

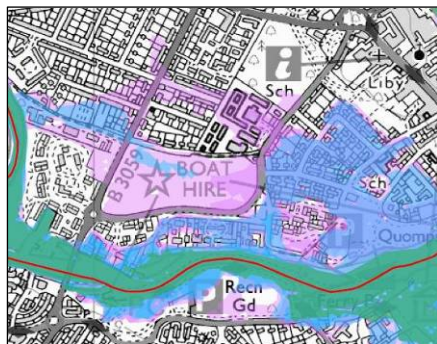
# Christchurch Borough Council

## Strategic Flood Risk Assessment

### Level 2 SFRA – Executive Summary

August 2009

**Halcrow Group Limited**



**Christchurch Borough Council**  
Strategic Flood Risk Assessment  
Level 2 SFRA – Executive Summary

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#### Contents Amendment Record

This report has been issued and amended as follows:

Issue	Revision	Description	Date	Signed
1	0	Draft	11 August 2009	C Hart
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## Executive Summary

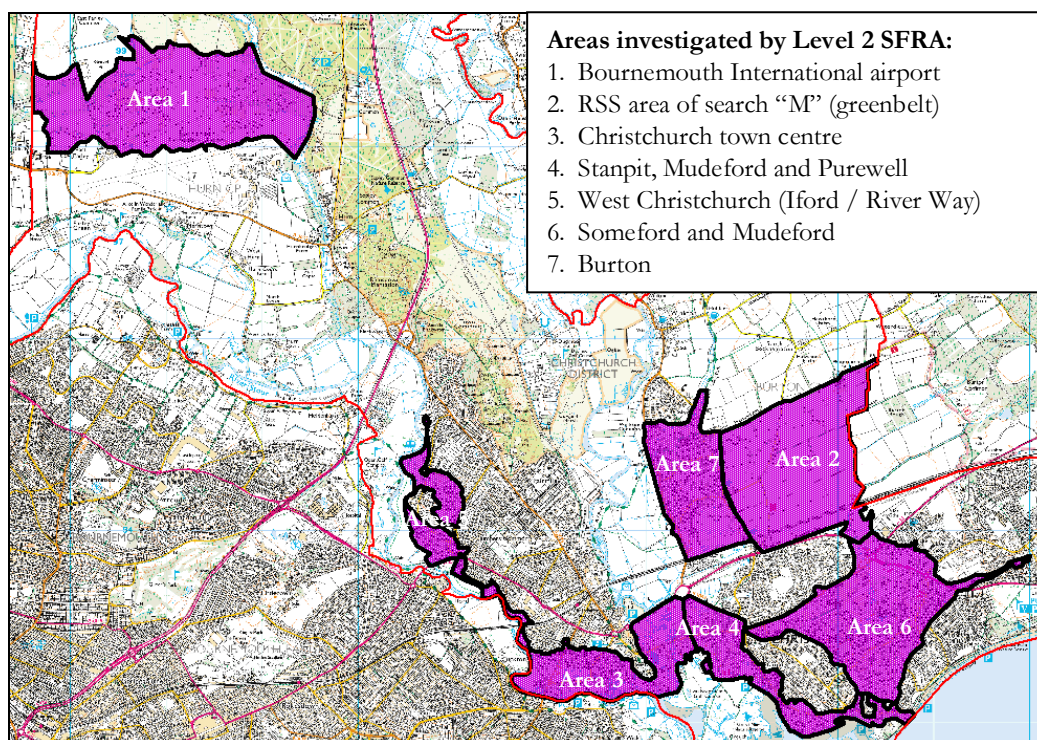
### A Introduction

#### A.1 Background

In June 2008, Christchurch Borough Council (CBC) commissioned Halcrow to produce a Level 2 Strategic Flood Risk Assessment (SFRA) for all populated areas at risk of flooding and locations being considered for future development (identified by Level 1 SFRA). The seven areas investigated are shown below.



The Level 2 SFRA is in accordance with Planning Policy Statement 25: Development and Flood Risk (PPS25) and its accompanying practice guide. It refines and builds upon the recent Level 1 SFRA (February 2008), providing more detailed information on all forms of flood risk: fluvial (rivers), tidal, surface water, groundwater, sewer and from impounded water bodies (reservoirs), both now and in the future given the likely impacts of climate change.



#### A.2 Planning context

National planning policy relating to flooding is set out in PPS25, which recognises that, although flooding cannot be wholly prevented, its impacts can be avoided and reduced through good planning and management. The recent Pitt Review is also pertinent, as a comprehensive review of the lessons to be learned from the flooding of summer 2007.

Flood risk is required to be taken into account at all stages in the planning process to avoid inappropriate development in areas of flood risk and to direct development away from areas of highest risk. This is referred to by PPS25 as the sequential approach. Where new development is necessary in such areas, under exceptional circumstances, the policy aims to make development 'safe' through application of the Exception Test without increasing flood risk elsewhere and, where possible, reducing flood risk overall (Development and Flood Risk practice guide, 2008).

#### A.3 *Purpose of the SFRA*

- SFRAs form part of evidence base for the Local Development Framework
- Inform the Sustainability Appraisal
- Inform decisions on land allocation / policies:
  - PPS25 Sequential Test of development sites
  - PPS25 Exception Test of development proposals
  - demonstrate if development will be “acceptably safe”
  - take into account future climate change
- Identify the level of detail required for site-specific flood risk assessments
- Provide information to developers for use in flood risk assessments
- Support the emergency planning capability
- Consider the beneficial effects of flood defences



The Level 2 SFRA will be used by Christchurch Borough Council in the application of the sequential approach as set out in PPS25 because many of the sites being considered for housing development are within Flood Zones 2 and 3.

The SFRA provides detailed flood risk information, identifying the lower risk areas within a Flood Zone, so that flood risk can be mitigated and developments made safe. Both undefended and defended conditions are taken into account, so that protection provided by existing flood defences can be considered.

The SFRA details flood related planning policy at national, regional and local levels. This highlights that flood risk must be taken into account at every hierarchical level within the planning process. A series of policy recommendations are made, and information contained in the SFRA provides evidence to facilitate the preparation of robust policies for flood risk management.

## **B The SFRA**

### B.1 *Structure of the SFRA document*

This document comprises three separate volumes:

- Volume I is the main report which presents the current and climate change flood risks for the areas investigated, flood risk management practices and policy recommendations.
- Volume II contains the SFRA maps that illustrate all the flood risks in the study area.
- Volume III is the modelling report that details the technical work to produce the maps

The SFRA is a living document and should be updated as new data becomes available.

### B.2 *Products and work done*

Detailed hydraulic models have been developed for flood risk areas that had only previously been modelled by the Environment Agency using a national generalised computer model. Where appropriate, 2-D modelling software has been used to produce peak flood extents, depths and flow velocities and this information has been used to produce flood hazard classifications and animations to illustrate the rate of onset of flooding.

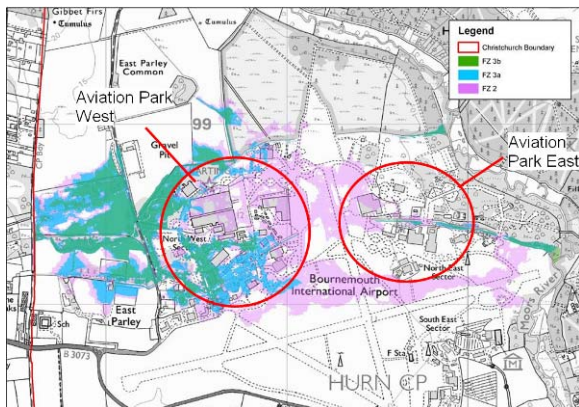
The areas benefiting from flood defences are identified (with the SFRA flood maps presenting defended and undefended scenarios), as these are used in exceptional circumstances where lower flood risk sites are not available and the variation in flood risk across a site requires further analysis.

The emerging Local Development Framework for Christchurch is expected to run until 2026. To correspond with this planning horizon, the impact of climate change on the risk of fluvial and tidal flooding has been assessed for 60 years (minimum design life of non-residential development) and 100 years (residential development) beyond 2026, i.e. in year 2086 and year 2126. This approach ensures that CBC is planning in line with the LDF and beyond the RSS.

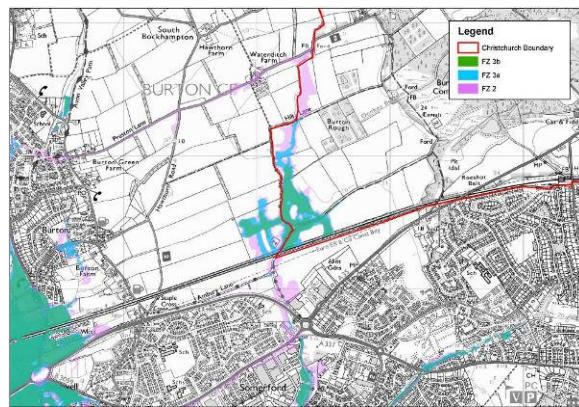
**B.3** *SFRA Flood Zones maps – define flood risks in the absence of any defences*

The SFRA Flood Zones for the seven areas investigated (by modelling) are defined as:

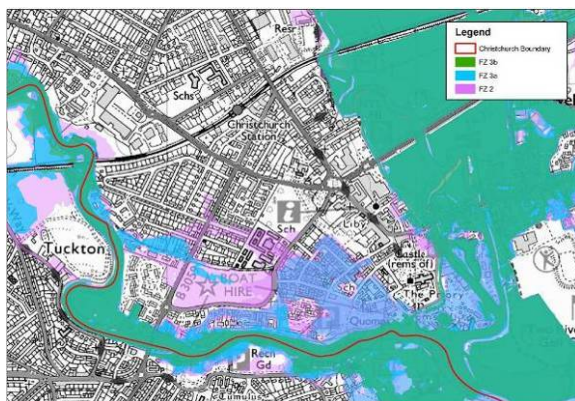
- Zone 1 Low Probability (<1 in 1000-year)
- Zone 2 Medium Probability (1 in 100 to 1000-year)
- Zone 3a High Probability (1 in 100-year or greater)
- Zone 3b Functional Floodplain (1 in 20-year or greater)



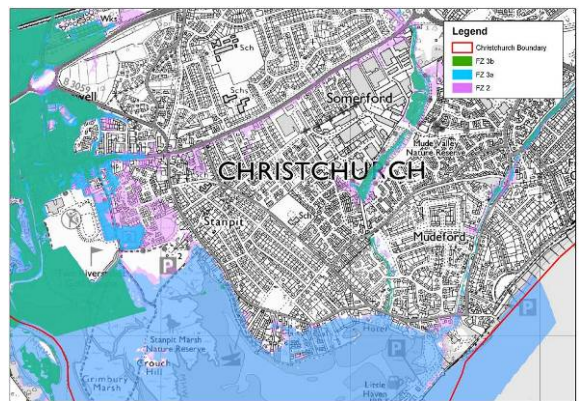
**Area 1: Bournemouth airport**



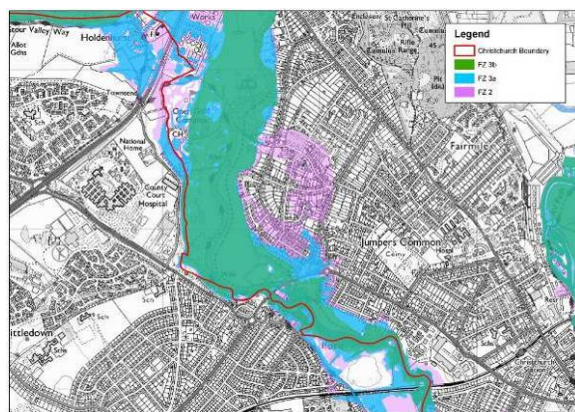
**Area 2: Roeshot Hill area of search**



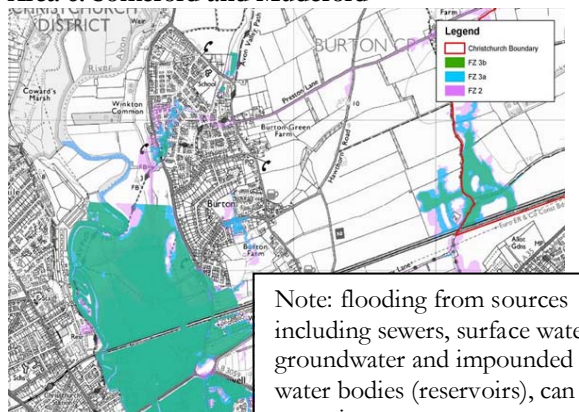
**Area 3: Christchurch Town Centre**



**Area 4: Stanpit, Mudeford and Purewell**  
**Area 6: Somerford and Mudeford**



**Area 5: West Christchurch (Iford / River Way)**



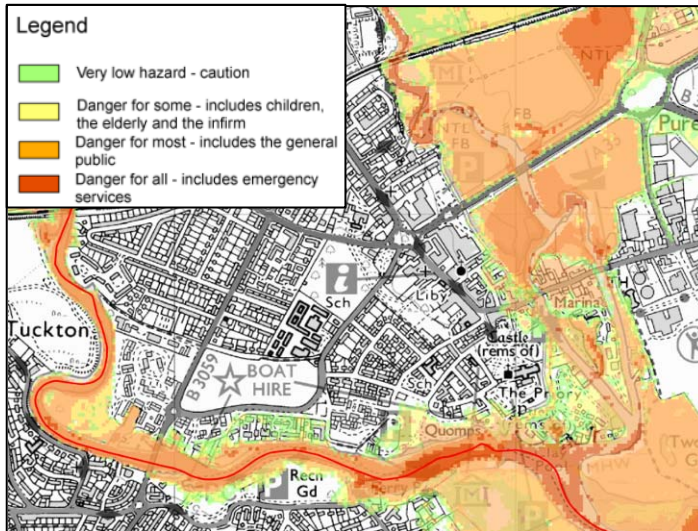
**Area 7: Burton**

Note: flooding from sources including sewers, surface water, groundwater and impounded water bodies (reservoirs), can occur in any zone



B.4 SFRA Flood Zone hazard maps

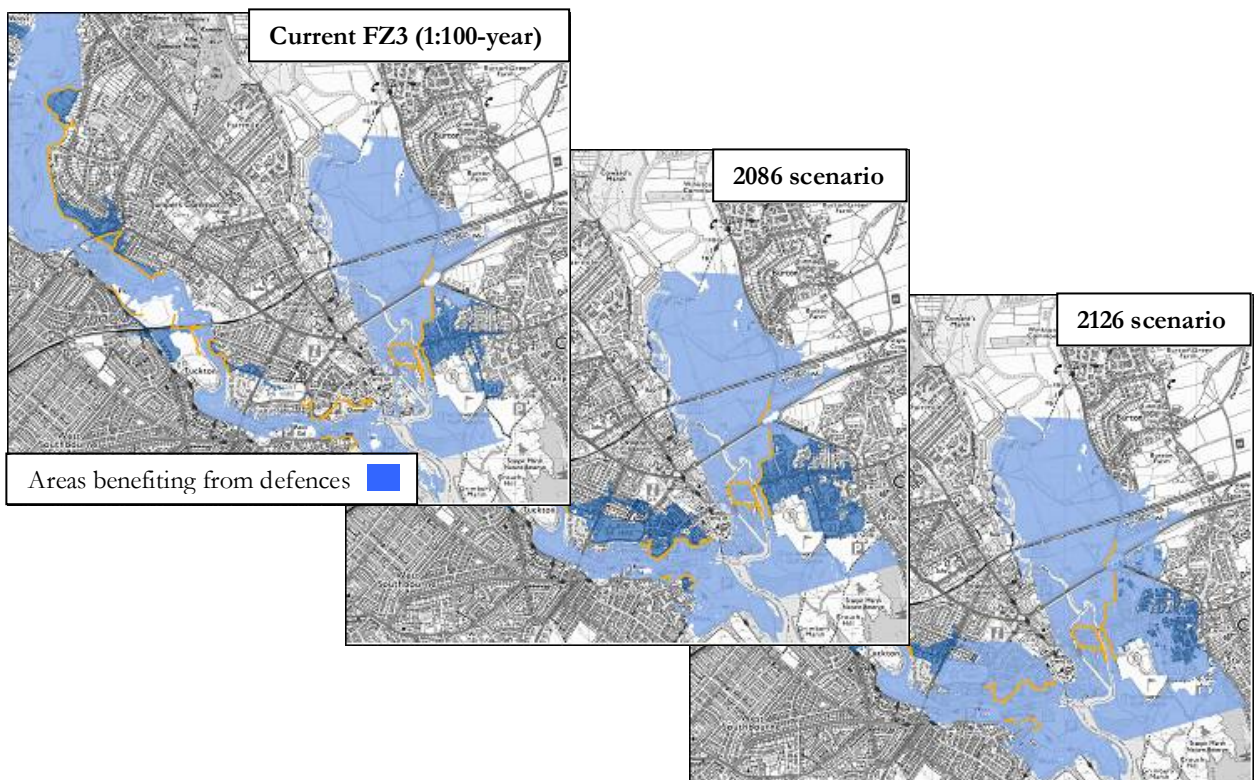
The SFRA presents flood maps (see example below) that define the Flood Zone hazard following the Defra flood risks to people classification (2006) intended for development and planning control. The degree of hazard is determined as low, moderate (danger for some), significant (danger for most) and extreme (deep or fast flowing water that presents a hazard for all people).



B.5 SFRM Flood Zone climate change maps

Within all seven areas investigated, the impact of climate change is that generally the area at risk of flooding is increased. This impact on each of the Flood Zones has been assessed to 2086 and 2126 (see example below) based on the following assumptions taken from PPS25:

- < River (fluvial) flood flows increase by 20% from 2025
- < Sea levels rise by +0.67m in year 2086 and +1.25m in year 2126
- < Wave height allowance of +0.1m for years 2086 and 2126



### B.6 SFRA surface water flood risk maps

As part of the Level 1 SFRA (February, 2008) a series of consultations were undertaken to identify known local drainage issues (surface water flooding). These incidents, limited in number and extent, have been added to the Level 2 SFRA maps.

The surface water flooding records are not considered an exhaustive assessment of surface water flooding since these data are based on historical events rather than predictive modelling. This means that very rare events will not be represented and, hence, the full extent of surface water flooding mechanisms is unlikely to have been captured.

There is currently no requirement to prepare a surface water management plan, as defined by the Pitt Review, and this should be reconsidered in 5 years or after significant flooding. There is, however, a need to review surface water management at local level due to the potential for extensive flooding identified at Bournemouth Airport (e.g. in the event of blockage in main drains) and the past flooding of the Wessex Water drainage network along the River Stour.

A key recommendation for Christchurch is to obtain and update surface water flooding records after any significant flooding incidents, to ensure the best available information is used to inform site allocations and windfall sites.

## C Major implications

### C.1 Flood risks areas investigated (by modelling)

#### ◀ 1. Bournemouth airport:

A significant area of Aviation Park West and a limited area of Aviation Park East (along the southernmost stream) are situated within FZ3b. FZ3a spans a larger area of Aviation Park West, while FZ2 affects much of Aviation Park West and part of Aviation Park East. The remainder of the site is classified as FZ1.

#### ◀ 2. Roeshot Hill area of search:

The majority of the Roeshot Hill area of search lies within FZ1. However, to the north of the railway line in the east (along the River Mude) there are limited areas of FZ2, FZ3a and FZ3b. Small areas of FZ2 lie to the north along Hawthorne Road and Preston Road.

#### ◀ 3. Town Centre:

Significant areas of the town centre are at risk of flooding from both the Rivers Avon and Stour. Locations along the banks of both of these rivers lie within FZ3b, which can only be developed for 'water compatible' uses (Table D.3 of PPS25). The Quomps and parts of Tuckton and Purewell are situated within FZ3a. Much of the remaining areas being assessed within Area 3 lies within FZ2, with limited areas of FZ1.

#### ◀ 4. Stanpit, Mundeford, Purewell:

Purewell and Stanpit are at risk of flooding from both the River Avon and the sea. Mundeford is at risk of flooding from the sea, the River Mude and Bure Brook (see Area 6 for assessment of Mundeford). Part of Purewell lies within FZ3b. Areas along the coastline and part of Purewell are identified as FZ3a, with areas further inland classified as FZ2.

#### ◀ 5. West Christchurch:

West Christchurch is at risk of flooding from the River Stour. The banks of the River Stour are classified as FZ3b, which includes the caravan park. Limited areas of adjacent land are classified as FZ3a, with larger areas of western Jumpers identified as lying within FZ2.

- 6. River Mude and Bure Brook:  
The majority of Area 6 lies within FZ1, but limited areas along the River Mude and the Bure Brook are situated within FZ3b, FZ3a and FZ2. To the north of Area 6 the B3059 Somerford Road is also identified as a flood flow route during a 1 in a 1000 year flood event and is therefore classified as FZ2.
- 7. Burton:  
Parts of Burton are at risk of flooding from the Clockhouse stream (north Burton) and the Burton Brook (south Burton). The area of undeveloped land to the south and west of Burton is at risk of flooding from the River Avon. Model results identify locations along the Clockhouse stream and to the south and west of Burton to be within FZ3b.

Areas to the north-west of Burton along the River Avon (e.g. Winkton Common) are also at risk of flooding from the River Avon but that the flood risk to these areas has not been modelled/mapped in this SFRA. In addition, there are small areas identified as both FZ3a and FZ2 along both the Clockhouse stream and the Burton Brook.

Within all seven areas considered in this SFRA the effect of climate change to 2086 and 2126 is that generally the area at risk of flooding is increased. Maps 2a and 3b (see Volume II) show the extents of the flood zones in 2086 and 2126.

#### C.2 Using the SFRA to guide planning

The Draft South West RSS (June 2006) sets out requirements for housing and employment within the borough to 2026. This strategy (Policy SR29) includes the requirement for 3,450 houses in borough to include 600+ dwellings in urban extension to north of Christchurch, east of Burton. The Council planners are currently identifying suitable sites for housing/employment, and the SFRA is intended to help with this process.

Government guidance requires a risk based approach to planning and PPS25 provides guidance on the sequential approach. Flood Zones are the starting point to guide planning, with the SFRA flood maps identifying FZ2 and FZ3 (ignoring existing defences) and other forms of flooding. The Sequential Test ensures compatibility of land-use and flood risk and guides development to areas of lowest flood risk.

Flood Zone (FZ)	Vulnerability of development				
	Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
FZ 1	Development is appropriate	Development is appropriate	Development is appropriate	Development is appropriate	Development is appropriate
FZ 2	Sequential Test required	Sequential Test required	Exception Test required	Sequential Test required	Sequential Test required
FZ 3a	Exception Test required	Sequential Test required	No	Exception Test required	Sequential Test required
FZ 3b (functional floodplain)	Exception Test required	Sequential Test required	No	No	No

No = development should not be permitted

Why the sequential approach?

- ◀ Aims to steer development to sites with little or no flood risk.
- ◀ Where no FZ1 sites are available: decision makers should identify reasonably available Zone 2 sites - applying the Exception Test, if necessary.

- ◀ Where no FZ1 or FZ2 sites are available: decision makers should identify reasonably available FZ3 sites - applying the Exception Test, if necessary.
- ◀ Within each Zone: direct development to sites with the lowest probability of flooding.
- ◀ Higher vulnerability uses: should be sited with the least flood risk.

For the Exception Test to be passed:

- ◀ Demonstrate the development provides sustainability benefits that outweigh flood risk
- ◀ Development should be on developable Previously Developed Land (PDL), if not, there should be no reasonably available developable PDL site
- ◀ Supporting Flood Risk Assessment required to demonstrate, inter alia, that development will be safe without increasing flood risk elsewhere

### C.3 *Flood risk related policies*

The complex range of issues that result from the Level 2 SFRA have wide ranging implications for future planning in Christchurch. The Local Development Framework will require detailed policies to ensure development takes place in safe and suitable locations, while making the best use of the scarce developable land.

As policies are too detailed for inclusion in the Core Strategy alone, the Council will need to give consideration to preparing a Supplementary Planning Document for additional detail on the subject of flood risk and how the LPA and developers should deliver the Core Strategy policies.

Some example policies for consideration include:

- ◀ Potential for upstream storage to reduce downstream flood risk
- ◀ Possibility of reinstating functional floodplain
- ◀ Possibility to increase flood awareness, encourage self-help measures, improve emergency planning (e.g. flood warden schemes)
- ◀ Importance of SUDS
- ◀ Possibility for developer contributions towards flood schemes
- ◀ To seek risk reduction through spatial planning and site design
- ◀ To reduce surface water runoff from new developments (e.g. with SuDS)
- ◀ To enhance and restore the river corridor
- ◀ To protect and promote areas for future flood alleviation schemes
- ◀ To improve flood awareness and emergency planning
- ◀ To inform the update to the Borough's Major Incident Plan in terms of flood planning and evacuation.

### C.4 *Location specific development policies*

Each of the seven areas investigated span Flood Zones 1, 2, 3a and 3b, but within these Flood Zones the flood hazard varies due to differences in flood depth and velocity. As a result, location specific development policies as summarised below are recommended for these areas.

These policies are additional to those borough wide policies advised as part of the Level 1 SFRA, except the policy recommendations for safe access and egress are revised in the Level 2 SFRA in line with the updated PPS25 Practice Guide (June 2008).

In allocating sites for development the Council is required to adopt the climate change fluvial and tidal flood zone maps for the lifetime of the proposed development, in addition to any other sources of flooding (surface water, groundwater and sewer).

Site description and potential for development	Policy recommendations for lifetime of proposed developments <i>(to 2086 for non-residential and 2126 for residential)</i>
<b>1. Bournemouth airport</b>	
Continued use as operational airport and employment land	<ul style="list-style-type: none"> <li>◀ Large areas of this site are at risk of flooding, but flood depths and velocities vary across the site and so development should be directed to the areas of lowest risk (in the east), unless flood risks in the west of the site can be mitigated.</li> <li>◀ Culverts at the airport need to be maintained. At the present there are three structures that were observed to be partially blocked during the site survey.</li> </ul>
<b>2. Roeshot Hill area of search</b>	
Currently greenbelt. Partial development for housing; most likely south of the railway and possibly along the east edge of Burton. Remaining land to continue use for agriculture within green belt.	<ul style="list-style-type: none"> <li>◀ Much of this site lies within Flood Zone 1. Therefore it is recommended that any future development sites are allocated within Flood Zone 1.</li> </ul>
<b>3. Town Centre</b>	
Medium to high density urban area; housing, commercial and leisure uses. Continuing pressure for development. Large green spaces likely to continue to be protected.	<ul style="list-style-type: none"> <li>◀ Large areas of this site are at risk of flooding, but flood depths and velocities vary across the site and so development should be directed to the areas of lowest risk (in the north).</li> <li>◀ Fluvial defences lower the risk of flooding within this area. Any sites behind a defence that is being considered for residential development will require a breach and overtopping assessment to allow any development to be designed appropriately.</li> <li>◀ Old landfill sites should be avoided due to the risk of potential contaminants.</li> </ul>
<b>4. Stanpit, Mundeford, Purewell</b>	
Low to medium density residential area. Moderate pressure for intensification (infill residential development). Large green spaces likely to continue to be protected.	<ul style="list-style-type: none"> <li>◀ Large areas of this site are at risk of flooding, but flood depths and velocities vary across the site and so development should be directed to the areas of lowest risk (in the east).</li> <li>◀ Fluvial defences lower the risk of flooding to the north of this area (Purewell). Any sites behind a defence that is being considered for residential development will require a breach and overtopping assessment to allow any development to be designed appropriately.</li> <li>◀ Old landfill sites should be avoided due to the risk of potential contaminants.</li> </ul>
<b>5. West Christchurch</b>	
Medium to low density residential area. Continuing pressure for intensification (infill residential development). Large green spaces likely to continue to be protected.	<ul style="list-style-type: none"> <li>◀ Large areas of this site are at risk of flooding, but flood depths and velocities vary across the site and so development should be directed to the areas of lowest risk (in the east).</li> <li>◀ Fluvial defences lower the risk of flooding to the west of this area (west of Jumpers Common). Any sites behind a defence that is being considered for residential development will require a breach and overtopping assessment to allow any development to be designed appropriately.</li> </ul>
<b>6. River Mude, Bure Brook</b>	
Primarily green spaces and wildlife corridors within medium density residential area. Mild pressure for intensification (infill residential development). Large green spaces likely to continue to be protected.	<ul style="list-style-type: none"> <li>◀ Much of this site lies within Flood Zone 1. Therefore it is recommended that any future development sites are allocated within Flood Zone 1.</li> <li>◀ Culverts on the River Mude and Bure Brook need to be maintained.</li> </ul>
<b>7. Burton</b>	
Medium density residential area and some green spaces. Moderate pressure for intensification (infill residential development). Large green spaces likely to continue to be protected.	<ul style="list-style-type: none"> <li>◀ Much of this site lies within Flood Zone 1. Therefore it is recommended that any future development sites are allocated within Flood Zone 1.</li> <li>◀ Culverts on the Burton Brook need to be maintained.</li> </ul>

C.5 Other key policy drivers

European policy includes for example: the Water Framework Directive that is the most substantial piece of European Community (EC) water legislation to date. It requires all inland and coastal waters to reach "good ecological status" by 2015.

National policy includes for example: Defra's Making Space for Water: Government Strategy for flood management over the next 20 years; and the Environment Agency's Catchment Flood Management Plans (CFMP) and Shoreline Management Plan (SMP) as high-level strategic planning documents for long-term flood risk management over 100 years.

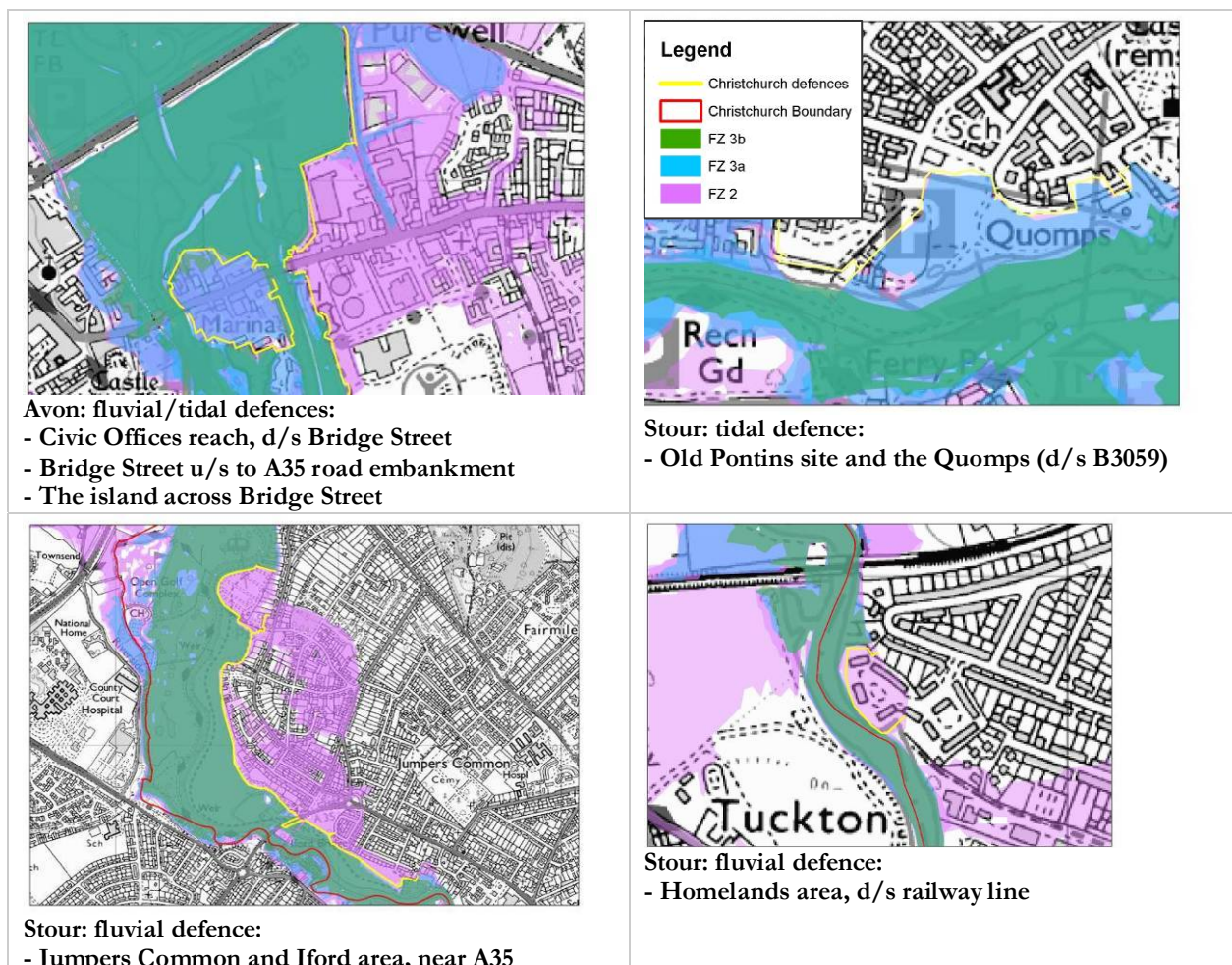
The Flood and Water Management Bill when implemented (currently at draft stage) will:

- ◀ make clear who is responsible for managing all sources of flood risk;
- ◀ encourage more sustainable forms of drainage in new developments
- ◀ make it easier to resolve misconnections to sewers.

D Flood defences

D.1 Origin

Most defences in the Christchurch SFRA area were constructed under the 1993 Lower Stour Flood Defence Scheme or the 1998 Lower Avon Scheme. These defences are owned by the Environment Agency with exception of two short sections (upstream Bridge Street and marina area). The key groups of flood defences are indicated below.



*(only fluvial flood zones are illustrated, except for the Old Pontins site and the Quomps with the tidal flood zones also shown)*

#### D.2 *Current state*

The overall condition of defences is classified as 'good' to 'very good', all at less than 20 years old. Only minor concerns for the defences currently in place are identified: firstly, two low spots in the Avon defences and secondly maintenance to some sections of earth embankments.

The majority of the defences are designed to provide a 1 in 100-year standard of protection. There are a limited number where the protection is lower (below 1 in 20-year, small private defences only) or higher (1 in 200-year).



#### D.3 *Upgrading existing defences*

The Environment Agency's policy for fluvial defences within Christchurch is to take further action to reduce flood risk, although there are currently no plans to improve on the 1 in 100-year protection currently provided by the existing defences. The Environment Agency considers defences for existing developments, not future needs.

The relevant CFMP / SMP policies for Christchurch are:

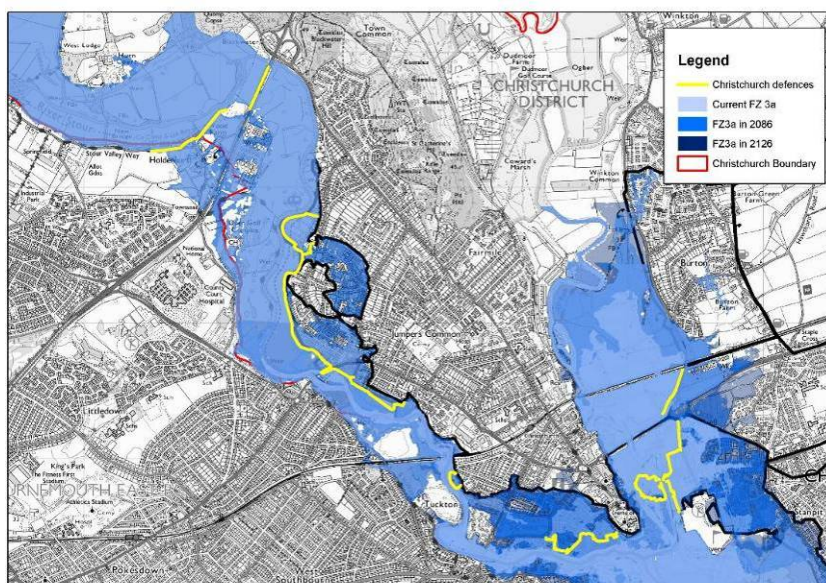
- ◀ Future need for defences will increase:
  - increased fluvial flood risks
  - rising sea levels
  - potential increase in storm surge
- ◀ Environment Agency policy to continue protection to properties
- ◀ Avon and Stour CFMPs (draft) policy: take further action to reduce flood risk
- ◀ Poole & Christchurch Bays SMP policy:
  - Stanpit and Mundeford: 'hold the defence line'
  - Stanpit Marsh: 'managed realignment' policy
  - Christchurch Bay: 'mixed management types'

The Poole and Christchurch Bays SMP indicates that the policy for tidal defences in Stanpit and Mundeford is largely to 'hold the existing defence line' where properties are at risk of flooding. The Environment Agency also accepts that these tidal defences can be upgraded and will not object to others undertaking the works.

#### D.4 *Implications of failure*

A significant risk within Christchurch is the reliance on raised defences and as sea levels continue to rise any breach or overtopping of defences could be very severe and have a major impact. The areas at greatest risk of breach or overtopping (particularly the sites located close behind the flood defences) are the Town Centre, West Christchurch and Christchurch Harbour.

The undefended model flood limits show the areas at risk of flooding if the defences are removed, and hence indicates the areas at risk of flooding if the defence should fail. Undefended model runs for the present day, and in 2086 and 2126 with climate change can be seen in the figure below. This indicates that if existing defences are raised and widened (to maintain current standards of protection with climate change), the areas at risk of flooding as a result of defence failure (i.e. overtopping or breaching) will progressively increase.



The above figure is only indicative of the effect of defence failure, and breach and/or overtopping scenarios are recommended to better understand risks to any existing or future development.

#### ***E Concluding remarks***

The Level 2 SFRA follows PPS25 and its associated practice guidance and the guidance provided at all stages by the Environment Agency and Council planners. The Levels 1 and 2 SFRA together form part of the evidence base for the Local Development Framework (LDF) and are intended to inform decisions regarding land allocation and policies. The SFRA will be considered an integral part of the Sustainability Appraisal of relevant component documents of the LDF.

Seven geographical areas that may need to be considered for development have been investigated, with the final SFRA output including hydraulic models developed for areas not previously modelled and new flood information in the form of Flood Zones maps (defended and undefended) and flood hazard maps (defended) for current conditions and climate change scenarios (2086 and 2126). Animations for each area of the rate of flooding onset for the selected design events and surface water flood risk maps (collated records) also form part of the output.

The best information is to be used to guide the site selection process for future developments. For this reason, this SFRA is a living document (reports and maps) to be updated as new information becomes available, e.g. further improvements to river models, surface water flooding incidents or revised climate change guidance.