



General Certificate of Education
Advanced Level Examination
June 2014

Geography

GEO4B/PM

Unit 4B Geographical Issue Evaluation

Preliminary Material (Advance Information Booklet)

To be opened and issued to candidates on or after Saturday 22 March 2014

For this paper you must have:

- The Ordnance Survey map extract (enclosed).

Instructions

- This Advance Information Booklet will be issued on or after Saturday 22 March 2014 in advance of the examination for Unit 4B. You should make yourself familiar with the information in the booklet.
- This booklet must be kept **unmarked** for use in the forthcoming examination.

STUDY ALL THE INFORMATION IN THIS BOOKLET

The information in this booklet comprises the following:

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Item 1 The Morpeth Floods (based on BBC 'Inside Out' 01.10.08)

'It was the worst flooding in Morpeth's history. But after the floods subsided, major questions are now being raised.

- Could the town have been better prepared?
- Was there enough warning of what was to come?
- Did the town's rescue plan stand up to the test?

Summer 2008 had been unusually wet in the north-east of England so the ground was already saturated. Then, in early September, an area of intense frontal rainfall became almost stationary over Northumberland.

At 11.26 on Saturday 6 September, a severe flood warning was issued telling people in the High Stanners area to leave their homes.

Mitford Road, on the north side of the River Wansbeck, was one of the first areas to start to flood. There was also water coming into the first houses at the eastern end of the Oldgate Bridge in central Morpeth, and residents were preparing to evacuate houses in the Low Stanners area.

The Environment Agency advised the emergency services to start evacuating parts of the town. But was that done early enough? Ian Hodge of the Environment Agency says that a balance had to be struck: "Morpeth is a busy town centre – it was a Saturday and we can cry wolf once too often. We do have to strike a balance so we don't give advice that people don't take notice of."

By mid-afternoon a major evacuation exercise had started and the town's emergency plans were put to the test.

Resident Ian Smith believes that measures were taken too late, "I rang the council for the sixth or seventh time to say the sandbags were far too late. They said that they have to prioritise. I said how much of a priority is the river in my house?"

What became clear was there simply weren't enough sandbags – and the rescue teams were forced to improvise. By late afternoon, the emergency services were at full stretch and lives were at risk.

One fireman told 'Inside Out', "We were getting calls from the public to report elderly relatives who needed medication – which we were able to prioritise. In the main, it was a systematic search of the area – starting at the area at greatest risk and then bringing in other resources, such as the RAF helicopter from Boulmer, because the water was so deep and fast flowing."

Three hundred people were in need of rescuing from the affected properties. When the RAF arrived, the first task was to pick people up from roof tops.

Morpeth has a long history of flooding and, according to its emergency plans, it should have had pleasure boats on standby to help in a crisis. But the day when they were really needed they were full of flood water and of no use to the rescuers.'

'Ken Dunbar, the Chief Executive of Morpeth Council, explains, "The speed of the flood meant those boats were inaccessible without great danger. So there are lessons there. If we'd had more people, we would have moved the boats – the reality is that people were knocking on doors trying to evacuate people from their homes and that was a priority."

The local fire service didn't have a boat either and had to borrow an inflatable from nearby Tyne and Wear Fire Service. Luckily two lifeboats arrived to help, one from the RNLI and another from the RSPCA.

Despite the heroic efforts of rescue services elsewhere, in Middle Greens there was still no one around. So it was down to local people to help each other.

Resident Andrew Wilson says, "We had no warnings, no help whatsoever. Me and my pals knew there was a boat in the allotments – so we went and got it. We brought it down the streets, got the elderly out, got disabled people out – just made trips up and down getting people out."

Around 2000 people had been forced to sleep away from their homes – 900 houses and 90 businesses had been wrecked.

The Environment Agency's automated telephone warning service had missed the Middle Greens area of the town. 'Inside Out' has been told that was simply down to human error from a computer operator. Ian Hodge from the Environment Agency says, "We actually issued 45 different flood warnings that day unfortunately the warning didn't go out to Middle Greens It was essentially a click of the mouse in the wrong place. It is terrible and we understand the devastation that people will have experienced during that flood event."

All the services involved in the emergency plan are now reviewing what happened.

Chief Executive Ken Dunbar says, "I accept here and now that we simply didn't have enough people on the ground. The big lesson from this is that, as a council, we have been given a lot of credit for reducing staff. The reality is that it makes us leaner but it makes it very difficult responding to emergencies like this. We are campaigning to say we are expecting the full cost of the flood recovery and restoration to be from government funds."

There's no definitive figure yet on the final bill for the restoration of the town, but it will be counted in tens of millions of pounds.

The urgent job now is to make sure that such a devastating disaster never happens again. More flood defences are planned for the town but the question remains – will the town be better prepared next time?'

Turn over for the next item

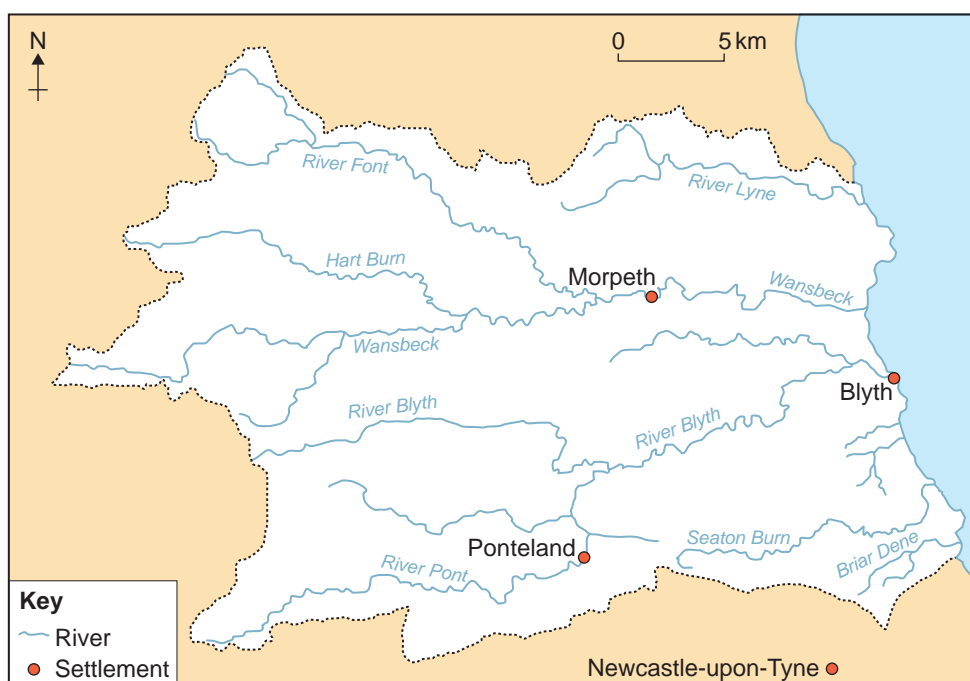
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Item 2 The Wansbeck river system and Morpeth

Morpeth lies in the Wansbeck catchment area, a relatively small river catchment that covers 331 km². The main reach of the Wansbeck has an active flood plain that is between 100 m to 300 m wide. The town itself is located within this flood plain (see **Figure P1**).

The river has three main tributaries: the Font, the Hart Burn and the Wansbeck itself. The three rivers combine just west of the A1, before flowing through the town. In Morpeth itself, the Wansbeck is joined by several other small tributaries. These small tributaries rise in an area of agricultural moorland and flow over land with clay soils formed on deposits of glacial till. As they approach Morpeth most of the tributaries flow into steep-sided wooded valleys. They are all classified as 'rapid response' catchments. In the more built-up areas the streams have been culverted and there are often trash screens at the entrances to the culverts. These screens can lead to blockages if not cleared regularly.

Figure P1 – The rivers of south-east Northumberland



Historic flooding in Castle Morpeth Borough

Flooding in Morpeth is not unprecedented, but the recent flood had the biggest recorded flow on the River Wansbeck and was the most damaging in living memory. The record for the flow measurement station at Mitford, just upstream from Morpeth, commenced in 1968. The flood of 2008 was by far the largest flood in the record.

A severe flood occurred in 1963, in which over 500 properties were flooded. The flood defences in Morpeth were designed to contain a repeat of the flood magnitude in 1963 as this was considered to be an event of unusual severity. Reference was made to historic flood marks in 1878 and 1898. It was considered that the 1963 flood event was greater than both of these historic floods, with a return period probably in excess of 100 years. The flood level in the September 2008 flood was in excess of the 1963 flood and, therefore, overtopped the defences.

Studies of the September 2008 flood concluded that it is likely to have been the greatest in at least the last 250 years. This places the estimated return period of the event well in excess of 100 years. This corresponds with the assessment based on the return period of the rainfall combined with the unusually wet initial catchment conditions.

The rainfall event

Figures from the Environment Agency rainfall and river flow data show that on 4, 5 and 6 September 2008 alone, the Morpeth area received 235% of the rainfall that could normally be expected in the whole of September. The situation resulted from an almost stationary front, which lay across the country from Devon to south-east Scotland. See **Figure P3** on pages 14 and 15.

Item 3 Reconstruction of the flood sequences in Morpeth

The map in **Figure P2**, on pages 8 and 9, is based on a report produced by a Senior Lecturer in Hydrology and Water Resources in the School of Civil Engineering and Geosciences at Newcastle University. He was also a flood victim as he is a resident of Mitford Road in Morpeth.

The idea for the project arose from seeing the widespread and rapid public response in posting photographs of the flood from digital cameras and mobile phones on social networking websites. The report used these sources and others to produce detailed interpretations of flooding mechanisms during the event.

The report divided the flooded area into five different sections and analysed the sequence of events in each section. Events during the flood were recorded in the order in which they happened. It was not always possible to give accurate timings. The events have been summarised on the map in **Figure P2**.

- Different coloured numbers have been placed in positions that give a general indication as to where each event took place.
- The numbers show a general time sequence in each of the five flooded areas.
- The notes around the edge of the map provide a key to the events in each of the areas.

Figure P2 should be studied alongside the OS map extract provided as an insert with this booklet.

Item 3 continues on the next page

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Figure P2 – Stages of flooding on Saturday 6 September 2008

Mitford Road

- 1 Low-lying parts of Mitford Road flood to a shallow depth from surface run-off due to inadequate drainage
- 2 Water spills over banks of river onto Mitford Road
- 3 Water flows north-east along Mitford Road causing rapid flooding of houses
- 4 As river level falls, water is trapped and cannot drain back to river because of the row of houses
- 5 In later stages of the flood, water level is considerably higher on the road than in the river

High Stanners

- 1 The only vehicle access road into the housing estate floods early from surface run-off due to poor drainage
- 2 River breaks out of banks, across the Green and starts to flood houses
- 3 Some houses flood from below due to ground water flows through alluvial gravel
- 4 Almost all the estate flooded, except for a few houses on slightly raised ground



Central Morpeth

- 1 River water floods into unprotected areas
- 2 Shallow depths of surface run-off occur due to lack of protection from rising river levels in the town
- 3 Flood water from overtopped walls continues to flow into the town centre
- 4 Flood depths increase rapidly across most of the town in the early evening



the approximate movement of

areas of the town centre
 accumulate behind flood walls, which provide
 early to middle stages of the flood event
 combines with water from Bridge Street
 most of the area during late afternoon/

Low Stanners

- 1 Areas of shallow surface water, including drain water and sewage, collect on some streets. Most areas remain free of flood water until mid-afternoon on 6 September
- 2 Flood walls overtopped around mid-afternoon
- 3 Flood water from overtopped walls combines with water from Bridge Street to flow into the estate
- 4 Flood depths increase rapidly across most of the area during late afternoon/early evening

Middle Greens

- 1 Areas of shallow flooding from local surface water develop in some areas, cutting off the main road access into Middle Greens
- 2 Drains bring storm water and sewage from roads and housing estates to the south and cause localised flooding
- 3 Small amounts of water leak through flood walls
- 4 Pressurised flow through the culverted section of a small tributary blows open a manhole cover. This combines with continued storm water and sewage flow from drains to cause more extensive flooding
- 5 River water flows around the end of the flood barrier and joins the existing flood
- 6 Almost all of the estate floods

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Item 4 Planning flood responses

Planning for the Morpeth floods can be said to have begun in November 2000, when floods occurred in Ponteland, a small town, a few kilometres south of Morpeth. 123 residential properties and 24 commercial properties were flooded.

Both towns are in Northumberland, so Northumberland County Council (NCC) has some responsibilities to plan for, and respond to, flood events in these towns. Their responsibilities are shared with the local councils – with Castle Morpeth Borough Council (CMBC) in the case of Morpeth. Organisations such as the Environment Agency (EA) and the police also have responsibilities for preparation and response. In severe emergencies the army and air force, the RNLI, mountain rescue, etc, can be called on for help.¹

Preparation included:

- three major multi-agency exercises (2001, 2002 and 2005) to rehearse roles that would be played in future flood events
- Preparation of flood action plans by CMBC, NCC and the EA.

¹Note that since the floods in 2008, all the local councils' responsibilities for flood preparation have been taken over by the newly formed Northumbria Local Resilience Forum.

The responses during the 2008 flood¹ included:

5 September	16.00 EA alerted partners to be on standby
6 September	03.30 EA preliminary flood watch issued for River Wansbeck
	07.25 EA Flood Warning issued for High Stanners and Mitford Road
	07.30 CMBC Emergency Flood Plan invoked
	08.55 Police informed. GOLD (multi-agency, major incident co-ordination centre) set up
	08.55 CMBC emergency control centre set up
	09.20 CMBC Green & Clean Team (of environmental services staff) deployed with signs and sandbags
	11.00 NCC started to evacuate properties in High Stanners
	11.20 EA Severe Flood Warnings issued for High Stanners, Mitford Road and town centre
	12.25 CMBC mobilises rest centre staff
	12.25 NCC full evacuation of High Stanners invoked
	12.45 NCC King Edward VI School opened as rest centre
	12.49 EA Severe Flood Warning for Low Stanners invoked
	13.10 CMBC implements evacuation of town centre
	14.00 CMBC starts sand bagging to protect evacuation routes
	15.45 NCC request assistance from Red Cross, St John Ambulance and North East Ambulance Service
	16.30 RAF helicopters, Mountain Rescue and RNLI involved in evacuation/rescue
	18.25 CMBC advised by Fire Service that there are still residents in need of evacuation
	23.30 CMBC Green & Clean Team stood down
7 September	13.17 Police hand control of incident back to CMBC
	14.00 CMBC Flood Information Point opened
	16.00 NCC rest centres closed
	18.00 CMBC Emergency Co-ordination Committee stood down.

¹Note that information on this page has been collated from several different sources. There are some differences in these sources regarding timings, but there is no disagreement about the overall sequence.

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Item 5 Press reports on planning in the aftermath of the floods

In December 2010, the Environment Agency website published:

'Environment Agency engineers continue to work on plans for the proposed £17 million flood defences for the town to reduce flood risk to more than 1000 properties from the River Wansbeck.

In the two years since Morpeth suffered its worst recorded flooding, some £2.25 million has been spent on essential work and repairs to reduce flood risk in the future.

Repairs included the replacement of the stone facing to a stretch of wall in Carlisle View, replacing waterproof seals on flood walls throughout the town and the rebuilding of a privately-owned wall in Newmarket Car Park.

Culverts that were badly damaged during the September 2008 flooding have been repaired. Work has included removal of debris and silt, strengthening the culvert walls and replacing a section of the roof. Tonnes of gravel deposited during the flood have also been removed from the River Wansbeck near Oldgate Bridge. In addition, the Environment Agency created a new evacuation route for residents of High Stanners.

A proposed flood scheme will be presented to the Environment Agency's national review group in November 2011. Planning for the scheme began in November 2007 and, following investigations by engineers and consultation with the public, the current proposals include upstream storage and additional walls in the town.'

On 22 January 2011, The Journal of Newcastle reported on the planned Morpeth flood defence scheme:

'Environment Agency officials confirmed yesterday that – unless there is a last-minute change in funding allocations – work on Morpeth's vital flood defence project will not start as scheduled in December this year.... .

Work was programmed to start this year and be completed by late 2013, but the scheme has fallen victim to the coalition government's massive public expenditure cuts.

Yesterday, the Environment Agency's Northumbria Flood Defence Committee was told that the Morpeth scheme has not been included in the region's indicative spending allocation for 2011/12. The committee was told the project might have to be broken down into its constituent parts and carried out in phases in a bid to make it affordable. Alternatively, costs could be cut by reducing the current level of flood protection it provides, or seeking alternative sources of funding.'

On 9 February 2011, The Guardian reported on cuts to the government's planned spending on flood defences across England. It referred to:

'Major projects in Morpeth are having their funding cut, along with more than 1000 other smaller schemes.' It then stated that:

'The Environment Secretary, Caroline Spelman, has acknowledged that the risk of flooding is rising because of climate change but imposed a year-on-year cut of over 20% on flood defence spending. The flooding minister, Richard Benyon, said projects cut from the list had been "deferred not cancelled".

Alan Bell, chairman of the flood action group in Morpeth, said the loss of the project for the town had shocked residents. "On average, insurance went up 70% after the flood and much more for some. Blight could set in for homes and for the commercial viability of the whole town because if businesses can't get insurance, they won't invest."

On 23 June 2011, The Morpeth Herald wrote:

'Morpeth's flood scheme could get the go-ahead within months as councillors prepare to commit up to £12 million to the project. Northumberland County Council is planning to allocate between £7 million and £12 million over the next five years to push the project up the priority list for national approval.

Last week the Environment Secretary, Caroline Spelman, said the Morpeth scheme did not provide sufficient benefits to secure full funding from national budgets. But with the local authority's proposal, the amount required from the central pot would be about half the anticipated total cost of £21 million.'

On 9 February 2012, the BBC News website, Tyne and Wear page wrote:

'Funding for a flood defence scheme for Morpeth has been approved by the government and the Environment Agency

Construction work on the £21 million defences will start early in 2012 and is expected to take between a year and 18 months. The government will contribute £10.6 million as part of its Partnership Funding model, with up to £12 million coming from Northumberland County Council.

Designs are being drawn up for the scheme, which includes a flood storage area on open land on the flood plain upstream from Morpeth. New defences will also be built at Mitford Road, High Stanners and around Oldgate Bridge, and a few existing ones raised where necessary.'

Item 6 Environment Agency rainfall and river flow data

In **Figure P3**, on pages 14 and 15, the three columns contain the following:

Column 1 Date and time of readings.

Column 2 Rainfall reading in millimetres for Wallington Logger Station, situated on the River Wansbeck, 15 km west of Morpeth. The station measures the total rainfall every hour.

Column 3 River flow in cumecs on the River Wansbeck at Mitford (grid reference 174857). Measurements are taken automatically using laser readings of the depth of water flowing through a weir and using a flow meter to measure speed of flow. Note however, that between 14.15 and 16.45 on 6 September, the river level was too high for the depth measuring device. The figures for 15.00 and 16.00 have been estimated by the Environment Agency from observations of the 'wreck level' on the banks. This is the highest level at which vegetation and sediment were deposited by the river in the flood.

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Figure P3

1. Date and time	2. Rainfall (mm)	3. River flow (cumecs)
05/09/2008 00.00	0.0	2.4
05/09/2008 01.00	0.0	2.35
05/09/2008 02.00	0.0	2.29
05/09/2008 03.00	0.0	2.22
05/09/2008 04.00	0.0	2.16
05/09/2008 05.00	0.0	2.1
05/09/2008 06.00	0.0	2.05
05/09/2008 07.00	0.0	1.99
05/09/2008 08.00	0.0	1.94
05/09/2008 09.00	0.0	1.89
05/09/2008 10.00	0.0	1.84
05/09/2008 11.00	0.4	1.8
05/09/2008 12.00	1.2	1.78
05/09/2008 13.00	1.0	1.76
05/09/2008 14.00	2.4	1.8
05/09/2008 15.00	3.4	1.9
05/09/2008 16.00	2.8	2.1
05/09/2008 17.00	3.2	2.68
05/09/2008 18.00	3.0	4.09
05/09/2008 19.00	3.2	6.43
05/09/2008 20.00	2.0	10.8
05/09/2008 21.00	2.6	17.3
05/09/2008 22.00	1.4	26.8
05/09/2008 23.00	3.2	45.3
06/09/2008 00.00	0.8	57
06/09/2008 01.00	1.0	67.3
06/09/2008 02.00	3.4	78.5
06/09/2008 03.00	2.6	85.7
06/09/2008 04.00	2.8	93
06/09/2008 05.00	2.6	99.2
06/09/2008 06.00	5.0	107
06/09/2008 07.00	4.6	124
06/09/2008 08.00	4.2	145
06/09/2008 09.00	4.0	169
06/09/2008 10.00	5.0	191
06/09/2008 11.00	4.4	217
06/09/2008 12.00	5.6	243

1. Date and time		2. Rainfall (mm)	3. River flow (cumecs)
06/09/2008	13.00	5.6	269
06/09/2008	14.00	3.6	297
06/09/2008	15.00	4.6	337
06/09/2008	16.00	3.8	357
06/09/2008	17.00	2.0	324
06/09/2008	18.00	0.6	304
06/09/2008	19.00	3.0	275
06/09/2008	20.00	5.8	241
06/09/2008	21.00	4.8	215
06/09/2008	22.00	1.6	206
06/09/2008	23.00	4.6	213
07/09/2008	00.00	1.0	224
07/09/2008	01.00	0.2	231
07/09/2008	02.00	0.2	223
07/09/2008	03.00	0.0	203
07/09/2008	04.00	1.0	175
07/09/2008	05.00	2.4	150
07/09/2008	06.00	0.2	133
07/09/2008	07.00	0.0	124
07/09/2008	08.00	0.0	113
07/09/2008	09.00	0.0	103
07/09/2008	10.00	0.0	94.3
07/09/2008	11.00	1.4	86.5
07/09/2008	12.00	0.2	80.6
07/09/2008	13.00	0.2	75.8
07/09/2008	14.00	1.8	72.6
07/09/2008	15.00	0.0	71
07/09/2008	16.00	0.2	68.9
07/09/2008	17.00	0.4	64.4
07/09/2008	18.00	0.2	60.2
07/09/2008	19.00	0.6	56.8
07/09/2008	20.00	0.0	54
07/09/2008	21.00	0.0	52.4
07/09/2008	22.00	0.0	50.6
07/09/2008	23.00	0.0	48.3
08/09/2008	00.00	0.0	46

Turn over for the next item

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Item 7 Further research

Whilst preparing for this examination you should carry out further research to see how far the plans to protect Morpeth from future flooding have progressed. It is suggested that you type 'Morpeth flood defences' into a search engine and study the most recent press reports. The BBC News website and the Newcastle Journal's 'journallive' site are potentially useful sources.

In September 2012, Morpeth was flooded again. Articles posted on the days of the flood included:

<http://www.morpethherald.co.uk/news/agency-defends-morpeth-flood-scheme-work-1-4960404>

<http://www.journallive.co.uk/north-east-news/todays-news/2012/09/25/morpeth-residents-evacuated-as-rain-causes-chaos-video-61634-31901708/>

There are **no** suggestions in this booklet for planning and preparation of primary data collection.

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