Cumberland Council

Westmorland & Furness Council

Working for **Cumberland Council** and **Westmorland & Furness Council**

Highbridge, Stockdalewath and Gaitsgill

Flood Investigation Report No. CC9

Flood Event 22/23 May 2024

This flood investigation report has been produced by Cumberland Council and supported by Westmorland and Furness Council as Lead Local Flood Authorities under Section 19 of the Flood and Water Management Act 2010.

Version	Undertaken by	Reviewed by	Approved by	Date
Draft	Joanne Ghorst – CC Colin Riggs – EA David Kennedy – EA Iwan Lawton – EA	Andrew Harrison-CC Ben Wilson – EA Helen Renyard - WAF	Karl Melville	24/9/24
Published	Joanne Ghorst – CC Colin Riggs – EA David Kennedy – EA Iwan Lawton – EA	Andrew Harrison-CC Ben Wilson – EA Helen Renyard - WAF	Graeme Innes	11 02 2025

Revision No.	Revisions	by	Date

Contents

1. Executive Summary

Exceptionally wet weather was experienced across parts of England, North Wales, southern and eastern Scotland between the 21st and 23rd May 2024. A slow-moving weather front associated with low pressure in the North Sea resulted in 50mm of rain over a wide area of northwestern England, with 75mm to 100mm experienced in the wettest locations. On the 22nd May northern England recorded its wettest spring day since 1891, with many stations recording their wettest May day on record.

High rainfall totals in small, agricultural catchments that don't generally experience such events resulted in rivers and watercourses rising quickly, with very little warning in some instances. Over 100 properties in and around the Carlisle area were flooded internally during the event and this Section 19 report investigates the flood event, considers the causes, and makes recommendations for further actions in the Highbridge, Stockdalewath and Gaitsgill areas.

Cumberland Council as the Lead Local Flood Authority has prepared this report with the assistance of other Risk Management Authorities (RMA'S) as it considers necessary to do so under Section 19 of the Flood and Water Management Act 2010. Roe Beck and the River Ive are classified as main rivers (see Appendix 2) and as such the Environment Agency have contributed significantly to the Stockdalewath, High Bridge and Thistlewood parts of the report. Pen Beck at Gaitsgill is an ordinary watercourse, and as such that part of the report has been prepared solely by Cumberland Council. Westmorland and Furness Council have also inputted into the report for High Bridge and Thistlewood.

Given that the communities are in close proximity and flooded as a result of the same rainfall event, it was considered appropriate to consider them in the same report.

Any additional information that residents and others can provide to the Environment Agency and Cumberland Council or Westmorland and Furness Council to help develop our understanding of the flooding is welcomed. Information has already been provided, much of which has been used to inform this report. Any additional information should be provided to **lfrm@cumberland.gov.uk.** Any additional information for Highbridge and Thistlewood should be provided to **LLFA@westmorlandandfurness.gov.uk**.

The Flood Investigation Report

Under Section 19 of the Flood and Water Management Act (2010) Cumberland Council and Westmorland and Furness Council, as Lead Local Flood Authorities (LLFA), have a statutory duty to produce Flood Investigation Reports for areas affected by flooding. Section 19 of the Flood and Water Management Act states:

1) *On becoming aware of a flood in its area, a lead local flood authority must, to the extent that it considers it necessary or appropriate, investigate:*
    a. *which risk management authorities have relevant flood risk management functions, and*
    b. *whether each of those risk management authorities has exercised, or is proposing to exercise, those functions in response to the flood.*

2) *Where an authority carries out an investigation under subsection (1) it must –*
    a. *publish the results of its investigation, and*
    b. *notify any relevant risk management authorities.*

This section of the Act leaves the determination of the 'extent' of flood investigation to the LLFA. It is not practical or realistic for Lead Local Flood Authorities to carry out a detailed investigation into every flood incident that occurs, but every incident with basic details will be recorded by the LLFA. Only those with 5 or more properties/businesses involved will have investigations published on the council's website.

An investigation will be carried out, and a report prepared and published by the LLFA when the flooding impacts meet the following criteria:

- Where there is ambiguity surrounding the source or responsibility of flood incident
- Internal flooding of one property that has been experienced on more than one occasion
- Internal flooding of five properties has been experienced during one single flood incident
- There is a risk to life as a result of flooding.

As a flood Risk Management Authority (RMA), the Environment Agency have partnered with the councils to produce this flood investigation report.

Scope of this report

This Flood Investigation Report **is**:

- An investigation on what, when, why, and how the flooding took place resulting from the 22nd to 23rd May 2024 event.
- A means of identifying potential recommendations for actions to minimise the risk or impact of future flooding.

This Flood Investigation Report **does not**:

- Interpret observations and measurements resulting from this flooding event. Interpretation will be undertaken as part of any subsequent reports.
- Provide a complete description of what happens next.

The Flood Investigation Report outlines recommendations and actions that various organisations and authorities can do to minimise flood risk in affected areas. Once agreed, the reports can be used by communities and agencies as the basis for developing future plans to help make areas more resilient to flooding in the future.

2. Introduction

2.1 Geographical setting

The Roe Beck catchment is located approximately 12km south of Carlisle in North Cumbria. The River Roe catchment incorporates all watercourses above the confluence of the River Caldew including Roe Beck, River Ive and their tributaries. The catchment is rural with a dispersed population incorporating a number of communities including Thistlewood, Highbridge, Stockdalewath and Gaitsgill (Figure 1).

The elevation range within the Roe Beck catchment is 311m, with a maximum elevation of 370m above Ordnance Datum (mAOD) in the south-west of the catchment towards the Lake District National Park and a minimum elevation of 59mAOD in the north of the catchment where the Roe Beck meets the River Caldew. The high slope gradient around the channel network results in a limited floodplain area which constrains the flow during a storm event.

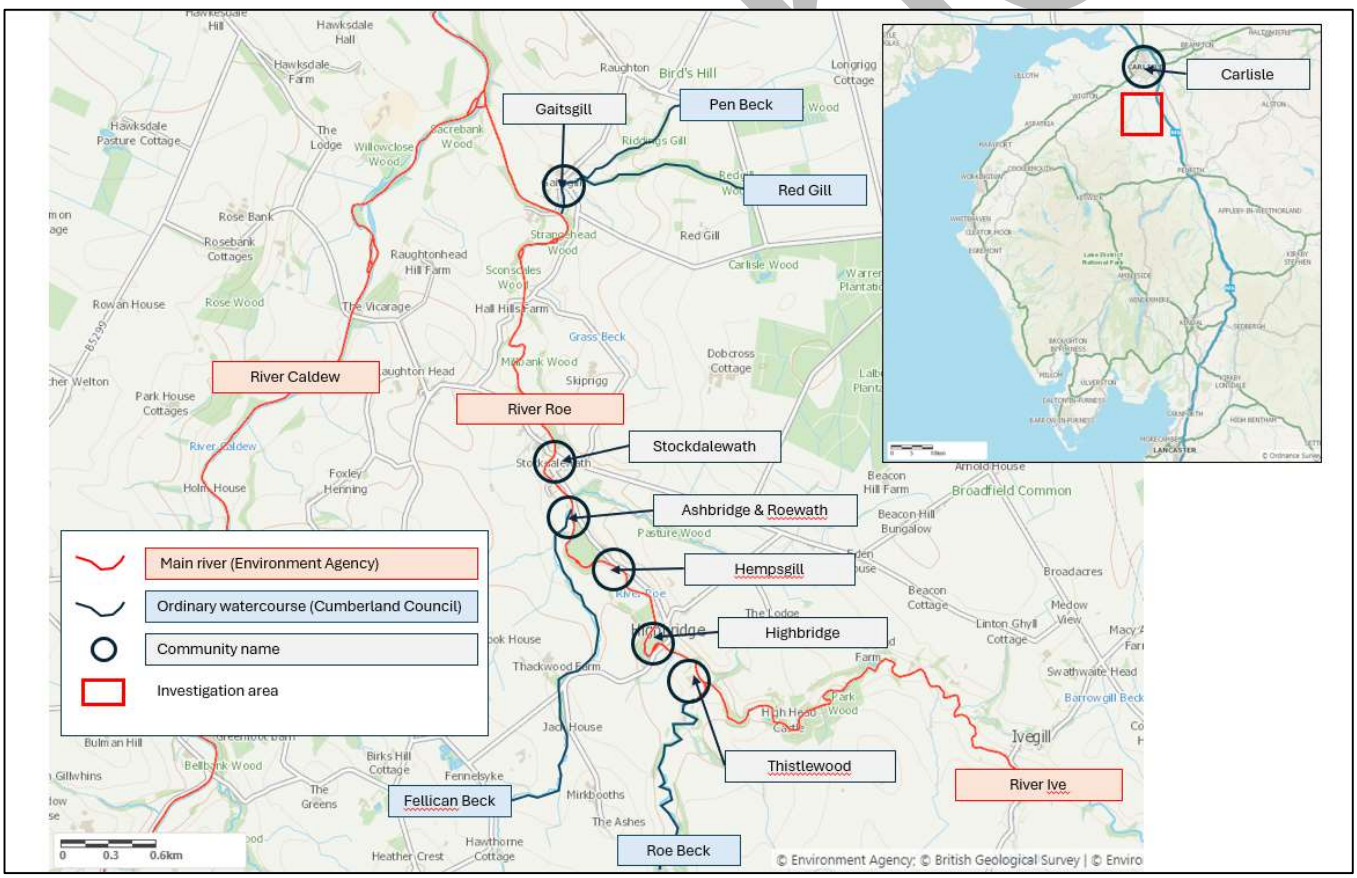


Figure 1: Map of location and impacted communities.

2.2 Flood history

The Roe Beck catchment has been impacted by at least four flooding events in recent history, namely 2005, 2013 and 2015. The May 2024 rainfall event is estimated to have exceeded the 1% annual exceedance probability (AEP). The AEP describes the likelihood of a specified flow rate (or volume of water within a specified duration) being exceeded within a given year. There are several ways to express AEP as shown in Table 1. Throughout this report AEP is expressed as a percentage. As such, an event having a recurrence interval (return period) of 1 in 100 chance of occurring in any single year will be a 1% AEP event.

Recurrence interval (RI): Years	annual exceedance probability (AEP) as percentage (%)	AEP as probability
1 in 2	50 %	1 in 2
1 in 5	20 %	1 in 5
1 in 10	10 %	1 in 10
1 in 25	4 %	1 in 25
1 in 50	2 %	1 in 50
1 in 75	1.33 %	1 in 75
1 in 100	1%	1 in 100
1 in 1000	0.1 %	1 in 1000

Table 1: Annual Exceedance Probability (AEP)

3. Flood event 22/23 May 2024

3.1 Background

The month of May was relatively dry prior to the event. From the 1st to the 21st May, the north-west region received 46 mm of rainfall which represents 62% of the long term average monthly rainfall for May. Local rain gauges suggest there was no rainfall from 15th May to the 21st May, and therefore catchment conditions would not have been unusually wet at the start of the event.

The majority of the heavy rainfall associated with this event fell between 21st and 23rd May 2024, Figure 2. Rainfall on 21st May was focused across central England and East Anglia, with 20-30mm falling widely and over 50mm falling in the wettest locations. On 22nd May, the main rain-bearing front tracked north with the focus of the rain across North Wales, much of northern England, southern and eastern Scotland, with over 50mm falling widely. This rainfall event continued throughout the 23rd May in the Edinburgh area before the rain finally ceased as the area of low pressure weakened and filled.

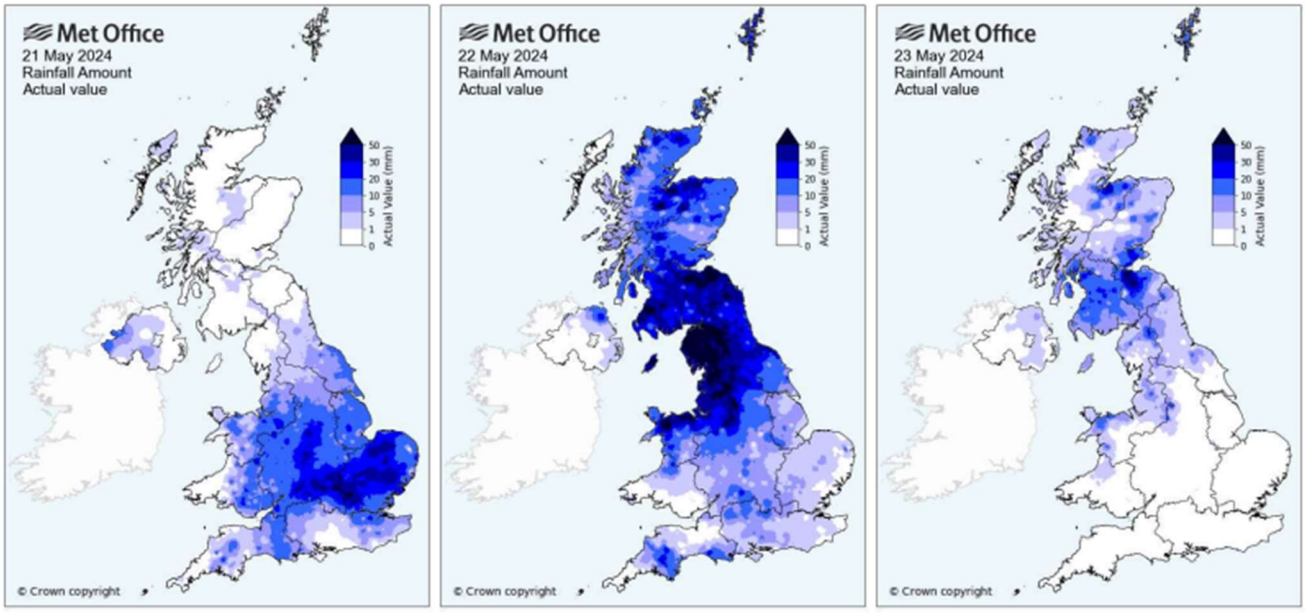


Figure 2: Met Office radar maps for 21st- 23rd May.

3.2 Rainfall event

On Wednesday 22nd May to Thursday 23rd May 2024 locations in North West England experienced heavy rainfall resulting from a slow-moving low-pressure system moving across England and Wales. Rain fell consistently from the morning of 22nd May until the afternoon of 23rd May, with the heaviest totals between 5pm on 22nd May and 2am on 23rd May. 24-hour rainfall totals exceeded 100 mm at several rain gauge sites, approximately twice the long-term average rainfall for the month of May.

The meteorological conditions at the time led to the system crossing the North-West region from the east, rather than from the more typical westerly direction. This led to higher levels of precipitation than usually experienced in the easterly catchments, which lie in the rain shadow of westerly storms. Figure 3 shows total rainfall accumulations (derived from Radar data) for an area of north Cumbria as well as highlighting the catchment area upstream of Stockdalewath. This figure shows how some of the most intense rainfall was centred over this catchment.

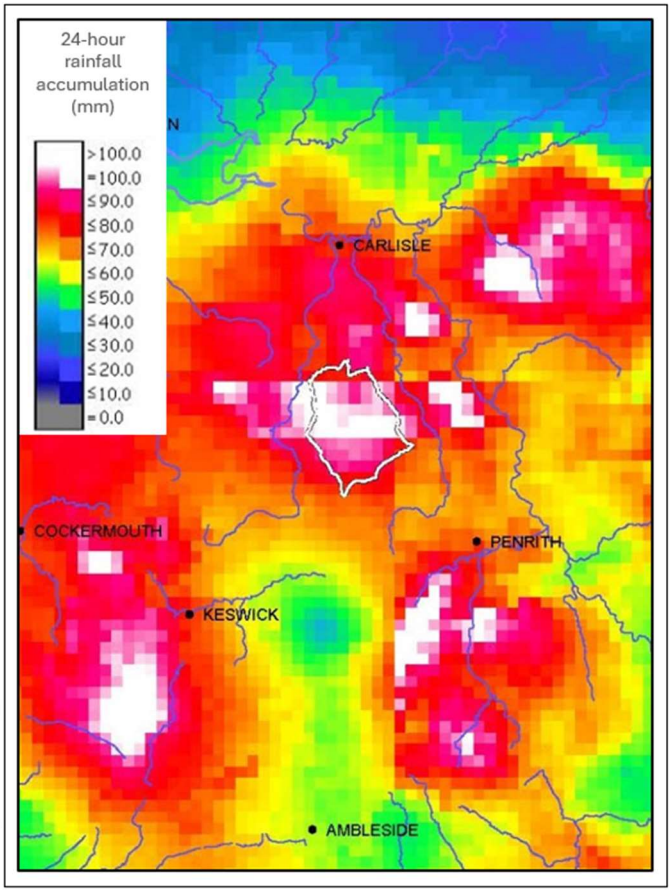


Figure 3: 24-hour rainfall accumulation from 08:00 on 22/05/2024. The white polygon shows the catchment area upstream of Stockdalewath.

Rainfall data was analysed at selected rain gauges based on the spatial pattern of heaviest rainfall. The rain gauges recorded between 46 and 119 mm of rainfall across the event (48-hour totals), with 24-hour maximum totals of 40 to 105 mm. The rain gauge at Skelton recorded 95mm in 24 hours.

Return period estimates for the rainfall vary from less than 50% AEP to between 0.5% to 0.33% AEP. In general, the 12 to 24-hour totals have the more extreme return periods. This indicates the persistent nature of the frontal rainfall. The 24-hour rainfall totals also exceeded 100% of the long-term average rainfall for May in 8 of the 11 rainfall sites assessed (i.e., more than a month's rain fell in one day). Figure 4 shows the locations of the rain gauges analysed and the maximum return period of the rainfall recorded at each. The most rainfall was recorded at rain gauges north of Stockdalewath but south of Carlisle (Thursby, Cumwhinton and Geltsdale).

Whilst rain gauges provide an accurate record of the rainfall that fell in a specific location, weather radar can be used to provide an estimate of rainfall across larger areas or to estimate

average rainfall across the whole catchment. This data indicates that 94mm of rain fell across the catchment upstream of Stockdalewath in 24 hours (from 08:00 GMT on 22/05/2024). These rainfall totals are significant and extremely large for catchment average rainfall. However, estimating return periods for radar rainfall totals is problematic. We consider it reasonable to suggest that the event rarity for the catchment average rainfall was in the order of 1.33% to 1% AEP. Figure 5 plots catchment average rainfall accumulations at 15 min intervals and cumulative totals over 48 hours.

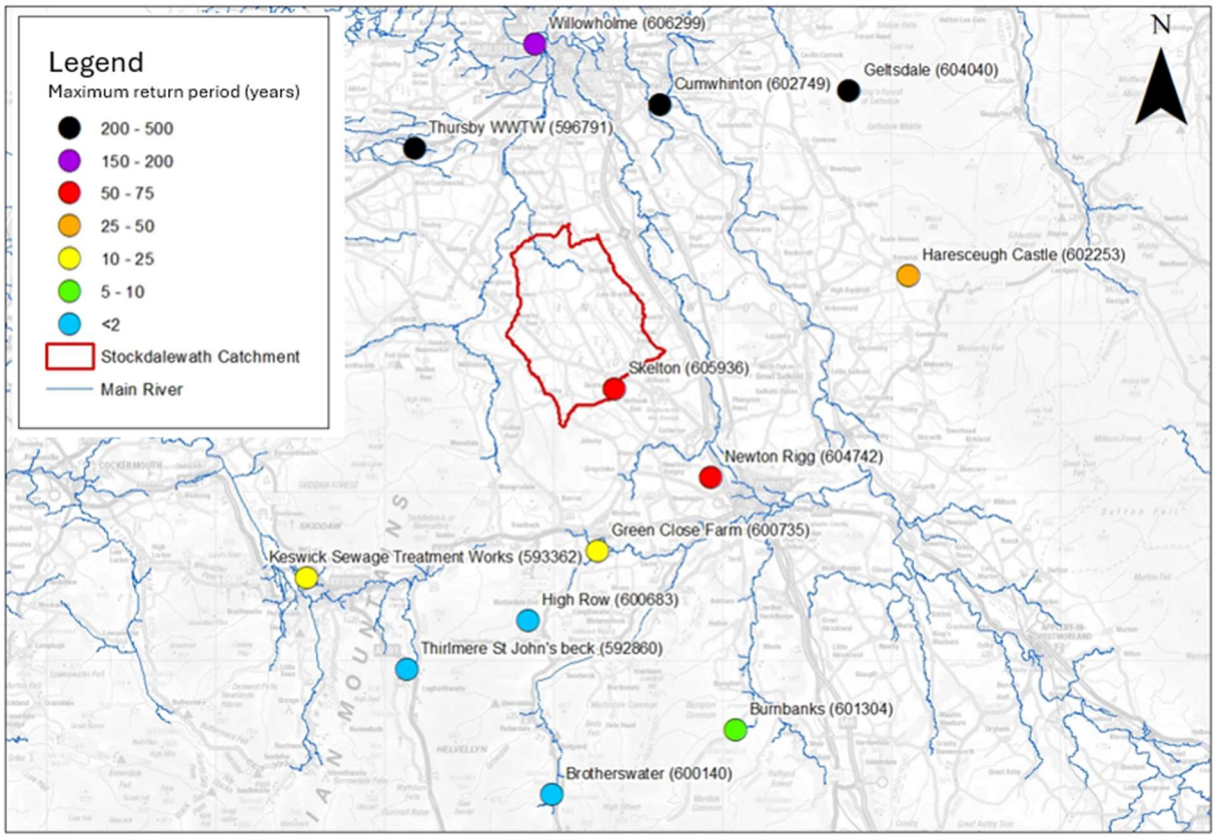


Figure 4: Rainfall return period at selected gauges

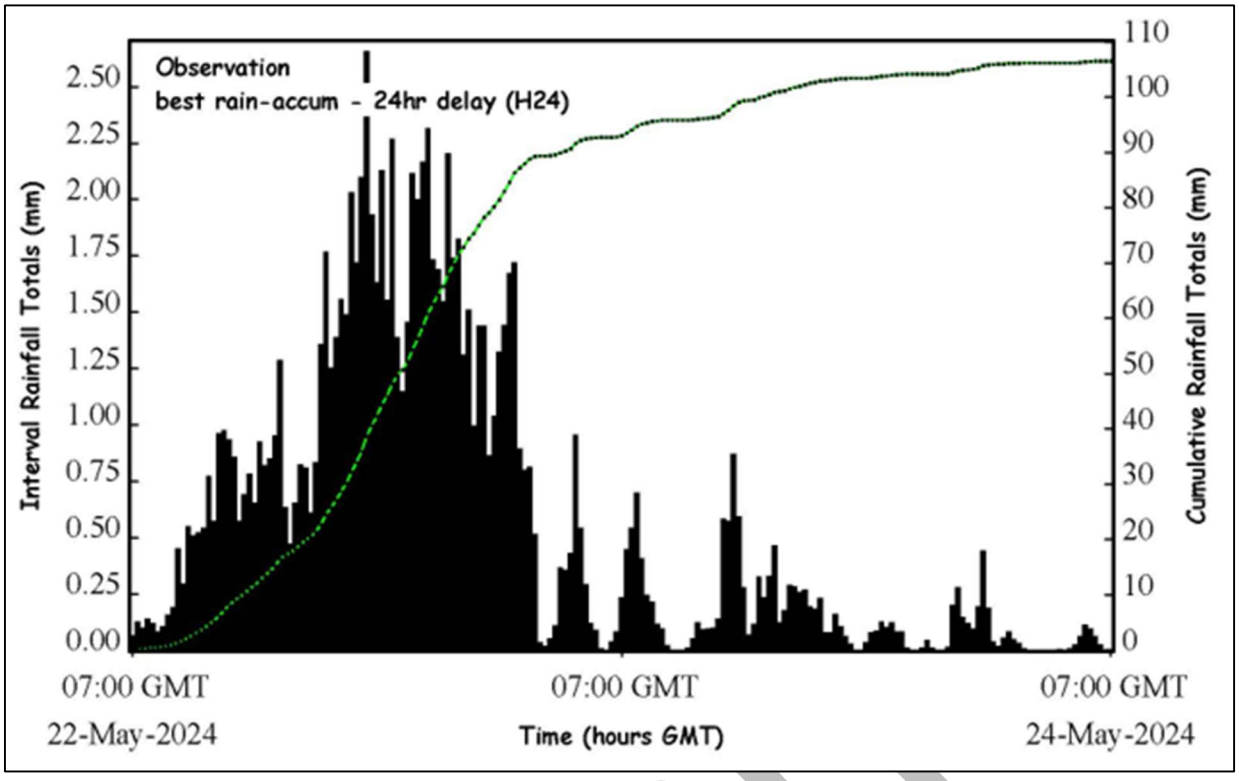


Figure 5: Catchment-averaged rainfall for the Roe Beck catchment upstream of Stockdalewath

3.3 River levels

The Environment Agency operates a river gauging network which records river levels and flows on watercourses throughout England. Peak river levels recorded during the May 2024 event at selected gauges within the Caldew and Petteril catchments were ranked alongside the other largest events in the gauged record. This analysis is summarised in Figure 6 which shows that the river levels were the highest on record for Roe Beck and the River Caldew. For the River Petteril, the event was only exceeded by December 2015 (Storm Desmond) during the 19-year record at Newbiggin Bridge. However, if data from the Newbiggin Bridge gauge is combined with data from an earlier gauge at Harraby Green (giving a total record length of 54 years) then the May 2024 is the third ranked event, with January 2005 also having a larger peak flow.

The peak level at Roe Beck exceeded the limit of the gauge but was later surveyed by Environment Agency staff from a wrack mark in the gauge hut. This surveyed level is used in the ranking analysis.

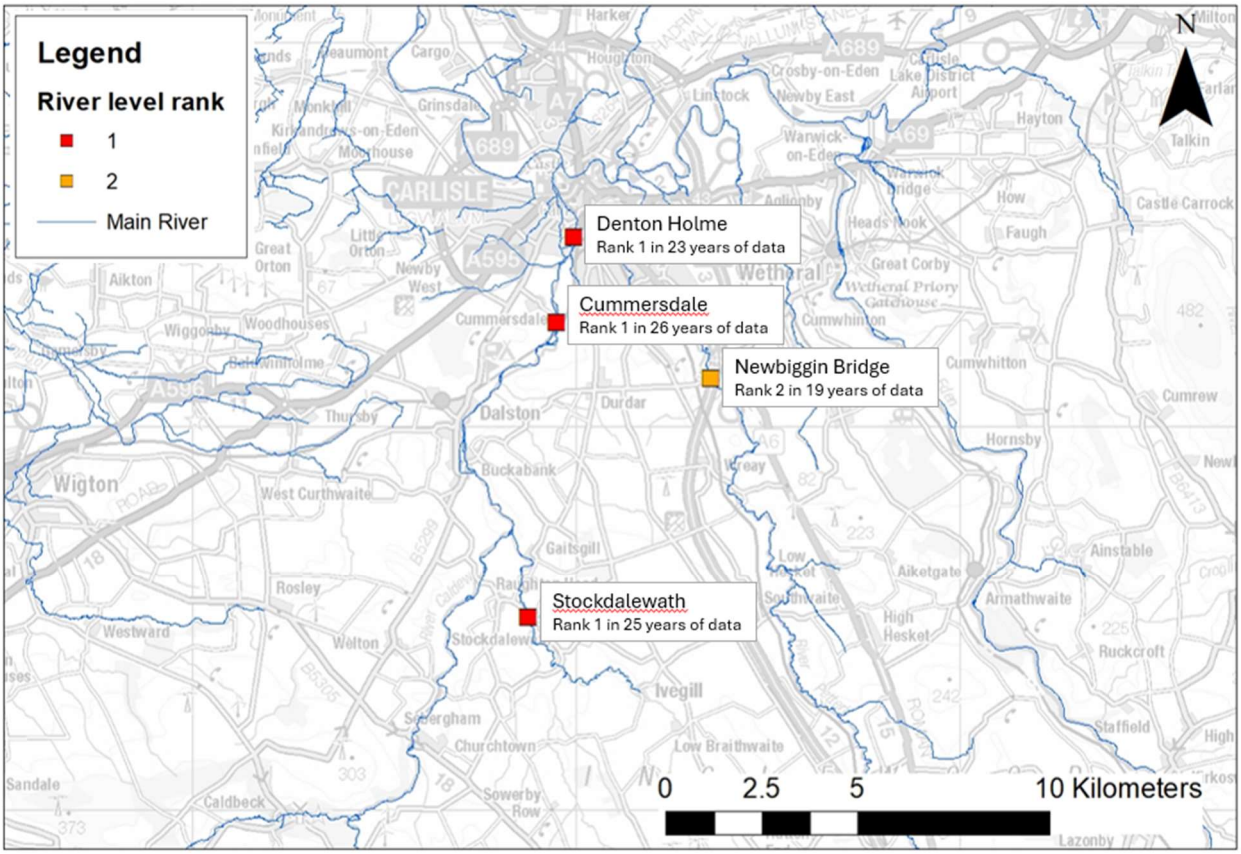


Figure 6: Ranking of the peak river level recorded during the May 2024 event at selected river gauges relative to other large events in the gauged record. A rank of 1 means this event was the largest on record.

One of the most challenging aspects of the flooding during the 22nd and 23rd May was the speed at which flood waters rose giving residents very little opportunity to take action to protect themselves and their property. Figure 7 shows that, at the river gauge in Stockdalewath, river levels took a little over 6 hours to rise approximately 3m to their peak; rising at an average rate of approximately 0.5m per hour. Figure 8 compares the river levels recorded at Stockdalewath during this event with those from the three other largest events on record (January 2005, May 2013 and December 2015). The events have been overlaid so that water levels in the river begin to rise at approximately the same time but the event durations and recorded levels have not been adjusted. It is notable how similar the rate of rise and overall profile of the May 2024 event and May 2013 events are; both of which were the results of relatively localised intense rainfall.

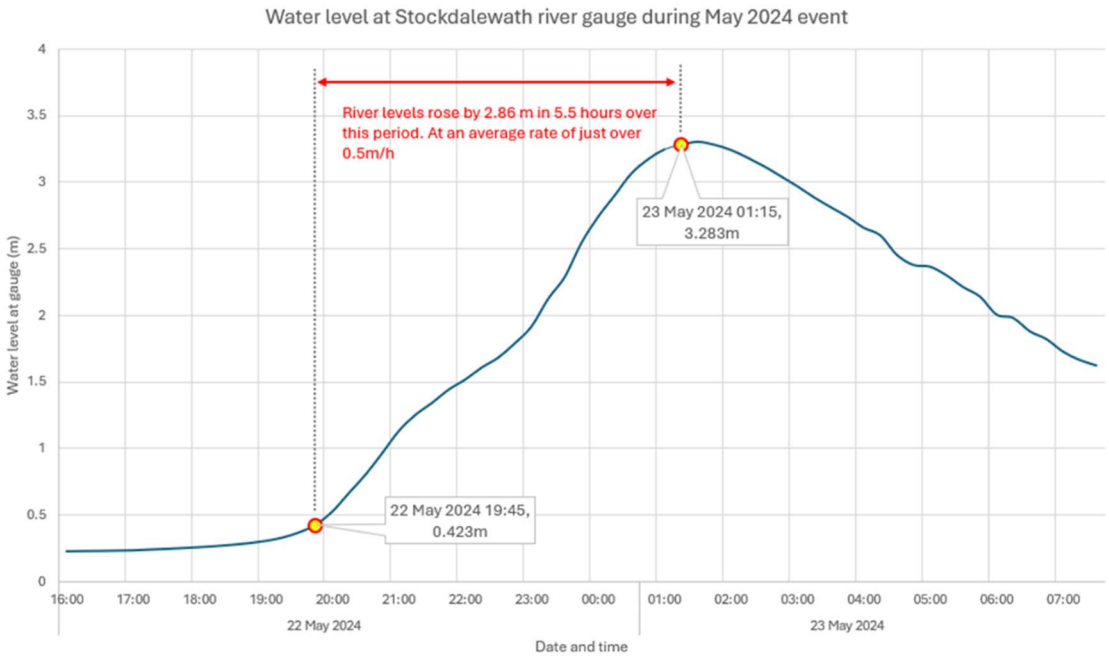


Figure 7: Average rate of rise at the Stockdalewath river gauge.

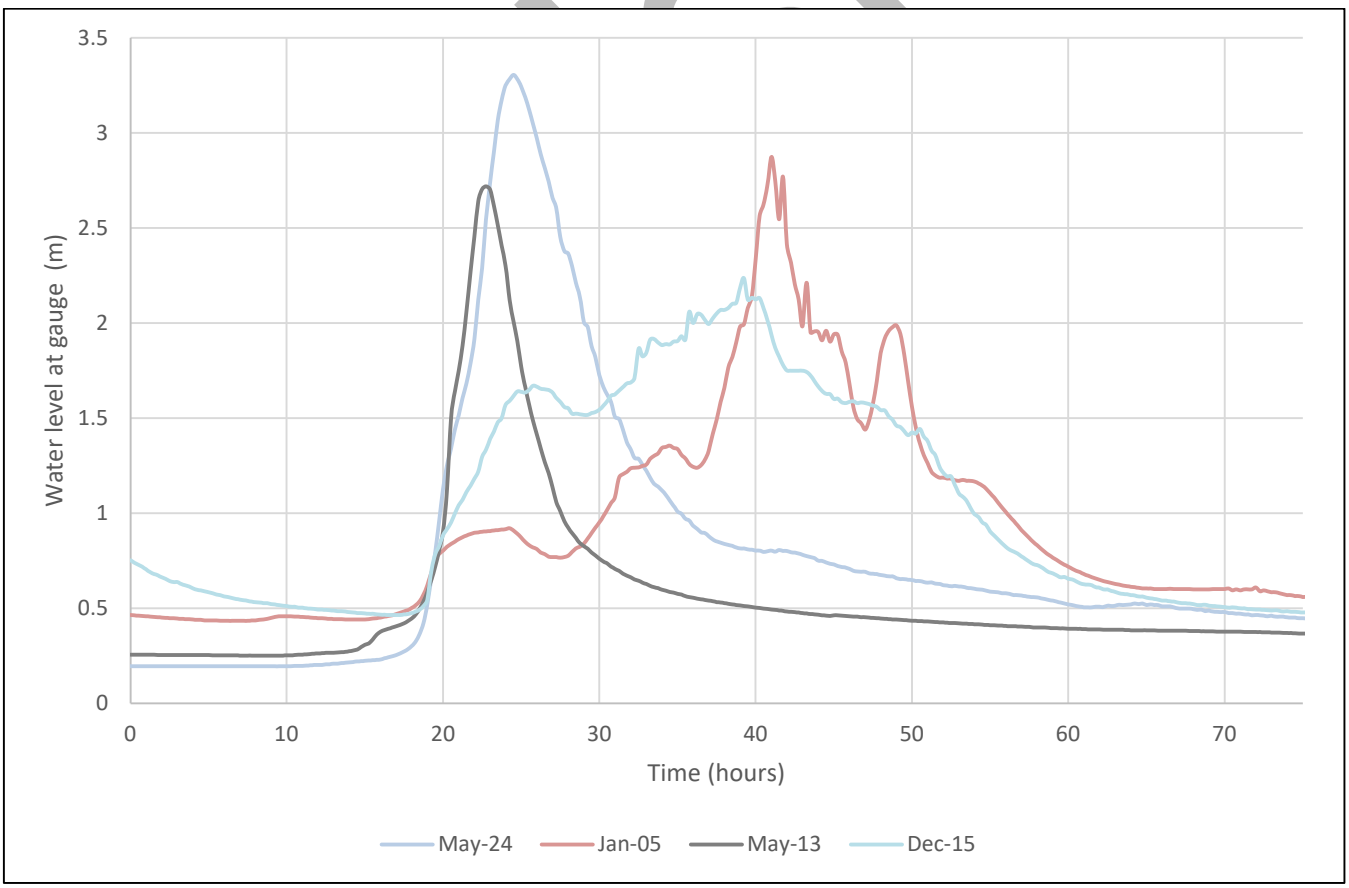


Figure 8: A comparison of the duration and rate of rise for the four largest flood events recorded at the Stockdalewath river gauge

3.4 River flows

River flow return periods have been assessed at the following gauging stations, the location of these gauging stations is shown above in Figure 6.

- Roe Beck at Stockdalewath
- River Caldew at Cummersdale
- River Petteril at Newbiggin

Table 2 provides current estimates of peak river flow (m^3/s) recorded at each site during the May 2024 event and estimates the rarity of this event, presented as an annual exceedance probability. The rarity estimates for river flow are very similar to those for rainfall accumulations, indicating that the flooding was driven by the extreme rainfall totals of the event.

	Roe Beck at Stockdalewath	Caldew at Cummersdale	Petteril at Newbiggin
Observed peak flow, May 2024 (m^3/s)	133	325	78
Annual exceedance probability	Between 0.5 and 0.2%	Between 1.33% and 1%	Between 4% and 2%

Table 2: Estimated peak river flow presented as annual exceedance probablility

The annual exceedance probabilities presented in Table 2 are based on current climatic conditions and are indicative of the likelihood of such an event happening in any given year over the next few years. However, climate change is already impacting our climate and in many places the frequency of large flood events. As we look further into the future climate change will mean that events such as this will occur more frequently. The impact that climate change will have on increasing the frequency and magnitude of large floods and the intensity of extreme rainfall is more extreme in Cumbria, and the River Eden catchment in particular, than in many other parts of the country.

"An assessment of the long term flood risk of areas can be accessed by using the following link **Check the long term flood risk for an area in England - GOV.UK**. Climate change predictions are now included in the assessment"

The peak flow recorded in Stockdalewath during the May 2024 is approximately 34 m^3/s larger than the January 2005 event and 43 m^3/s larger than the event in May of 2013; both of which caused widespread flooding. The next largest flow recorded at Stockdalewath occurred in December 2015 following Storm Desmond but is understood to have resulted in much less flooding in the Roe Beck catchment. This event had a peak flow of 73 m^3/s (or a little over half of the peak flow in May 2024). If around 75 m^3/s is therefore assumed to represent the onset of widespread flooding in and around Stockdalewath then it is possible to estimate the total volume of floodwater over this threshold passing through Stockdalewath during the May 2024 event. Figure 9 shows that in this simplified scenario this volume is 587,000m^3; in practice

attenuation flood flows to this extent would require significantly more storage than this in the upstream catchment. This volume is approximately 8 times the size of the flood storage basin upstream of Penrith on Thacka Beck or 62 times larger than the storage basin on Wiza Beck upstream of Wigton.

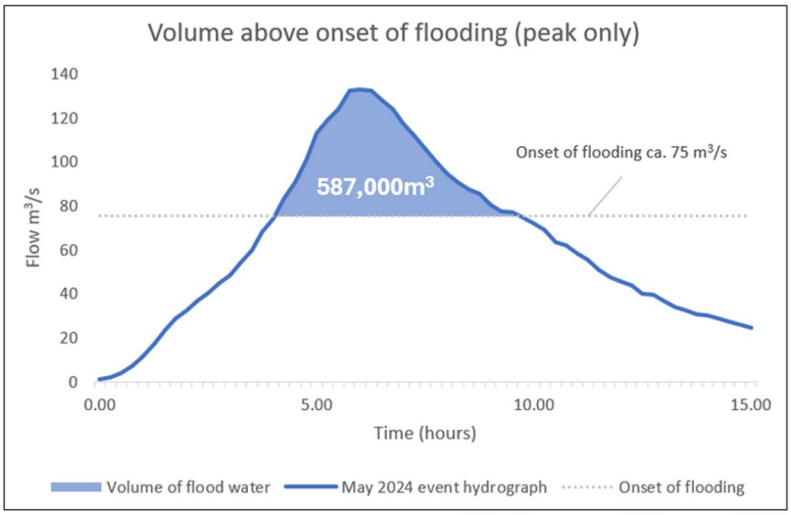


Figure 9: Volume of floodwater over the estimated onset of flooding during the May 2024 event

4. Investigation

This investigation has been compiled by the Environment Agency using information collected on the ground after the event, residents accounts, where available, and a post-flood event survey commissioned by the EA. This information was collected with the help of Cumberland Council. Post flood event walkovers were not able to confirm the flow routes and flood mechanisms for all properties as the event occurred in the middle of the night and not all residents were present when information was being collected.

This investigation divides the Roe Beck catchment into the individual communities and clusters of properties impacted by the May 2024 flood event and is presented from upstream to downstream, as shown in Figure 10. These are examined in further detail in the following sections of this report.

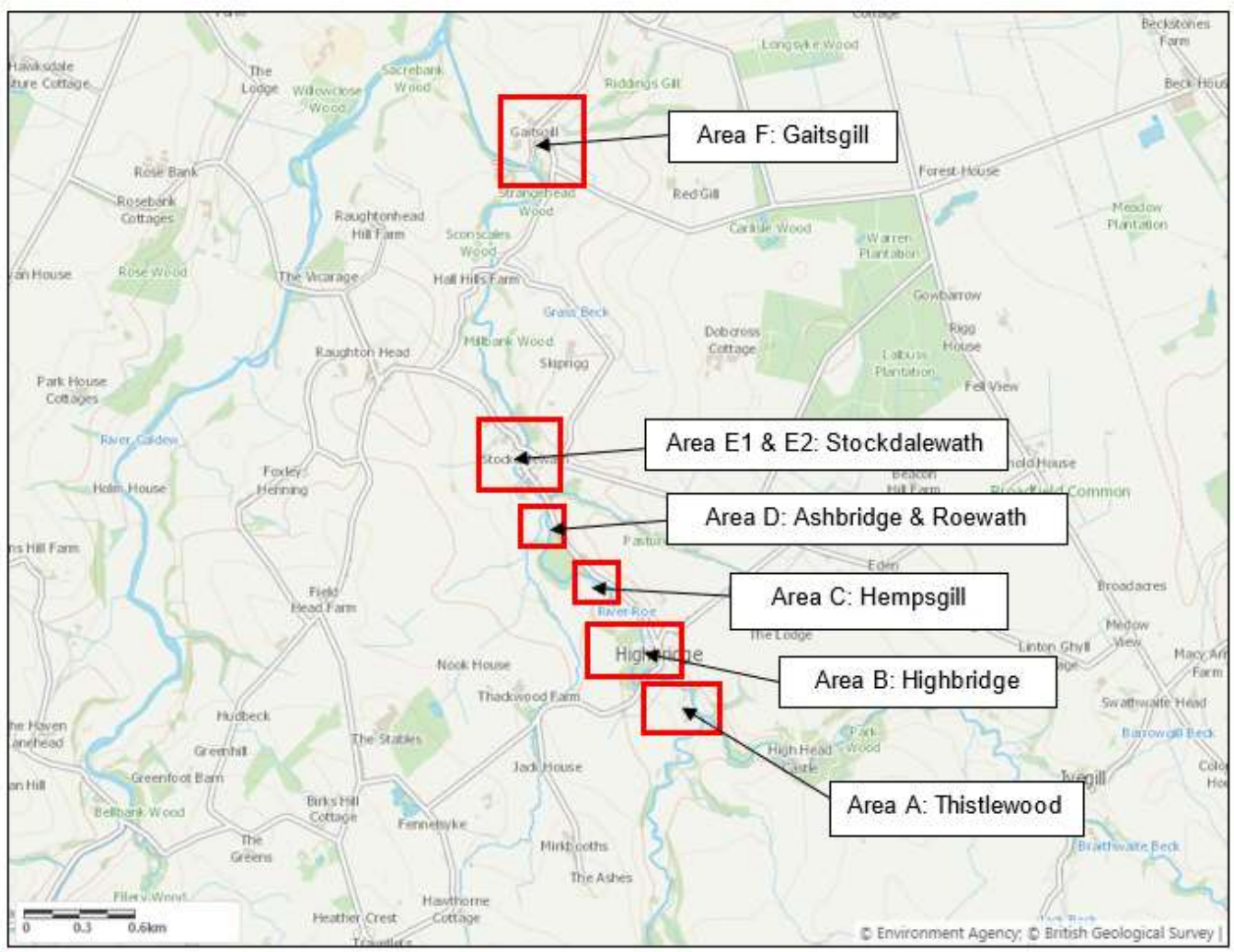


Figure 10: flood sub-areas

4.1 Timeline

Table 4 below shows the times of key events during the flooding event.

Date	Time	Event
21st May	10:30	Yellow rain warning issued by Met Office covering all of central and northern England as well as central and northern Wales.
	10:30	Yellow flood guidance statement issued covering all of central and northern England as well as central and northern Wales.
22nd May	05:57	Amber rain warning for by Met Office covering north Wales, north midlands, Cheshire and southern Lancashire. Cumbria was not included.
	10:32	Flood guidance statement remains yellow for Cumbria but has an amber area of concern covering N. Wales, Cheshire and Lancashire.
	13:15	Flood forecasting centre advised of potential for 100mm of rain in west Cumbria
	16:23	Flood Alert issued for Rivers Caldew and Petteril
	20:00	Flood water from the highway starts to impact No. 1 Highbridge Cottage (thought to be the first property to flood in the valley).
	22:50	Flood Warning issued for Stockdalewath
	23:40	Flood water starts to enter properties in Stockdalewath
	23:59	River level at the Stockdalewath gauge exceeds the peak level recorded in May 2013.
23rd May	00:10	Flood water starts to enter properties in Thistlewood and Highbridge.
	00:12	Severe Flood Warning issued for Stockdalewath
	00:13	River level at the Stockdalewath gauge exceeds the previous highest level on record (Jan 2005).
	00:40	Properties start flooding at Ashbridge.
	00:43	EA river level gauge in Stockdalewath stopped recording higher levels. The gauge continued to read a level of ca. 3.14m until 02:30 when river level started to fall below this level.
	01:00	Peak water levels observed by residents in Thistlewood
	01:30	Approximate time of flood peak at Stockdalewath.
	03:18	Emergency Alert issued by the UK Government.

Weather forecast
Flood warning
River levels
Reported flooding

Table 4: Timeline of events

4.2 Impact of the flood event

Up to 43 residential properties are thought to have suffered internal flooding from main river reaches of the Roe Beck (i.e. from Thistlewood to Stockdalewath). Many other properties suffered flooding and damage to the gardens, outbuildings and garages.

At Gaitsgill, up to 5 residential properties are thought to have suffered internal flooding from the ordinary watercourse, Pen Beck.

Access to communities from Thistlewood to Stockdalewath was severely disrupted, and in many cases impassible, during the peak of the event. The main road along the valley was impassible as were all of the smaller access bridges over the river, at least one of which partially collapsed.

The rapid onset of the flooding along with the fact that it occurred overnight and had not been forecast the previous day meant that many residents were unable to take measures to protect their property (such as moving cars or installing flood resilience measures). At a number of properties occupants were trapped until the flood waters receded.

The absence of mains gas in the valley means many homes are heated with oil and a significant number of private oil tanks were moved or tipped over by the flood water. Septic tanks are also common and in a number of cases were inundated with flood water, exacerbating the damage caused by the floods.

Area A: Thistlewood

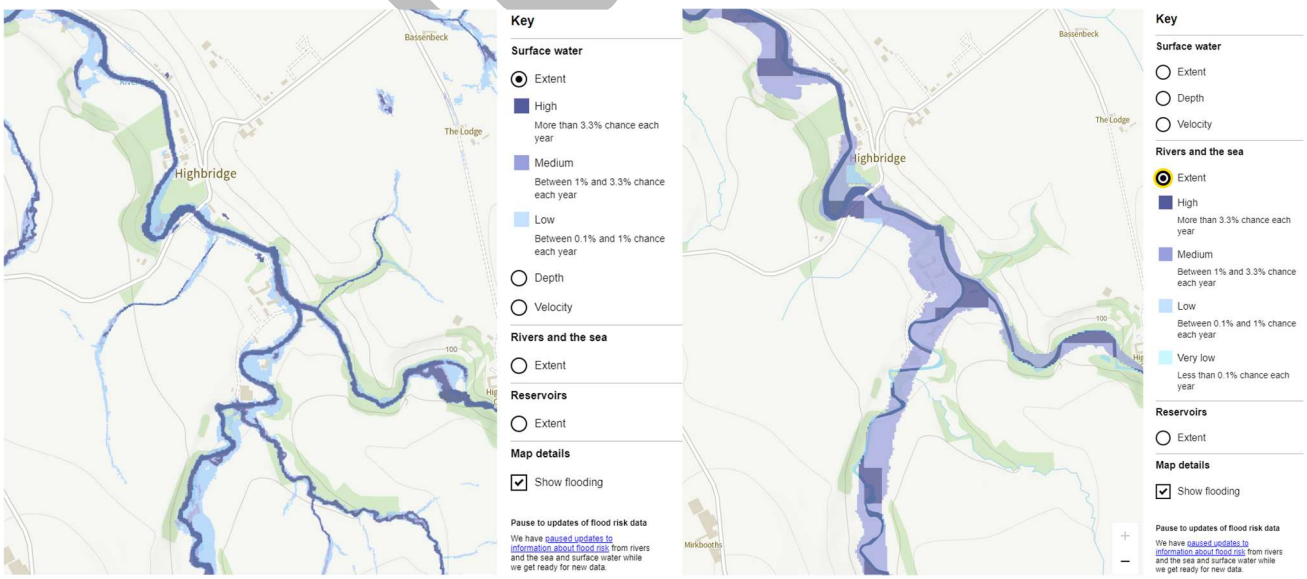


Figure 11: surface water flood risk mapping (left), fluvial flood risk mapping (right)

Thistlewood consists of a number of houses around a courtyard on the left-hand bank of the Roe Beck, Figure 12. The courtyard is adjacent to Thistlewood Tower, a Grade I listed building. There are also two large properties that sit on the right-hand bank of the Roe Beck, accessed via vehicle access bridges. One of the properties sits adjacent to the confluence of the Rivers Roe and Ive. Eleven properties are believed to have flooded at Thistlewood. Surface water flow routes were reported, though the main river is thought to have flooded at least five of the lower lying properties. Flooding depths varied depending on the floor level of the property and the mechanism by which they were flooded.

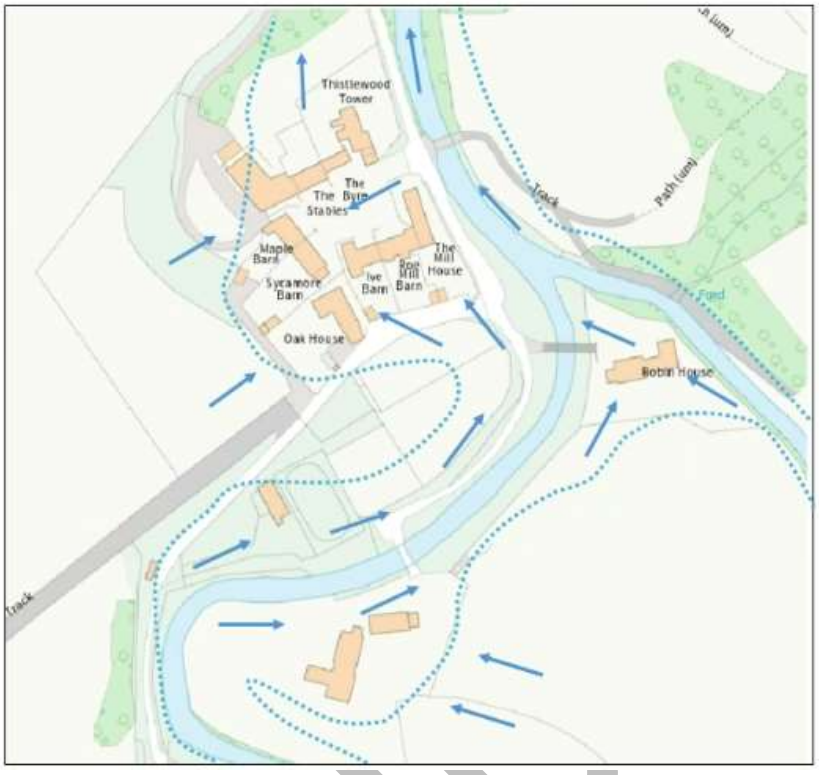


Figure 12: Flow routes at Thistlewood.

Properties were reported flooded all around Thistlewood courtyard, but the height of the wrack/water marks on properties nearest the Roe Beck suggests some of this may have been surface water related (i.e. those nearer the top of the courtyard may have flooded from surface water running off the fields behind the development).

Figure 13: Wrack/water marks on property (left), EA checking flood extent levels (right)

Figure 14: Water level shaded, at Thistlewood. Photo taken 27/05/2024

Figure 15: Farm access bridge. This access bridge was raised after the flood event in 2013 but the river was above the top railing in the May 24 flood.

Area B: Highbridge

Highbridge is a collection of properties that lie predominantly on the right-hand side of the Roe Beck, downstream of the road junction to Thistlewood at High Bridge. Highbridge House sits on the left-hand side of the channel and is accessed via a narrow vehicle access bridge. Numerous cottages were flooded by the river, above a depth of one foot (up to 2 feet in parts of the property nearest the river). Initial flooding was via a surface water flow route that inundates the highway gulley. A resident reported the levels were beyond those seen in living memory, and that the house had not flooded before. A property further downstream was also flooded. Flood water left the river channel and surrounded the property. The access bridge was inundated.

Figure 16: Flow routes at Highbridge

Figure 17: Bridge across Roe Beck. River flowed over the top of this bridge

Area C: Hempsgill

Hempsgill is approximately ¼ mile down the valley from Highbridge. It is located on the left-hand bank of the Roe Beck and sits close to the side of the river channel. There is a vehicle access bridge over to the properties. Having flooded in 2005 and 2013 flood defences were constructed, although these were overtopped in the May 2024 event. Flooding depths were significant with up to a metre deep internally and even deeper in places externally.

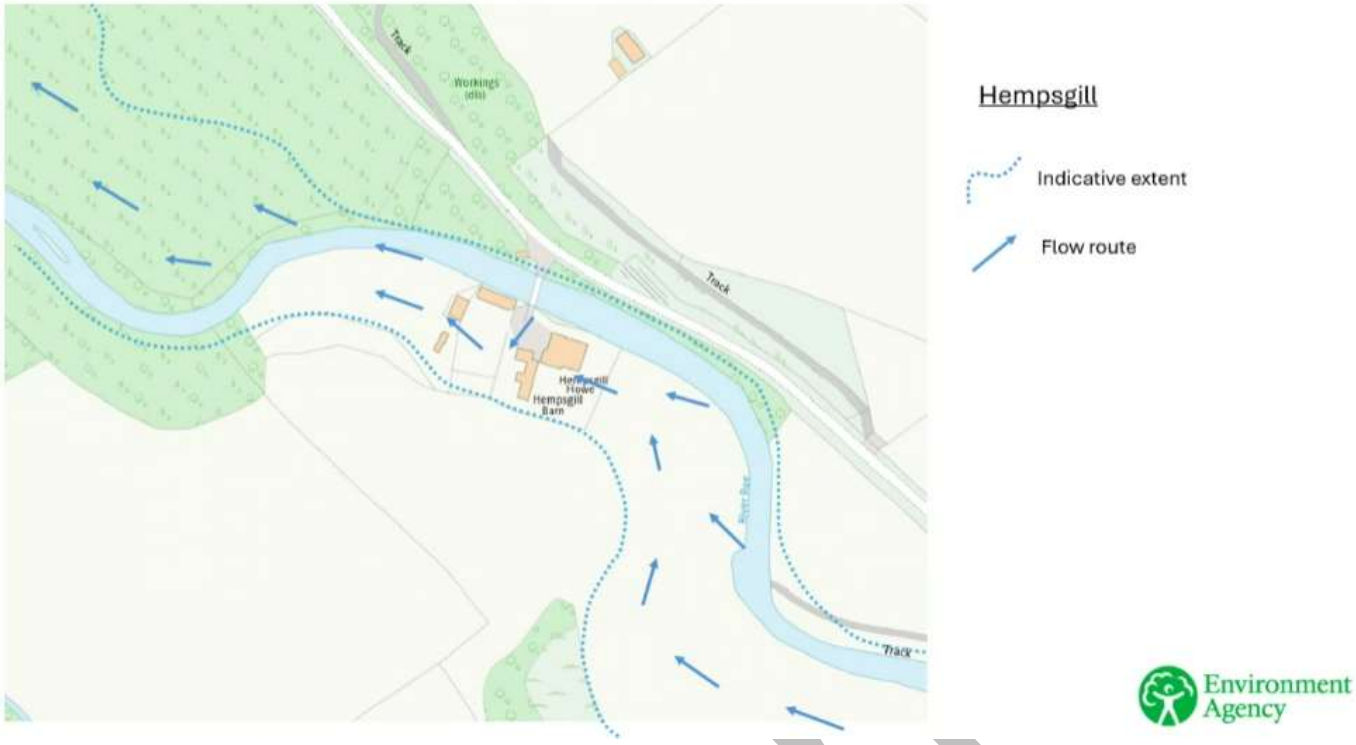


Figure 18: Flow routes at Hempsgill

Figure 19: Access bridge to Hempsgill. Flood level was above bridge deck.

Area D: Ashbridge & Roewath

Flood risk in this area is affected both by the Roe Beck and Fellican Beck but it is the Roe Beck that is understood to have had the greatest impact during this event.

Most of the affected properties are located on the west side of the Roe Beck and accessed by private access bridges. Both of these bridges were overtopped during the event meaning that residents were trapped in their properties. One of the private access bridges partially collapsed, Figure 21.

A private flood defence is understood to have been constructed at Ashbridge following the floods in 2013. This wall was overtopped during this event. The first property known to flood in this area started to have water entering it at 12:40am on 23rd May.

Figure 20: Flow routes at Ashbridge & Roewath

Figure 21: Partially collapsed access bridge at Roewath. Photo taken on 24/05/2024.

Area E1: Stockdalewath – upstream of the main road bridge

Upstream of the main road bridge in Stockdalewath there was severe flooding affecting properties and highways on both sides of the river. It is understood that as many as 12 properties in this area suffered internal flooding with further properties suffering external flooding as well as flooding of outbuildings and garages.

Flooding in this area was from Roe Beck which exceeded the capacity of the river channel and of the small access bridge which forms the sole access route for 5 properties on the west side of the river. Once the deck of the bridge had been overtopped there was no safe access or egress route for the residents of these properties until the floodwater had subsided. It is understood that the railings on the bridge had previously been removed in order to minimise its impact on upstream water levels. The bridge now has a relatively low profile and will have been unlikely to have had a significant influence on peak water levels.

The first properties known to have flooded in this area, on the western side (left hand bank) of the river, were inundated at approximately 12:30am as water came over a private flood wall constructed following the 2005 event.

As water levels in the river continued to rise flood water started to flow up the road on the eastern side of the bridge until it reached the road to Highbridge where it flowed north-west along both this road and Quarryfield.

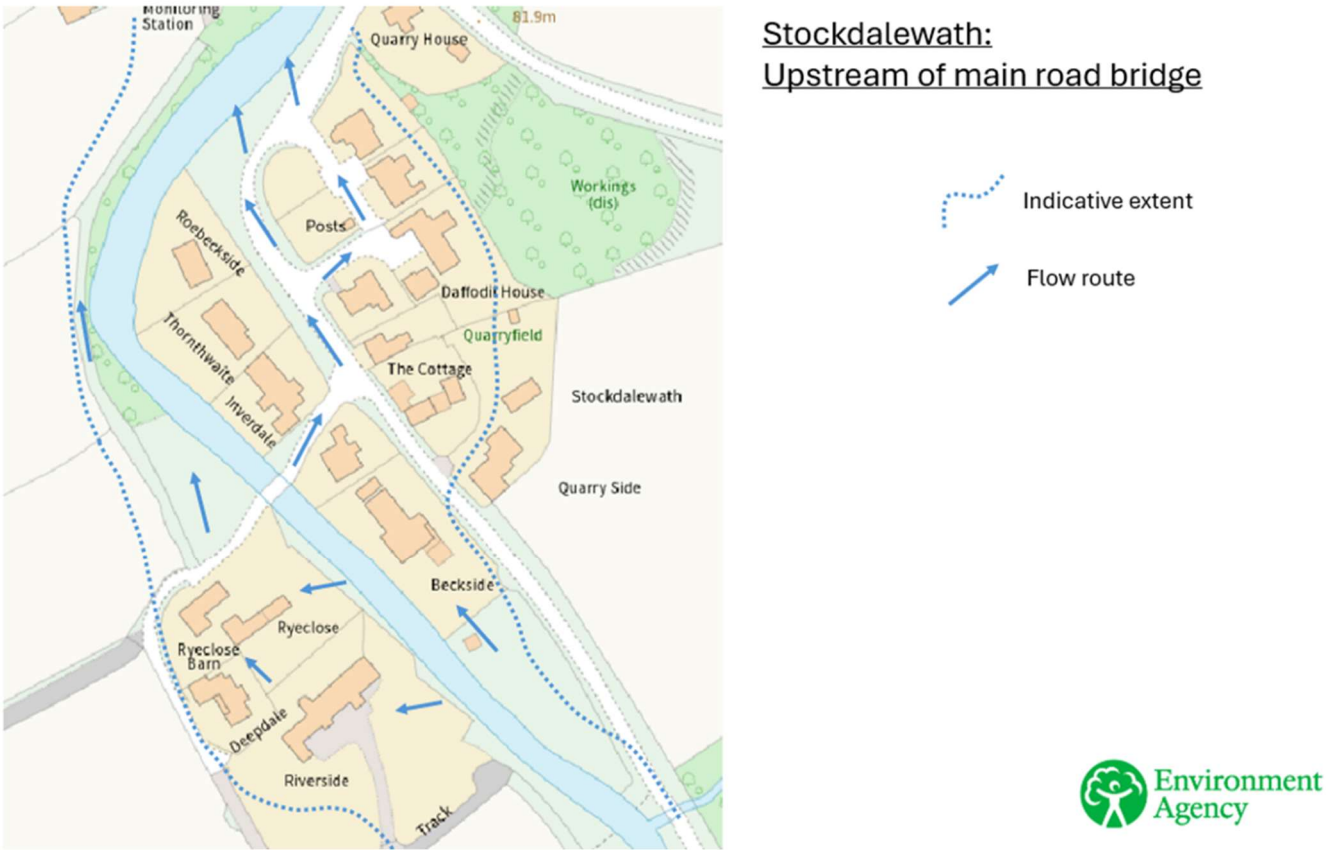


Figure 22: Flow routes upstream of main road bridge, Stockdalewath

Figure 23: Small road bridge in Stockdalewath. Photo taken 23/05/2024

Area E2: Stockdalewath – downstream of the main road bridge

Downstream of the main road bridge in Stockdalewath there was severe flooding which caused extensive damage due to both the depth and velocity of the floodwater. The majority of the floodwater came from Roe Beck; however, overland flow and flow from the stream entering the village from the west also contributed to the flooding.

Floodwater overtopping the left (western) bank of the Roe Beck flows onto the road past the kiosk of the Environment Agency river gauge. Some of this flow crossed the road and flows across the field opposite back towards the river. However, a significant volume of flood water was also conveyed north-west along the road and into the centre of the village leading to internal flooding of a number of homes as well as extensive damage to walls, driveways, gardens and property. The first property known to flood in this area was inundated at approximately 11:40pm on the 22nd May.

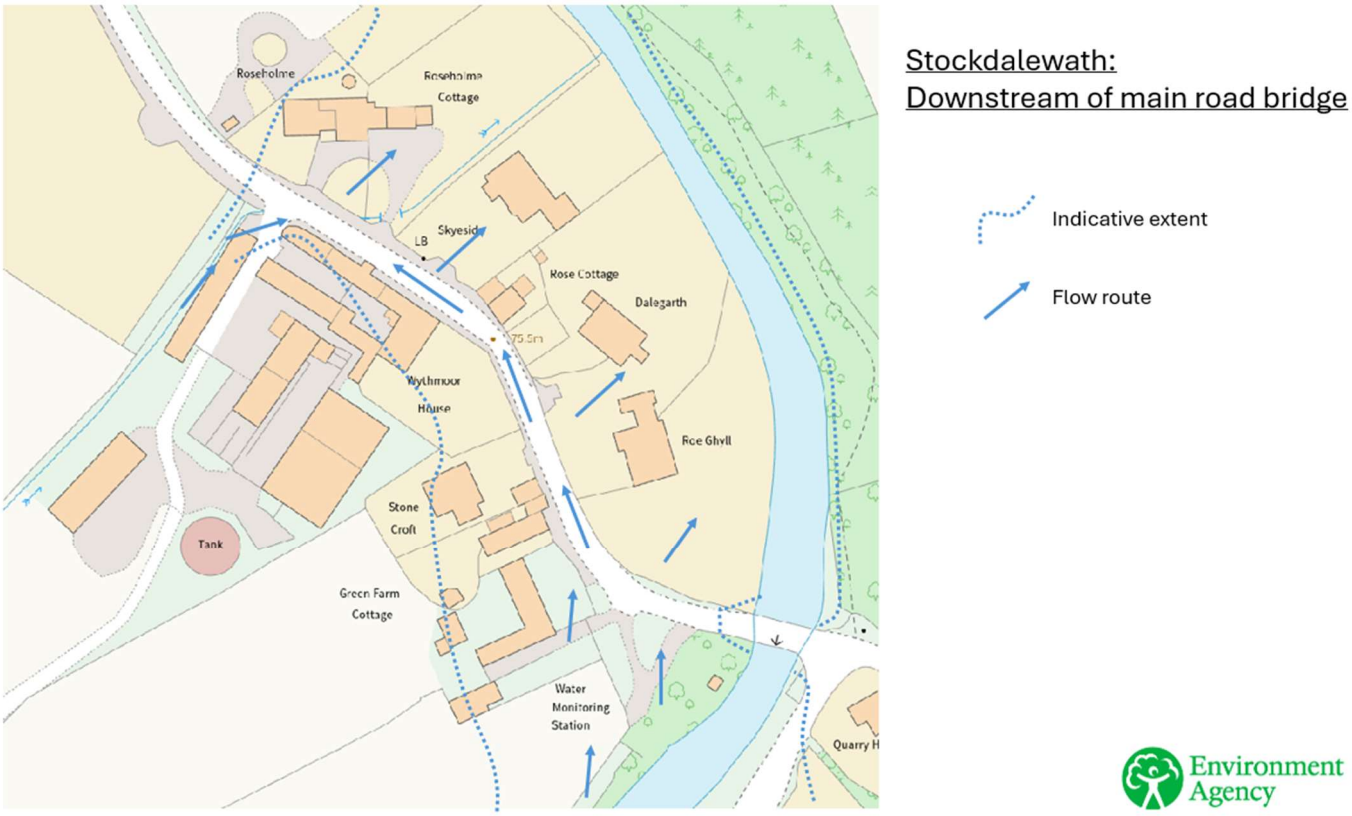


Figure **24**: Flow routes downstream of the main road bridge, Stockdalewath

Figure 25: Boundary wall and fence at Stockdalewath pushed over by flood water

Figure 26: Looking from the main road bridge west towards Stockdalewath. High water mark on the bridge approach is visible in the foreground. Damage to field boundaries (walls and fences) on both sides of the road.

Figure 27: The kiosk of the Environment Agency river gauge. High water mark is faintly visible on the external walls, this was far clearer inside the building.

Area F: Gaitsgill

The blue arrows denote the most intense flow routes towards Gaitsgill (Figure 28) and show where Pen Beck came out of bank in the gateway at Chapel House. The flows carried on and came out on to the road opposite Gaitsgill Hall and continued to flow down the road to the other affected properties downstream. It is believed that action was taken by a local resident using a loading shovel to keep the flows within the Pen Beck channel. This action most likely reduced the flooding impacts for the village.

Pen Beck crosses under Gaitsgill Bridge and meanders in front of and between properties before discharging into the river Roe to the south of Gaitsgill. It is this section of Pen Beck that has been adapted over the years with informal crossings and walls on the side of the watercourse that are becoming unstable. The metal footbridge outside the old Royal Oak Public House had gathered some debris but due to the topography of the village any issues below the bridge are unlikely to have had an impact on the flood source as there is almost 2 metres in height difference between the main spill point and the carriageway outside the Royal Oak.

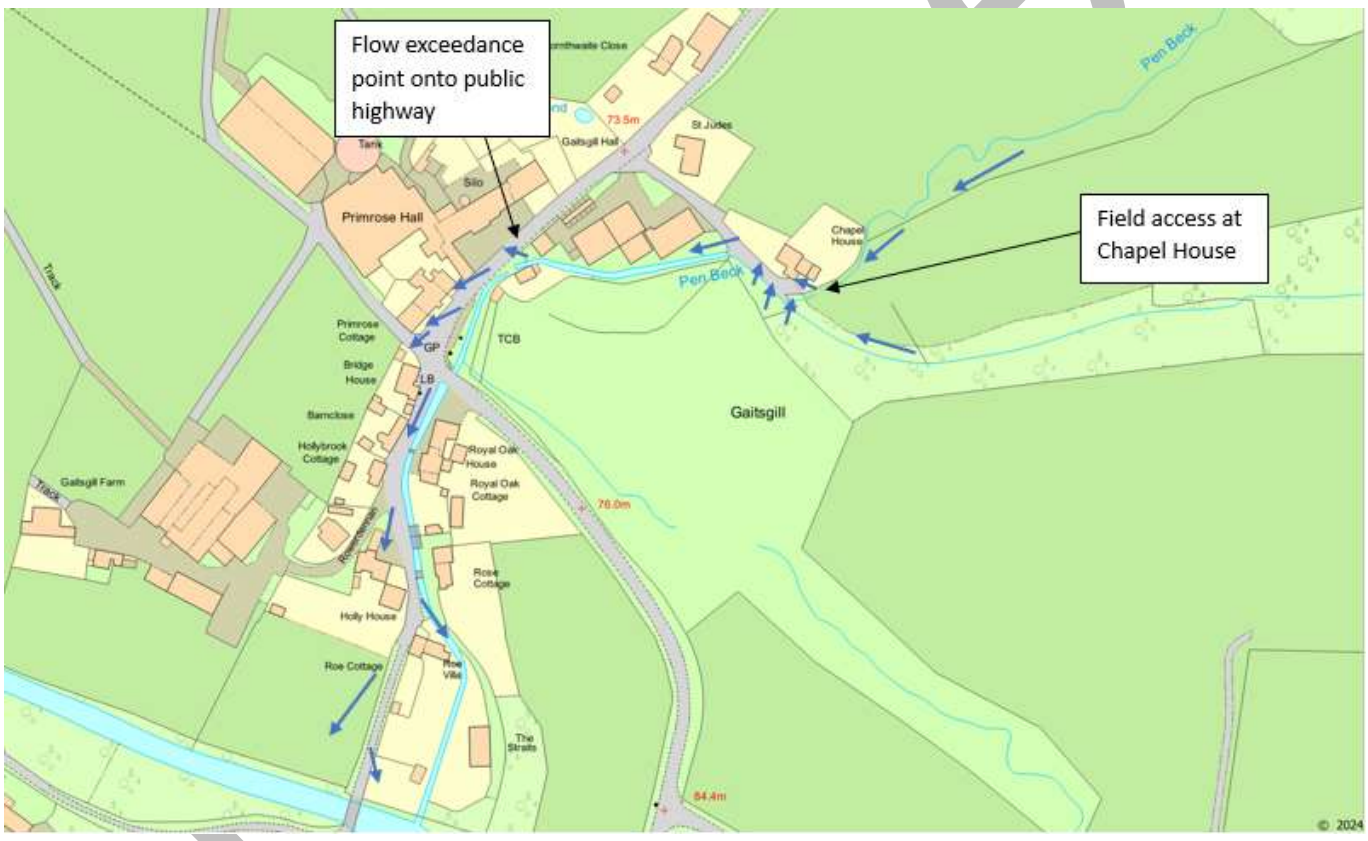


Figure 28: Flow routes at Gaitsgill

Figure 29: Field access gateway where flows exceeded from Pen Beck

Figure 30: Pen Beck along from Chapel House on the U1143 road. Main flood exceedance point in Gaitsgill.

Figure 31: Footbridge accumulating debris

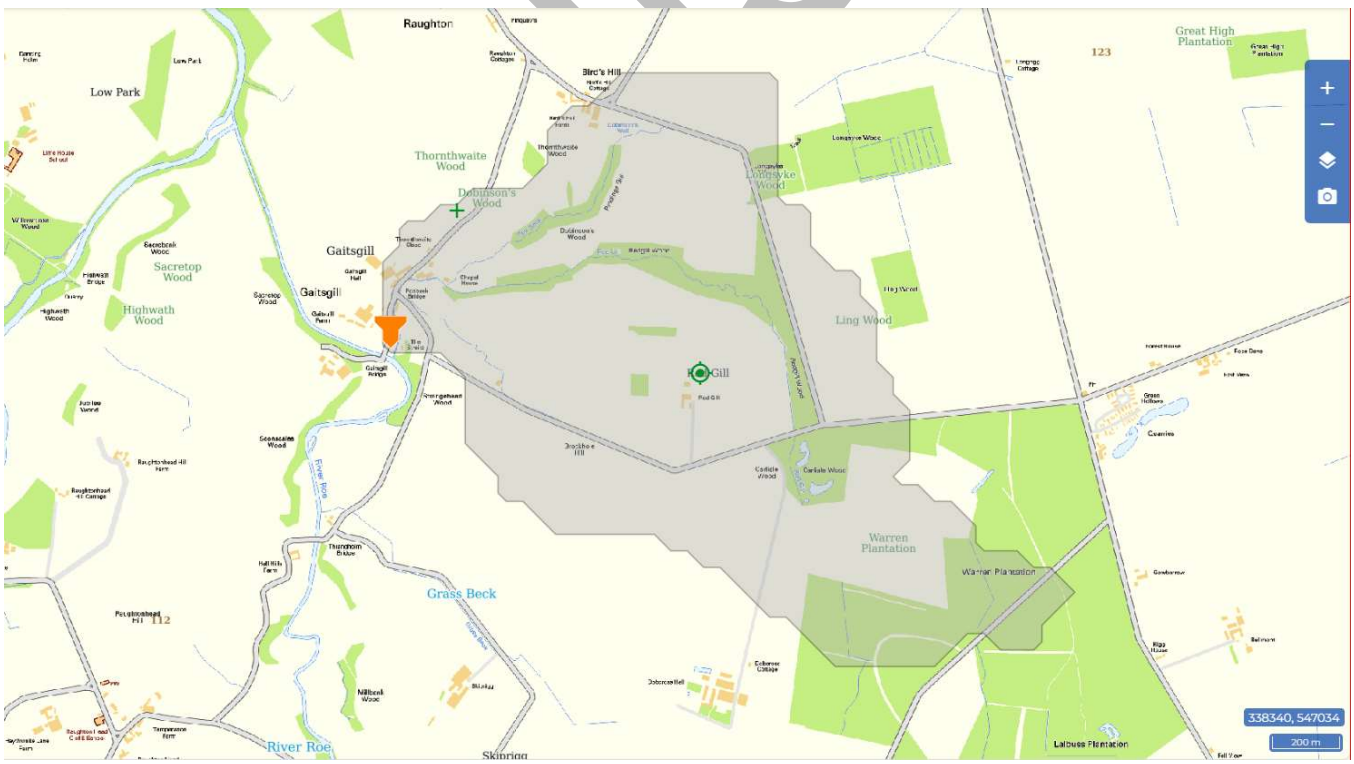


Figure 32: Gaitsgill catchment map

5. Flood incident response

The fire service was informed about the incident by the police and calls started coming into the fire service around 00:15 on 23rd May 24. Several people were stranded in properties. The fire service maintained contact with the occupants of certain properties where concern was greatest. The fire service had 2 fire appliances on the scene – one on either side of the bridge. The fire service advised people to stay in their homes. Nobody was evacuated by the fire services from their home in Stockdalewath.
The fire service had multiple flood incidents to attend that day.

6. Recommendations

What	How and Who	Status
Review of existing flood warning area's alarm trigger levels, extents (incorporate houses that have flooded but weren't previously in the flood risk area and encourage further resident sign up	Environment Agency and community	Active now
Update the river model for the Roe Beck, from Thistlewood to Stockdalewath, so that we better understand the present and future flood risk.	Environment Agency	Awaiting funding allocation
Commission Property Flood Resilience (PFR) surveys for properties in the valley. Initially looking at options for making properties more flood resilient, their eligibility for funding and the viability of successful delivery	Environment Agency	Active now
Investigate Local options around flow routing or small defences for groups of properties	Environment Agency and residents	Active now
Consider what options there might be to improve the means of communication in the valley so people can receive information and warnings etc.	All	Active now
Explore implications of improving the Pen Beck exceedance point onto the U1143. **Gaitsgill**	Cumberland Council	Add to future programme
Look into developing a possible flow route for the Chapel House area. **Gaitsgill**	Cumberland Council/landowners	Add to future programme
Ensure that riparian duties are carried out to prevent further issues in the future, stabilising channel sides and allowing natural flows in the channel. Your watercourse: rights and roles | Engage Environment Agency (engagementhq.com) **Gaitsgill**	Riparian owners	Highways carrying out riparian duties to the watercourse wall
Bespoke NFM modelling underway catchment scale.	Catchment wide model looking at where the large volumes needed could be accommodated: funded by CiFR	Active now
Seeking additional funding to help support work in the community and catchment	CiFR has secured some funding and is actively looking at more options	Active now
Discussing options with landowners regarding potential upstream NFM options etc.	CiFR has been looking at options where this may be possible with the kind assistance of landowners. To facilitate this CiFR is funding the work of a	Active now

	Natural England catchment sensitive farming advisor	
	Community/CIFR / council / Environment Agency	Active now

Appendices

Appendix 1: Glossary

Acronyms

AEP	Annual Exceedance Probability
ARI	Annual Recurrence Interval
AOD	Above Ordnance Datum
CC	Cumberland Council
EA	Environment Agency
FIAG	Flood Action Group
FWD	Flood Warnings Direct
FWMA	Flood and Water Management Act 2010
LDA	Land Drainage Act 1991
LLFA	Lead Local Flood Authority
LFRM	Local Flood Risk Management
MSfWG	Making Space for Water Group
RMA	Risk Management Authority
UU	United Utilities
WRA	Water Resources Act 1991

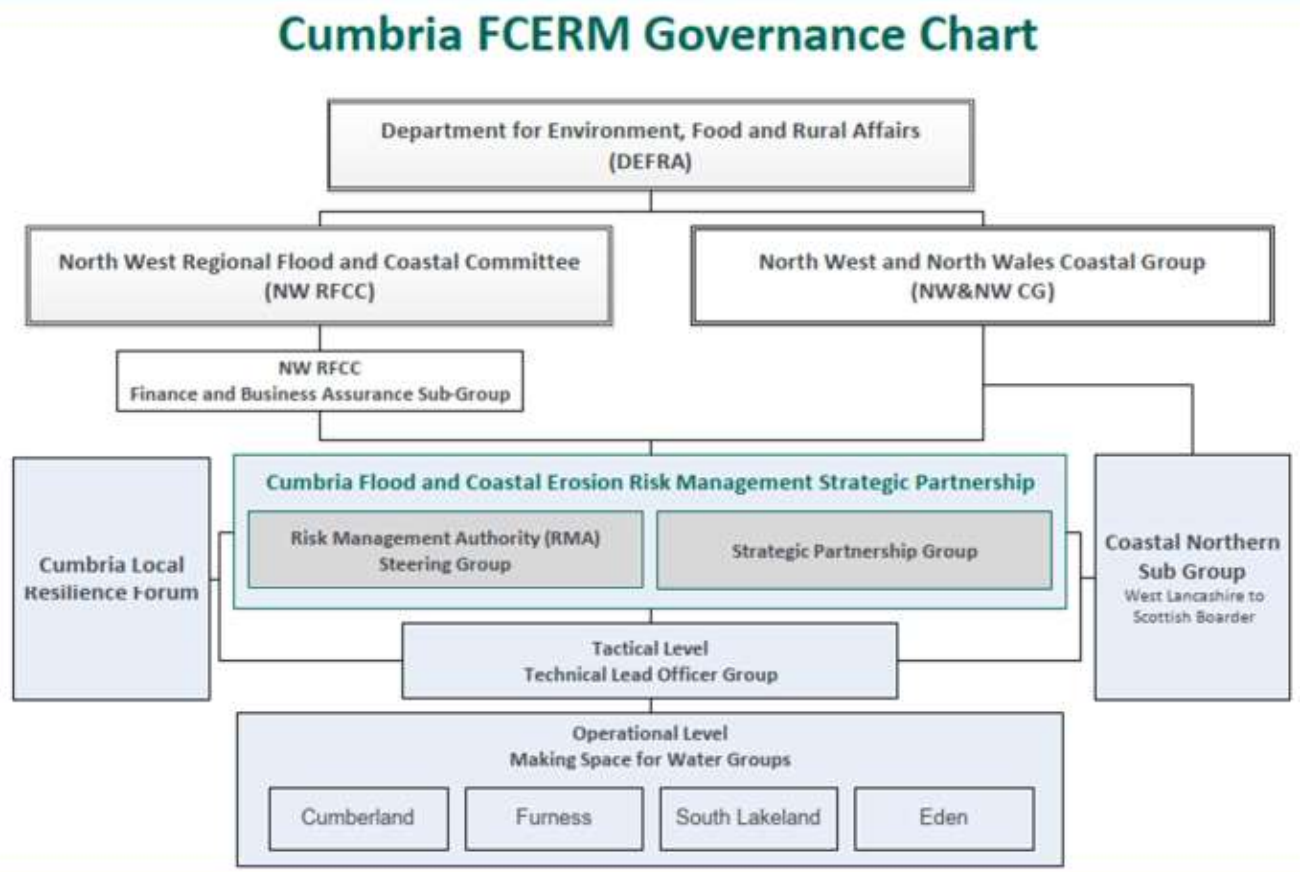
Term	Definition
Aquifer	A source of groundwater comprising water-bearing rock, sand or gravel capable of yielding significant quantities of water.
Annual Exceedance Probability	The AEP describes the likelihood of a specified flow rate (or volume of water with specified duration) being exceeded within a given year.
Attenuation	In the context of this report - the storing of water to reduce peak discharge of water.
Catchment Flood Management Plan	A high-level planning strategy through which the EA works with their key decision makers within a river catchment to identify and agree policies to secure the long-term sustainable management of flood risk.
Culvert	A channel or pipe that carries water below the level of the ground.
De facto flood defence	A feature or structure that may provide an informal flood defence benefit but is not otherwise designed or maintained by the Environment Agency.
Flood defence	Infrastructure used to protect an area against floods as floodwalls and embankments; they are designed to a specific standard of protection (design standard).
Floodplain	Area adjacent to river, coast or estuary that is naturally susceptible to flooding.
Flood resilience	Measures that minimise water ingress and promotes fast drying and easy cleaning, to prevent any permanent damage.
Flood risk	The level of flood risk is the product of the frequency or likelihood of the flood events and their consequences (such as loss, damage, harm, distress and disruption).

Flood Risk Regulations	Transposition of the EU Floods Directive into UK law. The EU Floods Directive is a piece of European Community (EC) legislation to specifically address flood risk by prescribing a common framework for its measurement and management.
Flood and Water Management Act	Part of the UK Government's response to Sir Michael Pitt's Report on the Summer 2007 floods, the aim of which is to clarify the legislative framework for managing surface water flood risk in England.
Flood storage	A temporary area that stores excess runoff or river flow often ponds or reservoirs.
Flood Zone	Flood Zones are defined in the NPPF Technical Guidance based on the probability of river and sea flooding, ignoring the presence of existing defences.
Flood Zone 1	Low probability of fluvial flooding. Probability of fluvial flooding is < 0.1%.
Flood Zone 2	Medium probability of fluvial flooding. Probability of fluvial flooding is 0.1 – 1%. Probability of tidal flooding is 0.1 – 0.5 %.
Flood Zone 3a	High probability of fluvial flooding. Probability of fluvial flooding is 1% (1 in 100 years) or greater. Probability of tidal flooding is 0.5%(1 in 200 years)
Flood Zone 3b	Functional floodplain. High probability of fluvial flooding. Probability of fluvial flooding is >5%.
Fluvial	Relating to the actions, processes and behaviour of a water course (river or stream).
Fluvial flooding	Flooding by a river or a watercourse.
Freeboard	Height of flood defence crest level (or building level) above designed water level.
Functional floodplain	Land where water has to flow or be stored in times of flood.
Groundwater	Water that is in the ground, this is usually referring to water in the saturated zone below the water table.
Inundation	Flooding.
Lead Local Flood Authority	As defined by the FWMA, in relation to an area in England, this means the unitary authority or where there is no unitary authority, the county council for the area.
Main river	Watercourse defined on a 'Main River Map' designated by DEFRA. The EA has permissive powers to carry out flood defence works, maintenance and operational activities for Main Rivers only. Also see "ordinary watercourse".
Mitigation measure	An element of development design which may be used to manage flood risk or avoid an increase in flood risk elsewhere.
Ordinary watercourse	The LLFA and Internal Drainage Boards have permissive powers to carry out flood risk management work, maintenance and operational activities. Also see "Main river".
Overland flow	Flooding caused when intense rainfall exceeds the capacity of the drainage systems or when, during prolonged periods of wet weather, the soil is so saturated such that it cannot accept any more water.
Residual flood risk	The remaining flood risk after risk reduction measures have been taken into account.
Return period	The average time period between rainfall or flood events with the same intensity and effect.
River catchment	The areas drained by a river.

Sewer flooding	Flooding caused by a blockage or overflowing in a sewer or urban drainage system.
Sustainability	To preserve /maintain a state or process for future generations.
Sustainable drainage system	Methods of management practices and control structures that are designed to drain surface water in a more sustainable manner than some conventional techniques.
Sustainable development	Development that meets the needs of the present without compromising the ability of future generations meeting their own needs.
Sustainable Flood Risk Management	Sustainable Flood Risk Management promotes a catchment wide approach to flooding that uses natural processes and systems (such as floodplains and wetlands) to slow down and store water.
Topographic survey	A survey of ground levels.
Tributary	A body of water, flowing into a larger body of water, such as a smaller stream joining a larger stream.
Watercourse	All rivers, streams, drainage ditches (i.e. ditches with outfalls and capacity to convey flow), drains, cuts, culverts and dykes that carry water.
Wrack marks	An accumulation of debris usually marking the high water line.
1 in 100 year event	An event that on average will occur once every 100 years. Also expressed as an event, which has a 1% probability of occurring in any one year or 1% AEP.
1 in 100 year design standard	Flood defence that is designed for an event, which has an annual probability of 1%. In events more severe than this the defence would be expected to be overwhelmed and for flooding to occur.

Appendix 2: Summary of relevant legislation and the remit of Flood Risk Management Authorities

The table below shows the governance chart for cumbria's risk management authorities.



Cumbria governance chart

The Flood Risk Regulations 1999 and the Flood and Water Management Act 2010 (the Act) have established Cumberland Council (CC) as the Lead Local Flood Authority (LLFA) for Cumbria. This has placed various responsibilities on CC including Section 19 of the Act which states:

Section 19

(1) On becoming aware of a flood in its area, a lead local flood authority must, to the extent that it considers it necessary or appropriate, investigate—

(a) which risk management authorities have relevant flood risk management functions, and

(b) whether each of those risk management authorities has exercised, or is proposing to exercise, those functions in response to the flood.

(2) Where an authority carries out an investigation under subsection (1) it must—

(a) publish the results of its investigation, and

(b) notify any relevant risk management authorities.

A '*Risk Management Authority' (RMA)* means:

(a) the Environment Agency,
(b) a lead local flood authority,
(c) a district council for an area for which there is no unitary authority,
(d) an internal drainage board,
(e) a water company, and
(f) a highway authority.

The table below summarises the relevant Risk Management Authority and details the various local source of flooding that they will take a lead on.

Flood Source	Environment Agency	Lead Local Flood Authority	Water Company	Highway Authority
RIVERS				
Main river				
Ordinary watercourse				
SURFACE RUNOFF				
Surface water				
Surface water on the highway				
OTHER				
Sewer flooding				
The sea				
Groundwater				
Reservoirs				

The following information provides a summary of each Risk Management Authority's roles and responsibilities in relation to flood reporting and investigation.

Government – DEFRA develop national policies to form the basis of the Environment Agency's and Cumberland Council's work relating to flood risk.

Environment Agency (EA) – has a strategic overview of all sources of flooding and coastal erosion as defined in the Act. As part of its role concerning flood investigations this requires providing evidence and advice to support other risk management authorities. The EA also collates and reviews assessments, maps and plans for local flood risk management (normally undertaken by LLFA).

Lead Local Flood Authorities (LLFAs) – Cumberland Council is the LLFA for Cumbria (excluding Carlisle, Allerdale and Copeland areas). Part of their role requires them to investigate significant local flooding incidents and publish the results of such investigations. LLFAs have a duty to determine which risk management authority has relevant powers to investigate flood

incidents to help understand how they happened, and whether those authorities have or intend to exercise their powers. LLFAs work in partnership with communities and flood risk management authorities to maximise knowledge of flood risk to all involved. This function is carried out at Cumberland Council by the Flood and Development Management Team.

Water and Sewerage Companies – manage the risk of flooding to water supply, sewerage facilities and the risk to others from the failure of their infrastructure. They make sure their systems have the appropriate level of resilience to flooding and where frequent and severe flooding occurs, they are required to address this through their capital investment plans. It should also be noted that following the Transfer of Private Sewers Regulations 2011 water and sewerage companies are responsible for a larger number of sewers than prior to the regulation.

Highway Authorities – have the lead responsibility for providing and managing highway drainage and certain roadside ditches that they have created under the Highways Act 1980. The owners of land adjoining a highway also have a common-law duty to maintain ditches to prevent them causing a nuisance to road users.

Flood risk in Cumbria is managed through the Making Space for Water process which involves the cooperation and regular meetings of the Environment Agency, United Utilities, District/Borough Councils and Cumberland Council's Highway and Local Flood Risk Management (LFRM) teams to develop processes and deliver schemes to minimise flood risk. The Making Space for Water Groups (MSfWG) meet approximately 4 times per year to cooperate and work together to reduce the flood risk to vulnerable communities, including those areas identified in this report, by undertaking specific actions. Cumberland Council, as LLFA, has a responsibility to oversee the delivery of these actions.

Where minor works or 'quick-win' schemes can be identified, these will be prioritised and, subject to available funding and resources, will be carried out as soon as possible. Any major works requiring capital investment will be considered through the Environment Agency's capital programme or a partners own capital investment process.

Flood Action Groups (FlAG) are usually formed by local residents who wish to work together to resolve flooding in their area. The FlAGs are often supported by either Cumberland Council or the EA and provide a useful mechanism for residents to forward information to the MSfWG.

Appendix 3: CIFR Update

Stockdalewath Update – September 2024

Stockdalewath, and other nearby communities including Highbridge and Gaitsgill, suffered significant flooding overnight on 22/23 May 2024. This flood event means that we are reviewing the work we plan to undertake in the area.

Works completed to date

- Farm visits have been undertaken and potential locations for NFM, with monitoring of water quality, have been identified.
- Conversations are underway with dairy companies who buy from farms in the area to explore their interest in investing in NFM interventions, which will help them to meet their water quality targets.
- The team have met with the Flood Action Group to explain the work that CiFR had planned.
- CiFR have worked with Cumberland Council's Community Development Team and other partners to arrange support, with 4 drop-in sessions held in Primrose Hall following the recent flooding.
- CiFR have worked with partners to distribute an update newsletter to residents and Local Members appended to this update.
- A drop-in session has been organised to look at the draft Flood Investigation Report, produced by the Lead Local Flood Authority teams in both Councils, on 25th September 2024.
- Funding has been secured for additional work in the Stockdalewath area, both to improve warnings and to reduce the flood risk.
- CiFR have procured the support of an independent facilitator who will help to run workshops with the local community to look at flood risk, mitigation measures and climate change impacts.

Next Steps

- Attend the drop-in session arranged for 25th September 2024.
- Arrange workshops with the local community.

Future works

- Modelling to be finalised showing where NFM would be most beneficial in the Roe and Ive catchment.
- Grant prospectus to be published detailing the interventions to be delivered when landowner agreement is secured.

Challenges / Opportunities

- There is a feeling locally that flood risk management authorities have not delivered fast enough on previous commitments to find ways to reduce the flood risk to the community.

Further information

A further update will be provided following the next Review Group meeting late December / early January 2025.

The project team can be contacted via CIFR@westmorlandandfurness.gov.uk.

Appendix 4: Useful contacts and links

Cumberland Council (Local Flood Risk Management):
lfrm@cumberland.gov.uk, www.cumberland.gov.uk

Cumberland Council (Highways):
https://www.cumberland.gov.uk/parking-roads-and-transport/streets-roads-and-pavements/road-maintenance-closures-and-improvements/report-problem-street-or-road
tel: 0300 373 3736
Out of hours emergencies should be reported via the Police on 101

Westmorland and Furness Council (Flood and Coastal Risk Management):
LLFA@westmorlandandfurness.gov.uk, www.westmorlandandfurness.gov.uk

Westmorland and Furness Council (Highways):
https://www.westmorlandandfurness.gov.uk/parking-streets-and-transport/streets-roads-and-pavements
tel: 0300 373 3306
Out of hours emergencies should be reported via the Police on 101

United Utilities: www.unitedutilities.com, tel: 0845 746 2200

Flood and Water Management Act 2010:
http://www.legislation.gov.uk/ukpga/2010/29/contents

Water Resources Act 1991:
http://www.legislation.gov.uk/all?title=water%20resources%20act

Land Drainage Act:
http://www.legislation.gov.uk/all?title=land%20drainage%20act

Highways Act 1980:
http://www.legislation.gov.uk/all?title=highways%20act

EA – Owning a Watercourse Guidance: A guide to the rights and responsibilities of riverside occupation:
http://www.environment-agency.gov.uk/homeandleisure/floods/31626.aspx

EA – 'Prepare your property for flooding' how to reduce flood damage including flood protection products and services:
http://www.environment-agency.gov.uk/homeandleisure/floods/31644.aspx

EA - Hydrology Data Explorer. This is a data portal enabling you to access live and historic hydrometric and water quality data from the Environment Agency.