

Heavy rainfall/flooding in the Lake District, Cumbria - November 2009

Exceptionally prolonged and heavy rainfall on Wednesday 18 and Thursday 19 November led to severe flooding across parts of the Lake District.

Some areas of high ground received more than 400 mm of rainfall in a 72-hour period, and Seathwaite, Cumbria, recorded 316 mm of rainfall within 24 hours. Parts of north Wales and the Southern Uplands of Scotland also recorded high rainfall totals from this event. The associated high river flows and flooding problems were exacerbated by the very wet ground conditions - Cumbria had already received close to the whole-month November average rainfall before this event occurred. Many rivers in the Lake District exceeded their previous maximum flows by a wide margin, and exceptionally high flows were also reported across north Wales and southern Scotland.

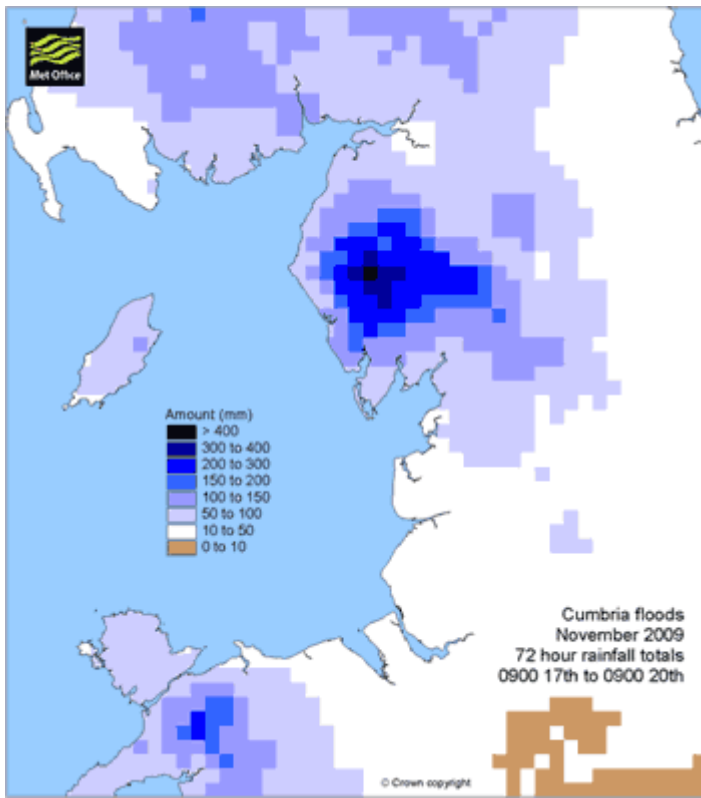
Impacts

The worst-hit areas were affected by flooding from the River Derwent, draining an area of the southern fells and flowing through Borrowdale via Derwentwater and Bassenthwaite Lake to the coast at Workington. In Workington, a police officer died after the A596 Northside road bridge collapsed, and the town was effectively cut in half as the remaining road bridge in the town was also severely damaged by floodwaters. Cockermouth was also badly affected by flooding, with the town centre under two metres or more of floodwater and several hundred other properties also affected by flooding. There was widespread disruption across the region including damage to further bridges. However, new flood defences in Carlisle built after the [Floods in Carlisle - January 2005](#) held firm.

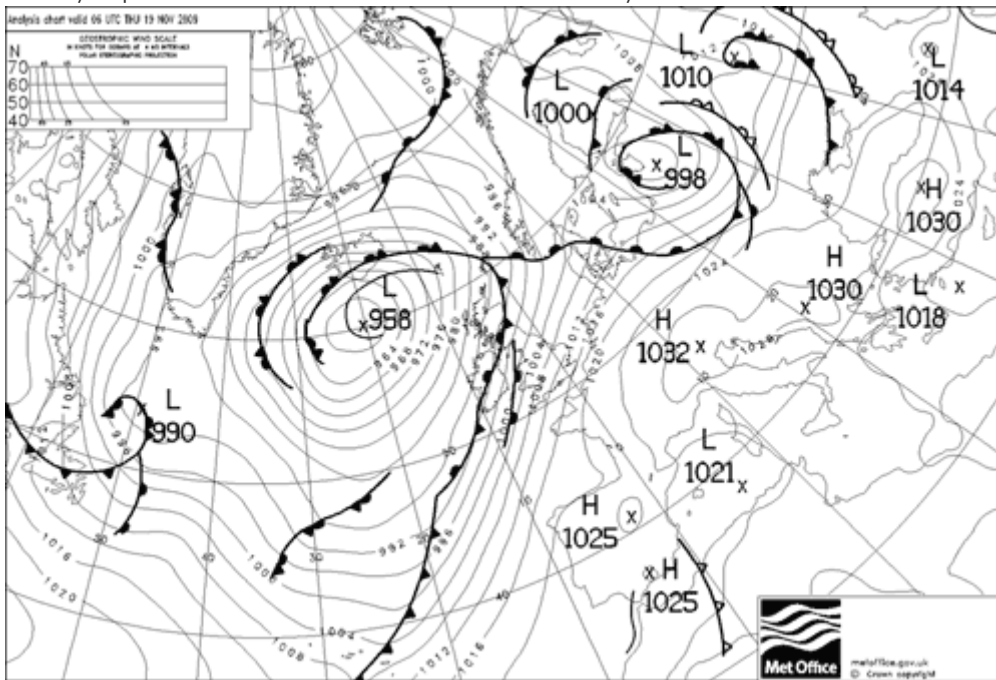
Weather data

Between Wednesday 18th and Friday 20th a warm, moist south-westerly airstream was affecting the UK associated with a very deep Atlantic depression tracking slowly north-eastwards between Scotland and Iceland. A weather front within this airstream brought exceptionally prolonged and heavy rainfall as the air was forced to rise over the higher ground of the Lake District - this feature persisting across northern England for around 36 hours. The highest rainfall occurred at Seathwaite in Borrowdale, which recorded 316.4 mm in 24 hours - a UK record for any 24-hour period. 377.8 mm was recorded there in a 34-hour period. Within a 72-hour period from 0900 on Tuesday 17th to 0900 on Friday 20th, the high ground toward the lower end of Borrowdale received more than 400 mm of rainfall.

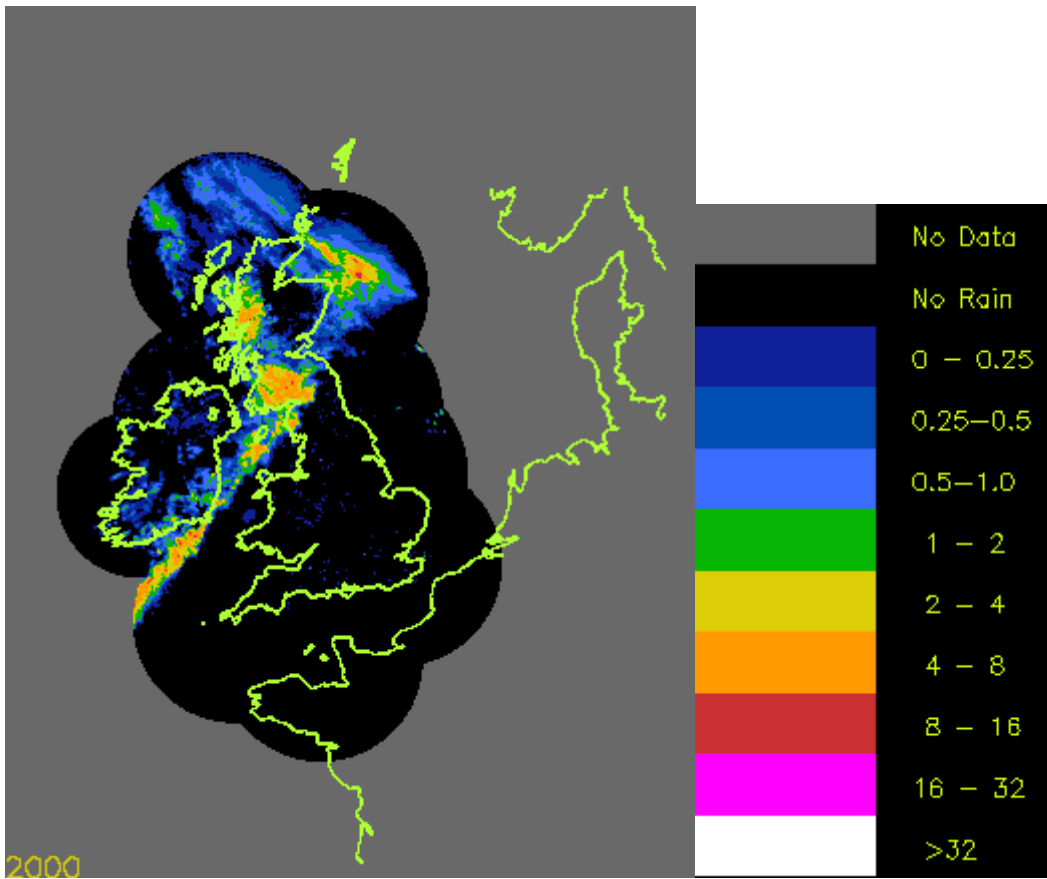
This map shows the distribution of rainfall in the 72-hour period from 0900 on the 17th to 0900 on 20 November 2009



The synoptic situation at 0600 GMT on Thursday 19 November 2009



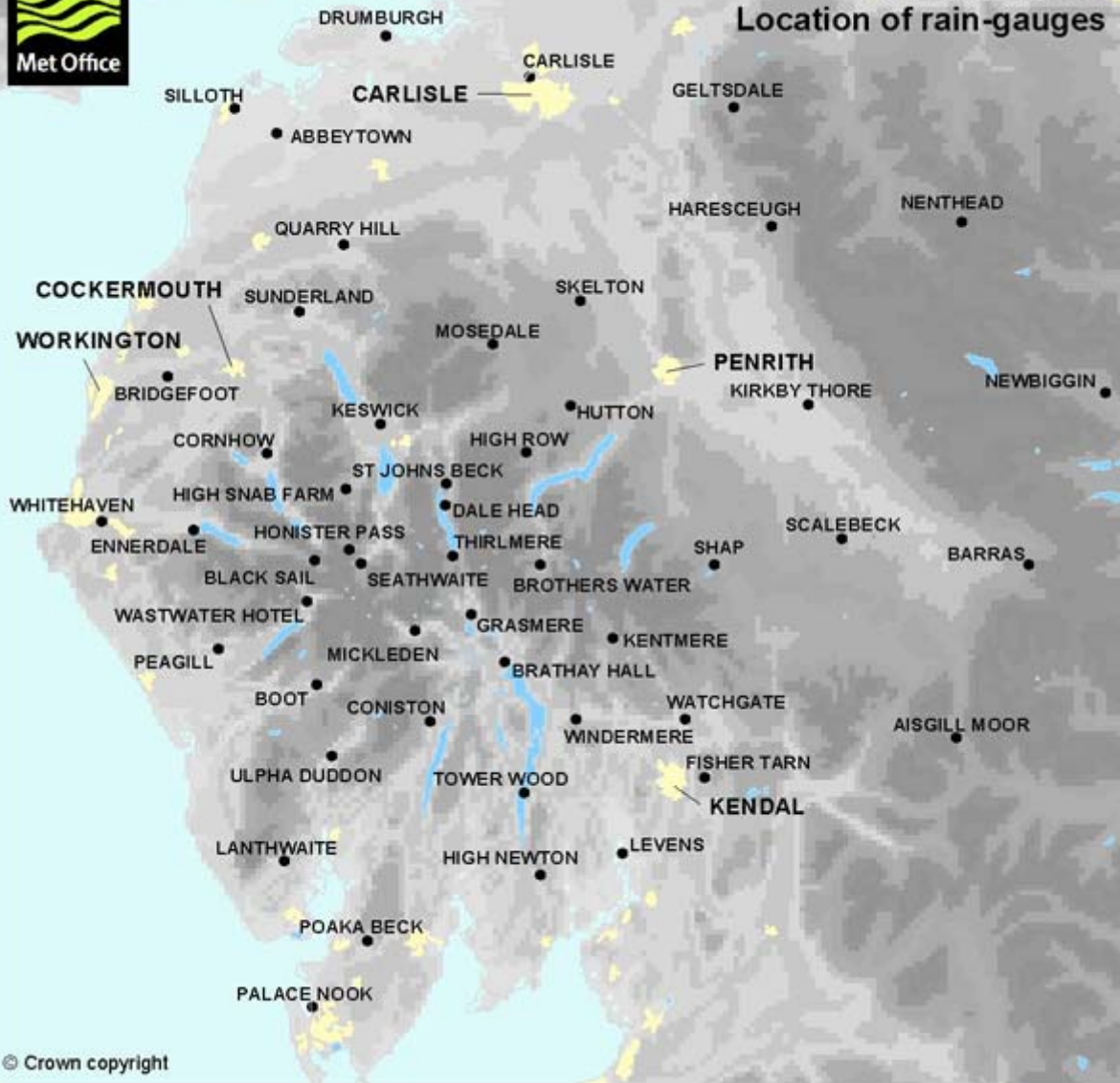
Shown below are the rainfall rates detected by the rainfall radar network every hour from 2000 on Wednesday 18th to 0600 on Friday 20 November



Shown below are the rainfall totals recorded by rain gauges during this event (data are courtesy of the Environment Agency)

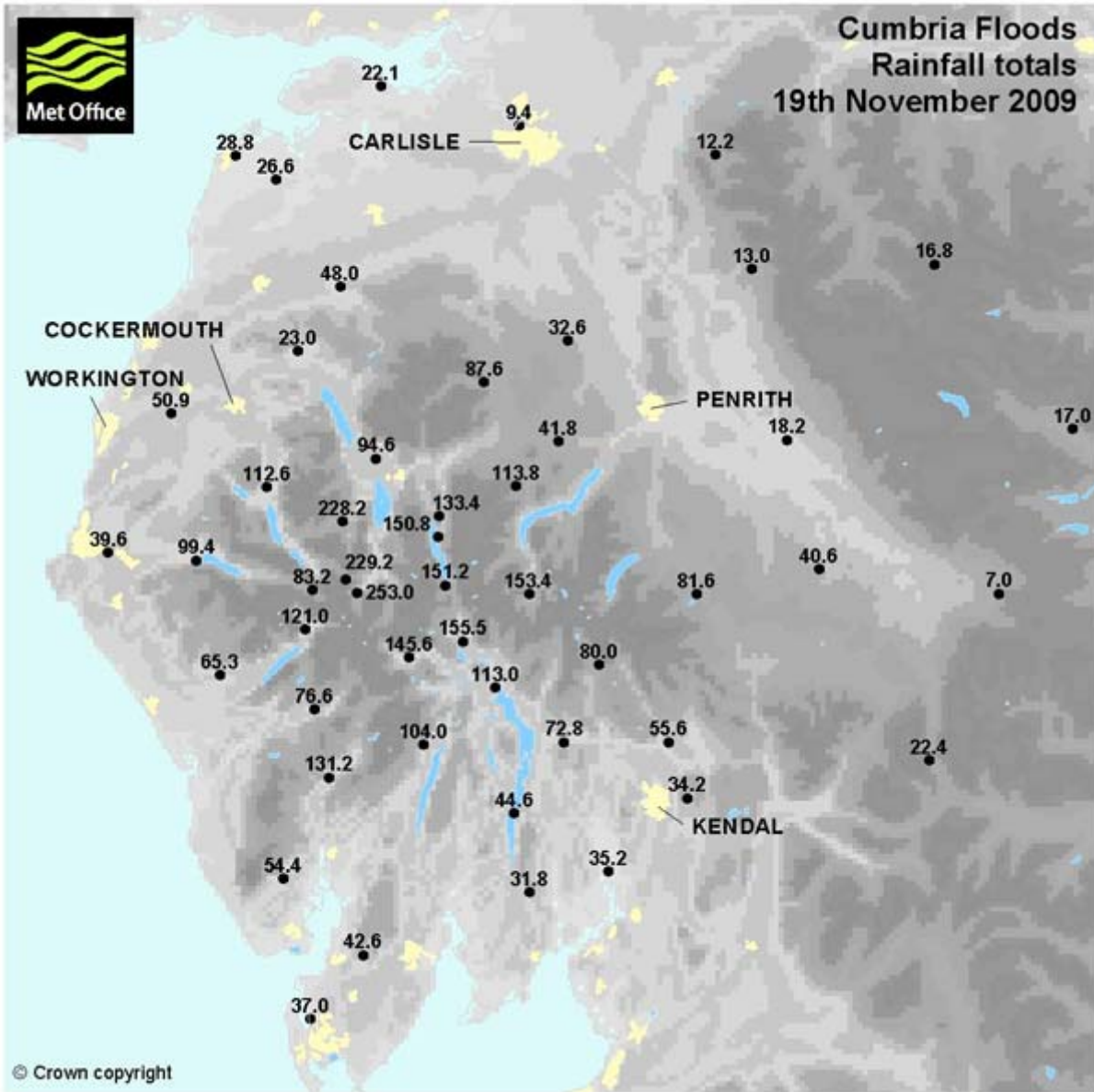


Cumbria Floods Location of rain-gauges

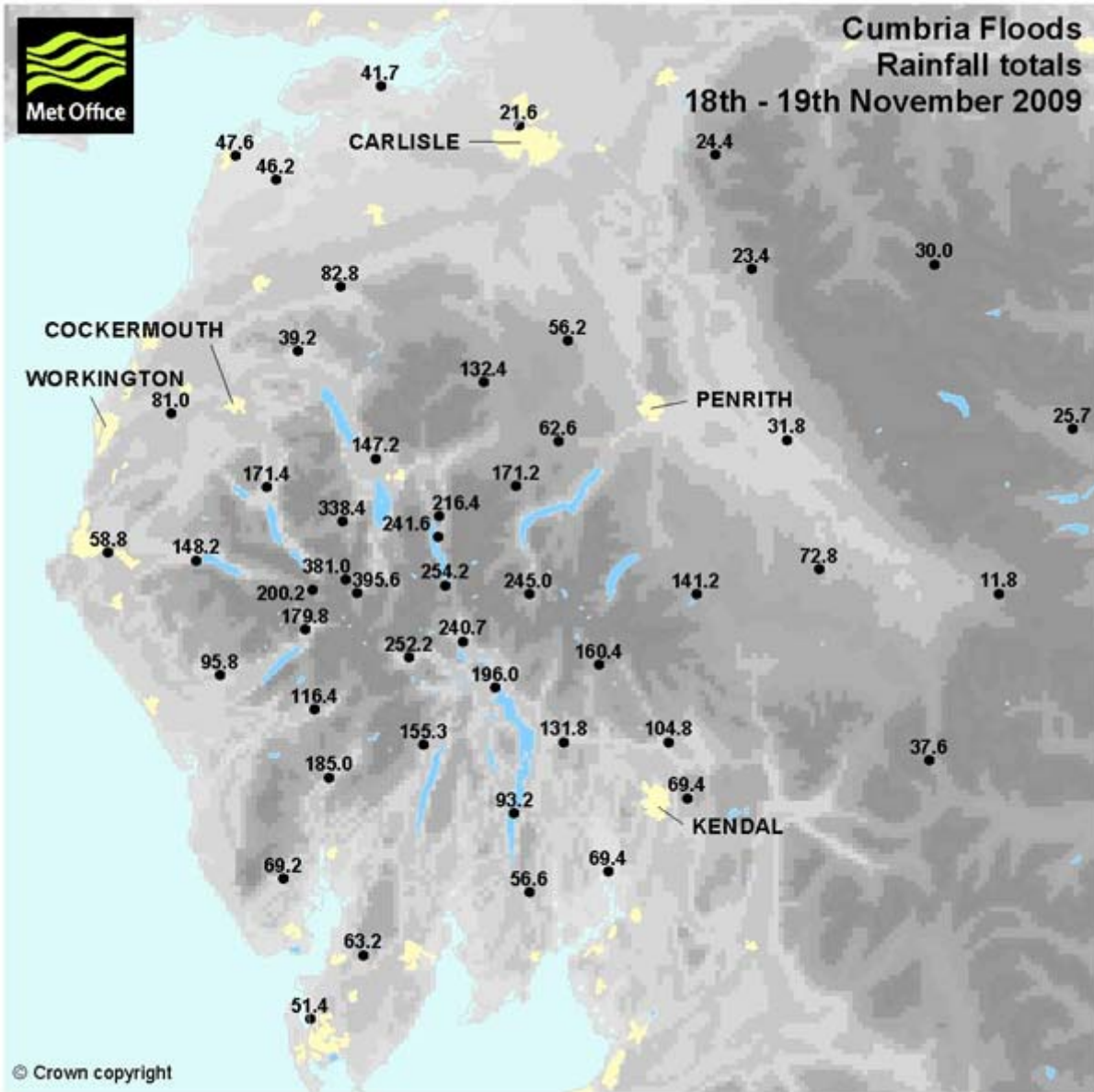


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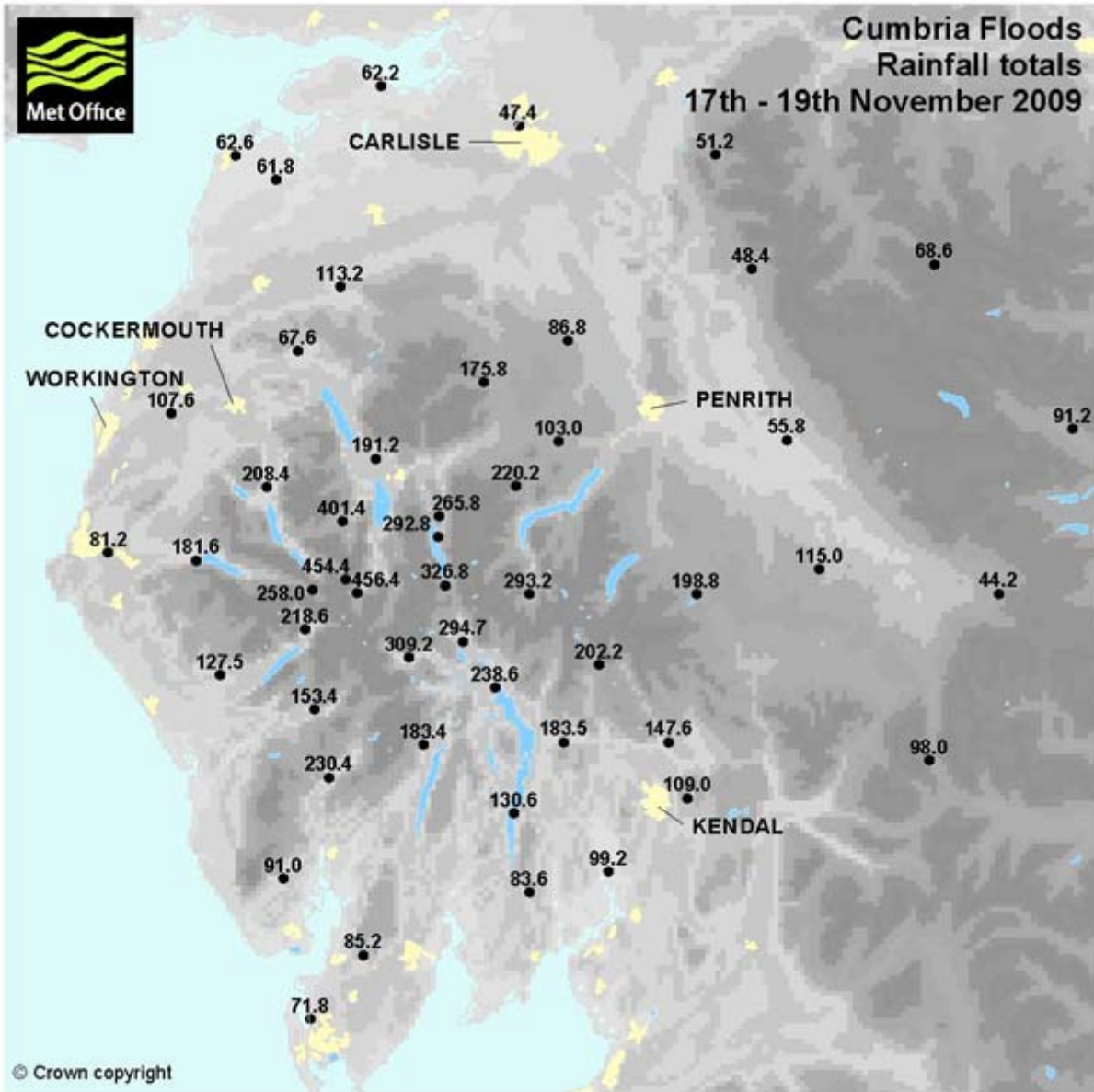
24-hour rainfall totals 0900 19th to 0900 20th



48-hour rainfall totals 0900 18th to 0900 20th



72-hour rainfall totals 0900 17th to 0900 20th



The table below shows the highest rainfall totals recorded by rain gauges during this event. These totals are exceptionally high and provide some indication of the persistent and prolonged nature of the rainfall experienced. An analysis of these rainfall data indicates a return period exceeding 200 years for the 48- and 72-hour durations.*

*Return period estimates are based on the Flood Estimation Handbook (FEH) methodology. It is important to recognise the large uncertainty associated with return period estimates for extreme events - values quoted are approximate. A return period of 200 years represents a 1 in 200 or 0.5% chance of exceedance, in that particular location, in any given year.

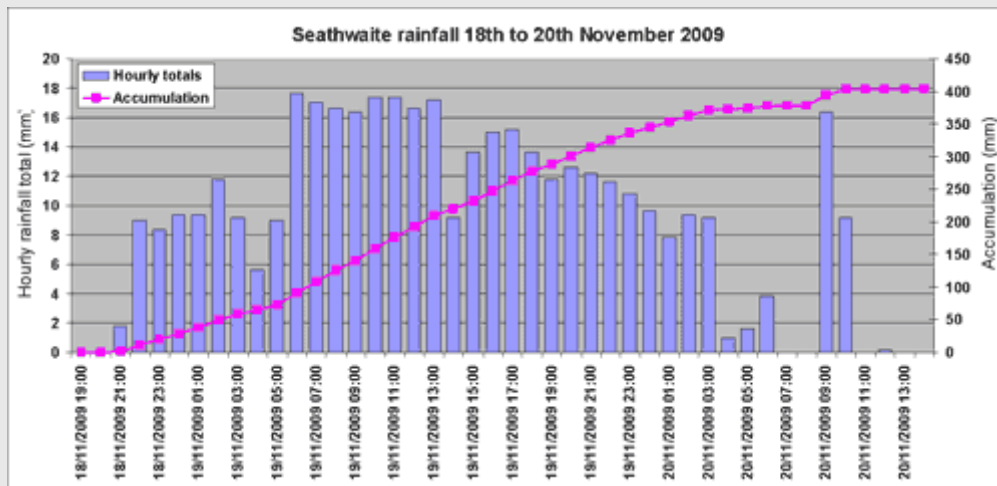
Table of rainfall, 17-20 November 2009

Station**	Amount (mm)	Amount (mm)	Amount (mm)	Amount (mm)	Amount (mm)
	0900 17th - 0900 18th (24 hours)	0900 18th - 0900 19th (24 hours)	0900 19th - 0900 20th (24 hours)	0900 18th - 0900 20th (48 hours)	0900 17th - 0900 20th (72 hours)
Seathwaite Farm	60.8	142.6	253.0	395.6	456.4
Honister Pass	73.4	151.8	229.2	381.0	454.4
High Snab Farm	63.0	110.2	228.2	338.4	401.4
Thirlmere, Nook	72.6	103.0	151.2	254.2	326.8
Mickleden, Middle Fell	57.0	106.6	145.6	252.2	309.2
Rydal Hall	49.5	105.5	148.1	253.6	303.1
Grasmere, Tanner Croft	54.0	85.2	155.5	240.7	294.7
Brotherswater	48.2	91.6	153.4	245.0	293.2
Dale Head	51.2	90.8	150.8	241.6	292.8
St Johns Beck	49.4	83.0	133.4	216.4	265.8

**All rain gauges listed are in Cumbria. Data provided are courtesy of the Environment Agency.

The figure below shows hourly rainfall totals and accumulations at Seathwaite rain-gauge. 377.8 mm fell in a 34-hour period from 2000 on 18 November to 0600 on 20 November. This event was very unusual for the exceptional duration over which very heavy rainfall intensities were sustained. Rainfall rates exceeded 10 mm per hour for much of the 34-hour period, including eight consecutive hours of more than 16 mm per hour.

Hourly rainfall totals and accumulations at Seathwaite rain-gauge



Last updated: 30 October 2012

