



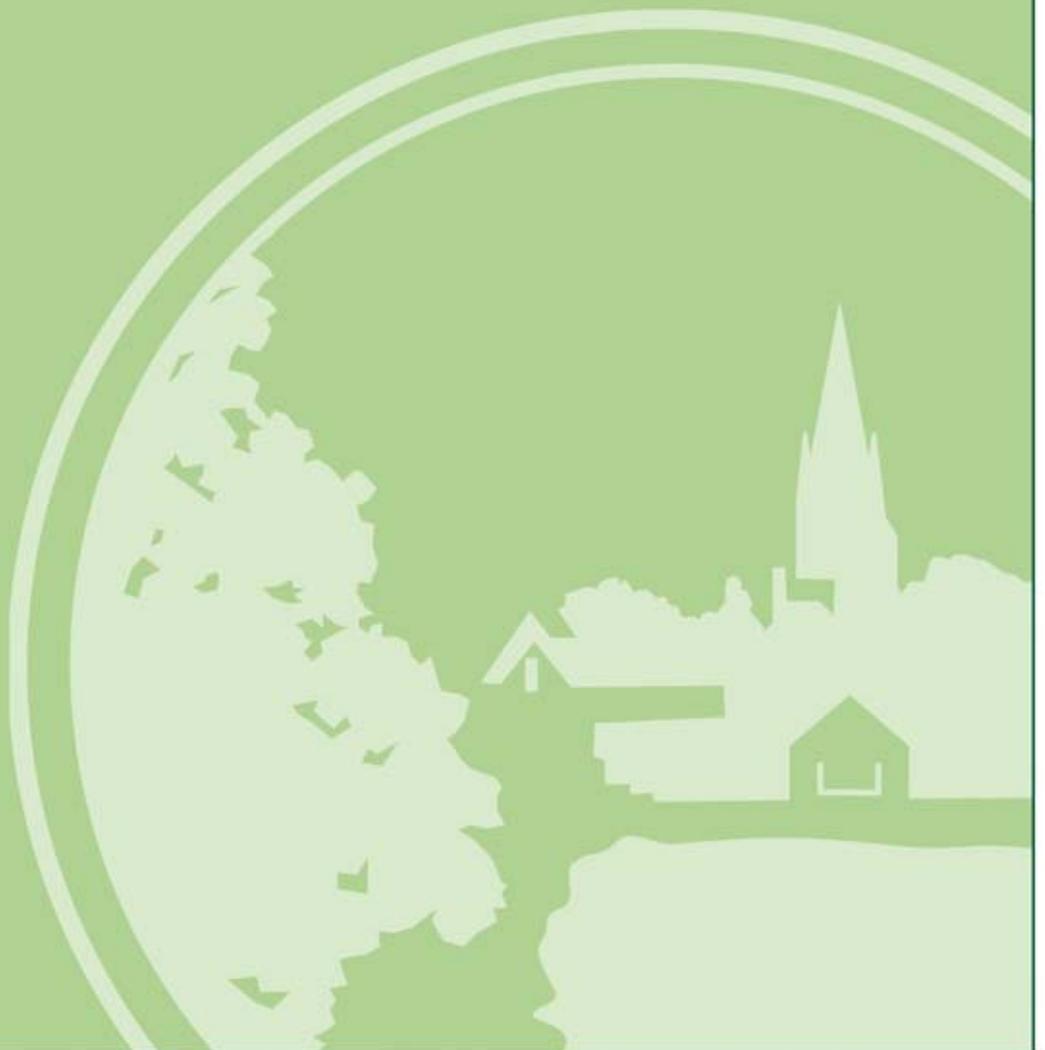
WEST OXFORDSHIRE  
DISTRICT COUNCIL

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# Parish Flood Report: **Combe**

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 powers<sup>1</sup> 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 riparian<sup>2</sup> land owner, and permissive powers<sup>1</sup> 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.

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<sup>1</sup> 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

<sup>2</sup> 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
  - 9 flood grants in Combe (£250.00 each) totalling £2,250.00
- 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 Combe

### 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 Combe 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 Combe during July 2007 and potential mitigating solutions.

Combe is a rural parish located towards the eastern margin of the West Oxfordshire District, approximately 6km north east of Witney. The parish sits in the catchment of the River Thames with the southern boundary of the parish following the River Evenlode. The Parish of Combe is adjacent to the Blenheim Park Estate and much of the land within the parish is owned and/or managed by the Estate.

Visual walkover surveys have been undertaken of the flooded areas and properties and meetings have been held with affected residents and a land agent from the Blenheim Estate. WODC have record of 9 applications for Grant Aid in Combe to include properties on Park Road, Akeman Street and Combe Mill.

Flooding experienced in Combe has been assessed in four separate areas (see section 4.1) comprising of Park Road at the post office and Recreation Ground (Area 1), Alma Grove (Area 2), Akeman Street (Area 3) and Horns Lane (Area4).

Flooding in Park Road at the post office (Area 1) was noted as originating from two main sources being excessive localised overland flow from surrounding farm land and inadequate highway drainage resulting in excess water running down the roads and running to the low point by the shop and across the recreation ground.

Flooding at Alma Grove (Area 2) has again been attributed to excessive localised overland flow from surrounding farmland and inadequate highway drainage. Oxfordshire County Council Highways Department has carried out some alleviation works in this area, however, one property is still affected by flooding.

Flooding along Akeman Street (Area 3), is caused by large volumes of surface runoff exacerbated by inadequate road drainage along Akeman Street. As rainfall intensity increases, surface water flows down Akeman Street and due to inadequate highway drainage, large volumes of water pool and flood houses. This is exacerbated by wash from vehicles. Water flowing down Akeman Street in turn affected the properties at the post office (Area 1) as the water surged down the road towards them.

Horns Lane (Area 4) experiences foul water flooding due to surcharging of foul water sewers.

Flooding problems and options, including description of works and how each public and private body is affected, effectiveness of each solution, affects on adjacent land and cost, are included in Section 5.

Conclusions and recommendations, including maintenance and flood defence improvement schemes and programme, are shown in Section 6.

This report also includes Appendix 1 detailing the Options Summary, Appendix 2 showing Photographs and Appendix 3 Glossary.

## **4.0 SURVEY**

### **4.1 Description of Area**

The Parish of Combe is located towards the eastern margin of the West Oxfordshire District, approximately 6km north east of Witney. Combe is a small parish with a village centre supporting approximately 100 inhabitants.

The Parish of Combe is rural in nature with much of the land within the parish being owned and/or managed by the Blenheim Park Estate.

The parish sits in the catchment of the River Thames and the southern boundary of the parish is formed by the River Evenlode. Using the Flood Estimation Handbook (FEH) the catchment area of the River Evenlode at Grintley Hill Bridge is calculated to be 275km<sup>2</sup>.

There are no further watercourses within the Parish of Combe.

### **4.2 Survey Method**

A visual walk-over survey of properties and worst affected areas within the village affected by the July 2007 flooding has been undertaken including the village green, recreation ground, Park road, Alma Grove and Akeman Street.

See Appendix 2 – Photographs.

### **4.3 Meetings**

A summary of meetings about flooding in Combe are given in Table I.

**Table I: Summary of meetings and flooding descriptions**

02.07.08	<p>Meeting with residents of Combe and Blenheim land agent</p> <p>Area 1 - Recreational Ground</p>	<ul style="list-style-type: none"> <li>• Flooding is a regular problem in the village. Flooding has occurred four times in the past three years.</li> <li>• The area has a high water table</li> <li>• Water naturally collects in a pond in the village green from where water used to flow across Park Road towards the recreation ground and to a network of drains that ultimately outfall to the River Evenlode.</li> <li>• A shop and extension have been built across this natural drainage path. (WODC to check that conditions on consent were fulfilled)</li> <li>• Water flows along Akeman Street and Park Road towards Church Walk and the Post Office. Water also flows through and across Combe Green. All the water that accumulates in this area flows across the road towards the shop, through the driveways of properties to the recreation Ground.</li> <li>• Five hours after the flooding of July 2007 the water had drained away.</li> <li>• The main flow path has been blocked by a shop and extension built on Park Road. Following periods of intense rainfall, water now flows through the adjacent properties onto the recreation field.</li> <li>• At the post office are a number of road gullies which connect to a 225mm diameter pipe conveying flow under properties of Park Road and the recreation ground.</li> <li>• The 225mm diameter pipe is inadequate for the volumes of water that collect at this point in the system, causing flooding.</li> <li>• Local residents have lifted manhole covers which show the 225mm pipe to be flowing at full capacity.</li> <li>• OCC have been contacted and have two possible solutions:             <ul style="list-style-type: none"> <li>• 1 - Install two 12 inch (approx 600mm) pipes to convey flow from Park Road to an existing manhole under the recreation ground.</li> <li>• 2 – Install two 12 inch (approx 600mm) pipes to connect to the existing drainage system downstream of the recreation ground.</li> </ul> </li> </ul> <p>A 9” pipe was installed by OCC to take surface water from the Post Office area across the recreation ground, this has proved to be inadequate.</p>
02.07.08	<p>Meeting with residents of Combe and Blenheim land agent</p> <p>Area 2 - Alma Grove</p>	<p>Local residents report that water flows from the corner of farmland behind Alma Grove into a field drainage ditch. During periods of intense rainfall the drainage ditch is over topped and water flows through one property and along a driveway onto Park Road.</p> <p>Surface water from Alma Grove is supposed to collect in road gullies on Park Road which then conveys flow in a 300mm stone culvert across the recreation ground. It is believed that this 300mm pipe is collapsed at least in part.</p> <p>The velocity of surface water on Park Road means that much of the water flows over gullies rather than into them.</p> <p>OCC have been out jetting along Park Road. A blockage was found, this was not able to be cleared at the time and they have not revisited the problem.</p> <p>The fields behind Alma Grove are rented from Blenheim Estates. These</p>

		<p>have had a drainage system installed which connects into a ditch that runs along the back of the row of houses on Park Road. In times of intense rainfall the ditch fills up and floods gardens, property and Park Road</p> <p>There used to be a ditch that ran in front of the houses along Park Road as well. This has now been filled in.</p> <p>OCC have installed a flood relief culvert to alleviate flooding problems on Park Road at Alma Grove. This is located at the low point of the field drainage system and connects via a piped culvert running under Park Road to the existing drainage system beneath the recreation ground .</p>
02.07.08	<p>Area 3 – Akeman St</p> <p>Meeting with residents of Combe and Blenheim land agent</p>	<p>Water inundates the houses from the front and back. Water runs off fields and gardens at the back of the properties.</p> <p>The houses along Akeman Street lie at a slightly higher level than the road. However the water levels get so high in the road that they overflow and extend up to the houses.</p> <p>Water in the road cannot drain away due to inadequate drainage. It then builds up in the road and runs towards the low point along Church Walk.</p> <p>There are some drains between the last house and Orchard Close. It is not known where these drains connect to. These were also recently cleared of roots.</p> <p>Blenheim land agent suggested draining water from Akeman Street onto Combe Green as a possible solution. This could then drain towards the pond which is planning on being dug out at Combe Green. The pond project has been put on hold due to the presence of newts, following correspondence with the EA. A newt survey is to be carried out.</p>
02.07.08	<p>Foul Water Problems</p> <p>Meeting with residents of Combe and Blenheim land agent</p>	<p>Foul water is pumped along Church Walk to Robin Hill where a gravity system is used which connects to a sewage works located to the west of the village. In times of heavy rainfall, the sewage system backs up along church walk, opposite the War memorial and along Horns Lane. This has led to foul water flooding on the corner of Horns Lane (sometimes referred to as Robin Hill on maps of the area).</p>
15/04/08	<p>Meeting of Combe Village Hall (CVH) and Recreation Ground Committee (RGC)</p>	<p>Meeting to discuss flooding issues in the vicinity of the Post Office on Park Road. It should be noted that the following points are taken from a discussion document produced by the drainage sub-committee.</p> <p>OCC intend to provide an overflow drain where flooding is experienced on Park Road.</p> <p>CVH &amp; RGC drainage sub committee are concerned of more water being directed onto the recreation ground as the field is already very wet.</p> <p>There is concern that the existing culvert running by the post office is not sufficiently maintained. If this culvert becomes blocked, the relief culvert will be operational more frequently.</p> <p>CVH &amp; RGC drainage sub committee believe that the existing culvert has the capacity to cope with discharge from 8 gully pots currently feeding to it on Park Road. It is felt that if additional gully pots are put in Park Road, the discharge will regularly overload the existing culvert and will enter the overflow pipe as per concerns noted above.</p>

		Options: Extend the new overflow to Garden Field so that no water is discharged onto the recreation ground. Connect the new drain to the existing system at a point dictated by invert levels on the existing system.
30.07.07	Report of flooding of property on Park Road in the vicinity of Alma Grove and in the vicinity of the post office	Flooding experienced three times in one year despite improvements made by OCC at Alma Grove. Blenheim estates are planning to dredge the pond in Combe Green. The spoil is to be used to create a bund against the dry stone wall to act as a retaining dam. It was noted that recent building has blocked the natural drainage path across Combe Green, a builder's yard and into a ditch which crossed the recreation ground. OCC suggest installation of two 12 inch overflow pipes and confirm that the existing culvert is free of obstruction. A second solution was to install shallow drainage pipes that discharge to the recreation ground. OCC stated that permission from CVH & RGC would be required to discharge to the recreation ground.

**Table 2: Summary of correspondence**

Company	Comments
OCC	Phone call to Gordon Hunt at OCC: <ul style="list-style-type: none"> <li>At present there is a culverted watercourse that runs by the post office and under the recreational ground. This was once a ditch but was culverted by the rural district council and used to get rid of sewage.</li> <li>OCC intend to improve the drainage of the road at the Post Office by keeping the existing system as it is but provide an extra overflow for times of extreme rainfall.</li> <li>Two new 12" pipes will be installed to run past the Post office and will connect further down into the existing network beneath the recreational ground. These new pipes will act as an overflow only, keeping the old system.</li> </ul>
EA	There have been no flooding issues reported that relate directly to main river watercourses, therefore, the EA have not been contacted as part of this study. The EA are in correspondence with Blenheim Estates regarding the pond in Combe Green and the possible presence of newts.

#### 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 9 residential properties in Combe have received Emergency Flood Relief Grant Aid, however it is acknowledge this is not the total number of properties affected in the Parish as some owners have been reluctant to claim.

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.

## 5.0 PROBLEMS AND CAUSES

### 5.1 Plans

Figure 1 in Appendix 2 shows areas in Combe where properties flooded in July 2007 and where owners have made claims for grant assistance. The flooding can be broadly split into four areas being:

- Area 1: Recreation Ground
- Area 2: Alma Grove
- Area 3: Akeman Street
- Area 4 – Horns Lane

A second map detailing the following is also included in 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 probability risk zone

Historic pictures, historical plan of drainage scheme, historic plan of storage pond locations, plan of the proposed drainage scheme for the post office area and plan of the recreational round are also included within appendix 2.

### 5.2 Area 1 – Park Road at the Post Office/Recreation Ground

In 2007, 3 properties located in the area by the Recreation Ground claimed flood damage grants. These properties are located in Environment Agency Flood Zone 1 being at low risk of flooding with a less than 0.1 % (1 in 1000 year) annual probability of river flooding in any one year

At some point in the last century a stream which provided drainage for both foul and surface water from the village was culverted in a 9 inch diameter drain (approx 225mm) by the then Chipping Norton Rural District Council (CNRDC). This culvert runs from Park Road, through a private garden, across the Recreation Ground, under the cricket pitch and on to a field. At this point it connects to a more recently constructed 18 inch (approx 450mm) culvert put in by CNRDC which crosses the field and discharges to an open ditch at Frogden Wood. A plan of the existing drainage is included in Appendix 2.

The cause of flooding at this location is one, or a combination of the following:

#### 5.2.1 Road Runoff

Properties in the vicinity of the Post Office are located at a low point in the village. During periods of heavy rainfall, surface water drains and gullies begin to surcharge and water flows along the road surface of Park Road Church Walk to the Post Office where it pools. Where properties have door levels at or below the road level, flooding occurs. Wash from vehicles exacerbates this problem.

#### 5.2.2 Overland Flow

Properties in the vicinity of the Post Office are located in a natural flow path, being affected by overland flow from Combe Green flowing through the dry stone walling and into the front of property on Park Road.

Direct overland flow occurs when ground either becomes fully saturated, preventing percolation into the upper layers of soil, or when the rainfall intensity is greater than the percolation rate of the receiving ground. Both result in sheet runoff, or water flowing directly off the surface of the land.

### **5.2.3 Inadequate Drainage**

The 9 inch (approx 225mm) diameter culvert installed by the Chipping Norton Rural District Council (CNRDC) does not provide sufficient capacity for the drainage area it is serving. Maintenance of the existing drainage system has also been poor due to lack of understanding of where the responsibility for maintenance lies.

### **5.2.4 Lack of maintenance**

A pond is located in Combe Green. This pond provides attenuation for overland flow and surface water from Akeman Street prior to outfall to Park Road. Over a period of time this pond has become overgrown and provides less storage in the upstream catchment resulting in greater volumes of water ponding on Park Road at the Post Office.

## **5.3 Area 2 – Alma Grove**

One property flooded in the Alma Grove area in July 2007. This property is located in the 2007 Environment Agency Flood Zone 1, comprising of land having less than 0.1% probability of flooding (less than 1 in 1000 year) of flooding from rivers.

Property at Alma Grove has open farm land located to the rear of property. This farmland is positively drained to a ditch at the rear of properties as illustrated on the record plan included in Appendix 2.

The cause of flooding at this location is one, or a combination of the following

### **5.3.1 Overland Flow**

Direct overland flow occurs when the ground either becomes fully saturated, preventing any percolation into the upper layers of soil, or where the rainfall intensity and rate is greater than the percolation rate of the receiving ground. Both result in sheet runoff, or water flowing directly off the surface of the land. In Combe this is exacerbated by a high water table caused by the clay topped land.

A substantial drainage system was implemented into fields at the rear of these properties financed by Blenheim Estates who own the land. This drainage system outfalls to the highway drainage system on Park Road at two locations determined by ground levels. A site visit confirmed that a small drainage pipe, 75mm diameter runs off the field into the drainage ditch and a 150mm pipe runs out, taking the field drainage into the highway drainage system located on Park Road.

During periods of intense rainfall, overland flow collects in the field drainage system which then over tops at the low points and flows through property at one location and onto the surface of the highway. Where flooding to property has been experienced, OCC have installed a drainage system to collect water running from the property to connect to a 225mm diameter pipe which links into the drainage system running under the recreation ground. This will not prevent flooding to property at Alma Grove but should reduce surface water flowing from farmland onto the highway in turn down to the post office and Area 1.

Discussion with local residents also highlighted that historically a ditch ran in front of the cottages along Park Road. This is no longer present.

### **5.3.2 Road Runoff**

During periods of heavy rainfall, the roads become drainage paths and convey large amounts of water. As the rainfall intensity increases, surface water drains and gullies begin to surcharge on Park Road at Alma Grove and water flows along the road surface increasing in depth causing flooding of the highway. This has been exacerbated by poor maintenance of the drainage system often due to unclear ownership and responsibility.

## **5.4 Area 3 – Akeman Street**

In 2007, 2 properties located along Akeman Street claimed flood damage grants . These properties are located in Environment Agency Flood Zone 1 being at low risk of flooding with a less than 0.1 % (1 in 1000 year) annual probability of river flooding in any one year.

There is no watercourse located in close proximity to Akeman Street.

The cause of flooding is one, or a combination of the following:

### **5.4.1 Inadequate Highway Drainage**

A site visit showed a lack of gullies along Akeman Street from the watershed to the north at Square Firs.

During periods of heavy rainfall, water on Akeman Street pools at low points in the catchment. There are two gullies located at these low points, however they are not able to cope with the volumes of water and quickly become surcharged. It has also been noted that the outfall for these gullies is unknown and may be blocked. As the depth of water increases, properties with door levels below street level become flooded. Wash from passing vehicles exacerbates the problem.

As with drainage in Area 2, as the depth of water increases at Akeman Street, water starts to flow down towards Area 1 and the Post Office.

A site visit showed that there are some grips located in the verge on Akeman Street at Combe Green. Since July 2007, there has been work carried out to clear these grips.

### **5.4.2 Overland Flow**

Properties affected by flooding on Akeman Street have been inundated from floodwater running off fields and gardens located to the rear of property.

Direct overland flow occurs when the ground either becomes fully saturated, preventing any percolation into the upper layers of soil, or where the rainfall intensity and rate is greater than the percolation rate of the receiving ground. Both result in sheet runoff, or water flowing directly off the surface of the land. In Combe this is exacerbated by a high water table caused by the clay topped land.

Flood water then flows towards the road where there is little drainage as described above, further increasing problems on Akeman Street as well as further down the road.

## **5.5 Area 4 – horns Lane**

Along Horns Lane no properties claimed flood damage grants. However a site visit and meeting with local residents highlighted problems with foul water flooding at this location.

### **5.5.1 Foul Sewer Flooding**

It is believed that new development in the parish has not incorporated surface water drainage and instead discharges surface water into the foul water system. This has led to foul water flooding along Horns Lane through the surcharging of manholes.

## 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 I. 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										
Combe										
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					
<b>Area 1 – Park Road at the Post Office/Recreation Ground</b>										
	<b>Overland Flow</b>  Flooding due to the position of houses in a historical flow path. During periods of heavy rain, overland flow from Combe Green spills through the dry stone wall on the north of Park Road and pools in front of property. As the depth of the pool increases, water starts to flow through properties to the recreation ground.									
<b>A</b>	Re-create pond on Combe Green to allow extra storage for flood waters	EA have been contacted and have requested a new survey for the pond.  No work can be carried out until this work has been completed.			WODC to provide co-ordination role	Blenheim estates own the land and have been approached informally to carry out works to re-instate the pond.	Will allow storage for flood waters, delaying the time it takes for water to enter the drainage system by the recreational ground.	Increased upstream storage	Up to £5,000	Before any work is done the EA have requested a new survey. Blenheim Estates are in contact with the EA to resolve this issue.
<b>B</b>	Create a bund along the northern face of the dry stone wall on the north of Park Road at the Old Post Office. This can be made from the spoil created from excavation of the Combe Green Pond.	EA should be consulted			WODC to provide co-ordination	Blenheim Estates to complete this work as part of the village pond works	Will increase storage in the Combe Green Area reducing flow to Post Office/Park Road	Improved land drainage	Up to £5,000	Blenheim Estates have agreed to complete this work.
<b>C</b>	Flood resilient measures to properties	The EA website contains reference information on flood resilient measures to properties.			WODC to provide a co-ordination role	Homeowners to provide protection against flooding to their properties e.g. flood boards, flood proofing of exterior walls, sandbags, air brick covers, water resistant door frames	Only effective if defences are put in place before the water level rises.	None	Up to £5,000	Homeowners have not been approached regarding this option

Option ref	Flood Overview	Description of work required					Key Issues			Comments
		Environment Agency	Oxfordshire County Council	Thames Water	WODC	Private	Effectiveness	Affects on adjacent land	Cost	
	Options	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					
<b>Area I – Park Road at the Post Office/Recreation Ground (cont...)</b>										
	<b>Road Runoff/inadequate drainage</b>  During periods of heavy rainfall, water flows along Park Road from the direction of Alma Grove and Church Walk and pools in front of property.									
<b>D</b>	Increase capacity of existing 9 inch drain that collects surface water from the highway in front of the Post Office by constructing two 12 inch overflow pipes to connect to the existing drainage system under the recreation ground. This option requires OCC to carry out modelling on the volume of water which will enter the existing system, in addition to ascertaining the frequency and level of surcharging which will be expected to occur on the existing system.		OCC suggested this option  OCC to carry out design and construction		WODC to provide a co-ordination role	Approval from Combe Village Hall and Recreation Ground Committee required  Maintenance issues need to be discussed and confirmed before works go ahead.	Will improve drainage of Park Road in the vicinity of the Post Office	May increase potential flood risk to recreation ground – calculations on the system required	£5,000 to £25,000	CVH & RGC are willing to consider construction of a overflow of no more than 12 inches to connect to the existing system.  Further consultation required.
<b>E</b>	Increase capacity of existing 9 inch drain that collects surface water from the highway in front of the Post Office by constructing two 12 inch overflow pipes to extend right across the recreation ground to the field beyond.		OCC are aware of this option, but the cost is much greater than option D  OCC to carry out design and construction		WODC to provide a co-ordination role	Approval from Combe Village Hall and Recreation Ground Committee required  Maintenance issues need to be discussed and confirmed before works go ahead.	Will improve drainage of Park Road in the vicinity of the Post Office	Improved land drainage. This option may improve drainage of the recreation ground as flood water will no longer be pumped into the recreation ground from Park Road during times of flood.	£20,000 to £50,000	This option is very expensive. Further consultation required with WODC and CVH &RGC  Further consultation required.
<b>F</b>	Carry out a survey of the existing system running under the recreation ground to assess the current capacity. Carry out clearance of roots/silt where necessary. This should be continued downstream where the culvert re-enters an open ditch system at Frogden Wood		OCC may be required to carry out some of the survey and maintenance works following investigation by WODC		WODC to provide co-ordination role and establish land ownership and responsibility where required.	Combe Village Hall and Recreation Ground Committee may be required to carry out part of this work as riparian owner.  Downstream landowners will be required to maintain drainage ditches.	Will ensure that the existing system is working to its full capacity	Improved land drainage	Up to £5,000 for each section	Further consultation required to establish maintenance responsibility for each section of the drainage system

Option ref	Flood Overview	Description of work required					Key Issues			Comments
		Environment Agency	Oxfordshire County Council	Thames Water	WODC	Private	Effectiveness	Affects on adjacent land	Cost	
		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					
<b>Area 2 – Alma Grove</b>										
	<b>Overland Flow</b> During periods of intense rainfall, water flows from farmland at the rear of properties at Alma Grove onto Park Road.									
<b>A</b>	Flood resilient measures to properties in the 0.1% probability (1 in 1000 year floodplain)	The EA website contains reference information on flood resilient measures to properties.			WODC to provide a co-ordination role	Homeowners to provide protection against flooding to their properties e.g. flood boards, flood proofing of exterior walls, sandbags.	Only effective if defences are put in place before the water level rises.	None	Up to £5,000	Homeowners have not been approached regarding this option  Older properties are prone to water rising through floors due to their construction.
<b>B</b>	Increase the capacity of the field drainage ditch at the rear of Alma Grove so waters do not over top and flow into properties so readily.				WODC to provide a co-ordination role	Landowner/occupier of fields to increase drainage ditch capacity	Will allow a larger volume of water to enter the ditch before it fills.		Up to £5,000	Landowners have not been consulted about this option
<b>C</b>	Create a bund on the side of field ditch at rear of Alma Grove closest the houses; this will prevent waters over topping and flowing into the back of properties.					Landowner could put small bund in place as part of the ditch clearance measures.	Water would be stopped from rising over the ditch and into the property	More water will be maintained in the ditch and will need to drain to somewhere		This option is yet to be discussed
<b>D</b>	Create drainage paths through the side of affected property on Park Road by raising the oil tank to allow water to flow beneath it.				WODC to provide a co-ordination role	Property owner to complete works to protect their property.	Flood water would follow a predetermined path to protect property from flooding.	Improved land drainage	Up to £5,000	This option has yet to be discussed
<b>E</b>	Carry out maintenance on the existing brick culvert that conveys flow from Alma Grove across the recreation ground. Local residents believe that this may be in part blocked or collapsed.		OCC to be consulted regarding works as some highway drainage from Alma Grove connects to this system		WODC to provide a co-ordination role	Riparian owner to carry out maintenance of brick culvert	Will improve drainage from Alma Grove	Improved drainage to Alma Grove	Up to £5,000	Further consultation required to establish where responsibility for maintenance of this culvert lies.
<b>F</b>	Create storage area in field at Alma Grove where water currently flows adjacent to property to Park Road.					Blenheim and field occupier to be consulted and this option would affect their land	Water running through Alma Grove would be reduced and so would the drainage impacts on Park Road	Will create stored water on land which is meant to be drained	Up to	Landowners have not been consulted about this option

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					
<b>Area 2 – Alma Grove, (cont...)</b>										
	<b>Inadequate Drainage</b>  During periods of heavy rainfall, surface water flows over highway drainage and onto the Post Office									
<b>G</b>	Drainage clearance work has been carried out but not completed. This needs to be fully completed. Blockages need to be identified, cleared and maintained.		OCC to carry out drainage clearance that was started but not completed				More water will be able to drain off the road			
<b>H</b>	OCC to upgrade highway drainage at Alma Grove to intercept water flowing along the path at Alma Grove Barn on the northern side of Park Road.		OCC to carry out design and construction. Potential to use a combined kerb and drainage unit on the southern verge to allow lateral entry of water continuously to drainage system. Potential to use a linear drainage system or French drain on the northern verge at access to Alma Grove Barn.		WODC to provide a coordination role		A larger volume of water will be able to enter the drainage system. This will prevent water flowing along Park Road	Improved land drainage and reduced flooding at the Post Office where this water collects.	£5,000 to £20,000	OCC have not been consulted regarding these works
<b>I</b>	Construct an extra overflow pipe to carry surface water from Alma Grove area directly to the existing 300mm diameter stone culvert running under the recreation ground.		OCC to carry out feasibility works and to carry out works.				This would reduce the volume of water flowing to the post office and re-direct it into the existing system under the recreation ground	Improved land drainage	£20,000 to £50,000	
<b>J</b>	Construct a raised 'speed bump' in across the road at Alma Grove to direct flow to gullies instead of flowing down to the Post Office		OCC to carry out feasibility. Lighting would be required		WODC to provide a coordination role		Will channel surface flow to existing highway drainage	May create a pool behind the speed bump if the drainage system is not upgraded	£5,000 to £20,000	Required further consultation
<b>Area 3 – Akeman Street</b>										
	<b>Inadequate Highway Drainage</b>  Following periods of intense rainfall (such as July 2007), road gullies surcharge as a result of capacity exceedence or blockages. Surface water flooding occurs of road and low lying properties									
<b>A</b>	Install new gullies along Akeman Street from Square Firs to Orchard Close.		OCC to design and complete works.		WODC to provide co-ordination role		This will reduce the flow of water on the highway, reducing flood risk.	Will improve road drainage	£5,000 to £20,000	Site visit confirmed that there were only 2 or 3 road gullies from the watershed at Square Firs to the low point in Akeman Street near to Orchard Close

Option ref	Flood Overview	Description of work required					Key Issues			Comments
		Environment Agency	Oxfordshire County Council	Thames Water	WODC	Private	Effectiveness	Affects on adjacent land	Cost	
	Options	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					
<b>Area 3 – Akeman Street (cont...)</b>										
<b>B</b>	Install grips on the eastern verge of Akeman Street to direct water to Combe Green. This will require weep holes to be put into the dry stone wall.				WODC to provide a coordination role	Blenheim Estates have agreed to complete this work.	Will take pressure off road drainage system. Less water will be directed down the road	More water will be directed onto Combe Green, with the potential to impact Area 1 if no mitigation measures are in place.	Up to £5,000	
<b>C</b>	OCC to carry out a survey and clearance of the existing piped network at the bottom of Akeman Street by Orchard Close. It is not known where this drainage connects to.		OCC to carry out survey works and act on findings.		WODC to provide co-ordination role and ensure work is completed.		Will ensure that existing system is working to its full capacity	Improved land drainage	Up to £5,000	
<b>D</b>	Install raised kerbs at the low points of Akeman Street. This will prevent overtopping of flood water from the road into houses.		OCC to be consulted and to carry out works				Water will be contained within the road, so that it can drain away and not overtop into houses.		Up to £5,000	
<b>E</b>	Flood resilient measures to properties	The EA website contains reference information on flood resilient measures to properties.			WODC to provide a co-ordination role	Homeowners to provide protection against flooding to their properties e.g. flood boards, flood proofing of exterior walls, sandbags.	Only effective if defences are put in place before the water level rises.	None	Up to £5,000	Homeowners have not been approached regarding this option  Older properties are prone to water rising through floors due to their construction.
	<b>Overland Flow</b> During periods of intense rainfall properties in Akeman Street are flooded by overland flow from farmland and gardens at the rear.									
<b>F</b>	Landowner to create drainage ditch along the rear of properties to connect to the highway drainage in Orchard Close.		OCC to be consulted regarding the potential to connect into the highway drainage system		WODC to provide a co-ordination role	Landowner/occupier of fields to carry out works.	Water will be able to collect before it floods properties	Improved land drainage	Up to £5,000	Landowners have not been approached.
<b>Area 4 – Horns Lane</b>										
	<b>Sewer flooding has been a problem along Church Walk and Horns Lane. This has been attributed to the sewer network along Horns Lane being overwhelmed during periods of high intensity rainfall</b>									
<b>A</b>	Thames Water to clear foul water system from Church Walk to the Sewage Works. If this does not work, a CCTV survey will show if there are any blockages in the system that need addressing.			TW to carry out survey and appropriate works.	WODC to provide co-ordination role		Will ensure foul water system is working to its full capacity	Reduced foul water flooding of highway	Up to £5,000 for survey	Thames Water have not been approached
<b>B</b>	WODC to investigate whether any development has connected any foul sewage system to surface water system. WODC to carry out enforcement, if illegal connections are found to be in place.			TW to help carry out survey and appropriate works.	WODC to investigate		Will determine whether the foul sewage system is affected by surface water.	Will help reduce sewer flooding once survey is complete.	Up to £5,000 for survey	Thames Water have not been approached

## **7.0 CONCLUSIONS AND RECOMMENDATIONS**

### **7.1 Area 1 – Park Road and the Post Office/Recreation Ground**

#### **7.1.1 Maintenance**

The following on-going maintenance is recommended

- Option F – Carry out a survey of the existing drainage system running under the recreation ground to assess the current capacity. Carry out clearance of roots/silt where necessary. This should be continued downstream where the culvert re-enters a open ditch system at Frogden Wood

#### **7.1.2 Flood defence improvement schemes**

The following flood defence improvement schemes are recommended:

##### **Immediate (under 1 year)**

- Option A – Re-create pond on Combe Green to allow extra storage for flood waters
- Option B - Create a bund along the northern face of the dry stone wall on the north of Park Road at the Old Post Office. This can be made from the spoil created from excavation of the Combe Green Pond.
- Option C - Flood resilient measures to properties

##### **Mid-Term (under 1 -2 years)**

- Option D - Increase capacity of existing 9 inch drain that collects surface water from the highway in front of the Post Office by constructing two 12 inch overflow pipes to connect to the existing drainage system under the recreation ground.
- Option E - Increase capacity of existing 9 inch drain that collects surface water from the highway in front of the Post Office by constructing two 12 inch overflow pipes to extend right across the recreation ground to the field beyond.

### **7.2 Area 2 – Alma Grove**

#### **7.2.1 Maintenance**

The following on-going maintenance is recommended:

- Option G – OCC to undertake blockage and siltation inspections of road gullies and associated drainage along Park Road. Where necessary, undertake jetting or other clearance measures.

#### **7.2.2 Flood defence improvement scheme**

The following flood defence improvement schemes are recommended:

##### **Immediate (under 1 year)**

- Option A - Flood resilient measures to properties
- Option B- Increase the capacity of the field drainage ditch at the rear of Alma Grove so waters do not over top and flow into properties so readily.
- Option C - Create a bund on the side of field ditch at rear of Alma Grove closest the houses, this will prevent waters over topping and flowing into the back of properties.

- Option D- Create drainage paths through the side of affected property on Park Road by raising the oil tank to allow water to flow beneath it.
- 
- Option H - OCC to carry out drainage clearance works

### **Mid-Term (under 1 -2 years)**

- Option E – Carry out maintenance on the existing brick culvert that conveys flow from Alma Grove across the recreation ground. Local residents believe that this may be in part blocked or collapsed.
- Option F - Create storage area in field at Alma Grove where water currently flows adjacent to property to Park Road.
- Option H - OCC to upgrade highway drainage at Alma Grove to intercept water flowing along the path at Alma Grove Barn on the northern side of Park Road.
- Option I – Construct an extra overflow pipe to carry surface water from Alma Grove area directly to the existing 300mm diameter stone culvert running under the recreation ground.
- Option J - Construct a raised 'speed bump' in across the road at Alma Grove to direct flow to gullies instead of flowing down to the Post Office

## **7.3 Area 3 – Akeman Street**

### **7.3.1 Maintenance**

There is little to no drainage along Akeman Street. Towards the bottom of Akeman Street towards Orchard Close the drainage that is there requires maintenance work to be carried out. Further work needs to be carried out on this system to find where it connects. The system needs overall improvements to be made.

The following on-going maintenance is recommended:

- Option C – OCC to carry out a survey and clearance of the existing piped network at the bottom of Akeman Street by Orchard Close. It is not known where this drainage connects to.

### **7.3.2 Flood defence improvement scheme**

The following flood defence improvement schemes are recommended:

#### **Immediate (under 1 year)**

- Option A – Install new gullies along Akeman Street from Square Firs to Orchard Close.
- Option B – Install grips on the eastern verge of Akeman Street to direct water to Combe Green. This will require weep holes to be put into the dry stone wall.
- Option E - Flood resilient measures to properties

#### **Mid-Term (under 1 -2 years)**

- Option D– Install raised kerbs at the low points of Akeman Street. This will prevent overtopping of flood water from the road into houses.
- Option F – Landowner to create drainage ditch along the rear of properties to connect to the highway drainage in Orchard Close.

## **7.4 Area 4 – Horns Lane**

### **7.4.1 Maintenance**

The following on-going maintenance is recommended:

- Option A - Thames Water to clear foul water system from Church Walk to the Sewage Works. If this does not work, a CCTV survey will show if there are any blockages in the system that need addressing.
- Option B – WODC to investigate whether any development has connected any foul sewage system to surface water system. WODC to carry out enforcement, if illegal connections are found to be in place.

## **Appendix I: Photographs**

**Area I – Park Road at the Post Office/Recreation Ground**

Photograph 1: Flooding at Park Road, looking towards Church Walk

3rd June 2008



Photograph 2: Flow path of flood waters through driveway from Park Road to the Recreation Ground. 3<sup>rd</sup> June 2008



Photograph 3: Flooding on the recreation ground looking away from the village from Park Road

3rd June 2008



Photograph 4: Flooding in recreation field

3rd June 2008



Photograph 5: Flooding on recreational field looking towards the village from the skating bowl



Photograph 6: Flooding at skating bowl at the bottom of the recreational field



Photograph 7: Heaving of ground on the recreational field due to the water pressure



## Area 2 – Alma Grove

Photograph 8: Water flowing over road gullies and down Park Road from Alma Grove to Post Office



Photograph 9: Water flowing down Park Road from Alma Grove to Post Office



Photograph 10: Water in the back Garden of a property on Park Road. Flood Water is flowing from farmland to the rear.



Photograph 11: Field drainage ditch at the back of the houses on Park Road at Alma Grove



Photograph 12: Outfall from field drainage into field ditch at park of property on Park Road at Alma Grove



Photograph 13: Outlet from field ditch at rear of property on Park Road at Alma Grove. Drainage connects to highway drainage system on Park Road.



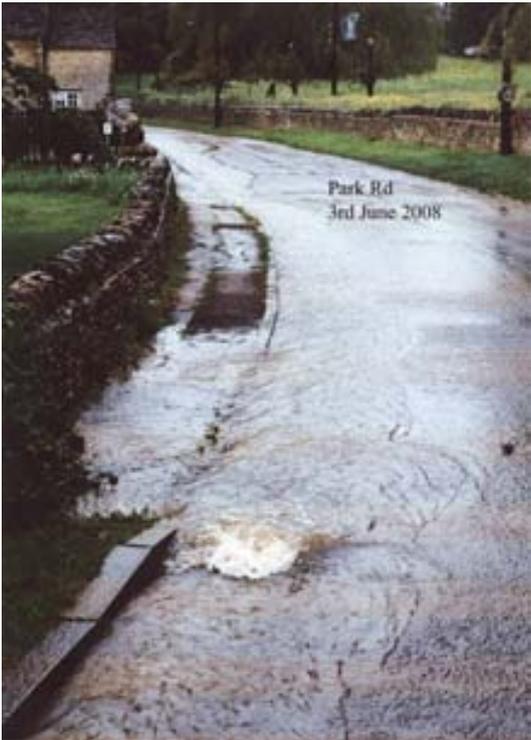
Photograph 14: Water flowing from farmland at rear of property to Park Road at Alma Grove.



Photograph 15: Water flowing from farmland at the rear of Alma Grove towards Park Road

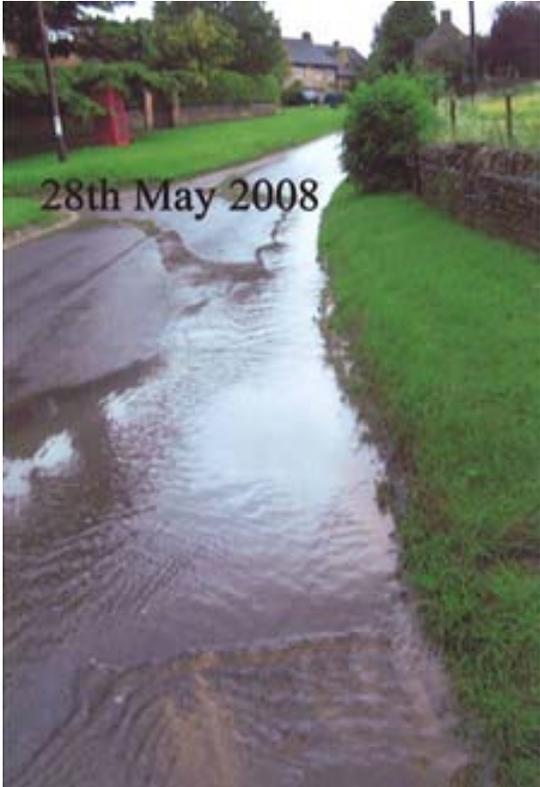


Photograph 16: Water flowing down Park Road at Alma Grove showing the surcharging of road gullies.



**Area 3 – Akeman Street**

Photograph 17 – Surface water flowing down Akeman Street



Photograph 17: Akeman Street – looking away from the village towards Square Firs showing a lack of road gullies.



Photograph 18: Grip on Akeman Street. Weep holes required in dry stone wall to direct water to Combe Green.



Village postcards from last century show the position and size of the village pond.



Courtesy of Combe Parish Council