WEST OXFORDSHIRE
DISTRICT COUNCIL

www.westoxon.gov.uk

Parish Flood Report:
Carterton

May 2008

Contents

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[1] 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[2] land owner, and permissive powers[1] 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

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

Ditch Clearance

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

Flood Grants

- 1137 WODC Flood Grants totalling £284,250 given out overall
  - 26 (£6,500) for Carterton
- 40 Red Cross Flood Grants totalling £80,929 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 Carterton

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 Carterton 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 Carterton during July 2007 and potential mitigating solutions.

Carterton is a town of approximately 472 Hectares (1,166 Acres). It is located approximately 7.5 km west of Witney, on the B4020 and B4477 and is adjacent to RAF Brize Norton. Carterton is the second largest settlement in the West Oxfordshire District with a population of approximately 14,000.

Shill Brook is the only main river in the Parish and flows in a southerly direction to the west of the Town of Carterton, forming the parish boundary with Alvescot Parish Council. There is also an ordinary watercourse (ditch) flowing in an south-easterly direction through the north of the town from the football ground and allotment gardens at the north of Swinbrook Road, past Beverley Crescent and Northwood Crescent to Monahan Way and Carterton Road to the east of the town.

During July 2007, properties were reported to have flooded in Carterton. In total, 26 compensation claims were made to WODC, however, the actual number of properties flooded may be greater. Several roads were flooded, including Monnhan Way, the roundabout and the junction at the entrance to the West Oxon Industrial Park.

Visual walkover surveys were undertaken where residents were consulted and a meeting was held with the Town Council to clarify the extent of flooding. From these discussions and consultation with the EA, flooding of properties in Carterton appears to have occurred sporadically across the town with no particular concentrated areas of flooding.

Although unaffected by the floods in July, local residents have stated that the electricity substation on Northwood Crescent came very close to flooding and has come close on several occasions in the past.

It is thought that the main sources of flooding in the area in July were:

1. Surface water as a result of blocked road drains, overwhelmed road drains and overland flow
2. Potential fluvial flooding from the drainage ditch to the north of the town as a result of channel incapacity or blockages.
3. Foul water (sewer) flooding has been known to occur in areas of the town in the past, though there were no reported incidents in the Summer of 2007. It is clear from visual walkovers, that sewer flooding occurs regularly around manholes near the electricity substation.

Flooding problems and mitigation options, including description of works, effectiveness of each solution, affects on adjacent land and cost (based on professional judgement rather than detailed analysis) and how each public and private body is affected, are included in Section 5. Priority ranking is included in Section 6.

Conclusions and recommendations, including maintenance and flood defence improvement schemes and programme, are shown in Section 7.

4.0 SURVEY

4.1 Description of Area

Carterton is a town of approximately 472 Hectares (1,166 Acres). It is located approximately 7.5 km west of Witney, on the B4020 and B4477 and is adjacent to RAF Brize Norton. Carterton is the second largest settlement in the West Oxfordshire District with a population of approximately 14,000.

The parish consists primarily of the Carterton town and also includes parts of RAF Brize Norton. Carterton is expanding rapidly and has seen large residential and commercial development to the North and East in recent years. Much of this high development rate has been due to the presence of the adjoining RAF Brize Norton air base, which is also the largest employer in the town.

The town lies on the edge of the Thames Valley and on the watershed between Shill Brook and Northmoor Brook, both tributaries of the River Thames. Shill Brook is the only main river in the Parish and flows in a southerly direction to the west of the Town of Carterton, forming the parish boundary with Alvescot Parish Council.

There is also an ordinary watercourse (ditch) flowing in an south-easterly direction through the north of the town from the football ground and allotment gardens at the north of Swinbrook Road, past Beverley Crescent and Northwood Crescent to Monnhan Way and Carterton Road to the east of the town.

Another ditch is present to the east of the town near Hastings Drive though this is outside of the Parish Council area.

4.2 Survey Method

Several visual walk-over surveys of the town have been undertaken including:

- Strathmoor Close
- Northwood Crescent
- West Oxon Industrial Park
- Halton Road
- Selwood Drive
- Shilton Road

The general areas around reported flooding incidents were inspected along with the drainage ditch and electricity substation at Northwood Crescent.

See Appendix 1 – Photographs.

4.3 Meetings

A summary of meetings about Carterton flooding in July 2007 are given in Table 1.

Table 1: Summary of meetings calls and flood description

Date	Location	Description
19.03.08	WODC Witney	• To discuss flooding in Carterton and data that can be provided by WODC. • It was confirmed that OCC carry out gulley cleaning 1.25 times a year. • WODC have cleared a 600m stretch of a ditch located in the north of the town in 2007. • There are no FLARE reports
19.03.08	Carterton – several locations with local residents	• Foul water flooding occurred on Halton Road as a result of Thames Water pumping station. Residents have contacted Thames Water.
26.03.08	Town Clerk at Carterton Town Hall	• There is a general perception amongst town residents that new development contributed to the flooding that occurred in July 2007. • Most flooding was due, however, to rapid runoff from roads and fields as a result of intense rainfall. • The wide distribution of flooded properties reflects the fact that certain surface water gullies and drains surcharged and overflowed because they were either blocked or silted up, or had insufficient capacity to cope with the volume of water. • There is not an extensive history of surface water flooding in the town, though some properties with floor levels lower than adjacent road levels have been affected. • The electricity substation on Northwood Crescent has been close to flooding on a number of occasions, including the Summer of 2007. This substation is deemed as critical infrastructure to the town and, if flooded and disabled, could result in the whole town being without electricity. • Responsibility of the ditch lies with several riparian owners or occupiers including the Town Council, WODC, County Council, the MOD, Developers and private landowners. • The ditch is often blocked with debris and overgrown at several locations along its length. WODC have cleared a 600m stretch of the watercourse in 2007. However, some significant debris blockages have built up again. • Overland flooding affected one property bordering the school playing field on Selwood Drive.
26.03.08	Town Clerk at Caterton Town Hall (*cont…*)	• Parts of the West Oxon Industrial Park and the adjacent playing fields were also flooded – there are attenuation ponds in the vicinity. • Foul water or sewer flooding has occurred at the Electricity substation (as a result of a MOD Combined Sewer Overflow (CSO) operating frequently) and at the end of Halton Rd (connected to the Thames Water pumping station).
26.03.08	Carterton – several locations with local residents	• According to local residents, the ditch on Northwood Crescent is often bank full. During the summer of 2007, the substation nearly flooded. There is always a problem with raw sewerage in the area.

In addition, there has been liaison with the Environment Agency, Oxfordshire County Council and Thames Water. Details of communications are included in Table 2.

Table 2: Summary of consultation calls with EA, OCC, SE and TW

Date	Organisation	Description
29/11/07	OCC	• OCC have completed a lot of work at the airfield where there was extensive surface water flooding. • No extra work has been completed for the remainder of Carterton and non is currently planned apart from the annual gulley cleaning programme which OCC currently operate. OCC felt that the flooding of July 2007 was an extreme event and do not plan further action
March & April 2008	EA	• The EA have completed a flood Review for July 2007 to cover Brize Norton, Clanfield and Bampton (to include the Shill Brook). There has been no flood review completed for Carterton and there is not one planned. The EA recommend the following: • The EA will work with riparian owners to increase awareness of riparian landowner rights and responsibilities on the Shill Brook and local land drainage systems to improve maintenance. • The majority of flooding experienced in Carterton was due to surface water flooding, which is not directly dealt with by the EA.
7/04/08	Thames Water	• TW are currently looking at Halton Rd and Alvescot Rd to replace the pumps, pipework, valves and control panels, also the generator at Halton Rd. TW have quotes but as yet no funding, but would hope to have funding from FY 08/09. • There is also work to be undertaken on the balancing pond which serves the NE Carterton surface Water Catchment, but discharges in Brize Norton. TW will be looking to cap off one of the outfalls and reducing the outgoing flow from the remaining outlet chamber, thus holding more flows in the balancing pond during storm conditions.
16/04/08	Southern Electric	• Southern electric believe that the ditch that runs around the sub station is owned by WODC. The ditch was blocked with tree debris/ shopping trolleys etc and as such during the rainfall event of July 07 water backed up and flowed onto the sub station. The depth of the water was only a few inches deep and no damage was caused to equipment. • Southern electric do not plan to take any action as they believe with maintenance of the ditch this will not be a problem in the future. • WODC have been out since July 07 and have cleared the ditch. • Southern Electric have confirmed that the substation on Northmoor Crescent serves the whole of Carterton. • Equipment is protected to a depth of approximately 2ft as equipment is raised and a bund is in position to protect transformers.

4.4 Application for Grant Aid

WODC has distributed Emergency Flood Relief Grant Aid to each of the 26 affected properties in the Parish of Carterton.

5.0 PROBLEMS AND CAUSES

5.1 Location plan

The location plan (Figure 1 – Appendix 2)) shows four main areas in Carterton where properties flooded in July 2007 and where owners have made claims for grant assistance.

Area 1 – Shilton Road (B4020) and Strathmoor Close
Area 2 – Northwood Crescent, Manahan Road and West Oxon Industrial Park
Area 3 – School, Selwood Drive, and Halton Road
Area 4 – The Crescent and Marlborough Close

Flooded areas in July 2007 were sporadic and dispersed across the town with no obvious clusters. This reflects the fact that the sources of flooding were primarily as a result of blocked gullies, road drains and overland flow.

It should be noted that there may be additional areas affected by flooding that have not been recorded as grant applications, or as a result of site walkovers and meetings with residents and town council representatives.

A map detailing the following is shown 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 of 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

5.2 Area 1 - Shilton Road (B4020) and Strathmoor Close

5.2.1 Direct Overland Flow along Shilton Road

Direct overland flow and ponding affected Shilton Road to the north west of the town. 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.

Direct runoff from fields adjacent to Shilton road, flowed downhill along the road and towards Carterton. This contributed to the surface water flooding issues and resulted in some lower level properties being flooded.

5.2.2 Surface Water Flooding along Shilton Road & Strathmoor Crescent

26 properties made grant applications to WODC following the July floods and all were affected by flooding as a result of surface water runoff and overland flow. During the course of the heavy rain in July 2007, ponding was observed on numerous roads throughout the town. As the rainfall intensity increased, the surface water drains and gullies began to surcharge and water flowed down roads, increasing in depth until kerbs and drives were overtopped and properties with lower floor levels were flooded.

Several properties along Shilton Road and Strathmoor close were affected by surface water flooding.

5.3 Area 2 - Northwood Crescent, Monahan Road and West Oxon Industrial Park

5.3.1 Fluvial Flooding at Northwood Crescent and the Electricity substation

Although there are no reports of property flooding that has been solely attributed to watercourses, the Town Council and several residents have reported that the ditch (ordinary watercourse) flowing in a south easterly direction to the north of the town has overtopped on several occasions. The ditch is very overgrown and is, in places, almost completely blocked with debris. WODC cleared a 600m stretch of the watercourse in 2007. However, some significant debris blockages have built up again.
There are several riparian landowners or occupiers including the Town Council, County Council, the MOD, Developers and private landowners.

The electricity substation (Southern Electric) near Northwood Crescent was surrounded by water in July 2007 on several occasions, though the equipment did not actually flood. However, these reports highlight a potentially very serious flood risk to critical infrastructure in Carterton – should the substation flood, and be shut down as a consequence, the whole of the town would be without electricity (confirmed by Southern Electric 02.05.08).

The access track to the substation crosses the ditch over a bridge (see photos in Appendix 2). The ditch is culverted under the bridge through a circular concrete pipe approximately 0.6 m in diameter and 3.5 m in length. The inlet is estimated to be approximately 40% blocked and the channel immediately upstream contains a lot of debris. Water backs up behind the culvert inlet and overflows onto the banks, bridge deck and the substation. Channel and culvert clearance would reduce the impact of flooding in the area.

On informal footpath has formed adjacent to the substation. In order to cross the ditch debris is placed in the channel, creating a blockage and potential flood risk to the substation.

5.3.2 Surface Water Flooding along Monahan Way and West Oxon Industrial Estate

Ponding was observed on Monahan Way, which overflowed into the West Oxon Industrial Park. As the rainfall intensity increased, the surface water drains and gullies began to surcharge and water flowed down roads, increasing in depth.

5.3.3 Sewer flooding near substation at Northwood Crescent.

Evidence of sewer flooding has also been observed at the electricity substation on Northwood Crescent. Sewer detritus was observed around a manhole, in the channel and on the banks of the watercourse. A combined sewer overflow (CSO) is present nearby and that this operates when water levels in the ditch are high. The MOD are responsible for the CSO and manhole.

5.4 Area 3 - School, Selwood Drive, and Halton Road

5.4.1 Surface Water Flooding along Burford Road and Selwood Drive

Properties flooded due to surface water ponding on Burford Road and in Selwood Drive. As the rainfall intensity increased, the surface water drains and gullies began to surcharge and water ponded and flowed down roads, increasing in depth and into low lying properties.

5.4.2 Direct Overland Flow to Selwood Drive

One property was flooded on Selwood Drive as a direct result of overland flow from the school playing fields. 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.

5.4.3 Sewer Flooding on Halton Road and Hastings Drive.

One case of combined sewer and surface water flooding has been reported in the vicinity of Halton Road and Hastings Drive. There is a Thames Water pumping station (See Photos in Appendix 1) in the area and residents and Thames Water say this was overwhelmed in July 2007.

5.5 Area 4 – The Crescent and Marlborough Close

5.5.1 Surface Water Flooding to The Crescent

Properties flooded due to surface water ponding on The Cresecent and Marlborough Close to the South of the Town bordering the RAF Base. As the rainfall intensity increased, the surface water drains and gullies began to surcharge and water ponded and flowed down roads, increasing in depth and into low lying properties.

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							Actions which have already been completed or are ongoing			
Carterton Town							Actions which agencies have agreed to carry out within next 2 – 3 years			
							Actions which require further consideration			
`Version 1 – April 2008										
Option ref	**Flood Overview**	**Description of work required**					**Key issues**			**Comments**
	Options	**Environment Agency**	**Oxfordshire County Council**	**Utility Company (Thames Water/Southern Electric)**	**WODC**	**Private**	**Effectiveness**	**Affects on adjacent land**	**Cost**	
		For queries Tel 08708 506 506 Or email enquiries@environment-agency.gov.uk	Oxfordshire Highways Department: 0845 310 1111 Or email online@oxfordshire.gov.uk	TW Enquiries: 08459 200 800 SE Enquiries: 01865 845 900	Switchboard: 01993 861000	**N/A**				
Area 1 - Shilton Road (B4020) and Strathmoor Close										
	Primary Cause - Following periods of intense rain (such as July 2007), surface water drains and road gullies surcharge as a result of capacity exceedence or blockages. Surface water flooding occurs to roads and low lying properties.									
A	Undertake blockage and siltation inspections of road gullies, roadside ditches, culverts and road drainage in areas highlighted as having had surface water flooding problems. Where necessary, undertake jetting or other clearance measures.		OCC to organise and undertake inspection as part of their regular maintenance regime.		WODC to act as coordinator to liaise with Carterton Town Council, Shilton Parish Council and OCC to undertake road drainage and ditch maintenance on B4020 (Shilton Road) between Shilton and Carterton.	Landowner / occupier of fields to north of Shilton Road to assist with field ditch inspection and, where necessary, clearance.	This could improve drainage during high intensity rainfall events. However, this is unlikely to solve surface water drainage problems.	Potentially, reduced volume of water flowing onto adjacent land.	£5k to £20k per year	OCC have a maintenance regime in place. Gullies are cleared 1 and a ¼ times per year
B	Changes in land management e.g. contour ploughing to reduce direct runoff from farmland entering the Shilton Road	Advise landowner of upstream catchment on land management techniques to reduce runoff or to store water prior to flowing onto the Shilton Road			WODC to provide a co-ordination role	Landowners to change farming technique so as to increase infiltration. More hedgerows to be planted across the slope to reduce overland flow rates.	Studies have shown that this has had mixed results	There will be a change in land use in the upstream catchment	Landowners time	Landowners in the upstream catchment have not been approached. It may be possible for landowners/farmers to obtain environmental grants to plant hedgerows.
C	Creation of ditch to the north of Shilton Road along field boundary. A piped crossing of the Shilton Road will carry water to a ditch to the south and onto the Shill Brook. A pond could be located at the end of the ditch prior to crossing the Shilton Road if required.		OCC to investigate feasibility of proposal		WODC to provide a co-ordination role	Landowner / occupier of fields both to north and south of Shilton Road would be required to assist with field ditch inspection and, where necessary, clearance.	This will greatly reduce overland flow entering the existing highway drainage system and reduce flooding.	Potentially, reduced volume of water flowing onto adjacent land.	£20k to £50k	Landowners in the upstream catchment have not been approached.
Area 2 – Northwood Crescent, Monahan Road and West Oxon Industrial Estate										
	Primary Cause - Following periods of intense rain (such as July 2007), water levels in the ditch/watercourse to the north of the town overtop banks. Electricity substation has come very close to flooding on several occasions.									
A	Undertake channel maintenance on a regular basis to ensure excessive vegetation is trimmed, debris is removed and culverts are cleared of sediment and debris.		OCC are riparian land owners or occupiers on several reaches of the watercourse and are responsible for channel maintenance.		WODC to act as coordinator between various riparian land owners and occupiers. WODC also riparian land owners or occupiers and should continue to carry out channel maintenance for a 600m reach.	Riparian land owners or occupiers (including MOD and Southern Electric) responsible for maintaining their section of watercourse.	According to the Town Council and several local residents, water levels get high as a result of channel blockages and excessive vegetation. Therefore option could reduce flood risk.	Potential to pass a greater volume of water more quickly downstream.	Landowners time where equipment is available. Up to £5k where contractor is required	It is suggested that WODC could undertake channel maintenance for the whole ditch with funding contributions from other riparian owners or occupiers.

Parish Flood Options							Actions which have already been completed or are ongoing			
Carterton Town							Actions which agencies have agreed to carry out within next 2 – 3 years			
							Actions which require further consideration			
`Version 1 – April 2008										
Option ref	**Flood Overview**	**Description of work required**					**Key issues**			**Comments**
	Options	**Environment Agency**	**Oxfordshire County Council**	**Utility Company (Thames Water/Southern Electric)**	**WODC**	**Private**	**Effectiveness**	**Affects on adjacent land**	**Cost**	
		For queries Tel 08708 506 506 Or email enquiries@environment-agency.gov.uk	Oxfordshire Highways Department: 0845 310 1111 Or email online@oxfordshire.gov.uk	TW Enquiries: 08459 200 800 SE Enquiries: 01865 845 900	Switchboard: 01993 861000	**N/A**				
B	Replace piped culvert with a larger box culvert or clear span bridge to increase capacity of crossing.			Southern Electric to carry out feasibility of increasing capacity of the existing piped culvert access crossing to the Sub station			This will reduce potential for blockage due to debris and in turn reduce likelihood of flood water backing up and flooding the sub station. Only affective if the ditch is maintained.	Potential to pass a greater volume of water more quickly downstream.	£20k to 50k	
C	Undertake flood study with hydraulic modelling of the watercourse to determine flood risk to adjacent areas and electricity substation. Using water levels from flood study, flood defence and or warnings can be designed.	To be undertaken in consultation with EA who can provide hydrometric data and offer expert advice.	OCC to have input as there could be implications on emergency plan should electricity supply be stopped due to flooding.		WODC and Town Council to coordinate between various riparian owners and to explore funding options.	Affected riparian owners or occupiers to contribute to funding.	Will determine flood risk to land abutting watercourse which is being heavily developed in places. Would allow any flood risk management measures to be implemented by riparian owners.		£5k to £50k Topo survey - £5k-£10k. Flood Study: £10k-£15k. Design £10k-£20k	
D	When water levels are high in the ditch, the combined sewer overflow on Northwood Crescent near the electricity substation operates. This add untreated sewage to the floodwaters, which is then deposited in several locations in and around the substation. Upgrade/replace combined sewer overflow on Northwood Crescent near electricity substation.				WODC and Town Council to coordinate	MOD are the owners of the CSO and should be encouraged to upgrade facilities on public health grounds.	Work could reduce overall volume of water entering ditch and improve water quality.		£5k to £10k	
E	Using water levels from flood study undertake feasibility and design of flood wall. If feasible, construct flood wall. Height of wall and implications elsewhere to be identified from flood study. Compensatory storage may be required to ensure flooding is not made worse elsewhere.	To be undertaken in consultation with EA who can provide hydrometric data and offer expert advice.	OCC to have input as there could be implications on emergency plan should electricity supply be stopped due to flooding.		WODC and Town Council to coordinate between various riparian owners and to explore funding options.	Affected riparian owners or occupiers to contribute to funding. Expected that Southern Electric to be lead contributor.	Will determine flood risk to substation and land abutting watercourse which is being heavily developed in places. Would allow any flood risk management measures to be implemented by riparian owners.		£20 to 50k	
Area 3 – School, Selwood Drive, and Halton Road										
	Sewer flooding has affected a number of properties in the Halton Road / Hastings Drive area. This has been attributed to the Thames Water Sewage Pumping Station on Halton Road being overwhelmed during periods of high intensity rainfall.									
A	Undertake inspection of pumping station and, if confirmed to be the cause, carry out improvements to the pumping capacity so that potential for flooding is reduced.			Thames water to confirm if SPS has capacity issues during high intensity rainfall events and undertake improvement works to increase capacity if necessary.	WODC to provide a coordination role		If improvements to SPS capacity carried out, potential to reduce sewer flooding and risk to public health.		Inspection of pumping station capacity and feasibility of upgrade - <£5k Improvements – >£10k.	

Parish Flood Options							Actions which have already been completed or are ongoing			
Carterton Town							Actions which agencies have agreed to carry out within next 2 – 3 years			
							Actions which require further consideration			
`Version 1 – April 2008										
Option ref	Flood Overview	Description of work required					Key issues			Comments
	Options	Environment Agency	Oxfordshire County Council	Utility Company (Thames Water/Southern Electric)	WODC	Private	Effectiveness	Affects on adjacent land	Cost	
		For queries Tel 08708 506 506 Or email enquiries@environment-agency.gov.uk	Oxfordshire Highways Department: 0845 310 1111 Or email online@oxfordshire.gov.uk	TW Enquiries: 08459 200 800 SE Enquiries: 01865 845 900	Switchboard: 01993 861000	**N/A**				
	Following periods of intense rain (such as July 2007), surface water drains and road gullies surcharge as a result of capacity exceedence or blockages. Surface water flooding occurs to roads and low lying properties.									
B	Undertake blockage and siltation inspections of road gullies and road drainage in areas highlighted as having had surface water flooding problems. Where necessary, undertake jetting or other clearance measures.		OCC to organise and undertake inspection as part of their regular maintenance regime.				This could improve drainage during high intensity rainfall events. However, this is unlikely to solve all surface water drainage problems.	Potentially, reduced volume of water flowing onto adjacent land.	£5k to £20k per year	OCC have a maintenance regime in place. Gullies are cleared 1 and a ¼ times per year
Area 4 – The Crescent and Marlborough Close										
	Following periods of intense rain (such as July 2007), surface water drains and road gullies surcharge as a result of capacity exceedence or blockages. Surface water flooding occurs to roads and low lying properties.									
A	Undertake blockage and siltation inspections of road gullies and road drainage in areas highlighted as having had surface water flooding problems. Where necessary, undertake jetting or other clearance measures.		OCC to organise and undertake inspection as part of their regular maintenance regime.				This could improve drainage during high intensity rainfall events. However, this is unlikely to solve all surface water drainage problems.	Potentially, reduced volume of water flowing onto adjacent land.	£5k to £20k per year	OCC have a maintenance regime in place. Gullies are cleared 1 and a ¼ times per year

7.0 CONCLUSIONS AND RECOMMENDATIONS

7.1 Area 1 - Shilton Road (B4020) and Strathmoor Close

7.1.1 Maintenance

The following on-going maintenance is recommended (Option A):

- Road drainage and gullies in the areas affected should be checked and jetted if necessary to ensure that blockages and silt accumulations are cleared.
- Discussions should be undertaken with Shilton PC, the County Council and landowners along Shilton Road to ensure that road and field ditches are cleared and de-silted. This may help to reduce the effects of overland flow being channelled along Shilton Road and into Carterton.

7.2 Flood Defence Improvements

The following flood defence improvements are recommended:

Long term (3 years or more)

- Changes in land management e.g. contour ploughing to reduce direct runoff from farmland entering Shilton Road (Option B).
- Creation of ditch to the north of Shilton Road along the field boundary. A piped crossing of the Shilton Road will be required to carry water to a new ditch to the south and onto the Shill Brook. A pond could be located at the end of the ditch prior to crossing the Shilton Road if required (Option C).

7.3 Area 2 - Northwood Crescent, Manahan Road and West Oxon Industrial Estate

7.3.1 Maintenance

The following on-going maintenance measures are recommended for the ditch/watercourse flowing through the North of the town
(Option A).

- Riparian land owners or occupiers should be encouraged to ensure that the drainage ditch is kept trimmed from excessive vegetation growth and cleared of debris on a regular basis. WODC have cleared a large reach in the past.
- Arrangements could be put in place for WODC to clear the entire length of the ditch with financial contributions from other agencies.
- Southern Electric should be encouraged to undertake regular inspections of the access bridge & culvert to the substation to ensure that it is clear of debris and sediment.
- Road drainage and gullies in the areas affected should be checked and jetted if necessary to ensure that blockages and silt accumulations are cleared.

7.3.2 Flood Defence Improvements

The following flood defence improvements are recommended:

Immediate (under 1 year)

- Option C – As part of the investigative process, it is recommended that an individual flood study is carried out on the ditch so that extreme water levels can be determined and the actual risks to the areas adjacent to the ditch can be defined more accurately. Using this information, flood defences and or flood warnings can be implemented.

- Option D – The MOD should be approached to repair/upgrade the sewer overflow at the ditch on Northwood Crescent.

Mid-Term (under 1 -2 years)

- Option E – A small flood wall should be constructed around the electricity substation on Northwood Crescent. This will ensure that the substation can remain operational during severe rainfall events and the risk of power loss to the whole town could be reduced.

Long term (3 years or more)

- Replace piped culvert with a larger box culvert or clear span bridge to increase capacity of crossing (Option B).

7.4 Area 3 – School, Selwood Drive, and Halton Road

7.4.2 Maintenance

The following on-going maintenance is recommended:

Mid-Term (under 1 -2 years)

- Option A. Sewer flooding in July 2007 at Halton Road and Hastings Drive can be attributed to the Sewerage Pumping Station (SPS) - Carterton Halton Road SPS – CARTP3ZZ - being overwhelmed. This needs to be confirmed with Thames Water. It is recommended that TW assess the feasibility of undertaking improvements works.

Immediate (under 1 year)

- Option B. Road drainage and gullies in the areas affected should be checked and jetted if necessary to ensure that blockages and silt accumulations are cleared.

7.5 Area 4 – The Crescent and Marlborough Close

7.5.1 Maintenance

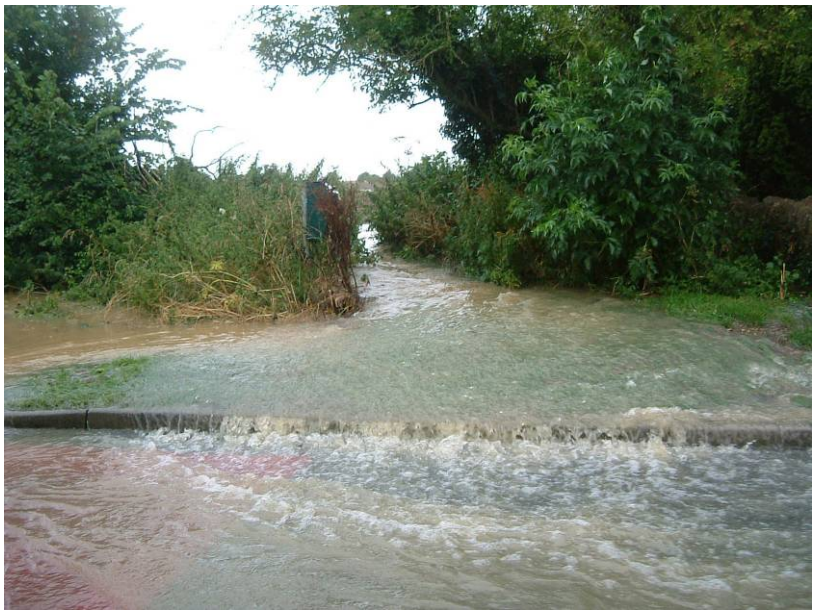
The following on-going maintenance is recommended (Option A):

- Road drainage and gullies in the areas affected should be checked and jetted if necessary to ensure that blockages and silt accumulations are cleared.

Appendix 1: Photographs

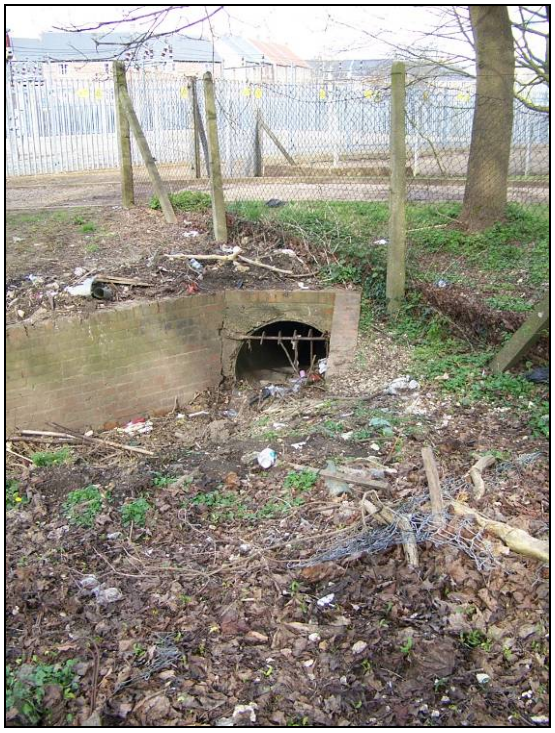
Area 1 – Shilton road (B4020) and Strathmoor Close

Flooding at Shilton Road

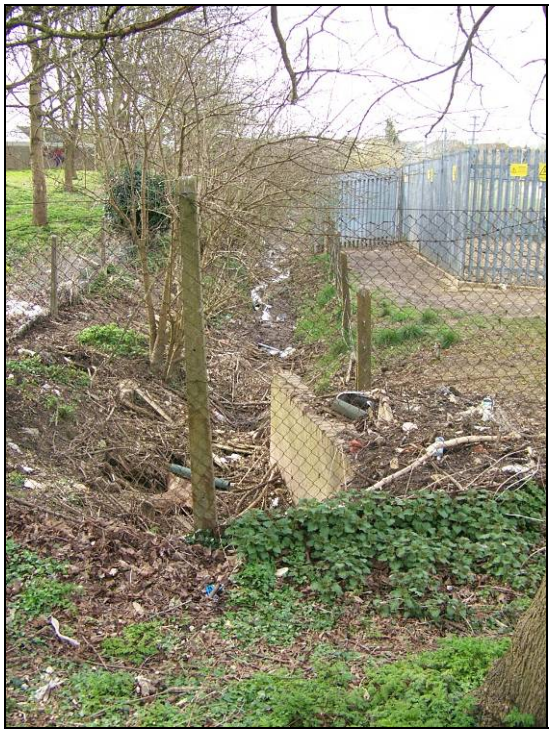


Area 2 – Northwood Crescent, Manahan Road and West Oxon Industrial Estate

Culvert on approach to Substation looking downstream

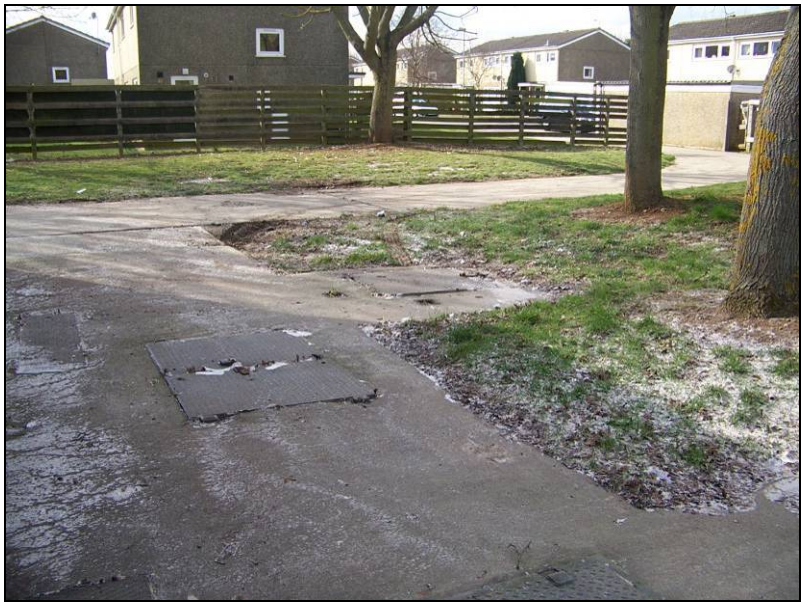


Ditch at north of Carterton near substation.



Area 3 – School, Selwood Drive and Halton Road

Halton Drive near SPS



Halton Drive SPS