

Cambridgeshire County Council

Cambridgeshire Surface Water Management Plan

Strategic Assessment Report

Final



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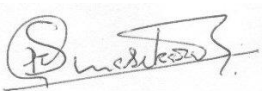



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Final

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Glossary	
ArcView	Software package used for spatial mapping and analysis of data
Annual Exceedance Probability	Annual chance of an event (rain storm) of a given magnitude occurring in any given year e.g. 1% AEP has a 1 in 100 annual chance of occurring in any given year.
Area Action Plan	An optional Development Plan Document forming part of a Local Development Framework. It is aimed at establishing a set of proposals and policies for the development of a specific area, such as an urban extension.
Aquifer	Layer of water-bearing permeable rock, sand, or gravel which is capable of providing significant amounts of water.
Awarded Watercourse	Ordinary watercourses that have been awarded to the respective Local Authority by the Enclosure Acts, such that the Local Authority is responsible for the maintenance of the public drain or watercourse.
Catchment Flood Management Plan	Strategic planning tool through which the Environment Agency works with other key decision-makers within a river catchment to identify and agree policies for sustainable flood risk management.
Combined Sewer Overflow	Discharge, during rain storms, of untreated wastewater from a combined sewerage system; diluted sewage is forced to overflow into streams and rivers through CSO outfalls.
Combined Sewer System	Sewer system that carries both sewage and storm water
Community Strategy	Overarching documents, which promote a long term vision for improving the economic, environmental and social wellbeing of an area.
Critical Drainage Area	Defined in the Town and Country Planning act as an area within Flood Zone 1 which has critical drainage problems and which has been notified... [to]...the local planning authority by the Environment Agency
Defacto Defences	Non flood defence infrastructure that can act as flood defence infrastructure e.g. road/rail embankments
DG5 Register	Register of sewer flooding maintained by a sewerage undertaker
Exception Test	When a development type is not compatible with flood risk in a particular location, the exception test may be applied if there are valid reasons as to why the development should proceed.
Flood and Water Management Act (2010)	Act which aims to improve both flood risk management and the way in which water resources are managed by creating clearer roles and responsibilities and instilling a more risk based approach. It transposes the EC Floods Directive (Directive 2007/60/EC on the assessment and management of flood risks) into domestic law and to implement its requirements. It places duties on the Environment Agency and local authorities to prepare flood risk assessments, flood risk maps and flood risk management plans.
Flood Risk Management	Use of a wide range of techniques including hard engineering, development management and education to manage flood risk
Flood Risk Regulations 2009	The Flood Risk Regulations transpose the EU Floods Directive 2007/60/EC into UK law and were introduced on 10 December 2009. It places duties on the Environment Agency and Lead Local Flood Authorities to prepare preliminary flood risk assessments, flood risk maps and flood risk management plans.

Flood Zones	These are a national data set held by the Environment Agency and show the predicted probability of flooding for any given area. They were created following Defra's Making Space for Water pilot study. This was a Government programme that sought to take forward the developing strategy for flood and coastal erosion risk management in England.
Flood Zone 1	Low probability of flooding: Land assessed as having a less than 1-in-1000 year annual probability of river or sea flooding in any given year, as defined fully in PPS25 table D1.
Flood Zone 2	Medium probability of flooding: Land assessed as having between a 1-in-100 and 1-in-1000 year annual probability of river flooding or between a 1-in-200 year and 1-in-1000 year annual probability of sea flooding in any given year, as defined fully in PPS25 table D1.
Flood Zone 3a	High probability of flooding: Land assessed as having a 1-in-100 year or greater annual average probability of river flooding or greater than 1-in-200 year annual average probability of sea flooding, as defined fully in PPS25 table D1.
Flood Zone 3b (Functional Flood Zone)	Land where water has to flow or be stored in times of flood. Local planning authorities have identified areas of functional floodplain, in agreement with the Environment Agency. The identification of functional floodplain takes account of local circumstances and is not defined solely on rigid probability parameters, but land which would flood with an annual probability of 1 in 20 (5%) or greater in any year, or is designed to flood in an extreme (0.1%) flood, provides a starting point to identify the functional floodplain, as defined fully in PPS25 table D1.
Green Roofs	Vegetated roofs, or roofs with vegetated spaces having a wide range of environmental, social and economic benefits.
Greywater	Wastewater generated from domestic activities such as dish washing, laundry and bathing
Habitat Regulations Assessment	Assessment of whether a particular plan or strategy will impact on a European Site. A European Site is any classified SPA, SAC, potential SPA, candidate SAC or listed Ramsar Site.
InfoWorks Model	Computer software used to simulate flow through the sewer system in order to identify and solve issues
Integrated Urban Drainage	Philosophy which considers all aspects of urban drainage (surface water, foul water, fluvial flows) in conjunction with one another in order to improve surface water management.
Internal Drainage Boards	Drainage districts have been established in the most drainage sensitive parts of the country; low lying areas constantly at risk from flooding. Drainage boards are responsible for the improvement and maintenance of rivers, drainage channels and pumping stations, as well as consenting, providing planning advice, advising on SuDS adoption, and emergency response within their Districts.
Lead Local Flood Authority	Lead Local Flood Authorities are unitary authorities or county councils, and were created as part of the Flood and Water Management Act. They are responsible for leading the co-ordination of flood risk management in their areas, but can delegate flood or coastal erosion functions to another risk management authority by agreement.

Local Area Agreements	Local Area Agreements set out the priorities for a local area agreed between central government and a local area (the local authority and Local Strategic Partnership) and other key partners at the local level. LAAs simplify some central funding, help join up public services more effectively and allow greater flexibility for local solutions to local circumstances.
Local Development Framework	A portfolio of Local Development Documents which provides the framework for delivering the spatial planning strategy for the area.
Local development scheme	Plan detailing how all parts of the local development framework will come together; listing the documents to be produced and the timetable for producing them. A local development scheme must be approved by the secretary of state.
Local Plan	Sets out detailed policies and specific proposals for the development and use of land in a district and guides most day-to-day planning decisions. Local development frameworks will gradually replace local plans over the coming years.
Main River	Main Rivers are usually larger streams and rivers, but also include smaller watercourses of strategic drainage importance. A main river is defined as a watercourse shown as such on a main river map, and can include any structure or appliance for controlling or regulating the flow of water in, into or out of a main river. The Environment Agency's powers to carry out flood defence works apply to main rivers only. Main rivers are designated by the Department of Environment, Food and Rural affairs.
Making Space for Water	Government strategy for flood and coastal erosion risk management in England
MapInfo	Software for spatial mapping and data analysis
National Flood and Coastal Defence Database	Definitive database for all data on flood and coastal defence assets held by the EA in England and Wales. Use in analysis and decision making on defence investments to help the Government prioritise expenditure for high-risk areas. Generally, the database contains mostly EA assets, although there are moves to create a definitive single dataset to incorporate the assets of responsible organisations as required as part of the Flood and Water Management Act 2010.
Ordinary Watercourses	Ordinary watercourses are all rivers, streams, ditches and drains that have not been designated as main rivers. The main responsibility for all watercourses lies with the riparian owners; however the local authorities and internal drainage boards do have permissive powers to carry out Land Drainage schemes on ordinary watercourses.
Pitt Review	Report into the summer 2007 flooding. The report examines both how to reduce the risk and impact of floods, and the emergency response to the floods in June and July 2007. The report made 92 recommendations to be addressed by Government.
Planning Policy Statement 25	Sets out Government policy on development and flood risk to ensure that flood risk is taken into account at all stages in the planning process, to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas of highest risk.
Preliminary Flood Risk Assessment	Requirement under the EU Floods Directive / Flood Risk Regulations. The LLFA must complete a preliminary assessment report on past and future flood risk, and identify significant flood risk areas using national datasets.
Ramsar Site	Wetlands of international importance designated under the Ramsar Convention (Convention on Wetlands of International Importance especially as Waterfowl Habitat) of 1971

Regional Flood and Coastal Committee (RFCC)	RFCC's have replaced Regional Flood Defence Committees following the Flood and Water Management Act. They consult with the EA to help develop flood risk management solutions, as well as providing advice on community engagement, coastal erosion, incident management and emergency planning within their regions. They also have responsibility for raising local levies and providing an accountable forum for testing new ideas and ways of working.
River Basin Management Plan	Outline the management of the water environment, provide a framework for more detailed decision making and provide a summary of the programmes of measures required for the River Basin District to achieve Water Framework Directive objectives.
Section 106 Agreement	Section 106 of the Town and Country Planning Act 1990 allows a local planning authority to enter into a legally binding agreement or planning obligation with a landowner in association with the granting of planning permission. These agreements are a way of delivering or addressing matters that are necessary to make a development acceptable in planning terms.
Separate Sewer System	Sewer system where surface water (rainfall) is kept separate from foul flows
Sequential Test	A planning principle that seeks to identify, allocate or develop land in low flood risk zones before land in high flood risk zones.
Source Protection Zone	Zones defined by the EA for 2000 groundwater sources (wells, boreholes and springs used for public drinking water supply) showing the risk of contamination from any activities that might cause pollution in the area.
Stakeholders	Individuals and organizations that are actively involved in a project, or whose interests may be affected as a result of the project's execution
Strategic Flood Risk Assessment	An approach to assessing flood risk which enables Local Planning Authorities to apply the Sequential Test to land allocations
Surface Water Management Plan	Framework through which key local partners with responsibility for surface water and drainage in their area work together to understand the causes of surface water flooding and agree the most cost effective way of managing surface water flood risk
Sustainability Appraisal	Assessment of the environmental, social and economic effects of a plan and appraisal in relation to the aims of sustainable development.
Sustainable Development	Development which meets the needs of the present generation without compromising the ability of future generations to meet their own needs.
Sustainable Drainage Systems	An approach to managing rainwater falling on roofs and other surfaces through a sequence of actions and measures, that manages the flow rate and volume or surface runoff to reduce the risk of flooding and protect and improve water quality.
UK Climate Impacts Programme	UKCIP publishes climate change scenarios on behalf of the Government showing how the UK's climate might change in this century. The UKCIP02 climate change scenarios are widely used in research into the impacts of climate change
Unitary Authority	A single tier local authority responsible for all local government functions within its area.
Urban Extension	Planned expansion of a city or town
Water Cycle	The continuous movement of water on, above, and below the surface of the Earth. The urban water cycle is the movement of water through the urban environment, through pipes, rivers
Water Cycle Strategy	Plan for new development in a holistic manner to ensure the sustainable and timely provision of necessary water services infrastructure

Water Framework Directive	EC water legislation designed to improve and integrate the way water bodies are managed throughout Europe It came into force on 22 December 2000. Member States must aim to reach good chemical and ecological status in inland and coastal waters by 2015.
Zero Carbon Development	A development that achieves zero net carbon emissions from energy use on site, on an annual basis.

Abbreviations	
AA	Appropriate Assessment
AAP	Area Action Plan
ABI	Association of British Insurers
AEP	Annual Exceedance Probability
AWS	Anglian Water Services Ltd
CCC	Cambridgeshire County Council
CDA	Critical Drainage Area
CFMP	Catchment Flood Management Plan
CFRMP	Cambridgeshire Flood Risk Management Partnership
CIRIA	Construction Industry Research and Information Association
CLG	Communities and Local Government
CSO	Combined Sewer Overflow
CWS	County Wildlife Site
DAP	Drainage Area Plan
DEFRA	Department for Environment, Food and Rural Affairs
DPD	Development Plan Document
EA	Environment Agency
EVY	Edenvale Young Associates Ltd
FRA	Flood Risk Assessment
FRM	Flood Risk Management
FRR	Flood Risk Regulations
GIS	Geographical Information Systems
HCL	Hyder Consulting (UK) Limited
HRA	Habitat Regulations Assessment
IDB	Internal Drainage Board
IUD	Integrated Urban Drainage
LDD	Local Development Documents
LDF	Local Development Framework
LPA	Local Planning Authority
NE	Natural England
NFCDD	National Flood Coastal Defence Database
NNP	Natural Networks Partnership
NNR	National Nature Reserve
PE	Population Equivalent
PPS25	Planning Policy Statement 25: Development and Flood Risk

RBD	River Basin District
RBMP	River Basin Management Plan
SAC	Special Area of Conservation
SFRA	Strategic Flood Risk Assessment
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
SPG	Supplementary Planning Guidance
SPS	Sewage Pumping Station
SPZ	Source Protection Zone
SuDS	Sustainable Drainage Systems
SWMP	Surface Water Management Plan
UKCIP	UK Climate Impacts Programme
WCS	Water Cycle Strategy
WFD	Water Framework Directive
WTW	Water Treatment Works
WwTW	Wastewater Treatment Works

1 Introduction

1.1 Terms of Reference

Hyder Consulting (UK) Limited (HCL) was appointed by Cambridgeshire County Council (CCC) to produce a Surface Water Management Plan (SWMP). This report forms the outputs from strategic stages of the study as described in Sections 1.2 and 2.1.

This Countywide SWMP does not report on the study area of Cambridge or Milton, as this area is the subject of a separate, more detailed report following the area's identification by Defra as a priority Early Action Settlement.

The Cambridge and Milton Detailed Assessment Report (5014-UA002163-BMR) will be completed in March 2011. The remaining wetspots identified in the study will be prioritised alongside other wetspots identified in the Cambridgeshire SWMP and addressed within this programme.

As part of the same commission, a Preliminary Flood Risk Assessment (PFRA) has been produced on behalf of CCC to satisfy the requirements of Flood Risk Regulations 2009.

1.2 Surface Water Management Plans

The wide scale flooding experienced during 2007 precipitated the publication of the Pitt Review¹ which contained a large number of recommendations for Government to consider. The key recommendation in the Pitt Review with respect to surface water management is Recommendation 18, reproduced below, which in turn refers to Planning Policy Statement 25 Development and Flood Risk (PPS25)².

Recommendation 18: "Local Surface Water Management Plans, as set out in PPS25, and coordinated by Local Authorities, should provide the basis for managing all Flood Risk"

Surface Water Management Plans (SWMPs) are referred to in Planning Policy Statement 25 (PPS25) as a tool to manage surface water flood risk on a local basis by improving and optimising coordination between relevant stakeholders. SWMPs will build on Strategic Flood Risk Assessments (SFRAs) and provide the vehicle for local organisations to develop a shared understanding of local flood risk, including setting out priorities for action, maintenance needs and links into local development frameworks and emergency plans.

Defra guidance on the production of SWMPs was published in March 2010³ informed by the Integrated Urban Drainage (IUD) Pilot Studies carried out under the Government's Making Space for Water (MSfW)⁴ strategy, between 2007 and 2009.

A SWMP outlines the preferred strategy for the management of surface water in a given location and the associated study is carried out in consultation with local partners having responsibility for surface water management and drainage in that area. The goal of a SWMP is to establish a long term action plan and to influence future strategy development for maintenance, investment, planning and engagement.

The stages for undertaking a SWMP is illustrated using a wheel diagram, reproduced from the Defra Guidance³ as shown in Figure 1-1.

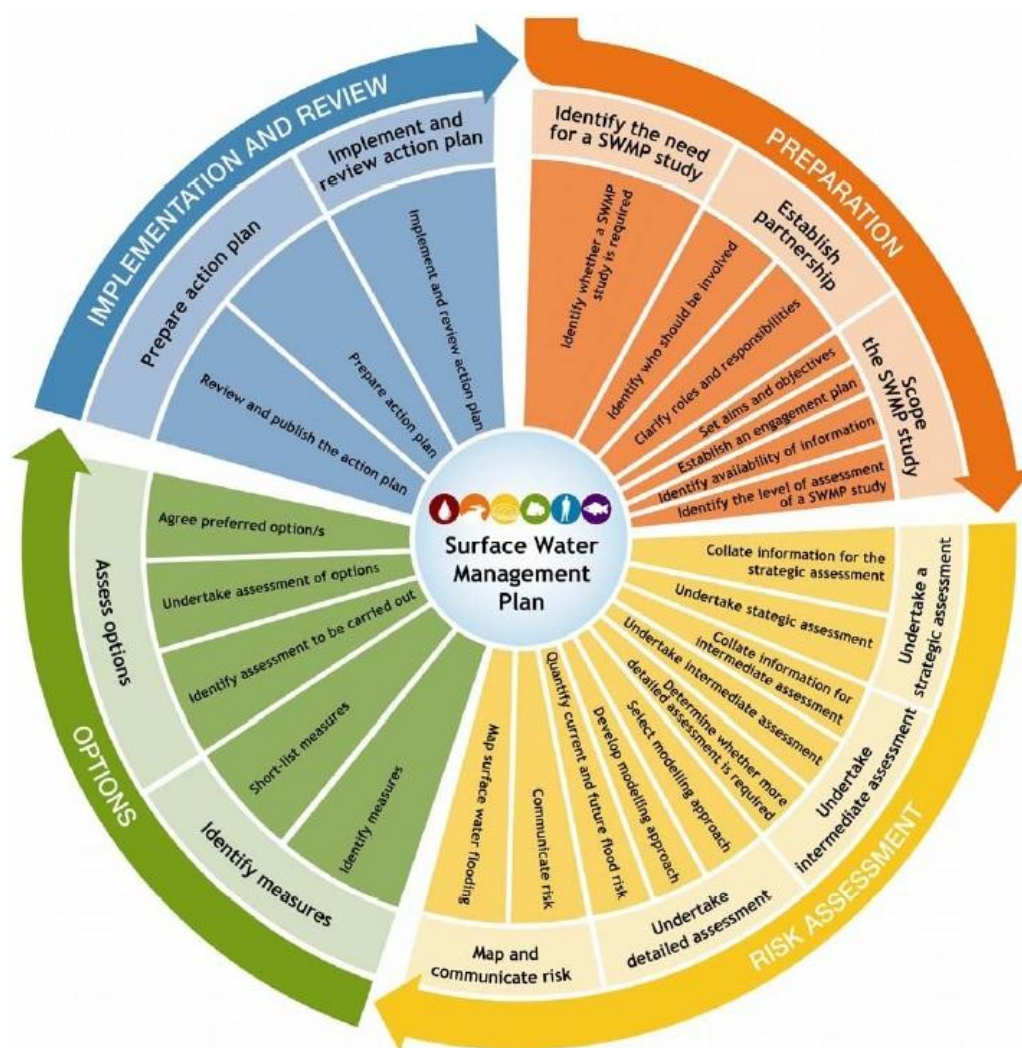


Figure 1-1 SWMP Wheel (source Defra Guidance³)

The SWMP process is formed of four principal phases;

- Preparation;
- risk assessment;
- options; and
- implementation and review.

This report contains the findings from the preparation stage and the strategic risk assessment phase for the entire county and a report (5014-UA002163-BMR) provides the findings from the detailed assessment and options phases for the Cambridge and Milton study area. An image of the SWMP wheel at start of each chapter summarise the elements of the guidance addressed within the subsequent text.

1.3 Surface Water Flooding

In the context of SWMPs, the technical guidance³ defines surface water flooding as:

- Surface water runoff; runoff as a result of high intensity rainfall when water is ponding or flowing over the ground surface before it enters the underground drainage network or watercourse, or cannot enter it because the network is full to capacity, thus causing flooding (known as pluvial flooding);
- Flooding from groundwater where groundwater is defined as all water which is below the surface of the ground and in direct contact with the ground or subsoil;
- Sewer flooding; flooding which occurs when the capacity of underground systems is exceeded due to heavy rainfall, resulting in flooding inside and outside of buildings. Note that the normal discharge of sewers and drains through outfalls may be impeded by high water levels in receiving waters as a result of wet weather or tidal conditions;
- Flooding from any watercourse not designated a “Main River”, including culverted watercourses which receive most of their flow from inside an urban area and perform an urban drainage function;
- Overland flows from the urban/rural fringe entering the built-up area; and
- Overland flows resulting from groundwater sources.

This report aims to consider surface water flooding issues in Cambridgeshire as above but it does not address sewer flooding where it is occurring as a result of operational issues, i.e. blockages and equipment failure. It should also be noted that the compilation of all historical flooding within the county area does include some flooding due to main rivers, although further investigation of these occurrences is outside the remit of this report.

Information on Main River Flooding is covered under other strategic planning documents such as Strategic Flood Risk Assessments, produced by district councils.

1.4 Policy Framework

1.4.1 Flood Risk Regulations 2009

The Flood Risk Regulations (FRR) 2009 transpose the European Floods Directive 2007/60/EC into English and Welsh law and bring together key partners to manage flood risk from all sources and in doing so reduced the consequences of flooding on key receptors. Local authorities are assigned responsibility for management of surface water flooding.

As part of the ongoing cycle of assessments, mapping and planning, the FRR requires the undertaking of a PFRA. National guidance was published by the Environment Agency (EA) in December 2010⁵. The requirements of the FRR have also been used to shape this report and to inform the content of the Council’s PFRA report to the Government produced by HCL. Where links between the SWMP and the requirements for a PFRA can be made, these are highlighted in the text boxes at the beginning of the relevant report section for ease of transfer in the future. However, this report does not form a PFRA report in its own right.

1.4.2 Flood and Water Management Act 2010

The Flood and Water Management Act places the responsibility for managing the risk of local floods on the Upper Tier or unitary authorities, as their role as Lead Local Flood Authorities (LLFAs), but allows for the delegation of flood risk management functions to other statutory authorities. The Act also seeks to encourage the uptake of Sustainable Drainage Systems (SuDS) by agreeing new approaches to the management of drainage systems and allowing, where delegated, for district councils and Internal Drainage Boards (IDBs) to adopt SuDS for new developments and redevelopments.

1.4.3 Planning Policy Statement 25

Planning Policy Statement 25 (PPS25) requires that new development should not increase flood risk, and requires developers to design, build and fund the maintenance of SuDS; a SWMP will support this by informing the Local Planning Authority (LPA) of areas at risk of surface water flooding 'and by providing an evidence base to aid the consideration of future development options.

1.5 Sustainable Drainage Systems (SuDS)

Sustainable drainage systems are used to manage rainfall run-off from impermeable surfaces. SuDS encompass a range of techniques which aim to mimic the natural processes of runoff and infiltration as closely as possible. These techniques can include green roofs, ponds, permeable paving and soakaways. Any SuDS scheme should integrate with existing drainage systems and be easily maintainable.

SuDS schemes should be based on a hierarchy of methods termed the 'SuDS treatment train' as illustrated in Figure 1-2.

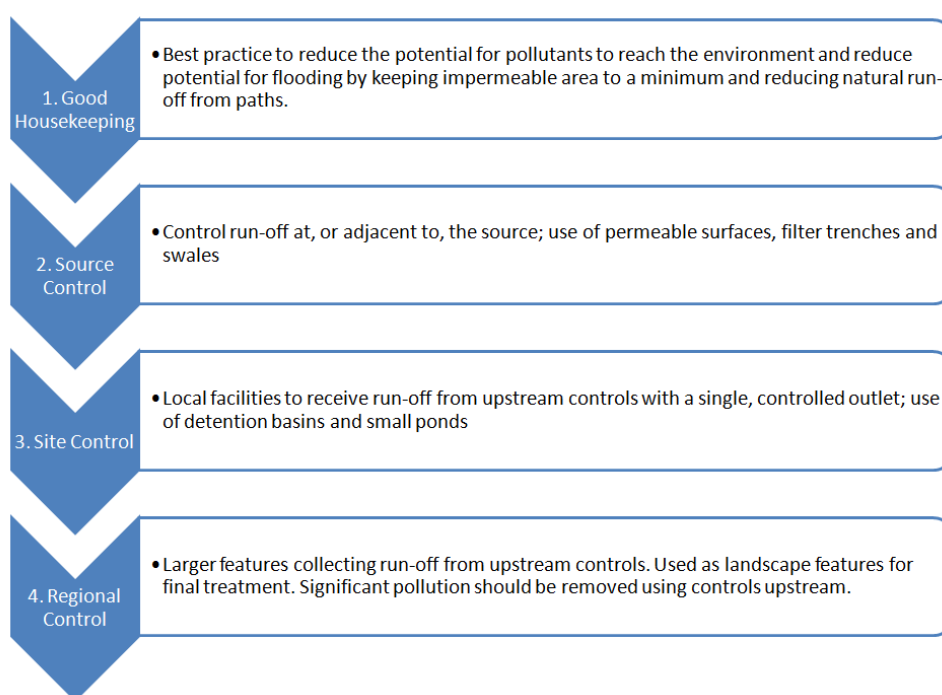


Figure 1-2 SuDS Treatment Train

Guidance recommends that the management of surface water runoff should use a combination of site specific and strategic SuDS measures, encouraging source control where possible to reduce flood risk and improve water quality. Table 1-1 describes some of the SuDS techniques that will be considered in the development of Cambridgeshire SWMP.

Type	Description
Balancing Pond	A pond designed to attenuate flows by storing runoff during the peak flow and releasing it at a controlled rate during and after the peak flow has passed. The pond always contains water. Also known as wet detention pond.
Brown Roof	A roof covered with a locally sourced material, its main aim is to partly mitigate any loss of habitat when new developments are constructed.
Detention Basin	A vegetated depression, normally dry except after storm events constructed to store water temporarily to attenuate flows. May allow infiltration of water to the ground
Filter Strip	A vegetated area of gently sloping ground designed to drain water evenly off impermeable areas and filter out silt and other particulates.
Green Roof	A roof with plants growing on its surface, which contributes to local biodiversity. The vegetated surface provides a degree of retention, attenuation and treatment of rainwater, and promotes evapo-transpiration. Sometimes referred to as a “living” roof.
Infiltration Basin	A dry basin designed to promote infiltration of surface water to the ground.
Road Side Rain Gardens	Where space allows, these can be constructed alongside roads to allow run-off from roads or pavements to filter slowly through the root system of plants, rather than entering underground drainage systems.
Permeable Surface	A surface formed of material that is itself impervious to water but, by virtue of voids formed through the surface, allows infiltration of water to the sub-base through the pattern of voids, e.g. concrete block paving.
Rainwater Harvesting	A system that collects rainwater from where it falls rather than allowing it to drain away. It includes water that is collected within the boundaries of a property, from roofs and surrounding surfaces. The harvested water is then re-used in applications where potable water is not essential.
Swale	A shallow vegetated channel designed to conduct and retain water, but may also permit infiltration; the vegetation filters particulate matter.

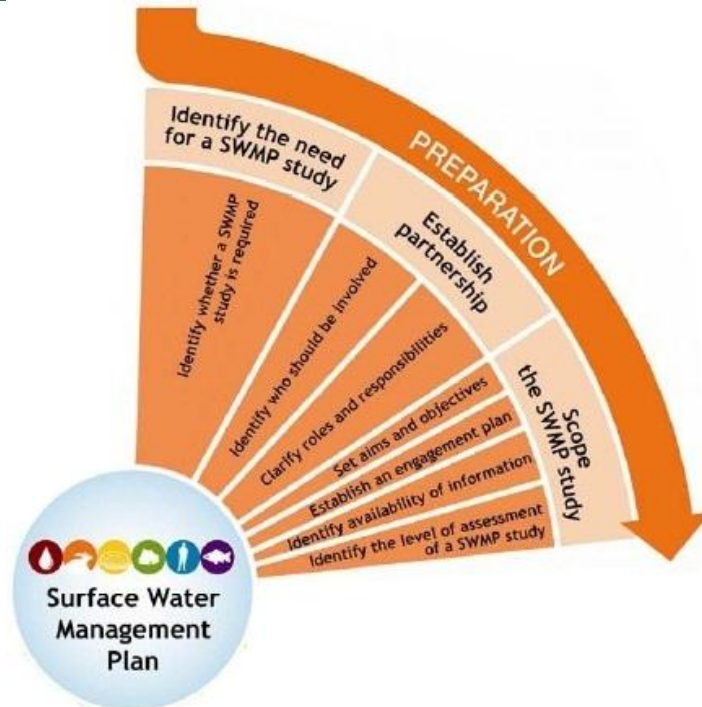
Table 1-1 SuDS Techniques (source Ciria⁶)

SuDS techniques can be divided into two main groups; infiltration based or attenuation based. Infiltration based SuDS facilitate the discharge of water directly into the ground through soil and rocks; this is only possible where the underlying geology is permeable enough to allow the passage of water downwards. Attenuation based SuDS retain water on a site and allow it to discharge at a prescribed and controlled rate into a watercourse or sewer.

2 Scope of the Cambridgeshire SWMP

Flood Risk Regulations 2009

Define the aims, objectives and purpose of the report
Describe the overall approach and methodology applied



2.1 Aims and Objectives

2.1.1 Study

The final aim of the SWMP study is to produce a long term surface water management Action Plan for Cambridgeshire, once in place this Action Plan will be reviewed every 6 years at a minimum.

The objectives of this strategic assessment are to:

- Engage with partners and stakeholders;
- Map historical flood incident data;
- Map surface water influenced flooding locations;
- Identify surface water flooding 'wet spot' areas;
- Assess, compare and prioritise 'wet spot' areas for detailed assessment;
- Identify measures, assess options and confirm preferred options for the prioritised 'wet spots'; and
- Make recommendations for next steps.

These objectives will be met following the progression of a number of project stages. The first stage is data collection, involving contact with the key partner organisations to obtain all relevant information. During this stage the collation of historical and future flooding along with information on flood receptors and flood consequences will take place.

Once the data collection stage is complete, the surface water flooding information will be analysed to identify “wetspots” that have a history of flooding incidents or potentially could be at risk of future flooding. Those “wetspots” identified as being at higher risk or priority through agreed local assessment criteria will then progress forward to the next stages, detailed assessment and optioneering.

Following the optioneering stage, recommendations for flood alleviation or mitigation will be consolidated.

2.1.2 Partnership Working

Existing partnerships between CCC and other stakeholders were already in place prior to the formal commencement of the Cambridgeshire SWMP. These partnerships include the Cambridgeshire Flood Risk Management Partnership (CFRMP) and the SWMP Project Management Board, and they are discussed in more detail in Section 3.1.

The CFRMP has developed a Stakeholder Engagement Plan, which will aid in communicating the work of the partnership to the key stakeholders, and is discussed in further detail in Section 2.4. It is of great importance that collaborative working of this nature is undertaken in order to share experience and expertise.

2.2 Geographic Extent

Flood Risk Regulations 2009

Define the geographic extent of the report and relate to the relevant river basin district and relevant maps

This strategic SWMP has been undertaken for the whole of the Cambridgeshire County area as shown in Figure 2-1. A 10km buffer zone has been considered to ensure that any surface water influences from outside the area have been incorporated. It is intended that Cambridgeshire will work closely with bordering LLFAs to ensure a consistent approach to flooding issues that span county boundaries.



Figure 2-1 Location Plan

The Cambridgeshire study area is located within the Anglian River Basin District. It is located primarily within the River Great Ouse catchment although a small portion of the northern study area falls within the River Nene catchment. Cambridgeshire is predominately a rural county with extensive low-lying areas especially in the northern and eastern parts. A large number of internal drainage boards are also involved in land drainage management across the study area.

2.3 Methodology

The methodology used to carry out this SWMP follows the advice set out in the Defra SWMP guidance³ for the preparation stage and the strategic risk assessment phase. Figure 2-2 illustrates the process carried out to inform this strategic assessment report, a key output of overall Cambridgeshire SWMP.

Further details on the methodology are discussed throughout the report in the relevant sections. The work undertaken for the study is also informed by the EA's PFRA guidance⁵ in order to assist in meeting the obligations of CCC as the Lead Local Flood Authority (LLFA). Information on the methodology for subsequent phases of the SWMP is set out in Sections 9 and 10 of this report.

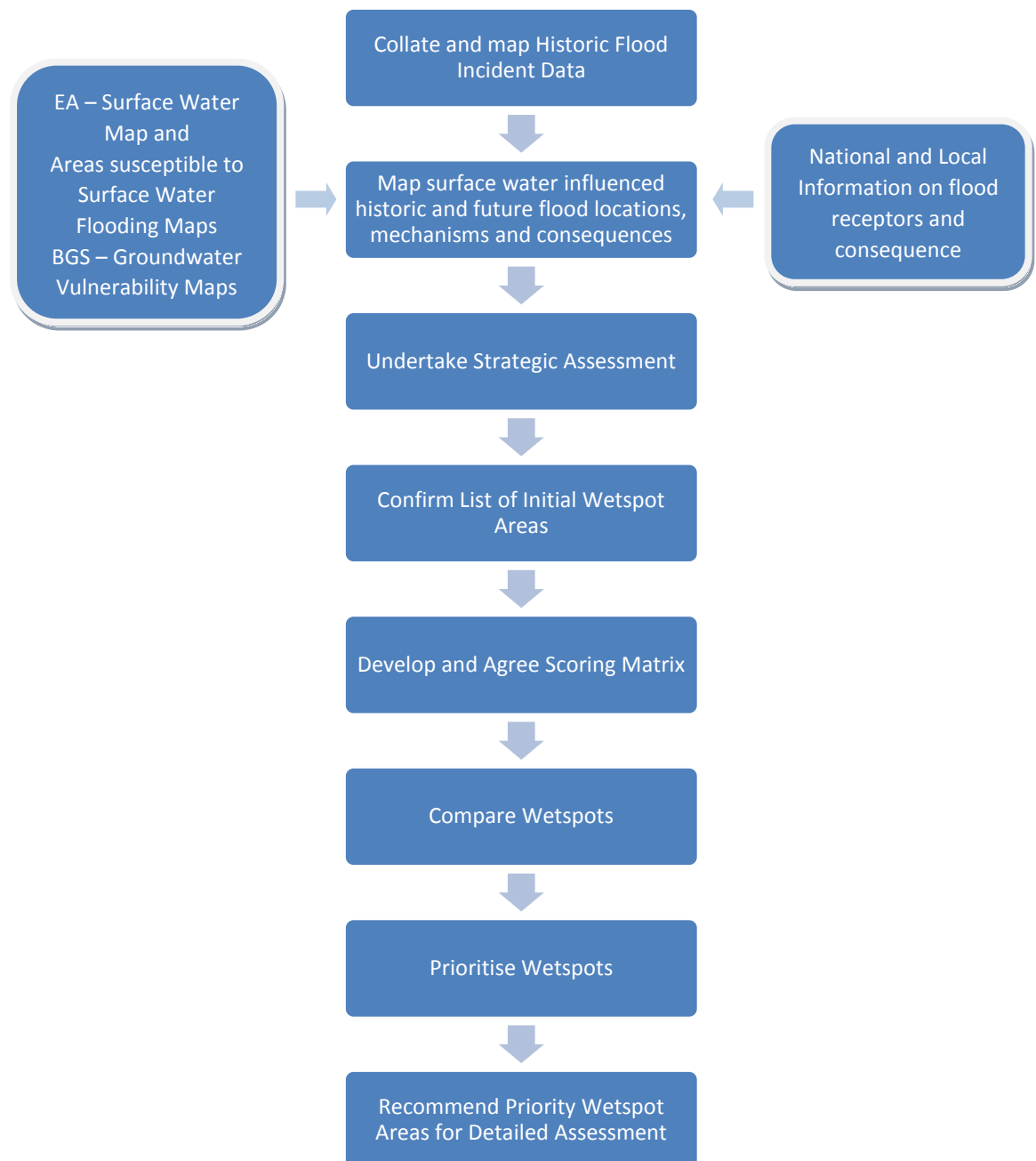


Figure 2-2 Strategic Assessment and Prioritisation Methodology

2.4 Stakeholder Engagement Plan

Flood Risk Regulations 2009

Define relevant authorities and partner organisations involved in the assessment of local flood risk.

Summarise means of stakeholder engagement and composition of local fora and liaison groups

A Stakeholder Engagement Plan⁷ has been previously developed by the CFRMP. The purpose of the engagement plan is to improve how the partnership consults and involves citizens and other stakeholders in decision making, and to ensure that their views are used to develop targeted and appropriate flood risk strategies within Cambridgeshire. The strategy sets out clear

objectives and principles, along with proposed methods of communication to engage the varying stakeholders.

The objectives and principles of the CFRMP engagement strategy are tabulated below.

Objective / Principle	
Objectives	Raise awareness and provide an understanding about the CFRMP programme of work and its objectives for all key stakeholder groups
	Ensure that the key stakeholders are aware of who they should contact for different flood risk management activities and how
	Provide all key stakeholder groups with an update on the progress of the programme of work, the programme governance arrangements, who the key project representatives are in each area
	Identify the most appropriate communication methods for communicating with each stakeholder group
	Providing keys stakeholders with a mechanism to feedback to the Programme and Project Managers in relation to the work of the partnership
	Ensure communication identifies clear links with other inter-dependent projects/areas of work to avoid confusing and conflicting messages to key stakeholder groups
	Effectively monitor communication activities and use this to influence future planning, messages and communication activities throughout the programme
Principles	Tell stakeholders what they can expect from the work of the Partnership
	Provide clear, accurate and easy to understand information – using plain English and offering a range of formats
	Make sure the communications and messages are consistent with one another
	Get the right balance in relation to the amount and level of communications with each of the stakeholder groups

During the progression of the SWMP, HCL has contributed to stakeholder engagement by holding meetings and workshops at various stages throughout the process. This has provided an opportunity for all stakeholders to present their opinions on the development of the SWMP.

A Web-GIS portal has been developed allowing the clear visualisation and communication of the outputs of the SWMP; and draft output consultations have been undertaken to explain and discuss the study's findings. The Web-GIS portal is discussed further in Section 5.3.

CCC have recently completed the "Flood Memories Project", which invited members of the public to share their flooding experiences, either via a paper or online questionnaire, and via five road shows across the county. Over 250 responses were received and these have been included within this SWMP's Flood Incident Register.

3 Partnership Establishment

The formation of partnerships has an important role in the undertaking of a SWMP, and is required under Defra's SWMP guidance documentation. The SWMP guidance details the identification of those partners / organisations that should be involved and what their roles and responsibilities should be.

It recommends the formation of an engagement plan, which should include objectives for the individual partners, and detail how and at what stages of the SWMP the engagement with stakeholders should take place.

The following sections describe the partners, their roles and responsibilities and their objectives as required by the SWMP guidance.

3.1 Stakeholders

Table 3.1 details all those partners or stakeholders who have an interest in flooding within the county area. More details of the CFRMP, SWMP Project Management Board and additional stakeholders are included in the following sections.

Organisation	CFRMP	SWMP Project Management Board	SWMP Additional Stakeholders
Cambridgeshire County Council	✓	✓	
Cambridge City Council	✓	✓	
East Cambridgeshire District Council	✓	✓	
Fenland District Council	✓	✓	
Huntingdonshire District Council	✓	✓	
South Cambridgeshire District Council	✓	✓	
Cambridgeshire Horizons	✓	✓	
Anglian Water Services	✓	✓	
Environment Agency	✓	✓	
Cambridgeshire County Council Highways Authority	✓	✓	
Middle Level Commissioners and associated IDBs	✓	✓	
Ely Group of Drainage Boards	✓	✓	
Bedford Group of Drainage Boards	✓	✓	
Non-Associated Drainage Boards			✓
Natural England	✓		✓
Wildlife Trusts	✓		✓
Town and Parish Councils			✓
Neighbouring Authorities			✓

Organisation	CFRMP	SWMP Project Management Board	SWMP Additional Stakeholders
Cambridgeshire & Peterborough Local Resilience Forum			✓
Highways Agency			✓
Emergency Services			✓
Elected Members			✓
Landowners / Developers			✓
Utility Companies			✓
General Public			✓

Table 3-1 Organisations Involved

3.1.1 Cambridgeshire Flood Risk Management Partnership (CFRMP)

Anticipating the Floods and Water Act and noting the Government's response to the Pitt review recommendations, Cambridgeshire County Council formed the 'Cambridgeshire's Flood Risk Management Partnership' (CFRMP) in June 2009.

The role of the partnership, made up of the City and District Councils, Environment Agency, Cambridgeshire Horizons, Anglian Water Services and the county's Internal Drainage Boards is to provide a coordinated approach to flood risk management across the County. The partnership will provide a strategic overview to the delivery of actions related to the relevant Pitt Review recommendations, the Flood and Water Management Act (2010) and the Flood Risk Regulations (2009). The partnership will enable Cambridgeshire County Council to fulfil its role as 'Lead Local Flood Authority' (LLFA) in coordinating local flood risk management activities.

3.1.2 SWMP Project Management Board

The SWMP Project Management Board sits within the CFRMP and is responsible for overseeing the production of the SWMP, one of five current projects being overseen by the CFRMP. The Defra guidance defines SWMP partners as those with responsibility for decision or actions regarding surface water management.

3.1.3 Stakeholders

Stakeholders are defined as those affected by, or interested in a problem or solution relating to surface water management.

In addition to those listed in Table 3.1 above, it is possible that, as the SWMP progresses, other stakeholders will be identified and become involved; these organisations will be highlighted in future reports and outputs as required.

3.2 Roles and Responsibilities

Cambridgeshire County Council, as the Lead Local Flood Authority has a number of specific responsibilities:

- To develop, maintain and apply a strategy for local flood risk management, including preparation of Surface Water Management Plans;
- To investigate flood events and determine which relevant authorities are involved and whether they have, or have not, discharged their responsibilities;
- To maintain a register of assets (flood defences, drainage infrastructure etc), including ownership and state of repair;
- Under the Flood Risk Regulations, to carry out an assessment of flood risks, map risks and hazards and publish a risk management plan in response to identified risks and hazards within a set timescale set out in the EU Floods Directive;
- To approve sustainable drainage systems (SuDS) as part of new development and, ultimately, will be responsible for their adoption and maintenance in perpetuity;
- To use powers to regulate flows of "non main rivers" outside the area of Internal Drainage Boards; and
- To plan for, and manage, any flood emergencies which may occur.

In conjunction with these, CCC and the other partner organisations have further responsibilities from the CFRMP including to share relevant information and co-operate to facilitate the management of flood risk.

3.3 Internal Drainage Boards

There are three Internal Drainage Boards operating within the area, The Middle Level Commissioners and associated drainage boards, The Ely Group of Drainage Boards and the Bedford Group of Drainage Boards. In the study catchment these drainage boards have a role in flood risk management. The Internal Drainage Boards also contribute to the planning process across Cambridgeshire.

The local partnership has the benefit of the experience of The Bedfordshire and River Ivel IDB (part of the Bedford Group of IDB's) who have been involved in Defra Integrated Urban Drainage Pilot Studies, a precursor to Surface Water Management Plans. .

3.4 Data Sharing and Licensing

A number of specific agreements have been put in place for the SWMP to facilitate the sharing of data between partners:

- AWS data sharing agreement setting out the terms under which their data is available and what and when it can be used;
- GIS licences for mapping and data supplied by CCC and Cambridge City Council;
- British Geological Society (BGS) licence for geological data supplied by BGS;
- Environment Agency standard data licence;
- Environment Agency surface water susceptibility maps licence; and
- Environment Agency LiDAR licence.

4 Need for a Cambridgeshire SWMP

4.1 Previous Studies

As part of this study, it has been critical to identify the links to other local and regional delivery plans which may influence or be influenced by the SWMP. The SWMP will seek to integrate and align these plans and processes to provide a clear and robust path to delivering flood risk management objectives throughout Cambridge. These studies listed below have already been completed, however the information from the SWMP and future Local Flood Risk Management Strategy can be used to inform any updates to these studies.

4.1.1 Great Ouse CFMP⁸

The Great Ouse Catchment Flood Management Plan (CFMP) was published by the Environment Agency (EA) in July 2010. The catchment covers approximately 8,600 km², and is predominantly rural, with the larger population centres of Milton Keynes, Cambridge, Bedford and King's Lynn.

In Cambridgeshire, the main sources of flood risk were identified as:

- river flooding from the River Great Ouse, Alconbury Brook and the River Cam;
- flooding within the areas managed by the Internal Drainage Boards (IDBs);
- breaching / failure of embankments, particularly in the Fenland area;
- surface water flooding in St Neots and Little Paxton, Cambridge, Cambourne, Little Downham, Littleport and Soham;
- groundwater flooding in Burwell.

A number of flood risk management policy options (i.e. how the areas are categorised and what maintenance would be undertaken by the EA) were identified across the whole catchment, and those policy options covering areas within Cambridgeshire are listed in the table below.

Area	Recommendations
Great Ouse Corridor	Policy Option 6 - Areas of low to moderate flood risk where we will take action with others to store water or manage runoff in locations that provide overall flood risk reduction or environmental benefits.
Cambridge Godmanchester St Neots Little Paxton	Policy Option 5 - Areas of moderate to high flood risk where we can generally take further action to reduce flood risk.
Houghton The Hemingfords St Ives The Fens	Policy Option 4 - Areas of low, moderate or high flood risk where we are already managing the flood risk effectively but where we may need to take further actions to keep pace with climate change.
Alconbury Alconbury Weston Huntingdon Brampton	Policy Option 3 - Areas of low to moderate flood risk where we are generally managing existing flood risk effectively.
Bedford Ouse Rural	Policy Option 3 - Areas of low to moderate flood risk where we are generally managing existing flood risk effectively.
Eastern Rivers	Policy Option 3 - Areas of low to moderate flood risk where we are generally managing existing flood risk effectively.

Table 4-2 Findings of draft Great Ouse CFMP

4.1.2 River Nene CFMP⁹

The River Nene CFMP was published by the EA in December 2009. The catchment covers approximately 2,300 km², and is predominantly rural, with the larger population centres of Northampton, Wellingborough, Kettering, Corby and Peterborough.

In Cambridgeshire, the main sources of flood risk were identified as:

- tidal flooding from the River Nene, downstream of Peterborough;
- flooding from lowland drains and riparian owner watercourses;
- breaching / failure of embankments, particularly in the Fenland area.

A number of flood risk management policy options were identified across the whole catchment, and those policy options covering areas within Cambridgeshire are listed in the table below.

Area	Recommendations
Upper and Middle Nene	Policy Option 2 - Areas of low to moderate flood risk where we can generally reduce existing flood risk management actions.
River Nene (Weedon to Kislingbury) and River Nene Corridor	Policy Option 6 - Areas of low to moderate flood risk where we will take action with others to store water or manage run-off in locations that provide overall flood risk reduction or environmental benefits.
The Fens	Policy Option 4 - Areas of low, moderate or high flood risk where we are already managing the flood risk effectively but where we may need to take further actions to keep pace with climate change.

Table 4-3 Findings of River Nene CFMP

4.1.3 East Cambridgeshire SFRA¹⁰

The final Level 2 SFRA for East Cambridgeshire was completed by Atkins in 2005. The aim of the study was to produce a data set to allow potential development areas to be graded by flood risk. The study focussed on 12 growth areas highlighted by East Cambridgeshire DC.

The study identified that the greatest flood risk in the area was posed by a failure or breach of defences along the Bedford Ouse and Ely Ouse river systems. The majority of the area is protected by defences designed to protect against fluvial flooding up to a return period of 100 years and tidal flooding to 200 years. The River Lark upstream of Isleham is the only area not protected. The predicted flood risk of the 12 growth areas is tabulated below.

Growth Area	Predicted Flood Risk
Stretham, Haddenham, Little Downham, Witchford, Isleham	Category 1 - Settlements within an area protected to an appropriate minimum standard of defence and not flooded from a breach inundation.
Ely, Sutton, Littleport	Category 2 - Settlements within an area protected to an appropriate minimum standard of defence and partially inundated by flooding from a breach.
Bottisham, Burwell, Fordham, Soham	Category 3 – undefended

Table 4-4 Findings of East Cambridgeshire SFRA

This SFRA was updated by Scott Wilson in 2010 in the form of a joint SFRA and Water Cycle Strategy (WCS) between Fenland and East Cambridgeshire District Councils. More information can be found in Section 4.1.6.

4.1.4 Fenland SFRA 2005¹¹

The first Level 1 SFRA for Fenland was completed by Bullen Consultants in 2005. The aims of the study were to produce a series of flood risk maps to aid land use planning and to undertake detailed flood risk assessments on 32 development areas highlighted by Fenland DC.

The study identified that the greatest flood risk in the area was posed by the tidal channel of the River Nene, the Great Ouse / Bedford River system between Denver and Earith and the Middle and North Level IDB systems, with breaching or overtopping of embankments the most likely method of flooding.

This SFRA was updated in 2010 by Scott Wilson in the form of a joint WCS and SFRA between East Cambridgeshire and Fenland District Councils. More information can be found in Section 4.1.6.

In addition, a separate Level 2 SFRA was also completed for the Wisbech area. See Section 4.1.5 for more information.

4.1.5 Wisbech Level 2 SFRA¹²

In 2009, JBA completed a Level 2 SFRA for Fenland DC covering the town of Wisbech, plus development land to the east into Norfolk, to the south to the borders of Elm and the parish of Leverington to the west.

Two historical flooding incidents were reported: the first in 1953, resulting in one death following a breach of the flood defences; and the second in 1978, also resulting in one death and damage to many properties. Further flood defences along the River Nene were constructed following this incident.

The study identified that the main source of flooding in Wisbech would be tidal flooding from the River Nene. Fluvial flooding is expected during extreme river levels, and surface water flooding following short duration intense storms would pose further risks to the town. The most severe flooding would be as a result of the overtopping or breach of flood defences on the River Nene.

Another Level 2 SFRA for Wisbech has recently been commissioned by Fenland DC and is currently being undertaken by WSP. This will use recent modelling data for the River Nene commissioned from HCL by the EA, and up-to-date Lidar data. This Level 2 SFRA is due for completion in May 2011.

4.1.6 East Cambridgeshire and Fenland Level 1 SFRA and WCS¹³

Due for completion in 2011, Scott Wilson are currently undertaking a joint Level 1 SFRA and WCS for East Cambridgeshire and Fenland District Councils. This study builds on the findings of two previous SFRAs, East Cambridgeshire and Fenland, both completed in 2005. More information on these earlier studies can be found in Section 4.1.3 and Section 4.1.4 respectively. The main findings of the WCS scoping report are listed below:

- Water supply in the Wisbech area will need to be improved;

- WwTWs in March and Chatteris require improvements for nutrient and organic pollution discharges, whilst additional capacity at Whittlesey and Doddington will be needed;
- There are potential environmental constraints on housing growth in some of the study area;
- Housing developments and their associated water infrastructure will need to be designed to mitigate these impacts which is likely to require significant investment;
- Management of water demand will be crucial to reduce potential constraints and reduce the costs associated with the provision of water infrastructure.

The findings of the SFRA and WCS are still outstanding, and details of these will be included in future revisions should they become available.

4.1.7 Huntingdonshire SFRA¹⁴

The final Level 2 SFRA for Huntingdonshire was completed by Mott MacDonald and Posford Haskoning in 2004. The aim of the study was to provide an assessment of the nature and extent of flood risk and its application to development planning.

The study investigated flooding from Main Rivers, Ordinary Watercourses, Middle Level Commissioners high level carriers and the IDB's low level systems, and for each individual river reach, those properties predicted to be at risk of flooding were identified.

This SFRA was subsequently updated in 2010 to take account of PPS25, and to take advantage of improved topography mapping and further flood risk mapping studies undertaken by the EA.

The main findings of this report were that surface water flooding is a recurring problem in several locations, some of which are not shown to be at risk on the EA maps. This was suggested to be due to either the resolution of available topographic maps, or due to features that can divert overland flows, such as kerbs, that are not taken account of on the EA maps. St Neots was highlighted as one area where a number of surface water flooding events had occurred. Based on the EA's surface water flood maps, other areas at risk were identified as Huntingdon, Alconbury, St Ives, Broughton, Hamerton, Ramsey, Sawtry, Old Weston and Buckden.

4.1.8 Huntingdonshire Water Cycle Strategy¹⁵

In 2008, Faber Maunsell AECOM completed the water cycle strategy for Huntingdonshire. Its aim was to provide evidence to support the documents submitted to the Government as part of Huntingdonshire's Local Development Framework.

4.1.9 Cambridge Water Cycle Strategy¹⁶

A Phase 1 Water Cycle Strategy (WCS) for the Major Growth Areas in and around Cambridge was completed in October 2008. This was commissioned by Cambridgeshire Horizons, who brought together a stakeholder steering group including representatives of the local authorities, the EA, water companies, Natural England and other relevant stakeholders. The Phase 1 WCS identified no insurmountable technical constraints to the proposed level of growth for the study area.

A Phase 2 WCS has since been commissioned and will be finalised in 2011. This goes further than the Phase 1 by providing evidence in support of a more aspirational vision for water management. It aims to aspire to water neutrality, improve biodiversity by protecting

environmental water quality, and protecting and enhancing the environment through sustainable surface water management.

4.1.10 South Cambridgeshire and Cambridge City Level 1 SFRA¹⁷

A Level 1 SFRA covering the Cambridge City and South Cambridgeshire District areas was completed by WSP in September 2010. The main aim of the study was to identify flood risk constraints to development to aid the preparation of the Councils' Local Development Frameworks. The SFRA also includes a toolkit to aid developers in producing site specific Flood Risk Assessments and highlights the importance of using SuDS.

4.2 Drivers for Change

CCC are undertaking this SWMP in order to:

- Better understand the risks and consequences of surface water flooding in Cambridgeshire so this can be shared and used as part of an evidence base for LDFs and the Local Flood Risk Management Strategy;
- To meet or significantly assist in meeting some of the requirements on CCC as LLFA under the Flood Risk Regulations 2009;
- To meet a number of the requirements of the Flood and Water Management Act specifically in terms of developing an asset register and producing a local flood risk management strategy.

At this point it is worth noting that the developed area of Cambridge has effectively doubled in the past 60 years and as such has had significant impacts on the natural environment, as greener rural areas have been replaced in part by housing, commercial and industrial developments, roads and other forms of community infrastructure.

This is clearly evident in the replacement of natural watercourse systems with concrete drains and channels and the introduction of urban-borne pollutants and sediments to the natural water ecosystems.

The SWMP process allows the opportunity to enhance the condition of these urbanised catchments helping to improve the water quality. Additionally, the implementation of the SWMP and Action Plan can help to provide significant economic and environmental benefits to the community through better preparation against these potential extreme rainfall events, which to a large extent has not occurred since this development has occurred. This key risk in these areas is that such events could be catastrophic in nature across large parts of the County.

4.3 Context

Alongside the legislative requirements above and following on from the context described in Section 3.1, this SWMP will support the following initiatives.

4.3.1 Local Flood Risk Management Strategies

Local Flood Risk Management Strategies¹⁸ came into force as part of the Flood and Water Management Act 2010. As LLFA, CCC must develop a strategy for local flood risk management. The strategy must be consistent with the National Flood and Coastal Erosion Risk Management Strategy for England and the regional CFMPs and River Basin Plans, and should be developed and maintained with consultation from other stakeholders, such as the public and other risk management authorities.

The strategy must specify:

- the risk management authorities in the authority's area;
- the flood and coastal erosion risk management functions that may be exercised by those authorities in relation to the area;
- the objectives for managing local flood risk (including any objectives included in the authority's flood risk management plan prepared in accordance with the Flood Risk Regulations 2009);
- the measures proposed to achieve those objectives;
- how and when the measures are expected to be implemented;
- the costs and benefits of those measures, and how they are to be paid for;
- the assessment of local flood risk for the purpose of the strategy;
- how and when the strategy is to be reviewed; and
- how the strategy contributes to the achievement of wider environmental objectives.

4.3.2 Catchment Flood Management Plan (CFMP)

The Cambridgeshire county area covers two catchment flood management plans: The River Nene and the Great Ouse. These are discussed further in Section 4.1. These plans, in conjunction with district wide SFRA's and this SWMP will assist in informing the Local Development Framework process.

5 Data Collection and Collation

5.1 Data Collected for the Study

A full catalogue of data used for the study is contained within Appendix A – Data Register. The data is flagged as:

- Data held by the Local Authority
- Data held by Partner Organisations
- Environment Agency National Data Set
- Environment Agency Local Data

5.1.1 Sources

Data was provided by:

- Cambridgeshire County Council
- Cambridge City Council
- East Cambridgeshire District Council
- Fenland District Council
- Huntingdonshire District Council
- South Cambridgeshire District Council
- Environment Agency
- Anglian Water Services
- Natural England
- English Heritage
- Ely Group of Drainage Boards
- Bedford Group of Drainage Boards
- Middle Level Commissioners and associated Internal Drainage Boards
- Cambridgeshire and Peterborough Biological Records Centre
- British Hydrological Society
- British Geological Society

5.1.2 Data Quality and Restrictions

The SWMP guidance highlights the importance in understanding the quality of the data in order to inform the later stages of the SWMP. Therefore, data incorporated into the data registers was assigned a quality score between one and four based on a high level assessment:

- 1 Best Possible
- 2 Data with known deficiencies
- 3 Gross assumptions
- 4 Heroic assumptions

This follows the recommendations in the SWMP guidance but these quality scores will require further assessment as the study is progressed into the next stages. A further review was carried out to define the status of the data in terms of distribution and licensing. This information is also included within the data registers.

5.1.3 Data Format

Existing

Data was supplied for the study in a variety of formats; one objective of the study was to take these disparate data formats and compile them in GIS compatible database formats. Data was obtained in the following formats:

- ArcGIS
- MapInfo
- ASCII
- PDF
- Excel
- Image
- Word

All data was supplied electronically making it easier to collate and store than if it had been provided in hard copy format. Spatial data was, where possible, converted to MapInfo GIS format such that it could be overlaid with other information and to facilitate the use of the data in development and emergency planning.

Data was uploaded onto a secure SharePoint site maintained by HCL; the capacity of the site allows large quantities of electronic data to be held and accessed by a defined set of personnel making it ideal when data is sensitive or restricted.

Future

The relevant flood risk and incident data will be supplied to CCC as part of the SWMP; it is recommended that CCC remain the custodian of this data and through this role is responsible for coordinating the maintenance of the databases. To ensure that the databases remain current and thus useful, all partners should be assigned the responsibility for providing updates to their assets and flood risk information in GIS format (at least on a yearly basis). There are two main options for keeping these databases current;

- 1 The data custodian at CCC receives updated data and alters it on the local system;
- 2 All partners have access to a web enabled interface which allows individual organisations to update their data.

5.1.4 Data Gaps and Limitations

A register of outstanding data was maintained throughout the duration of the study.

One key limitation identified is the differing formats of the data received, both between stakeholders and within each individual stakeholder. This was most apparent when data was provided in PDF format, resulting in the need for increased processing to digitise the information into a GIS format.

In addition, the compiling of the Flood Incident Register was made difficult due to the number of different formats that the historical flooding data was received in. Some datasets contained complete addresses and national grid co-ordinates, while other datasets were simply a graphical representation with no information contained within the GIS tables.

In particular, the largest source of historical flooding information, the Customer Complaints database provided by CCC, often had no grid co-ordinates for the flooding incidents, and none had a clear source of flooding listed, making the determination of these a laborious process. This also often compromised the confidence levels of data quality due to the assumptions made based on the limited available information.

5.2 Flood Incident Register

A sub task within the data assimilation stage was the development of a flood incident register to show all the historical surface water flooding incidents in Cambridgeshire. For each event, the location of the flood incident was registered and an approximate easting and northing recorded where this was readily available or could be estimated within the available project timescale and resources. Each flooding incident was assigned a unique flood incident reference number. The completed flood incident register is included in Appendix B.

For many incidents the exact location of flooding was not reported, for example “flooding occurred on Smith Street”. Where the exact location was not known, an indicative location was picked at a central point on the street. Where known, the house number, incident date and time of incident was recorded. It should be noted therefore, that the flood incident register contains approximate grid co-ordinate locations that may not be the exact location of the historical flooding incident. It should also note that grid co-ordinates are missing for several incidents at present.

A crucial component of the incident register is recording the confidence in the source of the information. Some flood events were well reported, with a high level of detail regarding the source, pathway and receptor and other reports did not provide such details. The criteria in Table 5-1 were used to assess the confidence in the flood source. It is recommended that this practice is continued for all new flooding incidences added to the register along with more accurate information on incident location and flood consequence.

Flood Source	Confidence in Flood Source
Little or no evidence to support flood source in incident report	Low - Source assumed
Flood source provided by residents or non technical experts with high level of detail in the incident report	Medium - Some evidence
Flood source provided by ‘technical experts’ e.g. IDB staff or residents with compelling evidence i.e. photos	High - Compelling evidence

Table 5-1 Confidence in flood report sources

5.3 Web based GIS Database

Edenvale Young and HCL, in conjunction with web designers Plan B, have developed a web-based GIS database that allows the user to store and assess information on historic and future flooding and to facilitate prioritisation of wetspots within Cambridgeshire through Multi-Criteria Analysis.

Information relating to property types, critical services, statutory environmental areas and transport routes can be uploaded to the website and assigned scores based on flood susceptibility and Property/ Land Use Multi Criteria weighting agreed with the SWMP Project Management Board. Section 7 provides further information on Multi-Criteria Assessment undertaken for wetspots prioritisation purpose.

Figure 5.1 shows a screen shot of the database, with the Cherry Hinton wetspot within Cambridge City shown in red. Properties at a medium risk of flooding are shown in blue, and those at a high risk in pink.

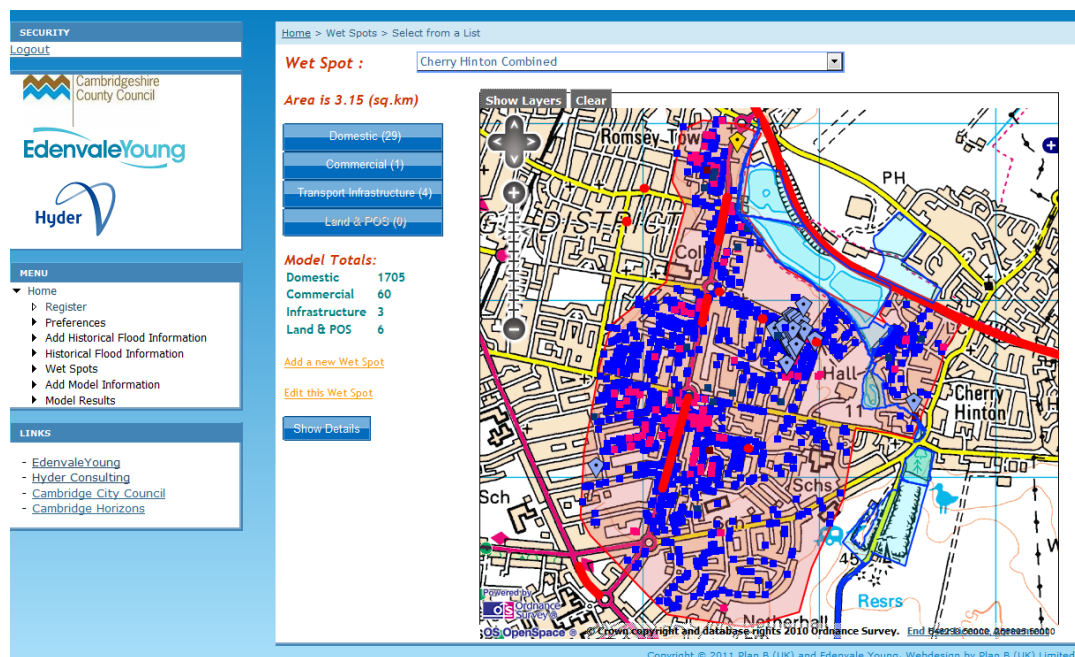


Figure 5-1 Screen Shot of Web-based GIS Database

In addition to showing modelled results, the website also allows information regarding historical flooding to be uploaded. Therefore, if decided by CCC, this GIS Database tool can be used in maintaining a “live” flooding register that can be updated whenever flooding occurs in future.

6 Evidence Base

6.1 Historical Flooding in Cambridgeshire

Flood Risk Regulations

Introduce the local sources of flood risk being considered for past floods and possible future floods.

Assess past floods which had significant harmful consequences for human health, economic activity, cultural heritage and the environment.

The following sections outline the historical flooding recorded within the Cambridgeshire county area within the context of the definition given in Section 1.3. This text should be read in conjunction with the Flood Incident Register shown Appendix B. It is highlighted that this report is based on the information supplied by partners up to January 2011; the occurrence of flooding is not static and thus this represents an understanding of the situation as of this date.

There have been over 3,700 reports, collated to date, of historical flooding in the county area. All the affected locations have been grouped into a number of “wetspots” and these wetspots are listed in Appendix C. They can also be viewed graphically using the Web-GIS database once uploaded. Further details of historical flooding by key events and district council can be found in the draft Cambridgeshire PFRA Report (5008-UA002163-BMR), February 2011.

6.1.1 Surface Water Runoff

Surface water runoff occurs as a result of high intensity rainfall causing water to pond or flow over the ground surface before entering the underground drainage network or watercourse, or when water cannot enter the network due to insufficient capacity.

Locations of historical surface water runoff occurrences were provided by a number of sources, including the county and district councils, IDBs and EA.

6.1.2 Groundwater

There have been seven known occurrences of groundwater flooding in the county area. The data was provided by East Cambridgeshire DC, and so the locations are confined to this district area. These incidences occur where the susceptibility to groundwater flooding is moderate to very high, as shown in the Groundwater Vulnerability Maps provided by the British Geological Society. See Section 6.2.3 for more information.

6.1.3 Main Rivers

Under the Water Resources Act 1991, the EA has powers to maintain and improve designated main rivers for the efficient passage of flood flow and the management of water levels for flood defence purposes. These powers are permissive only and there is no obligation on the Agency to carry out such works. The current maintenance regime for designated main rivers uses a risk based approach and government funding via Defra. The ultimate responsibility for maintaining the bed and banks of any watercourse, including its vegetation, rests with the riparian owner(s).

The EA offers a flood warning service to areas covered by main rivers and some ordinary watercourse tributaries. We also provide protection to certain areas at risk from Main River flooding in the form of strategic flood defences.

There is no specific requirement for this SWMP to investigate flooding from main rivers, unless there is clear evidence of interactions with surface water. Information on the main rivers in the county area was provided by CCC and the EA.

6.1.4 Ordinary Watercourses

Ordinary watercourses are all rivers, streams, ditches and drains that have not been designated as main rivers. The main responsibility for all watercourses lies with the riparian owners; however the local authorities and internal drainage boards do have permissive powers to carry out Land Drainage schemes on ordinary watercourses.

Details of the strategic ordinary watercourses were provided by the local authorities and internal drainage boards.

6.1.5 Sewers

Sewer flooding occurs when the capacity of underground systems is exceeded due to heavy rainfall, resulting in flooding inside and outside of buildings. AWS provided a list of sewer flooding incidents for the county area. These records include all forms of sewer flooding, rather than only those incidents attributable to surface water.

AWS provided the locations of 185 occurrences of sewer flooding across the county area, of which 20 have been internal flooding and 11 both internal and external flooding. The data provides only a road name and post code, so the exact properties affected are not known.

6.2 Potential Indicators of Surface Water Flood Risk

6.2.1 EA “Areas Susceptible to Surface Water Flooding”

The Environment Agency have produced the outputs of a simple surface water flood modelling at a national scale. The modelling did not take into account underground sewerage and drainage systems or smaller over ground drainage systems. No buildings were included and a single rainfall event was applied. The ‘Areas Susceptible to Surface Water Flooding (ASfSWF)’ map gives three bandings indicating areas which are ‘less’, ‘intermediate’ and ‘more’ susceptible to surface water flooding. The map is not suitable for identifying individual properties at risk of surface water flooding.

The first generation maps (Areas Susceptible to Surface Water Flooding) were updated and republished in January 2009.

6.2.2 EA “Flood Risk Maps for Surface Water”

Following on from the release of the Areas Susceptible to Surface Water Flooding, The Environment Agency updated the original mapping in order to produce the 2nd Generation of these maps, called the Flood Maps for Surface Water (FMfSW), which were released in October 2010.

The existing maps were updated to take account of buildings and the underground drainage system, and more storm events were analysed. However, it should be noted that they do not

take account areas that are artificially drained. The new maps have two bandings of “deep” (predicted surface water flooding above 300 mm depth) or “shallow” (predicted surface water flooding between 100 and 300 mm depth) and are produced for both 30 year and 200 year return periods.

6.2.3 British Geological Society Groundwater Vulnerability Maps

The groundwater flooding susceptibility data shows the degree to which areas of England, Scotland and Wales are susceptible to groundwater flooding on the basis of geological and hydrogeological conditions. It does not show the likelihood of groundwater flooding occurring, i.e. it is a hazard, not risk-based dataset.

Areas deemed to be susceptible to ground water flooding are given one of the following vulnerability designations:

- Very low
- Low
- Moderate
- High
- Very High

The susceptibility data is suitable for use for regional or national planning purposes where the groundwater flooding information will be used along with a range of other relevant information to inform land-use planning decisions.

6.2.4 Assets

Information on assets has been provided by stakeholders which can also be used as potential indicators of flood risk:

- Culverts which may be susceptible to blockage;
- All watercourses which can become blocked and full of debris;
- Flood defences along urban watercourses which could overtop during storm events;
- Pumping stations which could fail;
- Overflows which discharge to watercourses during periods of high flow;
- Sewers which may have insufficient capacity during storm events.

6.3 Maintenance Regimes

Maintenance regimes are critical to ensuring the continued and effective functioning of assets to manage surface water flood risk. Existing maintenance tasks/ responsibilities has been reviewed as part of the SWMP where information is currently available and these are listed below. The outputs of the Countywide SWMP and more detailed local SWMP studies will help to further identify and focus individual maintenance requirements in these studied areas. It is recommended that the Local Flood Risk Management Strategy helps to focus the Countywide and stakeholder needs to deliver a robust and deliverable maintenance programme that includes improvements in general duties as well as particularly focus for high risk assets.

Cambridgeshire County Council Highways Authority

The CCC Highways Authority has the over-riding responsibility for all highways and highway structures throughout the council area (with the exception of motorways and some major trunk roads, such as the A11), and operates programmes of inspection and maintenance for bridges and gullies within the county area.

Cambridge City Council

Cambridge City Council maintains 16 miles of awarded watercourses and a large number of watercourses that fall within its riparian responsibilities. It carries out annual weed cutting and de-silting when required, and also undertakes regular inspections of assets, including those that it is responsible for, as well as private assets.

East Cambridgeshire District Council

East Cambridgeshire District Council has responsibility for 27 miles of award ditches, on which it operates regular four yearly de-silting programmes and annual bank sides flailing programmes.

Fenland District Council

The award drains within the Fenland District Council area are inspected on a 6 monthly basis.

Huntingdonshire District Council

Huntingdonshire District Council has responsibility for maintaining 62 miles of award drains.

South Cambridgeshire District Council

South Cambridgeshire District Council has responsibility for 175 miles of award drains. It has a routine annual vegetation removal programme and an 'as required' silt removal programme.

Middle Level Commissioners and Associated IDBs

All of the drainage boards in the Middle Level have their own maintenance programmes, which are detailed in the individual Board Policy Statements. The Commissioners look after the main watercourses, while the IDBs maintain the smaller, arterial watercourses. Maintenance is undertaken on these watercourses, plus any assets, such as pumping stations or level control structures.

North Level IDB

North Level IDB has an annual mowing and flail cutting programme covering the whole of the district area, and undertakes capital improvement works as and when required. They also undertake cleansing of the watercourses on a five to ten year rotation programme.

Bedford Group of Drainage Boards

The Bedford Group of Drainage Boards operates a variety of maintenance programmes dependent on the amenity and ecological values of the watercourse. This includes bank vegetation clearance, tree maintenance, in-channel weed maintenance, to increase flow conveyance and reduce water levels, and de-silting.

Ely Group of Internal Drainage Boards

The Ely Group have over 120 assets, including pumping stations, inlets and culverts, all of which are subject to annual inspection and maintenance. They operate annual flail mowing and weed cutting programmes for all Main Drains, by machine, boat or hand.

Environment Agency

The Environment Agency carries out maintenance on those rivers or streams designated as main rivers. The Environment Agency's annual maintenance programme can be viewed by using their website¹⁹.

7 Wetspots Selection and Prioritisation

Flood Risk Regulations 2009

The assessment of the possible harmful consequences of future floods from local sources of flood risk



7.1 Approach

The principal purpose of a strategic assessment is to identify areas which are considered more vulnerable to surface water flooding. These areas are termed “wetspots” and the most vulnerable wetspots identified will be taken through intermediate and detailed assessments. This section describes the selection and prioritisation of the wetspots, in line with the strategic assessment phase through a Multi-Criteria Assessment process as agreed with the SWMP Project Management Board.

Data supplied for the study as described in Sections 5 and 6 of this report was used to inform the assessments.

7.2 Strategic Level Assessment

7.2.1 “Wetspot” Identification

The following section details the process of wetspot identification, using historical flooding information provided by stakeholders and the EA’s National Receptor Database (NRD) and Flood Maps for Surface Water (FMfSW).

It is likely that some of the wetspots identified either only had main river flooding incidents or a significant portion of the properties impacted by the EA FMfSW also fall within the EA fluvial flood zones 2 and 3 indicating main river dominance or high level of interaction. Appendix C provides this additional information for each identified wetspot.

The locations of the wetspots within each local authority area are shown in Figures C1 to C4 in Appendix C. However, the wetspots within the Cambridge and Milton detailed study area are not given as they will be shown in the Cambridge and Milton Detailed Assessment Report (5014-UA002163-BMR).

The methodology of creating the wetspots is outlined in Figure 7-1 and discussed in more detail below.

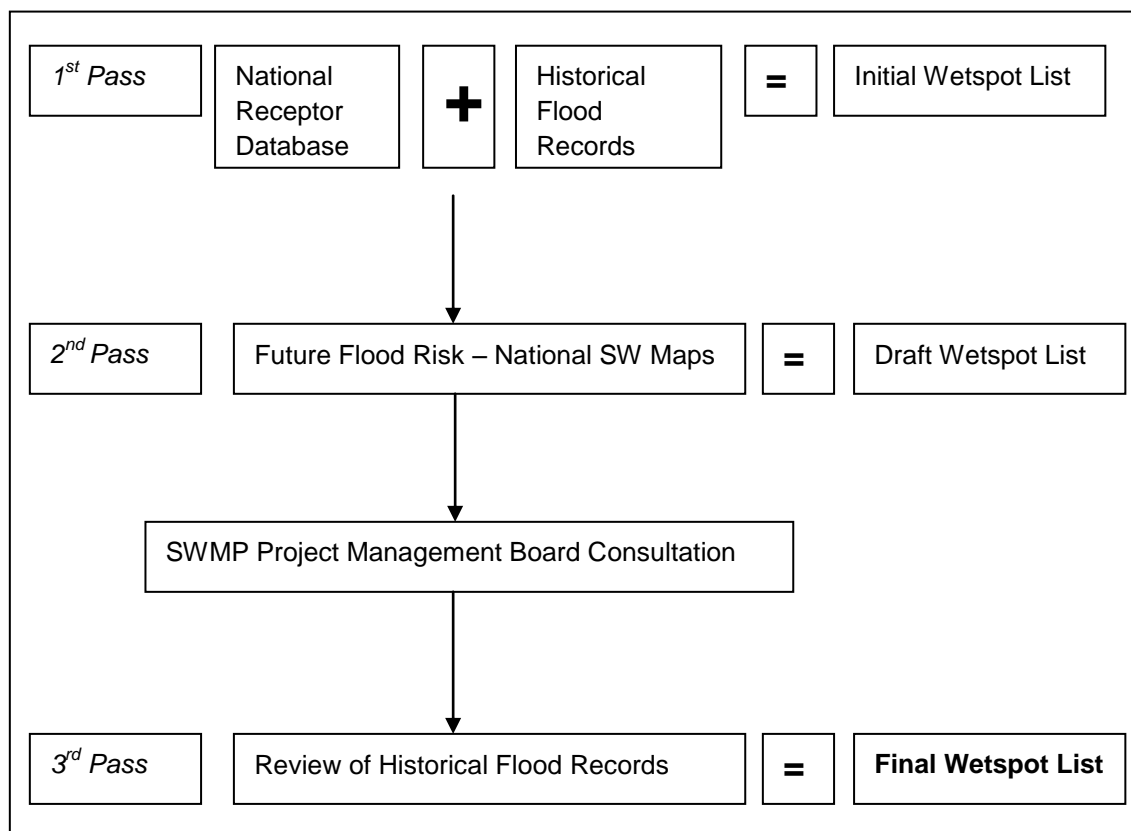


Figure 7-1 Methodology for wetspot list production

Historic Flooding

The first stage of the strategic assessment was to identify those locations where flooding had occurred historically, and to digitise a wetspot to encompass all historic flooding in the nearby vicinity. This generally meant that each wetspot comprised an entire or significant part of a town or village. This stage resulted in the identification of 246 wetspots across the county area.

Figure 7.2 shows the Bourn wetspot and its associated flooding locations.

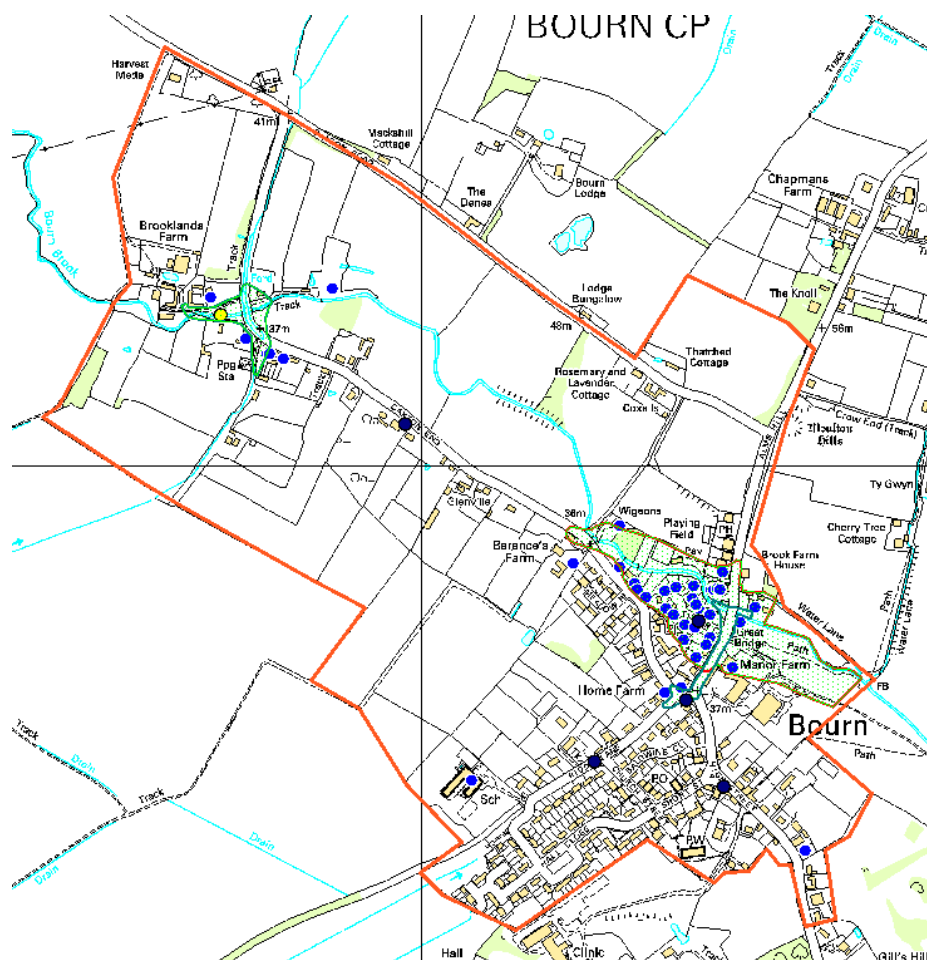


Figure 7-2 Bourn Wetspot

Future Flooding

The next stage was to incorporate the EA's National Receptor Database (NRD) property points into the wetspots. This database contains information on all known properties / land features in England and Wales, and has multiple potential entries for the land/property use such as for instance dwelling, school, pond, farming etc.

All the property points falling within the 200 year deep or shallow modelled areas of the Flood Maps for Surface Water were identified using simple database queries. If these properties were already contained within an existing wetspot, then no further action was taken. Those property points outside a wetspot were then analysed to identify if the existing wetspot could be expanded to incorporate them or required the creation of a new wetspot.

Where more than 10 properties in an area fell within the deep or shallow FMfSW and there was no historical flooding information/records, new wetspots were created. These wetspots are, therefore, those with a high chance of future flooding.

After discussion of a draft wetspot list with the project Board, an additional review was carried out of the historic flood records, this was requested by the project board. Final analysis of the data provided resulted in the identification of a further 27 wetspots resulting in a Final Wetspot List total of 273.

Figure 7.3 shows the locations of all the wetspots generated. Those in orange are based on historic flooding, while those in blue were solely identified due to a future flood risk.

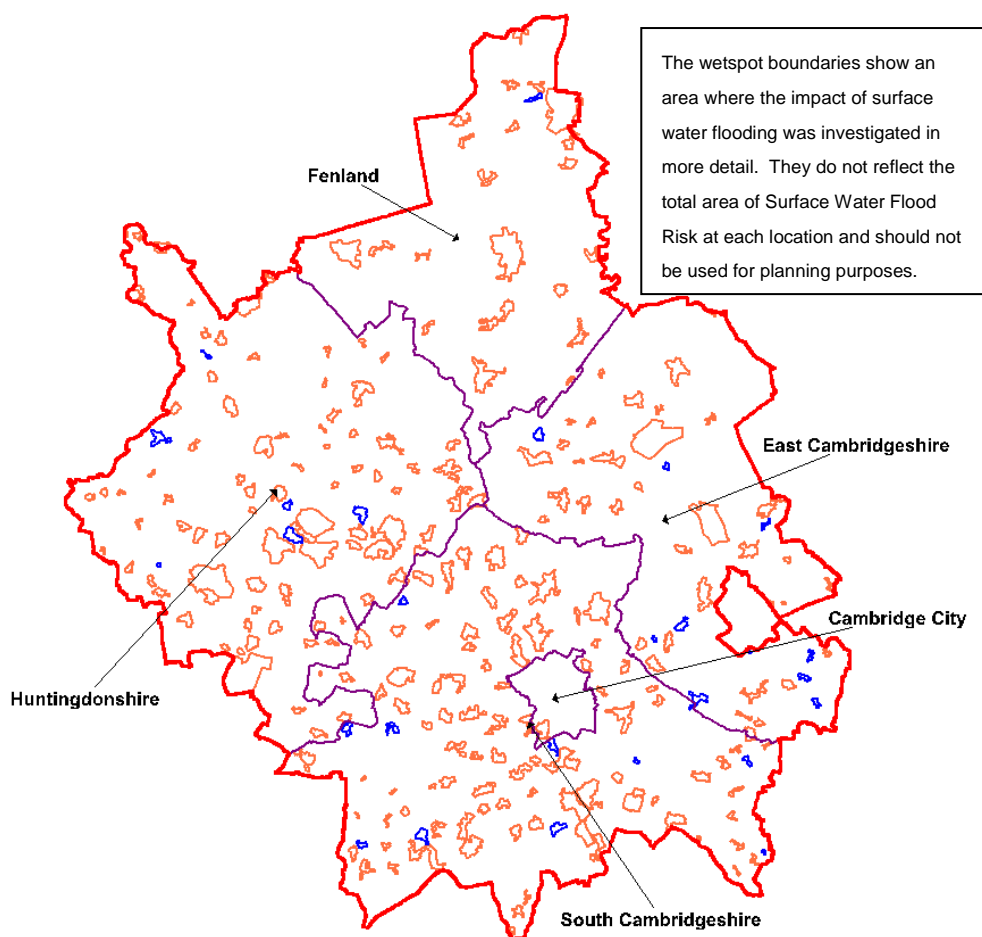


Figure 7-3 Locations of Countywide wetspots

7.3 Multi-Criteria Analysis (MCA)

For each identified wetspot, a Multi-Criteria Analysis was carried out. This analysis looks at the flood receptors within a wetspot and their susceptibility to flooding. A flood receptor is anything in the built or natural environment that can be affected by flooding, so can include properties, transportation links and environmental sites. The flood receptors within Cambridgeshire have been identified using a number of data sources, including the EA's NRD database, Local Authorities, AWS and the IDBs.

Once identified, each flood receptor is assigned a score based on its usage and its susceptibility to surface water flooding based on the EA's FMfSW. The scores for each property within each wetspot are then combined to give an overall MCA score for the wetspot.

Using these MCA scores, the wetspots can be prioritised to identify those at greatest risk of surface water flooding.

7.3.1 Flood Receptor Identification

Once all flood receptors had been compiled, they were divided into a number of categories:

- Domestic Properties

- Critical Infrastructure
- Non-Domestic Properties
- Transportation
- Land and Public Open Space
- Cultural

7.3.2 Domestic and Non Domestic Properties and Critical Infrastructure Identification

Property point data, i.e. the National Receptor Database (NRD), was obtained from the EA for the whole of the county area. This database was interrogated to identify domestic properties, critical infrastructure and non-domestic properties for use during the Multi-Criteria Analysis stage. Further consultation was undertaken with CCC's emergency planning, AWS and IDBs to update and consider critical infrastructure information at a more local level.

Domestic Properties

All those properties listed as “dwelling” within the property point database were identified. All domestic properties were then divided into their property type (detached, semi-detached, terrace or flat) using the “house type” provided in the property point database. It should be noted that the Web-GIS database also allows for the differentiation of bungalows, but this information is not given in the property point database and therefore was not used in this strategic assessment.

Critical Infrastructure

Critical infrastructure properties are those identified as having a greater cost or impact on the community should flooding affect them. This impact can be based on the number of people in a property, emergency services, utilities and the possibility of pollution. Those properties identified as critical infrastructure are listed below:

- Education Premises
- Hospital /Surgery / Health Centre / Residential Care Home
- Emergency Service – Fire / Police / Ambulance / Response Centre
- Water / Wastewater Treatment Works
- Pumping Stations
- Gas / Electrical Infrastructure – Refinery / Power Station / Sub-station
- Telecommunications Infrastructure
- Landfill Sites / Waste Licenced Sites / Radioactive Sites / Integrated Pollution Prevention and Control (IPPC)

Non-Domestic Properties

Property points not previously classified as domestic or critical were then analysed to identify non-domestic properties. These include shops, hotels, factories and playing fields etc. It should be noted that the NRD property points also contain locations such as ponds, farming or post-boxes but these have not been included within the strategic assessment.

7.3.3 Transportation Infrastructure Identification

Transportation information was provided by the Highways Department within Cambridgeshire County Council. This information consisted of the National Street Gazetteer for the county area and the 2009 Traffic Monitoring Report. Railway infrastructure was also provided by Cambridgeshire County Council. Using information provided in the traffic report, the road network within the county was graded according to measured traffic flows. All motorways, trunk roads and main county roads were graded, however smaller roads have not been graded and therefore not included in the MCA process.

7.3.4 Land and Public Open Space Identification

Land and public open space information was obtained from Natural England and the Cambridgeshire and Peterborough Biological Records Centre (CPBRC). This data listed all statutory areas, such as Sites of Special Scientific Interest (SSSIs), Special Areas of Conservation (SACs) and city and county wildlife sites. A full list is shown below:

- Special Area of Conservation (SAC)
- Special Protection Area (SPA)
- Ramsar Site
- Site of Special Scientific Interest (SSSI)
- County & City Wildlife Site
- County & City Nature Reserve
- RSPB Reserve
- Ancient Woodland, Fens & Environmentally Sensitive Areas
- World Heritage Site
- English Heritage Site
- National Park
- County Park
- Parks and Gardens of Special Historical Interest
- Scheduled Ancient Monuments (SAMs)
- Agricultural Land Classes

Potential flooding of agricultural land is an important issue in Cambridgeshire given the rural nature of the county and the increasing importance of food security.

7.3.5 Cultural Receptors Identification

Information about listed buildings and conservation areas were obtained from the County and District Councils and English Heritage.

7.3.6 Surface Water Flood Susceptibility Weighting

Following on from their release in October 2010, the EA's Flood Maps for Surface Water (FMfSW) were used to assign a surface water flood risk weighting score to each flood receptor described above.

Any receptor falling within the 200 year “shallow” map was assigned a susceptibility score of 1, while receptors in the 200 year “deep” maps were assigned a susceptibility score of 2. Therefore, the higher the susceptibility score, the greater the risk of surface water flooding of that receptor.

7.3.7 Scoring

Once all wetspots and flood receptors had been identified, they were uploaded to the Web-GIS database in order to obtain a Multi-Criteria Analysis (MCA) score for each wetspot.

The MCA score is calculated for each wetspot according to their potential flood risk and the likely damages to people, properties, infrastructure and the environment as a result of surface water flooding. It is determined according to:

- the number of flood receptors that are predicted to be at risk in each wetspot, as described in Sections 7.3.2 to 7.3.6;
- their flood susceptibility weighting score, as described in Section 7.3.6;
- their land use MCA weighting score, as agreed with the SWMP Project Management Board and CCC’s emergency planning team based on their presumed criticality over surface water flood risk vulnerability. For example, each domestic property was assigned a weighting of 2.34 (based on the average national occupancy rate), while hospitals could score up to 1,125 depending on the number of beds present.

A full list of all the flood receptors and their weighting criteria is given in Appendix C.

The methodology adopted for the MCA was consulted with the SWMP Project Management Board throughout the SWMP preparation, including stakeholder workshops and additional consultation with CCC’s emergency planning and highways teams and Natural England to finalise data sets and scoring.

By totalling the scores for each type of flood receptor, an overall MCA score is obtained for each wetspot. The MCA score for Bourn is shown below.

Bourn		
	Number in Wet Spot	MCA
Domestic Properties:	38	222.3
Commercial Properties:	9	127.0
Infrastructures:	0	---
Land / POS:	2	20.0
TOTAL	49	369.3

Figure 7-4 MCA Score for Bourn

Note that ‘commercial properties’ shown in Figure 7-2 include both critical infrastructure and other non-domestic properties whereas ‘infrastructures’ means transport infrastructure.

A list of all the defined wetspots and their MCA score is given in Appendix C and Figures C1 to C4 show the wetspots defined within each district council area excluding Cambridge and Milton detailed study area.

Those wetspots that scored the highest MCA scores and history of surface water flooding will then be progressed to the Intermediate and Detailed Assessment stages once agreed with the Steering Group.

It is also envisaged that a limited number of wetspots that currently have a low or medium MCA score will also be taken forward for further assessment as MCA adopted naturally lends to provide higher scores to the larger towns but local flood management strategies for other locations will help in achieving 'quick wins' and resolving local issues to smaller communities that are inherent in a rural county such as Cambridgeshire.

The exact number and time scale for further assessments are yet to be decided depending on local priority and funding needs; Section 8 provides further details on SWMP recommendations in this regard.

8 Next Steps - Action Plan

8.1 Intermediate and Detailed Assessments

Following the strategic assessment, the “Top Ten” wetspots ranked by MCA score are shown in the table below. Cambridge and Milton has been excluded from the rankings as this area has already been prioritised by Defra for detailed assessment prior to the involvement of HCL in the preparation of the Cambridgeshire SWMP; however the Cambridge & Milton MCA score is included in the first row of the table for comparison.

Rank	Wetspot	Council	MCA Score
	Cambridge & Milton	Cambridge City Council	24279.6
1	St Neots	Huntingdonshire	7014
2	Huntingdon	Huntingdonshire	5300.9
3	St Ives	Huntingdonshire	4861
4	Ely	East Cambridgeshire	4410.7
5	Girton	South Cambridgeshire	3522.9
6	Sawtry	Huntingdonshire	3142.4
7	March	Fenland	2796.3
8	Wisbech	Fenland	2547
9	Offord Cluny	Huntingdonshire	2479.9
10	Godmanchester	Huntingdonshire	2458.8

Table 8-1 Top Ten Wetspots based on MCA Score

A full list of all wetspots and their MCA scores is given in Appendix C.

8.1.1 Next Step 1 – Undertake detailed modelling and options appraisals for St Neots

St Neots is the next wetspot that has been identified for detailed modelling. A provisional scope of the work involved has identified a requirement to model the interaction between the surface water drainage network and the Main River Ouse as key to understanding the surface water flood risk in this area. As part of this step, a number of critical Anglian Water assets will be surveyed, alongside river surveys of the Great Ouse, and the Fox and Hen Brooks. Industry standard software for modelling integrated drainage systems will be used to identify and interrogate the risk in this area.

The options appraisal stage will involve modelling a range of soft and hard engineering solutions to give a strategic overview of the solutions that will provide the greatest benefits to the people of St Neots in terms of reducing flood risk.

8.1.2 Next Step 2 – Review of Stakeholder Asset Management and Capital Spending Plans for the next five years

Develop an integrated stakeholder asset management and capital spending plan to allow the identification and tracking of opportunities for adding value to these projects to deliver multiple benefits including helping to redress areas at risk of surface water flood risk. A regular review within the CFRMP will allow for improvements to be incorporated into these opportunities therefore assisting in delivering greater benefit from the private and public spending across the County.

This may include (but is not limited to) the identification of:

- Locations of future development and/or regeneration
- Locations of green infrastructure projects that may also allow opportunities to alleviate flood risk. The Cambridgeshire Green Vision are taking forward three Green Infrastructure elements including Green Corridors and through partnership working schemes such as these could provide opportunity to both alleviate flood risk and enhance green areas in Cambridgeshire.
- Locations of asset improvement projects across each stakeholder, such as a regular review of the planned Anglian Water Services AMP projects for clean and waste water infrastructure and the highways improvement schemes undertaken by the County Council or Highways Agency, amongst others.

8.1.3 Next Step 3 – Detailed analysis of District Priority wetspots

A review of the potential to undertake further detailed analysis for the remaining wetspots should be carried out to deliver a programme of works that assist with delivering tangible approaches to managing the risk within each District priority wetspot. A review of figures D1 to D4 in Appendix D will help to identify requirements for future detailed analysis projects within these wetspots.

The general methodology and principles that are currently being used in Cambridge and Milton Detailed SWMP should be used in these assessments but the modelling tools and approaches may vary depending on the local needs, including availability of existing models and data. It is also recommended that the scale of detailed modelling, hazard mapping and economic appraisals is best decided at a local level, in particular for those wetspots that require ‘quick wins’.

When considering the subsequent wetspots for further detailed analysis, consideration should be given to opportunities where Partnership working may be possible, following on from the review undertaken in Next Step 2.

8.1.4 Next Step 4 – Identification of quick wins

The complete Countywide wetspot list should be investigated to identify where smaller wetspots could be progressed to the intermediate stage, in order to assess the viability of “quick win” or inexpensive solutions that can be applied subsequently to a variety of similar smaller wetspots.

The identification of quick win wetspots should use both, local information i.e. where there is a known issue, and the existing Multi-Criteria Scoring information as the basis for their decisions.

When considering the longer list of wetspots for further detailed analysis, consideration should be given to opportunities where Partnership working may be possible, following on from the review undertaken in Next Step 2. SuDS, Local Flood Risk Management Strategies and “quick win” measures will be considered during the next stages of the SWMP.

8.2 Role of the Countywide SWMP Report in the Planning Process

This report summarises the strategic level assessment of surface water flood risk across the Cambridgeshire County area as per Defra SWMP guidance; the findings from the data collection phase, notably the incident registers, should be used to inform development proposals throughout the area. However for development occurring within the main urban area of Cambridge and Milton, the Cambridge and Milton detailed SWMP should be consulted in preference to the Strategic Assessment report as this provides a much greater level of detail.

This report informs the development of next stages Countywide SWMPs and will also be used to assist in the preparation of a Local Flood Risk Management Strategy. It also informs the PFRA process that is currently being prepared by HCL on behalf of CCC to satisfy the requirements of the Flood Risk Regulations 2009. Information on surface water flooding should also be included within local authority Strategic Flood Risk Assessments (SFRAs).

The Countywide SWMP does not provide a level of detail that can be used to make decisions on the allocation of land for different types of development in Local Development Frameworks (LDF). However, the report should be used to identify broad areas where surface water should be considered in more detail in a site based Flood Risk Assessment. It may also be used as an evidence base in the development of more general planning policies to help minimise the risk of flooding by surface water, such as policies promoting SuDS.

In order that planners are making best use of the information in the SWMP report when assessing planning applications and developing or reviewing their LDFs it is recommended that a guidance document is produced.

As planning policies are developed in LDFs which deal with surface water management, this guidance could be strengthened across the County to become a specific Supplementary Planning Document. However, until such policies are developed it is recommended that a guidance note on surface water management for planners is produced in the interim. This will need to contain advice for both policy planners and the allocating of sites for development, and also for development management officers in their consideration of planning applications.

8.2.1 Next Step 5 – Preparation of Planning Guidance Document

A guidance document should be produced for Local Planners on how to use more detailed modelling produced from the Countywide SWMP and Cambridge & Milton detailed SWMP in developing planning policies and assessing planning applications.

Whilst it is not possible to pre-empt what the guidance would contain we recommend that it provides advice on the following;

For strategic planners involved in developing the LDF:

- How to take account of SWMP data with regards to surface water and ordinary watercourse flooding when allocating sites. What weight this should be given and how the data should be used.

- Recommending the use of detailed surface water modelling information as an evidence base for identifying areas of surface water flood risk, and subsequently areas where developers will have to undertake an appropriate level of assessment of the Surface Water Flood Risk.

For Development Management Planning officers:

- Outline the information which should be requested from developers, to be submitted with their planning application, in relation to surface water in a site based Flood Risk Assessment (FRA).

The guidance will not recommend the use of the National 1st and 2nd Generation Surface Water Flood Maps in the consideration of individual planning applications. The scale in which this mapping was undertaken is not appropriate for this use.

The guidance should also consider:

- Recommendations for developers to consider the likelihood of urban creep (the cumulative impact that paving over front and rear gardens is having on towns and cities) in their design of surface water attenuation structures and include appropriate safety factors in these designs. This may include, but will not be restricted to, sensitivity testing of the assumptions made on extents of impermeable areas in new developments. We would expect this recommendation to be applied on a Countywide scale, not just where more detailed modelling exists.

The inclusion of measures to mitigate against Urban Creep comes as a result of findings in the Pitt Review of the Summer 2007 floods that suggested that increasing permeable areas through paving of front and back gardens and the building of conservatories can have a significant impact on the natural drainage of surface water and can increase the risk of surface water flooding.

The guidance should also include consideration of the advantages and disadvantages of the use of Article 4 Planning Directions to prevent removal of permeable areas, such as gardens with impermeable areas, and permitted development of small extensions and conservatories, in areas where the detailed modelling identifies key surface water flooding issues.

8.3 Emergency Planning

8.3.1 Next Steps 6 – Review of Council Emergency Plans

The Emergency Planning team at Cambridgeshire County Council should use historical data, updated flood receptors, MCA findings and broad wetspot areas to identify more vulnerable areas and prepare for suitable emergency planning measures.

8.3.2 Next Steps 7 – Review of Asset Vulnerability

All CFRMP partners and utility companies to undertake assessments of their key assets in the areas of surface water flood risk.

The sources of data should include the most detailed flood risk information available for the area of interest. This will allow identification of where the risks are critical to their operation so that suitable steps including contingency planning can be taken.

8.4 Sustainable Development & Rainwater Harvesting

Generally planning policies in the County encourage the use of SuDS. Developers need to consider the most appropriate SuDS measures for their site. As well as SuDS measures providing mitigation against flood risk, SuDS can provide environmental and amenity benefits to an area. As well as larger scale SuDS measures on development sites, individual homeowners can provide surface water attenuation through Rainwater Harvesting.

8.4.1 Next Steps 8 – Domestic Level Incentives

Householders should be encouraged to use water butts; either by working with existing schemes or through new initiatives. Whilst developers should not consider water butts as a method for reducing surface water run-off from a development site, water butts are a component part of SuDS measures.

They should be encouraged across the whole County area as a preventative measure as per CIRIA Interim Code of Practice for SuDS.

8.5 Monitoring

8.5.1 Next Steps 9 – Regular Review

The SWMP and its associated documents should be reviewed on a six yearly basis. This will ensure that the report is in line with the requirement to update the PFRA as specific in the Flood Risk Regulations 2009.

A detailed implementation and monitoring plan should also be produced as a final output from the SWMP once the detailed and options assessment stages are completed for the chosen wetspot. This should consider the impact of changing predictions on the impact of climate change on the review process.

8.6 Action Plan

Table 8-2 below outlines an indicative timetable for completing the next steps, at this stage indicative costs have not been included although within reason all costs associated with the strategic work for Surface Water Management Plans will be met by Cambridgeshire County Council as part of its leadership role as a 'Lead Local Flood Authority'. It is envisaged, however, in a time of frugality joint working to minimise costs will be considered wherever practicable. For example, joint working could be considered for an area that has been identified as requiring a detailed SWMP, that falls in an area requiring a 'Flood Risk Assessment' for development purposes.'

Next Step	Indicative Timescale	Lead Responsibility
1 Detailed Modelling of St Neots	6-12 Months	Huntingdonshire DC
2 Review Stakeholder Asset Management & Capital Spending Plans	Within 6 months	Cambridgeshire County Council
3 Detailed Analysis of top ten wetspots	6-12 Months	Cambridgeshire County Council
4 Identification of quick wins	6-12 Months	East Cambridgeshire DC, Cambridge City Council, Huntingdonshire DC, Fenland DC, South Cambridgeshire DC, Internal Drainage Boards,

Next Step		Indicative Timescale	Lead Responsibility
			EA, Anglian Water Services.
5	Preparation of Planning Guidance Document	3-6 Months	Cambridgeshire County Council in partnership with City and District Councils and the EA
6	Review of Council Emergency Plans	3-6 Months	Cambridgeshire County Council
7	Review of Asset Vulnerability	12-24 Months	CFRMP stakeholders and utility companies
8	Domestic Level Incentives	Ongoing	Cambridgeshire County Council & District Councils
9	Regular Review	Every 6 years	Cambridgeshire County Council

Table 8-2 Next Steps Timetable

9 References

- ¹ Sir Michel Pitt (2008) Learning Lessons from the 2007 Floods
- ² Department for Communities and Local Government (2010) Planning Policy Statement 25 Development and Flood Risk
- ³ Defra (2010) Surface Water Management Plan Technical Guidance
- ⁴ Making Space for Water; Taking for a new Government strategy for flood and coastal erosion risk management in England (2005)
- ⁵ Environment Agency (2010) Preliminary Flood Risk Assessment (PFRA) Final Guidance. GEHO1210BTGH-E-E
- ⁶ www.ciria.org.uk
- ⁷ CFRMP Stakeholder Engagement Plan (2010)
- ⁸ Environment Agency (2010) Great Ouse Catchment Flood Management Plan
- ⁹ Environment Agency (2009) River Nene Catchment Flood Management Plan
- ¹⁰ Atkins (2005) East Cambridgeshire Level 2 Strategic Flood Risk Assessment
- ¹¹ Bullen Consultants (2005) Fenland Level 2 Strategic Flood Risk Assessment
- ¹² JBA Consultants (2009) Wisbech Level 2 Strategic Flood Risk Assessment
- ¹³ Entec (2010) East Cambridgeshire and Fenland Water Cycle Strategy and Level 1 Strategic Flood Risk Assessment
- ¹⁴ Mott MacDonald / Posford Haskoning (2004) Level 2 Huntingdonshire Strategic Flood Risk Assessment
- ¹⁵ Faber Maunsell AECOM (2008) Huntingdonshire Water Cycle Strategy
- ¹⁶ Halcrow (2008) Cambridge Water Cycle Strategy
- ¹⁷ WSP (2010) South Cambridgeshire and Cambridge City Level 1 Strategic Flood Risk Assessment
- ¹⁸ Defra (2010) Flood and Water Management Act Section 9 – Local Flood Risk Management Strategies
- ¹⁹ <http://www.environment-agency.gov.uk/homeandleisure/floods/109548.aspx>