

**Plan for strategic management of surface waters and their local environment in the Forest of Marston Vale**

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# **The Surface Waters Plan**

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## **Appendices**



**Bedfordshire and River Ivel Internal  
Drainage Board and The Forest of Marston Vale**

Plan for strategic management of surface waters and their local environment in the Forest of Marston Vale

# THE SURFACE WATERS PLAN

## Appendices

written and produced by

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for

THE BEDFORDSHIRE AND RIVER IVEL INTERNAL DRAINAGE BOARD

and

THE FOREST OF MARSTON VALE

on behalf of

MARSTON VALE SURFACE WATERS GROUP

JUNE 2002



BEDFORD BOROUGH COUNCIL



Bedfordshire  
county council



MID-BEDS  
DISTRICT COUNCIL



Bedford Group



ENVIRONMENT  
AGENCY



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## APPENDIX A

### Glossary of Terms and Abbreviations

Attenuation	Slowing down the rate of flow to prevent flooding and erosion, with a consequent increase in the duration of the flow.
Balancing pond	A pond designed to attenuate flows by storing runoff during peak periods and releasing the water after the flood peak has passed. The pond always contains water. Storage periods may not be long enough to improve water quality.
Catchment	A river catchment is the whole area which drains either naturally or with artificial assistance to a river. It includes the drainage channels, tributaries, floodplains and washlands associated with a river and an estuary where one is present.
DEFRA	Department for Environment, Food & Rural Affairs
Detention basin	A basin, that is normally dry, constructed to store water temporarily to attenuate flows.
Development	In accordance with the definitions given in Section 55 of the Town and Country Planning Act 1990 with certain exceptions development means the carrying out of building, engineering, mining or other operations, in, on, over or under land or the making of any material change in use of any buildings or other land.
Drainage (land drainage)	The Water Resources Act 1991 (as amended by the Environment Act 1995) defines drainage as including: <ul style="list-style-type: none"><li>a) defence against water, including sea water;</li><li>b) irrigation other than spray irrigation;</li><li>c) warping;</li><li>d) the carrying on, for any purpose, of any other practice which involves management of the level of water in a watercourse.</li></ul>
Flood defence	Flood defence means the drainage of land (as defined above), and the provision of flood warning systems.
Flood return period/risk	The risk of flooding to floodplain areas and property is often described in terms of a return period. Statistical return periods relate to the long term average time interval between events of a particular magnitude. The 1 in 100 year return period flood has



	a one percent chance of occurring in any one year, that is the odds of it happening are one hundred to one. Similarly the 1 in 50 year flood has a 2% chance of occurrence in any one year, and the 1 in 5 year flood, a 20% chance of occurrence in any one year.
<b>Flooding</b>	Inundation by river or sea water whether caused by inadequate or slow drainage, or by breaches or over topping of banks or defences.
<b>Floodplain</b>	All land adjacent to a watercourse over which water flows in times of flood.
<b>LEAP</b>	Local Environment Agency Plan: A plan prepared by the Environment Agency to assist with integrated management of a river catchment. The plan describes the current state of the environment and sets targets for improvement.
<b>MAFF</b>	Ministry of Agriculture, Fisheries and Food (succeeded by DEFRA – see above)
<b>Main River</b>	Watercourses shown as such on the statutory main river maps held by the Ministry of Agriculture, Fisheries and Food. Main rivers are maintained by the Environment Agency.
<b>Ordinary Watercourses</b>	Any watercourse that does not form part of a Main River. Internal Drainage Boards maintain certain designated common watercourses within Internal Drainage Districts. Local Authorities maintain certain 'awarded' common watercourses and highway ditches outside Internal Drainage Districts. Generally, other common watercourses are the responsibility of riparian owners.
<b>PPG25</b>	Planning Policy Guidance Note 25: One of a series of guidance notes published by the Department of Environment, Transport and the Regions; in this case dealing with Development and Flood Risk. PPG25 was published in July 2001.
<b>ROMP</b>	Review of Minerals Permissions: A review of extant planning permissions for clay extraction sites in the northern sector of the Marston Vale that will lead to revised/updated permissions incorporating restoration plans for 'worked out sites'.

<b>Runoff</b>	Water flow over the ground surface to the drainage system. This occurs if the ground is impermeable or if permeable ground is saturated.
<b>Soakaway</b>	A subsurface structure into which surface water is conveyed, designed to promote infiltration.
<b>Source Control</b>	The control of runoff at or near its source.
<b>SuDS</b>	Sustainable (urban) Drainage Systems: A strategy, supported by a range of techniques, for dealing with surface water drainage that seeks to promote sustainable and environmentally beneficial or least damaging solutions. SuDS were developed initially with urban drainage in mind but the approach has broad application over all development drainage. SuDS techniques include Source Control.
<b>Swale</b>	A grass-lined channel designed to drain water from a site as well as controlling the flow and quality of the surface water.
<b>Watercourse</b>	Any natural or artificial channel which conveys surface water.
<b>Wetland</b>	A pond that has a high proportion of emergent vegetation in relation to open water that provides a variety of habitats.



## APPENDIX B

### The Marston Vale Surface Waters Group

The Marston Vale Surface Waters Group (originally known as the Marston Vale Working Group) was established in November 1997 on the initiative of the Bedfordshire and River Ivel Internal Drainage Board and the Forest of Marston Vale (formerly The Marston Vale Community Forest). Their principal aim was to create a vehicle to encourage an integrated approach to surface water issues in response to development pressure in the Marston Vale.

The unique nature of the area with its clay pits and landfill sites and its identification as a strategic corridor for development and designation as a Community Forest presents particular drainage and environmental challenges and opportunities. It is an indication of the significance of drainage to the area that an Internal Drainage Board was established as the Drainage Authority for much of the Marston Vale, as historically Boards have only been established in areas where there is particular vulnerability to poor drainage conditions.

However, risks and problems associated with high flows and water levels are not the only issues, as management of low flows is also crucial, particularly in relation to the Forest of Marston Vale's aspirations to create wetland habitats within the Marston Vale.

The Surface Waters Group aims to encourage the adoption of efficient, sustainable and environmentally beneficial solutions in this context.

B1

Membership of the Surface Waters Group consists of representatives of:

- Bedfordshire County Council
- Bedford Borough Council
- Mid-Beds District Council
- Forest of Marston Vale
- Environment Agency
- Bedfordshire and River Ivel Internal Drainage Board

Brief details of relevant functions of the member organisations are given at the end of this Appendix. Funding arrangements for the Surface Waters Group are described in Appendix G.

The basis for actions taken by the Surface Waters Group (formerly known as the Working Group) was defined at its inaugural meeting on 7 November 1997



as follows:

"The purpose of the Working Group is to provide a partnership to address matters relating to the natural water environment in the Marston Vale, and in particular:

- To receive representations from the members of the Working Group on matters relating to the natural water environment of the Marston Vale in relation to flood defence, drainage, improvement of the environment, recreation opportunities and other forms of development,
- To seek to identify strategies for reconciling development with the impact on the water environment, which meets as far as possible, the common aims of the Working Group Members to improve the environment of the Marston Vale; and to identify conflicts which may exist in achieving these aims,
- To take steps to encourage the bodies represented on the Working Group to adopt policies in support of the strategies referred to above."

It is not the aim of the Marston Vale Surface Waters Group to seek to influence planning decisions on the location and scale of future development. However its individual members may advise the Planning Authorities, through the normal consultation process, when proposed development is considered to have an adverse impact on surface water or environmental issues.

Rather, the aim of the Surface Waters Group is to encourage planners and developers to adopt strategic solutions for surface water drainage and flood defence for future development that are sustainable and provide environmental benefits. Hence the Surface Waters Group's interests will focus on development proposals promoted by others. Of necessity, the Surface Waters Group will limit its formal consideration of development proposals to those that have received Planning Authority assent (but not necessarily planning permission) and to the potential of existing features in the Marston Vale.

In general, therefore, only those development proposals that are tabled by the Planning Authorities during the Local Plan review process and those appearing in adopted Local Plans will be given specific consideration by the Surface Waters Group in the Surface Waters Plan.

The Surface Waters Group welcomes representations from interested parties who should direct their communications to:

The Bedfordshire and River Ivel IDB,  
Cambridge House,  
Cambridge Road,  
Bedford MK42 0LH

Telephone 01234 354396, Fax 01234 328196,

Email [drainage@idbs.org.uk](mailto:drainage@idbs.org.uk)

Further information can also be obtained on the Drainage Board's website [www.idbs.org.uk](http://www.idbs.org.uk).

## Brief description of relevant functions of the organisations represented on the Surface Water Group

**NOTE:** A more detailed and definitive description can be found in the legislation referred to below, member organisations' own publications and texts on Local Government and Land Drainage.

### Bedfordshire County Council

The Local Government Act 1972 provided a two-tier system of local governance. County Councils represent the first tier of this system and their responsibilities include strategic planning and local planning for minerals and wastes.

The Land Drainage Act 1991 confers certain powers on County Councils relating to land drainage. These enable a County Council to play a part in regulation of land drainage and implementation of improvement works (other than works on 'main river' or within an Internal Drainage District – see below under 'Bedfordshire and River Ivel Internal Drainage Board').

The Highways Act 1980 confers responsibility on County Councils for drainage of the highway network.

Bedfordshire County Council covers the whole of the area of the Forest of Marston Vale.

### Bedford Borough Council and Mid-Beds District Council

Borough and District Councils represent the second tier of local governance. The responsibility of these authorities includes local plan making and determining applications for development proposals.

The Land Drainage Act 1991 confers similar responsibilities and powers on these Local Authorities as for the County Councils.

Bedford Borough Council covers the north and eastern half of the Forest of Marston Vale and Mid-Beds District Council covers the south and west.

### Forest of Marston Vale

The Forest of Marston Vale is one of the twelve community forests formed under the 'Forests for the Community' programme launched in 1989. Marston Vale Community Forest (as the Forest of Marston Vale was first known) was established in 1991 as a joint initiative between Bedfordshire County Council, Mid Bedfordshire District Council, Bedford Borough Council, the Countryside Agency (formerly the Countryside Commission) and the Forestry Commission.

The principle aims of the Forest of Marston Vale include regeneration of the landscape

of the Vale by creation of significant areas of woodland and wetland. These works benefit the environment and ecology and increase opportunities for recreation. The strategy for the Forest is presented in the Forest Plan and annual business plans.

The area of the Forest of Marston Vale is shown on the Reference Plan in Appendix C and its focus is the Millennium Country Park at Stewartby.

#### **Environment Agency**

The Environment Agency has overall responsibility for land drainage and flood defence in England and Wales. It also has regulatory responsibilities for other aspects of the environment including water and air quality, contaminated land and waste disposal. Its powers and responsibilities arise from the Water Resources Act 1991, the Land Drainage Act 1991, the Environment Act 1995 and its byelaws.

It has general supervision over all aspects of flood defence and maintains and can carry out improvements to watercourses designated 'main river'. There are no main rivers within the Forest of Marston Vale but Elstow Brook flows into the River Great Ouse, which is main river, at the north east corner of the Forest.

#### **Bedfordshire and River Ivel Internal Drainage Board**

Internal Drainage Boards are local Drainage Authorities established historically in low lying areas with particular land drainage problems. The Bedfordshire and River Ivel Internal Drainage Board, in common with other Drainage Boards, draws its responsibilities and powers from the Land Drainage Acts 1991 and 1994 and its byelaws. It has a duty to exercise general supervision over all matters relating to drainage of land within its District (see Reference Plan in Appendix C). Whilst the District does not include the whole of the Forest of Marston Vale (it is limited to land up to 8 feet above a historic flood level), it does include all the significant watercourses and a large proportion of the surrounding area.

The Board is empowered to carry out work on all watercourses within its District but the powers are permissive. In practice the Board carries out maintenance on certain designated watercourses that are considered to be the most significant for the drainage of its area; whilst other, generally smaller, watercourses remain the primary responsibility of riparian owners. Elstow Brook is one of the Board's most important designated watercourses. The Drainage Board also has statutory obligations relating to conservation and the environment.

The Bedfordshire and River Ivel Internal Drainage Board is a member of the Bedford Group of Internal Drainage Boards. The Buckingham and River Ouzel Internal Drainage Board, whose District extends into the western fringes of the Forest of Marston Vale, is also part of this organisation and is able to make representations to the Surface Waters Group through the officers of the Bedford Group.

## **APPENDIX C**

### **Reference Plan (drawing no. 98037/01 Rev. E)**

**See next page**



**Bedfordshire Borough Local Plan**

Local Plan Ref	Name	Type
H14	Elbow Bridge	Housing
H9	Stewartby	Housing
H13	Stewartby	Housing
H7	W of Kempston	Housing
H21	Woodton	Housing
H12	Woodton	Housing
H11	Woodton	Housing
H23 (H)	Woodton	Housing
E3	Former Corston	Employment
E10	Former Elbow	Employment
H6	Stewartby	Employment
H14	Land at and near Elbow Storage	Employment
E2	Day	Employment
E3	Land E of B20	Employment
E2	Land W of Elbow Bypass	Employment
E4	Land W of Elbow Bypass	Employment
H7	Land W of Kempston	Employment
E7	Marsh Lane Farm	Employment
E3	S of Cambridge Rd	Employment
E17H12	Stewartby	Employment
E17H13	Woodton	Employment
E17H14	Woodton	Employment

**Mid Bedfordshire Local Plan**

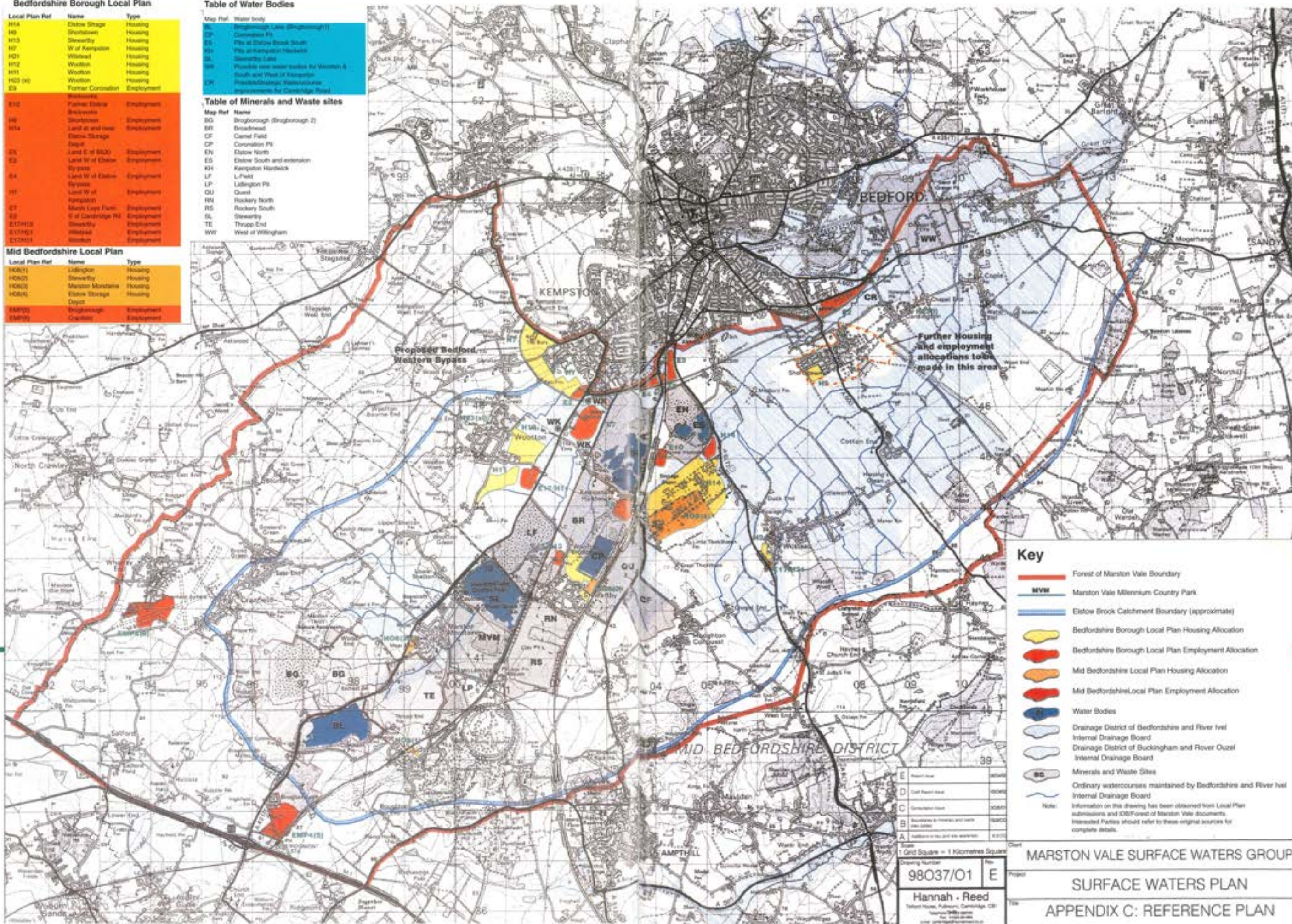
Local Plan Ref	Name	Type
H06(1)	Lidington	Housing
H06(2)	Stewartby	Housing
H06(3)	Marston Monks	Housing
H06(4)	Elbow Storage	Housing
E06(1)	Day	Employment
E06(2)	Cratfield	Employment

**Table of Water Bodies**

Map Ref	Water Body
BL	Brighthelm Lake (Brighthelm)
CP	Corston Pk
EN	Phy at Elbow Brook South
EN	Phy at Kempston Harbeck
SL	Stewartby Lake
SW	Proposed new water bodies for Woodton 4 South and West of Kempston
CP	Proposed new water bodies for Cambridge Road

**Table of Minerals and Waste sites**

Map Ref	Name
BG	Brighthelm (Brighthelm 2)
BR	Bradenham
CF	Camel Field
CP	Corston Pk
EN	Elbow North
ES	Elbow South and extension
KN	Kempston Harbeck
LF	L Field
LP	Lidington Pk
OU	Quint
RN	Rockery North
RS	Rockery South
SL	Stewartby
TE	Thrupp End
WW	West of Willingham



Further Housing and employment allocations to be made in this area

**Key**

- Forest of Marston Vale Boundary
  - MVM Marston Vale Millennium Country Park
  - Elbow Brook Catchment Boundary (approximate)
  - Bedfordshire Borough Local Plan Housing Allocation
  - Bedfordshire Borough Local Plan Employment Allocation
  - Mid Bedfordshire Local Plan Housing Allocation
  - Mid Bedfordshire Local Plan Employment Allocation
  - Water Bodies
  - Drainage District of Bedfordshire and River Ivel Internal Drainage Board
  - Drainage District of Buckingham and River Ouzel Internal Drainage Board
  - Minerals and Waste Sites
  - Ordinary watercourses maintained by Bedfordshire and River Ivel Internal Drainage Board
- Note: Information on this drawing has been obtained from Local Plan submissions and OS/Forest of Marston Vale documents. Interested Parties should refer to these original sources for complete details.

E	Project Area	100000
D	Dist. Project Area	100000
C	Construction Area	100000
B	Boundaries to Minerals and Waste Sites	100000
A	Publicity to the public	100000

Scale: 1 Grid Square = 1 Kilometre Square

Drawing Number: 98037/01 E

Hannah - Reed  
Tollon House, Fulbourn, Cambridge, CB1

MARSTON VALE SURFACE WATERS GROUP  
SURFACE WATERS PLAN  
APPENDIX C: REFERENCE PLAN

C2

C3

## APPENDIX D

### PLANNING CONTEXT

The Surface Waters Plan was prepared in 2000/2001. An outline of the context in relation to the planning process and other non-statutory guidance, at the end of 2001, is given below:

#### Structure Plan

The current Bedfordshire Structure Plan was adopted in March 1997 and covers the period to 2011. However, new Regional Planning Guidance for the South-East (RPG9) was published in March 2001. This has prompted a review of the current Structure Plan. Bedfordshire County Council issued an 'Issues Report' for consultation in 2001 and envisages putting a first draft of the Structure Plan on deposit in October 2002.

#### Local Plans

##### Bedford Borough

The current, statutorily adopted Bedford Borough Local Plan was dated 1993 and covered the period to 1996. Bedford Borough Council's Deposit Draft of the Local Plan was put on deposit in February 1997. Pre-Inquiry Changes were published in September 1998 and Further Changes in August 1999. The Public Inquiry opened in February 1999 and closed at the end of January 2000. A document sweeping up other amendments agreed by the Borough Council was issued as Proposed Changes in January 2000. The Inspector's report was received in March 2001 and the Borough Council has published a Modifications report. The Borough envisage that adoption of the new Local Plan will be achieved in 2002. The new Local Plan will cover the period to 2006.

The Borough has expressed its support for the strategic approach advocated in the Surface Waters Plan in paragraph 3.53 of the new Local Plan (Proposed Changes in January 2000).

##### Mid Bedfordshire District

The current, statutorily adopted Mid Bedfordshire Local Plan was dated September 1993 and covered the period to 1996. Mid-Bedfordshire District Council's First Review



Deposit Draft of its Local Plan was put on deposit in November 1997 and Pre-Inquiry

Changes were published in January and Further Proposed Changes in April 1999. The Public Inquiry commenced in April 1999 and ran until December 2000. It is expected that the Inspector's report will be published in Summer 2002. Statutory adoption of the Local Plan Review is not expected until late 2003. It will cover the period to 2006.

#### **Elstow New Settlement**

A joint report by the Local Plan Inspectors on the proposed Elstow New Settlement at Elstow Storage Depot that straddles the boundary between Bedford Borough Council and Mid-Bedfordshire District Council was issued in February 2001. The Councils are also giving consideration to outline planning applications submitted by the Developers.

#### **Minerals and Waste Local Plan**

The current Bedfordshire Minerals and Waste Local Plan was adopted in 1996 and covers the period to 2006. A review of the plan is under way. Bedfordshire County Council consulted on a first stage deposit draft in early 2002.

Reviews of extant planning permissions for clay extraction sites in the northern sector of the Marston Vale are taking place under a process known as ROMP: Review of Mineral Permissions. Submissions to Bedfordshire County Council were invited by 31 January 2000: examination of the proposals and consultation is underway and is expected to be a lengthy process due to the number of sites involved and the complexity of the issues. Decisions are not expected for some time.

Some of the sites covered by the ROMP process have also been the subject of separate planning applications during 1999/2000. These include Elstow South and Rookery North and South. Decisions on these applications are not expected much earlier than those of the ROMP applications, due to the interconnected nature of the decisions.

#### **Forest Plan**

Whilst not a statutory document, the Forest Plan prepared by the Forest of Marston Vale set out a vision for the environment of the Vale and aspirations for conservation, environmental enhancement and recreation. The original Forest Plan was dated January 1995 and set objectives for 10 years to 2005. The plan was reviewed during 1999/2000 and a revised plan 'Forest Plan 2000' published in 2001.

#### **Local Environment Agency Plan (LEAP)**

Local Environment Agency Plans were prepared and published by the Environment Agency and were intended to be a tool for developing integrated management of the environment, taking a broader view of the environmental issues that fall under the umbrella of the Agency. The Bedford Ouse (Lower Reaches) LEAP was published in December 1999. It was intended to have a 'shelf-life' of 5 years but was to be reviewed annually in relation to progress towards objectives. The next comprehensive review was expected to take place in 2003/2004.

#### **Catchment Flood Management Plan (CFMP)**

From 2002 onwards the Environment Agency will be producing Catchment Flood Management Plans to a programme (yet to be defined) for the whole country. They will provide a strategic planning framework for the integrated management of flood risk by:

- encouraging the provision of adequate and cost effective flood warning systems
- encouraging the provision of adequate technically, environmentally and economically sound and sustainable flood defence measures
- discouraging inappropriate development in areas at risk from flooding

They will be:

- led by the Environment Agency
- involve other flood defence and land drainage operating authorities
- encourage wide consultation on future flood risk management

The areas to be covered by each plan have not yet been defined but will be between 1,000 km<sup>2</sup> and 5,000km<sup>2</sup>.

Draft guidelines indicate that the Catchment Flood Management Plans will "Develop procedures for informing and supporting the planning system. (by ) liaison and sharing of information ... in order to develop a coordinated approach to catchment flood management risk"

This project is in the early stages, with a number of pilot studies underway with preparation of the plans expected to follow over the next five years. Further comments on the relationship of the Surface Waters Plan to the proposed Catchment Flood Management Plans are given in Appendix J.

#### **Bedfordshire and Luton Biodiversity Action Plan (BAP)**

Around 160 Local Biodiversity Action Plans are in preparation or being implemented across Great Britain. Each Action Plan works on the basis of partnership to identify

local priorities and to determine the contribution they can make to the delivery of the national Species and Habitat Action Plan targets.

All of the member organisations represented on the Marston Vale Surface Waters Group are also partners involved in preparation of the Bedfordshire and Luton Biodiversity Action Plan. The Bedfordshire and Luton Biodiversity Action Plan was published in 2001 and set out a range of targets. Information gathering and implementation of individual actions is underway. Monitoring groups have been established for each habitat type and these groups will meet on an annual basis to review progress. It is expected that a full review of the Action Plan will take place in about five years time.



D4

## APPENDIX E

### Potential Development in the Forest of Marston Vale

#### Development in current Local Plan process

##### Housing and Employment

1. Potential development areas within the time frame of this Surface Waters Plan have been ascertained by reference to the deposited Local Plans of Bedford Borough Council and Mid Beds District Council and the Pre-Inquiry and Further Changes and Modifications listed in Appendix D above.
2. Housing and Employment allocations identified in these documents are shown on the Reference Plan in Appendix C. Schools and similar community facilities have not been shown separately on the Reference Plan but the adjacent housing allocations have been extended to encompass these sites. Similarly, land allocated for employment has been extended to include park and ride sites.
3. The allocations may change as a result of the Planning Inquiries processes and Planning Authority considerations. Furthermore, whilst there is a strong presumption in favour of development areas identified in adopted Local Plans, planning permissions for other sites may be sought and will have to be considered on their merits by the Planning Authorities.
4. Nevertheless the allocations shown on the Councils' submissions to the Planning Inquiries are the best indication of probable development available in the public domain at the time of preparation of this Surface Waters Plan. The allocations are listed in Tables 1 and 2 overleaf.
5. Some of the development areas listed in the tables overleaf are redevelopment of sites on which there are already buildings or hard pavings and for which surface water drainage arrangements may already exist. However most if not all of the sites will require some form of surface water runoff control to avoid increasing flood risk to properties downstream.
6. It is noted that the Elstow Storage Depot and Stewartby sites listed cross Local Authority boundaries and include allocations that fall within both Bedford Borough Council and Mid Bedfordshire District Council.

E1

**Table 1: Bedford Borough Local Plan Proposals**

Local Plan Ref.	Name	Type
H14	Land at and near Elstow Storage Depot	Housing
H9 *(see note below)	Shortstown	Housing
H13	Stewartby	Housing
H7	West of Kempston	Housing
H21	Wilstead	Housing
H12	Wootton	Housing
H11	Wootton	Housing
H23 (xi)**(see note below)	Wootton	Housing
E9	Former Coronation brickworks	Employment
E10	Former Elstow brickworks	Employment
H14	Land at and near Elstow Storage Depot	Employment
E5	Land east of B530	Employment
E3	Land west of Elstow Bypass	Employment
E4	Land west of B530	Employment
H7	Land west of Kempston	Employment
E7	Marsh Leys Farm	Employment
E2	South of Cambridge Road	Employment
E17/H13	Stewartby	Employment
E17/H21	Wilstead	Employment
E17/H11	Wootton	Employment

**Notes:** \* further housing and employment will be allocated through preparation of the revised development brief.  
 \*\* re-numbered from H23 (xiii) due to deletions.

**Table 2: Mid Bedfordshire Local Plan Proposals**

Local Plan Ref.	Name	Type
HO8(1)	Lidlington	Housing
HO8(2)	Stewartby	Housing
HO8(3)	Marston Moretaine	Housing
HO8(4)	Land at and near Elstow Storage Depot	Housing
EMP4(5)	Brogborough	Employment
EMP4(6)	Cranfield	Employment

- Some of the sites identified have been partially developed already, having been included in the current adopted Local Plans.
- By far the greatest element of the potential development arises from the housing allocation on one site: land at and near Elstow Storage Depot. The areas on the Reference Plan in Appendix C represent the long-term potential of the site, beyond the period to 2006 covered by the Local Plans. Bedford Borough Council has designated only a proportion of the site in its draft Local Plan (a first phase) because it considers that development of the whole site would extend beyond the period of the new Local Plan. However from the point of view of determining the potential impact on the Forest of Marston Vale and the catchment of the Elstow Brook, it is desirable that a long-term view is taken.
- Only about 1/3rd of the area of the housing allocation for West of Kempston (H7) drains towards the Elstow Brook catchment. The remaining 2/3rds drain to the River Great Ouse. The other sites that lie outside the catchment are employment allocations at Brogborough and Cranfield (EMP4(5) and EMP4(6) respectively). The employment site South of Cambridge Road (E2) lies just outside the Forest of Marston Vale but has been included because it drains into the catchment and is a significant site in terms of area.
- Potential development at Shortstown east of the A600 is to be reconsidered through preparation of a revised Development Brief. This will include both housing and employment. The area to be addressed by the Development Brief is shown on the Reference Plan in Appendix C.

**Landfill sites**

- Landfill sites are of interest to the Marston Vale Surface Waters Group because of the potential for a major increase in surface water run-off from clay or geomembrane covered fill (compared with the historic or pre-landfill condition of the site). There is also opportunity for restoration proposals to contribute to the Forest of Marston Vale.
- The significant landfill sites within the area of the Surface Waters Plan are Brogborough, L-Field and Elstow North (see Reference Plan in Appendix C: Map Refs. BG, LF and EN respectively). Landfill has now ceased at Elstow North but permanent restoration measures dealing with increased run-off remain to be finalised and implemented. All three sites are large enough to have an adverse impact on current drainage arrangements if appropriate measures to deal with run-off are not implemented.
- Restoration plans for Brogborough have already been agreed, with provision having been made in the proposals for surface water attenuation and landscape works.

14. It is likely on the basis of the present rate of filling that landfill operations at L-Field will cease in about 2004/2005. A restoration plan is in place but permanent measures for dealing with increased run-off from the clay cap remain to be finalised and implemented.

### Development further into the future

#### Longer term Housing and Employment

15. The South West of Bedford Strategic Corridor, identified by Bedfordshire County Council in the Structure Plan, lies within the Forest of Marston Vale. It is evident that it will continue to be an area of development pressure. In encouraging a strategic approach to provision of surface water facilities, the Marston Vale Surface Waters Group will have an eye to the future, including the potential for the creation of new facilities or the expansion or enhancement of those proposed for development currently envisaged.

#### Longer term Landfill sites

16. Extant Planning Permissions for Elstow South and Rookery South (Map Refs. ES and RS respectively) allow for the possibility of landfill. Both sites will require appropriate surface water run-off measures and landscape works in the long term if they are restored in this manner. Proposals for these sites are under review as part of the ROMP process and separate planning submissions described in Appendix D above.

#### Infrastructure

- E4**
17. Major infrastructure proposals that could have a significant impact on surface waters in the Marston Vale include:
- Milton Keynes to Bedford Waterway
  - Bedford Western Bypass
  - East-West Rail link

## APPENDIX F

### MINERALS AND WASTES SITES

Extraction of clay and subsequent restoration is currently covered by two planning permissions, the first covering the sites north of Rookery, the second covering the southern sites including Brogborough.

#### Northern Clay Extraction Sites

1. The northern sites are currently subject to review under the ROMP process described in Appendix D above, with owners and operators having put forward proposals for further development and restoration. Bedfordshire County Council was still considering these submissions at the time of preparation of the Surface Waters Plan. A review of the Minerals and Waste Local Plan is also underway, as noted in Appendix D. The comments made below should not be taken as prejudging the outcome of these processes. The potential of the sites will be reviewed by the Surface Waters Group in the light of planning decisions in due course.
2. Northern sites of interest in terms of their potential for strategic water facilities comprise:

- |                     |                           |
|---------------------|---------------------------|
| • Elstow South      | • Rookery North and South |
| • Kempston Hardwick | • Stewartby               |
| • Quest             | • Broadmead               |
| • Camel Field       | • Coronation              |

Comments on these are given below.

#### Elstow South (See Reference Plan in Appendix C: Map Ref. ES).

3. Elstow South comprises part flooded pits, positioned close to the existing County Council operated Elstow North landfill site.
4. One of the restoration options available to the owners under the extant planning permission involves retention of the water bodies. These are large pits with significant environmental interest and potential for flow balancing, although the water level at present is low and there is no connection with surrounding watercourses. Restoration of the pits as permanent water bodies could realise their flow balancing potential and serve other developments in the area.

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5. Elstow South also has potential for landfill and this is another of the options allowed under the extant planning permission. A nature conservation feature within an area identified for extraction for capping and engineering fill is shown in the current Minerals and Waste Local Plan. If the future of this facility was to be secured during the ROMP process (or through a separate planning application), the nature conservation feature could have potential for creation of a strategic surface water facility. Certainly some form of balancing facility would be required in due course to attenuate run-off from the clay or geomembrane cover and if the facility were large enough it could also serve other development.

#### **Kempston Hardwick (Map Ref. KH).**

6. The brick works at this site has been closed. However there are unworked reserves at the site and these could still be extracted in the future.
7. Policy MW35 of the 1996 Minerals and Waste Local Plan states that the County Council will seek to retain the pits at Kempston Hardwick as water areas for recreation, amenity and nature conservation use. The restoration plan for the site will require planning approval after which restoration could proceed relatively quickly.
8. The pits are large with a combined area approaching that of Stewartby Lake. They are also in an ideal location to enhance management of existing flood risk and mitigate increased risk from future development in the locality, bearing in mind the restriction to flood flows caused by the railway embankment that cuts across the flood plain to the east of the pits. The Kempston Hardwick pits therefore have considerable potential for creation of a strategic surface water facility, subject to a detailed technical evaluation that would include checking that an effective connection could be provided with the Elstow Brook drainage system.

#### **Quest (Map Ref. QU).**

9. Extraction at Quest is ongoing and appears likely to continue for another five years or so.
10. As with Kempston Hardwick, policy MW35 of the 1996 Minerals and Waste Local Plan states that the County Council will seek to retain the pit at Quest as a water feature. If this approach is maintained through the ROMP process, the water feature could be of interest to the Surface Waters Group, although the pit is not particularly well located for drainage or flood risk mitigation purposes in relation to development scenarios currently envisaged in the Vale. Nevertheless, the site would be of long-term interest if significant development beyond the scope of the present planning horizon were to arise in the locality.

#### **Camel Field and West of Houghton Conquest (Map Ref. CF).**

11. Camel Field is a potential extraction site for the future.
12. At this early stage, the County Council envisages that restoration would involve creation of a water feature (Policy MW35). West of Houghton Conquest represents a possible future extension of Camel Field. These sites would be of long-term interest to the Surface Waters Group if significant development beyond the scope of the present planning horizon were to arise in the locality.

#### **Rookery North and South (Map Refs. RN and RS).**

13. Rookery South is a worked out pit and is being promoted for landfill. If this succeeds the site will obviously lose any potential as a strategic surface water facility.
14. The County Council will seek to retain the pit at Rookery North as a water feature for recreation, amenity and nature conservation (Policy MW35). This may be of potential long-term interest to the Surface Waters Group, although it is located adjacent to Stewartby Lake which already serves a major control function as noted below. Nevertheless, a water feature at Rookery North could provide necessary balancing to attenuate run-off from the clay or geomembrane cover of Rookery South. Again, this site would also be of long-term interest to the Surface Waters Group if significant development beyond the scope of the present planning horizon were to arise in the locality.

#### **Stewartby Lake (and the Pillinge) (Map Ref. SL).**

15. Transfer of land encompassing both Stewartby Lake and the Pillinge to the Marston Vale Trust and the creation of the Marston Vale Millennium Country Park appears to have secured the lakes from future extraction or landfill. The original planning permission has lapsed as no proposals for the site were submitted to Bedfordshire County Council under the ROMP review process.
16. Stewartby Lake already serves as a major surface water attenuation facility and is of strategic importance to the Elstow Brook system. Under an agreement between the Marston Vale Trust, the Bedfordshire and River Ivel Internal Drainage Board and the previous owner of the site, operational responsibility for the outfall of Stewartby Lake has been transferred to the Board. A new control gate has been installed at the outfall to improve management of water levels in the lake.
17. Stewartby Lake is considered to fall within the definition of a large raised reservoir under the Reservoirs Act 1975 and one aspect of the intended transfer arrangement is that the Internal Drainage Board has taken over the role of Undertaker for the lake under the Act. It seems entirely appropriate for the Internal Drainage Board, a public body, to take on this responsibility. A similar

arrangement may be appropriate if, as appears possible, other large water bodies within the drainage system are found to be large raised reservoirs under the Act.

#### Broadmead (Map Ref. BR).

18. Broadmead is simply a clay reserve at the present time, with planning permission extant until May 2042. It may be of very long term interest to the Surface Waters Group. A recent application for a replacement brickworks on part of this site has been submitted.

#### Coronation (Map Ref. CP).

19. Coronation is currently being worked for cover and capping material for L-Field landfill site. It has no further reserves.
20. Current restoration plans involve a water feature (Policy MW35) and reed beds. The pit is large with a combined area also approaching that of Stewartby Lake and appears to have potential for creation of a strategic surface water facility to serve development in the locality.

#### Southern Clay Extraction Sites

21. The southern sites are essentially dormant at present and a scheme of conditions will have to be submitted and determined by the Planning Authority before operations can commence at any site. The southern sites comprise:

- Brogborough 1 (Brogborough Lake)
- Brogborough 2
- Thrupp End
- Lidlington Pit

22. Brogborough 2 is part landfill and part clay reserves. Along with Thrupp End and Lidlington Pit, the clay reserves present the long term possibility of pits being formed, but all these sites would be subject to future development submissions and planning procedures, before extraction could commence.

23. The only southern site that is of present interest in terms of its potential for strategic water facilities is Brogborough Lake.

#### Brogborough Lake (Map Ref. BL).

24. Brogborough Lake is sited towards the head of Elstow Brook catchment in an area of relatively low development pressure. Its potential to contribute to management of flood risk is consequently low, compared with other water bodies to the north east. Nevertheless, it has considerable potential to contribute to management of low flows and the broader objectives of the Forest.

#### Aggregates Sites

25. The only significant aggregates site is at Willington in the north east corner of the Marston Vale.

#### Land West of Willington (Map Ref. WW).

26. Land West of Willington is currently being worked for extraction of aggregates and this is expected to continue for some time to come.
27. Development pressure is relatively low in this area (as evident by inspection of the Reference Plan in Appendix C). However, post restoration the gravel workings have the potential to provide an infrastructure of water bodies and other habitats that would make an important contribution to meeting the objectives of the Forest and to recreational opportunities under consideration in this locality.





## APPENDIX G

### Potential for Strategic Water Facilities

1. Opportunities appear to exist for strategic facilities in the areas identified in Table 1 below and shown on the plan in Appendix C.

**Table 1: Potential Strategic Water Facilities.**

Map Ref.	Water Body:	Development Sites:
BL	Brogborough Lake	Lidlington housing (Map Ref. H08(1))
SL	Stewartby Lake	Marston Mortaine housing (Map Ref. H08(3))
CP	Coronation Pit	Stewartby housing and employment (Map Refs. H13 and E17/H13)
ES	Pits at Elstow South	Elstow Depot housing and employment (Map Refs. H14 and E10)
KH	Pits at Kempston Hardwick	Redevelopment of brickworks for employment and possibly West of Bedford developments (Bedford Western Bypass, Wootton, West of Kempston, Marsh Leys Farm and related highway improvements) and L-Field (Map Refs. H11, H12, E17/H11, H7, H7/E2, E7, and LF)
WK	Possible new water body or bodies.	Various developments at Wootton and south and west of Kempston (Alternative to KH above).
CR	Possible strategic watercourse improvements	Developments south of Cambridge Road

2. There are no large water bodies in close proximity to the development sites at Wootton, West of Kempston and Marsh Leys Farm. However this significant group of developments, which are linked to proposals for the Bedford Western Bypass and other highway improvements, lend themselves to a strategic approach involving diversion of flows to the Kempston Hardwick pits or creation of a new water facility as noted in the table above.
3. Other major development allocations are identified in the deposited Local Plans at Brogborough, Cranfield and potentially at Shortstown; and smaller but still significant allocations at Wilstead. There are no large water bodies at present in close proximity to these sites. In these cases, as for small developments, local solutions may be the only sensible option. In some cases this approach has already been taken as noted below.
4. Local flood balancing facilities have been identified as the only practical solution for Brogborough (Map Ref.EMP4(5)) despite its proximity to Brogborough Lake, as the natural direction of discharge is to Broughton Brook rather than northwards towards Elstow Brook. Balancing lakes have been constructed to serve some of the employment allocation at Cranfield (Map Ref.EMP4(6)).
5. Whilst the allocations at Wilstead (Map Refs. H21 and E17/H21), which have been granted planning permission subject to a Section 106 Agreement, are relatively small, the village has existing flood problems. Works carried out by the Drainage Board have gone some way to alleviating the flood risk but other areas are still vulnerable and it will be expensive to deal with these. A local approach to new development is therefore needed and this should, if possible, address the sites together rather than individually.
6. Strategic solutions should be promoted for other developments where appropriate and practical, rather than piecemeal balancing schemes based on individual development plots.

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## APPENDIX H

### Outline proposals of the Marston Vale Surface Waters Group Relating To Specific Developments And Water Bodies

**Note: Location references relate to those shown on the Reference Plan in Appendix C**

#### Stewartby Lake (Map Ref. SL).

- 1.1 The Surface Waters Group emphasises the importance of flow attenuation provided by Stewartby Lake within the Elstow Brook drainage system. It will endeavour to protect this strategic flood defence function in the long-term.
- 1.2 The Surface Waters Group supports the transfer of operational responsibility for the outfall from Stewartby Lake to the Internal Drainage Board and will seek the preparation and implementation of a management plan that has regard to the various interests in the operation of the lake.

#### Developments at Wootton and south and west of Kempston and L-Field (Map Refs. H11, H12, E17/H11, H7, E7 and LF).

- 1.3 The Surface Waters Group will seek to encourage implementation of a strategic solution for surface water drainage and flood protection for proposed developments at Wootton and south and west of Kempston; as opposed to piecemeal solutions for individual developments.
- 1.4 Some elements of a strategic scheme have already been implemented in the form of new surface water attenuation and flood storage areas at the Marsh Leys development site. The Surface Waters Group will seek to encourage the further development of this approach which could include a scheme to harness the potential of existing pits at Kempston Hardwick (Map Ref. KH). Any such scheme should endeavour to provide appropriate environmental gains and recreational opportunities.
- 1.5 The Surface Waters Group affirms the need for surface water attenuation measures for the restored L-Field landfill site and would support consideration of

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an option to incorporate such measures within the strategic scheme for the proposed developments West of Bedford.

#### **Elstow Depot (Map Ref. H14).**

- 1.6 The Surface Waters Group will seek to encourage implementation of a strategic solution for surface water drainage and flood protection for the proposed long-term re-development of Elstow Depot; as opposed to piecemeal solutions for individual development plots.
- 1.7 Such a strategic solution could take the form of new surface water attenuation and flood defence facilities as currently being promoted by the developer. The Surface Waters Group would also support a solution that harnesses the potential of the proposed nature facility at Elstow South (Map Ref. ES) but recognises that there are a number of reasons, not least the current undecided planning application for Elstow South, that reduce the prospects of this solution.

#### **Brogborough Lake (Map Ref. BL).**

- 1.8 The Surface Waters Group will seek the recognition and long-term retention of Brogborough Lake as a facility for water management in the Elstow Brook.
- 1.9 The Surface Waters Group will seek to encourage the implementation of appropriate organisation of hydrological and hydraulic management of Brogborough Lake, having regard to the various interests in the lake and its potential to assist with management of flood risk and periods of low flow.

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## **APPENDIX I**

### **Funding Issues And Mechanisms**

#### **Statement prepared by Bedfordshire and River Ivel Internal Drainage Board**

The funding mechanisms described in this Appendix relate primarily to the activities of the Bedfordshire and River Ivel Internal Drainage Board. The following elements of funding are considered:

- (1) Funding of the Marston Vale Surface Waters Group's activities
- (2) Funding of investigations for development proposals
- (3) Funding of new works
- (4) Funding of the long-term maintenance of the new and improved facilities provided for development.

#### **(1) Funding of the Marston Vale Surface Waters Group's activities**

As a significant part of the area under consideration by the Surface Waters Group is within the Bedfordshire and River Ivel Drainage Board's District, the Board has accepted responsibility for the provision of secretarial and civil engineering support and the associated costs. It should be noted that, as the principal issues are development proposals, the Board does not consider it appropriate to fund these activities from general rating of Agricultural Land or the Special Levies received from the various Local Authorities. Funding is instead sourced from development contributions raised by the Board towards the cost of provision and maintenance of strategic storm water solutions in the Elstow Brook catchment area.

The Board will regularly review this policy in consultation with the Surface Waters Group members and vary it as necessary.

#### **(2) Funding of investigations for development proposals**

Where it is considered that development proposals may have an impact on watercourses, flood plains and water bodies within the Drainage District, the Board requires developers to carry out detailed investigations in order that appropriate storm water management facilities can be provided. This is in line with the requirements of

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PPG25. In some circumstances, mainly in areas remote from the Drainage District, the Environment Agency also requires these investigations to be undertaken by developers. Occasionally it is appropriate to expand the scope of particular studies rather than allow piecemeal solutions. In these instances the Board will make a financial contribution in order to cover the cost of the wider investigation. In addition, developers are encouraged to liaise and share information where it appears to the Board that they may be able to jointly provide financially viable solutions for storm water problems, particularly for solutions that are of a scale that will result in significant conservation and amenity benefit.

There will be circumstances when it will be desirable for investigations into strategic solutions for large potential development areas to be funded by any one, or combination of, the Planning Authority, the Environment Agency, Anglian Water plc and the Internal Drainage Board. It must be remembered that the provision of large-scale flood control facilities can be as important as the provision of highways and other critical infrastructure.

### **(3) Funding of New Works**

Presently, the Internal Drainage Board is prepared to enter into legal agreements with developers whereby the Board either provides and maintains new works or agrees to maintain works provided by the developer.

Payments to the Board are either based on recovery of actual costs of the works or in instances when this is not practical the developer's contribution is based on the impervious area of the development site. In the latter instance the rate per impervious square metre was calculated several years ago by independent consultants who compared the cost of provision of on-site storm balancing facilities to the Board's costs of provision of on-line attenuation. The Board reviews this charge annually and adjusts the rate as considered appropriate (as of January 2001 a rate of £2.70 per impervious square metre is applied to developments where the Board accepts responsibility for storm water attenuation facilities).

The Surface Waters Group considers that there is a need to evaluate the Drainage Board's system with a view to extending it throughout the project area, albeit that the Planning Authority rather than the Board may place the charge on the developer. It is considered that a move to charges by the Planning Authority will be particularly helpful for those development areas outside the Board's Drainage District where the Board's powers are limited.

Wherever possible developers should be encouraged to provide storm water management facilities as part of their infrastructure, which will be agreed within the Town and Country Planning process. Should the Board, or any other agency, provide the facilities, delays may occur as a result of the works having to go through the Environmental Evaluation process required for all new drainage works not covered by planning permission.

The Surface Waters Group has also considered the possibility of recommending some form of impervious area tax to be applied to all development sites. This would overcome the difficulties associated with small development areas, that is single properties, in-fill etc, whereby individually it is difficult to supply practical working solutions for storm water control, yet a number of such developments will jointly cause the same problems as larger developments with the same impervious area.

### **(4) Funding of the long-term maintenance of the new and improved facilities provided for development.**

The Internal Drainage Board believes it is appropriate that where new works are provided to service new development, and the new development is outside the Drainage District, that a commuted sum should be paid towards the upkeep of the works.

Where development takes place within a Drainage District the Board is able to raise annual finance through its rating and special levy system in order to provide the level of service required. Obviously, it would be unfair to the ratepayers' etc, within the Drainage District if they had to fund the maintenance costs of works provided for development outside their area. Agreements for such commuted sums are unique to each individual development, as they will need to reflect the true costs involved. Schemes can vary from minor widening of existing watercourses, which will have minimal additional maintenance costs, to provision of large storage areas with complex structures for water management.

Presently, there is not a satisfactory system in place whereby adequate funding can be provided in order for authorities to assume responsibility for storm water facilities outside the Drainage District. It may be appropriate, in order to ensure the most efficient management of storm water control facilities throughout a catchment, that agreement be sought for the Internal Drainage Board to manage all such facilities within the catchment. There will have to be a political willingness on behalf of all parties for this to be achieved.

### **SUMMARY**

Existing systems of funding centre on the arrangements made by the Internal Drainage Board. The Board's funding policy is that the developer should pay and that any additional costs should not become a financial burden on individual rate and Special Levy payers. Concern has been expressed that any additional development tax might jeopardise inward investment. However, priority must be given to providing a safe environment in which flood risk is minimised both for new and existing development areas. Government is undertaking a review of flood and coastal defence funding and the Surface Waters Group has made representations on these matters.

## APPENDIX J

### Planning Policy Guidance Note 25: Development and Flood Risk and Catchment Flood Management Plans

#### Planning Policy Guidance Note 25: Development and Flood Risk

Planning Policy Guidance Notes contain Central Government guidance to Planning Authorities.

Planning Policy Guidance Note 25: Development and Flood Risk (PPG25) was published in July 2001 and "explains how flood risk should be considered at all stages of the planning and development process in order to reduce future damage to property and loss of life. It sets out the importance that Government attaches to the management and reduction of flood risk in the land-use planning process, to acting on a precautionary basis and to taking account of climate change" (Foreword to PPG25)

PPG25 presents a number of concepts that planning and drainage authorities and developers have to consider as part of the planning process. These include, inter alia:

- Catchment wide consideration of flood risk: where necessary, across administrative boundaries
- A sequential test for flood risk when considering allocation of sites for development, based on flood risk assessments
- Consideration of the potential impact of climate change on flood risk, based on the precautionary principle
- Implementation of SuDS (Sustainable Drainage Systems) to deal with surface water run-off from developments
- The potential for development to contribute to a reduction of existing flood risk through development
- Consideration of environmental impacts

The guidance notes that "The complex range of issues involved requires a concerted effort to co-ordinate the activities of local authorities across their boundaries and with other agencies and to integrate policies in the various non-statutory plans that operate within coastal and flood-prone areas" (Section 7 of PPG25).



## COMMENT

1. The Surface Waters Group was established in 1997 in recognition of the complexity of surface water drainage and flood risk matters and the need for the Planning and Drainage Authorities, and the Forest of Marston Vale with its wider environmental interests, to make a concerted effort to work together. The approach has been largely catchment based, crossing the administrative boundaries of the District and Borough Councils. As such the formation of the Surface Waters Group was ahead of its time.
2. The Surface Waters Plan and supplementary information available from the Surface Waters Group members, including data on flood risk held by the Environment Agency and the Bedfordshire and River Ivel Internal Drainage Board, provide a basis for flood risk assessments. The Internal Drainage Board intends to undertake further flood risk modelling to investigate the potential impacts of climate change during 2002/2003.
3. The strategic solutions for surface water discharge that the Surface Waters Group seeks to promote through the Surface Waters Plan fall within the definition of 'regional control' in the hierarchy of Sustainable Drainage Systems (SuDS). In general, the SuDS approach seeks to encourage local forms of control, such as soakaways, in preference to regional controls. However, the soils of most of the Marston Vale, particularly to the south and west of Bedford, are clayey and unsuitable for infiltration devices. The Surface Waters Group also has other concerns about the suitability of these drainage solutions, for example in relation to long term maintenance.
4. However, the regional control approach advocated in the Surface Waters Plan does not prevent the implementation of some local elements of SuDS systems within developments. Indeed, the Surface Waters Group would generally support the use of swales and reed beds upstream of regional controls to improve the water quality of discharges.
5. Regional controls provide the most promising opportunity for achieving meaningful reductions in existing flood risk.
6. Developers and landowners should refer to PPG25 for a full appreciation of the planning guidance so that they can address the issues covered by the guidance in their development proposals.

## Environment Agency Catchment Flood Management Plans

As described in Appendix D, the Environment Agency has embarked on a new initiative involving river catchment studies and preparation of Catchment Flood Management Plans, the purpose of which will be to provide a large scale framework for integrated management of flood risks, as advocated in PPG25 (Section 48).

The plans will be catchment-based but global in nature with just two plans covering the whole of the River Great Ouse. As a second level of planning below the Catchment Flood Management Plans, the Environment Agency envisages the preparation of sub-catchment strategy plans. Whilst the Agency's project is in the early stages, it would appear that the Catchment Flood Management Plans will provide a useful framework for more detailed studies such as the Marston Vale Surface Waters Plan. In turn, the Surface Waters Plan will helpfully inform work on the Catchment Flood Management Plan over the next few years.

The Surface Waters Group will consider the development and findings of the River Great Ouse Catchment Flood Management Plans in due course, particularly when reviewing the Surface Waters Plan.



## APPENDIX K

### Data and models for assessment of flood risk in the Forest of Marston Vale

There are two principal sources of data on fluvial flood risk, including the extent of the flood plain and flood levels, in the Forest of Marston Vale. These are the Environment Agency indicative flood plain maps, available on the Agency's web site [www.environment-agency.gov.uk](http://www.environment-agency.gov.uk), and the results of river modelling undertaken by the Bedfordshire and River Ivel Internal Drainage Board, available from the Board's offices.

The Internal Drainage Board has undertaken hydrological and hydraulic modelling of Elstow Brook from its confluence with the River Great Ouse to Stewartby Lake for the 1% (1 in 100 year flood). The results of the modelling are available in the form of maps showing the estimated extent of the flood plain and tabulation of estimated flood water levels. Some tributaries of the Elstow Brook have also been included in the model. The hydraulic model is based on HEC-RAS software and is a dynamic river model.

The downstream reach of Elstow Brook is influenced by conditions in the River Great Ouse. Information on flood levels in this main river is available from the Environment Agency's offices.

One of the main tributaries of Elstow Brook, Internal Drainage Board maintained watercourse 3(1), passes through the proposed new settlement at Elstow Depot. This watercourse has been modelled by the consultants for the developer using HEC-RAS software and the output from this model is also available from the Internal Drainage Board.

It is the intention of the Internal Drainage Board to undertake additional flood modelling to provide data on more extreme floods, such as the 0.5% (1 in 200year) flood and the potential impacts of climate change. In addition the model can be used to assess the impacts of development and flood management improvement schemes. The model may also be extended to include some of the more significant tributaries of the Elstow Brook.

Additional information on historic flood incidents is also available for some locations from the Environment Agency and the Internal Drainage Board.



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