

# Brigham

## Flood Investigation Report



## Flood Event 3 - 5 December 2015

This flood investigation report has been produced by Cumbria County Council as a Lead Local Flood Authority under Section 19 of the Flood and Water Management Act 2010.

Version	Undertaken by	Reviewed by	Approved by	Date
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# Executive Summary

Brigham experienced severe flooding on the evening of the 3rd December 2015. As a precursor of Storm Desmond, a short period of very intense rainfall, falling on an already saturated catchment, fell across north-western Cumbria. This short duration intense rainstorm led to a rapid and extreme response in small watercourses and surface water systems and flows.

In response to the flood event, this Flood Investigation Report has been completed by Cumbria County Council as the Lead Local Flood Authority, under the duties as set out in Section 19 of the Flood and Water Management Act 2010. This report provides details on the flooding that occurred in Brigham on the 3rd of December 2015, and has used a range of data collected from affected residents, site visits, and data collected by observers, along with rainfall telemetry during the flood event.

Within Brigham, small watercourses became inundated with roads becoming major flow routes and any failures in infrastructure quickly becoming compromised this resulting in the internal flooding of six properties as well as the school and businesses located in the quarry area. Cumbria County Council as Lead Local Flood Authority has prepared this report with the assistance of other Flood Risk Management Authorities as it considers necessary to do so under Section 19 of the Flood and Water Management Act 2010.

We have also provided 9 summary recommended actions.

Any additional information that residents and others can provide to Cumbria County Council to help develop our understanding of the flooding is welcomed. A lot of information has already been provided, much of which has been used to inform this report. The scale of this report means that not every piece of information can be incorporated into the document. Any additional information should be provided to;

<http://www.cumbria.gov.uk/planning-environment/flooding/floodriskassessment.asp>

## Flooding History

Brigham has had sporadic flooding over the years. The majority of the areas listed in this report have had flooding issues previously. Pumping for some of the locations is essential at different times of the year to prevent flooding.

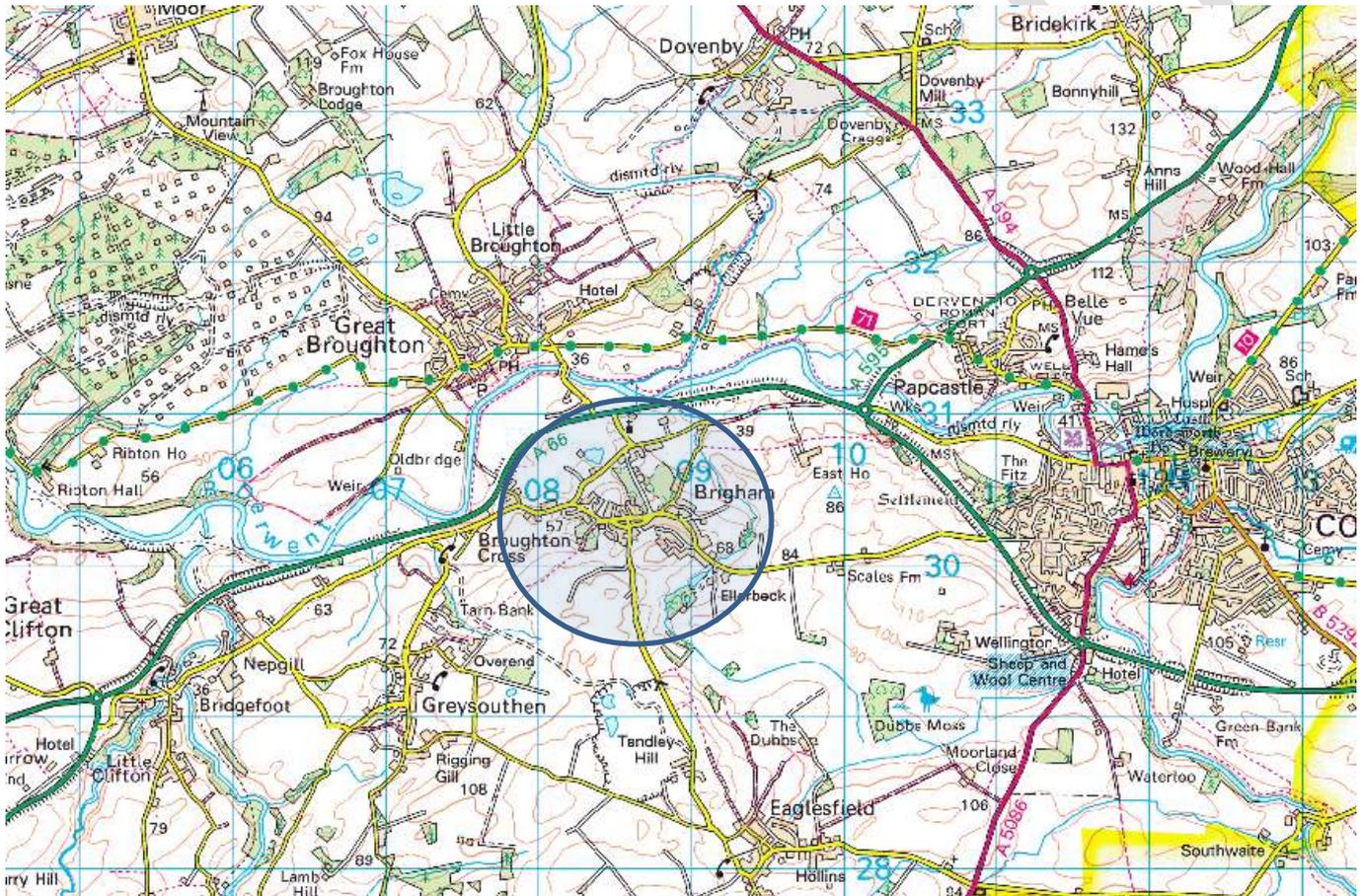
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# Event Background

## Flooding Incident

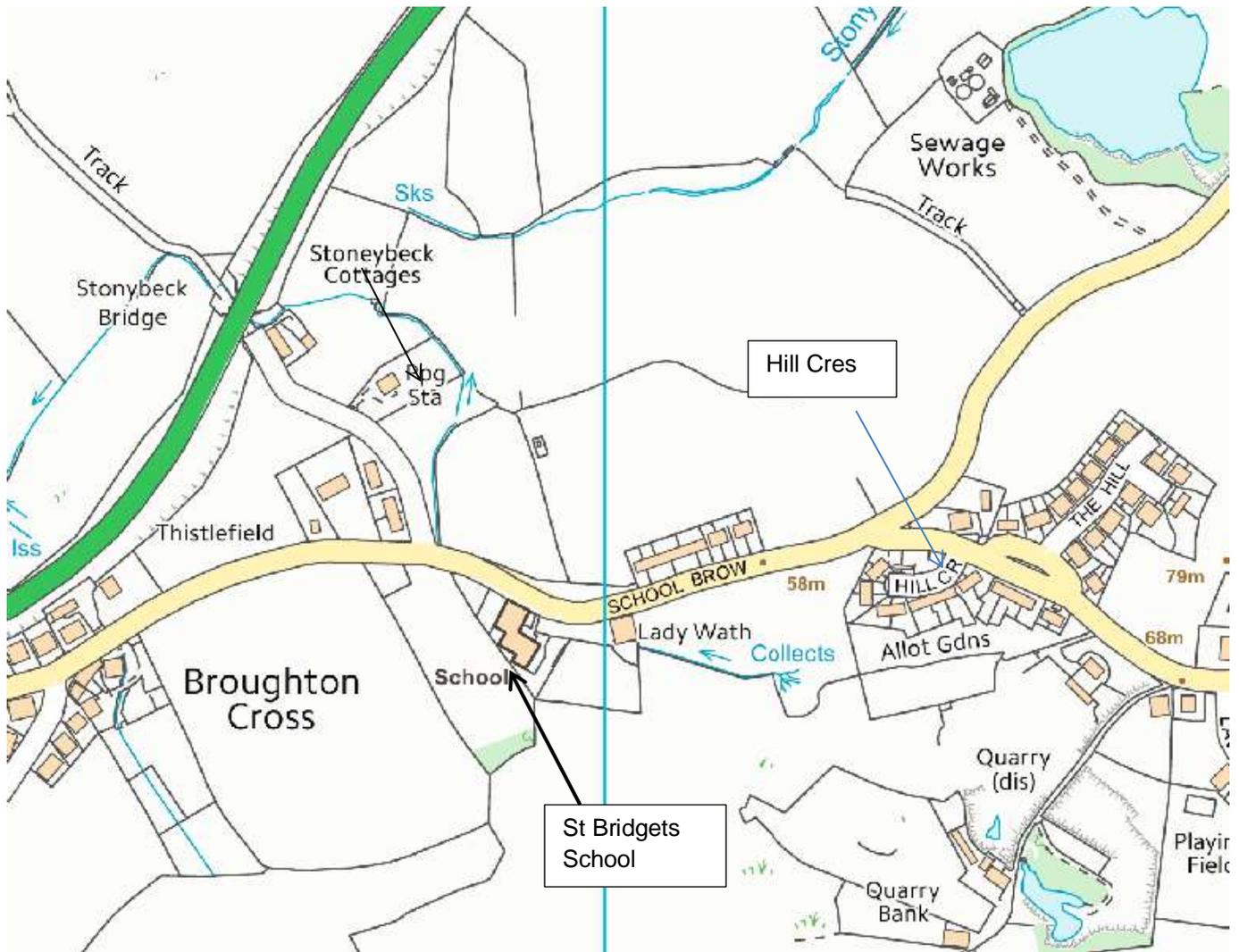
Location plan

### Brigham



**Figure 1: Location Plan**

Brigham is situated approx. 2 miles to the west of Cockermouth and 5 miles to the south east of Maryport and the Sea. There are ordinary watercourses that feed through to the Derwent from within the heart of the village. The Ellerbeck is main river but it does not contribute to any of the flooding due to its virtually rural path.



### **St Bridget's School**

St Bridget's School has a watercourse running directly under it. The watercourse has been changed over the years and now zig zags within the grounds and this will cause restrictions to the hydraulics of the system. A watercourse runs through the fields to the east of the school, this becomes culverted on the school boundary and has an informal grid. The grid became restricted during the flood and the small wall that was built during recent extension work was overtopped by the overland flows from the surrounding land. Recent surveys have shown that there was also a restriction downstream of the school where footballs are trapped in the culverted watercourse. This resulted in flows surcharging from the watercourse and almost flooding properties in the Stoneybeck and old station areas.

### **Hill Crescent**

The drainage that runs through the gardens in this area have differing pipe sizes, this causes restrictions in the flows through these gardens. Recently an outlet pipe has been installed from a manhole in the rear of number 11 that feeds towards the school outlet, this outlet pipe is approximately 300mm above the inlet so the water has to build up and back up the system prior to its release. This manhole has no sump therefore any build up of silt will inevitably block the inlet pipe causing water to back up the system and eventually surcharge.

The highway drainage that carries a small watercourse also followed this route putting further pressure on this system.

Number 14 Hillcrest was the only reported property that was internally flooded at this location.



### **122 and 124 High Brigham**

The Spout Trough watercourse is culverted and runs in front of the affected properties through the rear gardens of 116 and 118 High Brigham. The culvert reduces in size from a rectangular box culvert into a 300mm pipe before expanding again to a rectangular box culvert in the public highway. This restriction caused the water to back up in the system and surcharge from the point where the watercourse is culverted. This water then pours over the road and down the lane adjacent to the properties before entering the 2 affected properties.



### **Old Limekiln and Quarry area**

The Old limekiln has suffered from water building up in the rear of the property for a number of years. It is believed that historically water used to seep through Limestone fissures in the rock and through to the Kirkcross pond. Recent activity in Kirkcross has been attributed to the worsening situation of water build up to the rear of the Limekiln. During the storm, water built up to such a level that it entered the basement area of the property.

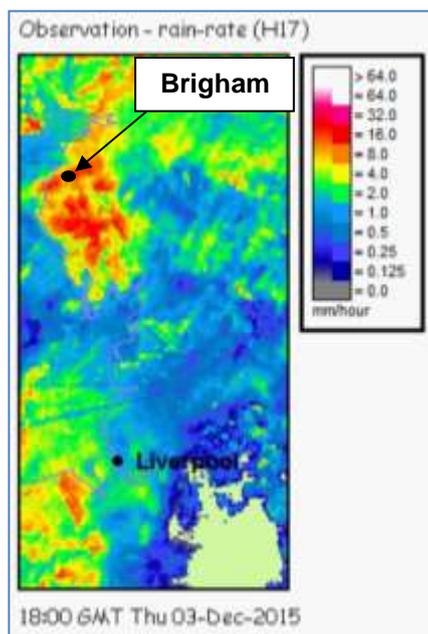
The businesses in the quarry area have had issues with flooding over the years and this has culminated in the buying and maintenance of pumps and a local group set up called the combined drainage group. The flooding occurred in this location due to a build up of water in the caravan park quarry and restricted escape routes for this pond.

Water also ran down Stan Lonning and down the steep incline of the private access road of the quarry area during the event.

## Rainfall Event

December 2015 was the wettest calendar month on record for the UK, with much of northern England receiving double the average December rainfall. This also followed a particularly wet November and as such, much of the ground within the Cumbria catchments was already saturated.

**Figure 2 Rainfall Intensity Radar over Cumbria 3 December 2015 18:00**



On the afternoon and early evening of Thursday the 3 December between 17:00 and 19:30 hrs an extreme rainfall event affected West Cumbria. The epicentre of the flooding was the west facing upslope areas near the coast, especially in the areas between Flimby and Maryport. In one 15 minute interval 7mm of rain was recorded.

The rain gauge at Dearham showed that during the evening of 3 December 2015 over 30mm of rain was recorded in a 3 hour period.

# Investigation

Cumbria County Council as LLFA for Cumbria have investigated the flooding for Brigham. This can be undertaken through site visits, talking to affected residents, door knocking, flooded property lists provided by Allerdale Borough Council and information passed on through the parish council.

## Map of Flow Routes



Figure 2: Flow Routes High Brigham and the School.



Figure 3: Flow Routes Brigham Quarry and the Old Lime Kiln.

## Likely Causes of Flooding

The flooding was caused by the sheer volume of water falling onto an already saturated catchment. The highway drains are only designed to cope with a reasonable amount of water that falls within the highway and so would not be able to cope with the excess water from the surrounding land.

There are legacy issues where infrastructure has been altered historically in almost all of the affected areas.

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# Recommended Actions

The following table details recommended actions for various organisations and members of the public to consider using the Cumbria Floods Partnerships 5 Themes: Community Resilience, Upstream Management, Strengthening Defences, Maintenance, and Internal Drainage Boards (IDB's). Some of these recommendations may have already been carried out and or are ongoing.

Cumbria Flood Partnership Theme	Action by	Recommended Action	Timescale
Maintenance	CCC Highways	Improve/ divert watercourse from Hill Crescent area	Completed
	CCC Highways	Look into possibility of providing a gully system directly into the watercourse downstream of the school	Ongoing
	Landowners	Check drainage infrastructure on land and clear where necessary.	Ongoing
Upstream Management	CCC	Ensure all new development complies with current greenfield runoff rates and improve where possible.	Ongoing
	CCC/Landowners/community	Look into possibility of diversion of watercourses from vulnerable areas.	Possible future works
Community Resilience	Residents	Use grant money to provide an overflow for spout trough watercourse in front of properties 122 and 124 High Brigham	Completed
	Businesses/residents/developer	Provide a ramp (stan lonning) to ensure water bypasses quarry area during heavy rain. (Grant money could be used)	2016 (Grant money applications end March 2017)

Strengthening Defences.	CCC School area	Extend wall at rear of school so that any flows from the rear of the school can escape round the side instead of through.	2017 Discussions ongoing
	CCC School area	Improve trash screen at rear of school to improve flows and resistance to blocking.	2017 Discussions ongoing

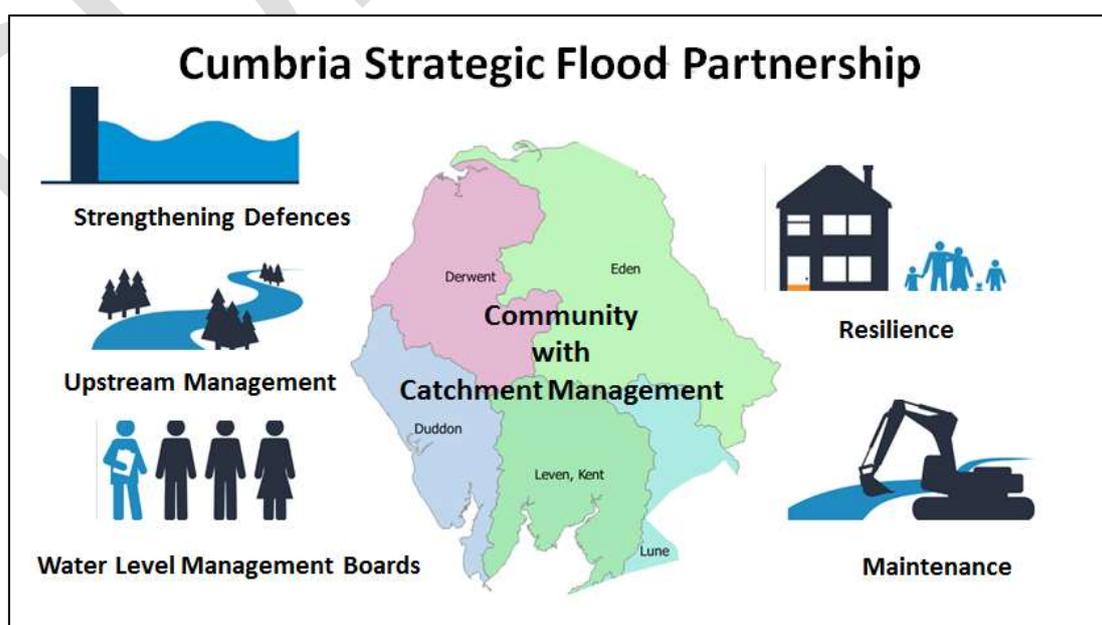
\* The Cumbria Local Resilience Forum includes emergency services, Local Authorities, Cumbria County Council, Environment Agency, Maritime Coastguard Agency and health agencies along with voluntary and private agencies. Under the Civil Contingencies Act (2004) every part of the United Kingdom is required to establish a resilience forum.

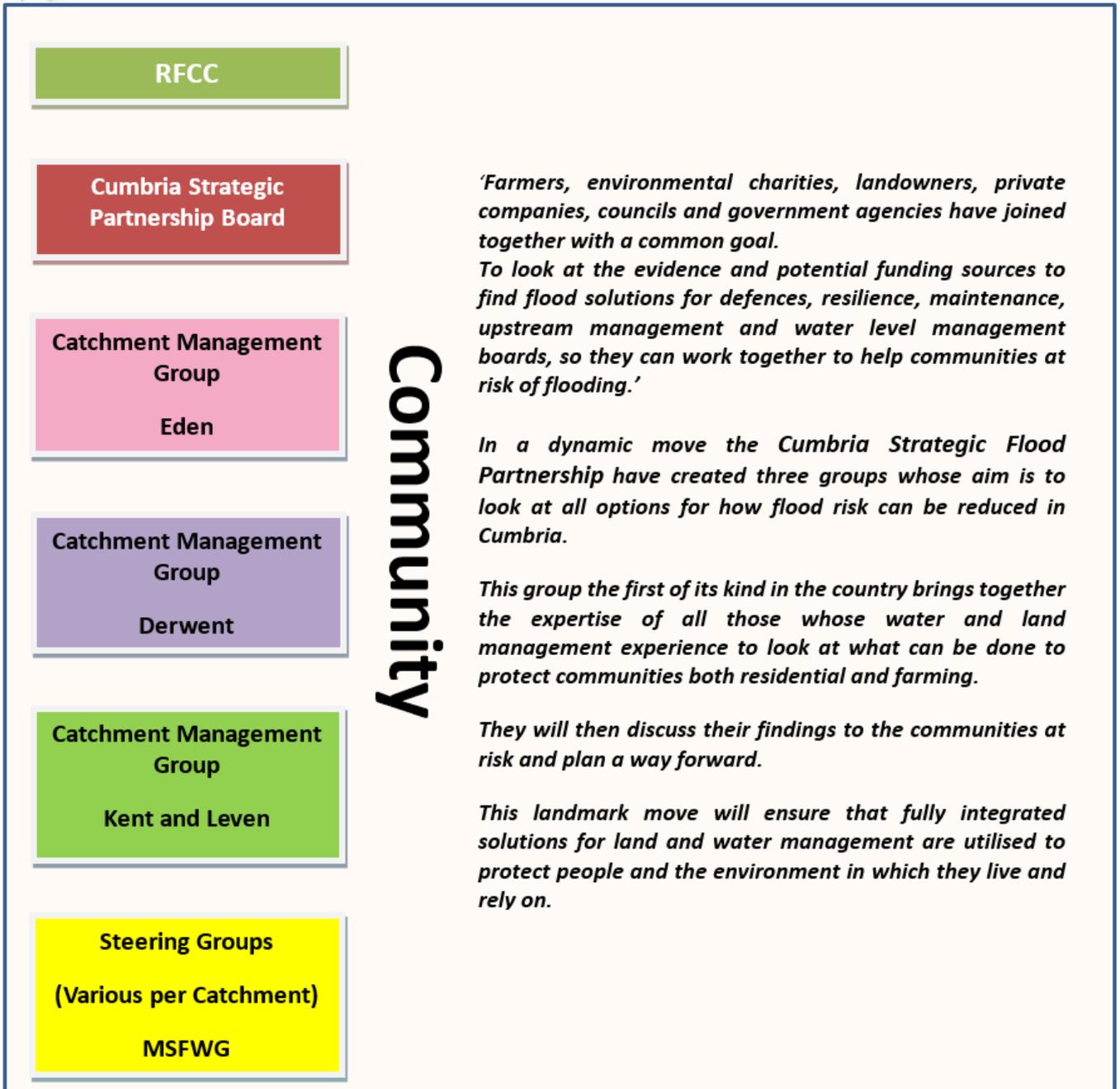
Residents and property owners who are aware that they are at risk of flooding should take action to ensure that they and their properties are protected. Community resilience is important in providing information and support to each other if flooding is anticipated. Actions taken can include laying sandbags and moving valuable items to higher ground, to more permanent measures such as installing floodgates, raising electrical sockets and fitting non-return valves on pipes. Anyone affected by flooding should try to document as much information about the incident as possible.

# Next Steps – Community & Catchment Action Plan

The Cumbria Floods Partnership has brought together a wide range of community representatives and stakeholders from a variety of sectors to plan and take action to reduce flood risk. The Cumbria Floods Partnership, led by the Environment Agency, is producing a 25 year flood action plan for the Cumbrian catchments worst affected by the December 2015 flooding, including Carlisle. The plan will consider options to reduce flood risk across the whole length of a river catchment including upstream land management, strengthening flood defences, reviewing maintenance of banks and channels, considering water level management boards and increasing property resilience. The Cumbria Floods Partnership structure below details how these 5 themes are being delivered in the Flood Action plans which will be completed in July.

The diagrams below help demonstrate how the two partnerships have now come together:





RFCC

Cumbria Strategic Partnership Board

Catchment Management Group  
Eden

Catchment Management Group  
Derwent

Catchment Management Group  
Kent and Leven

Steering Groups  
(Various per Catchment)  
MSFWG

**Community**

*'Farmers, environmental charities, landowners, private companies, councils and government agencies have joined together with a common goal.*

*To look at the evidence and potential funding sources to find flood solutions for defences, resilience, maintenance, upstream management and water level management boards, so they can work together to help communities at risk of flooding.'*

*In a dynamic move the Cumbria Strategic Flood Partnership have created three groups whose aim is to look at all options for how flood risk can be reduced in Cumbria.*

*This group the first of its kind in the country brings together the expertise of all those whose water and land management experience to look at what can be done to protect communities both residential and farming.*

*They will then discuss their findings to the communities at risk and plan a way forward.*

*This landmark move will ensure that fully integrated solutions for land and water management are utilised to protect people and the environment in which they live and rely on.*

# Appendices

## Appendix 1: Glossary

### Acronyms

EA	Environment Agency
CCC	Cumbria County Council
UU	United Utilities
LLFA	Lead Local Flood Authority
LFRM	Local Flood Risk Management
MSfWG	Making Space for Water Group
FAG	Flood Action Group
FWMA	Flood and Water Management Act 2010
LDA	Land Drainage Act 1991
WRA	Water Resources Act 1991

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## Appendix 2: Summary of Relevant Legislation and Flood Risk Management Authorities

The Flood Risk Regulations 1999 and the Flood and Water Management Act 2010 (the Act) have established Cumbria County Council (CCC) as the Lead Local Flood Authority (LLFA) for Cumbria. This has placed various responsibilities on CCC 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—
- which risk management authorities have relevant flood risk management functions, and
  - 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—
- publish the results of its investigation, and
  - notify any relevant risk management authorities.

A 'Risk Management Authority' (RMA) means:

- the Environment Agency,
- a lead local flood authority,
- a district council for an area for which there is no unitary authority,
- an internal drainage board,
- a water company, and
- 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	District Council	Water Company	Highway Authority
<b>RIVERS</b>					
Main river					
Ordinary watercourse					
<b>SURFACE RUNOFF</b>					
Surface water					
Surface water on the highway					
<b>OTHER</b>					
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 Cumbria County Council's work relating to flood risk.

Environment Agency 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) – Cumbria County Council is the LLFA for Cumbria. 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 CCC by the Local Flood Risk Management Team.

District and Borough Councils – These organisations perform a significant amount of work relating to flood risk management including providing advice to communities and gathering information on flooding.

Water and Sewerage Companies manage the risk of flooding to water supply and 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 meeting of the Environment Agency, United Utilities, District/Borough Councils and CCC's Highway and LFRM Teams to develop processes and schemes to minimise flood risk. The MSfWGs meet approximately 4 times per year to cooperate and work together to improve the flood risk in the vulnerable areas identified in this report by completing the recommended actions. CCC 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 Medium Term Plan or a partners own capital investment process.

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

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## Appendix 3: Useful contacts and links

**Cumbria County Council (Local Flood Risk Management):**  
[lfrm@cumbria.gov.uk](mailto:lfrm@cumbria.gov.uk), [www.cumbria.gov.uk](http://www.cumbria.gov.uk), tel: 01228 221330

**Cumbria County Council (Highways):**  
[highways@cumbria.gov.uk](mailto:highways@cumbria.gov.uk), [www.cumbria.gov.uk](http://www.cumbria.gov.uk), tel: 0300 303 2992  
Out of hours emergencies should be reported via the Police on 101

**Insert Neighbourhood forum contact details**

**United Utilities:** [www.unitedutilities.com](http://www.unitedutilities.com), tel: 0845 746 2200

**Insert relevant DC contact details**  
[www.Allerdale.gov.uk](http://www.Allerdale.gov.uk)

**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 – ‘Living on the Edge’** 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>

## Translation services

If you require this document in another format (e.g. CD, audio cassette, Braille or large type) or in another language, please telephone 01228 606060.

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## Appendix 4: Response from Brigham Parish Council and parish drains.

### RESPONSE FROM BRIGHAM PARISH COUNCIL FLOOD ACTION GROUP TO THE BRIGHAM FLOOD INVESTIGATION (SECTION 19) REPORT – FLOOD EVENT 3 – 5 DECEMBER 2015

Comments will appear in the order of the Section 19 Flood Investigation report

#### St. Bridgets School

We agree with the description of the cause of the flooding at the School. The recommended action is not clear, however, with respect to the extension of the wall. Is this a vertical extension to raise the height or is it intended to be extended lengthways? The wall was overtopped in the flood event so evidence suggests that it is not high enough to contain the flow. We trust the final report will make clear the intended action on the extension of the wall.

We assume the School has applied for Grant money to meet the costs of this resilience work. However, if this is not the case then there is a risk of flooding occurring again. Is this work dependent on this grant application? Was the issue of the School being a “public institution” with regard to a grant application resolved or is it a case that only private individuals can apply?

#### Hill Crescent

We agree with the recommended action for diversion of the watercourse. Assuming grant applications are successful and the neighbours agree on the course of action the standardisation of the drainage system in terms of pipe diameters can be successfully resolved. We also feel that there should be community action to keep the road drains clear of grit above Hill Crescent. There is a significant movement of grit and small stones down Quarry Bank Lanning in times of heavy rain and this causes the road drains to fill up with debris.

#### 122 and 124 High Brigham

We agree with the recommended action to assist with the excess flow of water from Spout Trough to avoid the flooding of these 2 properties. We believe that both properties have made grant applications for this work to be carried out.

However, the Parish Flood Action Group are still very concerned, despite assurances to the contrary, that the construction of the new housing estate above the current Lawson Garth development will impact on the flow of water in Spout Trough. We have been told that the flow of water will not be increased because of the construction of attenuation tanks, but there is still a nagging doubt.

Your map showing the Old Lime Kiln and Quarry area does not show the outflow of Spout Trough from the downstream end of the culvert. This appears in the field north of Brigham Hill Mansion and flows overland for a short distance before a waterfall takes the water directly into the pond south of the caravan site. This is the major source of water into the Quarry system. On the 5.12.15 at 10.15am the flow of water was estimated to be 13.2m<sup>3</sup>/minute. This was measured using cross-sectional area and flow velocity. We hope that the measurement of such data by the local community is recognised as important. Remedial work at 122 & 124 High Brigham will only speed the flow of water into the Quarry system from this source.

Old Lime Kiln and Quarry area

Taking into account the previous comment regarding Spout Trough, your map does not show other sources of water into the Quarry System. Opposite the shop, over the wall, in the middle of the village are two pipes. The first is a small white pipe which emerges from the ground a short distance from the wall. Water flows from this when precipitation is heavy. The second pipe is a short distance away and is larger than the first and supplies a significantly larger volume of water. This is believed to be the outlet of the old Victorian drain which we think takes water from natural springs under the village and also surface water drainage from the High Rigg estate.

The input of water from these two sources was slowed by the existence of a large bunded pond and by substantial woodland deep in the old Quarry. Much of this woodland has been removed and the bunded pond significantly reduced in size so that water now flows freely onto the industrial site of Egertons and Pattersons. The Pattersons have controlled this problem by channelling this flow under the ground to their pumping station. It adds to the water already pumped under the road to the Cut behind the Lime Kiln.

The Section 19 report states that water from the Cut historically seeped through limestone fissures into the Kirkcross pond. We agree that the recent activity in the Kirkcross Quarry has worsened the situation at the Lime Kiln. The residents of the Lime Kiln have used their grant money to build a wall to prevent future flooding from the Cut by containing the excess water. They have also had a ramp built to divert the flow of surface water from Stan Lonning away from their property. We hope that this resolves the flooding issue at the Lime Kiln, but we still have the issue of the outflow of water from the Quarry system.

