

Woodend Farm

Flood Investigation Report 42



Flood Event 30/8/2012

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
Preliminary	Colin Parkes	Anthony Lane		10 th May 2013
Draft	Colin Parkes	Anthony Lane		7 th June 2013
Published	Andrew Harrison	Anthony Lane	Doug Coyle	1 st April 2013

Executive Summary

Cumbria County Council as Lead Local Flood Authority has prepared this report with the assistance of other Flood Risk Management Authorities under Section 19 of the Flood and Water Management Act 2010.

The report identifies that Woodend Farm suffered from flooding on 30th August 2012 and again on 17th October 2012. The main cause of the flood was that an Ordinary Watercourse is restricted by a culvert which carries the watercourse under a road outside Woodend Farm. A major contributing factor is that surface water is brought to the same location by the roads and fields

Three actions have been identified in the report which would minimise the risk of future flooding. These actions are aimed at improving the existing drainage system.

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Event Background

This section describes the flood incident and identifies the properties affected.

Flooding Incident

Woodend Farm is located where an unclassified road crosses an unnamed watercourse which originates in the fields behind the farm near Bigrigg.

Woodend Farm, Woodend, Egremont, Cumbria, CA22 2TA.
300891, 512875. Circled in red on plan.



Figure 1: Location of Woodend Farm.

During the night of 29-30th August 2012 intense rainfall resulted in a rise in levels of the beck adjacent to Woodend Farm exacerbated by a restriction to flows at the culvert. The beck rose out of the channel flooding Woodend Farm to a depth of 300mm. The resident had installed flood protection measures after previous incidents but these failed during this event. Flood water also entered the property across the road (Woodend House) to a lesser extent but enough to cause internal damage.

A repeat of the flooding also occurred seven weeks later during a storm on the afternoon of Wednesday 17th October 2012.

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Investigation

Rainfall Event

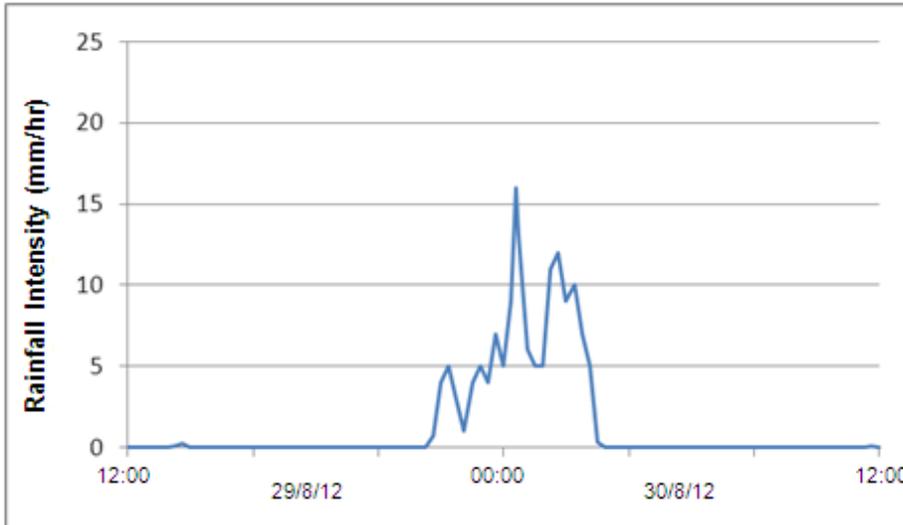


Figure 2. Rainfall intensity at Woodend Farm from 12pm, 29/8/12 to 12pm, 30/8/12

30/8/2012

No rain gauge data is available and the following has been calculated from radar data. Peak rainfall at Woodend was about 16mm/hr and occurred at about 12:25am. The rain started at 9:35pm and finished at 3:00am with 33mm in the period. The normal average total rainfall for the whole of August is 92mm (1981-2010).

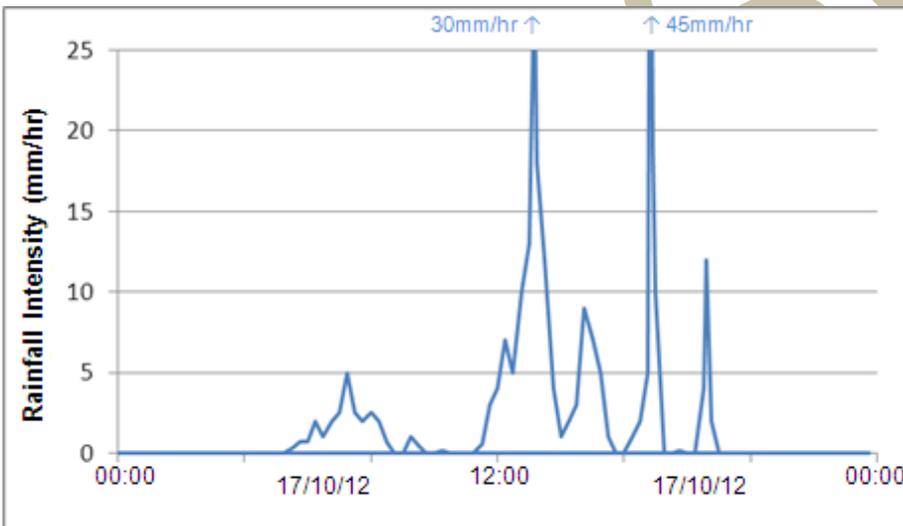


Figure 3. Rainfall intensity at Woodend Farm on 17/10/12.

17/10/2012

Radar data shows that the rain started at 5:30am with light showers and the main event started at 11:30am with a peak rainfall of 45mm/hr at 4:50pm. There had been another huge spike in rainfall of 30mm/hr at 1:10pm and numerous other bursts of very heavy rain. The storm finished at 6:30pm after 44mm had fallen.

Map of Flow Routes

Water reached Woodend Farm from all directions, the main source being the unnamed beck coming from the west. The rainfall intensity caused surface water to flow over the fields towards the farm. Flood water was also brought to the farm along road surfaces which converge on this area with the crossing over the beck, which is culverted downstream of this point.

A hole in the parapet wall above the culvert entrance allows road water to drain directly into the beck. When the beck level rises, this drainage route is reversed and water from the beck flows onto the road. During both flood events, the culvert could not take all the water and so flood water levels rose at the culvert entrance.

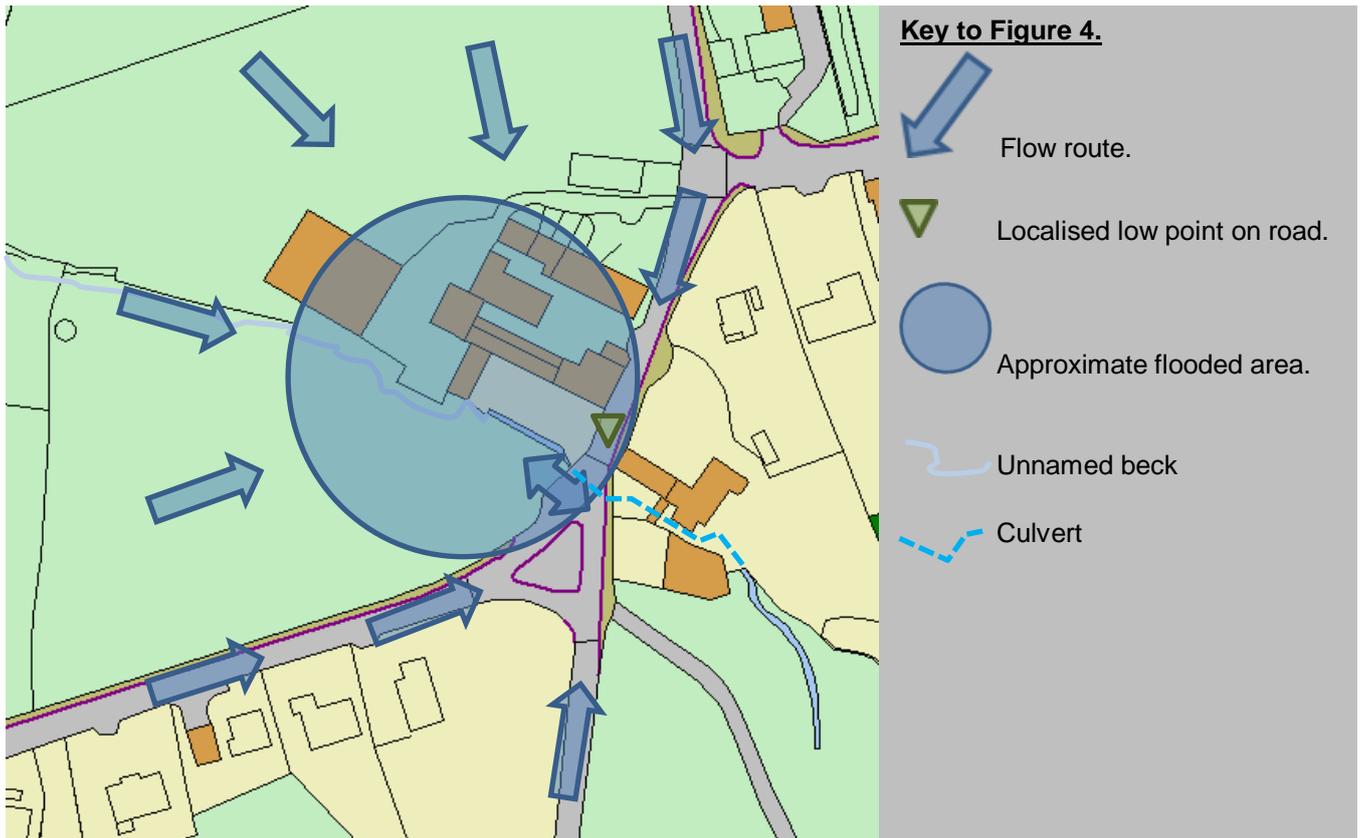


Figure 4: Flood flow routes at Woodend.

Likely Causes of Flooding

Ordinary Watercourse

The stream which flows past the farm starts near Bigrigg. The beck flows out of a pipe, the purpose of which has not yet been identified.

The watercourse flows for 680m until it reaches the culvert at Woodend Farm. This presents a restriction to the flow causing a rise in flood waters in front of the culvert entrance.

The culvert starts as an 800mm diameter arch constructed in brick. It is in fairly good condition but there are numerous design problems.

- It is smaller than the stream channel so flows are likely to exceed the culvert capacity as proven by the flooding.

- Services are routed through the culvert in more than one location. This reduces capacity as well as increasing the risk of blockages.



Figure 5. Culvert entrance

- Culvert construction and cross-section varies (it is an arch at the entrance but the exit is rectangular) which result in a loss of hydraulic efficiency.
- There are four changes in direction within the culvert which also result in a loss of hydraulic efficiency, and make maintenance difficult. In modern culverts access for maintenance must be provided at each change in direction. This culvert is not of modern design and appears to have been constructed in stages.



Figure 6. Picture from CCTV survey showing service pipe passing through the culvert and a branch caught on it

Surface Water

Woodend Farm is susceptible to surface water flooding due to its location below slopes on three sides.

The roads in the area fall to a low point which is adjacent to Woodend Farm and these convey extra surface water to the area. The hole in the parapet wall allows surface water from the road to drain into the beck in normal conditions. Because it is on the upstream end of the culvert, this contributes to the problem of restricted flows in the culvert and rising floodwaters at the culvert entrance.

Flooding History

Woodend Farm has flooded four times in 13 years. Flooding occurred twice in 2012, once in 2009 and 1999.

Recommended Actions

Action by	Recommended Action	How
County Highways / LLFA	Increase capacity of culvert	<ul style="list-style-type: none"> • Examine feasibility of culvert enlargement or new culvert route. • Investigate sources of funding. • Commission hydraulic study. • Request removal of gas pipe through the middle of the culvert. Completed
County Highways	Reduce surface water in culvert.	Investigate possibility of diverting surface water collected on roads to downstream side of culvert.
LLFA / Land Owner	Reduce flow.	Investigate feasibility of upstream attenuation.

Next Steps

CCC as the LLFA will continue to ensure that any actions identified within the actions table of this report are appropriately taken forward by each Risk Management Authority identified. Actions will continue to be prioritised through the Making Space for Water process and monitored through regular meetings of the group. Details of the MSfWG members and summary of related processes are detailed in Appendix 3.

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Appendices

Appendix 1: Summary of residents feedback to draft report

Report issued to residents 12th June 2013 who had no further comments to add.

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Appendix 2: Glossary

Acronyms

EA	Environment Agency
CCC	Cumbria County Council
LLFA	Lead Local Flood Authority
LFRM	Local Flood Risk Management
MSfWG	Making Space for Water Group

Measurements

ha	Hectares (1ha = 10000m ² or 2.5 acres)
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Appendix 3: Summary of Relevant Legislation and Flood Risk Management Authorities

The Flood Risk Regulations 2009 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 4: Possible culvert options.

The culvert is clearly inadequate to deal with flows observed in 2012. It appears to be causing severe flooding on a 3-5 year basis. This can be addressed by increasing capacity and/or reducing the flows in the beck. Due to the proximity of various utility services the construction of a new culvert would be complex.

INCREASING CAPACITY

- A new culvert could be installed to cross the road, most likely as an overflow to the existing culvert but it could also be done as a replacement. This would appear to be the most straightforward solution to the flooding.

A new culvert would have to be as short as possible, with good access made available and no development above it. Current regulation would most likely require the length of culvert to be reduced. It would have to deliver improvements over the current situation to flood risk and ecology.

- It may be possible to increase flows within the existing culvert by improving the culvert geometry to maximise hydraulic efficiency. Streamlining the inlet or outlet is the most likely way that this could be achieved. Removing the service crossings, reducing the sharpness of the corners, and lining the culvert to remove roughness may also have an effect. A hydraulic study would be required to determine the flow conditions within the culvert and to assess whether any of these actions would have a significant effect on increasing capacity. The LLFA would have to either conduct or commission this survey.

REDUCING THE FLOW

- Attenuation would be possible in the fields upstream of Woodend Farm so that peak rainfall can be stored and released at a slower rate after storm events. This would need the support of the landowner(s) affected.

Appendix 5: Catchment Analysis

A look at the contours shows that the natural catchment at the culvert entrance is 36ha (shaded blue in Figure 7 below). It has been suggested that an extra 25ha (shaded orange) may also reach this point. Roads to Egremont (14ha), and Moor Row (11ha), could convey flood water that would naturally enter the beck downstream of Woodend Farm, back to the culvert location. At this point there is a hole in the parapet wall, above the culvert entrance, which drains highway areas. This would increase the catchment size at the culvert entrance by 75%, to 61ha and it is likely that a considerable amount of the water that falls in this extra area does arrive at the culvert entrance.

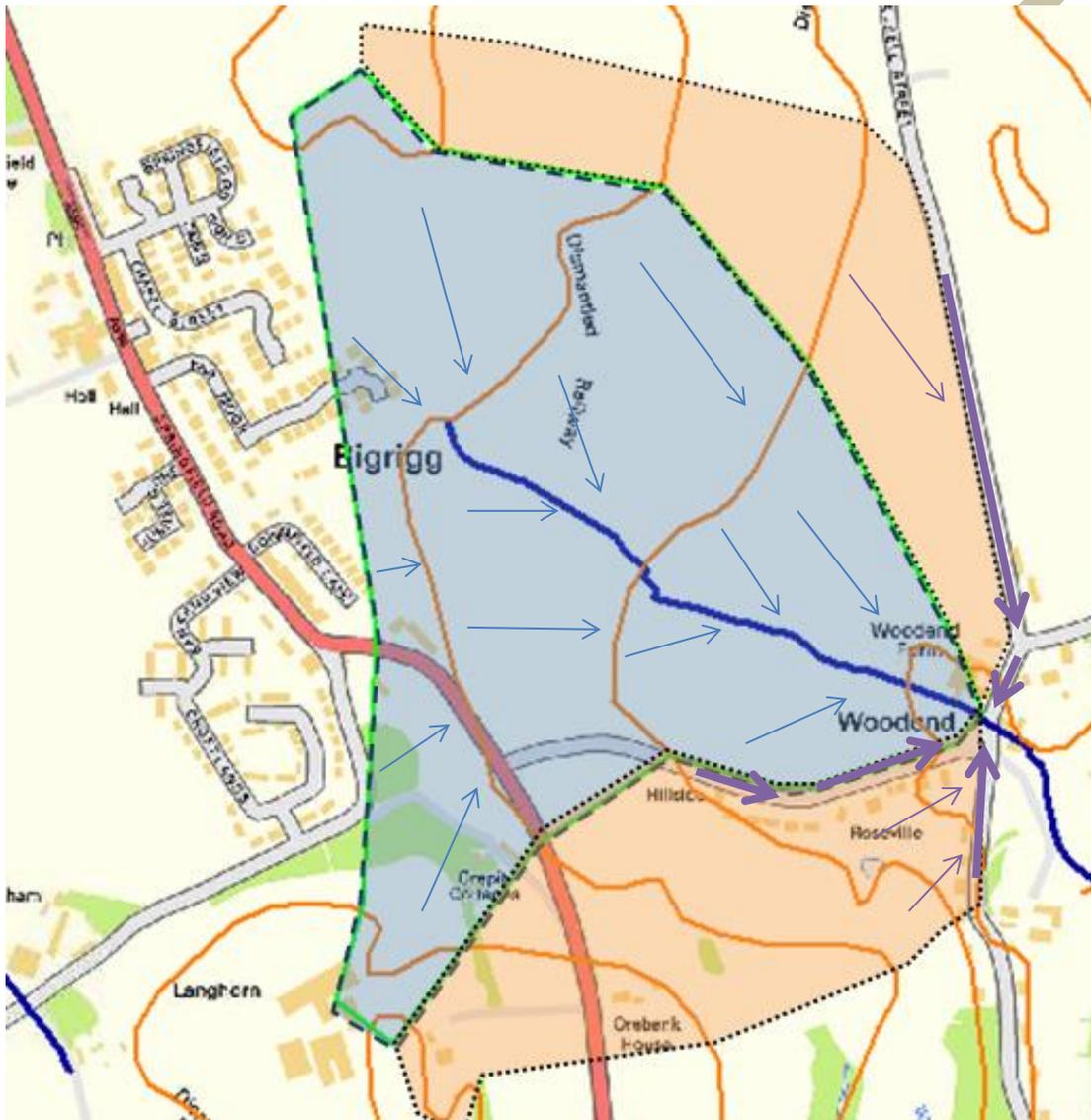


Figure 7. Map showing the natural catchment (blue) and the possible extended catchment (orange) at the entrance to the culvert at Woodend Farm.

Appendix 6: Useful contacts and links

To report flooding: Incident hotline tel: 0800 80 70 60 (24hrs)

Floodline: tel. 0845 988 1188

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: 0845 609 6609

Cumbria County Council Neighbourhood Forum: tel: 01946 505022

cumbria.gov.uk/sayit

United Utilities: tel: 0845 746 2200

Copeland Borough Council

info@copeland.gov.uk, www.copeland.gov.uk, tel: 0845 054 8600

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.

আপনি যদি এই তথ্য আপনার নিজের ভাষায় পেতে চান তাহলে অনুগ্রহ করে 01228 606060 নম্বরে টেলিফোন করুন।

如果您希望通过母语了解此信息，
请致电 01228 606060

Jeigu norétumète gauti šią informaciją savo kalba,
skambinkite telefonu 01228 606060

W celu uzyskania informacji w Państwa języku proszę
zatelefonować pod numer 01228 606060

Se quiser aceder a esta informação na sua língua,
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