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**Calder Catchment Strategic
Flood Risk Assessment –
Volume II (Calderdale MBC)**

Final Report

July 2016

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This report describes work commissioned by Tom Ghee, on behalf of Kirklees Council, Calderdale Metropolitan Borough Council and Wakefield Council, by email dated 13 September 2013. The Councils lead representative for the contract was Tom Ghee of Kirklees Council. Mike Williamson of JBA Consulting carried out this work.

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Purpose

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Executive Summary

As set out in the National Planning Policy Framework¹ (NPPF) and its supporting Flood Risk and Coastal Change Planning Practice Guidance², Calderdale Metropolitan Borough Council as a Local Planning Authority is required to undertake a Strategic Flood Risk Assessment (SFRA) to support the preparation of their Local Plan. This Level 1 SFRA updates the previous Level 1 SFRA completed in 2008.

The SFRA forms an essential reference tool providing the building blocks for future strategic planning. Calderdale MBC should use the evidence provided in this SFRA to inform their knowledge of flooding, refine information on the EA Flood Map for Planning and determine the variations in flood risk from all sources of flooding. The SFRA should form the basis for preparing appropriate policies for flood risk management within the area.

The primary objective of the SFRA is to enable the Council to apply the Sequential and Exception Test in the development allocation and development management process set out in the NPPF.

The NPPF requires that all development is steered to areas of lowest flood risk, where possible. Development is only permissible in areas at risk of flooding in exceptional circumstances where it can be demonstrated that there are no reasonable available sites in areas of lower risk and that the benefits of that development outweigh the risks from flooding. Such development is required to include mitigation and management measures to minimise risk to life and property should flooding occur.

The previous SFRA in 2008 was prepared under Planning Policy Statement 25 (PPS25). However, since 2009 new legislation, policies, strategies and flood risk evidence have emerged. In September 2013, Kirklees Council, as lead Council, commissioned JBA Consulting to update the 2008 SFRA using the NPPF, the Flood Risk and Coastal Change Planning Practice Guidance and most up-to-date flood risk datasets.

This Level 1 SFRA collates all flood risk evidence into two volumes. The core output of a Level 1 SFRA is a series of flood risk maps illustrating the risk to potential development sites together with a development site assessment spreadsheet which aids the Local Planning Authorities with their Sequential Testing of sites. However, Calderdale Metropolitan Borough Council has requested a high level review of flood risk within the borough rather than a review of specific development sites. This Volume II report provides a review of flood risk across the borough and a high level review of fluvial and surface water flood risk. A high level review of the potential for designating critical drainage areas has also been carried out.

The Council must generate a finalised list of proposed development sites as part of their Local Plan. These sites should be assessed against the flood risk information provided in the SFRA Maps to screen against the level of flood risk to the sites. Where wider strategic objectives require regeneration in areas at risk of flooding, then the Council should consider the compatibility of vulnerability classifications and Flood Zones (refer to Flood Risk and Coastal Change PPG tables) and whether or not the Exception Test will be required before allocating sites. In this case, the decision making process should be transparent and information from this SFRA should be used to justify decisions to allocate land in areas at high risk of flooding.

When assessing potential sites for development, it is important to consider that each individual site will require further investigation, as local circumstances may dictate the outcome of any decisions. Such local circumstances include:

- If sites have planning permission but construction has not started, the SFRA will only be able to influence the design of the development e.g. finish floor levels. New, more extensive flood extents (from new models) cannot be used to reject development where planning permission has already been given
- Some sites may be able to develop round the flood risk. Planners are best placed to make this judgement i.e. will the site still be deliverable if part of it needs to be retained to make space for flood water

¹ National Planning Policy Framework, Department for Communities and Local Government, March 2012

² <http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/>

- Surrounding infrastructure may influence scope for layout redesign / removal of site footprints from risk
- Current land use. For brownfield sites, existing development could be taken into account as further development may not lead to increased flood risk. The Environment Agency may have their own views on this in regard to health warnings as new-build properties in risk areas could be built with flood protection in mind
- Existing planning permissions may exist on some sites where the Environment Agency may have already passed comment and / or agreed to appropriate remedial works concerning flood risk. Previous flood risk investigations / FRAs may already have been carried out at some sites

Scenarios for Development

There are several scenarios that could be considered when reviewing potential sites for development against flood risk. These could include:

- Rejection of a site for development in the Local Plan or refusal of planning permission if the Sequential Test cannot be passed.
- Where the Sequential Test can be passed, further considerations include:
 - Exception Test, where applicable
 - Consideration of site layout and design

If justified, accepting a site option or granting planning permission which may include ensuring the part of the site at risk of flooding is not developed.

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Abbreviations

AEP.....	Annual Exceedance Probability
AIMS	Asset Information Management System
AStSWF	Areas Susceptible to Surface Water Flooding
AStGWF.....	Areas Susceptible to Ground Water Flooding
CDA	critical drainage area
CFMP	Catchment Flood Management Plan
CMBC	Calderdale Metropolitan Borough Council
DCLG	Department of Communities and Local Government
FMfSW	Flood Map for Surface Water
FRA.....	Flood Risk Assessment
FWMA.....	Flood and Water Management Act
LFRMS.....	Local Flood Risk Management Strategy
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
NFCDD	National Flood and Coastal Defence Database
NPPF	National Planning Policy Framework
NRD	National Receptor Database
PFRA	Preliminary Flood Risk Assessment
PPG	Planning Practice Guidance
PPM	Planned Preventative Maintenance
PPS.....	Planning Policy Statement
RBMP.....	River Basin Management Plan
RFRA	Regional Flood Risk Appraisal
RMA	Risk Management Authority
SA	Sustainability Appraisal
SFRA	Strategic Flood Risk Assessment
SIRS.....	Sewerage Incident Register System
SWMP	Surface Water Management Plan
uFMfSW	updated Flood Map for Surface Water
WFD.....	Water Framework Directive
WIRS.....	Wastewater Incident Register System

1 Introduction

1.1 Commission

Kirklees Council (KC) commissioned JBA Consulting in September 2013 to undertake an update of the existing Level 1 Strategic Flood Risk Assessment (SFRA) in accordance with the Government's development planning guidance. The commission is in partnership with Calderdale Metropolitan Borough Council (CMBC) and Wakefield Council (WC). This updated SFRA makes use of the most up-to-date flood risk datasets to enable the local authorities to assess risk to the proposed development allocation sites and key settlements in the three Council areas.

1.2 Report Format

The Level 1 SFRA has been produced in two volumes, one generic 'front end' document applicable to all three Councils making up Volume I, and three separate documents aimed at each specific Council making up Volume II. Volume I introduces the SFRA and provides background information on flood risk. Volume II (this report) covers the National Planning Policy Framework and flood risk policy whilst assessing actual flood risk, flood risk within key communities and conclusions and recommendations for further work.

The structure of each volume has been prepared in sections, supported by mapping, which will enable users to identify and focus on their particular requirements and areas of interest. The strategic assessment of risk has broadly been carried out through the collection of readily available flood risk information in order to provide a spatial assessment of flood risk from all sources across the catchment.

1.3 SFRA Future Proofing

This SFRA was developed using the most up-to-date data and information available at the time of submission. The SFRA has been future proofed as far as possible though the reader should always confirm with the source organisation (the Council) that the latest information is being used when decisions concerning development and flood risk are being made. The National Planning Policy Framework (NPPF) and the Flood Risk and Coastal Change Planning Practice Guidance (PPG) are referred to throughout this SFRA as these are the current primary development and flood risk guidance documents available at the time of the finalisation of this SFRA.

2 The Planning Framework and Flood Risk Policy

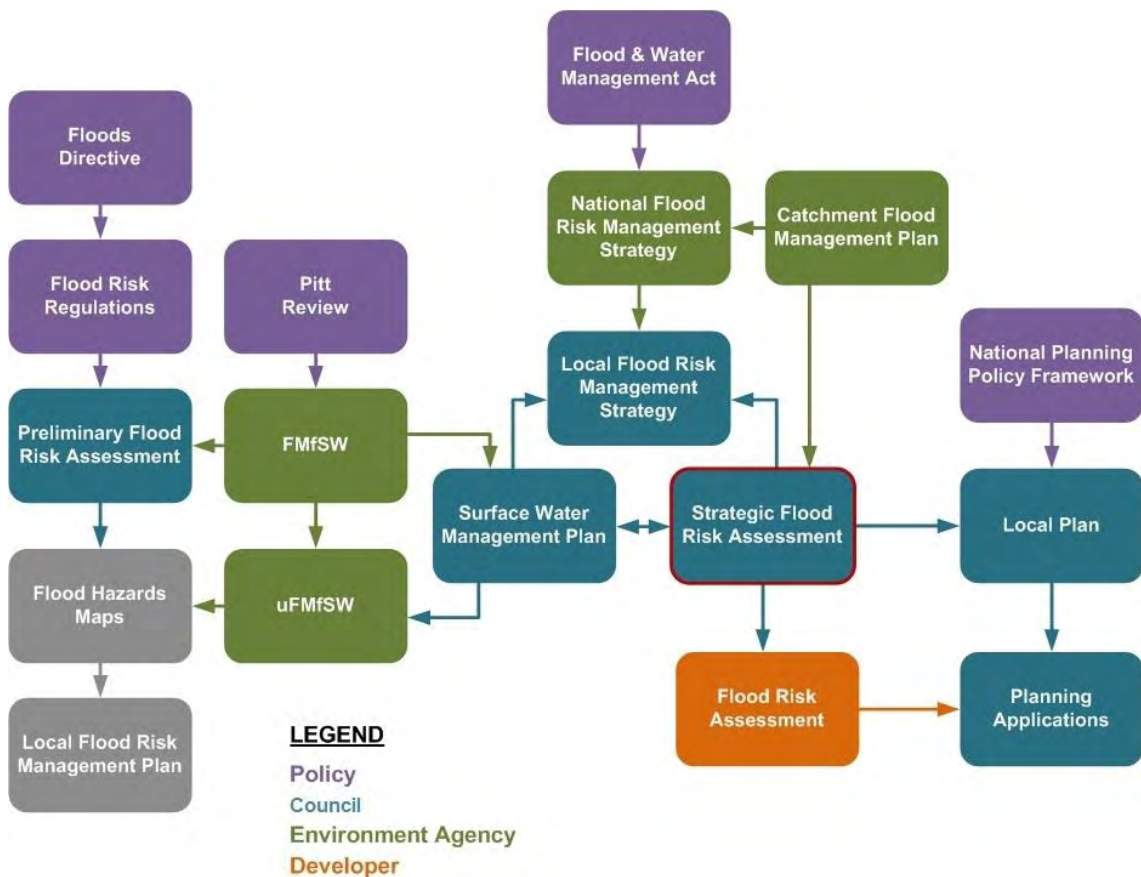
2.1 Introduction

The main purpose of this section of the SFRA is to provide an overview of the key planning and flood risk policy documents that have shaped the current planning framework. This section also provides an overview and context of the Council's responsibilities and duty in respect to managing local flood risk including but not exclusive to the delivery of the requirements of the Flood Risk Regulations (FRR) 2009 and the Floods and Water Managements Act (FWMA) 2010.

Figure 2-1 illustrates the links between legislation, national policy, statutory documents and flood risk assessments. The figure shows that whilst the key pieces of legislation and policy are separate, they are closely related and their implementation should aim to provide a comprehensive and planned approach to asset record keeping and improving flood risk management within communities.

It is intended that the non-statutory SWMPs and SFRAs can provide much of the base data required to support the delivery of statutory flood risk management tasks as well supporting Local Authorities in developing capacity, effective working arrangements and informing Local Flood Risk Management Strategies (LFRMS) and Local Plans, which in turn help deliver flood risk management infrastructure and new development at a local level.

Figure 2-1: Key Documents and Strategic Planning Links – Flood Risk



2.2 Legislation

2.2.1 EU Floods Directive & the Flood Risk Regulations

The European Flood Directive (2007) sets out the EU's approach to managing flood risk and aims to improve the management of the risk floods pose to human health, the environment, cultural heritage and economic activity.

The Directive was translated into English law by the Flood Risk Regulations (FRR) 2009 and outlines the requirement for the Environment Agency and Lead Local Flood Authorities (LLFA) to create Preliminary Flood Risk Assessments (PFRAs), with the aim of identifying significant Flood Risk Areas.

PFRAs should cover the entire area for local flood risk (focusing on ordinary watercourses, surface water and groundwater flooding). Where significant Flood Risk Areas are identified using a national approach (and locally reviewed), the LLFA are then required to undertake flood risk hazard mapping and Flood Risk Management Plans (FRMPs) as illustrated in Figure 2-2.

The FRMP will need to consider objectives for flood risk management (reducing the likelihood and consequences of flooding) and measures to achieve those objectives.

The Environment Agency has implemented one of the exceptions for creating PFRAs, etc for main rivers and coastal flooding, as they already have mapping (i.e. EA Flood Map for Planning) and plans (i.e. CFMPs) in place to deal with this. The Environment Agency has therefore focused their efforts on assisting LLFAs through this process.

Calderdale Preliminary Flood Risk Assessment

The Calderdale PFRA was published in July 2011 as required under the FRR. No flood risk areas significant on a European scale were identified within the PFRA so Flood Hazard Mapping was not carried out by the Council.

The PFRA identified flooding incidents at 2,177 locations in the Borough with the principle cause thought to be due to breakdown in field drainage and other infrastructure. Around 20% of the total incidents were considered to be of local significance however on a national scale, the majority of incidents recorded were relatively minor.

The PFRA recommended a study group be set up, as part of the Calderdale Flood Risk Management Group, to investigate the interaction between Main River and surface water infrastructure in order to understand how, where and when these interactions occur to cause surface water flooding. The Council's watercourse and surface water data collection and analysis system DAMS was recommended to be developed as an asset management tool alongside other corporate management tools. This helps to fulfil the Council's duty as a Risk Management Authority (RMA) under the Flood and Water Management Act (FWMA) to produce and maintain an asset register relating to flood risk.

2.2.2 Flood & Water Management Act

The Flood and Water Management Act (FWMA) was passed in April 2010. It aims to improve both flood risk management and the way we manage our water resources.

The FWMA creates clearer roles and responsibilities and instils a more risk-based approach. This includes a new lead role for Local Authorities in managing local flood risk (from surface water, ground water and ordinary watercourses) and a strategic overview role of all flood risk for the Environment Agency.

Figure 2-2: PFRA Process



The content and implications of the FWMA provide considerable opportunities for improved and integrated land use planning and flood risk management by Local Authorities and other key partners. The integration and synergy of strategies and plans at national, regional and local scales, is increasingly important to protect vulnerable communities and deliver sustainable regeneration and growth. Table 2-1 provides an overview of the key LLFA responsibilities under the FWMA.

Table 2-1: Key LLFA Duties under the FWMA

Responsibility	Description	Start Date
Local Strategy for Flood Risk Management	A LLFA is required to develop, maintain, apply and monitor a local strategy for flood risk management in its area. The local strategies will build on information such as national risk assessments and will use consistent risk based approaches across different Local Authority areas and catchments. The local strategy will not be secondary to the national strategy; rather it will have distinct objectives to manage local flood risks important to local communities.	Published February 2013
Investigating Flood Incidents	A LLFA has a duty to investigate and record details of significant flood events within their area. This duty includes identifying risk management authorities and their functions and how they intend to exercise those functions in response to a flood. The responding risk management authority must publish the results of its investigation and notify any other relevant risk management authorities.	Ongoing
Asset Register	A LLFA has a duty to maintain a register of structures or features, which are considered to have an effect on flood risk, including details on ownership and condition as a minimum. The register must be available for inspection and the Secretary of State will be able to make regulations about the content of the register and records.	Ongoing
Works Powers	The Act provides a LLFA with powers to do works to manage flood risk from surface runoff, groundwater and on ordinary watercourses, consistent with the local flood risk management strategy for the area.	Ongoing
Designation Powers	The Act provides a LLFA with powers to designate structures and features that affect flooding or coastal erosion. The powers are intended to overcome the risk of a person damaging or removing a structure or feature that is on private land and which is relied on for flood or coastal erosion risk management. Once a feature is designated, the owner must seek consent to alter, remove, or replace it.	Ongoing
Planning Requirements for SuDS	Sustainable Drainage Systems (SuDS) are to become a planning requirement for major planning applications of 10 or more residential units or equivalent commercial development schemes with sustainable drainage. The LLFA is now a statutory planning consultee and it will be between the LPA and the LLFA to determine the acceptability of these proposed sustainable drainage schemes subject to exemptions and thresholds. Approval must be given before the developer can commence construction. Planning authorities should use planning conditions or obligations to make sure that arrangements are in place for ongoing maintenance of any SuDS over the lifetime of the development.	April 2015
Latest changes to FWMA legislation. ³		

2.2.3 Water Framework Directive & Water Environment Regulations

The purpose of the Water Framework Directive (WFD) is to deliver improvements across Europe in the management of water quality and water resources. The WFD requires all inland and coastal waters to reach “good ecological status” by 2015 through a catchment-based system of River Basin Management Plans (RBMPs), incorporating a programme of measures to improve the status of all natural water bodies. There is an exception for “heavily modified water bodies”,

³ <http://www.legislation.gov.uk/ukpga/2010/29>

that are required to achieve “good ecological potential”. The Water Environment Regulations (2003) transposed the WFD into law in England and Wales. The Environment Agency is leading on the delivery of the WFD.

Calderdale is within the Humber River Basin District and the Environment Agency published the final River Basin Management Plan for the Humber River Basin District in December 2009. The main responsibility for CMBC is to work with the Environment Agency to develop links between river basin management planning and the development of Local Authority plans, policies and assessments. In particular, the programme of actions (measures) within the RBMP highlights the need for:

- Water Cycle Studies to promote water efficiency in new development through regional strategies and local development frameworks,
- Surface Water Management Plan implementation,
- Considering the WFD objectives (achieving good status or potential as appropriate) in the spatial planning process, including LDDs and Sustainable Community Strategies, and
- Promoting the wide scale use of Sustainable Drainage Systems (SuDS) in new development.

2.3 Planning Policy

2.3.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF) was published in March 2012, as part of reforms to make the planning system less complex and more accessible, to protect the environment and to promote sustainable growth. It replaces most of the Planning Policy Guidance Notes (PPGs) and Planning Policy Statements (PPSs).

The NPPF is guidance for Local Planning Authorities to help them prepare Local Plans and take development management decisions. The NPPF states that Local Plans

“...should be supported by a Strategic Flood Risk Assessment and develop policies to manage flood risk from all sources, taking account of advice from the Environment Agency and other relevant flood risk management bodies, such as Lead Local Flood Authorities and Internal Drainage Boards. Local Plans should apply a sequential, risk-based approach to the location of development to avoid, where possible, flood risk to people and property and manage any residual risk, taking account of the impacts of climate change.” (Para 100)

Planning practice guidance for flood risk and coastal change has been published, in March 2014, alongside the NPPF and sets out how policy should be implemented.

The Sequential Test procedure has also been carried forward from the now out of date PPS25 and must be performed when considering the placement of future development and for planning application proposals. The Sequential Test is used to direct all new development (through the site allocation process) to locations at least risk of flooding, giving highest priority to Flood Zone 1.

2.3.2 Flood Risk and Coastal Change Planning Practice Guidance (PPG)

On 6 March 2014 the Department for Communities and Local Government (DCLG) launched their planning practice guidance, including guidance for flood risk and coastal change, which replaces the Technical Guidance to the National Planning Policy Framework 2012. This new guidance is available as a web-based resource⁴, accessible to all. Whilst the NPPF concentrates on high level national policy and avoids prescriptive guidance, the PPG is more detailed. The new guidance advises on how planning can take account of the risks associated with flooding and coastal change in plan making and the application process.

⁴ <http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/>

2.3.3 Planning and Compulsory Purchase Act, 2004 – implications for the Planning System

The Planning and Compulsory Purchase Act (PCPA) radically changed the raft of documents required in order for a Local Plan to be produced and adopted. Previous documents – regional planning guidance, county structure plans, district local plans and unitary development plans, old-style ‘structure’ plans, were replaced with Regional Spatial Strategies and Local Development Frameworks contained within a series of Development Plan Documents (DPD). The DPDs usually include a core strategy, statement of community involvement, a waste DPD, green belt review DPD, land allocations DPD, development control DPD, area action plan DPD and also supplementary planning documents for example: affordable housing, management of housing supply, waterside development, (specific) town centre development, developer contributions towards education infrastructure and loss of employment land, open space provision and locally determined standards, sustainable design, renewable energy, planning obligations, and car park requirements.

2.3.4 Localism Act

The Localism Act was given Royal Assent in November 2011 with the purpose of shifting power from Central Government back to Councils, communities and individuals. The Government abolished the Regional Spatial Strategies, providing the opportunity for Councils to re-examine their local evidence base and establish their own local development requirements for employment, housing and other land used through the plan making process.

Additionally the Act places a duty to cooperate on Local Authorities, including statutory bodies and other groups, in relation to planning of sustainable development. This duty to cooperate requires Local Authorities to

“...engage constructively, actively and on an ongoing basis in any process by means of which development plan documents are prepared so far as relating to a strategic matter.” (Provision 110)

The Act also provides new rights to allow Parish or Town Councils to deliver additional development through neighbourhood planning. This means local people can help decide where new homes and businesses should go and what they should look like. Local Planning Authorities will be required to provide technical advice and support as neighbourhoods draw up their proposals.

2.3.5 Local Plan

A Local Plan⁵ should focus on land use development and protection, set within the context of wider social, economic and environmental trends and considerations. Reflecting the NPPF, Local Plans make strategic provision for the long-term use of land and buildings, providing a framework for local decision making and the reconciliation of competing development and conservation interests. They aim to ensure that land use changes proceed coherently, efficiently, and with maximum community benefit. Local Plans indicate clearly how local residents, landowners, and other interested parties might be affected by land use change. They are subject to regular periods of intensive public consultation, involvement and negotiation.

The NPPF requires that the evidence base for the Local Plan includes a SFRA. The SFRA should be used to ensure that when allocating land or determining planning applications, development is located in areas at lowest risk of flooding. Policies to manage flood risk should be written into the Local Plan.

Sustainability Appraisal

The Sustainability Appraisal (SA) is a key component of the Local Plan evidence base, ensuring that sustainability issues are addressed during the preparation of Local Plans. The SA is a technical document which assesses and reports on a plan’s potential impact on the environment, economy, and society and should be informed by this SFRA. The SA carries out an assessment of the draft policies at various stages throughout the preparation of the Local Plan, and does this by testing the potential impacts of the plan’s objectives and policies against a SA Framework. This ensures that the potential impacts from the plan on the aim of achieving sustainable development are considered.

⁵ Town and Country Planning, England. The Town and Country Planning (Local Planning) (England) Regulations 2012

Calderdale MBC Local Plan

The Council is currently, at the time of the submission of this SFRA, developing its Local Plan. The Local Plan will eventually supersede the Replacement Calderdale Unitary Development Plan (UDP), adopted 25 August 2006. Until the Local Plan has completely replaced the Replacement Calderdale UDP (2006), not likely to occur until the end of 2017, planning decisions will be based upon both sets of documents where relevant. The Local Plan will be evolving following the submission of this SFRA. For progress on the Local Plan, check the CMBC website at <http://www.calderdale.gov.uk/environment/planning/local-plan/progress.html>.

Once complete, the Local Plan will contain strategic policies, roughly equating to the Core Strategy, and Land Allocations and Designations.

Other documents within the Local Plan include:

- Evidence Base – the Local Plan must be based on robust evidence of the district's needs. A wide range of evidence has been commissioned to inform the Local Plan.
- Annual Monitoring Report – this sets out each year the effectiveness of policies and proposals in the Local Plan.
- Neighbourhood Development Plans – these community produced plans have been introduced by the Localism Act 2011 (Section 2.3.4). Once they have been examined and subject to the results of a referendum in the local area they will be "made" by the Local Planning Authority and become part of the development plan.
- Statement of Community Involvement (SCI) – the SCI sets out the processes to be used by the Council in involving the community in the preparation, alteration and review of Local Plan documents and decisions on planning applications.
- Supplementary Planning Documents (SPDs) – SPDs may cover a range of issues, thematic or site specific, and provide additional detail to policies contained within other planning documents such as the UDP, Core Strategy or Land Allocations and Designations documents.

2.4 Flood Risk Management Policy

2.4.1 Catchment Flood Management Plans

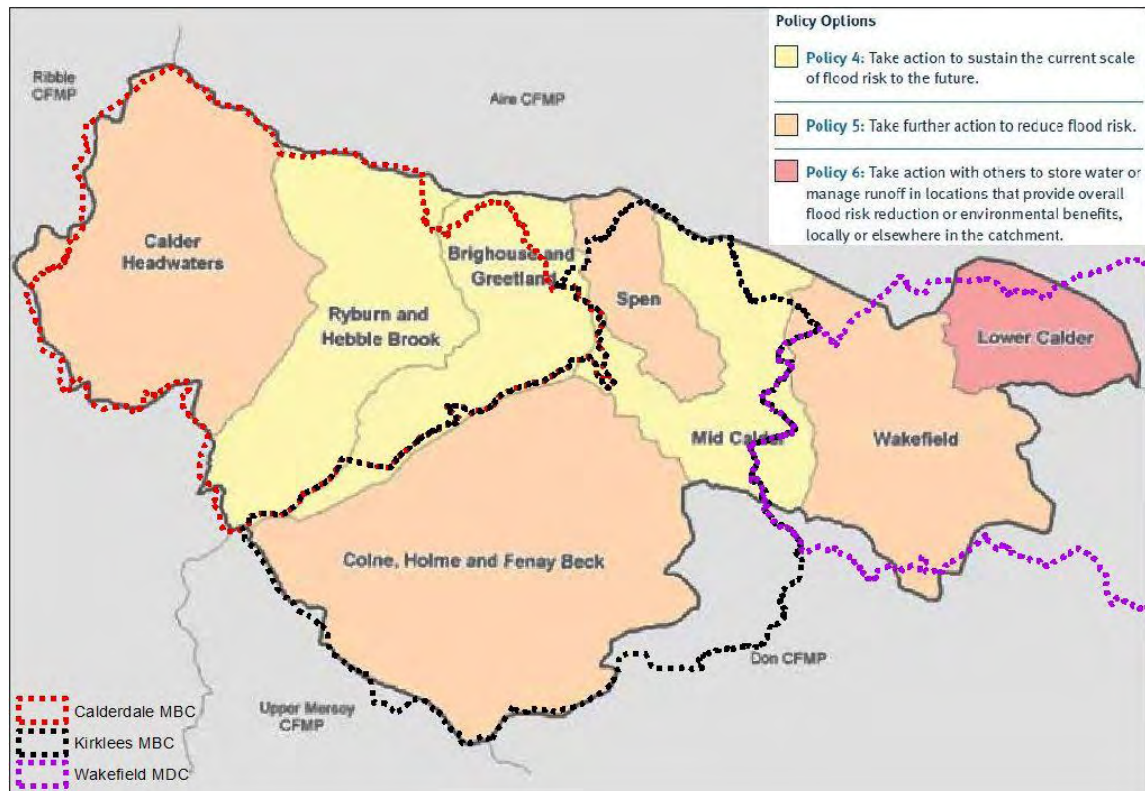
A Catchment Flood Management Plan (CFMP) is a key tool within spatial planning. As well as providing a broad overview of flood risk mainly from Main River and tidal sources, they develop complementary policies for long-term management of flood risk within the catchment that take into account the likely impacts of climate change, the effects of land use and land management, deliver multiple benefits and contribute towards sustainable development. This is critical when areas under development pressure coincide with high flood risk.

Chosen policies and actions highlight where to avoid development in those areas deemed inappropriate to reduce flood risk now and in the future. They also indicate when water should be allowed to flood or where current flood risk measures should be reduced. Development should therefore be focused towards the more 'sustainable' areas in terms of lower risk of flooding or where flood risk management is considered viable within the short and long-term plans. Therefore if development has been proposed in flood risk areas and the chosen policy is not to take further action to reduce flood risk, then developments will find it difficult to rely on Environment Agency led FRM infrastructure investment and there will be a great reliance on private (developer) funding to reduce risk. In this instance, development may not be viable.

As part of the CFMP process each CFMP area was divided up into broad areas (known as 'policy units'), which represent areas of similar characteristics, flood mechanisms and flood risks. Each policy unit was then assessed to decide which policy will provide the most appropriate level and direction of flood risk management both now and in the future. Whilst the policy unit simplifies direct action over vast areas of land, in reality, the chosen policy may only focus on a small urban or rural area within that policy unit.

The Calder CFMP covers all of Calderdale. Figure 2-3 illustrates the Calder CFMP policies.

Figure 2-3: Calder CFMP Policy Units⁶



It is important to note that Policy Options 4 and 5 do not automatically equate to the Environment Agency, or others, taking action on the ground. Any responses to the chosen policy options indicate a long-term approach to flood risk management and do not reflect the likelihood of any particular area qualifying for funding for a scheme under the Environment Agency's priority scoring system. The priority scoring system was set up by Defra to "ensure that the projects with the greatest benefits per unit cost are carried out first and to allow authorities to devote resources to those projects"⁷.

2.4.2 National and Local Flood Risk Management Strategies

The FWMA establishes that flood risk will be managed within the framework of National Strategies for England and Local Strategies for each LLFA area.

The National Strategy for England has been developed by the Environment Agency with the support and guidance of Defra. It sets out principles for how flood risk should be managed and provides strategic information about different types of flood risk and which organisations are responsible for their management. The Act requires risk management authorities (local authorities, internal drainage boards, sewerage companies and highways authorities) to act consistently with the National Strategy in carrying out their flood and coastal erosion risk management functions.

LLFAs have responsibility for developing a Local Flood Risk Management Strategy (LFRMS) for their area covering local sources of flooding. The local strategy produced must be consistent with the National Strategy. It will set out the local organisations with responsibility for flood risk in the area, partnership arrangements to ensure co-ordination between these, an assessment of the flood risk and plans and actions for managing the risk.

The Calderdale LFRMS is in the final stages of drafting (Iteration 1). It will not initially complete the task of risk assessment and establishment of action plans until the Calder Valley Flood Investment Plan, initiated following the summer floods of 2012, has completed its studies of the interaction between rivers, canal, sewers and surface water run-off.

⁶ Policy Units extracted from – Calder Catchment Flood Management Plan, Summary Report, December 2010

⁷ <http://www.publications.parliament.uk/pa/cm200708/cmselect/cmenvfru/49/4909.htm#a14>

2.4.3 Surface Water Management Plans

In June 2007, widespread extreme flooding was experienced in the UK. The Government review of the 2007 flooding, chaired by Sir Michael Pitt recommended “*Local Surface Water Management Plans (SWMPs) ... coordinated by local authorities, should provide the basis for managing all local flood risk.*”

The Governments guidance document⁸ for SWMPs defines a SWMP as:

- A 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.
- A tool to facilitate sustainable surface water management decisions that are evidence based, risk based, future proofed and inclusive of stakeholder views and preferences.
- A plan for the management of urban water quality through the removal of surface water from combined systems and the promotion of SuDS.

As a demonstration of its commitment to SWMPs as a structured way forward in managing local flood risk, Defra announced an initiative to provide funding for the highest flood risk authorities to produce SWMPs.

Calderdale MBC has not produced a Borough-wide Surface Water Management Plan. Previously however, Defra identified 77 locations nationally where SWMPs were deemed necessary, and one of these was Todmorden in the west of the Borough.

The LFRMS may recommend other locations where SWMPs may be needed, in areas where there is significant surface water flood risk and / or development pressure.

2.5 Roles and Responsibilities

The new and emerging responsibilities for the risk management authorities (RMA) under the Flood and Water Management Act and the Flood Risk Regulations are summarised below.

2.5.1 Environment Agency as a RMA

The Environment Agency:

- Has a strategic overview role for all forms of flooding.
- Has the power to request information from any partner in connection with its risk management functions.
- Must exercise its flood or coastal erosion risk management functions in a manner consistent with the National Strategy and Local Strategies.
- Must be consulted on Local Strategies, if affected by the strategy, by the LLFA.

2.5.2 Calderdale MBC as a LLFA

- Must develop, maintain, apply and monitor a strategy for local flood risk management. This must be consulted on with all RMAs, the public and all other partners with an interest in local flood risk.
- The Act also imparts several other responsibilities on LLFAs
 - LLFAs are required to coordinate local flood risk management between relevant authorities and partners.
 - LLFAs are empowered to request information from others when it is needed in relation to their flood risk management functions.
 - Where it considers this necessary or appropriate, the LLFA must investigate flooding incidents in its area.
 - LLFAs have a duty to establish and maintain a record of structures within their area that have a significant impact on local flood risk.
 - LLFAs are empowered to designate structures and features that affect flooding.

⁸ Surface Water Management Plan Technical Guidance - <https://www.gov.uk/government/publications/surface-water-management-plan-technical-guidance>

- The LLFA must make provision for the determination, approval and adoption of sustainable drainage.
- LLFAs have powers to undertake works to manage flood risk from surface runoff and groundwater. Powers in relation to Ordinary Watercourses remain with district authorities.
- LLFAs must exercise their flood and coastal erosion risk management functions in a manner consistent with the National Strategy and the Local Strategy.
- LLFAs are permitted to agree the transfer of responsibilities for risk management functions (except the production of a Local Strategy) to other RMAs.
- Local Authorities and other RMAs must aim to contribute to sustainable development.
- LLFAs should consider flooding issues that require collaboration with neighbouring LLFAs and other RMAs.

2.5.3 Yorkshire Water as a RMA

Yorkshire Water:

- Has a duty to act in a manner that is consistent with the National Strategy and have regard to Local Strategies.
- Must be consulted on Local Strategies, if affected by the strategy, by the relevant LLFA.
- Has a duty to be subject to scrutiny from LLFAs.

2.5.4 Highways Service (CMBC) as a RMA

- Has a duty to act consistently with the National Strategy and Local Strategies.
- Has responsibility for ensuring effective drainage of local roads in so far as ensuring drains and gullies are maintained.
- Must be consulted on Local Strategies, if affected by the Strategy, by the relevant LLFA.
- Has a duty to be subject to scrutiny from LLFAs.

2.5.5 The Public

- Must be consulted on Local Strategies by the LLFA.
- The public have a key role in ensuring Local Strategies are capable of being successfully delivered within the community. They should actively participate in this process and be engaged by the LLFA.

2.5.6 Riparian Owners

A riparian owner is someone who owns land or property alongside a river or other watercourses including a culvert. A watercourse is any natural or artificial channel through which water flows, such as a river including where rivers flow through a culvert, brook, beck, or mill stream.

Riparian owners have statutory responsibilities, including:

- Maintaining river beds and banks;
- Allowing the flow of water to pass without obstruction;
- Controlling invasive alien species

Further guidance for riverside property owners can be found in the Environment Agency's helpful booklet 'Living on the Edge, 4th Edition'⁹ published in June 2013.

⁹ <http://www.environment-agency.gov.uk/homeandleisure/floods/31626.aspx>

2.5.7 Developers

- Have a vital role in ensuring effective local flood risk management by avoiding development in areas at risk of flooding. Local Strategies should form a key element of local planning guidance.

3 Flood Risk in Calderdale

3.1 Flood Risk Datasets

This section of the SFRA provides a strategic overview of flood risk from all sources within the Borough. The information contained is the best available at the time of publication and is intended to provide the Council with an overview of risk. Where further detail is available, then the source of information is provided. Table 3-1 provides a summary of the key datasets used in this SFRA according to the source of flooding.

Table 3-1: Flood Source and Key Datasets

Flood Source	Datasets
Fluvial	Environment Agency Flood Map for Planning
	Environment Agency Risk of Flooding from Rivers and the Sea Map
	Environment Agency Flood Risk Mapping Studies
	Section 19 flood investigation reports
	Calder CFMP
	Historic evidence – Environment Agency Recorded Flood Outlines and Historic Flood Map, local evidence from CMBC drainage engineers
Pluvial (surface water runoff)	Environment Agency Surface Water Flood Maps – uFMfSW
	Calderdale PFRA
	Todmorden SWMP
	Local evidence from CMBC drainage engineers
	Section 19 flood investigation reports
Sewer	Yorkshire Water Historical Flood Records (DG5 Register)
Groundwater	Environment Agency Groundwater Susceptibility Maps
Canal	Canal & River Trust Asset Register
Reservoir	Environment Agency Reservoir Flood Maps (available online)
Flood Risk Management Infrastructure	Environment Agency Asset Information Management System (AIMS)
	Canal & River Trust Asset Register

3.1.1 2015 Winter Floods

Following widespread flooding across Calderdale during the winter of 2015, the Environment Agency are working with partners to pull together information and data. This information is not available at the time of writing but will be important when making future decisions on development and flood risk.

3.2 Fluvial Flooding

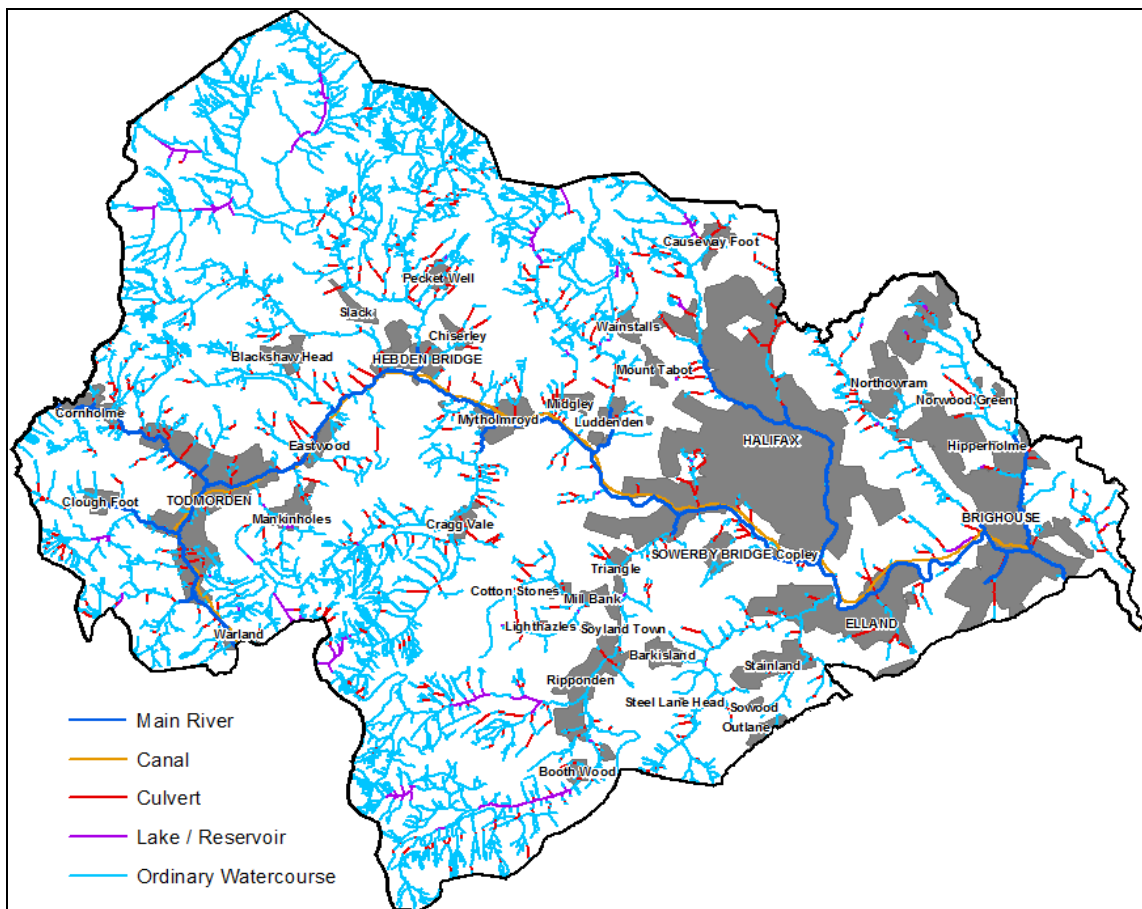
Fluvial flooding is associated with the exceedance of channel capacity during higher flows. The process of flooding from watercourses depends on a number of characteristics associated with the catchment including geographical location and variation in rainfall; steepness of the channel and surrounding floodplain; and infiltration and rate of runoff associated with urban and rural catchments. It should be noted that for some proposed development sites that are not considered to be at risk from fluvial flooding, a Flood Risk Assessment (FRA) may be required to assess risk from non-fluvial sources. Non-fluvial flood sources are discussed over the next few sections.

The Calderdale Borough covers roughly 36,392 hectares and lies within the River Calder catchment. The Borough contains several Main Rivers with the River Calder flowing easterly through the towns of Todmorden, Mytholmroyd, Sowerby Bridge, Elland and lastly Brighouse. The main tributaries are that of Walsden Water in the west and Hebble Brook in the east. Walsden Water flows through the town of Walsden and joins the Calder in Todmorden. Hebble Brook flows from its source downstream of Ogden Reservoir and flows south through Halifax before feeding the Calder at the southern end of Halifax. Other notable smaller Main River tributaries include Hebden Water in Hebden Bridge, Cragg Brook at Mytholmroyd, Luddenden Brook at Luddenden, River Ryburn at Sowerby Bridge and Red Beck, Jumble Dike and Clifton Beck all in Brighouse.

Together with the aforementioned Main Rivers, there are approximately 7,000 Ordinary Watercourses across the Borough, generally feeding the Main Rivers. Ordinary Watercourses are any watercourses that are not designated a Main River. These watercourses can vary in size considerably and can include rivers and streams and all ditches, drains, cuts, culverts, dikes, sluices, sewers (other than public sewers within the meaning of the Water Industry Act 1991) and passages, through which water flows.

Prior to the enactment of the FWMA, the responsibility for the regulation of Ordinary Watercourses was often not clearly identified. As a result, their conditions are likely to be highly variable. Consequently, it is likely that there will be several locations where structures on Ordinary Watercourses will be in a significant state of disrepair. Furthermore, the condition of the assets will continue to deteriorate over time. Figure 3-1 presents a breakdown of the Environment Agency's Detailed River Network (DRN) dataset in Calderdale.

Figure 3-1: Detailed River Network



3.2.1 Historic Fluvial Flooding

CMBC drainage engineers imparted their local knowledge of past flood events within the Borough with both fluvial and pluvial flooding (see Section 3.3.2) responsible. Runoff from the steep moorland around a number of urban areas causes major flooding to the towns in the valley

bottom with the road networks acting as floodwater pathways. There is a particular issue with sedimentation of culverts and other drainage infrastructure due to material being transported from surrounding moorland to the watercourse network. This has led to blockages and subsequent backing up of flows in the past, causing out of bank flows and flooding.

The bullets below provide an overview of known fluvial flood incidents in the Borough, provided by CMBC drainage engineers:

- Todmorden, 1982 – large scale flooding at the head of the River Calder caused by culverted river sections upstream of Todmorden becoming blocked due to a build up of silt and bed material. This led to remedial works being carried out such as culvert clearance and the installation of silt / gravel traps.
- Walsden Water is prone to causing fluvial flooding of Walsden and Todmorden. Walsden suffered greatly during the floods of 2012. The chief cause was from the large number of small tributaries of Walsden Water running down from surrounding moorland and causing capacity exceedance of the Walsden Water channel. A recently engineered flood balancing facility could not help prevent the flooding as it is located on a branch of the channel that did not flood.
- Ramsden Clough watercourse, a tributary of Walsden Water, causes sedimentation of structures and subsequent flooding, particularly of the road crossing near the cricket ground, if regular maintenance to clear the structures is not carried out. There are no silt / gravel traps in place on Ramsden Clough.
- Walsden – Railway Bridge 96 floods regularly due to low clearance and shoaling.
- Clough Foot, Bacup Road – suffers runoff from steep moorland on to Bacup Road. The highway known to flow like a river.
- Hebden Bridge, June 2012 – major fluvial flooding. There are considerable turbulence issues at the Hebden Water / River Calder confluence. It is estimated that water levels here could be reduced by up to 0.8 m, if laminar flow were to be established, thus keeping water in bank. There are also known flooding issues related to the Rochdale Canal and sewer capacities in Hebden Bridge are unknown.
- Mytholmroyd – suffers from multiple flood mechanisms. Excessive vegetation cover on the banks of the Calder can cause backing up of flows. Vegetation clearance works are ongoing. As per Hebden Bridge, the sewer capacity of the town is unknown and defences on the Calder in this area are in very poor condition. Raised defences, with a standard of protection of 50 years, have a number of large cracks in the walls which allow water to get through. White Lea Clough watercourse, adjacent to Midgley Road in the village centre, is prone to cause flooding. Also, recent (October 2013) flooding from the Rochdale Canal into the Clough causing out of bank flows.
- Cragg Vale – suffers fluvial flooding from Cragg Brook and due to large number of tributaries running from surrounding steep sided moorland. Cragg Brook caused flooding of Cragg Vale and Mytholmroyd in the late 1980s. Highway flooding is prevalent in Cragg Vale and Mytholmroyd. Culvert inspections are required to determine capacity and condition.
- Sowerby Bridge is prone to fluvial flooding. There is a low lying area at the confluence with the River Ryburn that is particularly prone to flooding. A previous pluvial event around the golf course caused flooding of Watson Mill Lane which led to the road being eroded down to the sewer network below. A number of properties also flooded.
- The Rochdale Canal played a major part in the June 2012 floods in the Calder Valley. Excessive water from smaller moorland tributaries entered the canal and those watercourses that travel beneath, overtopped into the canal due to culvert blockages from bed material.
- Luddenden Brook produced the worst fluvial event ever recorded in Calderdale on 19th May 1989. The Walshaw Dean raingauge measured 192 mm in under two hours leading to flooding of properties in Luddenden and Luddendenfoot.
- Copley, Halifax – suffered much historic flooding. Levees subsequently built on the River Calder to limit the risk.
- Elland – the large meander on the River Calder, at Low Fields, flooded into adjacent Calder & Hebble Navigation Canal caused flooding of properties in 2008 and 2012.

There is also a high probability of flooding of the Low Fields Business Park. Part of this area of land is raised against flood waters however the lower parts almost flooded in 2008.

- Brookfoot, Brighouse – flooding from the main valley sewer which joins the Red Beck sewer – the downstream capacity is too small. A scheme set up to penstock and pump water around this section is often unsuccessful. The local factory is regularly flooded.
- Clifton Beck, Brighouse – causes regular flooding of the Tesco car park and Wellholme Park. Much came from Yorkshire Water sewers in 2008 flood but Clifton Beck was also responsible. There are also a number of properties at risk on River Street in Brighouse. Flooding of several properties occurred during 2008 and 2012 floods.

The Section 19 flood investigation report for the 22nd June 2012 flood event¹⁰ identified the following fluvial flood mechanisms:

- Main River overtopping defences
- Interaction of Main River and the Rochdale Canal causing flooding to surrounding areas
- River Calder Sub-catchment watercourses surcharging onto railways and highways

The urban areas most affected as a result of this flood event were Walsden, Todmorden, Hebden Bridge, Mytholmroyd and the small villages of Brearley and Luddenden Foot. Sections 3.3.2 and 3.3.4 list the surface water and sewer flooding mechanisms respectively.

The Section 19 flood investigation report for the 6-9th July and 25th August 2012 flood events¹¹ cites heavy rainfall as the cause of flooding. In fluvial terms, the River Calder sub-catchment watercourses overtopped due to the excess rainfall. Section 3.3.2 discusses the pluvial flood mechanisms that led to the flooding of a number of urban areas.

Environment Agency Historic Flood Map

The Historic Flood Map (HFM) shows areas of past fluvial flooding. These outlines can be viewed on the accompanying SFRA Maps. The HFM covers the majority of the River Calder and Walsden Water with the urban areas of Todmorden, Eastwood, Hebden Bridge, Mytholmroyd, Halifax, and Elland in particular covered by the HFM.

3.2.2 Environment Agency Flood Map for Planning

The Environment Agency's Flood Map for Planning is the main dataset used by planners for predicting the location and extent of fluvial and tidal flooding. This is supported by the CFMPs and a number of detailed hydraulic river modelling reports which provide further detail on flooding mechanisms.

The Flood Map for Planning provides flood extents for the 1 in 100 year fluvial (Flood Zone 3), 1 in 200 year tidal (also Flood Zone 3) and the 1 in 1000 year fluvial and tidal flood events (Flood Zone 2). Flood zones were originally prepared by the Environment Agency using a methodology based on the national digital terrain model (NextMap), derived river flows (Flood Estimation Handbook (FEH)) and two dimensional flood routing. Since their initial release, the Environment Agency has regularly updated their flood zones with detailed hydraulic model outputs as part of their flood risk mapping programme.

The EA Flood Map for Planning is precautionary in that it does not take account of flood defences (which can be breached, overtopped or may not be in existence for the lifetime of the development) and, therefore, represents a worst-case extent of flooding. The flood zones do not consider sources of flooding other than fluvial and tidal, and do not take account of climate change. The Environment Agency also provides a 'Risk of Flooding from Rivers and the Sea Map'. This map shows the Environment Agency's assessment of the likelihood of flooding from rivers and the sea, at any location, and is based on the presence and effect of all flood defences, predicted flood levels and ground levels. This dataset is discussed further in Section 3.2.5.

This SFRA uses Flood zones 2 and 3 (3a) of the February 2016 EA Flood Map for Planning. The Environment Agency Areas Benefitting from Defences and Flood Storage Area datasets are

¹⁰ Flood Investigation Report, Section 19, Flood & Water Management Act (2010), Upper Calder Valley, Calderdale Council. January 2013

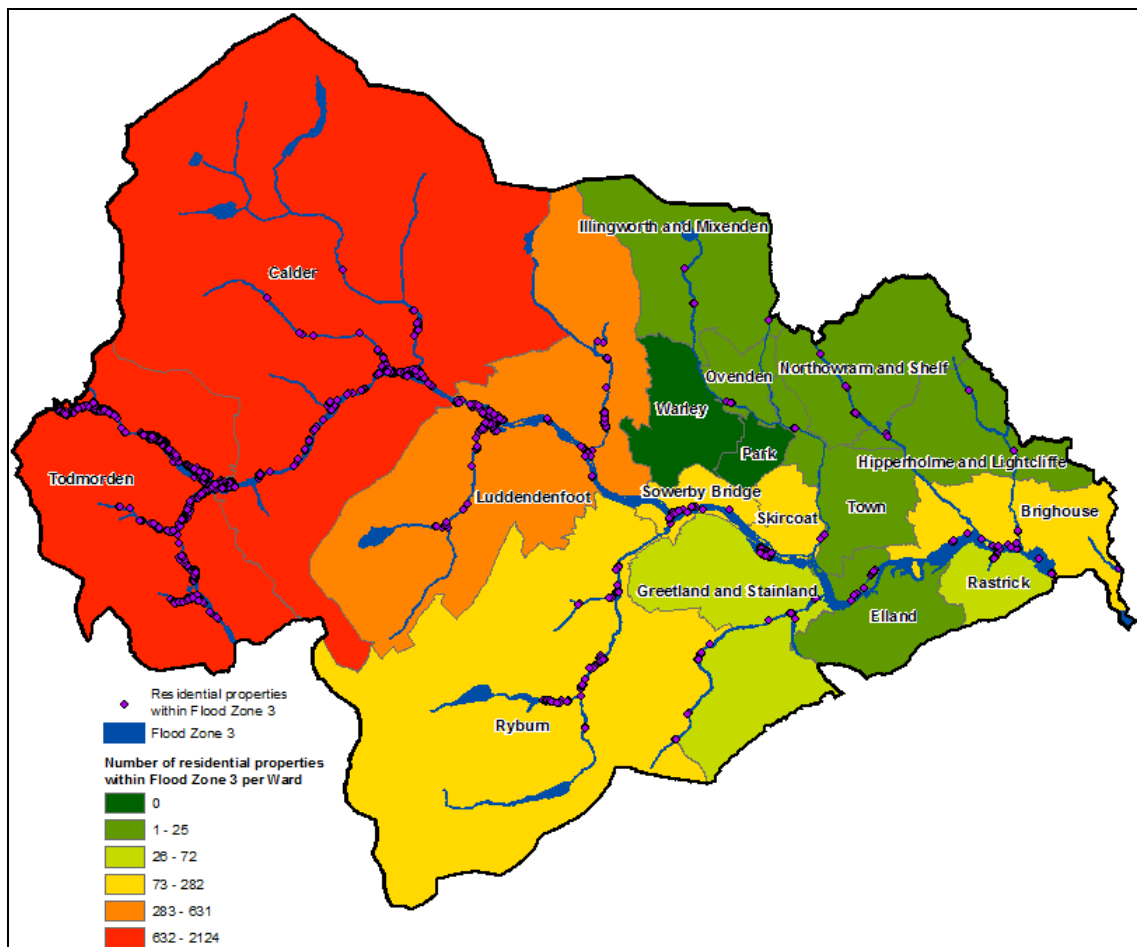
¹¹ Flood Investigation Report, Section 19, Flood & Water Management Act (2010), Upper Calder Valley – 6-9th July & 25th August 2012 Flood Incidents, Calderdale Council. March 2013

also from the February 2016 Flood Map. The River Calder downstream of Eastwood has been remodelled and was completed in June 2015. See Section **Error! Reference source not found.** for the site assessment.

Using the Flood Map for Planning Flood Zone 3, the number of existing residential properties potentially at risk from the 1 in 100 year fluvial flood event has been identified¹² to present risk spatially across the Borough. Figure 3-2 illustrates the distribution and total number of existing dwellings at risk in each Calderdale Ward.

In the whole Borough, 4,648 residential properties have been identified to be within Flood Zone 3. The Wards with the most properties at risk include Todmorden, Calder, and Luddendenfoot with 2,124, 805 and 631 residential properties at risk respectively. Like the Flood Zones, these numbers include the properties that may be protected, to some extent, by flood defences.

Figure 3-2: Residential Properties within Flood Zone 3 (2013 Flood Map for Planning) per Ward



3.2.3 Functional Floodplain

The NPPF and the Flood Risk and Coastal Change Planning Practice Guidance define functional floodplain as Flood Zone 3b and is described as land where water has to flow or be stored in times of flood and includes water conveyance routes and flood storage areas. CMBC has agreed on the areas defined as functional floodplain, in this SFRA, with the Environment Agency. The practice guidance states that ‘the identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters’.

The functional floodplain is usually defined by more frequent flood events, such as the 1 in 20 or 1 in 25 year flood outlines, but does not include currently developed land or areas that benefit

¹² Residential properties at risk have been identified using a GIS query. Initially OS MasterMap building polygons that intersect Flood Zone 3 were selected. The selected buildings were then used to query NRD property points with the theme ‘Dwelling’.

from raised flood defences, infrastructure or buildings. The following areas are not included in an area of functional floodplain:

- Land already benefiting from raised flood defences as identified in the Environment Agency's Areas Benefiting from Defences (ABD) GIS layer;
- Currently developed land where no flood alleviation function has been defined;
- Major transport infrastructure (e.g. motorways and railways).

As part of this SFRA, the Environment Agency provided all its available hydraulic river models for the Borough. Where the 1 in 20 year outlines were available, they were used to define the functional floodplain. Where a 1 in 20 year outline had not been produced, the 1 in 25 year outline was used.

Where river models were not available, identified sites are located in Flood Zone 3a. Flood Zone 3a is defined as the areas of Flood Zone 3 that is not functional floodplain. It is recommended that further analysis is carried out during detailed site specific FRAs to improve the understanding and assessment of the actual risk and extent of any functional floodplain for those proposed sites within Flood Zone 3a where 20 year or 25 year outlines were not available.

3.2.4 Flood Zone 3ai

The Flood Zone 3ai approach has been implemented by the council. Flood Zone 3ai can be defined as developed land within Flood Zone 3b where water would flow or be stored in times of flooding if not already constrained by development. In NPPF terms this is part of Flood Zone 3a but following discussions with the Environment Agency it was agreed that Flood Zone 3a should be subdivided. Identification of zone 3ai allows the council to assess risk within 3a in more detail showing areas where existing development is likely to be restricting flood flows and water storage that would otherwise be within the functional floodplain. Should sites in Flood Zone 3ai become available for new or further development (e.g. as brownfield sites) then both the risk at the sites and their role in managing flood risk in the surrounding area should be carefully considered in line with Local Plan policies. Flood Zone 3ai includes the areas of land that would be in Flood Zone 3b if not already developed and should therefore be used as an indicator of flood risk, from a modelled 1 in 20/25 year event, to existing developed sites.

Flood Zone 3ai has been defined using the same 1 in 20 and 1 in 25 AEP event outlines produced from flood risk mapping studies that were used to create the functional floodplain. These outlines were assessed and refined by the LPA and the Environment Agency, based on their local knowledge.

3.2.5 Environment Agency Risk of Flooding from Rivers and the Sea Map

This map shows the likelihood of flooding from rivers and the sea based on the presence and effect of all flood defences, predicted flood levels and ground levels. The map splits the likelihood of flooding into four risk categories:

- High – greater than to equal to 1 in 30 (3.3%) chance in any given year
- Medium – less than 1 in 30 (3.3%) but greater than or equal to 1 in 100 (1%) chance in any given year
- Low – less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year
- Very Low – less than 1 in 1,000 (0.1%) chance in any given year

The SFRA Maps present the Risk of Flooding from Rivers and the Sea Map to enable a comparison with the 'undefended' Flood Map for Planning. It is a supplementary piece of flood risk information to assist the LPA in the decision making process for site allocation and the Flood Map for Planning should be used for the Sequential testing of site allocations, as per the Flood Risk and Coastal Change PPG. Details on this assessment can be found in Section **Error! Reference source not found.**

3.3 Surface Water Flooding

Surface water flooding, in the context of the Calder Catchment SFRA, includes:

- Surface water runoff (also known as pluvial flooding); and
- Sewer flooding

Surface water flooding can occur anywhere in Calderdale where ground levels and terrain profiles tend to cause surface water to flow and accumulate. However, there are certain locations where the probability and consequence of these mechanisms are more prominent due to the complex hydraulic interactions in the urban environment. Urban watercourse connectivity, sewer capacity, and the location and condition of highway gullies all have a major role to play in surface water flood risk.

It should be acknowledged that once an area is flooded during a large rainfall event, it is often difficult to identify the route, cause and ultimately the source of flooding without undertaking further site specific and detailed investigations.

The updated Flood Map for Surface Water (uFMfSW) is used to carry out an assessment of surface water risk to proposed development allocations in this SFRA. See Section 3.3.3 for information regarding the uFMfSW.

3.3.1 Pluvial Flooding

Pluvial flooding of land from surface water runoff is usually caused by intense rainfall that may only last a few hours, or even minutes in the case of parts of Calderdale. In these instances, the volume of water from rural land can exceed infiltration rates in a short amount of time, resulting in water flowing over land. Within urban areas, this intensity is too great for the urban drainage network resulting in excess water flowing along roads, through properties and ponding in natural low spots. Areas at risk can, therefore, lie outside of the fluvial flood zones.

Pluvial flooding within urban areas will typically be associated with events greater than the 1 in 30 year design standard of new sewer systems. Some older sewer and highway networks will have significantly less capacity than the 1 in 30 year event. There is also a residual risk associated with these networks due to possible network failures, blockages or collapses.

The Environment Agency has produced three national surface water flood maps aimed at helping to identify those areas where localised, flash flooding can cause problems even if the Main Rivers are not overflowing. The third generation updated Flood Map for Surface Water, used in this SFRA, has proved extremely useful in supplementing the EA Flood Map for Planning by identifying areas in Flood Zone 1, which may have critical drainage problems.

3.3.2 Historic Pluvial Flooding

The PFRA states that the main cause of surface water flooding in Calderdale is the steep topography surrounding towns and villages. A number of other contributing factors are also outlined including:

- Blocked ditches, road gullies and culverts
- Poor land management
- New developments
- Surface water and Main River interaction
- Mine water
- Canal breaching / overtopping
- Large anomalous rainfall events

The Calderdale PFRA also lists a number of historic surface water flood events, the locations of which are shown in Table 3-2. Further details of the incidents can be found in Appendix 1¹³ of the PFRA.

Table 3-2: Surface water flood event locations

Location of Event
Dover Bridge man hole, Callis, Wadsworth
Allescholes Road, Todmorden

13 Calderdale PFRA, Calderdale MBC, July 2011, Annex 1 – <http://www.calderdale.gov.uk/council/publications/results.jsp?category=12473&offset=10>

Location of Event
Blake Hill End, Northowram
Clough Road, Walsden
Cross Stone Road, Todmorden
Hall Bank Lane / Stake Lane, Mytholmroyd
Inchfield Road, Walsden
Landemere Syke, Northowram
Lower Edge Road, Elland
Roselee Close, Siddal
Rossendale View, Todmorden
Broad Carr Farm on Sisley Lane, Todmorden
Midgley Road Culvert - Mytholmroyd, Hebden Bridge
Cornholme
Cragg Road, Mytholmroyd
Watson Mill Lane, Sowerby Bridge
Luddenden
Halifax Centre
Cooper Bridge Road, A62, Brighouse
Dover Bridge man hole, Callis, Wadsworth

Several examples of pluvial flooding have been recounted by CMBC drainage engineers:

- Kershaw Road, Walsden – cloudburst has, in the past, caused severe damage to culverts, the highway, the railway, including Walsden Station, and seven properties.
- Hebden Bridge, July 2012 – overtopping upstream of Mill Reservoir caused flooding to Hebden Bridge due to a partial blockage of a culvert. The flooding can be attributed to a large scale pluvial event.
- Cooper Bridge, Brighouse – beyond the M62 boundary with Kirklees – surface water flooding of the road. This was worsened by construction of the Yorkshire Water sludge plant which caused obstruction to gullies. Yorkshire Water has created a soakaway in an attempt to reduce flooding. There is also a secondary problem on the adjacent system where a drainage ditch has been infilled to reclaim land.
- A646, Mytholmroyd to Todmorden – several stretches of road regularly flood causing regular road closures. The Council are currently investigating the causes of these incidents.

The Section 19 flood investigation report for the 22nd June 2012 flood event identified the following surface water flooding mechanisms:

- Excessive surface water entering the Rochdale Canal overloading the canal network
- Hillside surface water runoff in Walsden

The Section 19 flood investigation report for the 6-9th July and 25th August 2012 flood events identified the following surface water flooding mechanisms, causing flooding in Hebden Bridge, Mytholmroyd and Todmorden:

- The Nutclough Reservoir spillway and overflow were unable to contain flood waters leading to surface water flooding of the surrounding areas
- Excess surface water entering the Rochdale Canal resulting in the canal overtopping
- Hillside runoff caused significant damage to drainage and highway infrastructure, properties and footpaths

3.3.3 Updated Flood Map for Surface Water (uFMfSW)

The Environment Agency updated the FMfSW in 2013 to produce a third generation national surface water flood map, the updated Flood Map for Surface Water (uFMfSW). The uFMfSW is much more refined than the second generation map in that:

- More detailed hydrological modelling has been carried out using several design rainfall events rather than one for the second generation
- A higher resolution Digital Terrain Model (DTM) has been used – 2 m, compared to 5 m for the second generation
- Manual edits of DTM to improve flow routes at over 91,000 locations compared to 40,000 for the second generation
- DTM edited to better represent road network as a possible flow pathway, this was not done for the second generation
- Manning's *n* roughness values varied using MasterMap Topography layer compared to blanket values for urban and rural land use in the second generation

The National Modelling and Mapping Method Statement, May 2013 details the methodology. This document was supplied to the Council with the uFMfSW, within the Supporting Documents folder.

3.3.4 Sewer Flooding

Combined sewers spread extensively across urban areas serving residential homes, businesses and highways, conveying waste and surface water to treatment works. Combined Sewer Overflows (CSOs), provide an overflow release from the drainage system into local watercourses or large surface water systems during times of high flows. Some areas may also be served by separate foul and surface water sewers which convey waste water to treatment works and surface water into local watercourses.

Flooding from the sewer network mainly occurs when flow entering the system, such as an urban storm water drainage system, exceeds its available discharge capacity, the system becomes blocked or it cannot discharge due to a high water level in the receiving watercourse. Pinch points and failures within the drainage network may also restrict flows. Water then begins to back up through the sewers and surcharge through manholes, potentially flooding highways and properties. It must be noted that sewer flooding in 'dry weather' resulting from blockage, collapse or pumping station mechanical failure (for example), is the sole concern of the drainage undertaker.

The water company that serves the administrative area is Yorkshire Water. The following data was requested from Yorkshire Water to aid with cataloguing of historical flood incidents:

- Sewerage Incident Register System (SIRS) - January 1990 to March 2008
- Wastewater Incident Register System (WIRS) - April 2008 to present day
- DG5 Register – latest dataset

The SIRS and WIRS datasets were not provided. These datasets would have provided a register of all incidents related to Yorkshire Water wastewater assets from 1990. The WIRS system replaced the SIRS in 2008.

The DG5 Register was provided in Excel spreadsheets and is a catalogue of properties that have suffered internal or external flooding from overloaded public sewers. The Register has been mapped and the incidents are shown on the SFRA Maps. The Register is 'live' and should be continually updated so properties can be added or removed. In order to remove a property from the DG5 Register the flooding problem should have been resolved or an investigation should have been undertaken to prove that the public sewer was not the source of the flooding.

The Section 19 flood investigation report for the 22nd June 2012 flood event identified sewer flooding along the Rochdale, Halifax and Burnley Roads. The Section 19 flood investigation report for the 6-9th July and 25th August 2012 flood events stated that rainfall and surface water exceeded the design capacity (1 in 2 year event) of the sewer network and highway drainage systems leading to widespread flooding of areas such as Hebden Bridge, Mytholmroyd and Todmorden. Blinding of road gullies by leaves or debris and overshooting of gullies by high flows on steep roads is also known to be a factor.

3.3.5 Critical drainage areas

One of the requirements of this SFRA is to identify indicative locations for critical drainage areas (CDAs) to help inform development policies and the possible need for detailed SWMPs. For the purpose of this Level 1 SFRA, the critical drainage areas are, at this stage, defined as indicative and are therefore not notified to the LPA by the Environment Agency but designated by the LPA as areas with critical drainage problems, based on the analysis described in Section 4.4.2.

A critical drainage area is considered to be an area contributing surface water runoff, either as direct overland flow or from the existing sewer network, which causes flooding at locations within that area, or at an area where development pressure could increase the strain on a system already at capacity. The risk of flooding is thereby confirmed, either by historical evidence, through an assessment of the updated Flood Map for Surface Water or through 'on the ground' local evidence provided by Council drainage engineers.

A critical drainage area therefore has areas within it where surface water flood risk exists (flood prone areas within a CDA) and areas where properties, although not directly at risk, contribute to that flood risk (upstream areas in a critical drainage area directly affect flood prone areas).

See Section 4.4.2 for more information on the defined indicative critical drainage areas for Calderdale and also see the SFRA Maps in Appendix A for the indicative critical drainage area boundaries.

3.4 Groundwater flooding

Groundwater flooding is caused by the emergence of water from beneath the ground, either at point or diffuse locations. The occurrence of groundwater flooding is usually local and unlike flooding from rivers and the sea, does not generally pose a significant risk to life due to the slow rate at which the water level rises. However, groundwater flooding can cause significant damage to property, especially in urban areas, and can pose further risks to the environment and ground stability.

There are several mechanisms that increase the risk of groundwater flooding including prolonged rainfall, high in bank river levels, artificial structures, groundwater rebound and mine water rebound. Properties with basements or cellars or that are located within areas susceptible to groundwater flooding are at particular risk.

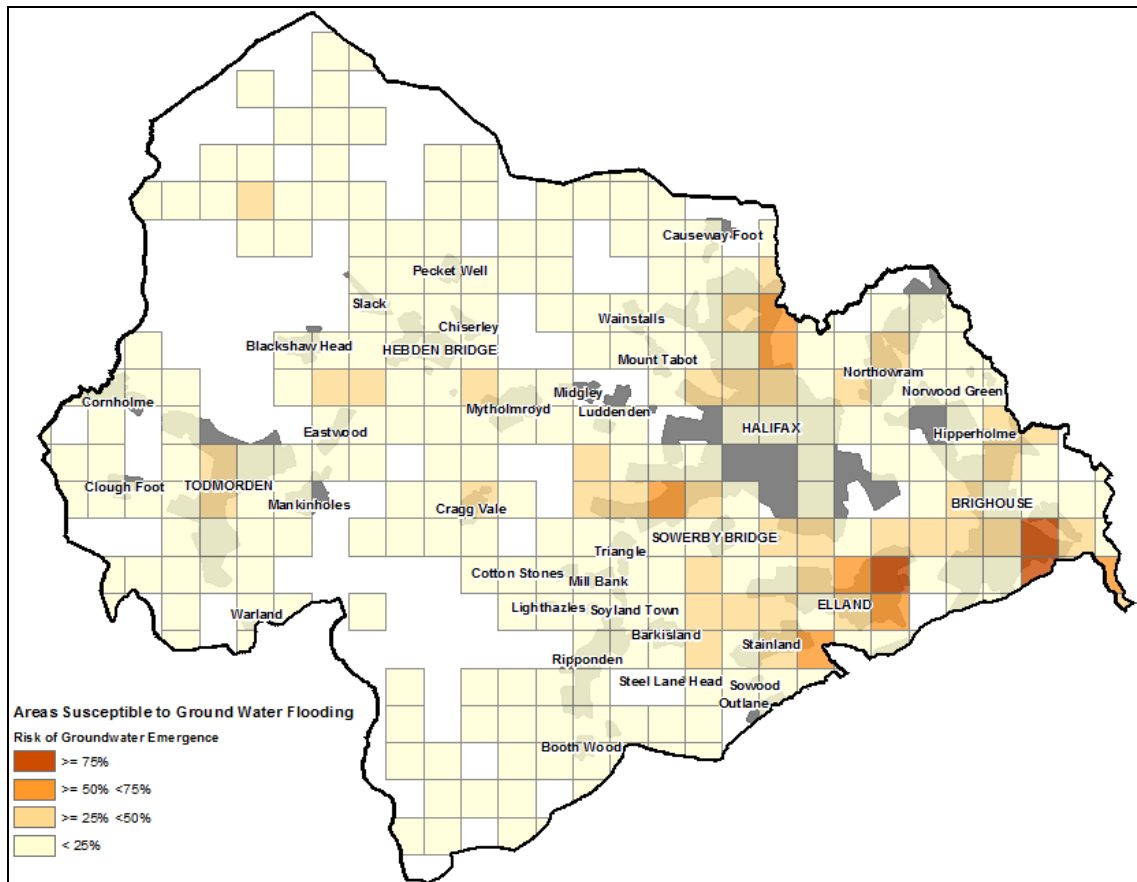
Development within areas susceptible to groundwater flooding will generally not be suited to SuDS and proposals for infiltration drainage; however, this is dependent on a detailed site investigation and risk assessment.

3.4.1 Areas Susceptible to Ground Water Flooding

The Environment Agency's national dataset, Areas Susceptible to Groundwater Flooding (AStGWF), provides the main dataset used to assess the future risk of groundwater flooding. The AStGWF map uses four susceptible categories to show the proportion of each 1km grid square **where geological and hydrogeological conditions show that groundwater might emerge. It does not show the likelihood of groundwater flooding occurring.**

Figure 3-3 illustrates the AStGWF map. It shows that the risk of groundwater emergence is high in parts of Brighouse and in the east of Elland though risk on the whole is minimal across the Borough. There could however be localised problems in other areas, which are not identified on this strategic map. CMBC has not specified any significant issues associated with groundwater flooding however.

Figure 3-3: Areas Susceptible to Groundwater Flooding



3.5 Canal and Reservoir Flood Risk

3.5.1 Canals

There are two sections of canalised waterways within Calderdale, namely the Rochdale Canal flowing from Warland, through Walsden, Todmorden, Hebden Bridge and Mytholmroyd to where it joins the Calder and Hebble Navigation at Sowerby Bridge. The Calder and Hebble Navigation then routes east through Copley and Brighouse before entering Kirklees. See SFRA Maps to view the canal network.

The Rochdale and Calder and Hebble Navigation canals are owned and maintained by the Canal & River Trust who have provided their asset database together with information on past breaches and overtopping events from the canals (see Section 3.5.4). The contribution from canals to surface water flooding has been assessed as part of the PFRA.

The risk of flooding along each canal is dependent on a number of factors. As they are manmade systems and heavily controlled, it is unlikely they will respond in the same way as a natural watercourse during a storm event. Flooding is more likely to be associated with residual risks, similar to those associated with river defences, such as overtopping of canal banks, breaching of embanked reaches or asset (gate) failure as highlighted in Table 3-3. Each canal also has significant interaction with other sources, such as watercourses that feed them and minor watercourses or drains that cross underneath.

The risks associated with these events are also dependent on their potential failure location with the consequence of flooding higher where floodwater could cause the greatest harm due to the presence of local highways and adjacent property. The focus should be on areas adjacent to raised embankments. The pound length of the canal also increases the consequence of failure, as flows will only cease due to the natural exhaustion of supply.

Stop plank¹⁴ (log) arrangements, stop gates and the continued inspection and maintenance of such assets by the Canal & River Trust manage the overall risk of an event.

Table 3-3: Canal Flooding Mechanisms

Potential Mechanism	Significant Factors
Leakage causing erosion and rupture of canal lining leading to breach	<ul style="list-style-type: none"> • Embankments • Sidelong ground • Culverts • Aqueduct approaches
Collapse of structures carrying the canal above natural ground level	<ul style="list-style-type: none"> • Aqueducts • Large diameter culverts • Structural deterioration or accidental damage
Overtopping of canal banks	<ul style="list-style-type: none"> • Low freeboard • Waste weirs
Blockage or collapse of conduits	<ul style="list-style-type: none"> • Culverts

3.5.2 Reservoirs

A reservoir is usually an artificial lake where water is stored for use. Some reservoirs supply water for household and industrial use, others serve other purposes, for example, as fishing lakes or leisure facilities. Like canals, the risk of flooding associated with reservoirs is residual and is associated with failure of reservoir outfalls or breaching. This risk is reduced through regular maintenance by the operating authority. Reservoirs in the UK have an extremely good safety record with no incidents resulting in the loss of life since 1925.

The Environment Agency is the enforcement authority for the Reservoirs Act 1975 in England and Wales. All large reservoirs must be regularly inspected and supervised by reservoir panel engineers. Local Authorities are responsible for coordinating emergency plans for reservoir flooding and ensuring communities are well prepared. Local Authorities should work with other members of the Local Resilience Forum (LRF) to develop these plans.

There are 29 reservoirs with over 25,000 cubic meters of water within the Borough of Calderdale. At the time of the PFRA submission in July 2011, 23 were owned by Yorkshire Water, three by United Utilities, one by the Environment Agency and one was under private ownership.

3.5.3 Reservoir Flood Maps

The Environment Agency has prepared reservoir flood maps for all large reservoirs that they regulated under the Reservoirs Act 1975 (reservoirs that hold over 25,000 cubic meters of water).

The maps show the largest area that might be flooded if a reservoir were to fail and release the water it holds but do not give any information about the depth or speed of the flood waters. CMBC Emergency Planners should have access to this information so they can develop effective Emergency Plans. This is not available to the public due to the sensitivity of the information and therefore has not been provided within this SFRA.

However, reservoir flood maps can be viewed online only and can be found on the Environment Agency's website¹⁵.

The FWMA updated the Reservoirs Act and targeted a reduction in the capacity at which reservoirs should be regulated from 25,000m³ to 10,000m³. This reduction is, at the time of writing, yet to be confirmed meaning the requirements of the Reservoirs Act 1975 should still be adhered to.

¹⁴ Wooden boards for dropping into grooves at a narrows; to permit drainage for maintenance work on a canal section or to isolate a leaking section

¹⁵[http://maps.environment-](http://maps.environment-agency.gov.uk/wiyby/wiybyController?x=357683.0&y=355134.0&scale=1&layerGroups=default&ep=map&textonly=off&lang=_e&topic=reservoir)

[agency.gov.uk/wiyby/wiybyController?x=357683.0&y=355134.0&scale=1&layerGroups=default&ep=map&textonly=off&lang=_e&topic=reservoir](http://maps.environment-agency.gov.uk/wiyby/wiybyController?x=357683.0&y=355134.0&scale=1&layerGroups=default&ep=map&textonly=off&lang=_e&topic=reservoir)

3.5.4 Historical Flooding from Canals and Reservoirs

As part of the SFRA, the Canal & River Trust have provided their Asset Database¹⁶, which includes a register of their assets including canals, major embankments and reservoirs together with historic breach and overtopping locations. The database is included in Appendix C and also contains a spreadsheet of 46 historical overtopping events including dates and a description of the cause and effects of the flooding. The Location ID column can be linked to the overtop points in the SFRA Maps (Appendix A).

3.6 Flood Risk Management

The aim of this section of the SFRA is to identify existing Flood Risk Management (FRM) assets and previous / proposed FRM schemes in Calderdale. The location, condition and design standard of existing assets will have significant impact on actual flood risk mechanisms. Whilst future schemes in high flood risk areas carry the possibility of reducing the probability of flood events and reducing the overall level of risk. Both existing assets and future schemes will have a further impact on the type, form and location of new development or regeneration through the Borough.

3.6.1 Environment Agency Assets

There are a number of flood defences identified within the Environment Agency's Asset Information Management System (AIMS) in Calderdale. The AIMS database is included in Appendix D and the SFRA Maps show the flood defences provided by the Environment Agency as part of the latest edition of the EA Flood Map. There are also many watercourses which are classed as maintained channels and are maintained by private owners or by the Environment Agency.

The Environment Agency carries out a number of other flood risk management activities that help to reduce the probability of flooding, whilst also addressing the consequences of flooding. These include:

- Maintaining and improving existing flood defences, structures and watercourses.
- Enforcement and maintenance where riparian owners carry out work detrimental to flood risk.
- Identifying and promoting new flood alleviation schemes where appropriate.
- Working with Local Authorities to influence the location, layout and design of new and redeveloped property and ensuring that only appropriate development is allowed on the floodplain.
- Operation of Flood Warnings Direct and warning services for areas along the River Calder and its tributaries.
- Promoting awareness of flooding so that organisations, communities and individuals are aware of the risk and are prepared in case they need to take action in time of flood.
- Promoting resilience and resistance measures for those properties already in the floodplain.

3.6.2 Yorkshire Water Assets

The sewerage infrastructure of Calderdale is likely to be based on Victorian sewers from which there is a risk of localised flooding associated with the existing drainage capacity and sewer system. The drainage system may be under capacity and / or subject to blockages resulting in localised flooding of roads and property. Yorkshire Water is responsible for the management of the urban drainage system throughout the Borough, including surface water and foul sewerage however Schedule 3 of the FWMA is set to alter the statement about responsibility for surface water management. Yorkshire Water assets include Wastewater Treatment Works, Combined Sewer Overflows, pumping stations, detention tanks, sewer networks and manholes.

¹⁶ Canal & River Trust Asset database dated 28/01/2013

3.6.3 Calderdale MBC Assets

As a LLFA, CMBC maintain and in some cases own a number of highway related assets throughout the Borough including culverts, bridge structures, trash screens, highway drains and gullies. The majority of these assets are likely to lie along the Ordinary Watercourses, especially within urban areas, such as Todmorden, where they have been culverted or diverted. These assets can have flood risk management functions whilst also affecting flood risk if they become blocked or fail.

As part of their FWMA duties, CMBC has a duty to maintain a register of structures or features, which are considered to have an effect on flood risk, including details on ownership and condition as a minimum. CMBC is in the process of creating their DAMS asset register as is the Council's duty as a Risk Management Authority under the FWMA to produce and maintain an asset register relating to flood risk.

The asset register should outline their ongoing maintenance programme, where the Council is the riparian owner. Where assets or features are located in a high risk area or have been assessed to have the potential to effect flood risk, the Council should prioritise and focus any maintenance or upgrades.

3.6.4 Flood Risk Management Work Programmes

There are a number of flood risk management work programmes that have taken place or are earmarked for commission in the future, in high risk areas across Calderdale. The most notable schemes and flood risk management works are listed below:

- The Todmorden Flood Alleviation Scheme (FAS) agreed in 2005, currently on Phase 3 which is looking to address flooding from Walsden Water. The first two Phases included improvement of flood defences and construction of new defences on the River Calder. Centre Vale Park was also designated as a flood storage area as part of the scheme.
- The Flood Investment Plan has funds coming from Calderdale Council capital funding, the CMBC land drainage division plus Local Levy funding from the Environment Agency. FDGiA funding opportunities have been assessed by the Environment Agency though zero funding has been allocated from this for 2014. This is due to the cost benefit ratio being generally poor, mainly due to the majority of buildings at risk being businesses and economic sites rather than residential dwellings.
- There may be funds available for flood risk management up to March 2015. Partnership funding has not yet been identified. Local Levy funding for CMBC is likely to be limited for a number of years as other authorities get their chance.
- Pathfinder Project – CMBC together with the Environment Agency is working on how best to utilise investment provided from Defra for the Pathfinder Project. There is also much local input. Work is currently in progress including the exploration of appropriate land management techniques with local landowners and the setting up of Flood Action Groups through community involvement. Such Flood Action Groups are currently in place in Todmorden, Hebden Bridge and Mytholmroyd.
- A feasibility study is underway to determine whether any reservoirs may be suitable for flood storage.
- DAMS asset register is currently under construction.
- Section 19 reports – a number of reports have been produced by CMBC detailing past flood events. This type of report will continue to be produced for all future locally significant flood events in Calderdale.
- A physical modelling study is due to be commissioned in Hebden Bridge at the confluence of Hebden Water and the River Calder following the July 2012 flooding here, discussed in Section 3.2.1.
- The Upper Calder Valley (Multi Agency) Flood Investment Plan will consider flood risk reduction and flood defence schemes to combat channel under-capacity, upland runoff, canal overtopping, canal and reservoir management, surface water flooding and other drainage issues. Major and minor solutions will be implemented as and when sound business cases are established and finance indentified. The Flood Investment Plan will be procured largely through the Environment Agency's "WEM framework". *Note: It is*

not yet clear who will ultimately be the lead client. The Agency is currently performing this role for preliminary design work on some minor schemes.

- Upper Calder Valley Flood Forecasting Review, 2014 – a review of rain gauges, network monitoring, RADAR data and other techniques available to improve flood forecasting performance and community response will be undertaken.
- Hebden Bridge Flood Alleviation Scheme is currently underway. This is CMBC's highest priority major scheme.
- CMBC minor works programme, which may include some projects referred to in the Environment Agency's Medium Term Plan.
- There are several locations where the Environment Agency has commissioned private consultants to establish the causes of flooding whilst outlining cost beneficial solutions and preparing works information for the design of suitable schemes in these locations. The proposed scheme locations are as follows:
 - Erringden Hillside, Hebden Bridge - hill slope runoff issues
 - Bacup Rd Hillside, Todmorden - hill slope runoff issues
 - Rochdale canal, Todmorden - canal overtopping
 - Pin Hill Lane, Midgley - surface water flooding
 - Shop Lock, Todmorden - canal overtopping
 - The Brocks, Luddenden Foot - hill slope runoff issues
 - Nutclough, Hebden Bridge - fluvial / reservoir flooding
 - Keighley / Lee Mill Rd, Hebden Bridge - hill slope runoff / surface water issues
 - A646 schemes: Burnt Acres Wood, Hunters Lane, Centre Vale Park – surface water / drainage issues

4 Development and Flood Risk

4.1 Introduction

This chapter of the SFRA would usually provide a strategic assessment of the suitability of potential site allocations across the borough. However, CMBC has requested that a summary of risk within the area, should be carried out, rather than an assessment of risk to specific proposed development sites against the EA Flood Map for Planning. The Council will be able to make decisions on areas within the borough where development growth may be constrained by flood risk and conversely where areas for growth can be targeted as part of the Local Plan site selection process which includes consultation with the Environment Agency.

The flood risk information provided on the SFRA Maps in Appendix A should help the LPA to identify specific locations where further, more detailed flood risk data and assessment work is required as part of a Level 2 SFRA, prior to the allocation of specific developments. Sections **Error! Reference source not found.** and **Error! Reference source not found.** of the report discuss the Sequential Approach and the Exception Testing procedure which should be used in the development allocation and development management process to inform the Sustainability Appraisal (incorporating the Strategic Environmental Assessment Directive) of the Local Plan.

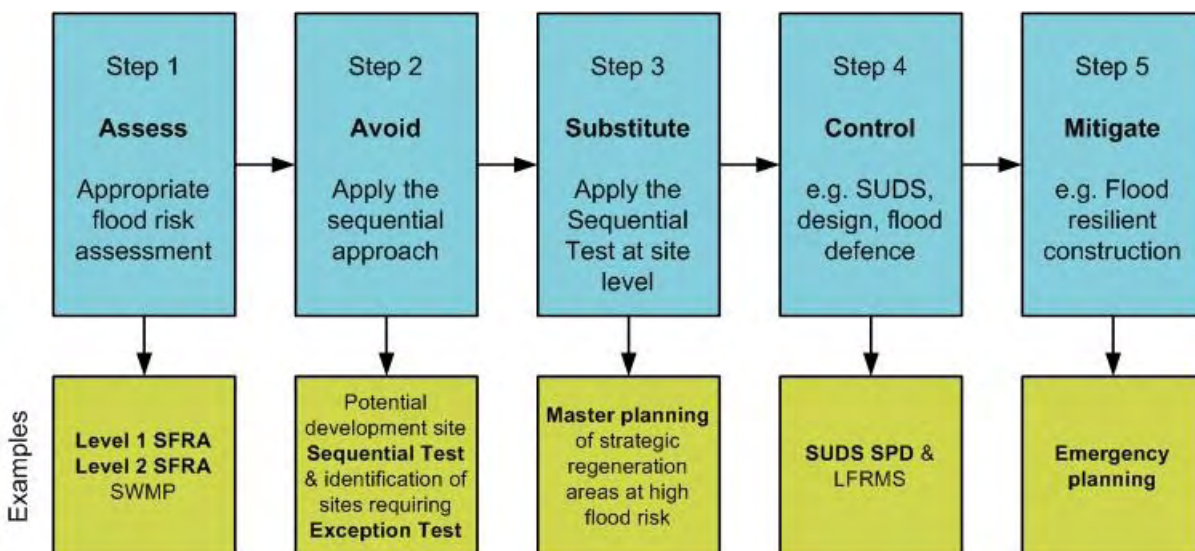
4.2 The Sequential Approach

The Flood Risk and Coastal Change Planning Practice Guidance (PPG) provides the basis for the Sequential Approach. It is this approach, integrated into all stages of the development planning process, which provides the opportunities to reduce flood risk to people, their property and the environment to acceptable levels.

The approach is based around the flood risk management hierarchy, in which actions to avoid, substitute, control and mitigate flood risk is central. For example, it is important to assess the level of risk to an appropriate scale during the decision making process, (starting with this Level 1 SFRA). Once this evidence has been provided, positive planning decisions can be made and effective flood risk management opportunities identified.

Figure 4-1 illustrates the flood risk management (FRM) hierarchy with an example of how these may translate into the Council's management decisions and actions.

Figure 4-1: Flood Risk Management Hierarchy



The overall aim of the Sequential Approach should be to steer new development to low risk Flood Zone 1. Where there are no reasonably available sites in Flood Zone 1, the flood risk vulnerability of land uses and reasonably available sites in Flood Zone 2 should be considered, applying the Exception Test if required.

Only where there are no reasonably available sites in Flood Zones 1 or 2 should the suitability of sites in higher risk Flood Zone 3, be considered. This should take into account the flood risk vulnerability of land uses and the likelihood of meeting the requirements of the Exception Test if required.

There are two different aims in carrying out the Sequential Approach depending on what stage of the planning system it is being carried out i.e. Local Planning Authorities (LPAs) allocating land in Local Plans or determining planning applications for development.

The following sections are split between the two key users to provide a guided discussion on why and how the Sequential Approach should be applied, including the specific requirements for undertaking **Sequential** and **Exception Testing**.

4.3 Local Plan Sequential & Exception Test

CMBC, as the LPA, should seek to avoid inappropriate development in areas at risk of flooding by directing development away from areas at highest risk and ensuring that all development does not increase risk and where possible can help reduce risk from flooding to existing communities and development.

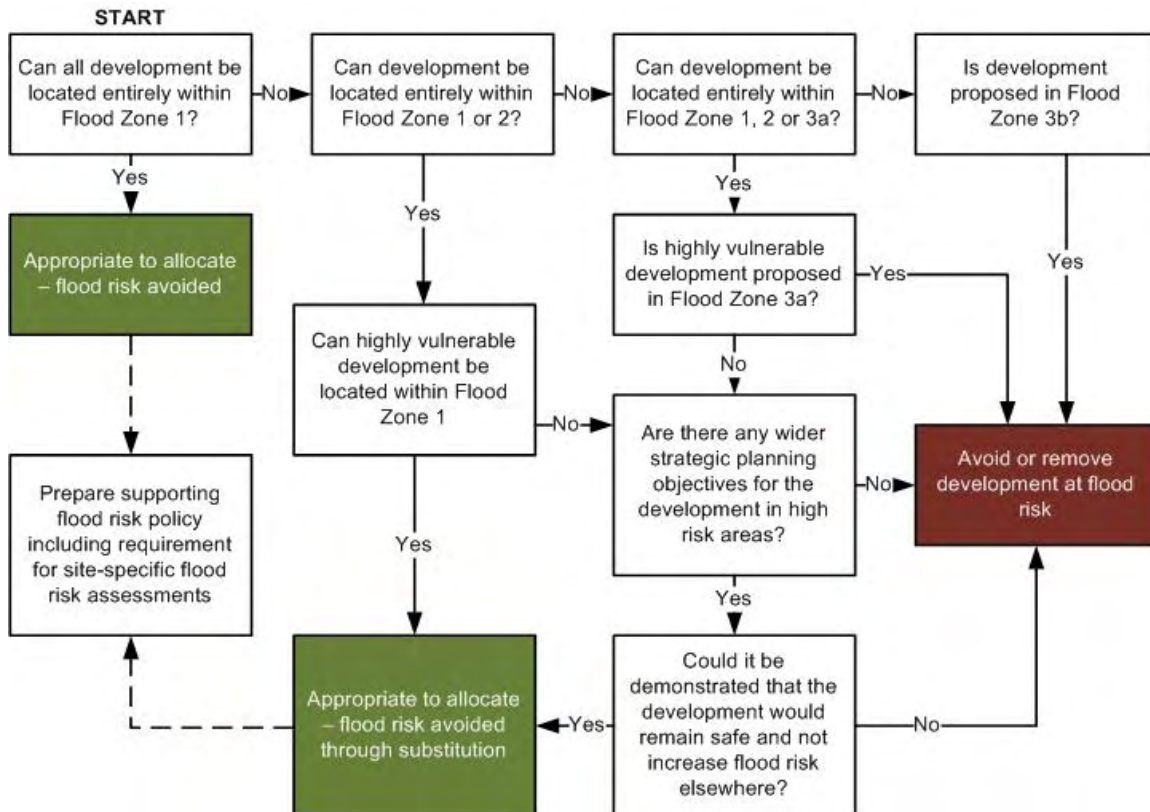
At a strategic level, this should be carried out as part of the allocation of sites for development during the Local Plan, or during the issues and options stage before approving the preferred option by applying the risk-based approach to the allocation of development to avoid flood risk to people and property and manage any residual risk, taking account of the impacts of climate change. This should be done by:

1. Applying the Sequential Test and if necessary, applying the Exception Test;
2. Safeguarding land from development that is required for current and future flood management; and
3. Using opportunities offered by new development to reduce the causes and impacts of flooding.

Figure 4-2 illustrates the Sequential and Exception Tests as a process flow diagram using the information contained in this SFRA to assess potential development sites against the Environment Agency's Flood Map for Planning Flood Zones and development vulnerability compatibilities.

This is a stepwise process, but a challenging one, as a number of the criteria used are qualitative and based on experienced judgement. The process must be documented and evidence used to support decisions recorded.

Figure 4-2: Local Plan Sequential Approach to Allocation



This SFRA provides the main evidence required, along with the Local Plan and Sustainability Appraisal, to carry out this process. This process also enables those sites that have passed the Sequential Test, and therefore require the Exception Test, to be identified.

For the Exception Test to be passed, NPPF Paragraph 102 states:

- a) It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk informed by a Strategic Flood Risk Assessment where one has been prepared; and
- b) A site-specific Flood Risk Assessment (FRA) must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

Both elements of the test will have to be passed for development to be allocated or permitted

Although actually passing the Exception Test will require the completion of a site-specific FRA, the Council should be able to assess the likelihood of passing the test at the Local Plan level by using the information contained in this SFRA to answering the following questions:

1. Can development within higher risk areas be avoided through avoidance or substitution?
2. Is flood risk associated with possible development sites considered too high; and will this mean that the criteria for Exception Testing are unachievable?
3. Can risk be sustainably managed through appropriate techniques without compromising the viability of the development?
4. Can the site and its occupiers remain safe during times of flood if developed?

Where it is unlikely that the Exception Test can be passed due to few wider sustainability benefits, the risk of flooding being too great, or the viability of the site is compromised by the

flood risk management work required, then the Council should consider avoiding the site all together.

Once the process has been completed the Council should then be able to revisit and update the Sustainability Appraisal with the allocation of development sites, as well as prepare flood risk policy including the requirement to prepare site-specific FRAs for all allocated sites that remain at risk of flooding.

4.4 Assessment of Risk to Future Development

The Council must generate a finalised list of proposed development sites as part of their Local Plan. These sites should be assessed against the flood risk information provided in the SFRA Maps to screen against the level of flood risk to the sites. Where wider strategic objectives require regeneration in areas at risk of flooding, then the Council should consider the compatibility of vulnerability classifications and Flood Zones and whether or not the Exception Test will be required before allocating sites. In this case, the decision making process should be transparent and information from this SFRA should be used to justify decisions to allocate land in areas at high risk of flooding.

When assessing potential sites for development, it is important to consider that each individual site will require further investigation, as local circumstances may dictate the outcome of any decisions. Such local circumstances include:

- If sites have planning permission but construction has not started, the SFRA will only be able to influence the design of the development e.g. finish floor levels. New, more extensive flood extents (from new models) cannot be used to reject development where planning permission has already been given
- Some sites may be able to develop around the flood risk. Planners are best placed to make this judgement i.e. will the site still be deliverable if part of it needs to be retained to make space for flood water
- Surrounding infrastructure may influence scope for layout redesign / removal of site footprints from risk
- Current land use. For brownfield sites, existing development could be taken into account as further development may not lead to increased flood risk. The Environment Agency may have their own views on this in regard to health warnings as new-build properties in risk areas could be built with flood protection in mind
- Existing planning permissions may exist on some sites where the Environment Agency may have already passed comment and / or agreed to appropriate remedial works concerning flood risk. Previous flood risk investigations / FRAs may already have been carried out at some sites

4.4.1 Scenarios for Development

There are several scenarios that could be considered when reviewing potential sites for development against flood risk. These could include:

- Rejection of a site for development in the Local Plan or refusal of planning permission if the Sequential Test cannot be passed.
- Where the Sequential Test can be passed, further considerations include:
 - Exception Test, where applicable
 - Consideration of site layout and design
- If justified, accepting a site option or granting planning permission which may include ensuring the part of the site at risk of flooding is not developed

Rejection

A site which fails to pass the Sequential Test and / or the Exception Test would also be rejected. Rejection would also apply to any residential dwelling or employment site if the site area is within Flood Zone 3b. The Flood Risk and Coastal Change PPG flood risk vulnerability classification states that only water-compatible uses and essential infrastructure should be permitted in Flood Zone 3b, though any essential infrastructure must pass the Exception Test. Land allocated for housing falls in to the more vulnerable category and employment sites in the less vulnerable category. Development should not be permitted for sites within the more vulnerable and less vulnerable categories that fall within Flood Zone 3b. If the developer is able to avoid 3b, part of the site could still be delivered.

In terms of surface water flood risk, if risk is considered significant or where the size of the site does not allow for on-site storage or application of appropriate SuDS

Exception Test

For those sites that, according to the NPPF vulnerability tables, would require the Exception Test, the likelihood of passing the test should be assessed, as discussed in Section 4.3. Only water-compatible and less vulnerable uses of land would not require an Exception Test in this zone. More vulnerable uses, including residential, and essential infrastructure are only permitted if the Exception Test is passed and all development proposals in Flood Zone 3a must be accompanied by a flood risk assessment. To avoid having to apply the Exception Test, the developer / LPA should attempt to avoid the risk area altogether.

Site Layout and Design

Site layout and site design is important at the site planning stage where flood risk exists. The site area would have to be large enough to enable any alteration of the developable area of the site to remove development from the functional floodplain, or to leave space for on-site storage of flood water within Flood Zone 3a. Careful layout and design at the site planning stage may apply to such sites where it is considered viable based on the level of risk. Surface water risk and opportunities for SuDS should also be assessed during the planning stage.

Depending on local circumstances, if it is not possible to adjust the site boundary to remove the site footprint from Flood Zone 3b to a lower risk zone then development should not be permitted. If it is not possible to adjust the developable area of a site to remove the proposed development from Flood Zone 3a to a lower risk zone or to incorporate the on-site storage of water within site design, then the Exception Test would have to be passed as part of a site-specific Flood Risk Assessment.

If a site is located within Flood Zone 3ai then any redevelopment of the site should have regard to restrictions set out in policies in the Calderdale Local Plan. Where possible, such sites should look to reduce risk when designing for new development.

Any site layout and design options should take account of the 8 m easement buffer along watercourses where development is not permitted. This easement buffer is recommended by the Environment Agency to allow ease of access to watercourses for maintenance works. Any site redesign, where Flood Zone 3a is included within the site footprint, should allow water to flow naturally or be stored in times of flood through application of appropriate SuDS techniques.

Flood Risk Assessment

According to NPPF footnote 20, a site-specific FRA should be prepared when the application site is:

- Situated in Flood Zone 2 and 3; for all proposals for new development (including minor development and change of use)
- Greater than 1 ha in size and located in Flood Zone 1
- Located in Flood Zone 1 where there are critical drainage problems or within a designated Critical Drainage Area (CDA) as notified to the LPA by the Environment Agency
- At risk of flooding from other sources of flooding, such as those identified in this SFRA. Where surface water flood risk exists, detailed surface water modelling may be required including options for SuDS

- Subject to a change of use to a higher vulnerability classification which may be subject to other sources of flooding

See Section 4.6 for more information regarding site-specific Flood Risk Assessments.

Site Permitted

Development sites could be allocated or granted planning permission where a Sequential Test and an Exception Test (if required) are passed. In addition, a site is likely to be permitted without the need to assess flood risk where the proposed use is for open space. Assuming the site is not to include any development and is to be left open then the proposal is likely to be acceptable from a flood risk point of view. For such sites, opportunities for flood storage should be explored however as part of an FRA.

All development proposals within Flood Zone 2 or Flood Zone 3a must be accompanied by a Flood Risk Assessment. Any sites 100% within Flood Zone 1 that are 1 hectare or more in area must be accompanied by a Flood Risk Assessment to determine vulnerability to flooding from other sources as well as fluvial. The FRA should determine the potential of increased flood risk elsewhere as a result of the addition of hard surfaces on-site and the effect of new development on surface water runoff. The Flood Risk and Coastal Change PPG states:

“Local authorities and developers should seek opportunities to reduce the overall level of flood risk in the area and beyond. This can be achieved, for instance, through the layout and form of development, including green infrastructure and the appropriate application of sustainable drainage systems, through safeguarding land for flood risk management, or where appropriate, through designing off-site works required to protect and support development in ways that benefit the area more generally.” (Paragraph 50).

4.4.2 Proposed critical drainage areas

As mentioned in Section 3.3.5, the criteria for the definition of indicative critical drainage areas (CDAs) is summarised below:

- Areas at surface water risk, according to the uFMfSW, that are within Flood Zone 1, but not exclusively in Flood Zone 1. Within the indicative CDAs listed below, there are areas of Flood Zone 2 and 3 as when allocating a site that has critical surface water issues, parts of the site may also be at fluvial risk
- Areas with clusters of allocated new development within Flood Zone 1 that are at risk from surface water flooding
- Areas with clusters of current buildings (using National Receptor Database (NRD)) within Flood Zone 1 that are at risk from surface water flooding

Based on the above criteria, the indicative CDAs can be backed by historical evidence of surface water flooding, as informed by the PFRA or CMBC drainage engineers. Appendix E details the methodology applied to produce the indicative CDAs.

Based on the analysis described above, there are 11 indicative CDAs covering several communities in Calderdale:

- CDA 1 – Walsden
- CDA 2 – Todmorden
- CDA 3 – Hebden Bridge
- CDA 4 – Ripponden
- CDA 5 – Halifax
- CDA 6 – Elland and Brighouse
- CDA 7 – Northowram and Shelf
- CDA 8 – Mytholmroyd
- CDA 9 – Luddenden
- CDA 10 – Cragg Vale
- CDA 11 – Bailiff Bridge

Many of the indicative CDAs coincide with the historical surface water flooding incidents, highlighted in Section 3.3.2, from the PFRA and the historical evidence provided by CMBC drainage engineers.

CDAs Further Work

The indicative CDAs can be refined through further, more detailed analysis as part of a Level 2 SFRA, detailed SWMP or drainage strategy. Any further work would entail consultation between Yorkshire Water and CMBC on the capacity of existing sewer systems in order to identify critical parts of the system (pinch points). Model outputs could be obtained to confirm the critical parts of the drainage network. Recommendations could then be made for future development i.e. the location of strategic SuDS sites; the parts of the drainage system where any new connections should be avoided or locations of the drainage system that may have additional capacity; and recommended runoff rates. In the case of Calderdale however, it is unlikely that there would be any spare capacity within the sewer network for surface water.

Appendix E includes a technical note on the methodology used to propose the CDAs.

4.5 Development Management Sequential & Exception Test

This section of the SFRA has been developed to provide a useful tool to inform the development management process about the potential risk of flooding associated with future planning applications and the basis for requiring specific FRAs where necessary.

According to the NPPF:

“When determining planning applications, local planning authorities should ensure flood risk is not increased elsewhere and only consider development appropriate in areas at risk of flooding where, informed by a site-specific flood risk assessment following the Sequential Test, and if required the Exception Test, it can be demonstrated that:

- *Within the site, the most vulnerable development is located in areas of lowest flood risk unless there are overriding reasons to prefer a different location; and*
- *Development is appropriately flood resilient and resistant, including safe access and escape routes where required, and that any residual risk can be safely managed, including by emergency planning; and it gives priority to the use of sustainable drainage systems.” (Para 103)*

The NPPF re-affirms that planning applications *“must be determined in accordance with the development plan unless material considerations indicate otherwise”* (Para 11). Development proposals that are in line with Local Plan policies should be approved. Those that conflict should be refused unless material considerations indicate otherwise.

4.5.1 Demonstrating the Sequential Test for Planning Applications

The Environment Agency recommends the approach¹⁷ below is used by LPAs to apply the Sequential Test to planning applications located in Flood Zones 2 or 3. The approach provides an open demonstration of the Sequential Test being applied in line with the NPPF and the Flood Risk and Coastal Change PPG. Close working between LPA Development Management and Spatial Planning departments will be required to implement the Sequential Test effectively. The Environment Agency also work with local authorities to agree locally specific approaches to the application of the Sequential Test.

The Sequential Test for planning applications can be carried out over three main stages described below and illustrated in Figure 4-3.

Stage 1 – Strategic application & development vulnerability

The Sequential Test does not apply to change of use applications unless it is for change of use of land to a caravan, camping or chalet site, or to a mobile home site or park home site. The Sequential Test can also be considered adequately demonstrated if both of the following criteria are met:

17 http://webarchive.nationalarchives.gov.uk/20140328084622/http://www.environment-agency.gov.uk/static/documents/Sequential_test_process_4.pdf

- The Sequential Test has already been carried out for the site (for the same development type) at the strategic level (Local Plan); and
- The development vulnerability is appropriate to the Flood Zone (see table 3 of the PPG).

If both these criteria are met, reference should be provided for the site allocation and Local Plan document in question and the vulnerability of the development should be clearly stated. If neither criterion is met, then the applicant should move onto Stage 2.

Stage 2 – Defining the evidence base

Stage 2 considers the parameters in which the Sequential Test is to be applied, including:

- The geographic area in which the test is to be applied,
- The source of reasonable available sites in which the application site will be tested against; and
- The evidence and method used to compare flood risk between sites.

Stage 3 – Applying the Sequential Test

Stage 3 focuses on applying the Sequential Test by comparing the reasonably available sites identified under stage 2 with the application site.

Sites should be compared in relation to flood risk; Local Plan status; capacity; and constraints to delivery including availability, policy restrictions, physical problems or limitations, potential impacts of the development, and future environmental conditions that would be experienced by the inhabitants of the development.

The test should conclude if there are any reasonably available sites, in areas with a lower probability of flooding that would be appropriate to the type of development or land use proposed.

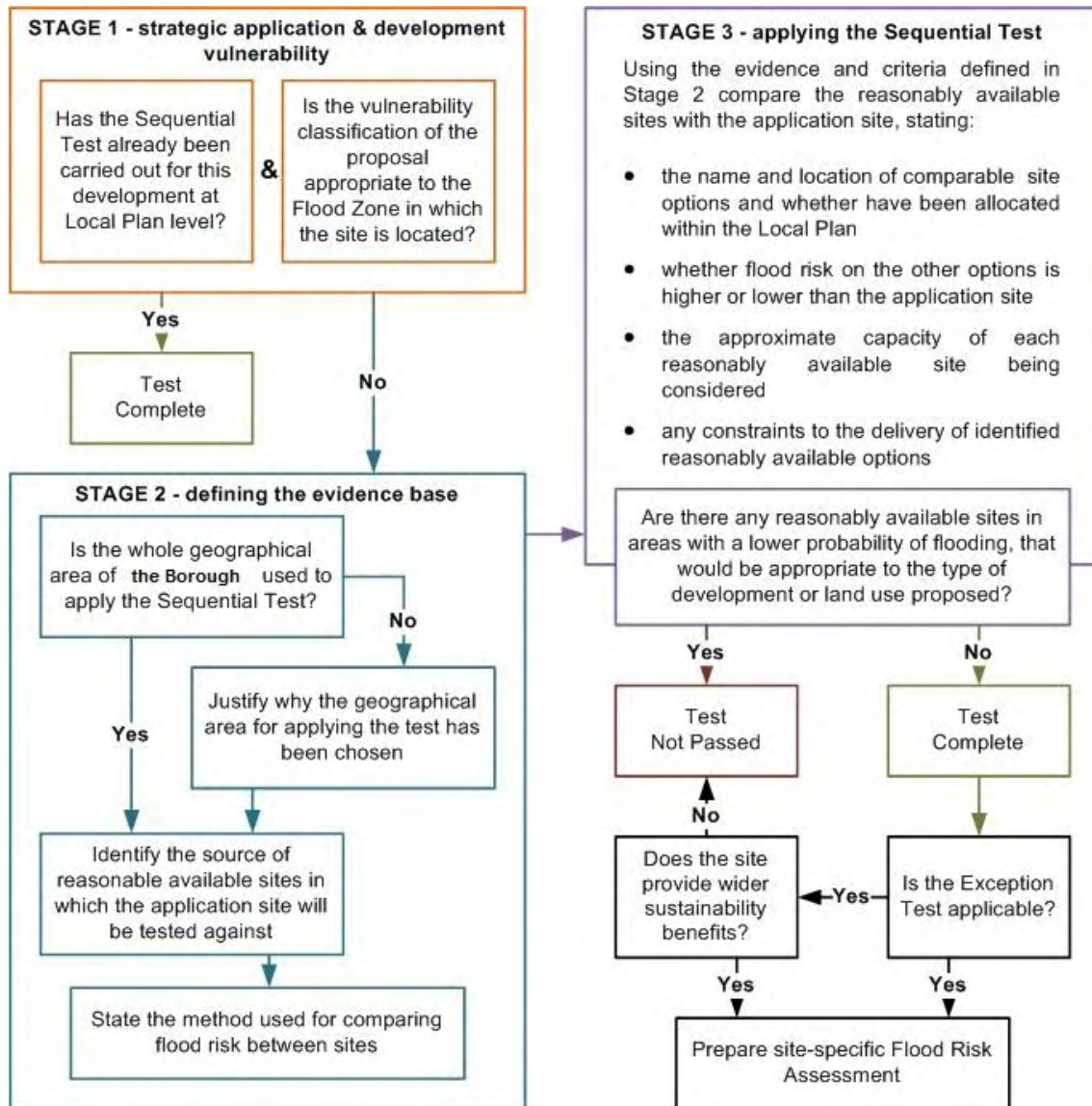
From the information provided in these three stages, the LPA should be able to assess whether or not the applicant site has passed the Sequential Test. If the Test has been passed the applicant should apply the Exception Test in the circumstances set out by tables 1 and 3 of the Flood Risk and Coastal Change PPG.

In all circumstances, where the site is within areas at risk of flooding and where a site-specific FRA has not already been carried out, a site-specific FRA should be completed in line with the NPPF and the PPG. Further guidance is provided in Section 4.6.

In addition to the formal Sequential Test, the NPPF sets out the requirement for developers to apply the sequential approach to locating development within the site. As part of their application and masterplanning discussions with applicants, LPAs should seek whether or not:

- Flood risk can be avoided by substituting less vulnerable uses or by amending the site layout;
- Less vulnerable uses for the site have been considered; or
- Density can be varied to reduce the number or the vulnerability of units located in higher risk parts of the site.

Figure 4-3: Development Management Sequential Test Process



4.6 Site-Specific Flood Risk Assessment

According to the Flood Risk and Coastal Change PPG (Para 30), a site-specific FRA is:

“Carried out by (or on behalf of) a developer to assess the flood risk to and from a development site. Where necessary (see footnote 20 in the National Planning Policy Framework), the assessment should accompany a planning application submitted to the local planning authority. The assessment should demonstrate to the decision-maker how flood risk will be managed now and over the development’s lifetime, taking climate change into account, and with regard to the vulnerability of its users (see Table 2 – Flood Risk Vulnerability of PPG).”

The objectives of a site-specific FRA are to establish:

- Whether a proposed development is likely to be affected by current or future flooding from any source;
- Whether the development will increase flood risk elsewhere;
- Whether the measures proposed to deal with these effects and risks are appropriate;
- The evidence for the local planning authority to apply (if necessary) the Sequential Test, and;
- Whether the development will be safe and pass the Exception Test, if applicable.

The Flood Risk and Coastal Change PPG doesn't contain any further detail on the minimum requirements for site-specific FRAs. It is therefore important that the Environment Agency's Flood Risk Standing Advice¹⁸ is referred to and the site-specific Flood Risk Assessment Checklist in paragraph 68 of the PPG. CIRIA's report C624 Development and Flood Risk also provides useful guidance.

When is a Site-Specific FRA Required?

According to NPPF footnote 20, a site-specific FRA should be prepared when the application site is:

- Situated in Flood Zone 2 and 3, for all proposals for new development (including minor development and change of use)
- Greater than 1 ha in size and located in Flood Zone 1
- Located in Flood Zone 1 where there are critical drainage problems or within a designated Critical Drainage Area (CDA) as notified to the LPA by the Environment Agency
- At risk of flooding from other sources of flooding, such as those identified in this SFRA
- Changed to a higher vulnerability classification that is subject to other sources of flooding

The LPA may also like to consider further options for stipulating FRA requirements, such as:

- Situated in an area currently benefitting from defences
- Situated within 20m of the bank top of a Main River
- Situated over a culverted watercourse or where development will require controlling the flow or any river or stream or the development could potentially change structures known to influence flood flow

These further options should be considered during the preparation and development of the Local Plan.

4.6.1 Taking Climate Change into Account

Climate change will increase flood risk over the lifetime of a development. In making an assessment of the impacts of climate change on flooding from the land and rivers as part of a FRA, the sensitivity ranges shown below may provide an appropriate precautionary response to the uncertainty about climate change impacts on rainfall intensities and river flow. Considering the impacts of climate change during a FRA will have implications for both the type of development that is appropriate according to its vulnerability to flooding and design standards for any SuDS or mitigation scheme proposed.

The Environment Agency has reviewed the climate change allowances for use in FRAs and SFRAs and, in February 2016 released new allowances here:

<https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

The modelled outputs available for this SFRA do not include these updated climate change allowances. It is recommended that any Level 2 SFRA should look at producing climate change outlines, depths and hazards based on the February 2016 allowances, using available Environment Agency models. These climate change outputs should then be used to assess the range of impact and the vulnerability of potential development sites to the effects of climate change. The February 2016 allowances will need to be taken into account in the preparation of site specific flood risk assessments.

4.7 Sustainable Drainage Systems

Development has the potential to cause an increase in impermeable area, an associated increase in surface water runoff rates and volumes, and consequently a potential increase in downstream flood risk due to overloading of sewers, watercourses, culverts and other drainage infrastructure.

¹⁸ <https://www.gov.uk/flood-risk-assessment-local-planning-authorities>

Managing surface water discharges from new development is therefore crucial in managing and reducing flood risk to new and existing development downstream. Carefully planned development can also play a role in reducing the amount of properties that are directly at risk from surface water flooding.

The FWMA, 2010, transferred the adoption and maintenance of SuDS to Sustainable Drainage Systems Approval Bodies (SABs) established by local authorities, or LLFA's, under Schedule 3 of the Act. This designation of a SAB however has since been removed following lengthy consultation, with the announcement from the Department for Communities and Local Government (DCLG) in December 2014 that local planners will be responsible for delivering SuDS. Changes to planning legislation give provisions for major applications of ten or more residential units or equivalent commercial development to require sustainable drainage within the development proposals in accordance with the interim national standards published in April 2015.

The system proposed by government builds on the existing planning system, which developers and local authorities are already using. Policy changes to the planning system can also be introduced relatively quickly ensuring that flood risk benefits from sustainable drainage systems can be brought forward as part of planning application proposals.

The NPPF continues to reinforce how planning applications that fail to deliver SuDS above conventional drainage techniques could be rejected and sustainable drainage should form part of integrated design secured by detailed planning conditions so that the SuDS to be constructed must be maintained to a minimum level of effectiveness. Maintenance options must clearly identify who will be responsible for SuDS maintenance and funding for maintenance should be fair for householders and premises occupiers; and, set out a minimum standard to which the sustainable drainage systems must be maintained.

The runoff destination should always be the first consideration when considering design criteria for SuDS including the following possible destinations in order of preference:

1. To ground;
2. To surface water body;
3. To road drain or surface water sewer;
4. To combined sewer

Effects on water quality should also be investigated when considering runoff destination in terms of the potential hazards arising from development and the sensitivity of the runoff destination.

The non-statutory technical standards for sustainable drainage systems¹⁹ (March 2015) set out appropriate design criteria based on the following:

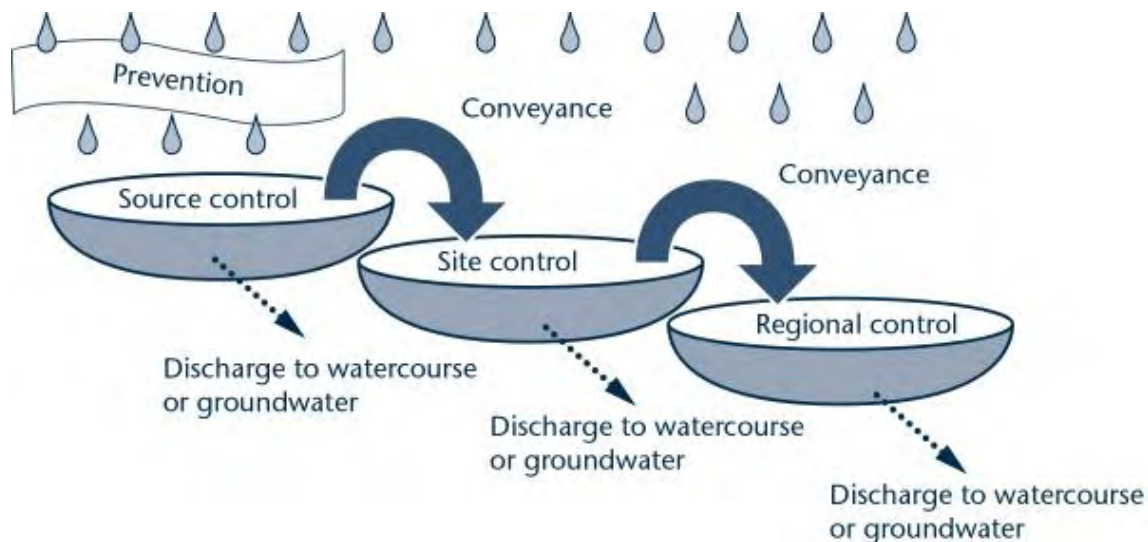
1. Flood risk outside the development
2. Peak flow control
3. Volume control
4. Flood risk within the development
5. Structural integrity
6. Designing for maintenance considerations
7. Construction

In addition, the Local Planning Authority may set local requirements for planning permission that have the effect of more stringent requirements than these National Standards. More stringent requirements should be considered where current Greenfield sites lie upstream of high risk areas. This could include improvements on Greenfield runoff rates. CIRIA has also produced a number of guidance documents relating to SuDS that should be consulted by the LPA and developers.

Many different SuDS techniques can be implemented. As a result, there is no one standard correct drainage solution for a site. In most cases, a combination of techniques, using the Management Train principle, will be required, where source control is the primary aim.

¹⁹ <https://www.gov.uk/search?q=sustainable+drainage+systems>

Figure 4-4: SuDS Management Train Principle²⁰



The effectiveness of a flow management scheme within a single site is heavily limited by land use and site characteristics including (but not limited to) topography, geology (soil permeability), and available area. Potential ground contamination associated with urban and former industrial sites should be investigated with the focus being placed on the depth of the local water table and potential contamination risks. The design, construction and ongoing maintenance regime of any SuDS scheme must be carefully defined as part of a site-specific FRA. A clear and comprehensive understanding of the catchment hydrological processes (i.e. nature and capacity of the existing drainage system) is essential for successful SuDS implementation.

4.8 Emergency Planning

The provisions for Emergency planning for Local Authorities as Category 1 responders are set out by the Civil Contingencies Act 2004 and the National Flood Emergency Framework for England, December 2014²¹. This framework is a resource for all involved in emergency planning and response to flooding from the sea, rivers, surface water, groundwater and reservoirs. The Framework sets out the government's strategic approach to:

- Ensuring all delivery bodies understand their respective roles and responsibilities when planning for and responding to flood related emergencies
- Give all players in an emergency flooding situation a common point of reference which includes key information, guidance and key policies
- Establish clear thresholds for emergency response arrangements
- Place proper emphasis on the multi-agency approach to managing flooding events
- Provide clarity on the means of improving resilience and minimising the impact of flooding events
- Provide a basis for individual responders to develop and review their own plans and
- Being a long-term asset that will provide the basis for continuous improvement in flood emergency management

Along with the Environment Agency flood warning systems, there are a range of flood plans at a sub-regional and local level, outlining the major risk of flooding and the strategic and tactical response framework for key responders.

This SFRA contains useful data to allow emergency planning processes to be tailored to the needs of the area and be specific to the flood risks faced. The SFRA Maps in Appendix A and

²⁰ CIRIA (2008) Sustainable Drainage Systems: promoting good practice – a CIRIA initiative

²¹ <https://www.gov.uk/government/publications/the-national-flood-emergency-framework-for-england>

accompanying GIS layers provided should be made available for consultation by emergency planners during an event and in the planning process.

4.8.1 Civil Contingencies Act

Under the Civil Contingencies Act (CCA, 2004)²², CMBC is classified as a Category 1 responder holding a statutory duty to provide civil protection to their communities to ensure human welfare, environmental stability and UK security are not affected. Under the Act, risk assessments and emergency planning are arranged through Local and Regional Resilience Forums (LRF/RRF).

During an emergency such as a flood event, the Local Authority must also co-operate with other Category 1 responders (such as the emergency services and the Environment Agency) to provide the core response.

CMBC is part of the West Yorkshire Resilience Forum (RF)²³. The role of the RF is to ensure that there is an appropriate level of preparedness to enable an effective multi-agency response to emergency incidents that may have a significant impact on the communities of West Yorkshire. The RF consists of representatives from the Emergency Services, Local Authorities, Health, Environment Agency and other professional and voluntary agencies. As a strategic decision-making organisation, the RF has prepared a Community Risk Register (CRR)²⁴, which considers the likelihood and consequences of the most significant risks the area faces including tidal fluvial and urban flooding. This SFRA can help to inform this.

4.8.2 Local Flood Plans

The SFRA provides a number of flood risk data sources that should be used when producing or updating flood plans. Plans currently in place or under preparation that affect CMBC have been outlined in Section 3.6.4.

This SFRA data can be used to:

- Update these Flood Plans if appropriate.
- Inform Emergency Planners in understanding the possibility, likelihood and spatial distribution of all sources of flooding (Emergency Planners may however have access to more detailed information, such as for Reservoir Inundation Maps, which have not been made available for this SFRA).
- Identify safe evacuation routes and access routes for emergency services.
- Identify key strategic locations to be protected in flooding emergencies, and the locations of refuge areas which are capable of remaining operational during flood events.
- Engage local communities.
- Support emergency responders in planning for and delivering a proportionate, scalable and flexible response to the level of risk.
- Provide flood risk evidence for further studies.

4.8.3 Flood Warning and Evacuation Plans

Developments that include areas that are designed to flood (e.g. ground floor car parking and amenity areas) or have a residual risk associated with them, will need to provide appropriate flood warning and instructions so users and residents are safe in a flood. This will include both physical warning signs and written flood warning and evacuation plans.

CMBC will be unable to write specific flood plans for new developments at flood risk. Developers should write their own. Guidance can be found on the Environment Agency web site²⁵. Generally, owners with individual properties at risk should write their own individual flood plans, however larger developments or regeneration areas, such as retail parks, hotels and leisure complexes, should consider writing one collective plan for the assets within an area.

²² <https://www.gov.uk/preparation-and-planning-for-emergencies-responsibilities-of-responder-agencies-and-others#the-civil-contingencies-act>

²³ <http://www.westyorkshire.police.uk/help-advice/resilience>

²⁴ <http://www.westyorkshire.police.uk/help-advice/resilience/reports>

²⁵ <http://www.environment-agency.gov.uk/homeandleisure/floods/38329.aspx>

Whilst there is no statutory requirement on the Environment Agency or the emergency services to approve evacuation plans, the Council is accountable, via planning condition or agreement, to ensure that plans are suitable. This should be done in consultation with Development Management Officers. Given the cross cutting nature of flooding, it is recommended that further discussions are held internally to CMBC between emergency planners and policy planners / development management officers and drainage engineers and to external stakeholders such as the emergency services, the Environment Agency, Yorkshire Water and the Canal & River Trust.

It may be useful for both Emergency and Spatial Planners to consider whether as a condition of planning approval, flood evacuation plans should be provided by the developer which aim to safely evacuate people out of flood risk areas, using as few emergency service resources as possible. The application of such a condition is likely to require policy support in the Local Plan, and discussions with the West Yorkshire Resilience Forum are essential to establish the feasibility / effectiveness of such an approach, prior to it being progressed. It may also be useful to consider how key parts of agreed flood evacuation plans could be incorporated within local development documents, including in terms of protecting evacuation routes and assembly areas from inappropriate development.

Once the development goes ahead, it will be the requirement of the plan owner (developer) to make sure the plan is put in place, and to liaise with the Council regarding maintenance and updating of the plan.

4.8.4 What should the Plan Include?

Flood warning and evacuation plans should include the information stated in Table 4-1.

Table 4-1: Flood Warning and Evacuation Plans

Consideration	Purpose
Availability of existing flood warning system	The Environment Agency offers a flood warning service that currently covers designated Flood Warning Areas in England and Wales. In these areas they are able to provide a full Flood Warning Service.
Rate of onset of flooding	The rate of onset is how quickly the water arrives and the speed at which it rises which, in turn will govern the opportunity for people to effectively prepare for and respond to a flood. This is an important factor within Emergency Planning in assessing the response time available to the emergency services.
How flood warning is given and occupants awareness of the likely frequency and duration of flood events	Everyone eligible to receive flood warnings should be signed up to the Environment Agency service. Where applicable, the display of flood warning signs should be considered. In particular sites that will be visited by members of the public on a daily basis; sports complexes, car parks, retail stores. It is envisaged that the responsibility should fall upon the developers and should be a condition of the planning permission. Information should be provided to new occupants of houses concerning the level of risk and subsequent procedures if a flood occurs.
The availability of staff / occupants / users to respond to a flood warning and the time taken to respond to a flood warning	The plan should identify roles and responsibilities of all responders. The use of community flood wardens should also be considered.
Designing and locating safe access routes, preparing evacuation routes and the identification of safe locations for evacuees	Dry routes will be critical for people to evacuate as well as emergency services entering the site. The extent, depth and flood hazard rating should be considered when identifying these routes.
Vulnerability of occupants	Vulnerability classifications associated with development as outlined in the Flood Risk and Coastal Change PPG. This is closely linked to its occupiers.
How easily damaged items will be relocated and the expected time taken to re-establish normal use following an event	The impact of flooding can be long lasting well after the event has taken place affecting both the property, which has been flooded and the lives that have been disrupted. The resilience of the community to get back to normal will be important including time taken to repair / replace damages.

4.8.5 Flood Awareness

Emergency planners may also use the outputs from this SFRA to raise awareness within local communities. This should include raising awareness of measures that people can take to make their homes more resilient to flooding from all sources and encouraging all those at fluvial flood risk to sign up to the Environment Agency's Floodline Warnings Direct service. It is also recommended that Category 1 responders are provided with appropriate flood response training to help prepare them for the possibility of a major flood with an increased number of people living within flood risk areas.

5 Conclusions and Recommendations

5.1 Conclusions

SFRAs are designed to be a single repository planning tool relating to flood risk and development. This SFRA provides guidance on what developers and the LPA should be doing in relation to development allocation and flood risk. It has not performed a preliminary assessment of the council's development allocations as requested by the council as they are undertaking their own assessment through their Local Plan site allocations process. The SFRA has consulted key flood risk stakeholders such as the Environment Agency and Canal & River Trust and collated all available and relevant flood risk information on all sources in one comprehensive assessment.

The flood risk information, assessment, guidance and recommendations of the SFRA will provide Strategic Planners with the evidence base required to apply the Sequential and Exception Tests, as required under the NPPF, and demonstrate that a risk based, sequential approach has been applied in the preparation of their development plans and documents. This will allow for a sustainable and robust approach to development during Local Plan.

Whilst the aim of the sequential approach is the avoidance of high flood risk areas, in locations such as Halifax and Brighouse, where the Council strives for continued growth and regeneration, this will not always be possible. The SFRA therefore provides the necessary links between spatial developments, wider flood risk management policies, local strategies and on the ground works by bringing flood risk information into one location.

5.2 Recommendations for Further Work

The SFRA process has however, developed into more than just a planning tool. Sitting alongside the Calderdale PFRA, it can be used to provide a much broader and inclusive vehicle for integrated, strategic and local flood risk management and delivery.

There are a number of plans and assessments listed in Table 5-1 that would be of benefit to CMBC in developing their flood risk evidence base to support the delivery of their Local Plan or help fill critical gaps in flood risk information.

5.2.1 Level 2 SFRA

The Council should review the sites where they expect the main housing numbers and employment sites to be delivered. A Level 2 SFRA will be required if a large site, or group of sites, are within Flood Zone 3 and have strategic planning objectives, which means they cannot be relocated or avoided. A Level 2 SFRA may also be required if the majority of the site(s) is within Flood Zone 2. The Level 2 SFRA should show that the site will not increase risk to others and will be safe, once developed.

The LPA will need to provide evidence in their Local Plan to show that the housing numbers (and other sites) can be delivered. The Local Plan may be rejected if a large number of sites require the Exception Test to be passed but with no evidence that that will be possible.

5.2.2 Critical Drainage Areas

Critical Drainage Areas (CDAs) are a useful planning tool, giving the LPA the means to reject a planning application or request further investigation from a developer, such as a site specific FRA. The indicative CDAs, defined as part of this Level 1 SFRA, should be discussed between the LLFA lead officer and an LPA officer. The Council may then decide that further work is required to accurately define CDAs in collaboration with Yorkshire Water and the Environment Agency.

Consultation between the Council and Yorkshire Water on the capacity of existing sewer systems would be required in order to identify critical parts of the system that may increase risk. Model outputs could be obtained to confirm the critical parts of the drainage network. Recommendations could then be made for future development. Any such assessment could be completed alongside a Level 2 SFRA or as a separate drainage strategy.

Table 5-1: Recommended Further Work

Type	Study	Reason	Timeframe
Strategy	LFRMS	CMBC should finalise their LFRMS as required under the FWMA.	Short Term
CDA Designation	Level 2 SFRA, SWMP, drainage strategy	Significant surface water flooding issues, uncertainty on the capacity of the drainage network.	Short term
Data Collection	Flood Incident Data	CMBC has a duty to investigate and record details of significant flood events within their area. General data collected for each incident, should include date, location, weather, flood source (if apparent without an investigation), impacts (properties flooded or number of people affected) and response by any RMA.	Short Term / Ongoing
Data Collection	Asset Register	CMBC should continue to update and maintain their DAMS register of structures and features, which are considered to have an effect on flood risk.	Short Term / Ongoing
Risk Assessment	Asset Register Risk Assessment	CMBC should carry out a strategic flood risk assessment of structures and features on the Asset Register to inform capital programme and prioritise maintenance programme.	Short Term / Ongoing
Capacity	LLFA	The Department for Communities and Local Government announced in December 2014 that local planners will be responsible for delivering SuDS. Changes to planning legislation give provisions for major applications of ten or more residential units or equivalent commercial development to require sustainable drainage within the development proposals in accordance with the interim national standards published in April 2015.	Unknown
Partnership	Yorkshire Water	CMBC should continue to work with Yorkshire Water on sewer and surface water projects.	Ongoing
Partnership	Environment Agency	CMBC should continue to work with the Environment Agency on fluvial flood risk management projects. CMBC should also identify potential opportunities for joint schemes to tackle flooding from all sources.	Ongoing
Partnership	Canal & River Trust	CMBC should continue to work with the Canal & River Trust to understand the residual risks associated with canals and reservoirs.	Ongoing
Partnership	Community	Continued involvement with the community through DMBC's existing flood risk partnerships	Ongoing

Appendices

A SFRA Flood Risk Maps

SFRA Interactive GeoPDFs

Note on how to use interactive GeoPDFs

For each set of maps, open the Index Map in Adobe Acrobat. The index maps contain a set of index squares covering different areas of the Borough. By clicking on any index square you will open up a more detailed map of the area covered by that index square, by way of a hyperlink. Within Adobe Acrobat, use the zoom tools and the hand tool to zoom and pan around the maps. In the legend on the right hand side of the detailed maps, layers can be switched on and off when required.

B Functional Floodplain and Flood Zone 3ai

C Canal & River Trust Asset Database and Historic Canal and Reservoir Overtopping and Breach Incidents

D Environment Agency AIMS Database

E Indicative critical drainage area Methodology

F SFRA User Guide



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