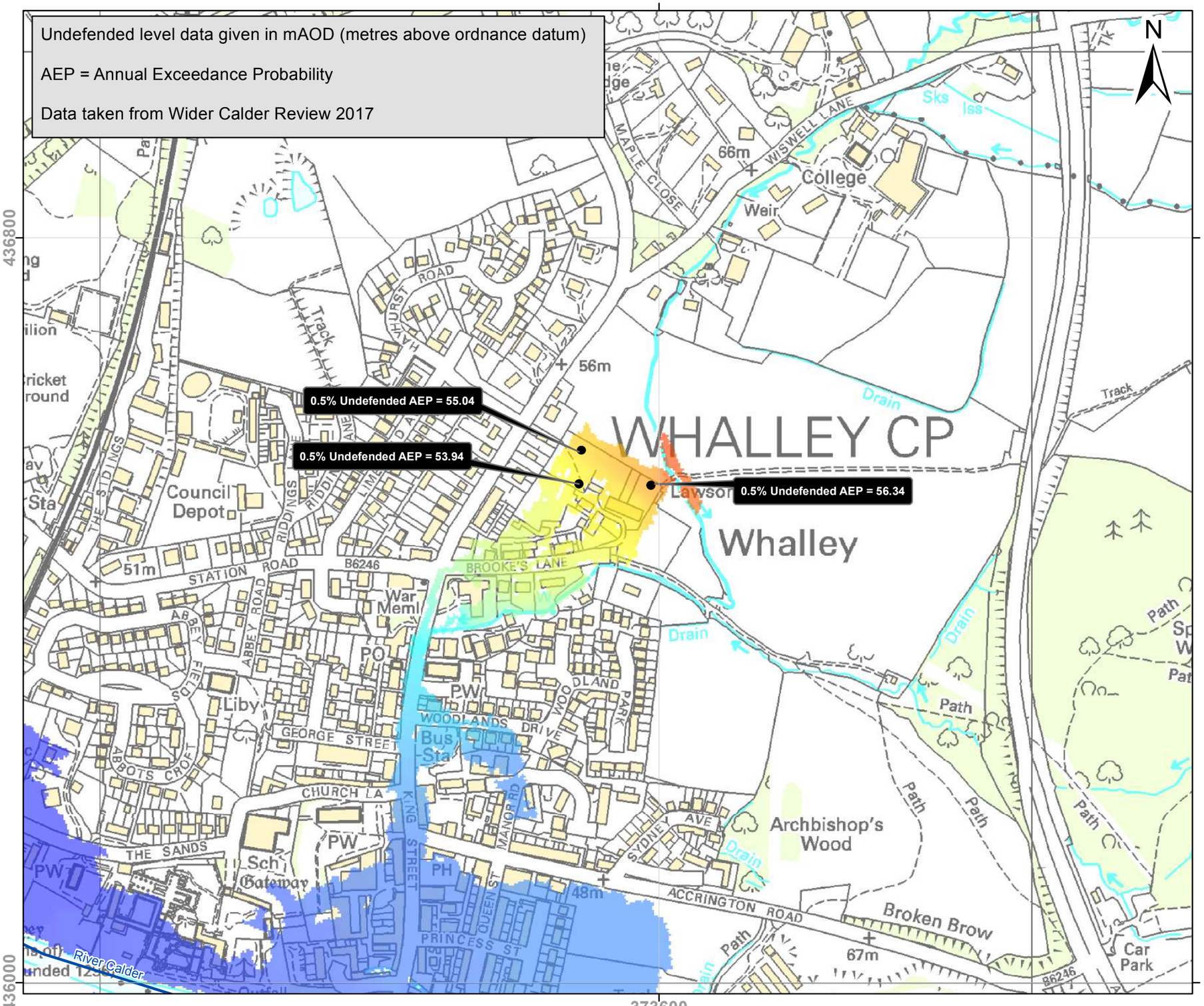
Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to 0.1% chance of occurring each year.

ABDs (Areas Benefiting from Defences) show the area benefiting from defences during a 0.5% tidal, or 1.0% fluvial flood event.

Undefended level data given in mAOD (metres above ordnance datum)

AEP = Annual Exceedance Probability

Data taken from Wider Calder Review 2017



Modelled water levels with climate change using +20% flow allowances are not suitable for the majority of planning purposes. New climate change allowances can be checked on the following website; www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances.

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Environment Agency

Fluvial Flood Levels Map: Land adjacent to Brookes Lane, Whalley, BB7 9RG

Produced: 13 April 2018
Our Ref: CL82099
NGR: 373,545 436,516

Key

Main River

Fluvial Undefended Scenario 0.5% Annual Probability of Flooding

mAOD

High : 59

Low : 43.6

Flood Zone 3 shows the area that could be affected by flooding:
- from the sea with a 0.5% or greater chance of happening each year
- or from a river with a 1.0% or greater chance of happening each year.

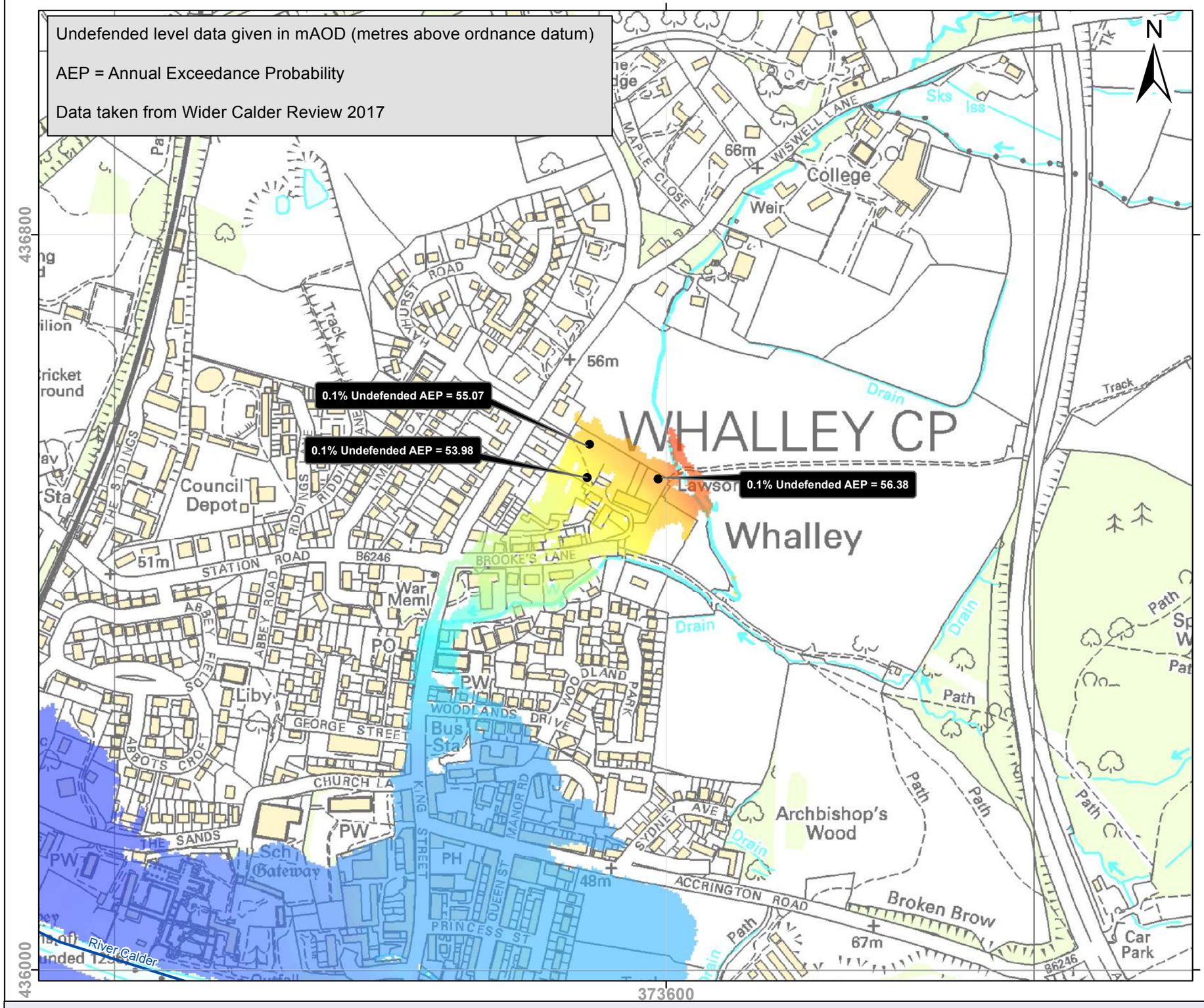
Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to 0.1% chance of occurring each year.

ABDs (Areas Benefiting from Defences) show the area benefiting from defences during a 0.5% tidal, or 1.0% fluvial flood event.

Undefended level data given in mAOD (metres above ordnance datum)

AEP = Annual Exceedance Probability

Data taken from Wider Calder Review 2017



Modelled water levels with climate change using +20% flow allowances are not suitable for the majority of planning purposes. New climate change allowances can be checked on the following website; www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances.

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Environment Agency

Fluvial Flood Levels Map: Land adjacent to Brookes Lane, Whalley, BB7 9RG

Produced: 13 April 2018
Our Ref: CL82099
NGR: 373,545 436,516

Key

Main River

Fluvial Undefended Scenario 0.1% Annual Probability of Flooding

mAOD

High : 59

Low : 43.6

Flood Zone 3 shows the area that could be affected by flooding:
- from the sea with a 0.5% or greater chance of happening each year
- or from a river with a 1.0% or greater chance of happening each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to 0.1% chance of occurring each year.

ABDs (Areas Benefiting from Defences) show the area benefiting from defences during a 0.5% tidal, or 1.0% fluvial flood event.

APPENDIX 2 – Lancashire County Council Correspondence

keelan@KRSenvironmental.com

From: Suds <suds@lancashire.gov.uk>
Sent: 25 May 2018 11:03
To: keelan@KRSenvironmental.com
Subject: Land Adjacent 17 Brookes Lane, Whalley, BB7 9RG
Attachments: LLFA Pre application Guidance & ToCs.pdf; Pre-application form - July 2017.dotx

Good morning,

Thank you for your query. We will first need you to complete and return the attached application form, together with the supplementary information as specific on the form. We can only provide comments under our Pre-Application advice service for residential developments of 10 or more properties or a site area of 0.5Ha and above. Once the application is received, we will then review the application and confirm application fees etc. Without a pre-application request we will be unable to provide site specific information and will have to make our comments to the Local Planning Authority when a consultation is requested.

I have attached some guidance notes to help you with your application.

The Section 19 (Flood Investigation) reports for Ribble Valley following the December 2015 flooding can be found on the following link which may help provide information on flooding within an area http://www.lancashire.gov.uk/flooding/.

Information on watercourses and drainage consent can be found on the following link: http://www.lancashire.gov.uk/flooding/drains-and-sewers/alterations-to-a-watercourse/

Please note information on Flood Zones and flooding history can be found on the following link: https://www.gov.uk/check-flood-risk

Trusting this is of help.

Helen Lord
Flood Risk Technical Support Officer
Community Services
Lancashire County Council
T: 01772 536275
W: www.lancashire.gov.uk

From: keelan@KRSenvironmental.com [mailto:keelan@KRSenvironmental.com]
Sent: 17 May 2018 14:57
To: Suds <suds@lancashire.gov.uk>
Subject: FW: Land Adjacent 17 Brookes Lane, Whalley, BB7 9RG

Dear Sir/Madam,

I haven't had a response to the email shown below.

Please could you respond ASAP.

Regards,

Keelan

From: keelan@KRSenvironmental.com <keelan@KRSenvironmental.com>
Sent: 17 May 2018 11:36
To: 'FRM@lancashire.gov.uk' <FRM@lancashire.gov.uk>
Subject: FW: Land Adjacent 17 Brookes Lane, Whalley, BB7 9RG

Dear Sir/Madam,

I haven't had a response to the email shown below.

Please could you respond ASAP.

Regards,

Keelan

From: keelan@KRSenvironmental.com <keelan@KRSenvironmental.com>
Sent: 04 May 2018 09:05
To: 'FRM@lancashire.gov.uk' <FRM@lancashire.gov.uk>
Subject: FW: Land Adjacent 17 Brookes Lane, Whalley, BB7 9RG

Dear Sir/Madam,

I haven't had a response to the email shown below.

Please could you respond ASAP.

Regards,

Keelan

From: keelan@KRSenvironmental.com <keelan@KRSenvironmental.com>
Sent: 10 April 2018 15:17
To: 'FRM@lancashire.gov.uk.' <FRM@lancashire.gov.uk.>
Subject: Land Adjacent 17 Brookes Lane, Whalley, BB7 9RG

Dear Sir/Madam,

I am are undertaking a Flood Risk Assessment for a residential development on Land Adjacent 17 Brookes Lane, Whalley, BB7 9RG. I have attached a site location plan and propose site layout plan and the grid reference is 373508, 436557.

It would be useful if you could advise us of any historic data regarding flooding and drainage issues within this area. If you know of any council sewers within the area and any advice with regards to the disposal of the surface water from the site would also be much appreciated (i.e. the use of SUDs or surface water drainage system). Any other pertanent advice with regards to flood risk and drainage would also be much appreciated.

If you have any queries do not hesitate to contact me.

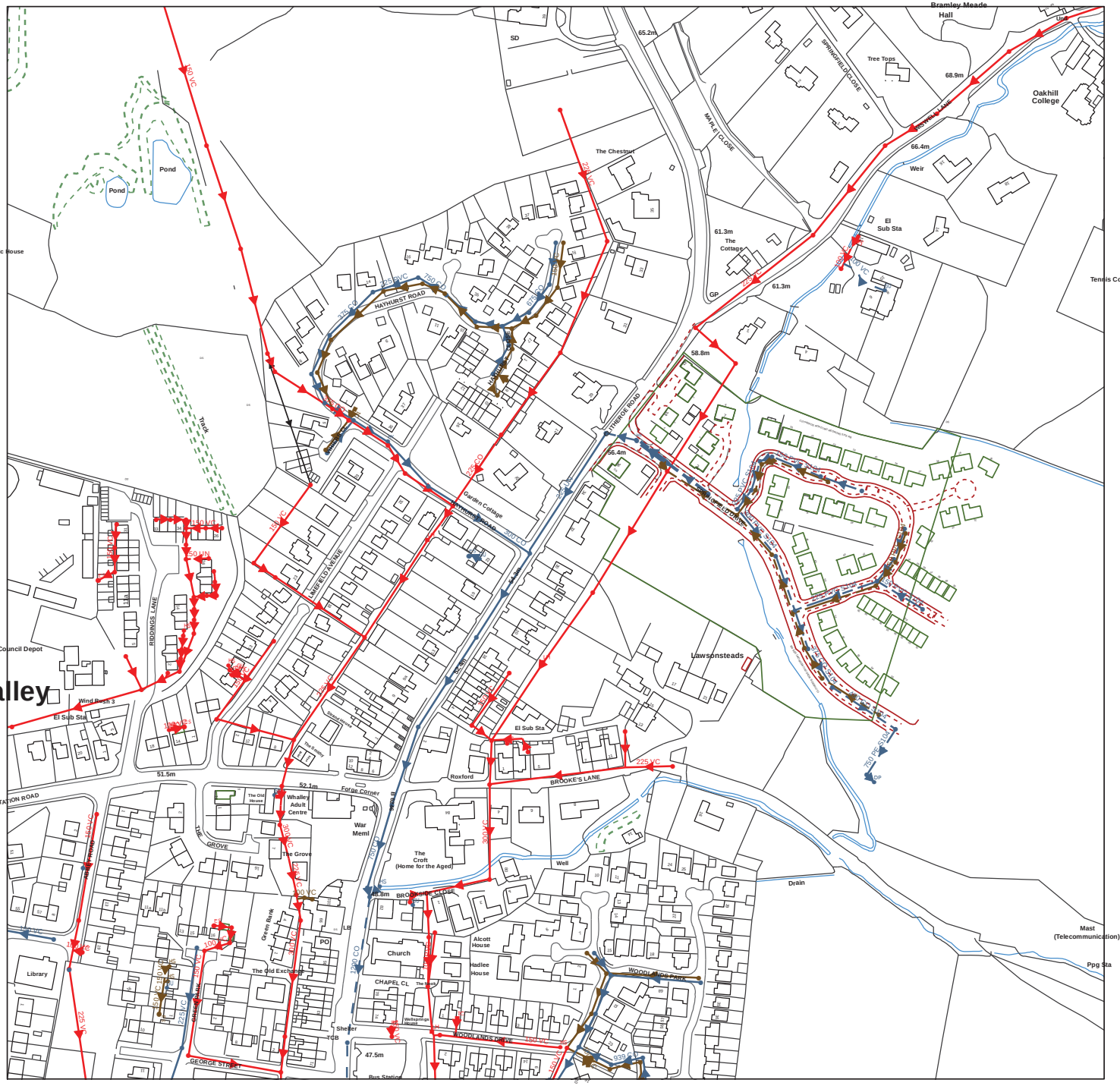
Regards,

Keelan Serjeant | Director
BSc, MSc, MCIWEM
KRS Environmental Ltd

T: 01686 668957
T: 01484 437420
M: 07857 264 376
E: keelan@krsenvironmental.com
W: krsenvironmental.com

Please think about the environment, only print this email if you need to.

APPENDIX 3 – United Utilities Correspondence



Extract from Map of Public Sewers

The position of underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available.

The actual positions may be different from those shown on the plan and private pipes, sewers or drains may not be recorded.

United Utilities will not accept any liability for any damage caused by the actual positions being different from those shown.

LEGEND

	Combined	Surface Water	Foul	Abandoned
Water Course				
Overflow Pipe				
Sludge Main				
Highway Drain				
Public Sewer				
Private Sewer				
Section 104				
Rising Main				

BOLTO/02

Printed By : Joanne Jones

Date: 01/12/2015

DO NOT SCALE

Approximate Scale: 1:2500

United Utilities
helping life flow smoothly

keelan@KRSenvironmental.com

From: Perry, Graham <Graham.Perry@uuplc.co.uk>
Sent: 08 May 2018 11:30
To: keelan@krsenvironmental.com
Cc: Wastewater Developer Services
Subject: Pre Development Enquiry for Brookes Lane Whalley - Our ref - 4200020702
Attachments: PDE 4200020702 Land Adj brookes lane Whalley due 08.05.18 (1.34 MB)

Importance: High

Dear Sir

We have carried out an assessment of your application which is based on the information provided; this pre development advice will be valid for 12 months

Foul

Foul will be allowed to drain to the public combined/ foul sewer network. Our preferred point of discharge would be to the 225mm combined sewer crossing the site at an unrestricted rate.

Surface Water

Surface water from this site must drain to soak away or some other form of infiltration system but if ground conditions confirm that this is not a viable solution all surface water can drain to the 225mm surface water sewer on Clitheroe road at a maximum pass forward flow of 5 l/s.

Connection Application

Although we may discuss and agree discharge points & rates in principle, please be aware that you will have to apply for a formal sewer connection. This is so that we can assess the method of construction, Health & Safety requirements and to ultimately inspect the connection when it is made. Details of the application process and the form itself can be obtained from our website by following the link below

http://www.unitedutilities.com/connecting-public-sewer.aspx

Sewer Adoption Agreement

You may wish to offer the proposed new sewers for adoption. United Utilities assess adoption application based on Sewers adoption 6th Edition and for any pumping stations our company addenda document. Please refer to link below to obtain further guidance and application pack:

http://www.unitedutilities.com/sewer-adoption.aspx

Existing Sewers Crossing the Site

A public sewer crosses this site and we will require unrestricted access to the sewer for maintenance purposes, we would ask that you maintain a minimum clearance of 6m which is measured 3m from the centre line of the pipe. If you cannot achieve this then you may wish to consider diverting the public sewer.

I suspect that the sewer will interfere with plot 3 on the site and a diversion may be necessary

Please refer to the link below to obtain full details of the processes involved in sewer diversion.

http://www.unitedutilities.com/sewer-diversion.aspx

Please be aware that on site drainage must be designed in accordance with Building Regulations, National Planning Policy, and local flood authority guidelines, we would recommend that you speak and make suitable agreements with the relevant statutory bodies.

Please note, if you intend to put forward your wastewater assets for adoption by United Utilities, the proposed detail design will be subject to a technical appraisal by an Adoption Engineer as we need to be sure that the proposals meets the requirements of Sewers for adoption and United Utilities Asset Standards. The proposed design should give consideration to long term operability and give United Utilities a cost effective proposal for the life of the assets. Therefore, further to this enquiry should you wish to progress a Section 104 agreement, we strongly recommend that no construction commences until the detailed drainage design, submitted as part of the Section 104 agreement, has been assessed and accepted in writing by United Utilities. Any works carried out prior to the technical assessment being approved is done entirely at the developers own risk and could be subject to change.

Regards

Graham Perry

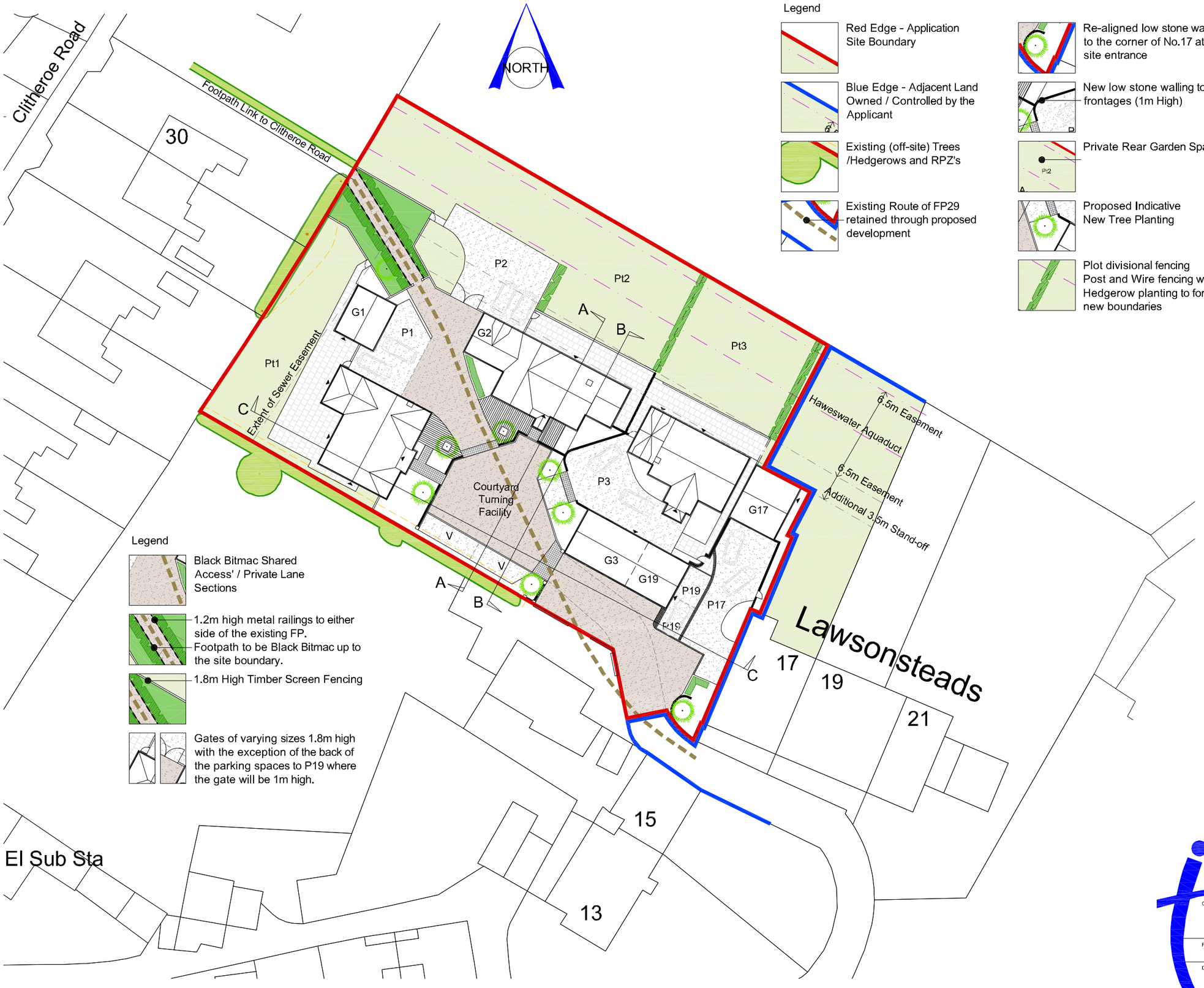
Development Engineer
Developer Services and Planning
Business Operations
United Utilities

T: 01925 679405 (internal 79405)
E: graham.perry@uuplc.co.uk
unitedutilities.com

Warrington, WA5 3LP
Registered in England and Wales. Registered No 6559020

www.unitedutilities.com
www.unitedutilities.com/subsidiaries

APPENDIX 4 – Proposed Site Layout



Legend

- Red Edge - Application Site Boundary
- Blue Edge - Adjacent Land Owned / Controlled by the Applicant
- Existing (off-site) Trees /Hedgerows and RPZ's
- Existing Route of FP29 retained through proposed development
- Re-aligned low stone walling to the corner of No.17 at the site entrance
- New low stone walling to site frontages (1m High)
- Private Rear Garden Spaces (Pt2)
- Proposed Indicative New Tree Planting
- Plot divisional fencing Post and Wire fencing with New Hedgerow planting to form the new boundaries
- Proposed Indicative New Hedgerow Planting
- Small arrows denote door entry points for dwellings and garages (excluding garage doors)
- Stone Flagging to rear patio and footpath areas
- Tegular paved entrances and rumble strip access'
- Existing Garage Block for No's 17 and 19 Brookes Lane re-configured for Plot 3 (New Development) and No. 19 Brookes Lane (G3 / G19)
- New Garage for No.17 Brookes Lane (G17)
- 2No new allocated parking spaces for No.19 Brookes Lane to enable a 'No Parking' Covenant in front of the existing garage block on the access. (P19)
- 2No 'Visitor' Parking Spaces provided within the new courtyard for the occupants of Plots 1 to 3 Only. (V)
- Illustrates a minimum of 2No parking spaces to the drives plus garaging proposed (P1)

Legend

- Black Bitmac Shared Access' / Private Lane Sections
- 1.2m high metal railings to either side of the existing FP. Footpath to be Black Bitmac up to the site boundary.
- 1.8m High Timber Screen Fencing
- Gates of varying sizes 1.8m high with the exception of the back of the parking spaces to P19 where the gate will be 1m high.

SITE PLAN - BROOKES LANE, WHALLEY

DGL ASSOCIATES
DGL Associates Limited

Barn Meadow House
Southfield Fold Farm
Southfield
Burnley
Lancashire
BB10 3RH

Tel : 01282 601157
Mbl : 07976 782876

Client: Mr R. Bolton

Project: BROOKES LANE, WHALLEY

Drawing Title: SITE PLAN AND ILLUSTRATIVE LANDSCAPING SCHEME

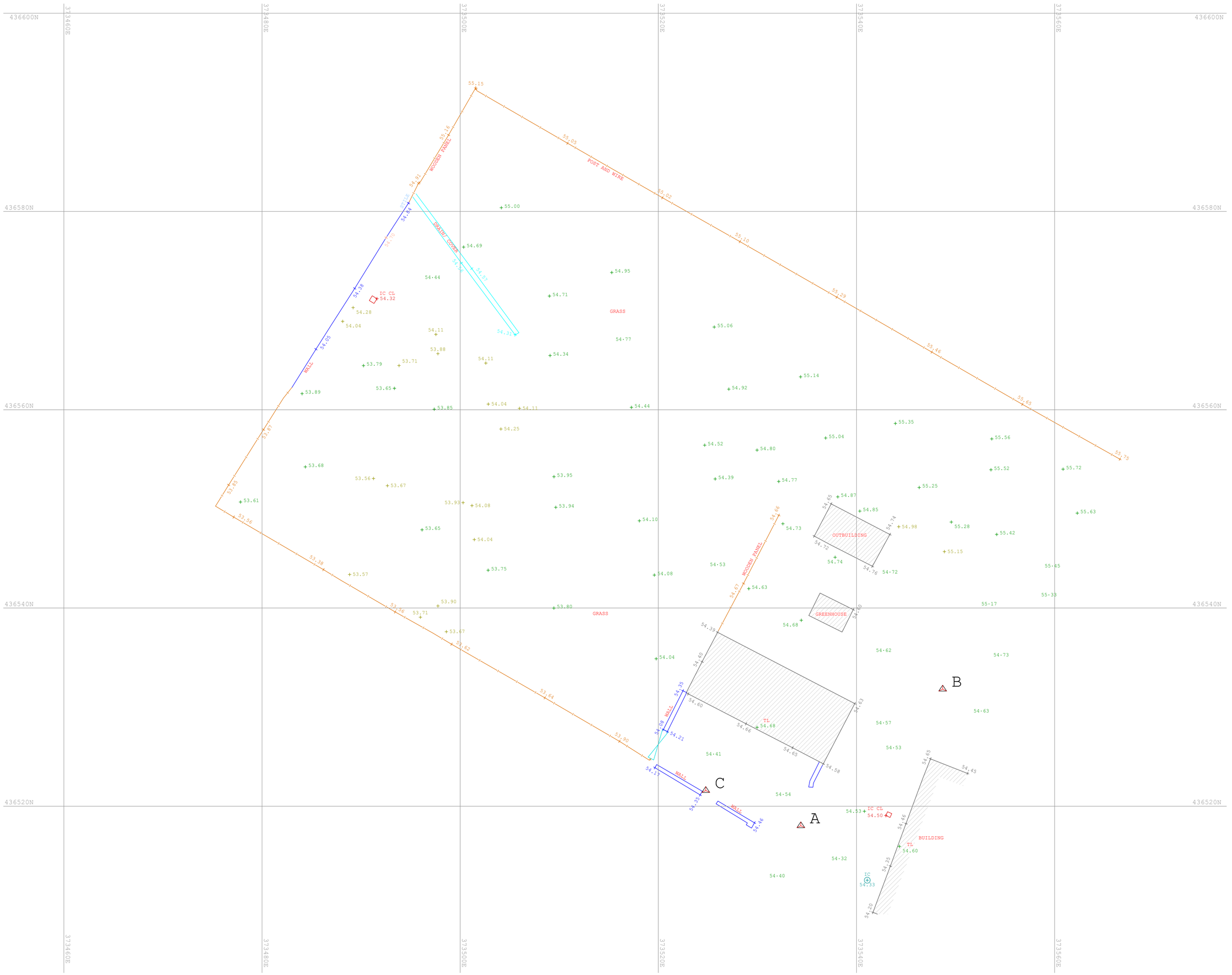
Drawing No.: 1589RBP/BLW/SP01

Revision		Checked
E	Drawn: DGL	
	Scale: 1:500	Approved
	Date: 21st Sept 2017	

E-mail : darren.dgla@gmail.com

A3

APPENDIX 5 – Topographical Survey



Revision No: -\	Level Survey	April 2018

Angle Surveys Limited
PlasEirias Business Centre
Abergele Road
Colwyn Bay
LL29 8BF
+44(0)1492 850050
www.anglesurveys.co.uk
enquiries@anglesurveys.co.uk

Project

LEVEL SURVEY
LAND AT 17 BROOKES LANE
WHALLEY

Client

KRS ENVIRONMENTAL LIMITED
3 PRINCES SQUARE
PRINCES STREET
MONTGOMERY
POWYS
SY15 6PZ

Reference No	Drawing No	Scale	Scale Factor
80410-09KS	001	1:200	1.0000

Survey Stations

Grid - Related to OSGB36 (National Grid) and OSTN15 derived from GNSS

Levels - Related to Ordnance Survey Datum via OSGM15 derived from GNSS

STATIONS	EAST	NORTH	HEIGHT	DESCRIPTION
A	373534.383	436518.036	54.548	Road Nail
B	373548.699	436531.818	54.657	Road Nail
C	373524.786	436521.594	54.363	Road Nail

Revisions/ Notes

All critical dimension to be checked on site

Further investigation may be needed to show the full extent of the drainage on site

Only ICs, fences, walls, building footprints and levels are shown

Fences/ walls shown do not necessary represent legal boundaries

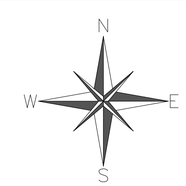
NOTES:

Legend

Bol	Bollards	MP	Mile post
BS	Bus stop	NP	Name plate
BT	British Telecom IC	O/G	Overgrown
CL	Ceiling Level	O/H	Overhead
CATV	Cable television IC	PO	Post
DK	Drop kerb	PM	Parking Meter
DR	Drain	RE	Rodding Eye
Elec	Electric IC	RS	Road sign
EP	Electric pole	RW	Retaining Wall
ER	Earth rod	SP	Soil pipe
FFL	Finished Floor Level	ST	Stop tap
FP	Fence post	Stay	Cable stay
FB	Flower Bed	TCB	Telephone call box
G	Gully	FFL 5.55	Finished Floor Level
GP	Gate Post	TL	Door Threshold Level
H/C	Harcore	TP	Telephone pole
HMP	Hazard Marker Posts	Tar	Tarmacadam
IC	Inspection cover	VP	Vent pipe
K	Kerb	W	Water cover
KO	Kerb outlet	WL	Water level
LB	Letter box	WM	Water meter
LP	Lamp post	WO	Water outlet
Mkr	Utility marker	UTL	Unable to lift

FENCE ANNOTATION

BW	Barb wire		Fence/ Height
WP	Wooden panel		Gate
CI	Corrugated iron		O/H Canopy
CL	Chain link		Foliage
CPWP	Concrete post Wooden Panel	A	Survey Control station
HR	Hand rail	12.28	Spot Level
IR	Iron railing		
PC	Post and chain		
PR	Post and rail		
PW	Post and wire		
SF	Security fence		
WP	Wooden Panel		



KRS Environmental Ltd

Mob: 07857 264 376

Tel: 01484 437420

Email: keelan@krsenvironmental.com

Web: www.krsenvironmental.com