Flood Risk Assessment

Woodhead Road,

Holmbridge, HD9 2NW

August 2024

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Contents

1.0 Background

1.1 Brief

BDN Ltd. has been commissioned by Nicola Orme to undertake a Level 1 Flood Risk Assessment (FRA) for the site which is to be developed for 4No. semi-detached residential development plots. The site is centered around Ordnance Survey Grid Ref: SE 12384 06938 with the nearest post code of HD9 2NW. This site-specific FRA has been completed to support the planning application. The site location plan presented in Figure 1.1 indicates the development boundary (red).

Developments have the potential to be at risk of a range of flooding mechanisms and increase the potential flood risk to the development and the surrounding area. As such flood risk is assessed with respect to risk to human life, damage to properties and the effect the development may have on surrounding watercourses, bodies of water and drainage systems. This Level 1 FRA has been prepared to examine the possible sources of flooding, within the context of the National Planning Policy Framework (NPPF) and Technical Guidance.

Consultation will be undertaken with the Environment Agency (EA), Yorkshire Water (YW) and Kirklees Borough Council (KBC) as part of the planning application. Data has also been gathered from a number of other sources including National Soil Research Institute (NSRI), local ground investigations, aerial photographs, Ordnance Survey (OS), evidence obtained from the EA online tools and anecdotal evidence.

Figure 1.1 Ordnance Survey Map – Site Location

1.2 Report Scope

The objectives of this report are as follows: The Level 1 FRA is based on readily available existing information, including reference to Kirklees Borough Council Strategic Flood Risk Assessment (SFRA) to confirm the extent of flood risk at the site. The report includes the review of site information and likely extent of any flood risk on the site; identification of whether there are any flooding or surface water management issues related to the development that may warrant further consideration; identification and scoping of other flood risks as required i.e. groundwater flooding; and determining whether further assessment is required i.e. a Level 2 FRA.

An FRA should consider a range of flooding mechanisms to satisfy the following three key objectives:

- To assess flood risk to the proposed development and to demonstrate whether any residual risk to the development and its user would be acceptable.

- To assess the potential impact of the proposed development on flood risk elsewhere and to demonstrate that the development would not increase flood risk elsewhere; and
- To satisfy the requirements of national planning policy.

Flood risk should be considered alongside other spatial planning matters such as transport, housing, economic growth, natural resources, regeneration, biodiversity, the historic environment, and the management of other hazards. Policies should recognize the positive contribution that avoidance and management of flood risk can make to the development of sustainable communities, including improving local amenities and better overall quality of life.

An FRA should be carried out to an appropriate degree at all levels of the planning process. It should assess the risks of all forms of flooding to and from development, considering climate change, and should inform the application of the sequential approach if applicable.
CIRIA C624 "Development and Flood Risk – Guidance for the Construction Industry" recommend a phase approach with three levels of assessment as defined below:

- Level 1: Screening Study to identify whether there are any flooding or surface water management issues related to a development site that may warrant further consideration. The screening study will ascertain whether a Level 2 or 3 FRA is required.
- Level 2: Scoping Study to be undertaken if the Level 1 FRA indicates that the site may lie within an area that is at risk of flooding, or that the site may increase flood risk due to increase run-off. This study should confirm the sources of flooding which may affect the site.
- Level 3: Detailed Study to be undertaken if the Level 2 study concludes that quantitative analysis is required to assess the flood risk related to the development site.

2.0 Relevant Policy, Legislation and Guidance

2.1 Potential Flood Mechanisms

The Level 1 FRA has been undertaken using the following legislation and guidance: National Planning Policy Framework

- Flood and Water Management Act
- Kirklees Borough Council Strategic Flood Risk Assessment
- Kirklees Borough Council Local Flood Risk Management Strategy
- Calder Catchment Flood Management Plan

2.2 National Planning Policy Framework

The NPPF published in December 2024, is a key part of the government's reform to make the planning system less complex and more accessible; to protect the environment and to promote sustainable growth.

In addition, the Technical Guidance to the NPPF published by the Department for Communities and Local Government has also been reviewed in relation to flood risk. This document provides additional guidance to ensure the effective implementation of the planning policy set out in the NPPF on development in areas at risk of flooding.

The NPPF aims to prevent inappropriate development in areas at risk of flooding and to ensure that, where development is necessary in areas at risk of flooding, it is safe without increasing flood risk elsewhere. Local Authorities should only consider development in flood risk areas appropriate where informed by a site-specific FRA, based upon the EA's Standing Advice on flood risk.

The NPPF requires that a site-specific FRA is required for proposals of 1 hectare or greater in Flood Zone 1; all proposals for new development (including minor development and change of use) in Flood Zones 2 and 3, or in an area within Flood Zone 1 which has critical drainage problems (as notified to the local planning authority by the EA); and where proposed development or a change of use to a more vulnerable class may be subject to other sources of flooding. This means that the FRA should identify and assess the risks of all forms of flooding to and from the development and demonstrate how flood risks will be managed so that the development remains safe throughout its lifetime, taking climate change into account.

Development should be directed as far as practicable towards Flood Zone 1 areas (Low Probability (< 0.1% Annual Exceedance Probability (AEP) of fluvial/ sea flooding)) to avoid fluvial flood risks wherever this is possible. For development proposed in Flood Zone 1, if the development area is greater than 1 hectare an FRA will still be required to address design issues related to the control of surface water runoff and climate change, as well as considering any other potential sources of flood risk for the development site.

2.3 The Flood and Water Management Act 2010

The Flood and Water Management Act 2010 determined the need for flood risk to be managed within the framework of National Strategies for England and Wales and within Local Strategies for each Local Flood Authority Area. The national strategy for England sets out the principles for flood risk management and which organisations are responsible for implementation.

In accordance with the national strategy for England, Lead Local Flood Authorities (LLFAs) have been allocated responsibility for developing independent Local Flood Risk Management Strategies (LFRMS's) to address sources of local flooding. Each LFRMS identifies which local organisation is accountable for

managing flood risk and establishes partnership agreements, as well as undertaking an assessment of flood risk and developing plans / actions, for tackling these risks.

2.4 Kirklees Borough Council Level 1 Strategic Flood Risk Assessment

This level 1 Strategic Flood Risk Assessment (SFRA), dated July 2016, is a joint study with Wakefield Council and Calderdale Council. It should be read in conjunction with the National Planning Policy Framework (NPPF) and associated National Planning Practice Guidance (NPPG).

The Level 1 SFRA is focused on collecting readily available flood risk information from a number of key stakeholders, the aim being to help identify the number and spatial distribution of flood risk sources present throughout the Kirklees authority area to inform the application of the Sequential Test.

2.5 Kirklees Borough Council Local Flood Risk Management Strategy

The flood and Water Management Act 2010 requires that every lead local flood authority develops and maintains a local flood risk management strategy. The focus in the Kirklees LFRMS is to reduce flood risk from local sources where it threatens property and public infrastructure. The Council is also committed to maximising opportunities to carry out flood risk reduction in ways which are sustainable in terms of affordability, environmentally and socially.

The Kirklees LFRMS develops as new evidence, expertise and resources influence the measures outlined in the strategy. The measures identified in the Kirklees LFRMS provide a long-term programme of works and initiatives, such as planning controls, community engagement and improvement and maintenance work, which will be prioritised and programmed to deliver affordable reductions.
in local flood risk.

2.6 Calder Catchment Flood Management Plan

CFMPs help us to understand the scale and extent of flooding now and in the future and set policies for managing flood risk within the catchment. CFMPs should be used to inform planning and decision making by key stakeholders such as:

- The Environment Agency, who will use the plan to guide decisions on investment in further plans, projects, or actions.
- Regional planning bodies and local authorities who can use the plan to inform spatial planning activities and emergency planning.
- IDBs, water companies and other utilities to help plan their activities in the wider context of the catchment.
- Landowners, farmers, and land managers that manage and operate land for agriculture, conservation, and amenity.
- The public and businesses to enhance their understanding of flood risk and how it will be managed.

3.0 Site Description & Existing Conditions

3.1 Site Location and Description

The site is currently vacant and the proposal for the site is 4No. Residential homes with associated hard and soft landscaping. Site access is achieved via Woodhead Road, which runs adjacent to the northern boundary of the site. The proposed plots will have individual accesses connecting the developments to Woodhead Road. The site is surrounded by agricultural farmland or other residential developments. The River Holme is located to the south of the site.

3.2 Topography

A topographical survey has been completed for the site. Following a review of the topographical survey; the site shows levels are relatively flat with some small fall in level across the site. There is a slight fall to the east of the site which appears to be a low point. There is a level difference of approximately 10m from the site to the river to the south of the site. Please refer to Appendix A for more information.

3.3 Hydrology

The Ordnance Survey and EA maps show that the site is situated within the catchment of the River Holme which is located approximately 20m to the south of the site. Dobb Dike is located adjacent to the River Holme approximately 50m from the site.

3.4 Drainage

A combined sewer (150mm) serves the residential properties within Woodhead Road. This runs adjacent to the proposed site. Refer to Appendix B for more information.

3.5 Water Mains

YW supply mains serve the properties within Woodhead Road. There are 4 mains pipes within the road.

3.6 Flood Defence

There are no flood defences within 1km of the site.

3.7 Reservoir

Following a review of Ordnance Survey maps, Brownhill Reservoir sits around 950m to the southwest of the site.

3.8 Geology and Hydrology

A site investigation has not been completed for the site; the following sources have therefore been reviewed to provide the anticipated ground conditions:

- BGS 1:50,000 scale map
- BGS GeoIndex

Summary of Anticipated Geology Features/Sources	**Description/Remarks**
Bedrock Geology	Medium strong to extremely strong medium to widely jointed thinly to thickly bedded fine to coarse-grained SANDSTONE may contain slate or mudstone and siltstone beds. Weathers to a loose to very dense sand, gravel, or silty/clayey sand. Low to high permeability flow is through matrix and discontinuities. Includes GREYWACKES.

Superficial (drift) Geology	Very soft to very stiff sometimes sandy CLAY or SILT. Desiccation of top few metres may result in firm to stiff material overlying soft to very soft deposits at depth. Generally, very low to moderate permeability flow dominantly through fissures. Includes lacustrine deposits, glaciolacustrine deposits, fine marine deposits, estuarine alluvium, and lowland river alluvium (any of which may contain peat beds or lenses) and loess/loessic soils.

Table 3.8 Anticipated Geology

4.0 Current Site Flood Classification

4.1 Flood Risk and Probability

The risk framework outlined in the SFRA defines the flood risk using the categories in Table 4.1. The EA flood map defines the geographical extent of fluvial flooding for Flood Zones 1, 2, 3a and 3b.

Flood Zone	Definition	Probability
Flood Zone 1	At risk from flood event greater than the 1 in 1000-year event (greater than 0.1% annual probability).	Low Probability
Flood Zone 2	At risk from flood event between the 1 in 100 and 1 in 1000-year event (between 1% and 0.1% annual probability)	Medium Probability
Flood Zone 3a	At risk from a flood event less than or equal to the 1 in 100-year event.	High Probability
Flood Zone 3b	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 otherwise defined by the Local Planning Authority. This zone also comprises land where water has to flow or be stored in times of a flood.	Functional Floodplain

Table 4.1a Fluvial Flood Zone Definition

Flooding is a natural process that can present a range of different risks depending on its form. Flood practitioners and professionals define the risks presented by flooding according to an Annual Exceedance Probability (AEP), or as having a 'return period.'

Flood Risk includes the statistical probability of an event occurring and the scale of the potential consequences. Flood risk is estimated from historical data and expressed in terms of the expected frequency of a flood of a given magnitude. The 10-year, 50 year and the 100-year floods have a 10%, 2%, and 1% chance of occurring in any given year, respectively. However, over a longer period the probability of flooding is considerably greater.

For example, for the 100-year return period flood:

- There is a 1% chance of the 100-year flood occurring or being exceeded in any single year.
- A 26% chance of it occurring or being exceeded in a 30-year period; and
- A 51% chance of it occurring or being exceeded in a 70-year period.

Table 4.1b below provides a summary of the relevant AEP and corresponding return period events of a particular severity.

AEP	Definition
100%	1 in 1 Year
10%	1 in 10 Years
2%	1 in 50 Years
1%	1 in 100 Years
0.5%	1 in 200 Years
0.1%	1 in 1000 Years

Table 4.1b Definition of AEP and Return Period Flood Events

4.2 Flood Risk Vulnerability and Flood Zone Compatibility

In terms of flood risk vulnerability, the proposed redevelopment is classified as "More Vulnerable" in the NPPF and SFRA which includes residential dwellings.

The SFRA states that the suitability of all sites in flood risk terms will be subject to ratification by the EA, a detailed site-specific FRA being prepared to support any planning application and demonstration that surface water runoff from the development will pose no detrimental impact to off-site areas.

The proposed site is considered as More Vulnerable Infrastructure and as such is suitable for Flood Zones 1 and 2 with an exception test required for developments in Flood Zone 3. Product 4 Data has been obtained by the EA which has been used to confirm that the site is located within Flood Zone 1.

Flood Zone 3 is split into two categories; 3a is a high flood risk with a chance of flooding between once every 30 and 100 years (1 – 3.3%), 3b is a functional floodplain where water must flow or be stored in times of flood. The southern boundary of the site is considered to be in Flood Zone 3. However, the site has been confirmed by the EA to be located within Flood Zone 1.

An exception test is usually required for developments within Flood Zone 3 to demonstrate the management of sources of flooding and that there are no reasonable alternative sites, that the development is safe, and it will not increase flood risk elsewhere. As the site is confirmed to be located outside the Flood Zone 3 it is considered that the requirements of the exception test are not applicable.

4.3 Sequential Test

The Sequential Test is applied to steer new development to areas with the lowest probability of flooding, in accordance with the National Planning Policy Framework NPPF. Residential development is classified as More Vulnerable development and is appropriate within Flood Zone 1, where the probability of fluvial flooding is low.

The EA Flood Map for Planning data confirms that the site is located entirely within Flood Zone 1. As the proposed development is situated within the area of lowest flood risk, application of the Sequential Test is not required.

Further confirmation of the site's low fluvial flood risk is provided by the EA Product 4 data modelling within Appendix E, which demonstrates that existing site levels are above the predicted fluvial flood levels. The proposed development is therefore considered appropriately located without a Sequential Test required.

4.4 Historic Flooding

A review of Environment Agency (EA) Product 4 data and historical flood records confirms that there is no recorded history of flooding at the site. The EA Asset Management data indicates that natural high ground provides an inherent level of protection. Anecdotal evidence and local authority records also confirm no previous flood incidents within the site boundary. This demonstrates that the site has historically remained dry during significant flood events, reducing residual risk.

4.5 Flood Risk Activity Permit (FRAP) Requirements & Protection Measures

The proposed development is located adjacent to the River Holme and therefore certain works may fall within the scope of the Environmental Permitting Regulations. As such, a Flood Risk Activity Permit (FRAP) may be required from the EA prior to commencement of any works.

It is acknowledged that the granting of planning permission does not remove the requirement to obtain a FRAP, and that permit approval is subject to separate assessment by the EA. The proposed

development will be designed and constructed to ensure that the requirements of a FRAP can be satisfied.

The site will maintain a continuous, unobstructed easement of 6 metres measured from the top of the river bank, in accordance with Environment Agency requirements for main river maintenance and emergency access.

No built development, fencing, permanent landscaping, level changes, or structures will be located within this easement. The area will remain available for inspection, maintenance, and future improvement works by the EA.

The proposed development will not adversely affect the stability of the river bank. The proposed development is set back from the watercourse, and no foundations, excavations, or loading are proposed within the 6m easement.

A buffer zone will be maintained where possible, and any landscaping or earthworks will be sensitively designed to retain existing vegetation and promote habitat continuity. Foundations and site drainage will be carefully designed to minimise disturbance to the bank and adjacent watercourse. Prior to commencement of works, agreement with the EA to secure any required Flood Risk Activity Permit and ensure compliance with relevant Water Environment (Water Framework Directive) regulations. With these measures in place, the proposed development is not expected to adversely affect the physical, ecological, or hydrological function of the river corridor.

4.6 Flood Assessment

Potential sources of flooding and associated mechanisms for review are as follows:

- Tidal Sources - Potential flooding resulting from tidal sources.
- River (Fluvial and Tidal) Sources - Potential flooding resulting from watercourses near to the site or from the sea.
- Groundwater Flooding- Potential flooding because of rising groundwater levels.
- Overland/Surface water (Pluvial) Flooding - Potential flooding because of surface water flows from adjacent land.
- Sewers and Drains - Potential flooding resulting from sewers or drains.
- Canals and Artificial Waterways - Potential flooding resulting from failure or overtopping canal networks.
- Reservoir/Lake Flooding - Potential flooding resulting from overtopping or bursting of reservoirs or lakes.
- Infrastructure - Potential flooding because of failed or burst water mains; and
- Climate Change – Potential rise in sea levels and estimated peak flows of watercourse.

4.7 Tidal Flooding

Coastal flooding occurs when sea levels rise above the normal tidal range. This can happen anywhere around the coast, including the estuaries. Tidal flooding is a result of one or a combination of high tides, storm or tidal surges, wave action and high sea levels combining with high river flows.

The site is located inland and does not lie within an area at risk of tidal flooding. Tidal flooding is therefore not a flood risk associated with this proposed development and requires no further consideration.

4.8 River (Fluvial) Flooding

The proposed site is considered as More Vulnerable Infrastructure and as such is suitable for development within Flood Zones 1 and 2, with an exception test required for Flood Zone 3a. The EA 'Product 4 Data' has been used to confirm the extent of the flood zone within the vicinity of a site which

shows the site is classified as 'Low Risk' (Flood Zone 1), as shown in Figure 4.6a and the relevant 'Product 4 Data' maps within Appendix E.

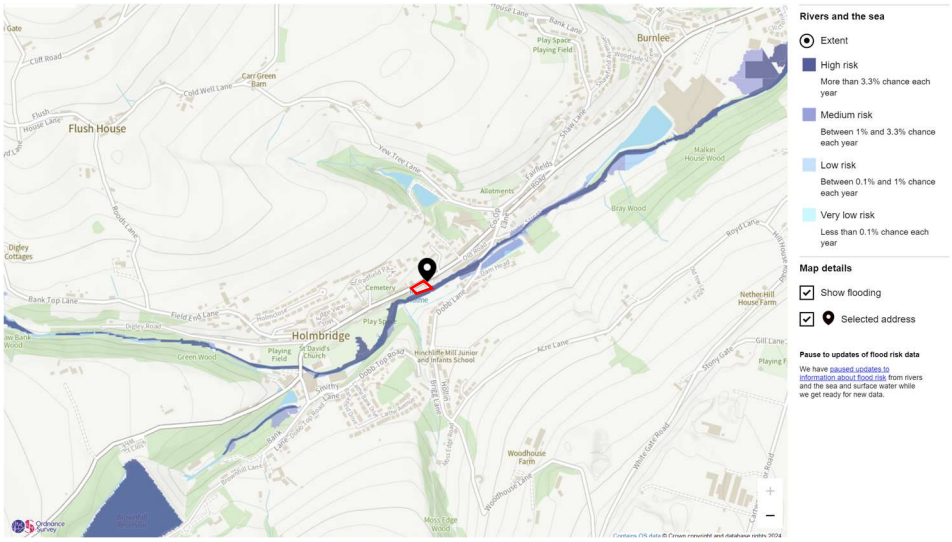


Figure 4.7a Environment Agency – Fluvial Flood Map

The Product 4 Data modelling from the EA from the Environment Agency to further analyse the flood modelling information relating to the site and its nearest node point for the River Holme. The product 4 data shows detailed modelling levels to the closest Node Point 6, which is the nearest modelled point to the site extracted from the River Holme.

Label	Modelled location ID	Easting	Northing	1% AEP (+20%)	1% AEP (+30%)	1% AEP (+50%)	0.1% AEP (+20%)
				Level	Level	Level	Level
1	1198928	412329	406865	172.50	172.56	172.69	172.95
2	1198929	412334	406885	171.98	172.05	172.19	172.49
3	1199109	412343	406905	171.57	171.66	171.80	172.17
4	1199264	412367	406906	171.26	171.34	171.51	171.94
5	1199230	412375	406909	171.26	171.34	171.51	171.94
6	1199307	412409	406923	170.69	170.77	170.94	171.47
7	1198880	412443	406940	170.14	170.24	170.43	171.18
8	1199170	412458	406949	169.91	170.0	170.22	171.17
9	1199105	412475	406959	169.74	169.81	170.16	171.20
10	1198872	412501	406974	169.43	169.69	170.14	171.21

Data in this table comes from the 2019 River Holme model model.
Level values are shown in mAOD, and flow values are shown in cubic metres per second.
Any blank cells show where a particular scenario has not been modelled for this location.

Figure 4.7b Environment Agency – Modelled Node Data

The EA has confirmed that *'No Flood History, nor flood defences or attributes available for this location'*. It should be noted that this terminology refers specifically to formal flood defence structures, such as flood walls. A review of the EA Asset Management data confirms that natural high ground in this area provides an inherent level of protection to the site extents.

A review of the EA modelled fluvial flood extent mapping confirms that the site does not fall within any designated Annual Exceedance Probability (AEP) flood extents. Existing site levels range from approximately 174.000mAOD to 182.920mAOD and are at least 2.530m above the predicted 1 in 1,000 year (0.1% annual probability) fluvial flood level at Node Point 6.

The proposed (minimum) FFLs for the new development are 174.100 mAOD – 174.600 mAOD. This provides a level increase of 2.630m above the predicted 1 in 1,000-year (0.1% annual probability) fluvial flood level at Node Point 6, ensuring that the dwellings are safely elevated well above extreme flood levels. This level of protection exceeds standard guidance for residential development and provides a robust safeguard against the effects of fluvial flooding, including allowance for potential future increases in river levels due to climate change.

The selected minimum floor levels ensure that the risk of flood damage to the proposed properties is minimised, and the safety of future residents is assured. On this basis, and in accordance with NPPF, the site is considered to be appropriately located in relation to fluvial flood risk. Please refer to Appendix E for the full Product 4 data modelling.

4.9 Groundwater Flooding

Groundwater flooding generally occurs during intense, long-duration rainfall events, when infiltration of rainwater into the ground raises the level of the water table until it exceeds ground levels. Groundwater flooding may take weeks or months to dissipate as groundwater flow is much slower than surface water flow and water levels thus take much longer to fall. Groundwater flooding is sporadic in time and location, but when it does occur, it usually lasts longer than surface water flooding and interferes with property and infrastructure (such as roads). Groundwater levels may also rise because of reactivating springs.

Based on the geological information available it is unlikely that the geological strata would be highly responsive to rainfall events and therefore the changes in groundwater level over time are unlikely to be significant resulting in groundwater flooding issues.

The information available suggests that the site is not at risk from groundwater flooding.

4.10 Overland/Surface Water (Pluvial) Flooding

Pluvial and overland flow results from rainfall that fails to infiltrate the surface and travels over the ground surface. This is exacerbated by low permeable urban development or low permeability soils and geology (such as clayey soils). Overland flow is likely to occur at the base of an escarpment and low points in terrain. Local topography and built form can have a strong influence on the direction and depth of flow. The design of development down to a micro-level can influence or exacerbate this. Overland flow paths should be considered in spatial planning for urban developments. In addition, surface water flooding can be exacerbated if development increases the percentage of impervious area.

The EA flood map as shown in Figure 4.7 has identified that the existing site is classed as very low risk (less than 0.1% annually) of surface water flooding.

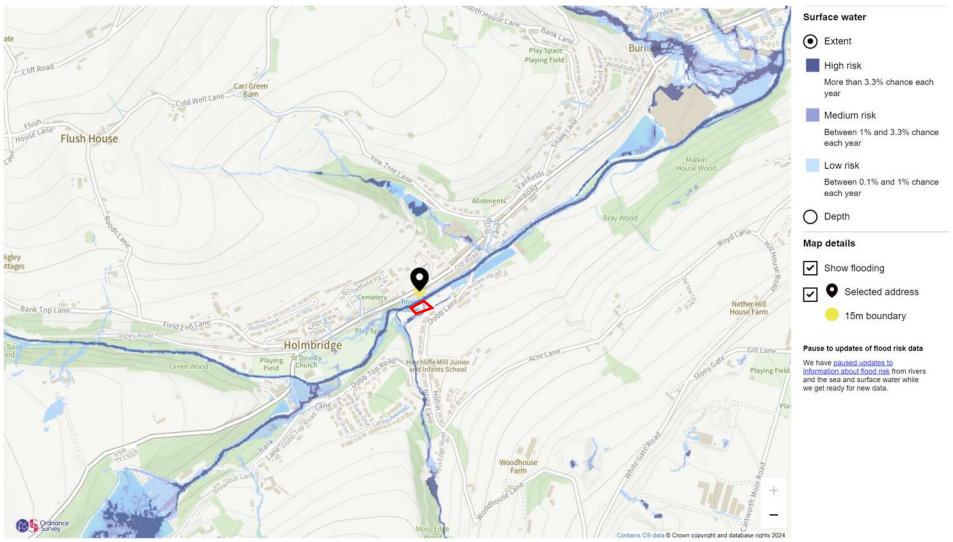


Figure 4.9 Environment Agency Pluvial Flood Map

Surface water flooding can be exacerbated if development increases the percentage of impervious area which has the potential to change the surface water flow regime for the site and the surrounding area. It is important to ensure that any surface water flows generated by the change to impermeable area are collected on site and do not pass into neighbouring land. The surface water regime for the site will be changed and will introduce positive drainage to the hardstanding area.

There is no change to the flood risk of the surrounding areas and flow routes from the proposed development, the risk of flooding elsewhere has not been increased, and the performance of the flood route has been maintained.

The location of the proposed access to the site will not affect the existing overland flow path. On this basis, the proposals for the development will not increase the risk of flooding in the area.

With the design of the surface water management of the site in line with the above principles no further consideration of this flooding mechanism is required.

4.11 Sewer Flooding

Flooding can occur when the sewerage infrastructure becomes overwhelmed by heavy rainfall (due to inadequate capacity) or blockages in drain systems (such as silt or debris accumulation). Works above or adjacent to existing sewer networks may also damage buried pipeline to the extent that it leads to flooding through damage during excavations or through damage causing blockages below ground.

There is no recorded flooding incidents caused by incapacity within the sewerage network affecting the site and as such no further consideration of this flooding type is required.

4.12 Canals and Artificial Waterways

There are no canals or artificial waterways within 1km of the site boundary, as such flood risk is considered low as such no further consideration of this flooding type is required.

4.13 Reservoirs and Lakes

When reservoirs and lakes flood, there can be implications beyond the immediate area of the water body. The EA flood map shown in Figure 4.10, shows that in the very unlikely event of a failure of a body of water upstream, the site would be at risk of flooding only when there is also flooding from rivers.

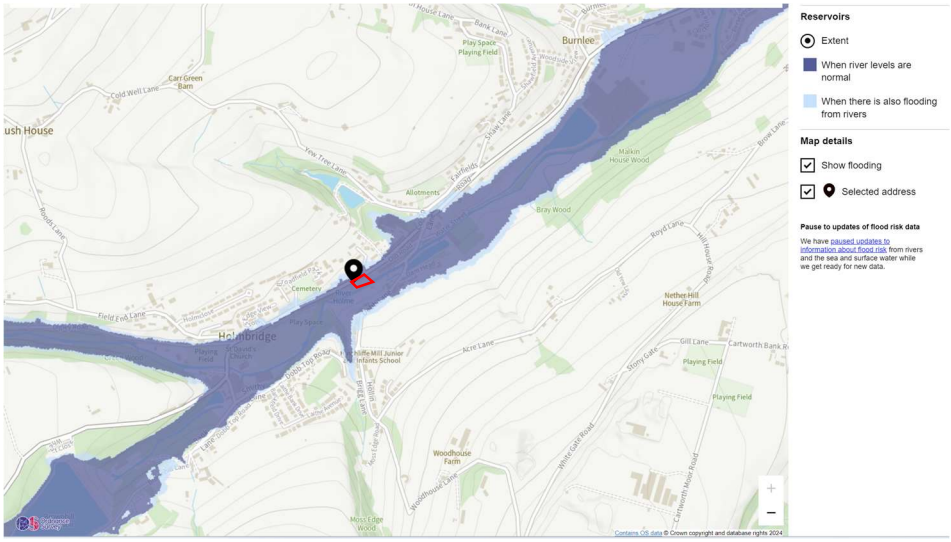


Figure 4.12 Environment Agency Reservoir Flood Map

The likelihood of reservoir flooding is much lower than other forms of flooding. Current reservoir regulation, which has been further enhanced by the Flood and Water Management Act, aims to make sure that all reservoirs are properly maintained and monitored to detect and repair any problem. Due to the flood management and protection regulations, the likelihood of reservoir failure is very low, therefore reservoir flood risk is ultimately very low. As such, the site is suitably located regarding reservoir flooding.

It is recommended that residents sign up to the EA flood warning system, where given the distance from the reservoirs there would be sufficient time to evacuate to a suitable location.

4.14 Water Mains

Based on the site topography and water main locations, the risk to the development is considered low and as such no further consideration of this flooding type is required.

4.15 Climate Change

Climate change will be the major cause of increased flood risk in the future. The CFMP suggests that for climate change the EA tested the following changes up to 2110:

- Further to review of paragraphs 30 to 32 of the Flood Risk and Coastal Change section of the planning guidance, it is understood that to adequately take climate change into account for the site, it should be within the upper end allowance category for Table 1 peak river flow allowances by river basin district (use 1961 to 1990 baseline). As such a 45% allowance for climate change should be allowed.
- A total sea level rise of 1050 mm by the year 2110. This will increase the probability of tidal flooding and increase the length of time that watercourses will not be able to flow freely to the sea at high tide (tide-locked).
- Therefore, climate change was shown to have a significant impact on flood risk.

The Analysis of UK Climate Projections 2018 (UKCP18) found that:

- There has been an increase in annual average rainfall over the UK, especially over Scotland where the most recent decade (2008–2017) has been on average 11% wetter than 1961–1990 and 4% wetter than 1981-2010.
- In recent decades there has been an increase in annual average rainfall over the UK, the most recent decade (2008–2017) has been on average 11% wetter than 1961–1990 and 4% wetter than 1981-2010.

It has been predicted that the UK's coastal flood risk will increase under all the emission scenarios used in UKCP18, because of mean sea level rise. This will result in an increase in the frequency and magnitude of extreme water levels around the UK coastline. This increase in coastal flood risk combined with an increase in precipitation in winter is likely to result in more frequent flooding in various parts of the UK.

The impact of climate change will likely increase the risk of flooding from several of the mechanisms considered, therefore it is recommended that the resident of the property sign up to the EA flood warning service and consider appropriate protection measures. It is not anticipated that an evacuation plan for the site is required as the normal access locations will be available.

Technical Guidance to the NPPF and the PPG include for an increase in the peak rainfall intensity of up to 30%, as well as increase in peak flows in watercourses of up to 20% within 100 years. This will significantly affect smaller urban catchments, leading to rapid runoff into and subsequent increased flows within watercourses, surface water flooding, surcharging of gullies, drains and sewer flooding.

CFMPs have also considered flood risk for the next 50-100 years and have considered the flood risk drivers of climate change, urban development, and changes in land use.

Catchment models and the Modelling and Decision Support Framework (MDSF) software were used in the CFMP to test sensitivity to the flood risk drivers across the catchments in the study area.

The location of future urban developments and flood defences within a catchment can heavily influence flood risk in the area and has the potential to further increase flood risk at areas downstream of such developments. Impacts include the lowering of the SoP offered by flood defences and the carrying capacity of culverts, drains, sewers and watercourse channels. This potentially leads to areas being at risk of flooding that were previously not at risk and highlights the increasing conflicts and pressures that are emerging between climate change scenarios and future development aspirations.

The NPPF sets out important objectives to tackle climate change, sea level rise and avoid flood risk. The purpose of design policies should be to ensure that developments are sustainable, durable, and adaptable to natural hazards such as flooding. Following this guidance, it should be possible to mitigate against increased flood risk through incorporating 'flood proofing' measures such as raised finished floor levels into the development design, and/or development of compensatory storage and flood storage basins. The Adaptation Strategies for Climate Change in the Urban Environment (ASCCUE) project is a study undertaken collaboratively by the University of Manchester, The University of Cardiff, University of Southampton, and Oxford Brooks University. One of the aspects examined was surface water runoff during extreme rainfall events. With an increase in development, there comes an increase in the number of impermeable areas thus leading to increased runoff during storm events.

5.0 Conclusion and Recommendations

5.1 Conclusions

This Level 1 FRA concludes that:

- Tidal Flooding – The Environment Agency mapping shows that the site is at low risk of flooding therefore no further assessment is required with respect to Tidal flooding.

- River Flooding (Fluvial) – The Environment Agency mapping shows that the site is in Flood Zone 1 and at low risk of flooding.

- Groundwater Flooding - there is a low risk of groundwater flooding occurring at the site; therefore, no further assessment is required with respect to groundwater flooding.

- Surface Water (Pluvial) Flooding - the Environment Agency mapping shows that the site is at very low risk of flooding. The proposed development will change the surface water flow regime for the site and proposals will need to be developed in line with local and national guidelines.

- Sewer Flooding - There are no known previous flooding incidents from the sewers located surrounding the site and as such there is low risk of sewer flooding affecting the site.

- Canals and Artificial Waterways Flooding – The location of canals and artificial waterways are sufficiently far from the site and therefore unlikely to result in flood risk and as such will not require further assessment.

- Reservoirs and Lakes – EA mapping indicates a residual risk in the event of a reservoir failure; however, the likelihood of such an event is very low, and the site is therefore considered suitably located.

- Water Mains – the location of water mains suggest that any flooding would be directed away from the site and does not require further assessment.

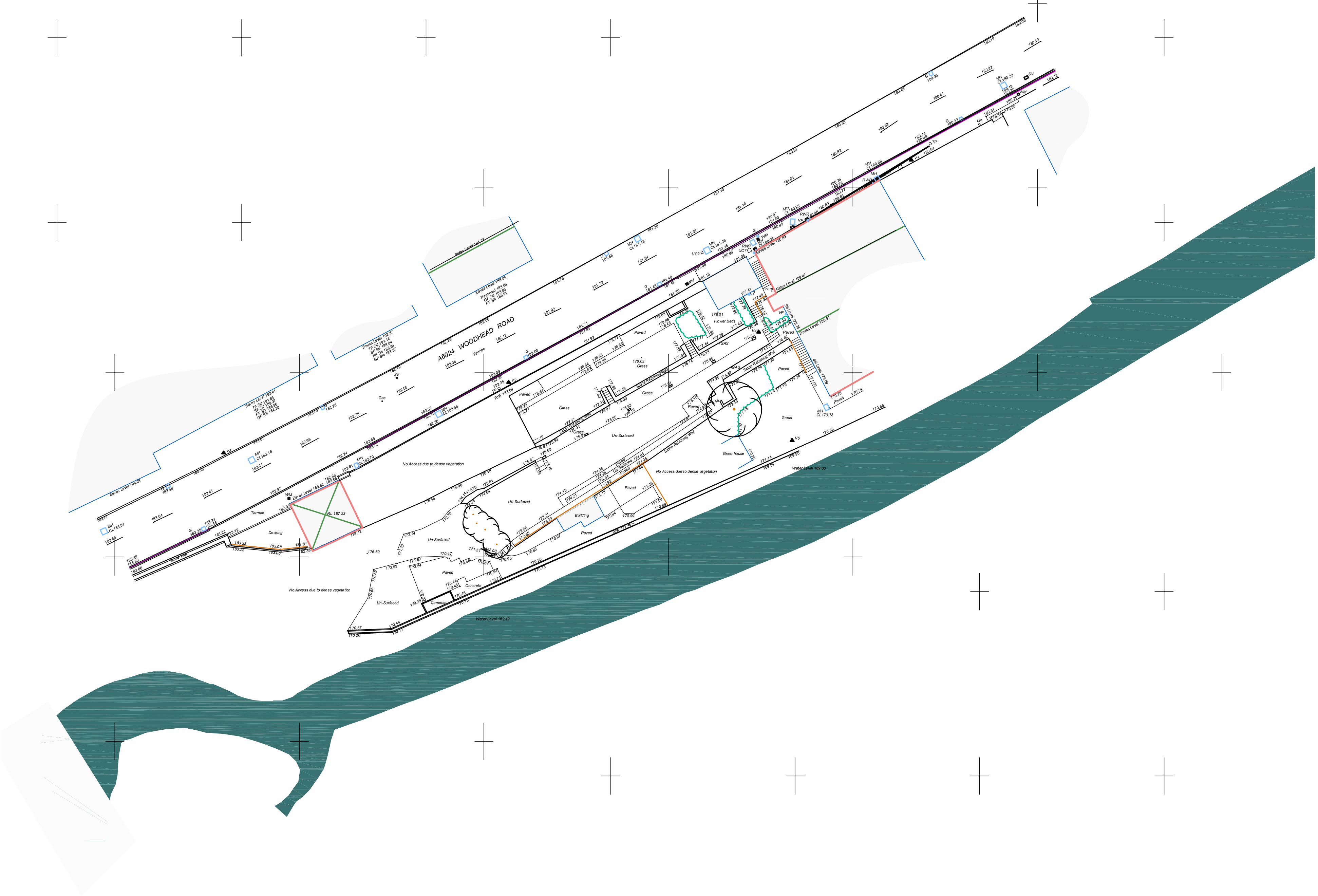
- Climate Change - the potential impacts of climate change will increase the risk of flooding and suitable protection measures should be considered.

5.2 Recommendations

The Level 1 FRA shows that the site is at low risk from fluvial flooding following the Product 4 Data modelling provided by the EA. A drainage strategy will be prepared to demonstrate the proposals to manage surface water flow within the site. The proposed development is suitably located based on the proposed land use and flood zone classification.

The EA objections in relation to protected species and protected habitats are acknowledged. These matters fall outside the scope of this Flood Risk Assessment and will need to be addressed separately through appropriately scoped ecological surveys and specialist assessments if required. Any mitigation, compensation, and licensing will be developed by suitably qualified ecologists and agreed with the relevant statutory bodies prior to determination and/or commencement of development, ensuring compliance with relevant planning policy, and environmental legislation.

Appendix A – Topographical Survey



Topographical Survey - 1:200

N

0 2 4 6 8 10 12 14

Notes

Do not scale from drawing, use figured dimensions only.

All dimensions must be checked and verified on site prior to commencement of work and Architect to be notified of any discrepancies.

This drawing is intended to permit overall scheme proposals only and cannot be used for construction purposes without further information.

Rev	Description	Drawn	Date
	Created from Vision Geomatics topographical survey - 05.2014	KA	26.06.24

Client
Nicola Orme

Site Address
179 Woodhead Road, Holmbridge, HD9 2NW

Project Description
Residential Development

Status
Planning

Date	Drawn	Checked
May 2015	Vision Geomatics	

Drawing	Scale @ A1
Existing Site Plan	1:200

Drawing No.	Revision
3595 (TP) 01	

ONE17 DESIGN

THE DYEHOUSE, ARMITAGE BRIDGE
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ONE17DESIGN.COM

Appendix B – Environment Agency Flood Map for Planning

Flood map for planning

Your reference	Location (easting/northing)	Created
<Unspecified>	**412396/406942**	**23 Jul 2024 8:32**

Your selected location is in flood zone 1, an area with a low probability of flooding.

You will need to do a flood risk assessment if your site is **any of the following:**

- bigger that 1 hectare (ha)
- In an area with critical drainage problems as notified by the Environment Agency
- identified as being at increased flood risk in future by the local authority's strategic flood risk assessment
- at risk from other sources of flooding (such as surface water or reservoirs) and its development would increase the vulnerability of its use (such as constructing an office on an undeveloped site or converting a shop to a dwelling)

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

Environment Agency

Flood map for planning

Your reference
<Unspecified>

Location (easting/northing)
412396/406942

Scale
1:2500

Created
23 Jul 2024 8:32

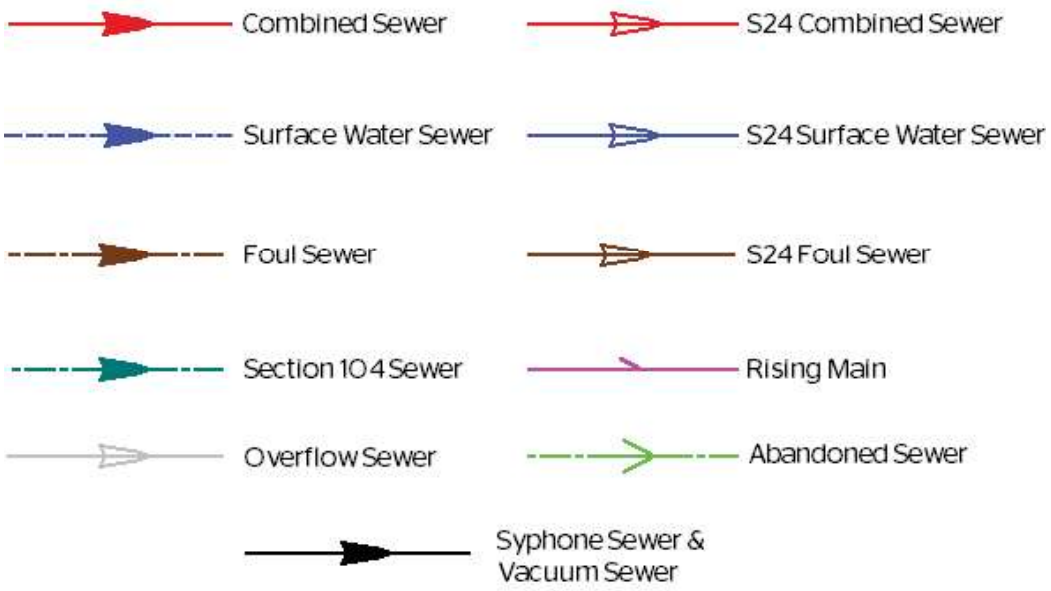
- Selected area
- Flood zone 3
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Water storage area

0 20 40 60m

Appendix C – Yorkshire Water Asset Plan

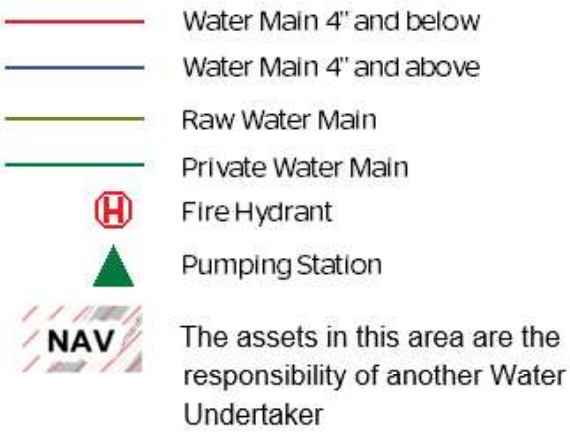
Property Identfier

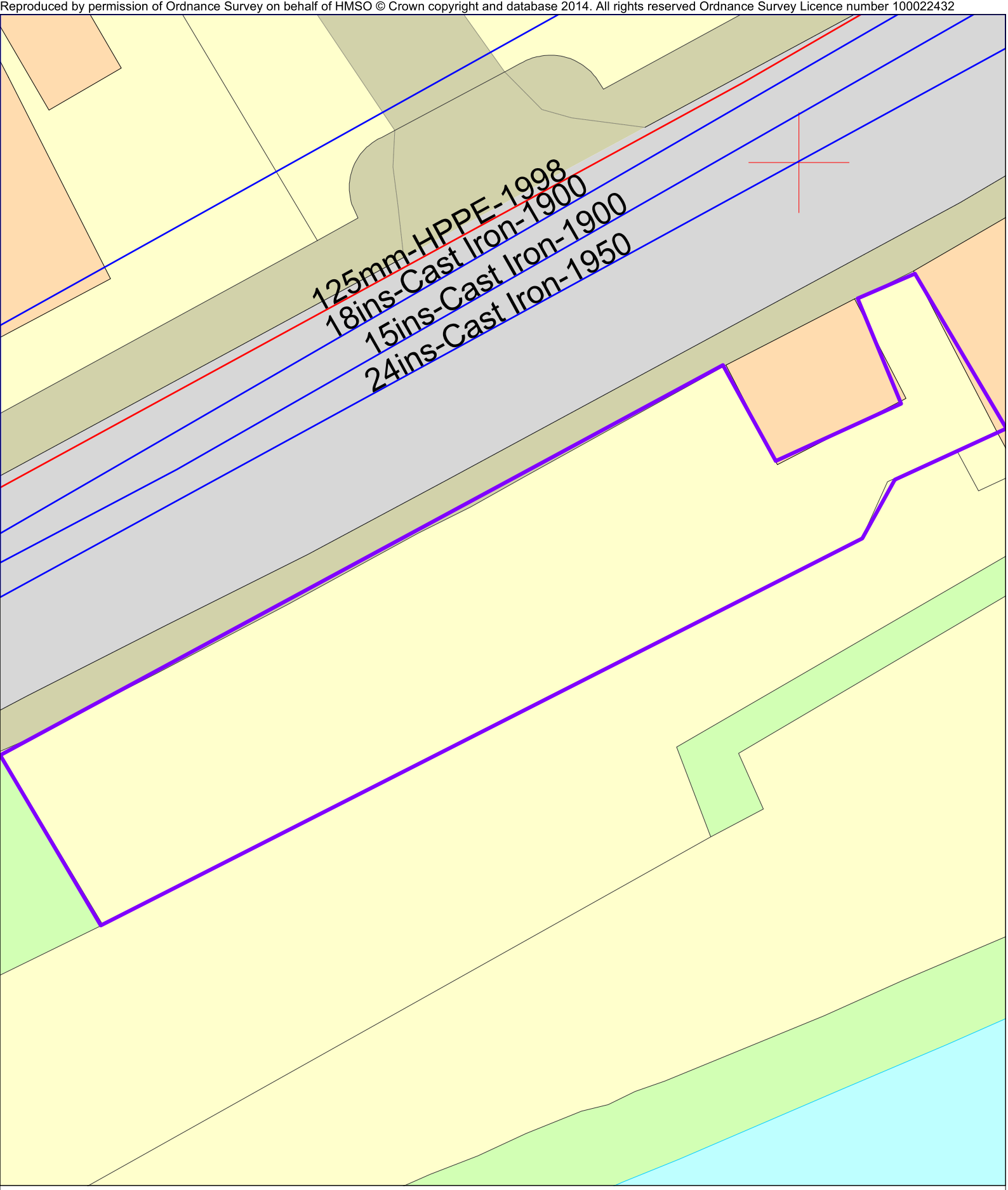
Sewer Legend



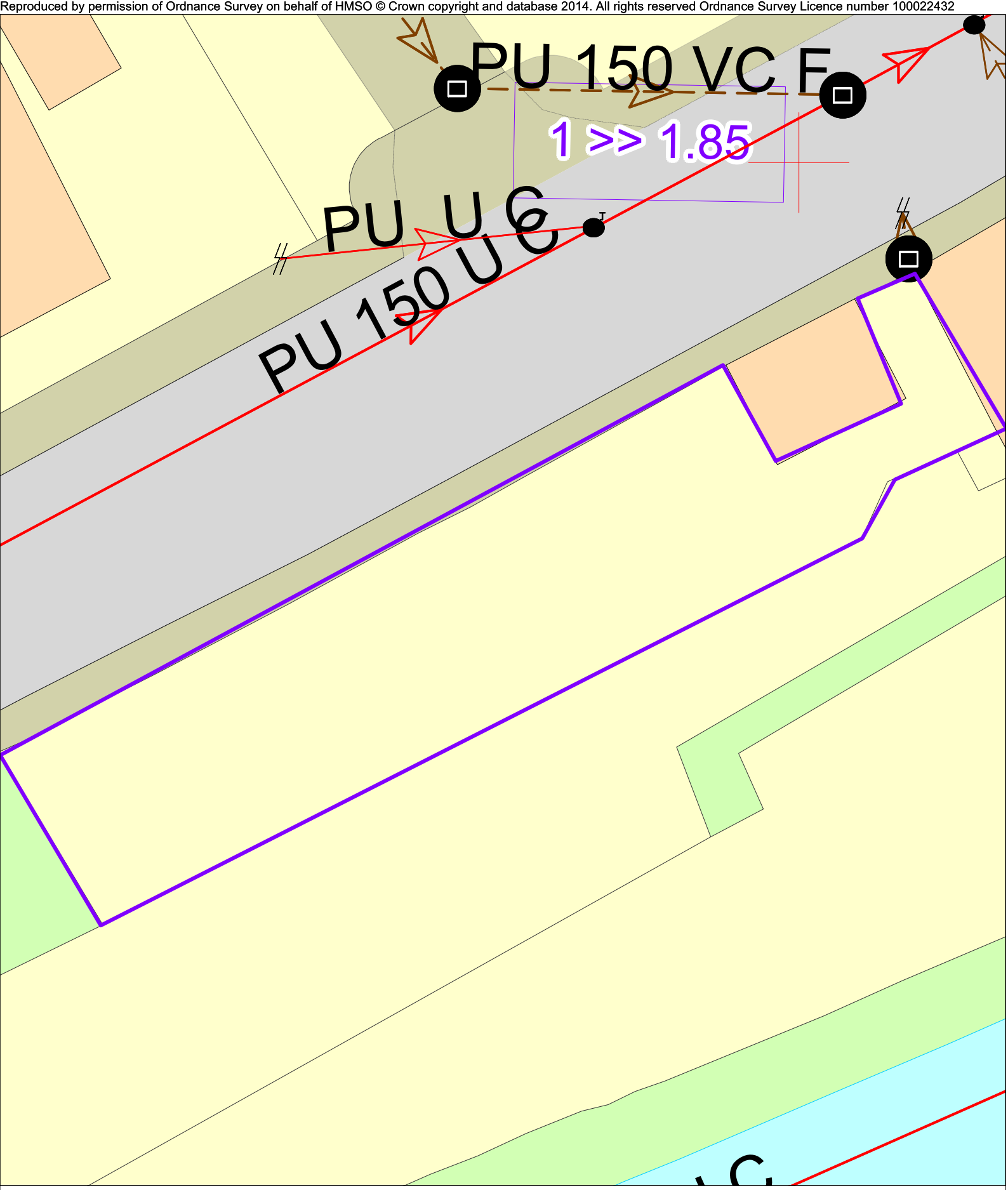
Please note that the direction of flow arrows may not always appear depending on the scale of the map.

Water Legend



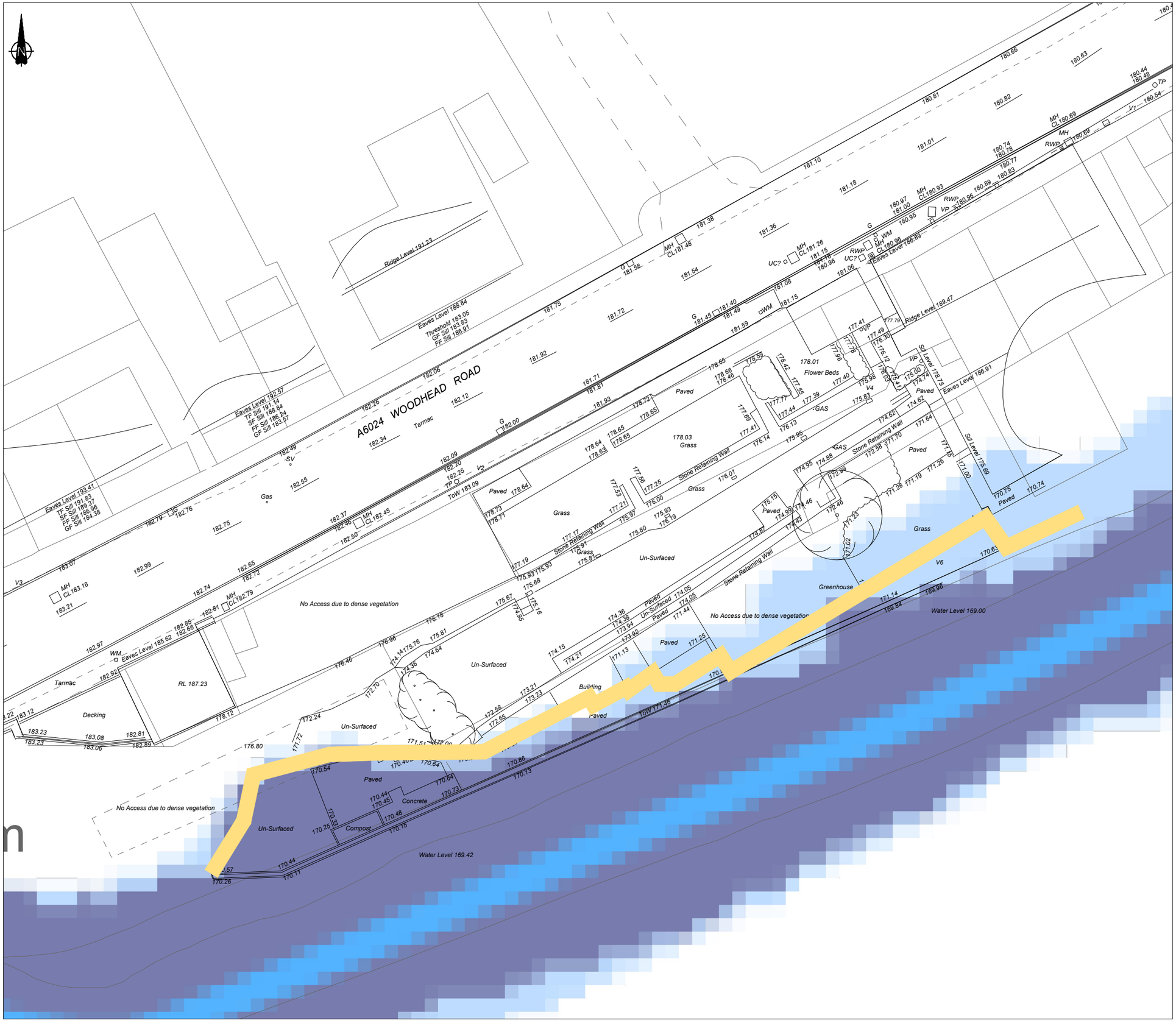


Public Clean Water Network 22/07/2024 15:13:55 OS Grid Coordinates: 412382 : 406924 Map Name : SE1206NW svcGISSafeMovePD



Public Waste Water Network 22/07/2024 15:13:56 OS Grid Coordinates: 412382 : 406924 Map Name : SE1206NW svcGISSafeMovePD

Appendix D – Flood Zone Estimation Plan



Do not scale from drawings unless by agreement with Architect/Engineer. Work to figured dimensions only. Check all dimensions on site prior to commencing the works. Drawings to be read in conjunction with other relevant consultant information. Where any discrepancy is found to exist it should be reported to the Architect/Engineer immediately.

LEGEND

ASSUMED EXTENT OF FLOOD ZONE 3

EXTENT OF 170.500mAOD CONTOUR

Revision	Date	Drawn	Description
P1	07/08/24	CA	Issued for Information.

Client & Project

Nicola Orme

Woodhead Road

Address

Woodhead Road

Holmbridge,
HD9 2NW

Drawing Title

Flood Zone Extents

Status / Stage	Sheet	Scale @ A3	Drawn	Checked
S2	1 of 1	1:250	CA	AW

Drawing Number S4655-BDN-XX-XX-DR-C-0001

Revision P1

0mm | 2.0m | 4.0m | 8.0m | 12.0m

Established 1983.

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North East (Head Office)
The Old School, Simpson Street,
Sunderland, SR4 6DR

North West
Room 110, Ulverston Business Centre,
Ulverston, LA12 7LQ

BuildingDesignNorthern

Appendix E – Environnent Agency Product 4 Data

Flood risk assessment data

Location of site: 412394 / 406942 (shown as easting and northing coordinates)
Document created on: 14 November 2025
This information was previously known as a product 4.
Customer reference number: GKAW7WNP64JV

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

How to use this information

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

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

Included in this document

In this document you'll find:

- how to find information about surface water and other sources of flooding
- information on the models used
- definitions for the terminology used throughout
- flood map for planning (rivers and the sea)
- modelled data
- information about strategic flood risk assessments
- information about this data
- information about flood risk activity permits
- help and advice

Information that's unavailable

This document **does not** contain:

- past floods
- flood defences and attributes

We do not have past flooding data for this location.

Please note that:

- flooding may have occurred that we do not have records for
- flooding can come from a range of different sources
- we can only supply flood risk data relating to floodng from rivers or the sea

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

We aren't able to display flood defence locations and attributes as there are no formal flood defences in the area of interest.

Surface water and other sources of flooding

When using the surface water map on the check your long term flood risk service the following considerations apply:

- surface water extents are suitable for use in planning
- surface water climate change scenarios may help to inform risk assessments, but the available data fall short of what is required to assess planned development
- surface water depth information should not be used for planning purposes

To find out about other factors that might affect the flood risk of this location, you should also check:

- reservoir flood risk
- groundwater flood risk - you could use the British Geological Survey groundwater flooding data, groundwater: current status and flood risk and the guide on mining and groundwater constraints for development - further information may be available from the lead local flood authority (LLFA)
- your local planning authority's SFRA, which includes future flood risk

Your Lead Local Flood Authority is Kirklees District.

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

About the models used

Model name: 2019 River Holme model
Scenario(s): No defences exist fluvial, no defences exist climate change fluvial
Date: 1 August 2019

This model contains the most relevant data for your area of interest.

Terminology used

Annual exceedance probability (AEP)

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

Metres above ordnance datum (mAOD)

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

Flood map for planning (rivers and the sea)

Your selected location is in flood zone 1.

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

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

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

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

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

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

Environment Agency

Flood map for planning

Location (easting/northing)
412394/406942

Scale
1:10,000

Created
14 Nov 2025

- Selected area
- Main river
- Flood Zone 3
- Flood Zone 2

0 100 200 300 400 500
metres

Modelled data

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

- outline maps showing the area at risk from flooding in different modelled scenarios
- modelled node point map(s) showing the points used to get the data to model the scenarios and table(s) providing details of the flood risk for different return periods

Climate change

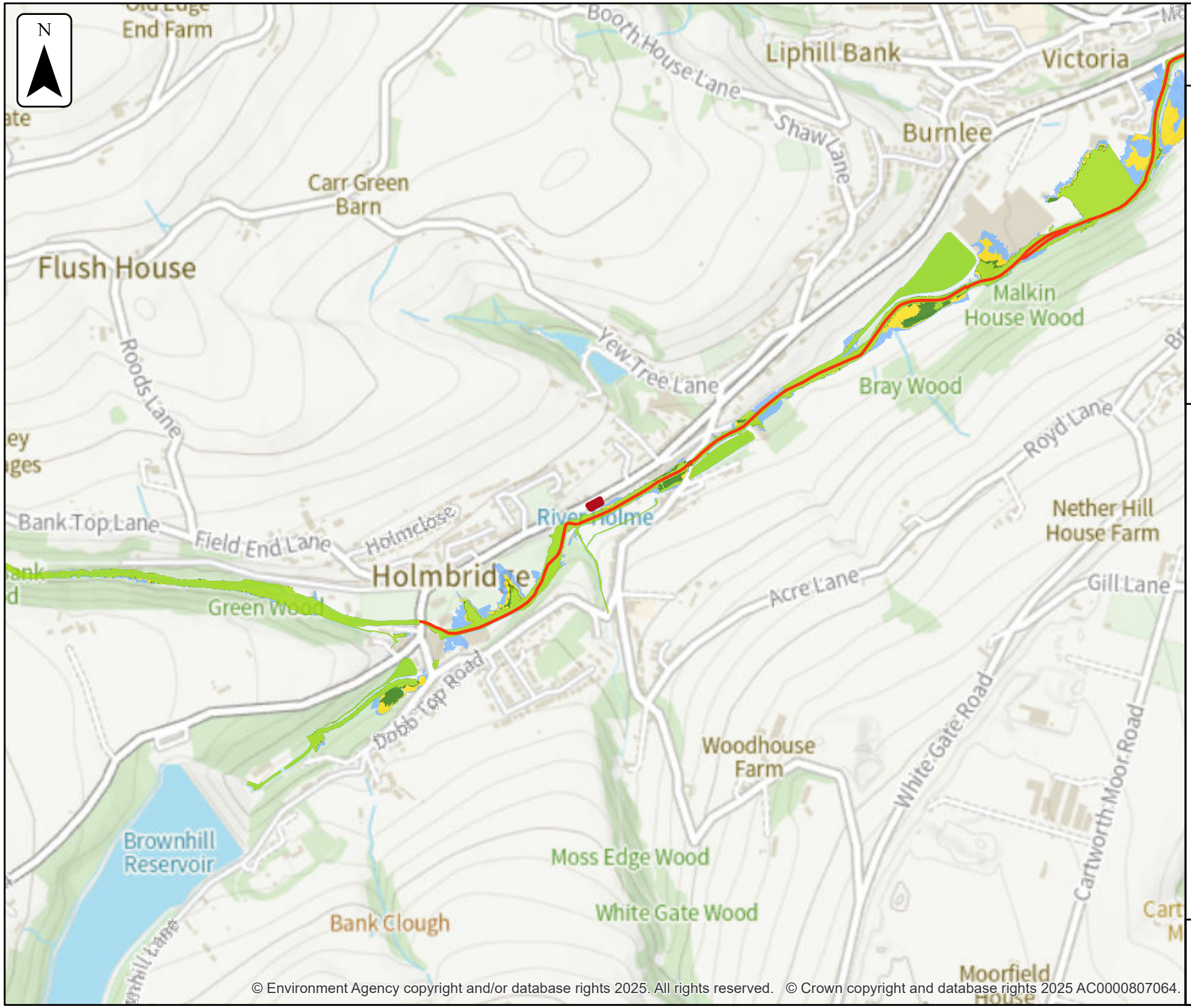
The climate change data included in the models may not include the latest flood risk assessment climate change allowances. Where the new allowances are not available you will need to consider this data and factor in the new allowances to demonstrate the development will be safe from flooding.

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

Modelled scenarios

The following scenarios are included:

- No defences exist modelled fluvial: risk of flooding from rivers where there are no flood defences
- No defences exist climate change modelled fluvial: risk of flooding from rivers where there are no flood defences, including estimated impact of climate change



Environment Agency

No defences exist climate change modelled fluvial extent

Location (easting/northing)
412394/406942

Scale
1:10,000

Created
14 Nov 2025

Model name
2019 River Holme model

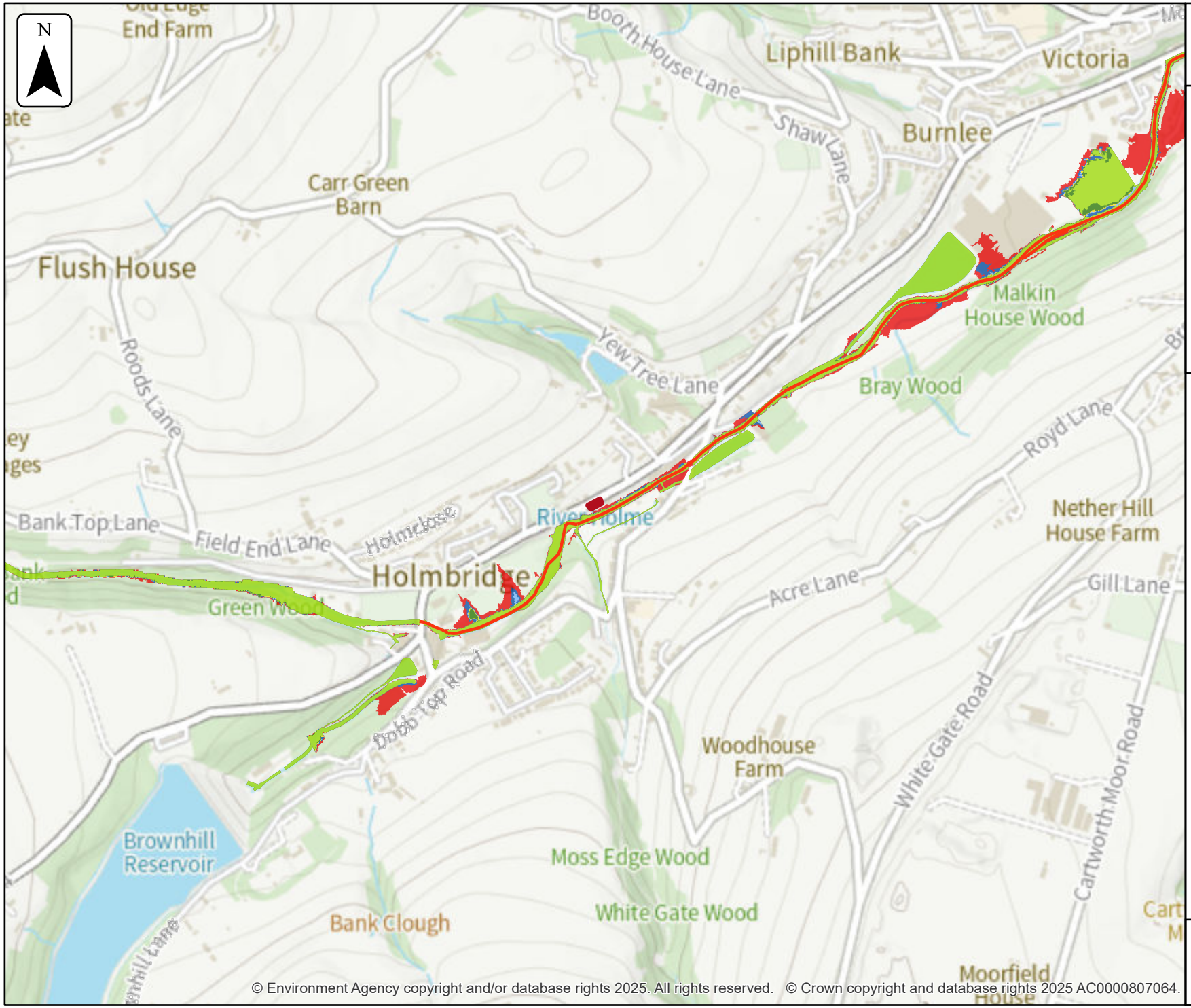
- Selected area
- Main river

Modelled flood extent

- 1% AEP (+20%)
- 1% AEP (+30%)
- 1% AEP (+50%)
- 0.1% AEP (+20%)

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

0 100 200 300 400 500
metres



Environment Agency

No defences exist modelled fluvial extent

Location (easting/northing)
412394/406942

Scale
1:10,000

Created
14 Nov 2025

Model name
2019 River Holme model

- Selected area
- Main river

Modelled flood extent

- 5% AEP
- 2% AEP
- 1.33% AEP
- 1% AEP
- 0.5% AEP
- 0.1% AEP

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

0 100 200 300 400 500
metres

Environment Agency

No defences exist climate change modelled fluvial node locations

Location (easting/northing)
412394/406942

Scale
1:2,500

Created
14 Nov 2025

Model name
2019 River Holme model

- Selected area
- Modelled location
- Main river

0 25 50 75 100
metres

Modelled node locations data

No defences exist climate change

Label	Modelled location ID	Easting	Northing	1% AEP (+20%)	1% AEP (+30%)	1% AEP (+50%)	0.1% AEP (+20%)
				Level	Level	Level	Level
1	1198928	412329	406865	172.50	172.56	172.69	172.95
2	1198929	412334	406885	171.98	172.05	172.19	172.49
3	1199109	412343	406905	171.57	171.66	171.80	172.17
4	1199264	412367	406906	171.26	171.34	171.51	171.94
5	1199230	412375	406909	171.26	171.34	171.51	171.94
6	1199307	412409	406923	170.69	170.77	170.94	171.47
7	1198880	412443	406940	170.14	170.24	170.43	171.18
8	1199170	412458	406949	169.91	170.0	170.22	171.17
9	1199105	412475	406959	169.74	169.81	170.16	171.20
10	1198872	412501	406974	169.43	169.69	170.14	171.21

Data in this table comes from the 2019 River Holme model model.
Level values are shown in mAOD, and flow values are shown in cubic metres per second.
Any blank cells show where a particular scenario has not been modelled for this location.

No defences exist climate change

Label	Modelled location ID	Easting	Northing	1% AEP (+20%)	1% AEP (+30%)	1% AEP (+50%)	0.1% AEP (+20%)
				Flow	Flow	Flow	Flow
1	1198928	412329	406865	60.36	65.26	75.09	100.28
2	1198929	412334	406885	60.36	65.26	75.09	100.28
3	1199109	412343	406905	60.36	65.26	75.09	100.27
4	1199264	412367	406906	60.36	65.26	75.09	100.27
5	1199230	412375	406909	60.36	65.26	75.09	100.27
6	1199307	412409	406923	61.46	66.44	76.46	102.47
7	1198880	412443	406940	61.46	66.44	76.46	102.46
8	1199170	412458	406949	61.46	66.44	76.46	102.45
9	1199105	412475	406959	61.46	66.44	76.45	102.44
10	1198872	412501	406974	61.45	66.43	76.44	102.42

Data in this table comes from the 2019 River Holme model model.
Level values are shown in mAOD, and flow values are shown in cubic metres per second.
Any blank cells show where a particular scenario has not been modelled for this location.

Environment Agency

No defences exist modelled fluvial node locations

Location (easting/northing)
412394/406942

Scale
1:2,500

Created
14 Nov 2025

Model name
2019 River Holme model

- Selected area
- Modelled location
- Main river

0 25 50 75 100
metres

Modelled node locations data

No defences exist

Label	Modelled location ID	Easting	Northing	50% AEP	20% AEP	10% AEP	5% AEP	4% AEP	3.33% AEP	2% AEP	1.33% AEP	1% AEP	0.5% AEP	0.1% AEP
				Level	Level	Level	Level	Level	Level	Level	Level	Level	Level	Level
1	1198928	412329	406865	172.03	172.12	172.17	172.22	172.23	172.25	172.30	172.34	172.38	172.48	172.78
2	1198929	412334	406885	171.30	171.40	171.48	171.56	171.59	171.62	171.69	171.76	171.82	171.95	172.29
3	1199109	412343	406905	170.69	170.85	170.97	171.09	171.12	171.15	171.25	171.32	171.38	171.54	171.93
4	1199264	412367	406906	170.31	170.53	170.65	170.78	170.83	170.86	170.95	171.02	171.08	171.23	171.67
5	1199230	412375	406909	170.31	170.53	170.65	170.78	170.83	170.86	170.95	171.02	171.08	171.23	171.67
6	1199307	412409	406923	169.71	169.95	170.10	170.23	170.27	170.30	170.40	170.47	170.52	170.66	171.10
7	1198880	412443	406940	169.10	169.35	169.50	169.62	169.67	169.70	169.80	169.88	169.94	170.11	170.66
8	1199170	412458	406949	168.81	169.07	169.20	169.34	169.38	169.41	169.51	169.61	169.68	169.88	170.57
9	1199105	412475	406959	168.62	168.85	168.99	169.12	169.16	169.19	169.31	169.42	169.51	169.71	170.54
10	1198872	412501	406974	168.20	168.40	168.53	168.67	168.72	168.76	168.89	169.02	169.11	169.38	170.56

Data in this table comes from the 2019 River Holme model model.
Level values are shown in mAOD, and flow values are shown in cubic metres per second.
Any blank cells show where a particular scenario has not been modelled for this location.

No defences exist

Label	Modelled location ID	Easting	Northing	50% AEP	20% AEP	10% AEP	5% AEP	4% AEP	3.33% AEP	2% AEP	1.33% AEP	1% AEP	0.5% AEP	0.1% AEP
				Flow	Flow	Flow	Flow	Flow	Flow	Flow	Flow	Flow	Flow	Flow
1	1198928	412329	406865	19.58	25.78	30.42	35.53	37.31	38.84	43.45	47.47	50.53	58.80	83.80
2	1198929	412334	406885	19.58	25.78	30.42	35.53	37.31	38.84	43.45	47.47	50.53	58.80	83.80
3	1199109	412343	406905	19.58	25.78	30.42	35.53	37.31	38.84	43.45	47.47	50.53	58.80	83.80
4	1199264	412367	406906	19.58	25.78	30.42	35.53	37.31	38.84	43.45	47.47	50.53	58.80	83.80
5	1199230	412375	406909	19.58	25.78	30.42	35.53	37.31	38.84	43.45	47.47	50.53	58.80	83.80
6	1199307	412409	406923	19.91	26.21	30.95	36.16	37.96	39.52	44.21	48.32	51.45	59.90	85.63
7	1198880	412443	406940	19.91	26.21	30.95	36.16	37.96	39.52	44.21	48.32	51.45	59.90	85.61
8	1199170	412458	406949	19.91	26.21	30.95	36.16	37.96	39.52	44.21	48.32	51.45	59.90	85.61
9	1199105	412475	406959	19.91	26.21	30.95	36.16	37.96	39.52	44.21	48.32	51.45	59.90	85.60
10	1198872	412501	406974	19.91	26.21	30.95	36.15	37.96	39.52	44.21	48.32	51.45	59.90	85.58

Data in this table comes from the 2019 River Holme model model.
Level values are shown in mAOD, and flow values are shown in cubic metres per second.
Any blank cells show where a particular scenario has not been modelled for this location.

Strategic flood risk assessments

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

This should give you information about:

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

Your Lead Local Flood Authority is Kirklees District.

About this data

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

Flood risk activity permits

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

Find out more about flood risk activity permits

Help and advice

Contact the Yorkshire Environment Agency team at neyorkshire@environment-agency.gov.uk for:

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