Geo Factsheet

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The causes and effects of the Carlisle Flood January 2005

Unprecedented rainfall and severe gales caused a 1 in 170 year event on January 8th 2005 flooding towns and villages in the river Eden catchment including the border city of Carlisle. This was the worst flood, in Carlisle, since 1822. A month's rain fell in under three days, the rising rivers broke through existing flood defences and inundated 1,900 properties (houses and others) leaving two dead and thousands displaced. Losses are estimated to exceed £450 million. This Factsheet looks at the causes and ongoing effects of the flood on the city.

CAUSES

Carlisle lies on the flood plain of the River Eden's 2400 km^2 catchment with average annual precipitation of 2,800mm in the upper Eden and 760mm in Carlisle. The upper Eden is moorland over 600m high. The confluences of the rivers Petteril and Caldew are in the city. Heavy, continuous rain for 2 weeks in late December 2004 and early January 2005 was followed by extreme weather from Thursday 6th to Saturday 8th January 2005, when 15% average annual rainfall fell in 36 hours. At Shap in upper Eden 227mm fell in 72 hours. In lower Eden estimates are 220mm in 36 hours. Storm force winds of 90mph gusting to 120mph felled many trees causing widespread road and river blockages and significant power failures across Cumbria, including Carlisle. Blockages in drains and rivers from debris and fallen trees and the overflowing of surface water and sewers significantly contributed to flood damage and occurred in advance of fluvial flooding. Carlisle started to flood at 2am on Saturday 8th January and by 9am the city was sealed off. Discharge in the Eden in the city reached a max of 1,500 cumecs, i.e. 1,500 tonnes per second. Flood waters started to recede at 3pm on Sun 9th January.

Fig. 1 Eden catchment.

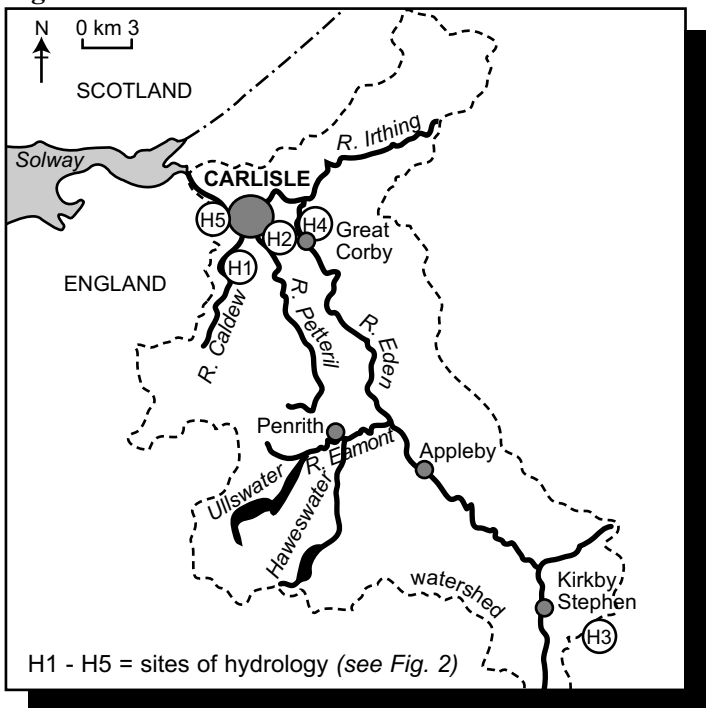
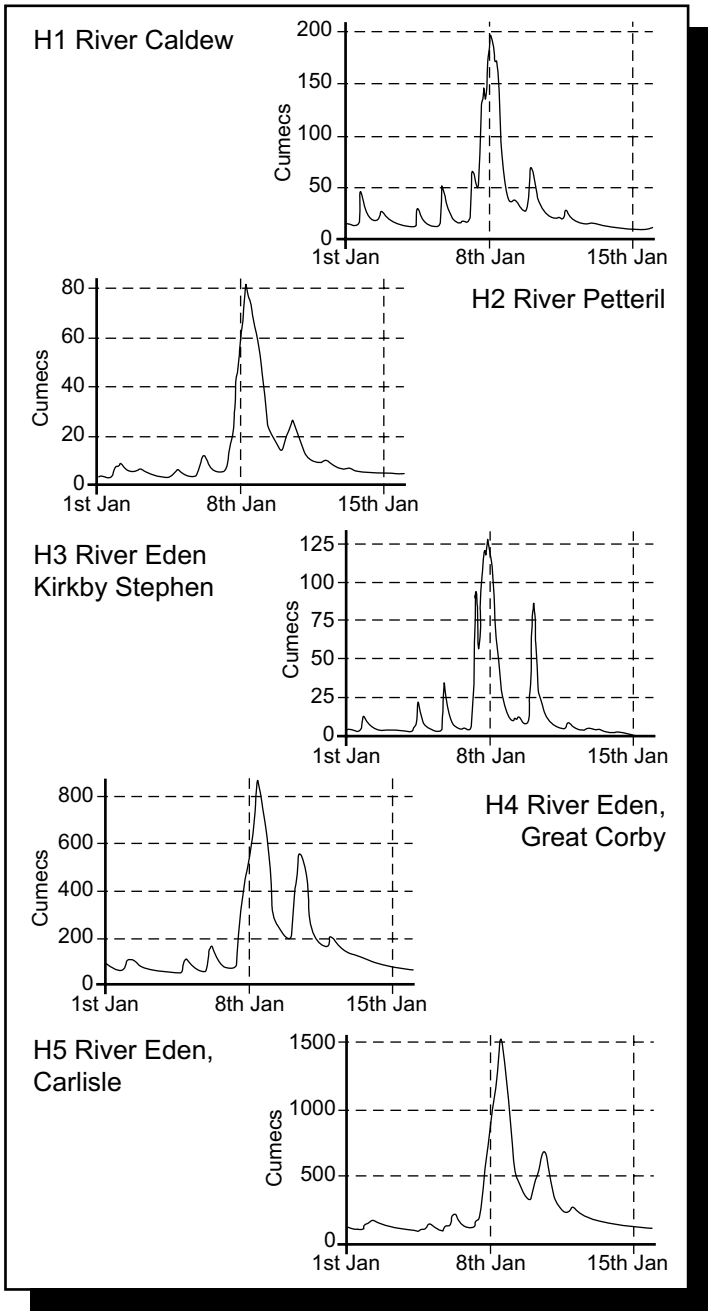


Fig. 2 Hydrographs of river discharge on rivers Eden, Caldew and Petteril for Jan 1st, 8th and 15th 2005.



Draining of upland bogs, using ditches (grips) may have contributed to the 'flashiness' of the flood but the exceptionally high rainfall and strong winds causing blockages of drains and rivers with debris, as well as ponding up discharge into the Solway, were the main causes of the flood. Defences were not built to withstand a 1in 170 year event. Flood levels in some areas ended up 1 metre higher than the defences constructed after the last floods in 1968 (when discharge reached 1048 cumecs). Carlisle has always had a policy of leaving the majority of the flood plain undeveloped through the city but rising ground water accounted for the flooding of many properties in the lower lying areas of the city.

Carlisle was not the only settlement affected - Cockermouth, Keswick, Appleby and Kendal – along with many villages, farms and hamlets also flooded.

Timings of the flood on 8th January 2005

0000: Turf Inn basement floods

0200: Surface water floods Willowholme Ind. Estate; Maltings floods. Caldew overtops defences as trees dam footbridge and water flows down streets to flood Denton Holme.

0230: Denton Holme floods. Water coming up manholes flows down streets to flood Caldewgate.

0245: Petteril outflanks defences as trees dam footbridge, water flows down streets to flood Warwick Rd where groundwater is rising.

0500: Substation floods. Rickergate floods (police, fire station and civic centre).

0830: Warwick Rd flood embankment overtopped. Roads into city closed, M6 north closed, rail links cut

0900: Emergency services HQ relocated to Penrith

1100: Power failures across city and surrounding area. Phone and mobile networks down.

Real life stories

Miss A: I'm an A level student and live in Etterby, beside the Eden. The AVM warning came about 2am and it was a race against time to move stuff upstairs. The water started coming in - I got an electric shock, we just didn't have time to turn off the power! We took the dogs upstairs and listened to water pouring into electrical appliances and circuits which exploded. The water was over 5ft deep in the house. In the morning we were rescued by a boat and a man in waders. We went to stay with friends in Scotland for 10 days then lived in a local college hall of residence for 6 months while our house was dried out and fixed. Every thing downstairs was lost - including all my A level coursework which I had to rewrite. The insurance covered all the costs but it's not the same is it - all new stuff.

Mr B: I am a volunteer with one of the emergency services. I went to work on Sat 8th at 8.30am but was turned back at the roundabout - the Police said the city was flooded! I went home and started to fix wind damage to our roof and fence - it was still windy and had started to hail. My pager went off about 10am, by 11am I was in chest waders pulling a rib through the streets of Botcherby taking flooded residents to the emergency centre in a school. They'd also set up a first aid station in a primary school. My colleagues were exhausted - they'd been up all night rescuing people in Appleby. It was weird - the power was off, the rain and hail had stopped but it was still blowing a gale so that made it really hard going. We were warned to watch out for stuff floating in the water - like skips loose from the recycling centre - you could hear them clanking about! By mid afternoon I was frozen, especially after one old lass was too scared to come out her house - she dropped the keys out the window and I had to go under water to open her front door then go in and carry her out. It was dark before 4pm which made things even harder. Some of us were telecommunications monitors - checking the phone lines were working in flooded parts of the city as we had radios so could relay messages. It was awful for the poor souls who'd lost everything - they were cold and in shock……..then of course when I got home late that night I couldn't even have a hot shower!

Mr C: I had an auto repair business in Willowholme; I heard about the rising water and went down but couldn't get near. I went back once the water'd dropped - everything was ruined. I'd built that business up for over 30 years. I'm 5 years off retirement and couldn't imagine starting again - my heart just went out of it. The insurers paid up but I just sold - I couldn't face it, now I work as a mechanic for someone else.

Mr D: I'm Head of one of the two flooded secondary schools. I heard about the floods on the radio at home on the Saturday morning and set off in the car. On arriving at 8.15am there seemed to be little risk to the school. By 9.0am I was told by the police to evacuate the school site and they were telling anyone in the city centre to leave. I was told at 2.00pm the water was on the school site, I was amazed! I managed to get through to school by 3.30pm - there was a frightened bullock running around the flooded tennis courts! He'd moved up with the rising water from the fields by the river and by 5.0pm the waters reached their maximum. Anyway, by 8.30 am on Sunday the damage was done, 85% of the ground floor was under 3 ft of filthy water- the Astroturf, the pool, day nursery and classrooms ruined – including all the resources. We were shut to students for 5 days, except for those taking modular exams by emergency lighting. Staff came in to start the clean up once the water dropped but many of them had been flooded too. The kitchens opened to give out hot drinks and sandwiches to local people. We reopened and coped in the space we had left plus four portacabins. The financial cost was incredible but the strain on staff and pupils was immeasurable. We thought it'd take a couple of months to recover but it has taken nine months and cost over £2 million.

Mrs E: I live in River Street off Warwick road. For us the worst aspect of the flooding has been the uncertainty about how best to respond. In the immediate aftermath we were bewildered and naively cleaned up our house. Once insurance reps arrived on the scene it was clear large scale structural work was required and we'd have to move out. The community has been dispersed, this has meant logistical difficulties for everyone – and is especially traumatic for the elderly residents. As the weeks and months go by the constant wrangling with loss adjusters, surveyors and builders has become wearing. We are still in rented accommodation with no fixed return home date. Our two young children seem to have coped remarkably well. It's the human cost of events like these that is impossible to measure.

EFFECTS

Services were seriously affected in the city; the police and fire stations and local authority offices in the Civic Centre were all flooded in 8ft water. The main electricity sub station, telephone exchange and sewage works were also flooded. All organisations had difficulty mobilising staff because of the weather conditions, blocked roads and because many staff were themselves suffering from flooding or damage to their own homes. The only communication systems which were fully operational were those of the Cumbrian Mountain Rescue Service.

Immediate effects:

- Environment Agency issues flood warnings via AVM (automated voice messaging), Floodline, local media and finally knocking on doors
- 3 people died – 2 drowned and one crushed by falling tree
- 1,600 homes flooded, estimated cost £100 mill
- 6,000 people had to be re-housed because of displacement
- 1,150 trees felled in the gales
- The designated 'Gold' emergency response HQ in the Civic Centre flooded, relocated to Penrith
- 70,000 people without power for 3 days; 3,000 for 5 days
- Rail services cut for 2 days
- Roads and bridges closed for 2 days
- 70 buses lost worth £3 million
- All city schools closed for minimum of 3 days, 2 seriously flood damaged, estimated cost over £4 million
- Magistrates court flooded, relocated to Penrith
- McVities Biscuits, employing 1100, flooded
- Willowholme, Caldewgate and Rosehill industrial estates flooded damaging 325 business properties estimated cost £100 million
- Police station flooded, all criminal evidence lost, mobile unit located in city centre.
- Fire station flooded, relocated to Carlisle Castle
- Emergency centres set up in a school and church hall to receive rescued residents, ran for 5 days
- Schools and pubs offer hot drinks and food to local residents using up defrosting food
- All shops shut, some reopened to give out emergency supplies of water, food and torch batteries, candles etc
- Phone exchange flooded, mobile phone mast down, no means of recharging phones led to communications breakdown – Radio Cumbria becomes main source of information and broadcast throughout the crisis
- RAF, Coastguard and Mountain Rescue teams evacuate people by boat and helicopter
- All non-emergency operations cancelled at infirmary (hospital)
- 'Dunkirk' spirit of the people to be cheerful in extreme adversity!

Medium term effects:

- Police use mobile unit for a week then in temporary offices in old Citadel for a year, police station found to be too contaminated to use.
- Firefighters clean up original station and return
- Emergency repairs to flood defences
- 50 buses brought in from northern region and then new fleet purchased
- Worst flooded school shut for 2 weeks then opens on split site/split shift system for 6 months
- Shortage of rental properties – flooded residents paid to live upstairs in their houses
- Shortage of second hand cars
- Builders and flood restoration firms drafted into city – boosts B+B trade in surrounding area
- Emergency works to flood defences carried out summer 2005
- Concerns mount as to insurance premiums and mortgage availability
- One suicide by uninsured householder
- Increase in cases of depression

Longer term effects:

- Reappraisal of flood defence needs for the city, works expected to last 3 years costing £20 million
- Plans to rebuild Police station on a new site
- Plans to significantly alter city centre
- Call to rebuild schools and change educational provision at the same time
- Many small family firms closed down
- A year on some flood victims still in temporary housing
- Increases in household and car insurance premiums throughout the Carlisle postcode area

Fig. 3 The immediate effects of flooding on the city of Carlisle, January 8th 2005.

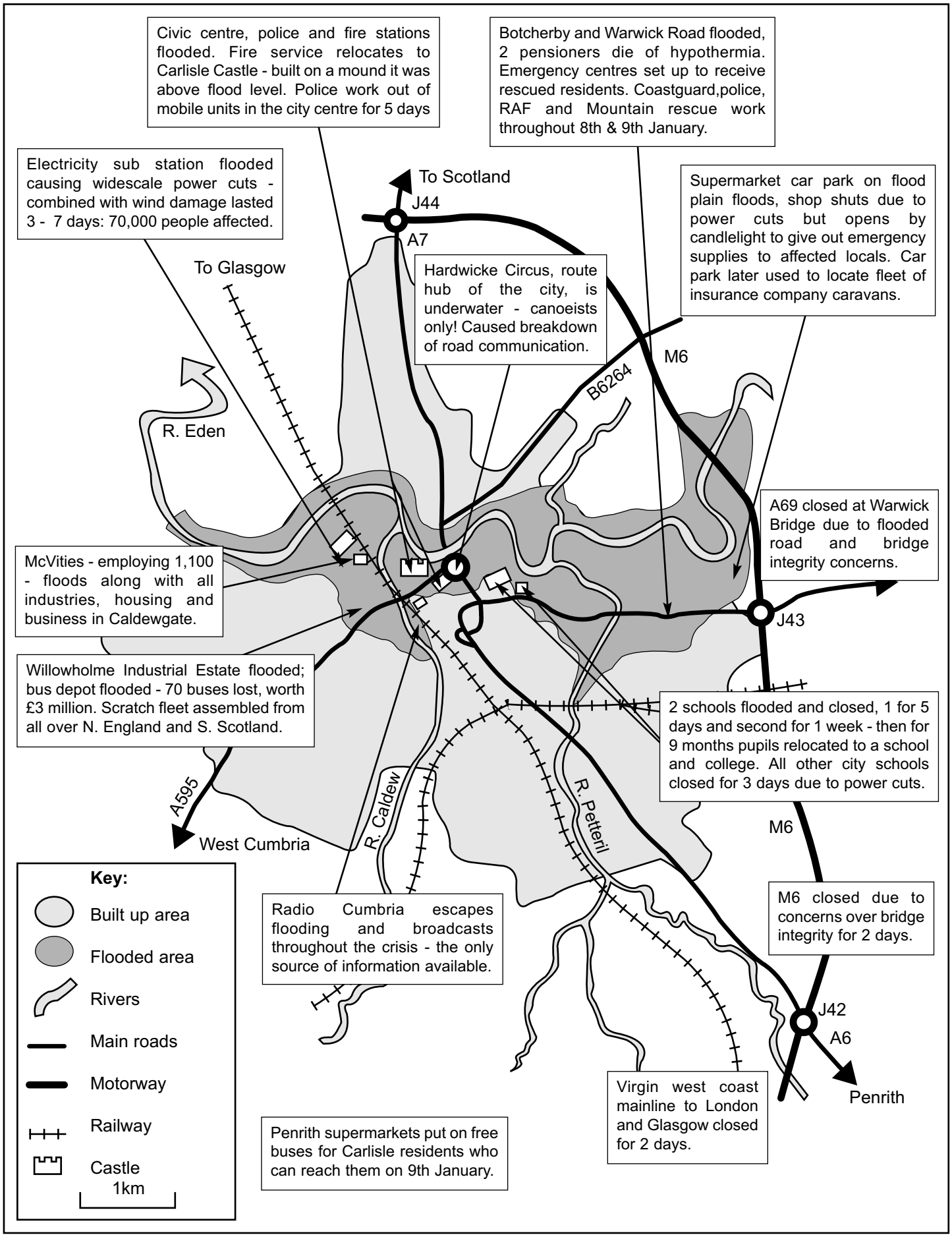
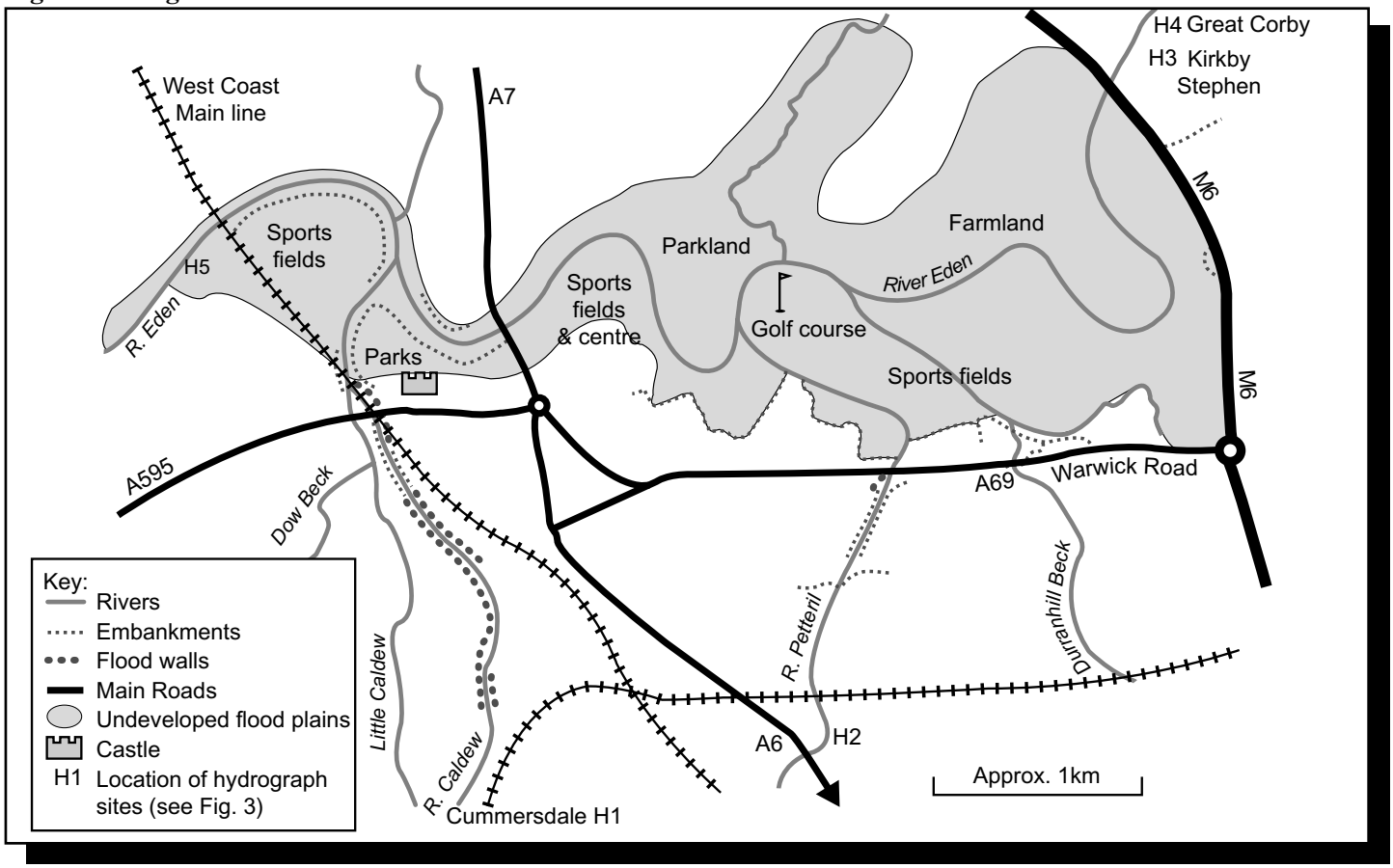


Fig. 4 Existing flood defences for Carlisle.



Future options for Carlisle

- The preferred option is to raise existing defences.
- Have some managed realignment of the rivers, i.e. strategic retreat in some areas.
- Improve channel conveyance by dredging.
- Upstream land use management in the moorlands is also being looked at.

Further research

- www.environment-agency.gov.uk for details on this and other flood events plus management.
- www.cumberland-news.co.uk local weekly paper reports on the floods and their aftermath.
- www.news-and-star.co.uk local evening paper reports on the floods and aftermath.
- www.bbc.co.uk/cumbria Radio Cumbria.

Exam questions and guidance

1. Using *Fig. 1* examine the physical and human causes of the Carlisle floods.
2. With reference to named locations examine the impact of a named flood event.
3. With reference to the hydrographs *(Fig. 2)* describe and suggest reasons for any differences.

Answer guidelines

1. Always use as much precision in your answer as possible.
   Phrases to include:
   Abnormal rainfall pattern (give figures)
   Extremely high antecedent of groundwater at saturation - rising water tables before the major storm event. Note intensity - very flashy hydrographs.
   Issues of high winds - coastal storm surges and numerous river blockages pond up waters.
   Issues of moorland drainage by grips (ditches)
   Increased run off rapidity.
   Issues of inadequate defences for a **recurrence** level of 1 in 170 years - give details.
   Town built at a **confluence** of many rivers, generally low lying flood plain partially urbanised.

2. Try to develop a very simple sketch map by drawing on the river framework. Use the timeline and *Fig. 3* to annotate key problems. Look at short, medium and long term.

3. Note the scales for discharge in cumecs do vary. Include details of peaks, lag times, rising and recession limbs. Note H5 is the end product of all the others (height/lag time at peaks).

Acknowledgements

This Factsheet was researched by Penny Ritson, an advanced skills teacher at St. Aidans School, Carlisle, whose students were badly affected by the flood.

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