

Shap

Flood Investigation Report



Flood Event 5th 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.

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Executive Summary

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.

Following the extreme weather event of Storm Desmond on 4-6th December 2015, CCC received information that approximately 25 properties had been affected by flooding from various sources during the event including from ordinary watercourse, surface water and surcharging of other drainage systems including those of the railway line to the east of Shap.

This report details the findings of CCC to date during its investigation to identify the causes of the flooding in each location and also recommends various actions to help minimise the flood risk at the various locations. The actions identified include actions by the flood risk management authorities as well as landowners, residents and businesses.

Event Background

This section describes the location of the flood incident and identifies the general locations of properties that were flooded. This section also provides details on the rainfall event that occurred at the time.

Flooding Incident

Shap is a village located approximately 10 miles south of Penrith. The main part of the village is set out in a linear format along the A6 with the West Coast Main Railway line to the east.

The village is located within a valley with higher ground to both the east and west with the main watercourse known as Shap Beck flowing from the east of the village towards Main Street and then flowing to the north of the village. Much of the watercourse is culverted through Shap village. In addition to this there are other minor watercourses with the majority flowing from east to west in the South end of the village or from the east to the north as in the watercourse running towards the school.

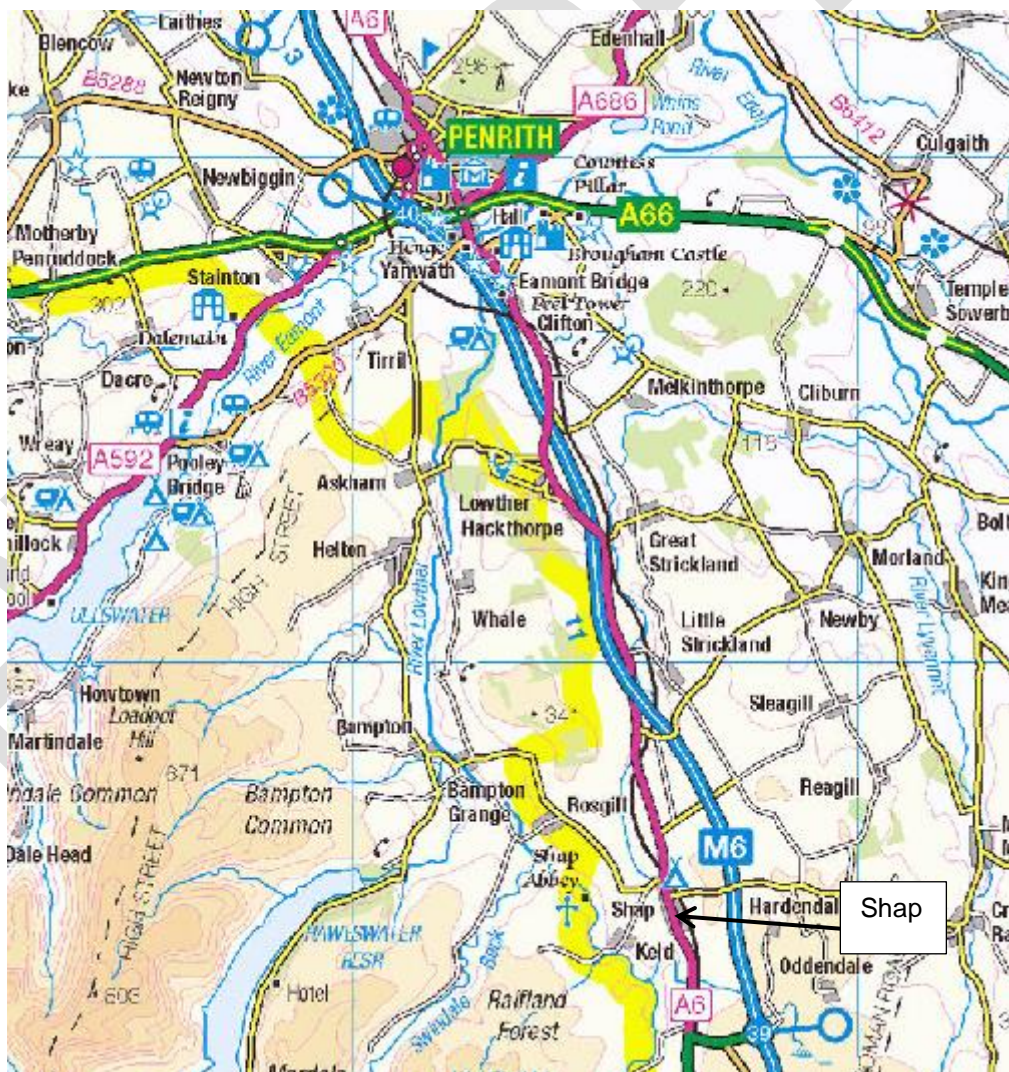


Figure 1: Location Plan.

During December 2015 many parts of Cumbria were hit by a significant storm which was named by the Met Office as Storm Desmond. This caused significant flooding to many parts of Cumbria including Shap.

Reports were received by CCC that approximately 25 properties in Shap were affected by flooding with many of them affected by internal flooding. The properties included both residential and business premises. The majority of the properties affected were located along Main Street but there were also other properties in the other areas of the village.

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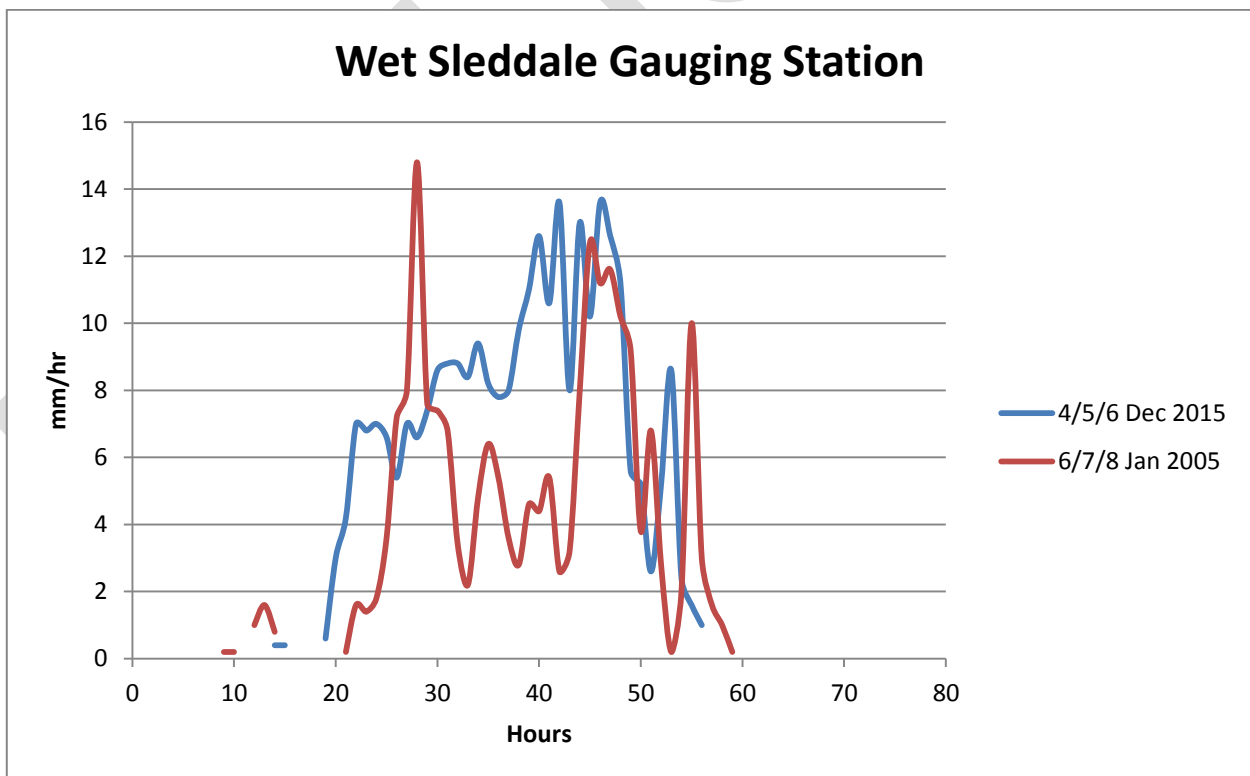
Rainfall Event

During the 4th, 5th and 6th of December 2015 much of Cumbria was affected by Storm Desmond which broke the United Kingdom’s previous 24 hour rainfall record by recording 341.4mm of rainfall at Honister Pass. The previous record was recorded at Seathwaite during 2009 when 316.4 mm of rainfall was recorded.

On average during the month of December Shap is estimated to have a rainfall of 215.6mm with an average of 1,779mm per year. The Environment Agency has 2no rain gauges near to Shap at Burnbank (5.5km) and Wet Sleddale (3.8km). The following total rainfall was recorded at each one during Storm Desmond. The rainfall data from the January 2005 event is also included for comparison. It can be seen from the table that 283mm of rainfall fell within 36hrs which is well above the average rainfall expected for the whole of December.

| Rain Gauge | 24hr | | 36hr (from 21:00 hr on the previous day to 07:00 hr on the following day) | |
|--------------|-------------------------------|------------------------------|---|------------------------------|
| | 5 th December 2015 | 7 th January 2005 | 5 th December 2015 | 7 th January 2005 |
| Burnbanks | 186.4 mm | 122.0 mm | 250.6 mm | 166.4 mm |
| Wet Sleddale | 223.0 mm | 149.2 mm | 283.4 mm | 197.4 mm |

Table 1: Rainfall totals for December 2015 and January 2005 flood events



Graph 1: Comparison of rainfall for December 2015 and January 2005 flood events

Investigation

This section provides details of the authorities who have contributed to this investigation, an analysis of flow routes and details of likely causes of flooding. Also included are details of the previous flooding history in the area and a list of recommended actions.

The authorities involved in producing this report included United Utilities, and Cumbria County Council (as Lead Local Flood Authority and Highway Authority). The Parish Council also played a significant role in gathering information from the residents affected and assisting with information for the report.

Map of Flow Routes

From the Environment Agency mapping it can be seen that some of the areas that have flooded during the December 2015 event were already identified as being at risk of flooding as is demonstrated on the extract from the Surface Water Map detailed below.

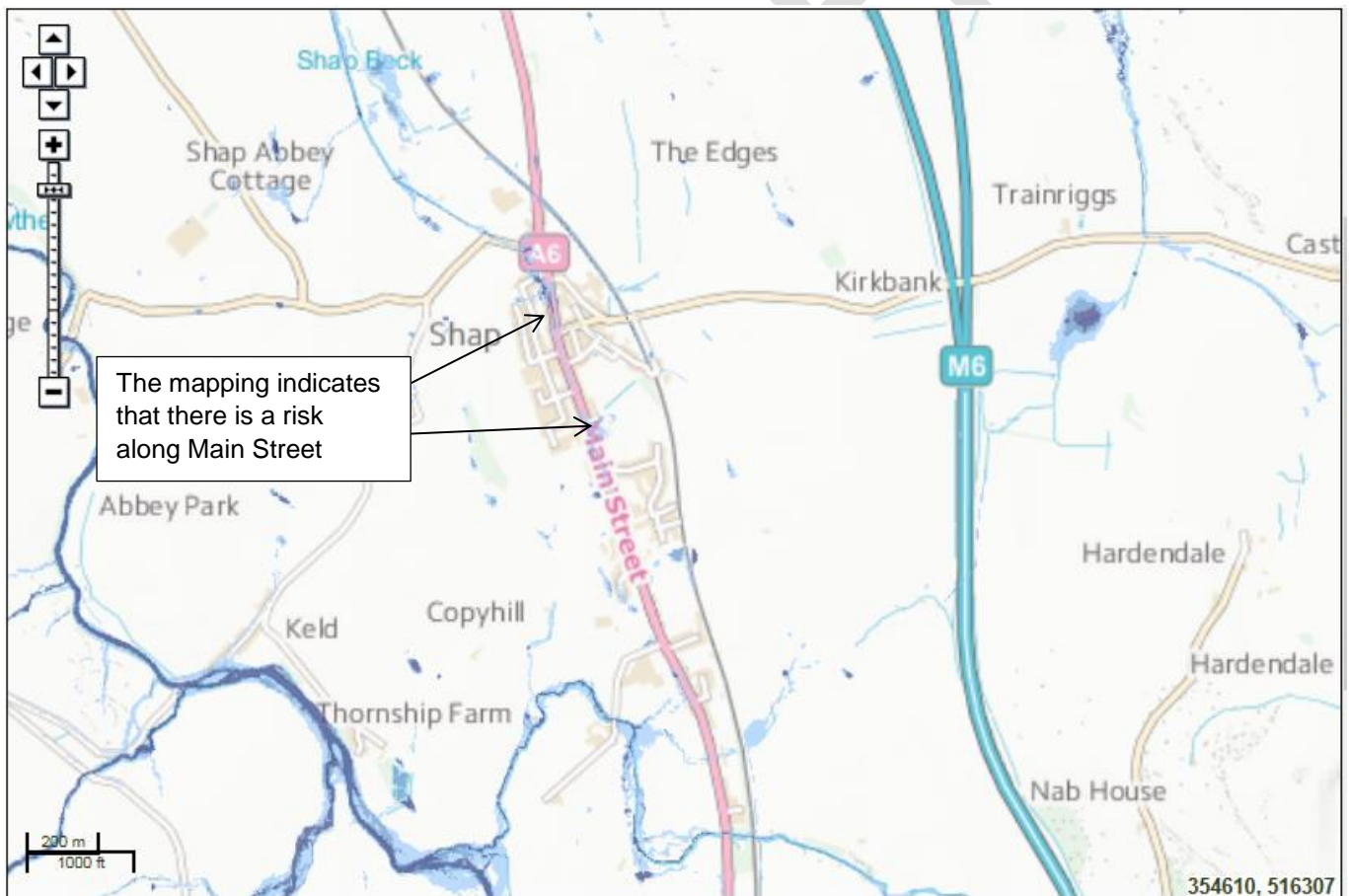


Figure 2: Extract from Environment Agency's Surface Water Mapping for the Shap area

Central and North area including Main Street

Although there were several different areas of Shap that were affected by flooding the main area was in the Central and North area including Main Street where approximately 18 properties were affected by internal flooding. Residents have reported that the main flooding along Main Street began on the afternoon of 5th December with the flood peaking at approximately 16.30 – 18.00hrs and the flood water dissipating by 02.00hrs on 6th December 2015.

The residents of the flooded properties have reported several areas of concern in regard to the cause of the flooding including surface water running off the railway line, drains/gullies being unable to cope, lack of capacity in the main drainage systems, culverting of watercourses, and possible resurfacing of roads. Other issues such as springs and the general topography were also referred to being issues by some of the residents.

Shap is located within a valley with higher land to the east which is intercepted by the railway line. The land to the west is also higher than the village but not as high as the east side of the village. Shap Beck which flows through the village of Shap originates to the east of the village before crossing the railway line in an aqueduct.



Photograph 1: Aqueduct across railway line

Residents have also expressed concern that the culverting of the upstream reach of the aqueduct has also had an impact on the flooding as it has caused surface water to flow directly on to the rail way line instead of going into the watercourse. Culverting of watercourses can create issues with surface water runoff being unable to enter its natural runoff route. The following diagram details the location of the newly culverted section in 2010.

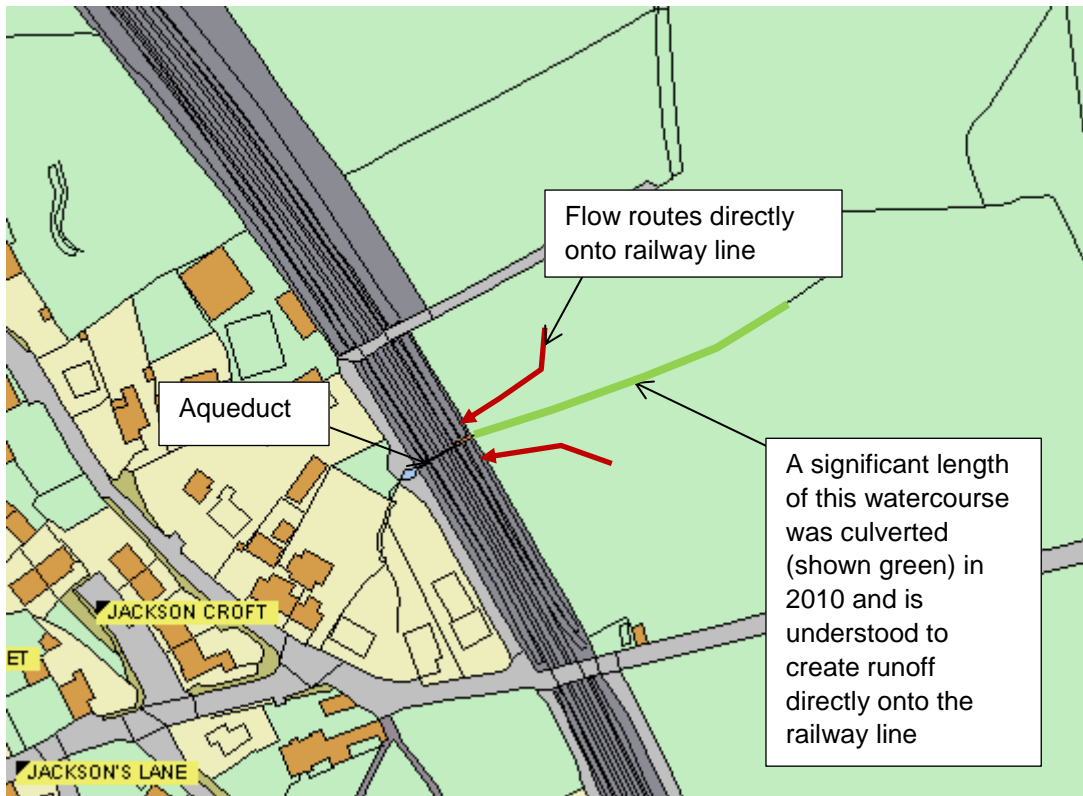


Figure 3: Recently culverted section of watercourse above railway line

It is not known how much surface water enters the railway line at this location but it is recognised that further investigation is required to assess this.

Once crossing the aqueduct Shap Beck runs through the village in both open and culverted sections. The following diagram indicates part of the route between Jackson's Lane and Main Street and indicates the section where flood water was seen to surcharge from the culverted section.

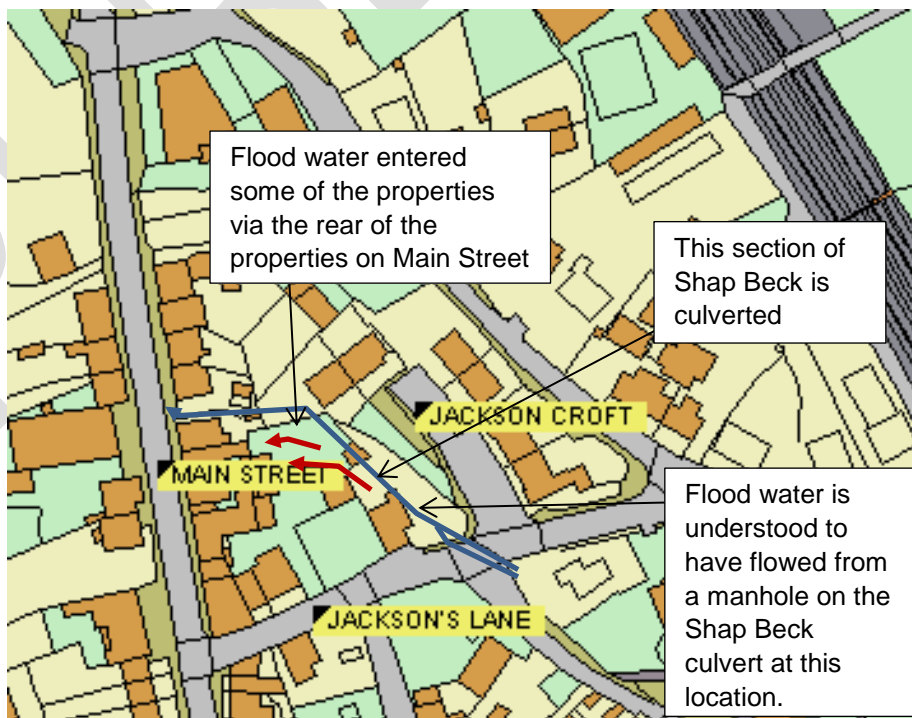


Figure 4: Plan indicating location of water surcharging from culvert near Jackson's Lane

The surcharging of this culvert caused flooding to the rear of some of the properties on Main Street. However, the majority of properties that were flooded on Main Street were affected by flooding from the front of their properties from Main Street.

A major part of the A6 became flooded and due to vehicles continuing to drive through the flood water this caused further issues for the flooded properties as vehicles caused 'bow' waves which increased the height of water flowing towards the properties. The following plan indicates the extent of the flooding along the A6.

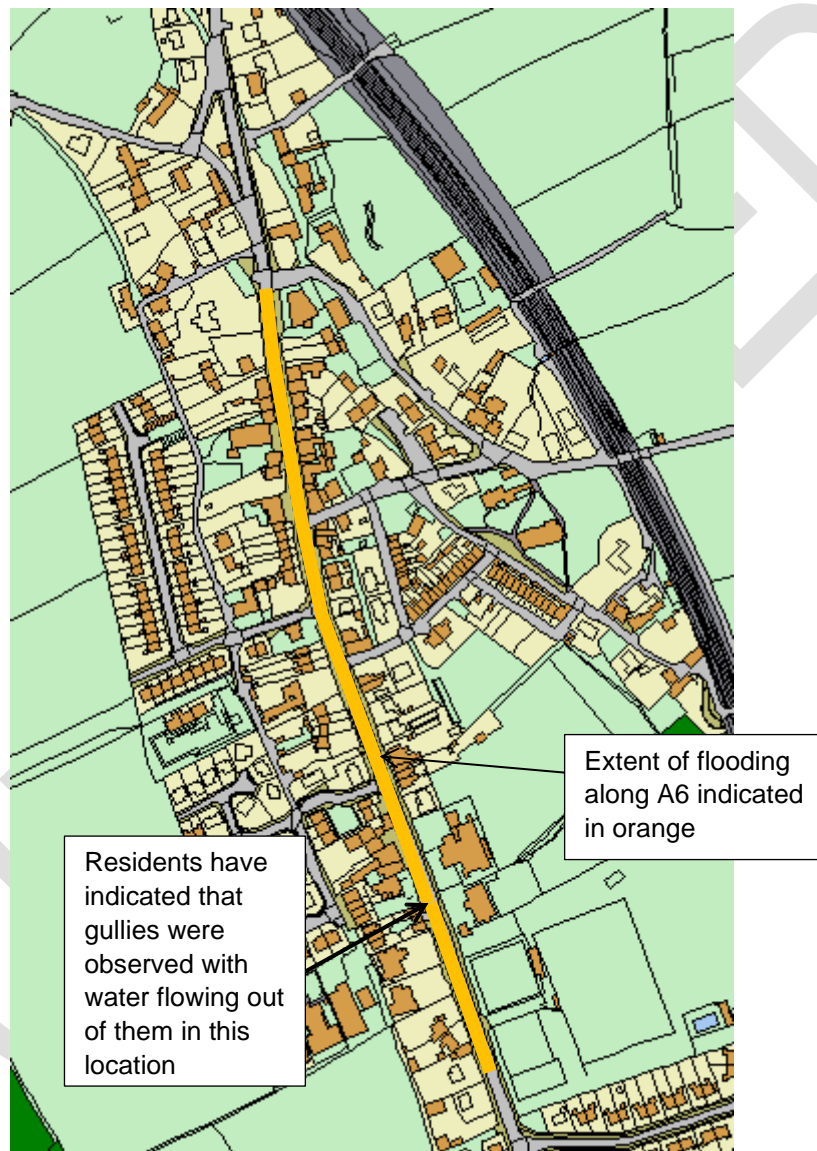


Figure 5: Plan indicating the extent of flooding along the A6 and location of surcharging gullies

The residents identified a further source of flood water which came from the railway line which was observed discharging into the playing field area next to the Village Hall. Meetings and correspondence with Network Rail Engineers have confirmed that they are aware that this is a low area in their network drainage system and this is a natural place that surcharging of the system is likely to occur when rainfall events exceed the drainage capacity. Network Rail has stated that they are aware that their drainage system has limits due to the capacity of the receiving surface water systems and watercourses downstream of their discharge points.

However, Network Rail is willing to co-operate with the other authorities involved in the flood investigation in order to reduce the risk of flooding to properties within Shap. (See action table for further information). The following photograph shows the excess runoff from the railway line on to Shap Memorial Park on 26th January 2016.



Photograph 2: Runoff from the railway line onto Memorial Park on 26th January 2016

Information gathered by the Parish Council also suggested that the gullies were blocked. CCC Highways have confirmed that the gullies in Shap received their annual clean at the end of August / beginning of September 2015. Although there would have been some debris in the gully pots it is not anticipated that this would have been a significant cause of the flooding particularly when it was observed that flood water was seen surcharging from the gullies. It was also reported that the flood water dropped quickly once the rain stopped.

The Parish Council provided CCC's LLFA team with plans indicating the locations of the drainage systems and watercourses within Shap. CCC had very little knowledge of these systems with regard to their construction or current condition and commissioned a CCTV survey of the systems considered to be significant in the cause of the flooding. Although the survey is not complete it has indicated that the drainage systems within Shap are made up of various construction methods from concrete pipes to stone culverts with flagged soffits. From information gathered from old maps it is apparent that some of the older stone culverts could have been in place since the mid-1800s. A large proportion of the drainage systems are located within the highway boundary but there are also reaches of Shap Beck and other watercourses that run through private ground. The map on the following page is a simplification of the approximate location of the drainage systems within the north and central parts of Shap.



Figure 6: Plan indicating extent of culverted watercourses and drainage systems in the north and central area of Shap.

Following the event CCC have begun a survey of the drainage and watercourse systems. Initial CCTV investigations have indicated that in some areas two or three pipes run together to convey water. Appendix 4 includes the plan of the surveys completed to date.

During the survey it was established that in some areas of the system there was significant debris and rocks within the drainage systems. The debris included rocks, a spade, tennis racket, wheel trim and plastic bottles as well as vegetation. The following photograph indicated the volume of debris within parts of the system.



Photograph 3: Debris in one of the manholes in the culvert

A further contributing factor to this was due to services being installed through the surface water and watercourse systems which created snagging points for debris to get caught on. On one particular manhole a sewer connection, two gas supply pipes and an electricity connection were observed. The following photographs indicate some of the connections through the systems.



Photographs 4: Services through the drainage systems

Following the initial survey discussions have taken place with the highway engineer that was involved in the upgrade of the section of drainage system in Main Street. It has been confirmed that the upgrade was difficult due to the number and the level of the services within the location of the drainage system. It was not possible to carry out the upgrades without incorporating some of the services within the drain particularly the existing public sewer connections. Therefore, at the time of the drain upgrade manholes were constructed at the major intersections with the services to enable extra capacity around the services that had to be incorporated and to allow for access to remove debris that may catch on the services within the invert of the drain.

South End of Shap

It was identified that 6 properties were affected by flooding to various degrees in the south end of Shap. Initial reports suggest that the main causes are either surface water runoff or from runoff from the railway although it was acknowledged that those affected by runoff from the railway line had noticed a decrease in flooding incidents since Network Rail had carried out works since 2010. Although the flooding appears to be from the rail track drainage it should be recognised that rail track drainage is not designed to accommodate surface water runoff from surrounding areas

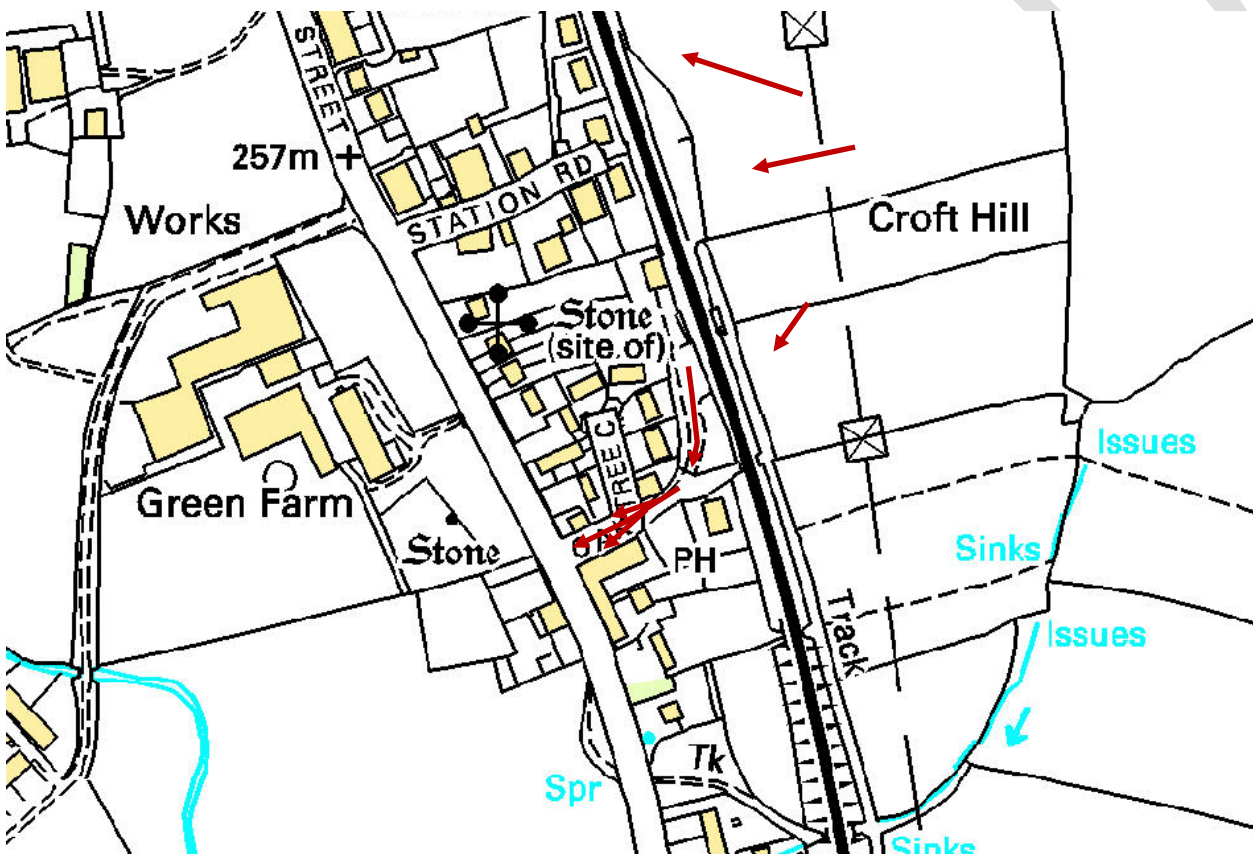


Figure 7: Some of the surface water flow routes in the south end of Shap

Very North End of Shap

It has also been identified that 2 properties at the very north end of Shap were also affected by surface water runoff from the surrounding fields. Further investigations are still required to identify if there are possibilities to reduce the risk of flooding but those householders who have experienced internal flooding should make use of the Property Level Flood Resilience Grants through Eden District Council.

Likely Causes of Flooding

From investigations carried out by CCC's LLFA team it is considered that the main cause of flooding was due to the very heavy rainfall event overwhelming the existing watercourse and surface water systems running through Shap. This was exacerbated by the services installed through the system and the volume of debris in the systems. It is also considered that the size of the system may also have had an impact on the ability of the system to cope with the volume of flood water, however, further investigation and funding to confirm this is required.

Flooding History

The Parish Council and residents have indicated that the north and Central part of Shap including the Main Street area was subject to flooding approximately 8 – 10 years ago but a specific date was not provided. It may be that the flooding occurred during the January 2005 floods which caused extensive flooding in Appleby and Carlisle. There is a comparison of the rain gauge information in the Rainfall Event section which indicates that although this was a significant event the rainfall levels were not as high as the event in December 2015. Other information has suggested that flooding has occurred in 1985, 2005 and 2009.

It is also understood that there was flooding during 2010 which affected properties in the south end of the village, however, it is understood that works were carried out by Network Rail which has helped to reduce the issue.

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) | Regular cleaning of gully pots | Ongoing but additional cleaning planned for Winter 2016 |
| | CCC (LLFA) | Commission CCTV survey of significant culverted water course and surface water drainage systems within the north and central areas of Shap. This will also involve clearing of any debris identified in the culverted or piped sections. | 1st part of survey completed April 2016. Further survey planned for Winter 2016 to complete the investigation |
| | CCC (LLFA/Highways) | Work with service providers and landowners to remove as many obstructions as possible, however, this may not be possible for many of the services particularly the sewer connections | Ongoing as and when identified by the CCTV surveys |

| | | | |
|------------------------|---|---|--|
| Strengthening Defences | CCC (LLFA) / Network Rail / United Utilities | To co-ordinate drainage information to assess capacity of surface water drainage systems within Shap and identify feasible improvement options. This will require funding through the FCERM GiA process to facilitate the assessment. | Apply for funding via FCERM GiA process – project to be identified in submission to EA/Defra by March 2017 |
| | CCC (LLFA) / Network Rail / United Utilities | To implement any options/projects identified from the assessments above | Timescale will be dependent on funding availability. Potential funding may be available via FCERM GiA, Highways budgets, Network Rail and/or United Utilities. |
| Upstream Management | Cumbria Strategic Partnership | Consider as part of the drainage assessment and option identification process | To be considered as part of options/project identification procedure |
| Community Resilience | Residential and Business owners that have experienced internal flooding | (All flooded properties) Consider applying for Property Level Flood Resilience Grant Scheme through Eden District Council | Contact Eden District Council on either 01768 817817 or customer.services@eden.gov.uk for further advise. Closing dates for applications – March 2017 |
| | Community / affected residents / Parish Council | (All areas) Prepare community flood action plan for use during flood events | Winter 2016 |

* 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.

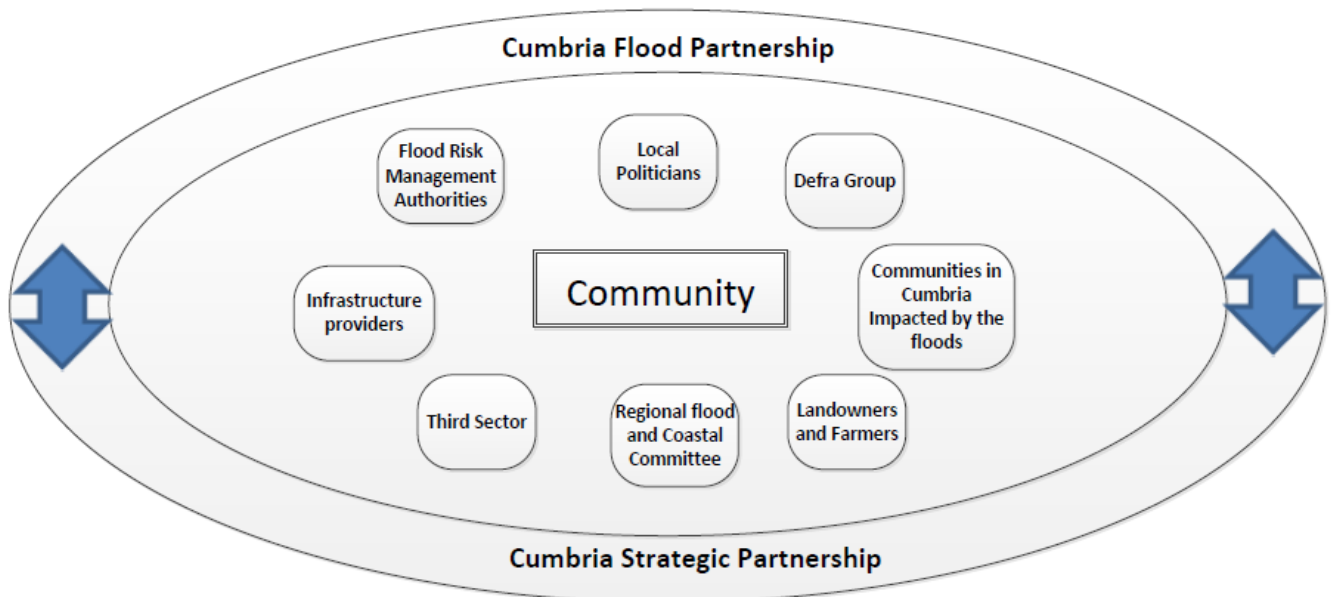
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Next Steps

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 defenses, 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 ‘Cumbria Floods Partnership’ was set up by Flood Minister Rory Stewart following December’s floods and includes all of Cumbria’s Flood Risk Management Authorities. They are working alongside the existing ‘Cumbria Strategic Partnership’, which was formed as part of the Flood and Water Management Act and comprises of the county’s Flood Risk Management Authorities (RMAs) including the Environment Agency, Cumbria County Council, Local Authorities and United Utilities. Both partnerships are working with communities, businesses and relevant stakeholders to understand and reduce flood risk across Cumbria.

This diagram below helps demonstrate how the two partnerships are working together:



Appendices

Appendix 1: Glossary

Acronyms

| | |
|-------|-------------------------------------|
| EA | Environment Agency |
| CCC | Cumbria County Council |
| UU | United Utilities |
| LLFA | Lead Local Flood Authority |
| 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—
- (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 | District Council | 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 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, www.cumbria.gov.uk, tel: 01228 221330

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

Cumbria County Council (Area Support Team)
tracey.moran@cumbria.gov.uk, tel: 01768 812662

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

Eden District Council: <http://www.eden.gov.uk/>, tel: 01768 817817

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>

Appendix 4: Plan of drainage systems surveyed in April 2016



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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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