



WEST OXFORDSHIRE
DISTRICT COUNCIL

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Parish Flood Report: **Curbridge & Lew**

July 2008

Version 1 – This report may be revised in the future to incorporate ongoing consultation results



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1.0 INTRODUCTION

On the 20th July 2007 large parts of the South of England were subjected to intensive storms. The scale and speed of the rainfall was unprecedented and took most communities by surprise causing widespread flooding of highways and property. On this occasion, unlike previous storms / flooding experienced, this impacted on many properties that had never been affected before, due to much of the flooding coming in the form of rain water run off from land.

A swathe of the district was particularly badly affected by the massive storms, which commenced in the morning and subsided in the evening. During the following days further disruption occurred due to rising river levels. At RAF Brize Norton, the records show that over 125 mm (5 inches) of rain fell in 12 hours, and this is a record going back over 100 years. Not only that, but the period from May to July had been the wettest on record since 1903 and meant that the ground was saturated and unable to absorb any more water.

On the 10th October 2007, the District Council's Cabinet considered a report of the Head of Street Scene and approved additional resources in order that a review of the affected areas could be carried out and further reports be prepared for the Council's considerations.

1.1 Purpose of the report

In response to requests from both the Parish and Town Councils and the general public West Oxfordshire District Council has produced a number of reports that identify each individual cause of flooding within the Parish / Town, what work is being carried out by external agencies (EA, Thames water etc); what the potential options are for future mitigation - and who might be best placed to fund such schemes. The reports themselves reflect the series of water systems that all played a part in the flooding experienced in July 2007 and will help all the organisations involved understand the need to sequence their activities.

This report has been prepared by a qualified Engineer in consultation with the key external agencies and seeks to explore the main reason behind why the floods happened in July 2007 and give an overview of the event itself. It will also provide an understanding of the different roles and levels of responsibility for the agencies involved.

This report should be used to make sure that all the agencies involved with flood prevention – like the Environment Agency, Thames Water, Oxfordshire County Council, Town / Parish Councils and private land owners – work in true partnership for the good of everyone in the local community.

A key outcome of the reports is that residents are given a broad overview of the complex linkages between the different organisations involved and also the range of options available.

1.2 Roles and responsibilities

One of West Oxfordshire District Councils key ongoing roles is to continue to lobby National agencies / Government on behalf of the residents and businesses of the district to secure funding and/or additional resources to assist with flood prevention and other relevant activities. The Council will also work closely with other agencies and organisation in order to highlight the local issues and actions identified in the report.

The legal responsibility for dealing with flooding lies with different agencies and is complex, so below is a simplified summary.

Environment Agency (EA) – permissive powers¹ for main rivers

Oxfordshire County Council (OCC) – Responsible for adopted highways and highway drainage.

Thames Water (TW) – Responsible for adopted foul and surface water sewers.

West Oxfordshire District Council (WODC) – duties as a riparian² land owner, and permissive powers¹ under Land Drainage Act 1991, Public Health Act 1936, Highways Act 1980 and Environmental Protection Act 1990.

Private land owners - duties as a riparian land owner.

1.3 Consultation and consent

The key organisations mentioned above are currently carrying out their own investigations, but operate independently of each other, have different methods of prioritisation and different funding criteria. The District Council has consulted with these agencies together with Parish Councils, Town Councils and individual property owners in order to prepare this report.

It is recognised that the majority of the options proposed in this report require further investigations / feasibility studies and / or consultation before they are carried out. Therefore these options may not be appropriate in every case when full costings, environmental, landscaping, biodiversity, built environment and historic factors are fully considered.

When considering protection against future flooding, it must be emphasised that the risk and impact of flooding can be mitigated against but in some cases not fully removed.

1.4 Response to this report

The options section of this report highlights the potential areas of work / activities under the responsible agency, for example the Environment Agency, West Oxfordshire District Council etc. If you have any specific questions relating to these activities please contact the relevant agency using the contact details provided at the top of the chart.

If you have any general questions please contact your Parish / Town Council who have been a key contributor to the production of the report and have agreed to act as the first point of contact.

The Council is also planning to hold a series of road shows in the Parish areas where representatives from all the relevant areas will be available to answer any questions local residents have as well as provide more information on ways residents may help themselves.

¹ Permissive powers are when an organisation may choose whether or not to exercise their powers. I.e. they are NOT under a duty. In making this choice account must be taken of any factors required by the legislation, plus for example how urgent, how necessary they are, cost, likely result, etc

² Riparian owners are responsible for the maintenance of any watercourse within or adjacent to the boundaries of their property.

1.5 Legal

No part of this report is to be reproduced, copied or used by any third party without the prior express written consent of WODC in its absolute discretion. All those reading this report acknowledge that any conditions, warranties or other terms implied by statute or common law are excluded to the fullest extent permitted by law. Without limiting the scope of the foregoing, West Oxfordshire District Council does not give any warranty, representation or undertaking as to the efficacy or usefulness of the information contained within this report, nor that any advice contained within this report will produce satisfactory results if followed. West Oxfordshire District Council hereby excludes liability to the fullest extent permitted by law for any reliance placed in this report by third parties.

2.0 THE DISTRICT COUNCIL'S ACHIEVEMENTS OVER THE PAST 12 MONTHS

Ditch Clearance

- 1731 Linear metres WODC owned ditches cleared overall
- 1923 Linear metres Privately owned ditches cleared overall
- Overall 2.27 miles of ditches have been cleared

Flood Grants

- 1137 WODC Flood Grants totalling £284,250 given out overall
 - 16 (£4,000) for Curbridge and Lew
- 112 Red Cross Flood Grants totalling £211,590 administered by WODC overall
- 301 Hardship Grants totalling £155,050 given out overall

Reports

- Interim Flooding Report published October 2007
- 12 Parish Flood Reports completed by June 2008, 1 report for Curbridge and Lew.

Actions from the Council's Interim Report published in January 2008

- The table below provides a summary of some of the completed actions identified in the report

Bronze command procedure to be updated to recognise the need for ensuring shift rotas are in place in the early stages of an emergency
Consider producing a revised warning system that identifies a higher category of risk that is only issued in exceptional circumstances
The emergency plan specifically addresses the need to keep in regular contact with elected members
That in future emergency situations District Councils ensure that they have a representative present at Silver Command from the start of the emergency to act as a conduit for information between Silver Command and the District Councils
The council should encourage all residents residing in the flood plain and in areas at risk of flooding to sign up to the EA Flood Alert system.
Provide clear information to residents and businesses about what type of waste we can collect and how it will be collected
Explanations to residents of our need for bulky waste to be placed on the roadside for collection
Commence a review of the mapping of the many thousands of privately owned ditches and culverts, and ensure they are kept clear and well maintained in accordance with the new policy (2 TOR 3)
Lobby central government for a single agency to take control of all land drainage issues
WODC continues to act in a coordination capacity with key external agencies
Continue to liaise with EA to ensure that procedures relating to planning consultations are robust. Seminar being arranged to take place during 2008 to progress this
Progress the Strategic Flood Risk Assessment
Approaches to be made to the EA and Metrological Office with regard to improving their predictive capability
During emergency events, have an external media person (BBC) in Bronze Command
Purchase digital TVs to assist with reviewing weather, local and national news to assist emergency management

3.0 EXECUTIVE SUMMARY

Following the flooding events of July 2007, West Oxfordshire District Council (WODC) has responded to requests from both Town and Parish Councils to aid the coordination of all the agencies and bodies that were undertaking their own investigations into the floods through the production of Parish Flood Reports.

This document is the Parish Flood Report for Curbridge and Lew and has been prepared by the Council's Engineering team. It pulls together information from external agencies and individual property owners and seeks to identify the causes of flooding in Curbridge and Lew during July 2007 and potential mitigating solutions.

The villages of Curbridge and Lew are situated approximately 1km west and 3km south west of Witney respectively within the West Oxfordshire District boundary.

Curbridge is located towards the upstream extent of the Elm Bank Ditch catchment. The Ditch is classified by the Environment Agency as an 'Ordinary Watercourse' flowing as an open channel from the north west into a culvert which conveys the watercourse beneath the junction of Main Road and Well Lane in a generally south east direction through the centre of Curbridge Village. The Ditch reappears within private gardens flowing as an open channel through agricultural farm land in south easterly direction.

Elm Bank Ditch continues its course south becoming a statutory Main River north of Lew Parish, flowing adjacent to the eastern Parish boundary.

A number of agricultural drains and ditches originate at higher elevations to the west and south of Lew Village. Lew is located at the lower elevations within this catchment of which two main drainage ditches convey the water from multiple sources surrounding Lew. One flows north east from the south of University Farm, through Fords Close Farm, Ditcham Farm and Lower Farm where it joins a second main ditch flowing west to east from the north edge of Lew. This combined flow continues to discharge into Elm Bank Ditch to the east of the Village.

Meetings were held with members of Curbridge and Lew Parish Council (CLPC) and some of the affected residents. A visual walk-over survey of the area affected by the July 2007 flooding was undertaken, including the properties along Main Road and Well Lane.

The EA's 'Curbridge Flood Review July 2007' (February 2008) states that three properties were recorded as being flooded in Curbridge as a result of the summer floods. WODC however holds records of sixteen applications for Flood Relief Grant Aid within the combined Parishes of Curbridge and Lew.

Flooding experienced in Curbridge and Lew has been assessed as five separate areas as described below:

Area 1 is the centre of Curbridge Village around the junction of Main Road and Well Lane, which suffered flooding from Elm Bank Ditch as a result of flow restrictions associated with blockages and insufficient capacity of the Elm Bank Ditch culvert below Main Road and Well Lane.

Area 2 includes the rear of Curbridge Parish Hall, which suffered flooding directly as a consequence of localised surface water flooding and topographic drainage restraints.

Area 3 describes the eastern area of Curbridge alongside the A4095 Bampton Road which suffered flooding as a result of overland flow originating as surface water runoff from adjacent agricultural land, exacerbated by an insufficient capacity of, and blockages within highway drains, ditches and culverts.

Flooding in the centre of Lew Village alongside the A4095 Bampton Road (Area 4), has been attributed to overland flow from adjacent agricultural land, exacerbated by an insufficient capacity of and blockages within highway drains, ditches and culverts

Area 5 is in the vicinity of Manor Farm, Fords Close Farm and Lower Farm and adjacent road to the west, which also suffered flooding as a result of overland flow originating as surface water runoff from adjacent agricultural land, exacerbated by an insufficient capacity of and blockages within highway drains, ditches and culverts.

Conclusions and recommendations, including maintenance and flood defence improvement measures and a programme, are provided in Section 7.

This report also includes Appendix 1 showing Photographs, Appendix 2 showing Maps and Appendix 3 provides a glossary.

4.0 SURVEY

4.1 Description of Area

Curbridge and Lew are adjoining Parish Councils. The villages of Curbridge and Lew are rural in nature depicted by a majority of farms and cottages, and are situated approximately 1km west and 3km south west of Witney respectively within the West Oxfordshire District boundary.

Curbridge - is located towards the upstream extent of the Elm Bank Ditch catchment. The Ditch is classified by the Environment Agency as an 'Ordinary Watercourse' flowing as an open channel from the north west into a culvert which conveys the watercourse beneath the junction of Main Road and Well Lane in a generally south east direction through the centre of Curbridge Village. The Ditch reappears within private gardens flowing as an open channel through agricultural farm land continuing in south easterly direction.

Using FEH, the approximate catchment size of Elm Bank Ditch upstream of Curbridge Village is 2.13km².

Elm Bank Ditch continues its course south becoming a statutory Main River north of Lew Parish, flowing adjacent to the eastern Parish boundary.

Lew - A number of agricultural drains and ditches originate at higher elevations to the west and south of Lew Village. Lew is located at the lower elevations within this catchment, of which two main drainage ditches convey the water from multiple sources surrounding the village. One flows north east from the south of University Farm, through Fords Close Farm, Ditcham Farm and Lower Farm where it joins a second main ditch flowing west to east from the north edge of Lew. This combined flow continues to discharge into Elm Bank Ditch to the east of the Village draining an approximate catchment area of 2.06km² obtained from FEH. The approximate catchment size from FEH of Elm Bank Ditch below this confluence is 8.34km².

Downstream of Yelford, Elm Bank Ditch flows into the Brighthampton Cut before it is discharges into the River Thames approximately 1km from Newbridge.

4.2 Survey Method

Meetings were held with members of Curbridge and Lew Parish Council (CLPC) and some of the affected residents. A visual walk-over survey of the area affected by the July 2007 flooding was undertaken, including the properties along Main Road and Well Lane.

See Appendix 1 for photographs of the flooding during July 2007 and those collected during the walk-over survey.

4.3 Meetings

Table 1: Summary of Meetings and Flooding Descriptions

Date	Location	Description
21.07.08	Curbridge Parish Hall (Old Methodist Church)	<ul style="list-style-type: none"> • A meeting and walk-over survey were held with Mr John Ackerman, Mr. Robert Knight, Mr. Mark Wilson and Mr. Tony Wilson of Curbridge and Lew Parish Council (CLPC) to discuss the flood event of July 2007 in Curbridge and their ongoing concerns. • Flooding of properties at the junction of Well Lane with Main Road and within the surrounding area on the 20th July 2007 was attributed to overland flows originating from the Elm Bank Ditch. • The flow routes experienced were described by eyewitnesses to be the result of the culvert capacity becoming exceeded which resulted in water backing up behind the upstream headwall of the culvert, and continuing to flow south east along the roads to depths of 1 to 1.5m (3-5 feet). • The extent of damage caused to properties was depicted along Main Road and Well Lane. This included damage to residential dwellings, garages, cars and gardens, and included contamination with sewage. • Floodwater experienced to the rear of the Parish Hall which resulted in internal damage was attributed to localised surface water runoff from agricultural fields at a higher elevation to the south of the A40. Flooding of the Hall was repeated during an event of the 3rd June 2008. • Floodwater experienced at the junction with Main Road and Bampton Road in Curbridge was attributed to surface water runoff originating from surrounding agricultural fields. Houses along Bampton Road were also flooded and it was believed by residents that blocked gullies and highly vegetated highway drains and ditches alongside the road compounded the impact of the flood event. • Two properties in Curbridge adjacent the A4095 were also flooded during heavy rainfall events of the 3rd June 2008. • In both Curbridge and Lew, 30 properties were recorded by CLPC as affected by the summer 2007 flood. Concerns were raised of the possible drainage impact resulting from the Witney Lakes Resort and any future development (primarily proposed residential) within the upper catchment north of the A40.
24.07.08	By Telephone	<ul style="list-style-type: none"> • Mr. Patrick Foley of Crawley and Lew Parish Council was contacted to discuss the impact of the July 2007 flood event and the ongoing concerns of the residents of Lew Village. • Multiple properties either side of the A4095 Bampton Road became flooded. Lew House in particular was completely inundated, as were Manor, Fords Close and Lower Farms on the eastern edge of the village. • Two properties in Lew adjacent the A4095 were also flooded during heavy rainfall events of the 3rd June 2008. • The flooding was attributed to surface water runoff originating from elevated agricultural land to the west, where heavily vegetated and silted agricultural and highway drains, blocked gullies and insufficient pipe sizes were considered unable to accommodate or convey the floodwater into adequate channels. OCC are aware of this issue. • Minor repair works were undertaken by Oxfordshire Highways to unblock pipes in the vicinity of Lew Church, however it is considered that significantly more work is required to alleviate the impact of regular flooding events experienced (3 in the last 18 months).

4.3 Stakeholder Communications and Actions

Table 2: Stakeholder Communications and Actions

Stakeholder	Description
TW	<ul style="list-style-type: none"> Jenny Elliott of Thames Water has been approached regarding historic sewer flooding and any plans for further work in Curbridge or Lew. TW have stated that there are no planned sewer upgrades, and that Curbridge does not have a public surface water sewer.
WODC	<ul style="list-style-type: none"> Mr. Laurence King and Mr. Nick Hands hold multiple letters of correspondence between residents and Parish Councillors of Curbridge and Lew, with WODC, OCC and the Environment Agency, regarding their concerns over the regular instances of flooding in the village and requests for potential timescales of solutions proposed. Nick Hands met with CLPC in May 2008 to discuss the multiple instances of flooding experienced by the village over the previous year.
OCC	<ul style="list-style-type: none"> Mr. Gordon Hunt of Oxfordshire County Council Highways Department has been approached regarding historic instances highway flooding and any plans for future work in Curbridge and Lew. A repair to the culvert in Well Lane has been planned for 2008, however at the time this report was submitted that work had not yet been undertaken. CLPC stated that OCC Highways Department had undertaken a CCTV survey of the culvert and it was determined that the culvert is damaged and blockages are present, subsequently reducing the capacity of the culvert.
EA	<ul style="list-style-type: none"> Development Control Officers Mr. Phil Garvey and Mr. Nick Read were approached in July 2008. Reference was made to their 'Flood Review July 2007: Curbridge³' (February 2008) undertaken as part of the EA's Upper Cotswolds Flood Review. The EA are aware that much of the summer 2007 flooding in Curbridge and Lew was attributed to surface water runoff flowing over the A4095 Bampton Road in both villages.

4.4 Application for Grant Aid

The District Council has distributed a range of financial support to the residents of district in the form of;

- Emergency Flood Relief Grant Aid of £250
- 'Hardship' Grants
- Red Cross Grants

To date the owners of 16 residential properties in Curbridge and Lew have received Emergency Flood Relief Grant Aid, however it is acknowledge this is not the total number of properties affected in the Parishes as some owners have been reluctant to claim.

Twelve of the sixteen houses claiming flood grant were located in Curbridge and these properties were largely concentrated on Main Road (seven, plus one at the junction of Wells Lane / Main Road) and four in total along Bampton Road south of the Wells Lane junction. Of the remaining four, two were located to the east of Bampton Road (A4095) in Lew and two were farms along the eastern edge of Lew Village.

Whilst the Emergency Flood Relief Grant Aid was not paid to industrial and commercial properties, the Council did provide advice and support to local business affected by the flooding on funding available from Business Link and other organisations.

³ *Flood Review July 2007: Curbridge (February 2008), Environment Agency*

5.0 PROBLEMS AND CAUSES

5.1 Plans

Two maps detailing the following are shown in Figures 1 and 2 at Appendix 2:

- 1% annual probability of flooding - Flood Zone 3 (previously referred to as 1 in 100 year flooding)
A plan showing the 2008 Environment Agency 1% probability Flood Zone, this is the area defined by the EA as the extent of a flood with a 1 per cent chance happening in any year. This is the high probability risk zone.
- 0.1% annual probability flooding – Flood Zone 2 (previously referred to as 1 in 1000 year flooding)
A plan showing the 2008 Environment Agency 0.1% probability Flood Zone, this is the area defined by the EA as the extent of a flood with a 0.1 per cent chance happening in any year. This is the medium

The areas flooded during the July 2007 event are broadly split into five areas as shown in Figures 3 and 4 at Appendix 2, being:

Area 1 - Centre of Curbridge Village around the junction of Main Road and Well Lane.

Area 2 - Curbridge Parish Hall and Garden to the Rear.

Area 3 - East of Curbridge Alongside the A4095 Bampton Road.

Area 4 - Centre of Lew Village Alongside the A4095 Bampton Road.

Area 5 - Eastern Farms of Lew and Adjacent Road to the West.

The EA's 'Flood Review July 2007: Curbridge³' states that less than three properties were recorded as being flooded internally in Curbridge Village as a result of the summer floods, however WODC recorded sixteen and CPLC recorded thirty in total that experienced at least partial inundation.

5.2 Area 1 – Centre of Curbridge Village

As noted in the EA's 'Flood Review July 2007: Curbridge³', flooding of roads, roadside drains and gullies occurred following heavy rainfall on 20 July 2007. This flooding was caused by insufficient capacity of the drains and gullies discharging into Elm Bank Ditch, which combined with runoff from fields and other surface water drains, exceeded the capacity of the Elm Bank Ditch culvert beneath Main Road and Well Lane.

The Elm Bank Ditch conveys water from its rural upstream catchment located to the north west of Curbridge into a 750mm pipe culvert located within private property at the north west corner of the village to the north of Main Road. This culvert conveys water in a general south easterly direction below Main Road and Well Lane to reappear in a private garden located to the east of Well Lane and south of Main Road as twin 600mm pipes.

During the 20th July 2007, excess water flowed overland passing through residential gardens before flooding the junction of Well Lane with Main Road. Properties were flooded as the overland flow attempted to return into the natural flow path of the Elm Bank Ditch. Residents were additionally concerned as sewage was present in the floodwater.

It was determined in the 'Flood Review July 2007: Curbridge³' report that even if the culvert was working at full capacity, flows experienced on that day would have still exceeded its capability. However, it is likely that the damaged culvert contributed to the timings and magnitude of local floods.

There is also concern over the potential drainage impact of any future development in the upstream catchment, including the Witney Lakes Resort located north of the A40.

5.3 Area 2 – Curbridge Parish Hall and Garden to the Rear.

Floodwater experienced to the rear of the Curbridge Parish Hall during July 2007 was attributed to localised surface water runoff from agricultural fields at a higher elevation to the south of the A40 being unable to discharge, resulting in internal damage.

The Hall has a drainage ditch around the rear perimeter where it is believed that water collects as there is currently no mechanism for it to discharge, compounding the impact of the flood event. Flooding of this nature was further experienced on the 3rd June 2008.

5.4 Area 3 – East of Curbridge Alongside the A4095 Bampton Road.

Floodwater experienced at the junctions of Well Lane and Main Road with Bampton Road in Curbridge during July 2007 was attributed to overland flow originating as surface water runoff from surrounding agricultural fields. Multiple houses along Bampton Road were also flooded and it was believed by residents that blocked gullies and highly vegetated highway drains and ditches alongside the road exacerbated the impact of the flood event.

Two properties adjacent the A4095 were also flooded during heavy rainfall events of the 3rd June 2008.

5.5 Area 4 – Centre of Lew Village Alongside the A4095 Bampton Road.

Multiple properties either side of the A4095 Bampton Road became flooded in Lew during July 2007.

Flooding was attributed to overland flow originating from elevated agricultural land to the west, where heavily vegetated and silted agricultural and highway drains, blocked gullies and insufficient pipe sizes were considered unable to accommodate or convey floodwater.

Two properties adjacent the A4095 were also flooded during heavy rainfall events of the 3rd June 2008.

5.6 Area 5 – Eastern Farms of Lew and Adjacent Road to the West.

The farming area on the eastern edge of the village was inundated during July 2007. The flooding was attributed to overland flow originating as surface water runoff from elevated agricultural land to the south and west, where heavily vegetated and silted agricultural ditches and highway drains, blocked gullies and insufficient pipe sizes were considered unable to accommodate or convey the floodwater.

6.0 OPTIONS

The following table shows the possible options available for flood alleviation schemes throughout the Parish, and their potential effectiveness, as assessed by the District Council Engineers. The areas affected by flooding within the Parish have been given unique area numbers, i.e. Area 1. Several options for flood alleviation projects are identified for each area as "Actions" or "Options".

Many of these options will require further detailed investigation along with the agreement of the responsible landowner, identification of budget and a cost benefit analysis to be carried out before they could be implemented.

Some of the options shown are also mutually exclusive, that is if one option is carried out then another will not be necessary, to find if this is the case for an option, please look at the detailed description in the Conclusions and Recommendations Section (7.0).

If you require further information regarding a particular option, please contact the agency that would be responsible for implementation of the proposal, where this has been shown, using the contact information at the top of the column. If no contact details are shown, there may be a private landowner responsible. If this is the case the District Council will ensure that private landowners are made aware of their responsibilities.

Parish Flood Options										
Curbridge & Lew										
Version 1 – July 2008										
Option Ref	Flood Overview	Description of Work Required					Key Issues			Comments
		Options	Environment Agency	Oxfordshire County Council	Thames Water	WODC	Private	Effectiveness	Affects on Adjacent Land	
		For queries Tel 08708 506 506 Or email enquiries@environment-agency.gov.uk	Main switchboard: 0845 310 1111 Or e-mail: online@oxfordshire.gov.uk	Enquiries: 0845 200 800	Switchboard: 01993 861 000					
Area 1 – Centre of Curbridge Village										
	Flooding of the centre of Curbridge Village around the junction of Main Road and Well Lane.									
A	Riparian Landowners to remove restrictions to flow by actively clearing and managing vegetation within the channel and on the banks of Elm Bank Ditch and any agricultural drain and ditch tributaries.	To be undertaken in cooperation and agreement with the EA and with the necessary consents and licenses.			WODC to co-ordinate.	Riparian Landowner co-operation needed to organise clearance and maintenance of river channels and ditches.	Will increase the capacity of the channels and prevent silt accumulation, thus restoring the effectiveness of the channel to convey floodwater and therefore, reducing the magnitude of overland flow.	Water levels at Curbridge will be reduced, thus the flood risk will be reduced.	Up to £5,000	Riparian Landowner responsibilities require communicating in co-ordination with WODC.
B	Desilting of Elm Bank Ditch.	To be undertaken in cooperation and agreement with the EA and with the necessary consents and licenses.			WODC to co-ordinate.	Riparian Landowners to organise.	Will restore effectiveness of the channel to convey floodwater by increasing the capacity of the channel and therefore, reducing the magnitude of overland flow occurring.	Water levels at Curbridge will be reduced, thus the flood risk will be reduced.	£5,000 to £10,000	Riparian Landowner responsibilities require communicating in co-ordination with WODC.
C	OCC Highways to undertake necessary repair and maintenance of existing drains, gullies and culverts, specifically the Elm Bank Ditch culvert below Main Road and Well Lane. Cut grips and provide trash screens where necessary.		OCC Highways to inspect current drainage provision and undertake maintenance, upgrades and provision of new management systems where necessary.		WODC to co-ordinate	Riparian owners to carry out inspection and maintenance of Elm Bank culvert along Main Road.	Will increase the capacity of the culvert and prevent silt accumulation restoring the effectiveness of the culvert to convey floodwater from the upper Elm Bank Ditch catchment and will enable highway drains and gullies to work at their optimum design capacity, therefore not exacerbating the impact of overland flow originating from the agricultural land to the north west.	Will reduce flood risk in immediate surrounding area and downstream.	£5,000 to £20,000	Culvert works have been planned for completion by OCC Highways during 2008. Other highway maintenance work ongoing where inadequate.
D	Feasibility study should be undertaken for the use of Flood Storage Areas, which have been proposed by WODC to be excavated upstream of Downs Road.	To be undertaken in cooperation and agreement with the EA.	OCC to fund and provide flow control device on culvert under Downs Road.		WODC to co-ordinate.	Landowner cooperation required regarding use of land as a Flood Storage facility.	Will reduce water levels within Elm Bank Ditch by increasing the capacity of the floodplain upstream of Curbridge Village which would reduce the flow rate through the culvert following heavy rainfall.	Will reduce flood risk downstream of the A40.	£5,000 to £20,000	

Option Ref	Flood Overview	Description of Work Required					Key Issues			Comments
		Options	Environment Agency	Oxfordshire County Council	Thames Water	WODC	Private	Effectiveness	Affects on Adjacent Land	
		For queries Tel 08708 506 506 Or email enquiries@environment-agency.gov.uk	Main switchboard: 0845 310 1111 Or e-mail: online@oxfordshire.gov.uk	Enquiries: 0845 200 800	Switchboard: 01993 861 000					
Area 1 – Centre of Curbridge Village (...continued)										
E	Curbridge and Lew Parish Council needs to create their own 'Emergency Flood Plan' advising individual properties throughout Curbridge and Lew to be fitted with flood-resilient dry proofing methods and demountable, portable defence measures.	The EA website contains reference information on flood resilient measures to properties.			WODC to approve emergency flood plan.	Homeowners need to be made aware of measures they can undertake to protect their own properties from flooding. Flood proofing measures for example fitting flood boards, rendering external lower walls with waterproof sealants and having sand bags stored locally for easy application should be implemented. Relocation of valuables to higher floors and of electrical outlets to higher elevations will assist in protecting them.	Will protect individual properties; however, will only be effective if defence measures are put in place before the water level rises.	May increase flood risk to adjacent properties as flood water will be displaced.	Up to £5,000 (per dwelling)	On completion of the emergency flood plan, it should be sent to WODC for approval and registration.
Area 2 – Curbridge Parish Hall and Garden to the Rear										
	Flooding of Curbridge Parish Hall and garden to the rear.									
A	Riparian Landowners to remove restrictions to flow by actively clearing and managing vegetation within the channel and on the banks of agricultural drains and ditches in the Parish. This should particularly be implemented for the drain to the north east of the Parish Hall, south of the A40.	To be undertaken in cooperation and agreement with the EA and with the necessary consents and licenses.			WODC to co-ordinate.	Riparian Landowner co-operation needed to organise clearance and maintenance of river channels and ditches.	Will increase the capacity of the channel and prevent silt accumulation thus restoring the effectiveness of the channel to convey floodwater, and will allow floodwater to be effectively conveyed across the floodplain into the drain itself, rather than south towards the Parish hall.	Water levels at Curbridge will be reduced, thus the flood risk will be reduced.	Up to £5,000	Riparian Landowner responsibilities require communicating in co-ordination with WODC.
B	Landowner should re-landscape the grassed area behind the Parish Hall, including infilling the ditch to the rear of the building and providing flood storage by encouraging ponding in designated areas.	To be undertaken in cooperation and agreement with the EA and with the necessary consents and licenses.			WODC to co-ordinate.	Landowner to organise.	Will prevent surface water from reaching the rear face of the Parish Hall by providing a greater storage capacity for floodwater in rear garden area and redirecting surface water flows away from the immediate vicinity of the Hall and adjacent buildings. This will prevent accumulation of floodwater along the rear perimeter of the Hall.	Provided the design incorporates a minimum volume of flood storage compensation equal to the ditch in-filled at the rear of the building, and using level by level gradients within the garden, it will not increase the flood risk to adjacent property.		

Option Ref	Flood Overview	Description of Work Required					Key Issues			Comments
		Options	Environment Agency	Oxfordshire County Council	Thames Water	WODC	Private	Effectiveness	Affects on Adjacent Land	
		For queries Tel 08708 506 506 Or email enquiries@environment-agency.gov.uk	Main switchboard: 0845 310 1111 Or e-mail: online@oxfordshire.gov.uk	Enquiries: 0845 200 800	Switchboard: 01993 861 000					
Area 3 – East of Curbridge Alongside the A4095 Bampton Road										
	Flooding of the east of Curbridge Village alongside the A4095 Bampton Road.									
A	Riparian Landowners to remove restrictions to flow by actively clearing and managing vegetation within the channel and on the banks of agricultural drains and ditches in the Parish. This should particularly be implemented along the reach of Elm Bank Ditch in the vicinity the A4095 Bampton Road.	To be undertaken in cooperation and agreement with the EA and with the necessary consents and licenses.			WODC to co-ordinate.	Riparian Landowner co-operation needed to organise clearance and maintenance of river channels and ditches.	Will increase the capacity of the channel and prevent silt accumulation thus restoring the effectiveness of the channel to convey floodwater, and will allow floodwater to be effectively conveyed across the floodplain.	Water levels at Curbridge will be reduced, thus the flood risk will be reduced.	Up to £5,000	Riparian Landowner responsibilities require communicating in co-ordination with WODC.
B	OCC Highways to undertake maintenance of and upgrades to existing drains, gullies and culverts. Cut grips and provide trash screens where necessary.		OCC Highways to inspect current drainage provision and undertake maintenance, upgrades and provision of new management systems where necessary.		WODC to co-ordinate.		Enabling highway drains, culverts and gullies to work at their optimum design capacity will improve the management of surface water runoff from the A4095, reducing the risk of surface water flooding to properties along the Bampton Road, and will not exacerbate the impact of surface water runoff originating from the surrounding agricultural land flowing over the A4095.	Will reduce flood risk in immediate surrounding area and downstream.	Up to £5,000	Highway maintenance work ongoing where inadequate.
C	Feasibility study should be undertaken for a swale/catch ditch to the rear of properties to the west of Bampton Road near Duttons Farm. A new culvert would need to be installed underneath Bampton Road to link the interceptor ditch to a second ditch along the southern edge of the recreational fields to the south of the public house. Bunding will be required around the perimeter of the recreational fields to utilise them as a surface water storage area. The water would then be allowed to drain into the existing ditch running in a southerly direction from north of the public house adjoining Elm Bank Ditch to the east.	To be undertaken in cooperation and agreement with the EA and with the necessary consents and licenses.	OCC Highways to fund a culvert under Bampton Road and a flow control device into drainage ditch to the east of the recreational fields.		WODC to co-ordinate.	Landowner cooperation required regarding use of land as a Flood Storage facility.	Will intercept surface water runoff from the fields to the west of the properties along Bampton Road and direct it towards the recreational fields. Thus allowing the water to follow the natural drainage path into the ditch which discharges into Elm Bank Ditch. This will reduce the risk of flooding to properties along Well Lane and Bampton Road by increasing the capacity of the floodplain.	Will reduce flood risk to properties in immediate area; however, may increase the flood risk to agricultural land downstream as flood water will be displaced.	Up to £5,000 feasibility. £5,000 to £20,000 design/construction	

Option Ref	Flood Overview	Description of Work Required					Key Issues			Comments
		Options	Environment Agency	Oxfordshire County Council	Thames Water	WODC	Private	Effectiveness	Affects on Adjacent Land	
		For queries Tel 08708 506 506 Or email enquiries@environment-agency.gov.uk	Main switchboard: 0845 310 1111 Or e-mail: online@oxfordshire.gov.uk	Enquiries: 0845 200 800	Switchboard: 01993 861 000					
Area 3 – East of Curbridge Alongside the A4095 Bampton Road (...continued)										
D	Install raised curbs (along with access ramps) along Well Lane, Main Road and Bampton Road in the vicinity of properties. Water would be directed by relatively lower curbs to flow into the recreational field water storage area as detailed in Option C.		OCC Highways to fund.		WODC to co-ordinate.	Landowner cooperation required regarding use of land as a Flood Storage facility as for Option C.	Raising curbs would ensure water is kept on the road and channelled towards the storage area south of the public house, subsequently away from the adjacent properties.	May increase flood risk to adjacent agricultural land downstream as flood water will be displaced.	£5,000 to £20,000	
Area 4 – Centre of Lew Village Alongside the A4095 Bampton Road										
	Flooding of the centre of Lew Village alongside the A4095 Bampton Road.									
A	Riparian Landowners to remove restrictions to flow by actively clearing and managing vegetation within the channel and on the banks of agricultural drains and ditches in the Parish. This should particularly be implemented within agricultural drains and ditches to the west and south of the A4095 Bampton Road.	To be undertaken in cooperation and agreement with the EA and with the necessary consents and licenses.			WODC to co-ordinate.	Riparian Landowner co-operation needed to organise clearance and maintenance of river channels and ditches.	Will increase the capacity of the channel and prevent silt accumulation thus restoring the effectiveness of the channel to convey floodwater, and will allow floodwater to be effectively conveyed across the floodplain.	Water levels at Lew will be reduced, thus the flood risk will be reduced.	Up to £5,000	Riparian Landowner responsibilities require communicating in co-ordination with WODC.
B	OCC Highways to undertake maintenance of and upgrades to existing drains, gullies and culverts. Cut grips and provide trash screens where necessary.		OCC Highways to inspect current drainage provision and undertake maintenance, upgrades and provision of new management systems where necessary.		WODC to co-ordinate.		Enabling highway drains, culverts and gullies to work at their optimum design capacity will improve the management of surface water runoff from the A4095, reducing the risk of flooding from overland flow to properties along the Bampton Road, and will not exacerbate the impact of surface water runoff originating from the surrounding agricultural land flowing over the A4095.	Will reduce flood risk in immediate surrounding area and downstream.	Up to £5,000	Highway maintenance work ongoing where inadequate.
C	A feasibility study should be undertaken for the storage capacity of three ponds to the east of Bampton Road to be increased. This would involve providing a lowered buffer around each, to create two stage storage areas. The ponds would then be linked to the Bampton Road highway ditches by swales or other form of landscaped channel.	To be undertaken in cooperation and agreement with the EA and with the necessary consents and licenses.			WODC to co-ordinate.	Landowner cooperation required regarding use of land as a Flood Storage facility.	The channel and increased pond areas would usually remain dry. However, during periods of heavy rain or when surface water from the surrounding elevated ground flows as overland flow, the enlarged ponds and channels would divert water away from properties and store it before discharging it to the natural ditch to the north.	Water levels at Lew will be reduced, thus the flood risk will be reduced.	Up to £5,000 for feasibility £5,000 to £20,00 design and construction	

Option Ref	Flood Overview	Description of Work Required					Key Issues			Comments
		Options	Environment Agency	Oxfordshire County Council	Thames Water	WODC	Private	Effectiveness	Affects on Adjacent Land	
		For queries Tel 08708 506 506 Or email enquiries@environment-agency.gov.uk	Main switchboard: 0845 310 1111 Or e-mail: online@oxfordshire.gov.uk	Enquiries: 0845 200 800	Switchboard: 01993 861 000					
Area 5 – Eastern Farms of Lew and Adjacent Road to the West										
	Flooding of eastern farm area and adjacent road to the west.									
A	Riparian Landowners to remove restrictions to flow by actively clearing and managing vegetation within the channel and on the banks of agricultural drains and ditches in the Parish. This should particularly be implemented within agricultural drains and ditches immediately to the south of Lew Village.	To be undertaken in cooperation and agreement with the EA and with the necessary consents and licenses.			WODC to co-ordinate.	Riparian Landowner co-operation needed to organise clearance and maintenance of river channels and ditches.	Will increase the capacity of the channel and prevent silt accumulation thus restoring the effectiveness of the channel to convey floodwater, and will allow floodwater to be effectively conveyed across the floodplain.	Water levels at Lew will be reduced, thus the flood risk will be reduced.	Up to £5,000	Riparian Landowner responsibilities require communicating in co-ordination with WODC.
B	OCC Highways to undertake maintenance of and upgrades to existing drains, gullies and culverts. Cut grips and provide trash screens where necessary.		OCC Highways to inspect current drainage provision and undertake maintenance, upgrades and provision of new management systems where necessary.		WODC to co-ordinate.		Enabling highway drains, culverts and gullies to work at their optimum design capacity will improve the management of surface water runoff from the road, reducing the risk of flooding of the farms to the east, and will not exacerbate the impact of surface water runoff originating from the surrounding agricultural land flowing over the road.	Will reduce flood risk in immediate surrounding area and downstream.	Up to £5,000	

7.0 CONCLUSIONS AND RECOMMENDATIONS

At present there are no EA flood alleviation schemes in place for Curbridge or Lew and it is unlikely that flood defences will be provided for the homes at risk of flooding.

7.1 Area 1 – Centre of Curbridge Village

7.1.1 Maintenance

- **Option A** - Riparian Landowners to remove restrictions to flow by actively clearing and managing vegetation within the channel and on the banks of Elm Bank Ditch and any agricultural drain and ditch tributaries. This will increase the capacity of the channel and prevent silt accumulation, thus restoring the effectiveness of the channel to convey floodwater and therefore reducing the magnitude of overland flow occurring.
- **Option C** - OCC Highways to undertake necessary repair and maintenance of existing drains, gullies and culverts, specifically the Elm Bank Ditch culvert below Main road and Well Lane. Cut grips and provide trash screens where necessary. This will increase the capacity of the culvert and prevent silt accumulation, restoring the effectiveness of the culvert to convey floodwater from the upper Elm Bank Ditch catchment, and will enable highway drains and gullies to work at their optimum design capacity, therefore not exacerbating the impact of overland flow originating from the agricultural land to the north west.

7.1.2 Flood Defence Improvement Schemes

Mid-term (1 to 2 years)

- **Option E** – Curbridge and Lew Parish Council needs to create their own 'Emergency Flood Plan' advising individual properties throughout Curbridge and Lew to be fitted with flood-resilient dry proofing methods and demountable, portable defence measures. Homeowners need to be made aware of measures they can undertake to protect their own properties from flooding. Flood proofing measures for example fitting flood boards, rendering external lower walls with waterproof sealants and having sand bags stored locally for easy application should be implemented. Relocation of valuables to higher floors and of electrical outlets to higher elevations will assist in protecting them.
- **Option B** - Desilting or dredging of Elm Bank Ditch. This will restore the effectiveness of channel to convey floodwater by increasing the capacity of the channel and therefore reducing the magnitude of overland flow occurring.
- **Option D** - A feasibility study should be undertaken for the use of Flood Storage Areas, which have been proposed by WODC to be excavated upstream of Downs Road. These would reduce water levels within Elm Bank Ditch by increasing the capacity of the floodplain upstream of Curbridge Village which would reduce the flow rate through the culvert following heavy rainfall. OCC to fund and provide flow control device on culvert under Downs Road.

7.2 Area 2 – Curbridge Parish Hall and Garden to the Rear

7.2.1 Maintenance

The following ongoing maintenance is recommended:

- **Option A** – Riparian Landowners to remove restrictions to flow by actively clearing and managing vegetation within the channel and on the banks of agricultural drains and ditches in the Parish. This should particularly be implemented for the drain to the north east of the Parish Hall, south of the A40.

7.2.2 Flood Defence Improvement Schemes

Immediate (under 1 year)

Option B - Landowner should re-landscape the grassed area behind the Parish Hall, including infilling the ditch to the rear of the building and providing flood storage by encouraging ponding in designated areas. This will prevent surface water from reaching the rear face of the Parish Hall by providing a greater storage capacity for floodwater in rear garden area and redirecting surface water flows away from the immediate vicinity of the Hall and adjacent buildings. This will prevent accumulation of floodwater along the rear perimeter of the Hall.

Diversion of flows onto Main Road to discharge into highway drains or surface water sewers was considered unsuitable as it would likely increase the flood risk to adjacent properties along Main Road. Secondly, as highway drains and sewers are not responsible for draining surface water runoff from agricultural land, it would be unlikely to gain consent with OCC Highways or TW.

7.3 Area 3 – East of Curbridge Alongside the A4095 Bampton Road.

7.3.1 Maintenance

The following ongoing maintenance is recommended:

- **Option A** – Riparian Landowners to remove restrictions to flow by actively clearing and managing vegetation within the channel and on the banks of agricultural drains and ditches in the Parish. This should particularly be implemented along the reach of Elm Bank Ditch in the vicinity the A4095 Bampton Road.
This will increase the capacity of the channel and prevent silt accumulation thus restoring the effectiveness of the channel to convey floodwater, and will allow floodwater to be effectively conveyed across the floodplain.
- **Option B** – OCC Highways to undertake maintenance of and upgrades to existing drains, gullies and culverts. Cut grips and provide trash screens where necessary.
Enabling highway drains, culverts and gullies to work at their optimum design capacity will improve the management of surface water runoff from the A4095, reducing the risk of flooding from overland flow to properties along the Bampton Road, and will not exacerbate the impact of surface water runoff originating from the surrounding agricultural land flowing over the A4095.

7.3.2 Flood Defence Improvement Schemes

Mid-term (1 to 2 years)

- **Option C** – A feasibility study should be undertaken for a swale/catch ditch to the rear of properties to the west of Bampton Road near Duttons Farm.
A new culvert would need to be installed underneath Bampton Road to link the interceptor ditch to a second ditch along the southern edge of the recreational fields to the south of the public house.
Bunding will be required around the perimeter of the recreational fields to utilise them as a surface water storage area. The water could then be allowed to drain into the existing ditch running in a southerly direction from north of the public house adjoining Elm Bank Ditch to the east.
This will intercept surface runoff from the fields to the west of the properties along Bampton Road and direct it towards the recreational fields. From here, allowing the water to follow the natural drainage path into the ditch discharging into Elm Bank Ditch will reduce the risk of flooding to properties along Well Lane, Bampton Road by increasing the capacity of the floodplain.
- **Option D** - Install raised curbs (along with access ramps) along Well Lane, Main Road, and Bampton Road in the vicinity of properties. Water would be directed by relatively lower curbs into the recreational field water storage area as detailed in Option C.
Raising curbs would ensure water is kept on the road and channelled towards the storage area south of the public house, subsequently away from the adjacent properties.

7.4 Area 4 – Centre of Lew Village Alongside the A4095 Bampton Road.

7.4.1 Maintenance

The following ongoing maintenance is recommended:

- **Option A** – Riparian Landowners to remove restrictions to flow by actively clearing and managing vegetation within the channel and on the banks of agricultural drains and ditches in the Parish. This should particularly be implemented within agricultural drains and ditches to the west and south of the A4095 Bampton Road.
This will increase the capacity of the channel and prevent silt accumulation thus restoring the effectiveness of the channel to convey floodwater, and will allow floodwater to be effectively conveyed across the floodplain.
- **Option B** – OCC Highways to undertake maintenance of and upgrades to existing drains, gullies and culverts. Cut grips and provide trash screens where necessary.
Enabling highway drains, culverts and gullies to work at their optimum design capacity will improve the management of surface water runoff from the A4095, reducing the risk of surface water flooding to properties along the Bampton Road, and will not exacerbate the impact of surface water runoff originating from the surrounding agricultural land flowing over the A4095.

7.4.2 Flood Defence Improvement Schemes

Mid-term (1 to 2 years)

- **Option C** - A feasibility study should be undertaken for the storage capacity of three ponds to the east of Bampton Road to be increased by providing a lowered buffer around each, to create two stage storage areas. The ponds would then be linked to the Bampton Road highway ditches by swales or other form of landscaped channel. The channel and increased pond areas would usually remain dry. However, during periods of heavy rain or when surface water from the surrounding elevated ground flows as overland flow, the enlarged ponds and channels would divert water away from properties and store it before discharging it to the natural ditch to the north.

7.5 Area 5 – Eastern Farms of Lew and Adjacent Road to the West.

7.5.1 Maintenance

The following ongoing maintenance is recommended:

- **Option A** –Riparian Landowners to remove restrictions to flow by actively clearing and managing vegetation within the channel and on the banks of agricultural drains and ditches in the Parish. This should particularly be implemented within agricultural drains and ditches immediately to the south of Lew Village. This will increase the capacity of the channel and prevent silt accumulation thus restoring the effectiveness of the channel to convey floodwater, and will allow floodwater to be effectively conveyed across the floodplain.
- **Option B** – OCC Highways to undertake maintenance of and upgrades to existing drains, gullies and culverts. Cut grips and provide trash screens where necessary. Enabling highway drains, culverts and gullies to work at their optimum design capacity will improve the management of surface water runoff from the road, reducing the risk of flooding of the farms to the east, and will not exacerbate the impact of surface water runoff originating from the surrounding agricultural land flowing over the road.

Appendix 1: Photographs

Elm Bank Ditch Viewed North West Upstream of Culvert Entrance, North of Main Road.



Source: Taken during meeting with Curbridge and Lew Parish Council (July 2008))

Upstream Entrance to 750mm Diameter Culvert North of Main Road.



Source: Taken during meeting with Curbridge and Lew Parish Council (July 2008))

Flooding July 2007 - View West along Main Road, Curbridge.



Source: Courtesy of www.curbridge.net.

Flooding July 2007 - View West along Main Road, Curbridge



Source: Courtesy of www.curbridge.net.

Flooding July 2007 - View East along Main Road, Curbridge



Source: Courtesy of www.curbridge.net.

Flooding July 2007 - Property along Main Road.



Source: Provided by Curbridge Parish Council (July 2008)

Flooding July 2007 - Property along Main Road.



Source: Provided by Curbridge Parish Council (July 2008)

Flooding July 2007 - Property along Well Lane



Source: Provided by Curbridge Parish Council (July 2008)

Previously Flooded Properties viewed North West along Main Road.



Source: Taken during meeting with Curbridge and Lew Parish Council (July 2008)

Previous Flow Route Viewed North West along Main Road towards the Junction with Well Lane.



Source: Taken during meeting with Curbridge and Lew Parish Council (July 2008)

Flooding July 2007 - View North along Well Lane, Curbridge,



Source: Courtesy of www.curbridge.net.

Curbridge Parish Hall was flooded from surface water runoff from the north as a result of local topography and poorly drained perimeter ditch.



Source: Taken during meeting with Curbridge and Lew Parish Council (July 2008)

Downstream End of 2 x 600mm Diameter Pipe Culvert East of Well Lane and south of Main Road.



Source: Taken during meeting with Curbridge and Lew Parish Council (July 2008)

Flooding July 2007 - View South along Well Lane, Curbridge



Source: Courtesy of www.curbridge.net.

Flooding July 2007 - Flooding on Bampton Road (A4095), Curbridge where Elm Bank Ditch flows beneath Bampton Road.



Source: Courtesy of www.curbridge.net.