Bassetlaw District Council

Strategic Flood Risk Assessment

VOLUME FOUR MAPS

July 2009

FINAL REPORT

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CONTRACT

This report describes work commissioned by Bassetlaw District Council by order number 901008. Bassetlaw District Council's representative for the contract was Richard Schofield. Karen Shuttleworth, Francesca Hurt, Matthew Hemsworth, Richard Roebuck and Georgina Niciecki of JBA Consulting carried out the work.

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PURPOSE

This document has been prepared solely as a Strategic Flood Risk Assessment Report for Bassetlaw District Council. JBA Consulting accepts no responsibility or liability for any use that is made of this document other than by Bassetlaw District Council for the purposes for which it was originally commissioned and prepared.

ACKNOWLEDGMENTS

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EXECUTIVE SUMMARY

This report is a Strategic Flood Risk Assessment (SFRA) for Bassetlaw District Council. It is a Level 2 SFRA that incorporates the requirements of a scoping study SFRA (Level 1) and increased scope SFRA (Level 2). This SFRA has been prepared in accordance with current best practice, Planning Policy Statement 25 *Development and Flood Risk* (PPS25).

The SFRA constitutes one of a number of planning tools that enables the District Council to select and develop sustainable site allocations away from areas of greatest vulnerability to flooding in Bassetlaw. The assessment does not focus on specific development sites. The report discusses the broad scale flood risk within Bassetlaw, and also focuses in more detail on Worksop and Retford, allowing an informed decision to be taken when allocating future development sites. It sets out the procedure to be followed when assessing sites in the future. The SFRA will assist the District Council to make the spatial planning decisions required to inform the Local Development Framework (LDF) for the Bassetlaw area.

The SFRA is intended to be a "live" document, updated when appropriate to reflect changes in the district and as new information becomes available.

Relevant planning, policy and guidance documents have been taken into account in preparing this SFRA. The documents which have been reviewed include national, regional and local planning legislation, together with Environment Agency policy guidance.

A thorough review of existing information and the construction of new hydraulic models has identified the level of flood risk in the Bassetlaw area from fluvial (river flooding) and other sources.

Consultation has been undertaken with Bassetlaw District Council Engineers, the Environment Agency, the Rivers Idle and Ryton Internal Drainage Board (IDB), British Waterways and Severn Trent Water to assess the current flood risk from all sources, including sewers, IDB drains and the Chesterfield Canal.

The Environment Agency Flood Zone Maps are included in the SFRA and are to be used only where more detailed modelling is unavailable. The Flood Zone Maps show indicative flood outlines based on a broadscale assessment of fluvial flood risk only and do not take into account the protection offered by any defences. Hydraulic modelling has been undertaken for the SFRA to establish more realistic indicative flood outlines in key areas that take into account defences and consider how flood water flows within a floodplain. This modelling calculates expected depths and velocities of flood water across the floodplain and allows consideration of the flood risk to people and properties.

In accordance with current guidance, the flood scenarios considered in the SFRA are typically the 1 in 20, 1 in 100 and 1 in 1000 year annual chance flood events, which may also be expressed as 5%, 1% and 0.1% Annual Exceedance Probability (AEP) flood events.

An investigation has been carried out into the effect of defences on flood risk, the level of protection offered by the defences and the risk that remains behind them, for example by failure (due to breach) or overtopping. Purpose built, formal defences have been considered and also other features such as privately owned walls and road and rail embankments, which were not built specifically as flood defences, but which have an impact on the flow of flood water due to their elevated level.

An assessment of the impact of climate change on flood risk in the catchment is a highly important consideration. An allowance for climate change over the 100 year period to 2108 has been included in the assessment of flood risk.

The main flood risk within Bassetlaw is from fluvial flooding.

In Worksop, the River Ryton flows generally West to East with few maintained formal defences. The river passes through culverts in the town centre which are too small to carry a 1 in 100 annual chance flood, resulting in water backing up and flooding out of bank onto the surrounding land. Large open areas of land

have been identified as particularly vulnerable to flooding and also two developed areas within Worksop town centre; firstly around Central Avenue, King Street, Allen Street, and Hardy Street; and secondly around Priorswell Road and Shelley Street.

In Retford the River Idle flows generally from South to North. A significant tributary is the Retford Beck joining the right bank of the River Idle from the East. The Idle has very few formal defences as it flows through Retford. The channel has been widened previously and contains much of the 1 in 20 year annual chance flood flows in bank. There are very few features along the River Idle banks to prevent a 1 in 100 year annual chance flood spilling out of bank onto the adjacent land. Some properties are likely to be affected during a 1 in 100 year annual chance flood, particularly in the vicinity of Chancery Lane. Restriction of flow due to the presence of culverts on the River Idle does not have the same impact as on the Retford Beck, although there is some backing up of flood water due to the culverts under Albert Road and Bridgegate.

The lower reaches of the Retford Beck are heavily culverted and are considerably under capacity to convey the catchment flows, resulting in frequent flooding at culvert entrances.

Trent-side villages are protected by defences and IDB pumps. The River Trent Catchment Flood Management Plan (CFMP) recommends that existing flood risk management activities are reduced over the next 50 – 100 years in the Axholme and North West Lincolnshire Policy Unit which means that flood risk is accepted to increase over time. On the other hand, the CFMP advises that the preferred policy for the Sherwood Policy Unit is to continue with existing activities to manage flood risk at the current level. The towns of Worksop and Retford lie within the Sherwood Policy Unit whereas the lower catchment of the River Idle, including West Stockwith, lies within the Axholme and North West Lincolnshire Policy Unit.

Key villages considered in the SFRA are those with a history of flooding problems and where infill development is likely to have a significant effect on flood risk. Key villages include Clarborough, Hayton, Welham and Walkeringham where land drainage capacity problems are exacerbated by infill development; Sturton le Steeple and Beckingham which are situated on clayey impermeable soils, with poor land drainage and sewer networks and where infill development over the years has had significant impact. North Leverton where a watercourse passes through the village and the potential impact of development with direct sewer outfalls to the watercourse would have significant consequences; and Harworth, which has public sewer capacity problems and an inadequate land drainage system. There are also natural springs in the upstream areas of Harworth and Bircotes which exacerbate surface water problems.

Maps and GIS layers have been provided with the report showing realistic indicative flood outlines that take into account defences, the effect of climate change, residual flood risk from breach and overtopping of the flood defences, flood hazard posed by depth and velocity of flood water and other supporting information.

An overview of flood risk within Bassetlaw DC has been undertaken, allowing the District Council to apply the Sequential Test. It provides advice on any site-specific requirements for a Flood Risk Assessment within the different flood zones, and advises the District Council on the use of the Exception Test, should the Sequential Test be passed.

Guidance for the District Council on the future management of development with respect to flood risk has been given, relevant to the different flood zones and possible types of development.

In addition, an outline has been given of requirements for developers for Flood Risk Assessments, with supporting guidance on reducing flood risk and making development safe, including Sustainable Drainage Systems (SuDS) and flood mitigation measures. Advice is also given on environmental improvement opportunities and other issues to consider as part of a development proposal.

The SFRA is presented in four volumes. Volume 1 provides a non-technical summary of the SFRA process and findings. Volume 2 provides guidance for those using the SFRA. Volume 3 provides a technical summary of methods used to produce the SFRA. Volume 4 includes the mapped outputs of the SFRA.

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1 INTRODUCTION

1.1 Background

In September 2008 JBA Consulting was commissioned by Bassetlaw District Council (BDC), to undertake a Strategic Flood Risk Assessment for Bassetlaw District, which includes the towns of Worksop and Retford and smaller villages.

This SFRA has been prepared in accordance with current best practice, Planning Policy Statement 25 *Development and Flood Risk* (PPS25)[1]. The SFRA will assist the Local Planning Authority (LPA) to make the spatial planning decisions required to inform their Local Development Framework (LDF).

The SFRA is a planning tool that enables the LPA to select and develop sustainable allocations away from the highest flood risk areas. This report sets out the procedure to be followed when assessing sites for development in the future.

The SFRA should be treated as a 'dynamic' document that is periodically reviewed as Bassetlaw District changes or if further information becomes available to provide a better understanding of flood risk. The SFRA should be updated when changes are made to policies or strategy reports relating to flood risk or if conditions change that impact on the nature of flood risk in Bassetlaw, for example the presence and characteristics of flood defences, flood defence schemes or significant development in the district. When the Environment Agency Flood Zone outlines are updated, they should be incorporated into the SFRA.

1.2 Scope and objectives

The overall objective for this SFRA is to provide sufficient information for the application of the Sequential Test and to identify whether application of the Exception Test is likely to be necessary. It involves a broad scale assessment of flood risk to identify sites at flood risk from fluvial and other sources of flooding, utilising existing available information. In addition to this, the SFRA will allow BDC to:

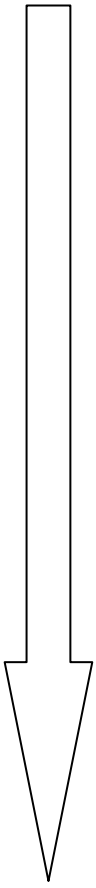
- prepare appropriate policies for the management of flood risk within Bassetlaw;
- inform the sustainability appraisal so that flood risk is taken into account when considering options and in the preparation of strategic land use policies;
- identify the level of detail required for site-specific Flood Risk Assessments (FRA) in particular locations, and
- enable BDC to determine the acceptability of flood risk in relation to emergency planning capability

1.3 SFRA Maps

Information and guidance on using the maps can be found in Volumes 1 and 2. A technical overview which provides further detailed information on the creation of the maps is provided in Volume 3.

The maps in Volume 4 have been produced as part of the SFRA in order to delineate the flood zone outlines and establish, in key areas, the variation of risk within the flood outlines.

The starting point for application of the Sequential and Exception Tests should be the Flood Zone Maps included in Volume 4.



- **Flood Zone Maps:** These are provided for the whole of Bassetlaw district. They include the latest Environment Agency Flood Zone 3 (100 year) and Flood Zone 2 (1000 year) outlines, which have been generated using broad scale modelling techniques and do not include the effect of any defences. They should be used as the starting point for application of the Sequential and Exception Tests for all areas within Bassetlaw district. The maps have been annotated to show where more detailed modelling is available, referring the user to the Defended Outline Maps in these areas.
- **Defended Outline Maps:** These maps show the defended flood outlines where available for the District. Outlines for the Rivers Idle and Ryton have been created using 1 dimensional river modelling techniques. The 20/25 year (Flood Zone 3b), 100 year (Flood Zone 3a), 100 year with climate change and 1000 year (Flood Zone 2) flood events are shown. Defended outlines for the River Trent have been created using 2 dimensional JFLOW modelling. These maps should be used in accordance with the instructions on the Flood Zone Maps. They will form the starting point for application of the Sequential and Exception Tests for areas adjacent to the Rivers Idle, Ryton and Trent. They are annotated to show where more accurate 2 dimensional modelling is available in the towns or Worksop and Retford, referring the user to the Flood Dynamic Maps in these areas.
- **Flood Dynamic Maps:** These maps show the defended flood outlines for the 20/25 year (Flood Zone 3b), 100 year (Flood Zone 3a), 100 year with climate change and 1000 year (Flood Zone 2) flood events for the Rivers Idle and Ryton within Worksop and Retford. The 100 year and 100 year with climate change outlines have been generated using 2 dimensional river modelling techniques, which are more accurate than 1 dimensional methods. The maps give an indication of the causes and severity of flooding, displaying details of the flood flow direction and the typical depth of flooding during a 100 year annual chance event. These maps should be used where instructed on the Defended Outline Maps. They will form the starting point for application of the Sequential and Exception Tests in areas adjacent to the River Ryton in Worksop and adjacent to the River Idle in Retford.

- **Depth Maps:** These maps are provided for the River Ryton in Worksop and River Idle in Retford, based on the 2 dimensional modelling. They show the variation in flood depth across the 100 year (Flood Zone 3a) defended outline. In addition, they show the extended flood outline where a breach in defences has been modelled. They should be used to inform the application of the Exception Test adjacent to these rivers in Worksop and Retford.

- **Hazard Mapping:** These maps are provided for the River Ryton in Worksop and the River Idle in Retford, based on the 2 dimensional modelling. The maps give details of the degree of flood hazard within the 100 year and 100 year with climate change defended outlines. The hazard rating is dependent on flood depth and velocity and has been calculated according to the methodology given in the DEFRA report FD2320. Four hazard categories are displayed – very low hazard, danger for some, danger for most and danger for all. They should be used to inform the application of the Exception Test adjacent to these rivers in Worksop and Retford.

- **Standard of Protection Maps:** These maps detail the standard of protection provided by existing flood risk management infrastructure (ie: flood defences) along the River Ryton in Worksop and Idle in Retford. The outlines shown are the same as the Flood Dynamic Maps but they give more information on the defences and infrastructure which affects flood flow. They should be used to inform the application of the Exception Test adjacent to these rivers in Worksop and Retford.

- **Trent Breach Maps:** These maps demonstrate the effects of failure of the Trent defences. The outlines have been produced using 2 dimensional JFLOW modelling. They should be used to inform the application of the Exception Test in areas adjacent to the Trent.
  These maps can be found as figures 5-17 and 5-18 on pages 72 and 73 of Volume 1 of the SFRA

- **Canal Breaches:** These maps detail the effects of a simulated failure of a canal embankment. They should be used to inform the application of the Exception Test in Worksop and Retford.
  These maps can be found as figures 5-7 and 5-15 on pages 59 and 69 of Volume 1 of the SFRA

- **Breaches in Mattersey and Misson:** These maps detail the effects of a simulated failure of defences on the River Idle close to the villages of Mattersey and Misson
  These maps can be found as figures 5-26 and 5-27 on pages 87 - 88 of Volume 1 of the SFRA.

- **Non-Fluvial Flood Risk Maps:** These maps show indicative flooding caused by surface water run off during an extreme (1 in 200 year) rainfall event, assuming sewer networks are full to capacity. The surface water flooding is categorised according to its depth and associated risk. The maps also highlight areas where instances of sewer flooding have been recorded. The maps should be used to inform Flood Risk Assessments. The maps Worksop and Retford are included in Volume 4.
  The maps for the key villages can be found as figures 5-19 – 5-25 on pages 75 - 85 of Volume 1 of the SFRA.

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2 SFRA MAPS

Drawing Number	Drawing Name
2008s3509 - 001	Flood Zone Map
2008s3509 - 002	Flood Zone Map
2008s3509 - 003	Flood Zone Map
2008s3509 - 004	Flood Zone Map
2008s3509 - 005	Flood Zone Map
2008s3509 - 006	Flood Zone Map
2008s3509 - 007	Flood Zone Map
2008s3509 - 008	Defended Outlines Map
2008s3509 - 009	Defended Outlines Map
2008s3509 - 010	Defended Outlines Map
2008s3509 - 011	Defended Outlines Map
2008s3509 - 012	Defended Outlines Map
2008s3509 - 013	Defended Outlines Map
2008s3509 - 014	Flood Dynamic Map - Worksop
2008s3509 - 015	Flood Dynamic Map - Worksop
2008s3509 - 016	Flood Dynamic Map - Worksop
2008s3509 - 017	Flood Dynamic Map - Retford
2008s3509 - 018	Flood Dynamic Map - Retford
2008s3509 - 019	Flood Dynamic Map - Retford
2008s3509 - 020	Flood Dynamic Map - Retford Beck
2008s3509 - 021	Flood Depth 100yr Worksop
2008s3509 - 022	Flood Depth 100yr Worksop
2008s3509 - 023	Flood Depth 100yr Worksop
2008s3509 - 024	Flood Depth 100yrcc Worksop
2008s3509 - 025	Flood Depth 100yrcc Worksop
2008s3509 - 026	Flood Depth 100yrcc Worksop
2008s3509 - 027	Flood Depth 100yr Retford
2008s3509 - 028	Flood Depth 100yr Retford
2008s3509 - 029	Flood Depth 100yr Retford
2008s3509 - 030	Flood Depth 100yrcc Retford
2008s3509 - 031	Flood Depth 100yrcc Retford
2008s3509 - 032	Flood Depth 100yrcc Retford
2008s3509 - 033	Flood Depth 100yr Retford Beck
2008s3509 - 034	Flood Depth 100yrcc Retford Beck
2008s3509 - 035	Flood Depth 100yrcc Trent
2008s3509 - 036	Flood Depth 100yrcc Trent
2008s3509 - 037	Flood Depth 100yrcc Trent
2008s3509 - 038	Flood Hazard 100yr Worksop
2008s3509 - 039	Flood Hazard 100yr Worksop
2008s3509 - 040	Flood Hazard 100yr Worksop
2008s3509 - 041	Flood Hazard 100yrcc Worksop
2008s3509 - 042	Flood Hazard 100yrcc Worksop
2008s3509 - 043	Flood Hazard 100yrcc Worksop
2008s3509 - 044	Flood Hazard 100yr Retford
2008s3509 - 045	Flood Hazard 100yr Retford
2008s3509 - 046	Flood Hazard 100yr Retford
2008s3509 - 047	Flood Hazard 100yrcc Retford
2008s3509 - 048	Flood Hazard 100yrcc Retford
2008s3509 - 049	Flood Hazard 100yrcc Retford
2008s3509 - 050	Standard of Protection - Worksop / Ryton

2008s3509 - 051	Standard of Protection - Worksop / Ryton
2008s3509 - 052	Standard of Protection - Worksop / Ryton
2008s3509 - 053	Standard of Protection - Retford / Idle
2008s3509 - 054	Standard of Protection - Retford / Idle
2008s3509 - 055	Standard of Protection - Retford / Idle
2008s3509 - 056	Non Fluvial Flood Risk Maps - Worksop
2008s3509 - 057	Non Fluvial Flood Risk Maps - Worksop
2008s3509 - 058	Non Fluvial Flood Risk Maps - Worksop
2008s3509 - 059	Non Fluvial Flood Risk Maps - Worksop
2008s3509 - 060	Non Fluvial Flood Risk Maps - Retford
2008s3509 - 061	Non Fluvial Flood Risk Maps - Retford