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Newark and Sherwood District
Strategic Flood Risk Assessment
Level 2, Phase 2
Newark and Sherwood District Council

September 2012

QM

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Contents

Executive Summary

A1. Newark and Sherwood District Council has commissioned WSP to undertake a Level 2 Phase 2 Strategic Flood Risk Assessment (SFRA) in accordance with the National Planning Policy Framework (NPPF) and the accompanying Technical Guide.

A2. This Level 2 Phase 2 SFRA for Newark and Sherwood, builds on the findings and recommendations made in the Level 1 SFRA (2009) and Level 2 Phase 1 SFRA (2010) produced by WSP for Newark and Sherwood District Council.

A3. The aims and objectives of the Level 2 Phase 2 SFRA are as follows:

- To provide a sound and robust analysis of flood risk in and around Newark and Sherwood District in order for Newark and Sherwood District Council to make informed decisions about the formulation of policies for inclusion in its Local Development Framework Plan Documents.
- To provide an increased scope for assessing flood risk in line with the NPPF and associated Technical Guide.
- To consider the beneficial effects of flood risk management infrastructure in reducing the extent and severity of flooding when compared to the Flood Zones on the Environment Agency's latest Flood Maps.
- It should, in particular, facilitate the application of the Sequential Test and Exception Test as set out in Paragraphs 101 and 102 of the NPPF.
- It should consider the detailed nature of flood hazards and take into account flood defences. It should be sufficiently detailed to allow a Sequential Approach to be adopted within a flood zone (in line with Paragraph 8 of the NPPF Technical Guide).
- It should make provision for the policies and practices required to ensure that development in such areas satisfies the Exception Test, and that these subsequently are incorporated in Local Development Documents (LDDs).

A4. In order to provide the necessary level of detail, the study area has been divided up into four sub locations. These are shown graphically in Appendix A.

A5. This Level 2 Phase 2 SFRA provides a sound framework with an appropriate level of detail required at this stage for making consistent and sustainable future planning decisions.

A6. The flood risk management measures within the district include defences, hydraulic structures and water level management systems provided by the Environment Agency and the Internal Drainage Boards.

A7. A key piece of information that has been used in the production of this Level 2 Phase 2 SFRA is the mapping resulting from the Environment Agency's River Trent Hazard Mapping Study (2011) produced by Halcrow. This newly released information helps to provide a detailed analysis of the study area's overall sustainability, in terms of development and flood risk.

A8. Flood Maps and Flood Hazard Maps have been provided in this Level 2 Phase 2SFRA in order to help assess fluvial flooding within the study area. Other sources of flooding will need to be assessed on a site-by-site basis.

A9. One of the key aspects of this Level 2 Phase 2 SFRA is that the study area benefits from defence from fluvial flood risk issues. This defence is provided by the Environment Agency and other land owners through a combination of raised flood defences along the River Trent and other assets owned and maintained by the various Internal Drainage Boards. Providing these defences are well maintained and upgraded when necessary, sustainable development could occur in defended flood risk areas subject to the Sequential and Exception Tests being passed, assessment of residual risk and consideration of the implications of the Hazard Mapping.

A10. A key reason for the production of the SFRA is to allow Newark District Council to undertake further analysis that provides the evidence base for the Sequential and Exception Tests. This Level 2 Phase 2 SFRA focuses on parts of the study area where there is a potential development as detailed in the Council's Strategic Housing Land Availability Assessment and Allocations and Development Management Options Report.

A11. The SFRA evaluates the current flood risk situation, incorporating the impacts of climate change in line with the NPPF.

A12. An FRA Toolkit has been provided for the study area in Appendix H. This will allow Newark and Sherwood District Council to consider appropriate flood risk issues affecting future development proposals. Where necessary, mitigation measures should be implemented in order to achieve sustainable development at both a site specific and strategic scale.

A13. Completion of the Level 2 Phase 2 SFRA will provide the Council with the necessary level of information for understanding flood risk at the local level. This will allow the Council to give full consideration of flood risk issues when preparing planning policies and making planning decisions.

A14. The Level 2 Phase 2 SFRA is a living document and should therefore be reviewed in line with the production of the Council's Local Development Plan or at least every five years, to reflect any amendments in future growth proposals.

Annual Exceedence Probability (AEP)	Annual Exceedence Probability is the estimated probability of a flood of given magnitude occurring or being exceeded in any year. Expressed as, for example, 1 in 100 chance or 1 per cent.
Breach Flood Hazard Map	The breach flood hazard map shows the level of flood hazard to people (called a hazard rating) if the flood defences are breached at certain locations, for a range of scenarios. The hazard rating depends on the depth and velocity of floodwater.
Catchment	An area drained by a specific river / watercourse.
Catchment Flood Management Plan (CFMP)	A Catchment Flood Management Plan is a strategic planning tool through which the Environment Agency seeks to work with other key decision-makers within a river catchment, to identify and agree policies for sustainable flood risk management.
Core Strategy	The Development Plan Document within the Council's Local Development Framework which sets the long-term vision and objectives for the area. It contains a set of strategic policies that are required to deliver the vision including the broad approach to sustainable development.
Development	The carrying out of building, engineering, mining or other operations, in, on, over or under land, or the making of any material change in the use of a building or other land.
Environment Agency (EA)	The Environment Agency is an Executive Non-departmental Public Body responsible to the Secretary of State for Environment, Food and Rural Affairs and an Assembly Sponsored Public Body responsible to the National Assembly for Wales.
Floodplain	Any area of land over which water flows or would flow or be stored in the absence of flood defences.
Flood Map	Nationally consistent delineation of 'high' and 'medium' flood risk, published on a quarterly basis by the Environment Agency. Shows the areas at risk of flooding based on various AEP events, as defined in the following sections.
Flood Zone 1 Low Probability	This zone comprises land assessed as having less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%).
Flood Zone 2 Medium Probability	This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% - 0.1%) in any year.

Flood Zone 3a High Probability	This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>0.1%) or a 1 in 200 or greater annual probability of flooding from sea (>0.5%) in any year.
Flood Zone 3b Functional Floodplain	Local planning authorities should identify in their SFRAs areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. But land which would flood with an annual probability of 1 in 20 (5%) or greater in any year, or is designed to flood in an extreme (0.1%) flood, should provide a starting point for consideration and discussions to identify the functional floodplain.
Flood Defence	A structure built and maintained specifically for flood defence purposes.
Fluvial	Relating to a watercourse (river or stream).
Green Infrastructure	A network of multi-functional green space for the promotion of natural and ecological processes set at a strategic planning level.
Greenfield Site	Land that is usually agricultural and has not been previously developed.
Groundwater	Water occurring below ground in certain geological formations.
Hydraulic Model	A computer simulation of the water level and flows of water within a watercourse.
Internal Drainage Board (IDB)	An Internal Drainage Board (IDB) is a type of operating authority which is established in areas of special drainage need in England and Wales with permissive powers to undertake works and secure water level management within a drainage district.
Lead Local Flood Authority (LLFA)	The Lead Local Flood Authority for an area is defined within the Flood and Water and Management Act 2010 as the Unitary Authority or County Council.
Local Development Framework (LDF)	Will comprise of a portfolio of local development documents which will provide the framework for delivering the spatial strategy for the area.
Local Flood Risk Management Strategy	The Flood and Water Management Act 2010 requires a LLFA to develop, maintain, apply and monitor a Strategy for Local Flood Risk Management in its area. The LLFA will be responsible for ensuring the strategy is put in place.
Main River	These are all watercourses shown on the statutory main river maps held by the Environment Agency and DEFRA listed as a 'Main River'. This may include any structure or appliance for controlling or regulating the flow of water into a channel; the Environment Agency has permissive powers to carry out works of maintenance and improvement on these rivers.

National Planning Policy Framework (NPPF)	The Department for Communities and Local Government current planning guidance for development sites. The NPPF was released in March 2012 and superseded a number of Planning Policy Statements, including Planning Policy Statement 25: Development and Flood Risk. The NPPF is accompanied by a Technical Guide.
Overtopping Flood Hazard Map	The overtopping flood hazard map shows the level of flood hazard to people (called a hazard rating) if the flood defences are overtopped for a range of scenarios. The hazard rating depends on the depth and velocity of floodwater.
Planning Policy Statement	A series of statements issued by the Government, setting out policy guidance on different aspects of planning. They have replaced Planning Policy Guidance Notes. A large number of the Planning Policy Statements have been replaced by the National Planning Policy Framework.
Pluvial Flooding	Flooding that is directly derived from surface water run-off. It is usually localised in its effects and is caused by rainfall flowing over ground.
Preliminary Flood Risk Assessment (PFRA)	The PFRA is a high level exercise based on existing and available information. It should bring together information from a number of available sources such as the Environment Agency's national information (such as the Flood Map for Surface Water) and existing local products such as Strategic Flood Risk Assessments (SFRAs) and Surface Water Management Plans (SWMPs) in England and Strategic Flood Consequence Assessments (SFCAs) in Wales.
Planning Policy Statement 25 (PPS25)	Planning Policy Statement 25: Development and Flood Risk Department for Communities & Local Government, 2006. PPS25 has been superseded by the National Planning Policy Framework.
Residual Risk	An assessment of the outstanding flood risks and uncertainties that have not been explicitly quantified and/or accounted for as part of the review process.
Strategic Flood Risk Assessment (SFRA)	The National Planning Policy Framework requires that the evidence base for the Local Development Framework includes a Strategic Flood Risk Assessment (SFRA).
Standard of Protection	The design event or standard to which a building, asset or area is protected against flooding, generally expressed as an AEP.
Source Protection Zone (SPZ)	This is an area where groundwater recharge is captured by an abstraction borehole. SPZs are designated by the Environment Agency so as to protect potable water supplies against polluting activities.

Sustainable Drainage Systems (SuDS)	These are management practices and control structures designed to minimise the impact of surface water on flood risk and the environment. The overall aim is to imitate the natural hydrological cycle.
SuDS Approval Body (SAB)	The SAB would have responsibility under the Flood and Water Management Act 2010 for approval, adoption and maintenance of proposed SuDS features for new developments (subject to exemptions and thresholds).
Sustainable Development	"Development that meets the needs of the present without comprising the ability of future generations to meet their own needs" (The World Commission on Environment and Development, 1987).
Surface Water Management Plan (SWMP)	SWMPs have an important role in developing a coordinated strategic approach to managing surface water drainage and reducing flood risk. They should reflect the future proposals of all key stakeholders and provide a clear delivery plan. They may also provide a way to integrate the requirements of forthcoming River Basin Management Plans. SWMPs should focus on managing flood risk and optimising the provision of SUDS.

ABBREVIATIONS AND ACRONYMS

ADMOR	Allocations and Development Management Options Report
AEP	Annual Exceedence Probability
AStSWF	Areas Susceptible to Surface Water Flooding
CFMP	Catchment Flood Management Plan
DCLG	Department for Communities and Local Government
DEFRA	Department for Environment, Food and Rural Affairs
EA	Environment Agency
FEH	Flood Estimation Handbook
FDS	Flood Defences Scheme
FMfSW	Flood Map for Surface Water
FRA	Flood Risk Assessment
FSR	Flood Studies Report
FWD	Floodline Warnings Direct
IDB	Internal Drainage Board
LDF	Local Development Framework
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
NFCDD	National Flood and Coastal Defence Database
NPPF	National Planning Policy Framework
NSDC	Newark and Sherwood District Council
PFRA	Preliminary Flood Risk Assessment
PPG	Planning Policy Guidance
PPS25	Planning Policy Statement 25 (Development and Flood Risk)
RSS	Regional Spatial Strategy
SAB	SuDS Approval Body
SFRA	Strategic Flood Risk Assessment
SHLAA	Strategic Housing Land Availability Assessment
SPZ	Source Protection Zone
SuDS	Sustainable Drainage Systems
SWMP	Surface Water Management Plan
TVIDB	Trent Valley Internal Drainage Board
UWIDB	Upper Witham Internal Drainage Board
WCS	Water Cycle Strategy / Water Cycle Study
WFD	Water Framework Directive
WMA	Water Management Alliance

1 Introduction

1.1 BACKGROUND

1.1.1 Newark and Sherwood District Council has appointed WSP to carry out a Phase Two of the Level 2 Strategic Flood Risk Assessment (SFRA). This document forms part of a suite of documents that assess flood risk in a strategic manner for the District, as a Level 1 SFRA and Phase One of the Level 2 SFRA have already been produced.

1.1.2 A key reason for the production of these Strategic Flood Risk Assessment documents is to provide an evidence base for the Sequential and Exception Tests to be carried out on flood risk grounds. The purpose of the tests is to ensure that development is located in a sustainable manner within the District.

1.1.3 The Level 1 SFRA was published in July 2009 and sets out the flood risk constraints for the District. It will help inform the preparation of the Local Development Framework for the Newark and Sherwood District.

1.1.4 Phase One of the Level 2 SFRA was published in June 2010. The Phase One of the Level 2 SFRA assessed three strategic sites around the town of Newark-on-Trent. The Phase One Level 2 SFRA provides information of the flood risk constraints for these three strategic sites, to help inform the Local Development Framework for the District.

1.1.5 This Phase Two of the Level 2 SFRA continues the assessment of flood risk constraints for other strategic development potential sites within the Newark and Sherwood District.

1.1.6 The Strategic Housing Land Availability Assessment (SHLAA) for the District has been used to identify potential residential development site locations, and the flood risk for each site or for clusters of sites has been assessed. Employment sites have also been assessed based on information provided by Newark and Sherwood District Council.

1.2 OBJECTIVES

1.2.1 The objectives of the Phase Two of the Level 2 SFRA are as follows:

- to provide a site specific summary assessment for the possible development sites within the District that are at risk of flooding and which have been assessed as part of the Strategic Housing Land Availability Assessment;
- to build upon the findings of the Level 1 SFRA;
- to consider the detailed nature of the flood hazard, taking into account the presence of flood risk management measures such as flood defences; and
- to facilitate the application of the Sequential and Exception Test as set out in Paragraphs 7 to 8 of the Technical Guidance to the National Planning Policy Framework Document.

1.2.2 The study includes some detailed hydraulic modelling for some of the sites which are currently being considered for development and which could require development within the floodplain. These sites have been assessed for their suitability for development (not just in terms of flood risk) within the Newark and Sherwood Allocations and Development Management Options Report (ADMOR). Further information on this is given in section 6.3.

1.3 SCOPE

1.3.1 This Phase Two of the Level 2 SFRA focuses on the identification and assessment of the principal sources of flood risk associated with the identified potential development sites across the District and can also be used as a tool for other possible future development sites within the District (i.e windfall sites). All aspects of surface water, ground water, and fluvial / tidal flooding have been assessed for each site in line with the requirements of a Level 2 SFRA as detailed in the PPS25 practice guide (Annex 3 of the NPPF states the guide remains pertinent as it was not replaced by the NPPF). Sites identified by the SHLAA and ADMOR have had an initial assessment carried out, providing an overview of flood risk from different sources.

2 Legislation and Planning Context

2.1 INTRODUCTION

2.1.1 The strategic assessment of flood risk is defined by national policy documents such as the National Planning Policy Framework (NPPF), published by the Department for Communities and Local Government. Other documents inform the assessment at a more local level, such as relevant catchment flood management plans.

2.1.2 A number of legislation and planning policy documents are outlined in the Newark and Sherwood District Council Level 1 SFRA and Phase One of the Level 2 SFRA. These documents are summarised in this section of the report. Some additional legislation and guidance has been produced since the previous SFRA reports were published and a summary of these documents has also been included below.

2.2 NATIONAL PLANNING POLICY

2.2.1 The National Planning Policy Framework (NPPF). Since 1988 the Government has been issuing national guidance in the form of Planning Policy Guidance Notes (PPG's). The Department for Communities and Local Government's (DCLG) PPS25 document replaced PPG25 in December 2006 and was revised in March 2010. The National Planning Policy Framework (NPPF) has since replaced Planning Policy Statement 25 in March 2012.

2.2.2 Paragraph 100 of the NPPF states:

Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, but where development is necessary making it safe without increasing flood risk elsewhere. Local Plans should be supported by 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, by:

- *Applying the Sequential Test;*
- *If necessary, applying the Exception Test;*
- *Safeguarding land from development that is required for current and future flood management;*
- *Using opportunities offered by new development to reduce the causes and impacts of flooding; and*
- *Where climate change is expected to increase flood risk so that some existing development may not be sustainable in the long-term, seeking opportunities to facilitate the relocation of development, including housing, to more sustainable locations.*

2.2.3 The NPPF Technical Guidance published alongside the NPPF provides further detail on how this policy should be implemented.

2.2.4 The DCLG aims to reduce the risks to people and the developed and natural environment from flooding by discouraging further built development within floodplain areas and by promoting best practice for the control of surface water runoff.

2.2.5 As part of best practice and in line with Environment Agency guidance, Newark and Sherwood District Council has commissioned a Level 2 SFRA for the District in order to define areas suitable for development from a flood risk perspective. This study also provides a reference and policy document to assist consideration of development proposals.

2.2.6 This Level 2 Phase 2 SFRA has been prepared based on the guidance set out in the NPPF and associated Technical Guide and NSDC SFRA Level 2 Invitation to Tender document (Aug.09). The study also builds on the findings of the Level 1 SFRA (July 2009) and Level 2 Phase 1 SFRA for Newark and Sherwood District Council.

2.2.7 Flood hazard mapping is available for parts of the District and this is detailed in section 6.3 of this report. In the absence of detailed hydraulic models and where hazard mapping is not available for each site investigated by NSDC and in support of Sequential and Exception Test, the analysis for this SFRA has adopted a consistent approach based on the principles listed within section 6.4 of this report.

2.3 FLOOD AND WATER MANAGEMENT ACT

2.3.1 The Pitt Review (2008) into the 2007 floods recognised the greater role that Local Authorities could have in flood risk management. Subsequent legislation in terms of the Flood Risk Regulations (2009) and Flood and Water Management Act (2010) have created the Lead Local Flood Authority (LLFA), which for Newark and Sherwood is Nottinghamshire County Council. The Flood and Water Management Act received Royal Assent in April 2010 and is now in the process of a phased commencement being conducted by the Government.

2.3.2 There are a number of links between the new responsibilities in the Flood and Water Management Act (2010) and the planning system. These are complicated by the split of responsibilities for planning between the County and District/ Borough Councils in Nottinghamshire and the Act being enacted in stages around which is significant uncertainty. Table 2.1 summarises the current status of the Act (as in significant enactment) and some of the potential implications for the planning process (note – this is not intended to be a complete list).

Table 2.1 Links between Flood and Water Management Act (2010) and planning process and legislation status summary

Sections of the Flood and Water Management Act	Legislation status as of August 2012*	Link to the planning system
Enables local partnerships between the LLFA and Risk Management Authorities to deliver local flood risk management. This includes delegation between RMAs but not the development of the Local Flood Risk Management Strategy	Commenced	Planning involvement in flood risk management partnerships
LLFA Scrutiny of Risk Management Authorities	Commenced	Scrutiny of planning decisions taken in relation to flood risk management
Develop, maintain, apply and monitor a Local Flood Risk Management Strategy	Commenced	Planning is a key non-structural response to flood risk Investment and future use of S106/ CIL for flood risk management
Investigating flood incidents to the extent considered necessary or appropriate	Commenced	Link to planning in areas known to be affected by flooding
Maintaining a register of structures and features that have a significant effect on flood risk	Commenced	Link to planning in areas known to be affected by flooding and where there are maintenance liabilities
Designation of third party assets and powers of enforcement where they serve a significant flood risk management function	Not yet commenced	Impact on future redevelopment of sites
Powers to do work to manage flood risk from surface water and groundwater	Commenced	Might be tied into future development and infrastructure development/ improvements

Sections of the Flood and Water Management Act	Legislation status as of August 2012*	Link to the planning system
Sustainable Drainage Systems Approval Body (SAB)	Not yet commenced	Of major importance to the use of SUDS on new developments
Introduces a risk based approach to reservoir management	Not yet commenced	Link to emergency planning
Transfer of consenting and enforcement role on Ordinary Watercourses to the County Council outside of Internal Drainage Board.	Commenced	Link to planning applications and issue of consents

2.3.3 Clear links between local flood risk management and the planning process are critical. A Local Flood Risk Management Steering Group has been set up on which Newark and Sherwood District Council are represented amongst other Districts and Boroughs in Nottinghamshire, the Environment Agency, Internal Drainage Boards and Severn Trent Water. The Local Flood Risk Management Steering Group will act to steer the development of the Local Flood Risk Management Strategy from a multi-agency perspective. Both Policy Planning and Development Management are represented in the makeup of the Steering Group. Chief Planning Officers are represented on the Nottingham and Nottinghamshire Strategic Flood Risk Management Board.

2.3.4 Further information on the Flood and Water Management Act can be found on the DEFRA website at http://www.defra.gov.uk, reference should also be made to the Nottinghamshire County Council Flood pages which give further information on local government flood planning issues at http://www.nottinghamshire.gov.uk/flooding.

2.4 REGIONAL AND LOCAL PLANNING CONTEXT

East Midlands Regional Flood Risk Appraisal

2.4.1 The overarching aim of the East Midlands Regional Flood Risk Appraisal (2009) was to inform the Regional Spatial Strategy (RSS) of flood risk issues. It is the intention for the Government to revoke the RSS East Midlands Regional Plan (2009) as set out in the Localism Bill. However, until the Localism Act comes in to effect the RSSs should still be used by decision makers, although the intention to revoke it should be a material consideration in assessing development proposals. The East Midlands Regional Plan puts Newark and Sherwood District Council within the Northern sub-region.

2.4.2 Policy 35 of the East Midlands Regional Plan is on the Regional Approach to Managing Flood Risk. The policy details that Local Development Frameworks should take account of the potential impact of climate change on flooding and land drainage, in particular:

"be informed by Strategic Flood Risk Assessments in order to evaluate actual flood risk. Priority areas for assessment include the built up areas of Derby, Nottingham and Newark;"

2.4.3 The policy also provides guidance on when development should not be permitted.

2.4.4 The Regional Flood Risk Appraisal (RFRA) was originally carried out in 2006, and updated in 2009. The RFRA covers flood risk, the application of the Sequential Approach and Test, and the Exception Test, in order to inform the RSS.

2.5 NEWARK AND SHERWOOD DISTRICT LOCAL DEVELOPMENT FRAMEWORK, CORE STRATEGY DEVELOPMENT PLAN

2.5.1 Newark and Sherwood District Council are currently preparing a Local Development Framework (LDF) to replace the existing Local Plan. The Core Strategy Development Plan Document, which forms a key part of the LDF, was adopted in March 2011.

2.5.2 The Core Strategy was developed by the District Council over the past five years and sets out the big issues that Newark and Sherwood District Council and the public and private sector partners need to address over the next twenty years. It sets the vision, a series of objectives and a number of policies to deliver. An updated Local Development Scheme (LDS) document came in to effect following the full council meeting of the 21st September 2010. This LDS document sets out the proposed timetable for production and adoption of the parts of the LDF.

2.5.3 Following the adoption of the Core Strategy Development Plan Document, the next document to be produced and adopted is the Allocations and Development Management Development Plan Document (DPD).

2.6 NEWARK AND SHERWOOD ALLOCATIONS AND DEVELOPMENT MANAGEMENT OPTIONS REPORT (ADMOR)

2.6.1 This document has been out for consultation and is the first stage in the production of the Allocations and Development Management Development Plan Document (DPD). The document will be one of the Local Development Documents (LDDs) within the Newark and Sherwood Local Development Framework. Newark and Sherwood District Council is currently considering the responses made to the ADMOR report and, taking these into account, is preparing the DPD (Pre Submission Document). Following a period when representations will be sought on this document a finalised DPD will be submitted to the Secretary of State and assessed by an independent Inspector in early September 2012.

2.6.2 The main purpose of the ADMOR document is to allocate sufficient land for housing, employment and retail, to meet the needs of Newark and Sherwood to 2026 and beyond. The document also sets out amendments to urban boundaries and village envelopes, retail boundaries and proposed sites for Gypsies and Travellers, as well as sites requiring continued protection from development (open space and green infrastructure designations).

2.7 STRATEGIC FLOOD RISK ASSESSMENTS

Newark and Sherwood District Council Level 1 SFRA

2.7.1 A Level 1 Strategic Flood Risk Assessment (SFRA) was carried out by WSP for Newark and Sherwood District Council and was published in July 2009. This was prepared in full accordance with the flood risk management guidance set out in Planning Policy Statement 25 (PPS25) Development and Flood Risk.

2.7.2 The document incorporates the recommendations of PPS25 and identifies local flooding constraints, sufficient to assist Newark and Sherwood District Council with the formulation of planning policies, and the variation in flood risk across Newark and Sherwood District Council's administrative area for current climatic conditions and accounting for the predicted effects of climate change.

Newark and Sherwood District Council Level 2 Phase 1 SFRA: – Three Strategic Sites

2.7.3 The Level 2 Phase 1 SFRA was carried out by WSP and was published in June 2010 for three strategic sites centred on the Newark Growth Point. The three sites assessed were as follows:

- Land South of Newark,
- Land East of Newark, and
- Land around Fernwood.

2.7.4 The main aim of the Phase 1 study was to provide an understanding of the flood risk constraints for the three sites and to assist Newark and Sherwood District Council with the formulation of planning policies. The study was prepared in full accordance with the flood risk management guidance set out in Planning Policy Statement 25 (PPS25) Development and Flood Risk.

2.7.5 Bespoke hydrodynamic modelling for each strategic site was undertaken to allow for an assessment of each site's overall sustainability in terms of development and flood risk.

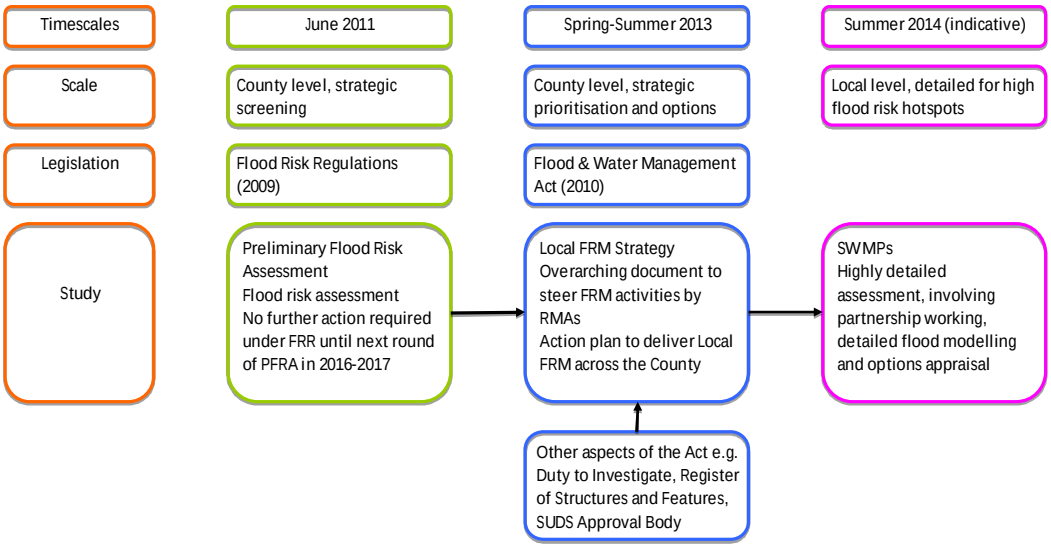
2.7.6 Since the production of the Level 2 Phase 1 SFRA, hydraulic modelling work has been carried out by Halcrow on behalf of the Environment Agency for the River Trent and Tributaries near Newark-on-Trent. This work indicates the hazard to people for the River Trent through the southern part of the study area up to just north of Newark-on-Trent. This model was issued in August 2011 and therefore the flood risk mapping produced within this Level 2 Phase 2 SFRA uses the latest modelling information.

2.7.7 A Newark Future Model was also produced in April 2011 which takes into account allocated future development within the Newark and Sherwood District. Both the Newark Future Baseline model and the River Trent Halcrow model use the same River Trent (Black and Veatch) baseline model data. The differences between the two models are the topographical data and grid details, which for the baseline Newark Future Model is more refined. The mapping which will be shown in this Level 2 Phase 2 SFRA may therefore show some variations compared to the issued Newark Future flood levels, this is due to the refined data for the baseline Newark Future Model.

2.8 NOTTINGHAMSHIRE LOCAL FLOOD RISK MANAGEMENT STRATEGY

2.8.1 Figure 2.1 sets out a framework for strategic flood risk management documents in the County. Nottinghamshire County Council produced a Preliminary Flood Risk Assessment in 2011, as required by the Flood Risk Regulations (2009). This was a broad scale flood risk assessment for flooding from local sources (namely Ordinary Watercourses, surface water and groundwater) across the County. There were found to be no nationally significant 'Flood Risk Areas' in Nottinghamshire and so the next round of activity will be the Preliminary Flood Risk Assessment in 2017.

Figure 2.1: Framework of local flood risk management strategy documents



2.8.2 As the Lead Local Flood Authority, the County Council is required to develop, maintain, apply and monitor a Local Flood Risk Management Strategy that sets out:

- Risk Management Authorities (RMAs, including the Environment Agency, Districts and Boroughs, Lead Local Flood Authorities, Internal Drainage Boards, Water Companies and Highways Authorities)
- Flood and coastal erosion risk management functions that RMAs may exercise;
- Objectives for managing flood risk;
- Measures proposed to meet the objectives;
- How and when measures will be implemented;
- Costs, benefits and funding of measures;
- Assessment of local flood risk;
- Review mechanism;
- Contribution to wider environmental objectives; and
- Develop a summary document.

2.8.3 The Councils are required to consult with affected RMAs and the public on the Local Flood Risk Management Strategy.

2.8.4 Flood risk management is cross-cutting and the Local Flood Risk Management Strategy has key links to planning policy, development management, emergency and resilience planning, conservation and heritage, sustainability and climate change, highways etc. It will also contain an investment strategy for future flood risk management, which will tie together various funding streams and prioritise future investment between RMAs.

2.8.5 Surface Water Management Plans may be taken forward in the future, for example where there is very high flood risk from local sources and the sources of flooding are complex and inter-related. The Local Flood Risk Management Strategy will set out and prioritise locations for Surface Water Management Plans.

2.8.6 The Local Strategy webpage can be found at http://www.nottinghamshire.gov.uk/flooding

2.9 LOCALISM BILL

2.9.1 The Government has introduced the Localism Bill, which proposes to change the way that many parts of government are run. The Bill shifts many aspects of power from central government to local authorities, allowing local councils more freedom in what they do. The Bill also allows individuals to have more influence over their councils; it will also reform aspects of the planning system.

2.9.2 The ramification of this Bill is that it will empower local communities to have a greater influence over proposed growth within their area. Communities will be given the opportunity to influence planning decisions to a greater extent. This Phase 2 of the Level 2 SFRA is a key piece of technical evidence that seeks to inform Newark and Sherwood District Council and residents within the study area of the main issues in relation to sustainable development and flood risk.

2.10 THE SEQUENTIAL TEST

2.10.1 The Sequential Test, as set out in the NPPF and associated Technical Guidance, aims to steer vulnerable development towards areas of lower flood risk. The Sequential Test should demonstrate where there are sites available in areas of a lower probability of flooding. Following on from the Level 1 SFRA and Phase 1 of the Level 2 SFRA, a key reason for the completion of the Level 2 Phase 2 SFRA is to provide supporting evidence for Newark and Sherwood District Council to undertake this test in more detail. The Level 2 SFRA should also assist the sequential approach within a specific site to prevent inappropriate development in areas of high flood risk.

2.11 THE EXCEPTION TEST

2.11.1 The NPPF outlines the use of the Exception Test for testing whether particular development is suitable even within areas vulnerable to flooding. Following application of the Sequential Test, if it is not possible consistent with wider sustainability objectives for the development to be located in zones of lower probability of flooding, the Exception Test can be applied.

2.11.2 The Exception Test provides a mechanism for managing flood risk while still allowing necessary development to occur. It should not, however, be used to justify 'highly vulnerable' development in Flood Zone 3a, or 'less vulnerable', 'more vulnerable' and 'highly vulnerable' development in Flood Zone 3b.

2.11.3 For the Exception Test to be passed it must be demonstrated that:

1) the development provides wider sustainability benefits to the community that outweigh flood risk, informed by an SFRA where one has been prepared; and

2) a site specific Flood Risk Assessment must demonstrate that the development will be safe for the lifetime taking into account the vulnerability of its users, without increasing flood risk elsewhere, and where possible, will reduce flood risk overall.

2.11.4 Both parts of the Exception Test must be passed for development to be acceptable.

2.11.5 This Level 2 SFRA provides supporting information for the Exception Test to be undertaken for any potential development sites that fall within areas of medium to high probability flood risk. This SFRA takes no account of other socio-economic or sustainability factors other than flood risk and drainage infrastructure. These wider issues are to be considered by Newark and Sherwood District Council as part of their Sequential Test and Exception Test procedures.

2.12 CATCHMENT FLOOD MANAGEMENT PLANS

2.12.1 The key objective of Catchment Flood Management Plans (CFMPs) is to set policies across the whole catchment which will achieve long-term sustainable flood risk management. The majority of the study area is covered by the River Trent CFMP, with a small eastern part of the study area being covered by the River Witham CFMP.

2.12.2 CFMPs act as high level strategic documents which assess the sustainable management of flood risk within the catchment over the next 50 to 100 years.

2.12.3 The CFMPs act to form a framework for flood risk management at more local levels. A single CFMP may guide several strategies which in turn may lead to numerous flood risk management schemes. The policies adopted from the CFMP process will help the EA to prepare System Asset Management Plans (SAMPs). These plans are a useful tool to help inform a site specific FRA as they will provide information on all flood defence structures (including third party assets) and at a high level will provide guidance on how to manage them and whether changes will be needed in the future.

River Trent Catchment Flood Management Plan

2.12.4 The River Trent Catchment Flood Management Plan (CFMP) was published in December 2010 and covers the majority of the Newark and Sherwood District, other than a small portion of the south-east of the District.

2.12.5 The overall role of the CFMP is to establish flood risk management policies which will deliver sustainable flood risk management for the long term within the River Trent CFMP area.

2.12.6 The key objective of the Trent CFMP is to set policies across the whole catchment which will achieve long-term sustainable flood risk management. More specifically, the aims are to:

- Reduce the overall risk from flooding and harm to people, and the natural, historic and built environment;
- Work with natural processes so that flood risk management brings benefits and contributes effectively to sustainable development;

- Inform and support planning policies, statutory land use plans and implementation of the Water Framework Directive.

2.12.7 The EA has set out a list of policies to be adopted across the CFMP area; these are driven by the extent, nature and scale of current and future flood risk within different parts of the catchment. These six policies (as given in Table 6.1.1 of the CFMP and the Newark and Sherwood Level 1 SFRA) are listed below;

- Policy Option 1- No active intervention (including flood warning and maintenance). Continue to monitor and advise.
- Policy Option 2- Reduce existing flood risk management actions (accepting that flood risk will increase over time).
- Policy Option 3- Continue with existing or alternative actions to manage flood risk at the current level (accepting that flood risk will increase over time from this baseline).
- Policy Option 4- Take further action to sustain the current scale of flood risk into the future (responding to the potential increases in flood risk from urban development, land use change and climate change).
- Policy Option 5- Take further action to reduce flood risk.
- Policy Option 6- Take action with others to store water or manage run-off in locations that provide overall flood risk reduction or environmental benefits, locally or elsewhere in the catchment.

2.12.8 As stated in the Level 1 SFRA, the entire Trent catchment is divided up into ten different sub-areas. The sub-areas which affect the District are the Sherwood sub-area which covers the western half of the District, and the Shelford to Gainsborough sub-area which covers the eastern half of the District.

2.12.9 The Sherwood sub-area is covered by Policy Option 3.

2.12.10 This policy has been selected because the risks are currently managed appropriately and the risk of flooding is not expected to increase significantly in the long term. This policy may mean reviewing the current flood warning services and/or how the existing defences are managed.

2.12.11 Shelford to Gainsborough sub-area is covered by Policy Option 4.

2.12.12 This policy has been selected because although the risk is currently managed appropriately, it is expected to rise significantly in the long term. In these circumstances, more effort is required to reduce the expected flood risk increase in the future.

River Witham Catchment Flood Management Plan

2.12.13 A small area of the south east part of Newark and Sherwood District falls within the area of the River Witham Catchment Flood Management Plan (CFMP).

2.12.14 The River Witham CFMP aims to recommend broad policies for the management of current and future flood risk within the River Witham catchment area. These policies were identified through appraising different policies against a number of objectives. Seven objectives were set based on specific issues, taking into account opportunities and constraints associated with sustainable flood risk management. The seven objectives are as follows:

- Minimise flood related risks to the population;
- Minimise community disruption from flooding of critical infrastructure;
- Manage flood risk to sites of cultural, architectural and heritage value;
- Manage the economic impacts of flooding;
- Ensure future investment in the catchment is proportional to the risks;
- Minimise economic agricultural damages; and
- Manage flood risk to habitats and species.

2.12.15 The River Witham CFMP is divided up into fourteen sub areas. Each area represents similar types of flood risk in terms of mechanisms of flooding, the level of risk and type of receptor (such as people, environment, etc.). Each of these areas has been assigned an appropriate policy through a detailed objective-led appraisal process using the seven catchment objectives. The District contains areas from both sub-areas 1 (Upper Witham) and 13 (Outer Lincoln South).

2.12.16 The policy options for the River Witham CFMP are the same as those listed for the River Trent CFMP.

2.12.17 Of particular relevance are the policies towards maintaining and upgrading the flood defence network within the Trent and Witham catchments.

2.12.18 For sub area 1 (Upper Witham) of the Witham CFMP, Policy 2 was selected.

2.12.19 The reason why this policy was selected is that there is currently a low risk of flooding in the Upper Witham sub area. If there is a reduction in flood risk activities, then flood risk is not forecast to increase significantly under the future scenario. No additional people or property will be at risk, and the risk to the economy will only increase slightly. Adopting Policy 2 allows the flood risk in the Upper Witham sub area to be sustained into the future.

2.12.20 One of the catchment wide opportunities identified by this sub area is to develop a SAMP to phase out flood risk management activities on all systems. The CFMP also highlights that the SAMP should also investigate how and where the EA can reduce maintenance of defences. Ceasing maintenance activities provides the opportunity to improve floodplain connectivity, in stream geomorphology and aquatic habitats.

2.12.21 As set out in the CFMP, the objectives met by this policy are as follows:

- Manage the economic impacts of flooding;
- Ensure future investment in the catchment is proportional to the risks;
- Minimise economic agricultural damages;
- Minimise flood related risks to the population;
- Minimise community disruption from flooding of critical infrastructure;
- Manage flood risk to sites of cultural, architectural and heritage value; and
- Manage flood risk to habitats and species.

2.12.22 For sub area 13 (Outer Lincoln South) of the Witham CFMP, Policy 6 was selected.

2.12.23 Adopting Policy 6 in the Outer Lincoln South Policy Units allows the flood risk in the Outer Lincoln South sub area to be sustained at the current level in the future. The scale of flood risk in this area is considered to be low. The CFMP states that selecting this policy supports the economic, social and environmental sustainability through taking action to sustain future flood risk.

2.13 SURFACE WATER MANAGEMENT PLANS

2.13.1 As defined by DEFRA, a Surface Water Management Plan (SWMP) is a framework through which key local partners with responsibility for surface water drainage in their area work together to understand the cause of surface water flooding. This also allows local partners to agree the most cost effective way of managing surface water flood risk. The overall purpose of a SWMP is to make sustainable urban surface water management decisions that are evidence based, risk based, future proofed and inclusive of stakeholder views and preferences.

2.13.2 The information listed within a SWMP gives a good indication of current drainage issues and the implications for draining a proposed development. It is advised that all FRA's produced should refer to the SWMP relating to that area.

2.13.3 A SWMP should allow Local Planning Authorities to:

- Undertake a comprehensive assessment of surface water flooding as part of their SFRA and predict where it could happen;
- Make informed land use planning decisions on the basis of such an assessment;
- Clarify responsibilities and co-ordinate investment in drainage systems to manage the risk more effectively and with greater use of sustainable drainage systems; and
- Improve emergency plans for surface water flooding; this approach is pro-active and risk-based, and therefore delivers resources where they are most needed.

2.13.4 Aside from Nottingham City a Surface water management plan for Nottinghamshire has not yet been produced and is likely to follow on from the production of the Local Flood Risk Management Strategy. The SFRAs produced on behalf of Newark and Sherwood District Council should be used to help inform any future SWMP.

2.14 A GREEN INFRASTRUCTURE STRATEGY FOR NEWARK & SHERWOOD

2.14.1 The Green Infrastructure study was produced in February 2010 on behalf of Newark and Sherwood District Council, to allow for the expansion of settlements whilst ensuring that the District, its assets and landscapes suffer no negative effects and instead prosper from new development.

2.14.2 The District Council Draft Core Strategy and the District's Green Space Strategy have already set the scene for a green infrastructure strategy in the District. They identify a range of features and areas that in combination would form the backbone for green infrastructure proposals in the District, including recreational spaces and areas of environmental protection (including green belt, countryside and ecological designations).

2.14.3 Protecting and improving the environment is one of five strategic priorities included in Newark and Sherwood District Council's Core Strategy, both to protect existing assets and to enhance quality of place for visitors and residents alike. Similarly, it is a key aim of the District's Community Plan to "maintain and enhance the local natural and built environment and biodiversity".

2.14.4 The Green Infrastructure Strategy for Newark and Sherwood has these policy principles at its foundation, setting out priorities for the creation of assets and mapping the District's green infrastructure, its functions and the potential benefits it can bring.

This Strategy:

- Identifies existing networks of green and blue spaces and corridors within and between the urban areas, other settlements and the surrounding countryside to form the basis for developing a green infrastructure spatial plan;
- Provides an approach for the conservation, protection and enhancement of green spaces, access networks and environmental assets of Newark and Sherwood, taking growth projections into consideration;
- Articulates clear objectives to meet the District's needs and opportunities for development, nature conservation and community benefit; and
- Identifies policy and deliverability issues, including possible funding, delivery mechanisms and main actors for implementing green infrastructure in the District (i.e. the Strategy is grounded in deliverability).

2.15 NEWARK & SHERWOOD WATER CYCLE STRATEGY

2.15.1 A Water Cycle Strategy (WCS) for the District was published in September 2009. The WCS covers all aspects of water use within the District, including documenting the findings of detailed investigations into likely implications of the future growth scenarios put forward within the developing LDF and the future needs for water-related infrastructure and the effects upon the natural water environment within the District.

2.15.2 The following are the key elements that were addressed within the WCS:

- To investigate the long-term planning by both Severn Trent Water (STW) and Anglian Water (AW) for water resource provision within and adjoining the District, drawing upon the work by both companies from the Water Resources Management Plan (WRMP) process and comparing this with the updated growth forecasts arising from the New Growth Point (NGP) process. This will consider the need for new supply sources and for co-ordinated schemes for Newark and its hinterland;
- In conjunction with the above item, to investigate the location of future sources compared with future demand, with a view to lessen the need in future to transfer significant quantities of water into the eastern part of the District;
- To investigate the capacities of existing Wastewater Treatment Works (WwTW) assets serving those settlements likely to receive significant growth allocations, in partnership with STW and the Environment Agency, to establish the likely scope for accommodating such expansion and the scale of any upgrade in treatment provision for both quantity and quality of throughput in tandem with the condition and capacity of the receiving waters to accept such increases;
- To review the main growth cluster development sites against the findings of the Level 1 SFRA;
- To investigate, in conjunction with Natural England, the On-Trent project, the District and County Councils, the likely paths for achieving future improvements in bio-diversity within the water environment as part of the regional planning objective;
- To consult with the likely major developer(s) currently known within the District on their plans and expectations, to inform the forward planning of all related parties;
- To consult further with those bodies already engaged on their aspirations for the water-related environment and on the initial output from the first three tasks above;
- To consult with other local groups who had not yet been engaged over their views on the water-environment and on the likely consequences of future expansion.

3 Study Area

3.1 DESCRIPTION OF STUDY AREA

3.1.1 The full extent of the study area is illustrated in Appendix A. Each individual site assessed within this SFRA is illustrated in Appendix A.

3.1.2 Newark and Sherwood District is located within Nottinghamshire, to the north-east of Nottingham and to the east of Mansfield. Included is the urban area of Newark-on-Trent which is located within the south east corner of the study area.

3.1.3 The River Trent runs from south to north across the southern and eastern extent of the District. A number of tributaries feed in to the River Trent. Many of these tributaries are classified as Main Rivers by the Environment Agency, such as the River Greet, River Devon, Middle Beck, Slough Dyke, and Halloughton Dumble.

3.1.4 Other watercourses within the study area are the River Witham, which runs through part of the eastern boundary of the District, The River Meden and River Maun which run through the District from the north to the west. Some ordinary watercourses are also located within the study area, which act as tributaries for the River Trent and River Maun.

3.1.5 A plan showing the watercourses within the study area can be found in Appendix C.

3.1.6 Two Internal Drainage Boards (IDB) operate within the study area. These are the Trent Valley IDB, which is an amalgamation of a number of IDBs and covers the River Trent and its tributaries located around the Newark-on-Trent area, and the Upper Witham IDB, which covers a small area at the easternmost extent of the study area around the River Witham. The extent of the IDB regions is illustrated in Appendix C.

3.1.7 The river catchments associated with the study area are the River Trent and River Witham and their existing catchments will need to be maintained as part of any future development plans.

3.2 FLOOD RISK OVERVIEW

3.2.1 In accordance with the NPPF, Strategic Flood Risk Assessments are required to consider all sources of flooding. This section provides an overview of the different sources of flooding within the study area.

FLOODING FROM RIVERS

3.2.2 Fluvial flood risk is caused by the main rivers and ordinary watercourses within the study area. Fluvial flood risk is primarily caused by high rainfall and groundwater levels.

3.2.3 Rivers flood when the amount of water in them exceeds the flow capacity of the river channel. Most rivers have a natural floodplain to which the water spills in times of flood.

3.2.4 The characteristics of the catchment of each watercourse are key factors in determining fluvial flood risk. A catchment with low permeability or highly saturated soil, or a high proportion of urban area without suitable surface water attenuation measures, will exacerbate the risk of fluvial flooding due to rainfall reaching the river channel at a faster rate.

FLOODING FROM THE SEA

3.2.5 The River Trent is a potential source of tidal flooding to the study area. Tidal flooding is most likely to occur during storm surge conditions caused by either one or a combination of the following:

- High tide;
- Low atmospheric pressure; and
- Wind driven waves.

3.2.6 Tidal flood risk within the study area is confined to the area surrounding the River Trent to the north of Cromwell Lock, where it is tidally influenced. Cromwell Lock is located near the settlement of Cromwell, to the north of Newark-on-Trent.

FLOODING FROM LAND

3.2.7 Intense rainfall, often of short duration, that is unable to soak into the ground (due to urbanisation, poor soil infiltration and/or saturated ground) or enter drainage systems can quickly run off land and result in flooding.

3.2.8 In the summer of 2007 major flooding occurred in the UK, affecting 55,000 properties and over 7000 people needed to be rescued. To understand the likely causes and the lessons learnt, The Pitt Review report *"Learning lessons from 2007 floods"* (2008) was produced. This concluded that a significant proportion of flooding was the result of surface water runoff.

3.2.9 The Environment Agency has undertaken two rounds of modelling of surface water flooding at a national scale, producing the Areas Susceptible to Surface Water Flooding (AStSWF) and Flood Map for Surface Water (FMfSW), both of which give an indication of the broad areas likely to be at risk of surface water flooding.

3.2.10 The surface water flood maps do not show flooding that occurs from overflowing watercourses, drainage systems or public sewers caused by catchment-wide rainfall events or river flow.

3.2.11 The Preliminary Flood Risk Assessment carried out by Nottinghamshire County Council sets out a strategy of using both the AStSWF and FMfSW in different parts of the county. The relevant sections for the Newark and Sherwood District are that in low lying areas covered by the Internal Drainage Boards the AStSWF should be used, and in all other areas the FMfSW should be used. Refer to section 6.5 for further information relating to this.

3.2.12 The dataset used within the Preliminary Flood Risk Assessment is known as the 'Locally Agreed Surface Water Information' which includes the results of some local studies, although these did not include Newark and Sherwood.

FLOODING FROM GROUNDWATER

3.2.13 Groundwater flooding occurs when water levels rise above the surface elevations. It is most likely to occur in low-lying areas underlain by permeable rocks (aquifer).

3.2.14 Water levels below the ground rise during the wetter winter months and therefore may lead to the flooding of normally dry land, as well as reactivating flow in bournes (intermittent streams that only flow for part of the time, when groundwater is high).

3.2.15 Groundwater flooding may take weeks or months to dissipate because groundwater flow is much slower than surface flow and water levels thus take much longer to fall.

3.2.16 A Plan showing areas that are susceptible is included within this report. This shows that areas of Newark and Sherwood located within the proximity to the River Trent have a greater than 75% chance of suffering from groundwater flooding. There is a range of probability across the district for groundwater flooding. These range between <25% to >75%. Refer to Appendix D for further information.

FLOODING FROM SEWERS

3.2.17 In urban areas rainwater is often drained into either surface water sewers or sewers that contain both foul and surface water known as “combined sewers”. Flooding can result when a sewer exceeds capacity during heavy rainfall, becomes blocked or is of inadequate capacity. When this happens with a combined sewer there is a high risk of land and property flooding with water contaminated with raw sewerage as well as pollution of rivers due to discharge from combined sewer overflows.

3.2.18 Any drainage outfalls to the River Trent may become surcharged (i.e. water cannot freely flow out of the outfall structure) when water levels are high. This causes the water to back-up within the drainage system eventually resulting in flooding if no allowance for a surcharged outfall has been made within the drainage design.

3.2.19 Poor maintenance will eventually result in increased sedimentation, blockages or reduced flow capacity, causing water to back-up within the system and eventually result in flooding. Flooding can also be caused should the system collapse as a result of poor maintenance.

3.2.20 All of these flood risk sources and mechanisms combine to create an overall picture of flood risk for the study area.

3.3 FLOOD RISK MANAGEMENT INFRASTRUCTURE

3.3.1 Details of hydraulic structures such as sluices, weirs and defences within the study area from the National Flood and Coastal Defence Database (NFCDD) were provided as part of the Level 1 SFRA and are contained in Appendix C.

3.3.2 A key requirement of a Level 2 SFRA is to assess the probability and consequences of overtopping or failure of flood risk management infrastructure. Overtopping flood outlines from the River Trent (fluvial) for the study area have been provided in Appendix F as taken from the Environment Agency's River Trent and Tributaries at Newark Flood Risk and Hazard Mapping Study dated July 2011.

3.4 GEOLOGY, HYDROGEOLOGY AND ENVIRONMENT

Geological Maps

3.4.1 The British Geological Survey classifies the geology of the study area as having drift deposits, Mercia Mudstone and outcroppings of Kidderminster Formation and Tarporley Siltstones. A detailed review of the Geology is listed within the Level 1 SFRA.

3.4.2 Sustainable Drainage Systems (SuDS) infiltration feasibility plans for each strategic development potential site within the District are shown in Appendix D. These have been provided for the study area based on information taken from the Level 1 SFRA. These plans indicate the potential suitability for SuDS infiltration techniques based on the permeability of ground conditions, although this is not the only factor affecting the choice of SuDS. Infiltration methods rely on discharging to ground, where suitable ground conditions allow.

3.4.3 The SuDS Infiltration feasibility plan should not be used as reason to negate the need for soakaway tests. A detailed site specific FRA will still need to assess the permeability of the underlying soil through ground investigations. The plans in Appendix D provide an initial indication of the suitability of these methods.

Source Protection Zone Maps

3.4.4 Source Protection Zones (SPZ's), relate to groundwater supplies used for drinking and the risk of contamination through pollution. The Environment Agency classify them into four main zones; Zone 1 (Inner Protection Zone), Zone 2 (Outer Protection Zone), Zone 3 (Total Catchment) and Zone of Special Interest.

3.4.5 Based on the information provided by the EA, source protection zones for each strategic development potential site within the District are contained in Appendix D.

3.5 ADMINISTRATIVE BOUNDARIES

Land Drainage / Flood Risk Management

3.5.1 Two Environment Agency regions cover the District. These boundaries are set at the catchment boundaries, hence the Environment Agency Anglian Region covers the area covered by the River Witham CFMP, and the Environment Agency Midlands Region covers the area that is covered by the River Trent CFMP.

3.5.2 The Trent Valley Internal Drainage Board (IDB) covers a large amount of the eastern half of the District. The Upper Witham IDB covers a small area to the far east of the District.

Sewerage

3.5.3 Anglian Water and Severn Trent Water are responsible for sewerage in the area.

3.5.4 Anglian Water Sewerage records for the study area can be viewed through the website DigDat at http://www.digdat.co.uk and records for both Anglian Water and Severn Trent can be viewed at Newark and Sherwood District Council offices or obtained at a cost direct from Anglian Water and Severn Trent. Refer to Anglian Water and Severn Trent websites for further information.

- http://www.anglianwater.co.uk/
- http://www.stwater.co.uk/

3.5.5 For capacity flow information reference should be made to the latest Newark and Sherwood District Council Water Cycle Study.

3.6 ROLES AND RESPONSIBILITIES

Newark and Sherwood District Council

3.6.1 Newark and Sherwood District Council is the Local Planning Authority for the study area and has due regard for drainage and flood risk in accordance with local and national guidance and responses from consultees. Specific responsibilities with regard to drainage and flood risk are as follows:

- Development Control (planning) to ensure new development is not at risk of flooding or exacerbates existing issues;
- Emergency Planning;
- Planning Policy (i.e. LDF), to allocate land to provide a spatial framework for development control decisions, Strategic Flood Risk Assessments and Surface Water Management Plans; and
- Where appropriate to reduce flood risk from ordinary watercourses and from land drainage problems.

Environment Agency

3.6.2 The Environment Agency is a governmental organisation whose overarching objective is to protect and enhance the environment in England and Wales. The Environment Agency has permissive and statutory duties to:

- Maintain or improve any watercourses which are designated as Main Rivers;
- Maintain or improve any sea or tidal defences;
- Install and operate flood warning equipment; and
- Control actions by riparian owners and occupiers which might interfere with the free flow of a watercourse which is designated as a Main River.

3.6.3 Additionally, following the amendment to the Town and Country Planning Act in October 2006, the Environment Agency became a statutory consultee for the LPA for all planning applications within areas of flood risk (except minor developments). The Environment Agency's Standing Advice sets out when the Environment Agency should be consulted on planning applications (consultation matrix), it includes the following planning application scenarios:

- Householder development and alterations within 20m of the top of a bank of a Main River and/or includes culverting or control of flow of any river or stream;
- Non-residential extensions with a footprint of less than 250m² that is within 20m of the top of bank of a Main River and/or includes culverting or control of any river or stream;
- Change of use from 'water-compatible' to 'less vulnerable' development within 20m of the top of bank of a Main River and if the site falls within Flood Zone 3;
- Change of use resulting in 'highly vulnerable' development within 20m of the top of bank of a Main River and if the site falls within Flood Zone 2 or 3; and

- Operational development of 1 hectare or greater if the development includes culverting or control of flow of any river or stream and/or the development is within Flood Zone 2 or 3.

Internal Drainage Boards (IDBs)

3.6.4 The role of the drainage boards is to maintain a network of watercourses within the study area and to provide drainage. The IDB's operate a series of assets which are key in managing the water levels within the various IDB watercourses. This responsibility is brought about through Acts of Parliament (Land Drainage Acts) to provide flood protection and water level management services. All drainage boards have the power to undertake works on any watercourse within its district, other than Main Rivers which are maintained by the Environment Agency.

3.6.5 The Land Drainage Acts of 1991 and 1994 require IDBs to provide for:

- General supervision over all aspects of land drainage and water level management within its District;
- Improving and maintaining the drainage system, including the operation of pumping stations;
- Regulating activities in and alongside the drainage system, other than on those waterways designated as main rivers and under the Environment Agency's control;
- Duties to conservation; and
- Raising income to support land drainage works.

3.6.6 Under Section 66 of the Land Drainage Act, 1991 and Byelaws approved by the Department for Environment Food and Rural Affairs, the Board have specific requirements that must be complied with when planning or operating near an IDB asset. Permission to carry out these works must first be consented by the Board; this will avoid contravention of the Byelaws and enforcement action.

Trent Valley Internal Drainage Board

3.6.7 Trent Valley Internal Drainage Board (TVIDB) has permissive powers under the Land Drainage Act 1991 to exercise a general supervision over all matters relating to the drainage of land within its District. TVIDB also has other powers to perform such other duties as are conferred or imposed on internal drainage boards by this Act.

3.6.8 To ensure efficient drainage within its District, TVIDB maintain a network of watercourses and pumping stations. Responsibility for maintaining the remaining private watercourses falls upon the riparian owners.

3.6.9 Byelaws were made by the TVIDB under the powers vested in it by the Land Drainage Act of that time and have continued under subsequent Land Drainage Acts. The primary purpose of these Byelaws is to ensure efficient drainage within the TVIDB District. Byelaws seek to guarantee the TVIDB maintained watercourses can be accessed for maintenance or improvement in the future and ensure the unimpeded flow of water on all watercourses within the TVIDB District at all times.

3.6.10 Any person wishing to carry out works on or adjacent to any watercourses within TVIDB's District should note the following:

- Works affecting a designated Main River will require the prior consent of the Environment Agency.
- Any works in, over, under or within 9.0m of either top of bank of a TVIDB maintained open watercourse, or the outside edge of a TVIDB maintained culverted watercourse, will require prior consent from TVIDB.
- To ensure access for future maintenance is not impeded TVIDB will generally seek to ensure proposed development incorporates a 9 meter wide undeveloped buffer strip on either side of TVIDB maintained or culverted watercourse.
- Prior consent of TVIDB will also be required for the introduction of flows into any watercourse (excepting designated main rivers) within the TVIDB District. Generally, TVIDB expect that on site attenuation is incorporated into development sites to ensure the post development surface water flows do not exceed the pre-development discharge rates.
- In exceptional circumstances TVIDB may consider accepting higher discharge rates provided that flood risk does not increase to offsite areas and all costs that TVIDB have or will incur in providing watercourses and systems of sufficient capacity are met by the developer.
- In certain areas TVIDB's catchments extend beyond the District Boundary. Developers are reminded that the consent of TVIDB is also required prior to increasing the flow of surface water into the TVIDB District.
- Any works affecting the flow on a private watercourse (culverts, diversions weirs etc.) within the TVIDB's District will require consent from TVIDB as detailed in Section 23 of the Land Drainage Act 91.
- Works must not commence until the Board has issued consent. The granting of any other Planning Consent does not override the need for obtaining consent from TVIDB.

Upper Witham Internal Drainage Board

3.6.11 The District of the Upper Witham Internal Drainage Board encompasses all low lying areas which derive benefit or avoid danger as a result of drainage operations in the catchment area of the River Witham and its tributaries upstream of the High Street in Lincoln. It includes the valley of the River Till between Lincoln and Gainsborough and the valleys of the River Witham and River Brant between Lincoln and Grantham.

3.6.12 Most of the Board's District is now intensely farmed but there are areas of urban development such as Lincoln, Saxilby, North Hykeham and Grantham. Over 20% of the Board's District relies on pumped drainage.

3.6.13 A significant part of the Board's District is at some risk of flooding. However that risk is controlled although varying standards of protection apply. The following are the key details of the Upper Witham IDB maintained infrastructure within their Board's District:-

Board Maintained Infrastructure

- Pumping Stations: 15 No.
- Other Water Level Control Structures: 13 No.
- Balancing Lagoon: 1 No.
- Watercourses: 319 km
- Strategic Ordinary Watercourses: 17 km
- Raised Embankments: 13 km

3.6.14 The Board will, as required, exercise its powers under the Land Drainage Act 1991 and its Byelaws to ensure that activities in and alongside the drainage system do not reduce flood protection standards and unnecessarily increase flood risk.

3.6.15 Through the operation and maintenance of the pumping stations and the drainage system the Board seeks to maintain a general standard capable of providing flood protection to agricultural land and developed areas of 1 in 10 and 1 in 50 years respectively. This likely return period cannot be taken literally and should be considered as a chance of some over-spilling from the system taking place each year as being 10% and 2% respectively.

3.6.16 Any person wishing to carry out works on or adjacent to any watercourses within UWIDB's District should note the following:

- Works affecting a designated Main River will require the prior consent of the Environment Agency.
- Any works in, over, under or within 6.0m of either top of bank of a UWIDB maintained open watercourse, or the outside edge of a UWIDB maintained culverted watercourse, will require prior consent from UWIDB.
- To ensure access for future maintenance is not impeded UWIDB will generally seek to ensure proposed development incorporates a undeveloped buffer strip, distance to be agreed with UWIDB, on either side of UWIDB maintained or culverted watercourse.
- Prior consent of UWIDB will also be required for the introduction of flows into any watercourse (excepting designated main rivers) within the UWIDB District. Generally, UWIDB expect that on site attenuation is incorporated into development sites to ensure the post development surface water flows do not exceed the pre-development discharge rates.
- In exceptional circumstances UWIDB may consider accepting higher discharge rates provided that flood risk does not increase to offsite areas and all costs that UWIDB have or will incur in providing watercourses and systems of sufficient capacity are met by the developer.

- In certain areas UWIDB's catchments extend beyond the District Boundary. Developers are reminded that the consent of UWIDB is also required prior to increasing the flow of surface water into the UWIDB District.
- Any works affecting the flow on a private watercourse (culverts, diversions weirs etc.) within the UWIDB's District will require consent from UWIDB as detailed in Section 23 of the Land Drainage Act 91.
- Works must not commence until the Board has issued consent. The granting of any other Planning Consent does not override the need for obtaining consent from UWIDB.

3.6.17 The Board monitors the condition of its pumping stations and watercourses, particularly those designated as critical and strategic, over-spilling from which could affect several properties. Consistent with the established need a routine maintenance programme is in place to ensure that the condition of the assets is commensurate with the standards of protection which are sought. Where standards are not at the policy level, improvement works will be considered and undertaken as resources allow.

3.6.18 Much of the Board's maintenance work on watercourses, vegetation control and de-silting is a vital and routine requirement. Whilst inevitably some short term impact will arise, this management also maintains the diverse aquatic habitat in the Board's District. The Board maintains a significant proportion of the total watercourse length in the Board's District, the remainder being the responsibility of the Environment Agency and riparian land owners.

Nottinghamshire County Council

3.6.19 Nottinghamshire County Council has a number of roles and responsibilities for flood risk management and drainage, including:

- Local flood risk management: as a Lead Local Flood Authority under the Flood Risk Regulations (2009) and Flood and Water Management Act (2010);
- Emergency planning: as a Category 1 Responder under the Civil Contingencies Act (2004);
- Enforcement and land drainage consenting powers under the Land Drainage Act (1991) for ordinary watercourses; and
- Highways drainage under the Highways Act (1980).

3.6.20 Flood risk management is cross-cutting and also affects planning policy and development control functions that sit at the County Council level, sustainability and climate change, property management, social care, education and conservation and heritage.

Sewerage Undertakers

3.6.21 Sewerage undertakers are responsible for any sewers adopted under the requirements of the Water Industry Act 1991. They work closely with other stakeholders on the production of planning documents such as Strategic Flood Risk Assessments, Water Cycle Strategies and Surface Water Management Plans. For further information on the water authority regions within Newark and Sherwood refer to the Newark and Sherwood Level 1 SFRA.

Anglian Water

3.6.22 Anglian Water will consider the adoption and maintenance of Sustainable Drainage Systems (SuDS) in public open spaces, subject to verification of design, construction and maintenance requirements set out within the Anglian Water Sustainable Drainage Systems (SuDS) adoption manual. Anglian Water may also consider the adoption and maintenance of SuDS in development where surface water features integrate with public open space, subject to verification of design, construction and maintenance requirements set out within the Anglian Water SuDS adoption manual.

3.6.23 Anglian Water has two pumping stations which they are responsible for within the SFRA study area; these are Wigsley and Harby Terminal pumping stations and also the Harby Sewerage Treatment Works. Situated to the south east, located outside the study area, is the Barnby in the Willow Sewage Treatment Works, the Barnby in the Willows Terminal Pumping Station and Claypole Sewage Treatment Works balancing facility.

3.6.24 For further information please go to the Anglian Water website at http://www.anglianwater.co.uk.

Severn Trent Water

3.6.25 Severn Trent Water (STW) fully supports the concept of SuDS. STW believes that, subject to proper design and maintenance provisions, appropriate SuDS techniques in conjunction with traditional approaches to urban drainage, offer real opportunities to reduce the impact of urban drainage on the environment. It is recognised that the different techniques involved can vary in their effectiveness, depending in part on local conditions. On occasions complex issues relating to ownership and future liability have to be resolved.

3.6.26 The successful implementation of SuDS can only be realised if all stakeholders approach the issue with real commitment. Further guidance is coming in the form of the SAB role for LLFAs and the mandatory build standards. STW will play an active role in facilitating this process and developing practical guidelines for the future. For further information please go to the Severn Trent Water website at http:// http://www.stwater.co.uk.

4 Methodology

4.1 DATA SOURCES

4.1.1 The majority of data sources for this SFRA have been received from the Environment Agency. A small number of data sources used for this Level 2 Phase 2 Strategic Flood Risk Assessment (SFRA) have been taken from the Level 1 and Level 2 Phase 1 SFRA data.

4.1.2 The new data sources received from the Environment Agency are:

- The River Trent and Tributaries at Newark Flood Risk and Hazard Mapping Study (2011);
- Main rivers and ordinary watercourses;
- The latest Flood Map information showing the extent of Flood Zones 1, 2 and 3;
- Groundwater flooding information;
- National Flood and Coastal Defence Database information on raised defences; and
- The Areas Susceptible to Surface Water Flooding and Flood Map for Surface Water for the District.

4.1.3 Further information has been received from the IDB's with regards to their district boundaries and assets.

4.1.4 Guidance documents for the area have been used to inform parts of this SFRA. The River Witham and River Trent Catchment Flood Management Plans (CFMPs) have been used to provide recommendations within the SFRA, specifically relating to flood defence maintenance and upgrades.

4.1.5 A data register is contained in Appendix C.

4.2 APPROACH AND METHODOLOGY

4.2.1 This Level 2 Phase 2 SFRA has been conducted in line with the Department for Communities and Local Government (DCLG) National Planning Policy Framework (March 2012), the supporting NPPF Technical Guidance (March 2012) and Newark and Sherwood District Council SFRA Level 2 Invitation to tender document (Aug 09).

4.2.2 Hazard mapping has been undertaken as part of this Level 2 SFRA for some of the sites currently being considered for development. These sites were assessed to ascertain their suitability for development (not just in terms of flood risk) within the Newark and Sherwood Allocations and Development Management Options Report (ADMOR). Further information on this is given in section 6.3. A full list of the sites assessed within the Level 2 SFRA is provided in Appendix B.

4.2.3 The study includes some detailed hydraulic modelling for sites which are currently being considered for development and which could require development within the floodplain.

4.2.4 The objective of the Level 2 Phase 2 SFRA is as follows:

1. An appraisal of the current condition of flood defence infrastructure and of likely future flood management policy with regard to its maintenance and upgrade;

2. An appraisal of the probability and consequences of overtopping or failure of flood risk management infrastructure, including an appropriate allowance for climate change;

3. Definition and mapping of the functional floodplain in locations where this is required;

4. Maps showing the distribution of flood risk across all flood zones from all sources of flooding taking climate change into account;

5. Guidance on appropriate policies for sites which satisfy parts a) and b) of the Exception Test, and requirements to consider at the planning application stage to pass part c) of the Exception Test as set out in PPS25; (Since the production of the tender document PPS25 has been superseded by the NPPF, therefore this document has been produced in accordance with this latest planning document).

6. Guidance on the preparation of FRAs for sites of varying risk across the flood zones, including information about the use of SuDS techniques;

7. Identification of the location of critical drainage areas and identification of the needs for Surface Water Management Plans;

8. Meaningful recommendations to inform policy, development control and technical issues.

4.3 RIVER TRENT AND TRIBUTARIES AT NEWARK FLOOD RISK AND HAZARD MAPPING STUDY (2011)

4.3.1 A River Trent and Tributaries at Newark Flood Risk and Hazard Mapping Study was issued in July 2011. This study enabled the Environment Agency to produce hazard maps for all urbanised areas at risk of flooding from the Trent.

4.3.2 The study scope comprised the production of flood maps, design levels, velocity and depth grids together with a review of Flood Warning arrangements between Colwick and North Muskham and included the River Devon downstream of Cotham.

4.3.3 The Flood Risk Mapping and Hazard Mapping that have been produced for the River Trent Study have been applied to the study area and the effects on the sites investigated as part of this SFRA.

4.3.4 Depth, Velocity and Hazard Maps associated with the River Trent model are contained in Appendix F.

4.4 CLIMATE CHANGE

4.4.1 The NPPF Technical Guidance document takes into account the impacts that climate change may have on flooding issues and sustainable development. The nature of climate change at a regional level will vary. Projections for the UK predict a greater frequency of short duration, high intensity rainfall and more frequent periods of long-duration rainfall. Sea levels will continue to rise. Winters are predicted to become wetter in the UK by as much as 20% by the 2050s. Summer and autumn are predicted to become much drier. These effects will need to be incorporated into site specific Flood Risk Assessments (FRAs) (see FRA Toolkit in Appendix H). When assessing climate change, the NPPF encourages an integrated approach across various sectors such as land use, water resources and biodiversity.

4.4.2 Table 5 of the NPPF Technical Guidance gives a direction on how impacts of climate change should be calculated and applied. The contents of Table 4 from the NPPF are reproduced below.

Recommended national precautionary sensitivity ranges for peak rainfall intensities, peak river flows, offshore wind speeds and wave heights (From Table 5 of The NPPF Technical Guidance):

Parameter	1990 to 2025	2025 to 2055	2055 to 2085	2085 to 2115
Peak rainfall intensity	+5%	+10%	+20%	+30%
Peak river flow	+10%	+20%		
Offshore wind speed	+5%		+10%	
Extreme wave height	+5%		+10%	

Notes:

1. Refer to DEFRA FCDPAG3 Economic Appraisal Supplementary Note to Operating Authorities - Climate Change Impacts. October 2006 for details of the derivation of this table.

2. For deriving peak rainfall, for example between 2025 and 2055, multiply the rainfall measurement (in mm/hour) by 10 per cent between 2055 and 2085 multiply the rainfall measurement by 20%. Therefore, if there is a 10mm/hour event, this would equate to 11mm/hour for the '2025-2055' period; and for the '2055-2085' period, this would equate to 12mm/hour. Other parameters in Table 5 are treated similarly.

4.5 IMPACT OF CLIMATE CHANGE ON THE STUDY AREA

4.5.1 The NPPF Technical Guidance takes into account the impacts that climate change may have on flooding issues and sustainable development. Table 5 of the NPPF Technical Guidance (see paragraph 4.4.2 of this SFRA) provides indicative sensitivity ranges for different parameters affecting the likely severity of projected flooding.

4.5.2 Climate change flood outlines have been provided for the 1% (1 in 100) event for the River Trent Flood Study (2011). In line with the requirements of the NPPF Technical Guidance, hydraulic modelling has taken into consideration an increase in peak river flows up to the year 2115. This timescale incorporates the proposed lifetime of a development which is 60 years for commercial and 100 years for residential.

4.5.3 Impacts from climate change will need to be taken in to consideration as part of a detailed site specific Flood Risk Assessment within the study area.

4.5.4 It is important to note that climate change parameters may change from those currently used. This will impact on climate change flood outlines by possibly increasing them. SuDS systems implemented now based on current climate change criteria may not meet the required standards as climate change parameters are altered in the future.

4.5.5 The Government's Flood and Water Management Act (2010) reinforces the need to adapt to climate change. The Act takes into consideration the recommendations made in the Pitt review (2007). One of the principal aims of the Act is to deliver greater sustainability by helping people and their communities adapt to the increasing likelihood of severe weather events due to climate change. The Act also highlights that in order to respond to the challenges of climate change, bodies with direct responsibilities for managing flood and coastal erosion will need to work together to assess and manage these future risks.

4.5.6 This Level 2 Phase 2 SFRA should be used by Newark and Sherwood District Council to assist in performing the Sequential and Exception Tests. However, it is important to note that this study does not replace the need for these tests to be undertaken where necessary. The principle aim of the Sequential Test is to steer development towards sites of least flood risk (Flood Zone 1). If, following application of the Sequential Test, it is not possible, consistent with wider sustainability objectives, for the development to be located in zones with a lower probability of flooding, the Exception Test can be applied if appropriate. For further details on the Exception Test refer to section 2.11 and 7.2 of this SFRA.

4.5.7 Appendix G of this study takes the Flood Hazard 'with climate change' outlines into consideration in relation to providing guidance on the above.

4.5.8 This SFRA is key in helping Newark and Sherwood District Council to understand the full impact of climate change within the study area.

5 Flood Defence Infrastructure

5.1 FLOOD DEFENCE INFRASTRUCTURE

5.1.1 In line with the NPPF Technical Guidance, an SFRA is required to:

- Consider the beneficial effects of flood risk management infrastructure in generally reducing the extent and severity of flooding when compared to the flood zones on the flood map; and
- Enable the production of mapping showing flood outlines for different probabilities, impact, speed of onset, depth and velocity variance of flooding taking account of the presence and likely performance of flood risk management infrastructure.

5.1.2 This section of the SFRA reviews the flood defence assets and provides details about how the study area is protected from all sources of flooding. The following section of this report (section 6) then outlines the flood risk to the area, incorporating information about how the area is defended.

5.2 STANDARD OF PROTECTION OF FLOOD DEFENCES

5.2.1 Information has been provided by the Environment Agency on the structures and defences in the study area from the National Flood and Coastal Defence Database (NFCDD).

5.2.2 Plans included in Appendix C show the NFCDD structures and defences with tables detailing each structure or defence referenced by the NFCDD within the study area.

5.2.3 A large proportion of the study area would flood without defences. The existing raised defences are inspected on a regular basis by the Environment Agency and awarded a rating from 1-5, where 1 is very good, 2 is good, 3 is fair, 4 is poor and 5 is very poor. There are no raised defences which are very poor condition, with the majority of defences having a good or fair rating. Very good and good ratings are given to assets which either have no defects, or no defects that affect performance. Assets with a fair rating have defects that may reduce the performance of the asset.

5.2.4 There are two embankments which fall in to the poor condition category. These are along the River Devon on its west bank to the south-west of Newark, and along the River Trent on its south bank to the west of Newark downstream from Averham Weir. These two defences do not have any impact on the development sites assessed as part of this Level 2 Phase 2 SFRA. The defence along the River Devon that is in poor condition is addressed in the Level 2 Phase 1 SFRA as having no impact on the Land South of Newark site due to being along the left (western) bank of the Devon.

5.2.5 Failure of the defences can occur as a result of breach. Breach is where the defence has a crest level above adjacent land levels and the failure is as a result of high flood waters or due to an indirect source such as failure through damage or when flood gates are left opened. Overtopping of a defence in an extreme event is not a failure in itself, but it can lead to a breach. Overtopping occurs when water passes over a flood defence, when water levels exceed the defence level. Water will then spill over the defence onto adjoining land.

5.2.6 If a breach were to occur then the area close to the breach would be rapidly inundated with flood waters, causing a high hazard to nearby areas. During overtopping events there will also be a significant hazard to the area behind the overtopping point.

5.2.7 The River Trent and Tributaries at Newark Flood Risk and Hazard Mapping Study (2011) has provided velocity, depth and hazard outlines for overtopping for the 1% (1 in 100), 0.1% (1 in 1000) and 1% (1 in 100) plus climate change fluvial events. These outlines are shown on the maps in Appendix E of this report.

6 Flood Risk

6.1 OVERVIEW

6.1.1 This Level 2 Phase 2 SFRA provides a strategic overview of flood risk and its impact on the Newark and Sherwood District. It should be noted that:

- This Level 2 Phase 2 SFRA reflects current national planning policies and guidance at the time of writing;
- Policies may change; and
- Flood levels/flood zone classifications may change.

6.1.2 Through detailed data collection and analysis, it is concluded that a sufficient amount of information has been gathered to complete the Level 2 Phase 2 SFRA. Refer to Section 4.1 for further detailed information and Appendix C for the data register.

6.1.3 Flooding can occur due to a number of different sources, either alone or in combination. Refer to section 3.2 for further information on flood sources.

6.2 FLOOD MAP

6.2.1 The Environment Agency publishes a Flood Map which shows areas potentially deemed to be at risk of flooding for all watercourses with a catchment area greater than 3km^2 in the UK. There are two different kinds of areas shown on the Flood Map. They can be described as follows:

6.2.2 Flood Zone 3 (dark blue) shows the area that could be affected by flooding either from rivers or the sea, if there were no defences. This area is affected by:

- Flooding from the sea during a 0.5% (1 in 200) annual exceedence probability (AEP) event; or
- Flooding from a river during a 1% (1 in 100) AEP event.

6.2.3 Flood Zone 2 (light blue) shows the area that could be affected by flooding in extreme circumstances either from rivers or the sea, representing the extent of a flood event with a 0.1% chance of occurring in any year, or the highest recorded historic extent of flooding if greater.

6.2.4 The Flood Map also shows flood defences and the areas that benefit from flood defences for Flood Zone 3 areas.

6.2.5 The Flood Map is updated periodically, typically every 3 months, to take account of the latest data.

6.2.6 The probability or likelihood of flooding is described as the chance that a location will flood in any one year. This can either be expressed as a percentage or a ratio. It is important to note that if an area is classified as having a 1% (1 in 100) AEP of flooding, for example, it does not mean that if it floods once in 100 years then it will definitely not flood for the next 99 years.

6.2.7 A description of the different Flood Zones is provided in the NPPF and reproduced below:

- **Flood Zone 1 (low probability):** This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%);
- **Flood Zone 2 (medium probability):** This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% - 0.1%) in any year;
- **Flood Zone 3a (high probability):** This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year; and
- **Flood Zone 3b (functional floodplain):** This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their SFRAs areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. But land which would flood with an annual probability of 1 in 20 (5%) or greater in any year, or is designed to flood in an extreme (0.1%) flood, should provide a starting point for consideration and discussions to identify the functional floodplain.

6.2.8 The Environment Agency Flood Map has been provided in Appendix E and have also been provided for each strategic development potential site within the District in Appendix G.

6.3 HYDRODYNAMIC MODELLING

6.3.1 As detailed in section 4.3 a River Trent and Tributaries at Newark Flood Risk and Hazard Mapping Study was issued in July 2011 which enabled the Environment Agency to produce hazard maps for all urbanised areas at risk of flooding.

6.3.2 Time to inundation mapping was not available as part of this study and has therefore been produced using the Trent mapping outputs and shown within the site specific assessments included within this SFRA.

6.3.3 Some site specific hydraulic modelling has been carried out as part of the site specific assessment where it has been agreed with NSDC and the EA. Further information on the sites that have had additional modelling is detailed in section 6.4 and the modelling methodology is detailed in Appendix I.

6.4 SITE SPECIFIC ASSESSMENTS

6.4.1 As part of the SFRA review Newark and Sherwood District Council requires flood risk assessment information for 38 sites within the District which have been determined as being at risk of flooding or within areas that have wider flood risk issues.

6.4.2 The site specific assessments have been carried out on a stand-alone basis relating to flood risk only and do not provide an assessment of the wider sustainability issues associated with the sites. The information within the site specific assessments is to be used to help inform a site specific FRA.

6.4.3 There are 38 sites to be assessed, which are those WSP have agreed with NSDC as having flood risk issues. 35 of these sites are proposed to be used as residential sites, and 3 are proposed to be used as employment sites. Refer to the Development Site Locations Plan in Appendix A.

6.4.4 Hazard mapping (which includes depth of water, velocity of water and hazard to people) from the River Trent and Tributaries at Newark has been used where applicable, and some site specific hydraulic modelling has been carried out for sites where it has been agreed with NSDC and the EA that modelling is required.

6.4.5 Site 29 of the Development Site Plan did not have sufficient hazard mapping available and therefore as requested by the EA detailed hydraulic modelling was undertaken. For further information on the hydraulic modelling undertaken for this site refer to Appendix I.

6.4.6 Site 34 has had a separate assessment carried out on baseline contour data combined with the flood zone extent. This provides an indication of site levels and flood depths.

6.4.7 Extracts of mapping from Appendices C, E and F have been used to present an assessment for each specific site.

6.4.8 Tables showing the information that is included in the site specific assessments is listed in Appendix G. The tables include where hazard mapping has been provided or undertaken, details on the residual and actual flood risk with respect to maximum flood depths, velocities, hazard ratings and time to inundation.

6.4.9 Refer to Appendix G for further information.

6.5 LOCALLY AGREED SURFACE WATER INFORMATION

6.5.1 As detailed in section 3.2.11 the PFRA uses two sets of maps, Areas Susceptible to Surface Water Flooding (AStSWF) and Flood Map for Surface Water (FMfSW). Both sets of maps have been provided to give an indication of the extents of surface water flooding, however they are not intended to identify whether an individual property will flood. These maps are included in Appendix E of this report. These maps have been produced using methodology for creating locally agreed surface water information maps from the Nottinghamshire Preliminary FRA. Both data sets have been represented on the maps with the AStSWF applied to the IDB areas (Trent Valley IDB and Upper Witham IDB) and the FMfSW having been applied for all other areas of the Newark and Sherwood district, refer to Appendix E for further information.

6.5.2 The Areas Susceptible to Surface Water Flooding is the first generation of surface water mapping produced by the EA. This shows areas that may be affected by surface water flooding and is based on a bare earth ground model and does not take into account the effect of the drainage systems. The modelling is based on a two dimensional ground model that routes water over the surface.

6.5.3 The Flood Map for Surface Water is the second generation product released by the EA. This shows the extent of surface water flooding for the 3.33% (1 in 30) and 0.5% (1 in 200) AEP rainfall events. For each AEP the maps illustrate two classifications showing shallower and deeper surface water flooding.

- Shallower is defined as surface water flooding between 100mm and 300mm deep; and

- Deeper is defined as surface water flooding greater than 300mm deep.

6.5.4 The 300mm threshold is chosen as it represents a typical value for the onset of significant property damages from flooding (above doorstep level). In addition, driving and walking through flood water at this depth may become more difficult.

6.5.5 The Flood Map for Surface Water is based on a ground model that includes buildings and does take into account the effect of drainage systems.

6.5.6 Both sets of mapping can also show locations where flooding from ordinary watercourses and groundwater might occur. However, they should not be used to identify individual properties themselves that could flood.

6.5.7 Surface water flooding can be defined as an event that results from rainfall generated by overland flow before the runoff enters a watercourse or sewer. The maps do not show flooding that occurs from overflowing watercourses, drainage systems or public sewers caused by catchment-wide rainfall events or river flow.

6.5.8 One of the key findings of the Pitt Review "*Learning lessons from the 2007 floods*" was that the Environment Agency, supported by local authorities and water companies should urgently identify areas that are susceptible to surface water flooding. The Flood Map for Areas Susceptible to Surface Water has been produced in direct response to these recommendations.

6.5.9 It is important to note that these maps should not be used to guide the site allocation process within the context of this Level 2 Phase 2 SFRA. The intention of these maps is to act as a starting point to highlight areas where the potential for surface water flooding needs particular assessment and scrutiny. These maps should not be used in isolation in terms of assessing surface water flooding issues. Additional studies such as historical records should also be used as supporting evidence.

6.5.10 The maps provided in Appendix E were modelled using a digital terrain model with rainfall data taken from the Flood Estimation Handbook CD-ROM. Depth-duration-frequency curves derived from the CD-ROM are then used to derive depth of water for the 3.33% (1 in 30) and 0.5% (1 in 200) AEP rainfall events.

6.5.11 At this time the Local Flood Risk Management Strategy is a key document with regard to helping inform planning decisions within the local area, however it is envisaged that the Surface Water Management Plans (SWMPs) (when produced) will also act as a useful tool for looking at existing problems within an area and helping to inform planning decisions for new development. Assessing and managing all forms of flooding to development is a key theme of the NPPF.

6.6 OTHER SOURCES

6.6.1 Potential sources of flooding from overland flow, groundwater, sewers and water mains would need to be assessed in detail by developers as part of a site specific Flood Risk Assessment.

7 Planning and Development

7.1 FLOOD RISK MANAGEMENT HIERARCHY

7.1.1 When assessing a site's development potential, the following flood risk management hierarchy should be used. This hierarchy emphasises the importance of assessing flood risk management in five steps:

- Step 1 - Assess (appropriate flood risk assessment);
- Step 2 - Avoid (apply the Sequential approach);
- Step 3 - Substitute (apply the Sequential Test at site level);
- Step 4 - Control (e.g. SuDS design); and
- Step 5 - Mitigate (e.g. flood resilient construction).

7.2 SEQUENTIAL AND EXCEPTION TEST

7.2.1 The primary reason for the completion of this Level 2 SFRA is to provide guidance on undertaking the Sequential and Exception Test within the study area. The flood maps produced for this Level 2 SFRA provide the basis for providing guidance on the Sequential and Exception Test within the various sub-locations. It is important to note that this SFRA should be used as guidance to undertake both these tests and does not replace the need for Newark and Sherwood District Council to complete them as a separate process. Both the Sequential and Exception Test help contribute towards the process of Sustainable Development.

7.2.2 Newark and Sherwood District Council have undertaken an Allocations and Development Management Options Report (ADMOR). This document has been out for consultation and is the first stage in the production of the Allocations and Development Management Development Plan Document (DPD). This document in part assesses the sites within the District on a sequential basis. The sites included within this SFRA have been assessed individually on flood risk grounds to help further inform this document and to assist Newark and Sherwood District Council on the undertaking the Sequential and Exception Tests for flood risk sites.

7.2.3 In order to meet the NPPF requirements, for each proposed development site, all reasonably available sites in the District need to be compared on a number of factors including Flood Risk.

7.2.4 The ADMOR highlighted that a number of sites are considered necessary to be located in areas at risk of flooding in order to meet the proposed housing and employment targets. Therefore, further information was required to support the findings of the ADMOR and to demonstrate the ability of the sites to pass the Exception Test.

7.2.5 Table 1 of the NPPF Technical Guidance (below) provides definitions for the flood zones, referring to the probability of fluvial and tidal flooding, ignoring the presence of defences.

NPPF Technical Guidance Table 1: Flood Zones & Appropriate Land Uses

Zone 1 Low Probability

Definition

This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%).

Appropriate uses

All uses of land are appropriate in this zone.

FRA requirements

For development proposals on sites comprising one hectare or above the vulnerability to flooding from other sources as well as from river and sea flooding, and the potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off, should be incorporated in a FRA. This need only be brief unless the factors above or other local considerations require particular attention.

Policy aims

In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development, and the appropriate application of sustainable drainage techniques.

Zone 2 Medium Probability

Definition

This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% – 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% – 0.1%) in any year.

Appropriate uses

Essential infrastructure and the water-compatible, less vulnerable and more vulnerable uses, as set out in Table 2 (of the NPPF Technical Guidance), are appropriate in this zone.

The highly vulnerable uses are *only* appropriate in this zone if the Exception Test is passed.

FRA requirements

All development proposals in this zone should be accompanied by a FRA..

Policy aims

In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area through the layout and form of the development, and the appropriate application of sustainable drainage techniques.

Zone 3a High Probability

Definition

This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

Appropriate uses

The water-compatible and less vulnerable uses of land (Table 2 of the NPPF Technical Guidance) are appropriate in this zone. The highly vulnerable uses should not be permitted in this zone

The more vulnerable and essential infrastructure uses should only be permitted in this zone if the Exception Test is passed. Essential infrastructure permitted in this zone should be designed and constructed to remain operational and safe for users in times of flood.

FRA requirements

All development proposals in this zone should be accompanied by a FRA..

Policy aims

In this zone, developers and local authorities should seek opportunities to:

i. reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage systems;

ii. relocate existing development to land in zones with a lower probability of flooding; and

iii. create space for flooding to occur by restoring functional floodplain and flood flow pathways and by identifying, allocating and safeguarding open space for flood storage.

Zone 3b The Functional Floodplain

Definition

This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their SFRAs areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. But land which would flood with an annual probability of 1 in 20 (5%) or greater in any year, or is designed to flood in an extreme (0.1%) flood, should provide a starting point for consideration and discussions to identify the functional floodplain.

Appropriate uses

Only the water-compatible uses and the essential infrastructure listed in Table 2 (of the NPPF Technical Guidance) that has to be there should be permitted in this zone. It should be designed and constructed to:

– remain operational and safe for users in times of flood;

– result in no net loss of floodplain storage;

– not impede water flows; and

– not increase flood risk elsewhere.

Essential infrastructure in this zone should pass the Exception Test.

FRA requirements

All development proposals in this zone should be accompanied by a FRA.

Policy aims

In this zone, developers and local authorities should seek opportunities to:

i. reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage techniques; and

ii. relocate existing development to land with a lower probability of flooding.

7.2.6 The principle aim of the Sequential Test is to steer new development to areas at the lowest probability of flooding. If there are no reasonably available sites in Flood Zone 1, then the flood vulnerability of the proposed development can be taken into account in locating development in Flood Zone 2 and then Flood Zone 3. Reference should be made to Table 2 (NPPF Technical Guidance) Flood Risk Vulnerability classification in relation to the vulnerability of various land uses. Reference should also be made to Table D.3 Flood Risk Vulnerability and Flood Zone Compatibility classifications as set out in the NPPF Technical Guidance. Both these tables are provided below:

NPPF Technical Guidance Table 2: Flood Risk Vulnerability Classification

Essential Infrastructure	• Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. • Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood. • Wind turbines.
Highly Vulnerable	• Police stations, Ambulance stations and Fire stations and Command Centres and telecommunications installations required to be operational during flooding. • Emergency dispersal points. • Basement dwellings. • Caravans, mobile homes and park homes intended for permanent residential use. • Installations requiring hazardous substances consent. (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as 'Essential Infrastructure').
More Vulnerable	• Hospitals. • Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. • Buildings used for: dwelling houses; student halls of residence; drinking establishments; nightclubs; and hotels. • Non–residential uses for health services, nurseries and educational establishments. • Landfill and sites used for waste management facilities for hazardous waste. • Sites used for holiday or short-let caravans and camping, **subject to a specific warning and evacuation plan.**

Less Vulnerable	• Police, ambulance and fire stations which are not required to be operational during flooding. • Buildings used for: shops; financial, professional and other services; restaurants and cafes; hot food takeaways; offices; general industry; storage and distribution; non–residential institutions not included in 'more vulnerable'; and assembly and leisure. • Land and buildings used for agriculture and forestry. • Waste treatment (except landfill and hazardous waste facilities). • Minerals working and processing (except for sand and gravel working). • Water treatment works which do not need to remain operational during times of flood. • Sewage treatment plants (if adequate measures to control pollution and manage sewage during flooding events are in place).
Water-compatible Development	• Flood control infrastructure. • Water transmission infrastructure and pumping stations. • Sewage transmission infrastructure and pumping stations. • Sand and gravel workings. • Docks, marinas and wharves. • Navigation facilities. • MOD defence installations. • Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location. • Water-based recreation (excluding sleeping accommodation). • Lifeguard and coastguard stations. • Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms. • Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

NPPF Technical Guidance Document Table3. Flood Risk Vulnerability and Flood Zone 'Compatibility'

Flood Risk Vulnerability Classification (see Table 2)		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone (See Table 1)	Zone 1	✔	✔	✔	✔	✔
	Zone 2	✔	✔	Exception Test required	✔	✔
	Zone 3a	Exception Test required	✔	X	Exception Test required	✔
	Zone 3b 'Functional Floodplain'	Exception Test required	✔	X	X	X

Development type is permitted under the NPPF. A site based FRA is required in accordance with the SFRA.

Development type is permissible under the NPPF, only if the exception test is passed. It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk. A site based FRA is required in accordance with the SFRA.

Development type is not permitted under the NPPF.

Notes from the NPPF Technical Guidance applicable to this table:

This table does not show: the application of the Sequential Test which guides development to FZ1 first, then FZ2, and then FZ3; FRA requirements; or the policy aims for each Flood Zone.

7.2.7 As highlighted in sections 2.10 and 2.11, the NPPF and NPPF Technical Guidance expands on the Sequential Test by incorporating the Exception Test. If following the application of the Sequential Test, it is not possible or consistent with wider sustainability objectives, for the development to be located in zones of lower probability of flooding then the Exception Test can be applied.

7.2.8 The Exception Test provides a mechanism for managing flood risk whilst still allowing necessary development to occur. However, it should not be used to justify 'highly vulnerable' development in Flood Zone 3a, or 'less vulnerable', 'more vulnerable' and 'highly vulnerable' development in Flood Zone 3b.

7.3 SUSTAINABLE DRAINAGE SYSTEMS

There is impending legislation due to come into force relating to SuDS as result of the Flood and Water Management Act (2010). As it is currently proposed the SuDS Approval Body, (The County Council) will become a significant organisation in the approval, adoption and maintenance of SuDS. Draft Standards and Regulations have been consulted on nationally and a final document will be available upon publication.

7.3.1 Sustainable Drainage Systems (SuDS) are the preferred approach to managing rainfall runoff generated from impermeable surfacing and should be used at any proposed development site. They can be used to reduce the rate and volume of surface water discharges from sites to the receiving environment (e.g. natural watercourses, public sewers), as well as reduce pollutants, maintain recharge to groundwater and provide a natural amenity and green space within a development. SuDS also provides an effective means to deal with the effects of climate change.

7.3.2 The SuDS hierarchy must be applied to all proposed sites and assessed within a site specific FRA, with justification given for the omittance of a device.

7.3.3 Pre-application discussions must be undertaken with the relevant stakeholders for the site, in most cases this will be both the Environment Agency and if within 50m of an IDB watercourse, then the relevant IDB. It is possible the IDB will have different criteria to the Environment Agency and therefore these discussions are an important part of the FRA process.

7.3.4 There are various SuDS techniques that are available and should be investigated for a proposed site. However the techniques operate on two main principles:

- Infiltration; and
- Attenuation.

7.3.5 Infiltration SuDS rely on discharging to ground, where suitable ground conditions allow. Infiltration methods include the use of permeable pavements, infiltration trenches, soakaways and other techniques that are generally located below ground such as geocellular systems.

7.3.6 Where site ground conditions are deemed unsuitable for the widespread implementation of infiltration techniques, surface water runoff will need to be attenuated using on-site attenuation storage. On site ‘above ground’ storage measures include basins and ponds, with ‘below ground’ facilities generally following the more engineered forms of underground storage. In other cases a combination of both infiltration and attenuation methods could be applied.

7.3.7 Where possible a SuDS technique should seek to contribute to each of the three goals identified below with the favoured system contributing significantly to each objective:

- Reduce flood risk to the site and neighbouring areas;
- Reduce pollution; and
- Provide landscape and biodiversity benefit.

7.3.8 The Flood and Water Management Act (2010) highlights that national SuDS design standards will be released and that allocated SuDS Approval Bodies (SABs) will be responsible for approving and adopting SuDS schemes.

7.3.9 Documents such as the Pitt Review emphasise the importance of controlling and reducing surface water flows. This helps reduce the level of flood risk to the subject site and surrounding areas.

7.3.10 Source Protection Zone maps, SuDS Infiltration Feasibility plans, and sewer records have been reviewed to provide general recommendations on the implementation of SuDS on a site specific basis. A summary of the geological conditions in the District can be found in the Newark and Sherwood District Level 1 SFRA (2009).

7.3.11 Site specific testing should be undertaken to ensure that the ground conditions on site are suitable for the SuDS measures being proposed.

7.3.12 Information on groundwater levels has not been provided on a site specific basis as it was not available.

7.3.13 Site specific information has been provided in the site specific assessment sheets included in Appendix G.

7.3.14 A Flood Risk Management Hierarchy can be applied to surface water management as it is important to consider both flood risk to the proposed development as well as the potential impacts on areas adjacent to and downstream of the development. The management hierarchy in relation to surface water is given below:

- **Assess** - risk associated with surface water through regional, strategic and site specific Flood Risk Assessments and Surface Water Management Plans where completed;
- **Avoid** - risks from surface water by controlling water at sources using SuDS and locating development away from risk areas;
- **Substitute** - apply the sequential approach to locate more vulnerable developments in lowest risk areas; and
- **Control** - use SuDS and implement Surface Water Management Plans to manage and reduce risk within the development and downstream.

7.4 MAINTENANCE

7.4.1 A maintenance plan should be provided for any SuDS feature. The plan will contain details of how to ensure the SuDS feature will work reliably throughout the lifetime of the development. The maintenance plan may be provided as part of an Owner's Manual for SuDS, as specified in section 22 of CIRIA document C697: The SuDS Manual. Section 22.9.1 of C697 provides specific details on the documentation that should be provided alongside SuDS features.

7.4.2 In the case of small developments a maintenance statement is commonly provided. In this case a single page is provided explaining the site management requirements for the development, including maintenance requirements for any SuDS features.

7.4.3 Guidance documents have been produced by certain bodies to ensure the maintenance plan that is provided is adequate for the adopting body. SuDS features may be adopted by the local water authority (e.g. Anglian Water / Severn Trent Water), the local Internal Drainage Board (IDB), or the local council (e.g. Newark and Sherwood District Council).

7.4.4 Anglian Water has published a Sustainable Drainage Systems (SuDS) Adoption Manual. This manual covers the design, construction and adoption of SuDS schemes. A major part of the adoption process is making sure that suitable maintenance procedures are implemented to allow the SuDS feature to be reliable throughout their design life.

7.4.5 The maintenance requirements for a SuDS feature are set out in section 4.3 of the Anglian Water SuDS Adoption Manual, with further detail in part 3 of the Manual which starts at section 12. It proposes that a management plan should be set out for the SuDS feature which will contain maintenance information, such as the tasks that need to be carried out for the system to perform as designed, specifications of how maintenance should be carried out and what materials should be used, a schedule describing what work is to be done and when, and a plan which shows the maintenance areas, control points and outfalls for the system. Responsibilities should be highlighted for each element of the system as part of the management plan.

7.4.6 The Anglian Water SuDS Adoption Manual also requires the management plan to provide evidence that for the 12 months following the construction, the system is maintained and that all parts of the SuDS are effective and robust. An example maintenance plan is contained in section 14 of the Manual, which shows what work is to be done and the frequency of operations.

7.4.7 Specific requirements may be asked for by the local council, internal drainage board, or other relevant authorities to ensure that any maintenance plan incorporates all required measures ensuring the SuDS feature(s) are reliable for the lifetime of the development.

7.4.8 A national guide for SuDS maintenance and design is currently being produced by DEFRA, but the guide had not been published at the time of writing this document.

7.5 FLOOD AND WATER MANAGEMENT ACT 2010

7.5.1 The Act requires SuDS to be designed, constructed, maintained and operated in accordance with National Standards. One of the key features of the Act is to encourage the uptake of sustainable drainage systems by removing the automatic right to connect to sewers and providing for Unitary Authorities and County Councils to adopt SuDS for new developments and redevelopments.

7.5.2 The sustainable drainage strategy produced as part of a site specific FRA will need to be submitted to the relevant SuDS Approval Body for consent in accordance with the requirements of the Act. Details on how the scheme shall be maintained and managed after completion must also be included.

8 Flood Warning and Emergency Planning

8.1 FLOOD WARNING AND EMERGENCY PLANNING

8.1.1 Within England the responsibility for flood warning rests with the Environment Agency. The Environment Agency provides flood warnings for designated Flood Warning Areas. Information relating to the Environment Agency Flood Warning Areas within the study area has been provided in Appendix G. Primarily the Environment Agency issue these warnings by their Flood Warning Direct service, on their website, and in some cases through the media (local radio and TV); these warnings only cover tidal and fluvial flooding in the area. Floodline Warnings Direct is the service which the Environment Agency use to disseminate flood warnings across the country.

8.1.2 Flood Warning Areas have been shown on the site specific assessments in Appendix G.

8.2 FLOODLINE WARNINGS DIRECT

8.2.1 Flood Warning is an essential component of the strategy to reduce flood risk. The Environment Agency runs a system called Floodline Warnings Direct (FWD), which provides guidance on the risk to people and property from flooding across the country. The warning levels are shown below, including key information about each warning level.

8.2.2 The online flood risk forecast is updated at least once a day. It is recommended to stay aware of the weather and check the flood risk forecast on the Environment Agency website.

Flood Alert and Safeguard Property

Key Message: Flooding is possible. Be prepared.

Timing: Two hours to two days in advance of flooding.

Actions:

- Be prepared for flooding;
- Prepare a flood kit of essential items; and
- Monitor local water levels and the flood forecast on the Environment Agency website.

Channels:

- FWD;
- Floodline; and
- Internet.

Flood Warning & Prepare to Evacuate

Key Message: Flooding is expected. Immediate action required.

Timing: Half an hour to one day in advance of flooding.

Actions:

- Move family, pets and valuables to a safe place;
- Turn off gas, electricity and water supplies if safe to do so; and
- Put flood protection equipment in place.

Channels:

- FWD;
- Floodline;
- Internet;
- Sirens;
- Loudhailers; and
- Media.

Safe Refuge or Evacuate

Key Message: Severe flooding. Danger to life.

Timing: When flooding poses a significant threat to life and different actions are required.

Actions:

- Stay in a safe place with a means of escape;
- Be ready should you need to evacuate your home;
- Co-operate with the emergency services; and
- Call 999 if you are in immediate danger.

Channels:

- FWD;
- Floodline;
- Internet;
- Sirens;
- Loudhailers; and
- Media.

Warning no longer in force

Key Message: No further flooding is expected for your area.

Timing: Issued when a flood warning is no longer in force.

Actions:

- Flood water may still be around and could be contaminated; and
- If you've been flooded, ring your buildings and contents insurance company as soon as possible.

Channels:

- FWD;
- Floodline; and
- Internet.

8.2.3 Flood Warning is an essential component of the strategy to reduce flood risk. The current flood warning systems provided by the Environment Agency are described in the Level 1 SFRA. However, it should be noted that the flood warning system only operates for fluvial or tidal flooding.

8.2.4 Sir Michael Pitt's review of the summer 2007 floods stresses the importance of developing a flood warning system for surface water flooding. One of the reports interim conclusions (IC3) was "the Environment Agency further develops tools and techniques for predicting and modelling river flooding, especially to take account of extreme multiple events; and takes forward work to develop similar tools and techniques to model surface water flooding."

EMERGENCY PLANNING

8.2.5 The Emergency Planning team assists with planning and preparation to help lessen the effects of major emergencies of all kinds which may occur within the District, from floods to motorway accidents, and by joint agreement provide assistance to Newark and Sherwood's neighbouring District and County Councils. This is guided by a number of Acts of Parliament, including the Civil Contingencies Act (2004). This Act highlights the following responsibilities that Newark and Sherwood District Council must ensure that it complies with, to ensure that it is as prepared as possible. These are set out below:

- To assess the risk of a number of emergencies and use the results to inform its work:
- To create Emergency Plans, Policies and Procedures;
- To identify and address Business Continuity Management issues;
- To inform the public about emergency planning matters;
- To share any information with other local responders to improve co-ordination;
- To work alongside other agencies to improve efficiency; and
- To provide advice and assistance to business and voluntary organisations about Business Continuity Management.

8.2.6 Newark and Sherwood District Council is a signatory to the Nottinghamshire Integrated Emergency Plan and as such form part of a structured approach to dealing with emergencies in Nottinghamshire or providing assistance to its neighbouring counties when they request it.

8.2.7 At least 30 other agencies are involved in integrated Emergency Planning within the County, details of which can be found in the Newark and Sherwood Emergency Plan.

8.2.8 The Nottinghamshire prepared website offers information and advice to residents, visitors and businesses on Nottinghamshire's preparation for and responses to major incidents and emergencies.

8.2.9 Services provided by the Newark and Sherwood Emergency Planning Team are:

- Preparation of specific emergency plans as required by legislation.
- Liaising with County, District Councils, voluntary and emergency services.
- Provision of emergency training for District staff.
- Preparation and execution of District emergency exercises.
- Attending emergency planning groups.
- Organising District emergency equipment stores.
- Advising, supporting the Chief Executive during emergencies.
- Preparation of District emergency website and providing latest information.
- Maintaining emergency call out, contact and risk registers.
- Supporting the public during emergency incidents.
- Liaising with transport companies and contractors.
- Providing advice on a number of planning applications including flooding matters and safe access and egress.

8.2.10 Newark and Sherwood District Council has an Emergency Plan (2010) which outlines the arrangements in place for co-ordinating and managing the response of Newark and Sherwood District Council to an emergency. Specific emergency plans that Newark and Sherwood maintain includes the Newark and Sherwood Flooding Plan.

8.2.11 Emergency planning is key to ensuring the safe evacuation of people from an area in the event of extensive flooding. The Newark and Sherwood District Council emergency plan is available from the Newark and Sherwood District Council Website..

8.2.12 The Council's website should be read by residents who live in areas prone to flooding. The web links to these websites are provided below:

Newark and Sherwood District Council:

http://www.newark-sherwooddc.gov.uk

9 Recommendations

9.1 RECOMMENDATIONS

9.1.1 Newark and Sherwood District Council is required to carry out the Sequential Test for allocating land for future development within the study area, based upon supporting evidence provided in this Level 2 Phase 2 SFRA. The Sequential Test should be undertaken in relation to the test criteria set out in section 7.2. Guidance has also been provided on appropriate policies for sites which satisfy the first part of the Exception Test and requirements to consider the planning application stage to pass the second part of the Exception Test as set out in the NPPF and NPPF Technical Guidance. The following recommendations should be taken into consideration by Newark and Sherwood District Council:

- Ensure that developers and their consultants make reference to this Level 2 Phase 2 SFRA prior to the formulation of development proposals and planning applications within the District. This is to ensure that the key requirements of the NPPF (supplemented by recommendations within the SFRA) are met;
- Ensure the developers and their representatives consult with all relevant stakeholders before issuing a FRA;
- Ensure that developers carry out site specific FRA's for their proposals in line with the NPPF and advice from the relevant authorities namely the Environment Agency, Internal Drainage Board, Local District Council and Anglian Water / Severn Trent Water;
- Ensure that flood mitigation measures are implemented on a site specific basis where necessary;
- Newark and Sherwood District Council should seek to implement strategic flood mitigation opportunities such as areas of Green Infrastructure (where possible). These areas would also provide biodiversity benefits which would help to enhance the natural environment and would provide community benefit;
- Support the implementation of SuDS by way of robust planning conditions and/or Section 106 agreements;
- Emergency Planners should take into consideration the findings presented within this Level 2 Phase 2 SFRA. This will help assist in the preparation of evacuation routes and emergency planning procedures in the event of extensive fluvial flooding in the District; and
- Liaise with the County Council as they develop responses to new legislation.

9.2 AREAS FOR FURTHER INVESTIGATION

9.2.1 On-going consultation should be undertaken with the LLFA, Environment Agency and IDBs with regards to future delivery of flood alleviation schemes in the District.

10 Conclusion

10.1 SUMMARY

10.1.1 This Strategic Flood Risk Assessment (SFRA) Level 2 Phase 2 report forms a part of the SFRA suite of documents for Newark and Sherwood District Council. The suite covers a wide range of flood risk issues for the District, with the Level 1 SFRA covering the general flood risk issues across the District and the Level 2 documents covering more specific site assessments to help to inform the Sequential and Exception Tests in line with the NPPF. This helps to ensure that new development sites are located in areas which are sustainable in terms of flood risk.

10.1.2 Newark and Sherwood District Council has identified a number of residential and employment sites that are or may be at risk from flooding as part of the Allocations and Development Management Options Report. In order to determine the flood risk to these sites information about flood risk has been collected and presented; this information will inform the Sequential and Exception Tests which will form part of the technical evidence for future planning documents.

10.1.3 This report covers the general flood risk issues within Newark and Sherwood District Council in relation to new development sites that may be at risk of flooding, as well as presenting high level site specific assessments for the development sites identified. These site specific assessments do not replace the requirements for a site specific flood risk assessment to be produced for any development sites as part of a planning application. The site specific assessments have been carried out on a stand-alone basis relating to flood risk only and do not provide an assessment of the wider sustainability issues associated with the site. A toolkit which provides guidance for site specific flood risk assessments is included as part of this SFRA.

10.1.4 The River Trent, River Meden, River Maun, and River Greet run through the study area along with a large number of tributaries and other contributing streams, brooks, dykes and drains. The fluvial flood risk from these watercourses is managed through allowing floodplain to flood in areas where it has no effect on the built environment, with defences implemented in built up areas that are at risk of flooding. Some built up areas are at risk of flooding in lower probability fluvial flooding events.

10.1.5 Hydraulic modelling work has been carried out by Halcrow on behalf of the Environment Agency for the River Trent and Tributaries near Newark-on-Trent. This work identifies the hazard to people for the River Trent through the southern part of the study area up to just north of Newark-on-Trent. This hydraulic modelling work has been supplemented by a model of the River Maun provided to WSP by the Environment Agency and subsequently modified to produce mapping showing the hazard to people. The hazard mapping from these hydraulic modelling studies has been provided as part of the site specific assessments.

10.1.6 The NPPF outlines the Sequential and Exception Tests for flood risk, where sites that are at lower risk of flooding are preferable to sites at a higher risk of flooding. Where sites are proposed to be developed within higher risk areas, the sequential approach should be used to site development within the lower risk areas of the site.

10.1.7 A site specific flood risk assessment (FRA) toolkit has been produced to provide guidance on the content of any site specific FRA produced for development sites in the area. The site specific FRA toolkit should be a general reference document for any site specific FRA carried out within the District, not restricted to sites specifically referenced as part of this SFRA.

10.1.8 This report has been carried out based on planning policy and guidance documents available at the time of writing (May 2012). Flood risk classifications may be subject to change in line with future government guidance and legislation.

Appendices, Figures & Tables

Appendix A District Boundary Plan, Development Sites Locations Plans

Date Modified: 02/11/2011

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - A - 1-0.mxd

KEY

District Boundary

WALESBY

HARBY

OLLERTON & BOUGHTON

EDWINSTOWE

SUTTON ON TRENT

CLIPSTONE

EAKRING

NORWELL

COLLINGHAM

CAUNTON

BILSTHORPE

NORTH MUSKHAM

RAINWORTH

FARNSFIELD

WINTHORPE

BLIDWORTH

CODDINGTON

HALAM

SOUTHWELL

NEWARK

FARNDON

BALDERTON

FISKERTON

FERNWOOD

BLEASBY

ELSTON

LOWDHAM

GUNTHORPE

0 1 2 4 6 8 Kilometres

Scale: 1:125,000

WSP

TITLE:

NEWARK & SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

DISTRICT BOUNDARY
1647 - A - 1.0

Date Modified: 24/05/2012

Drawn By: ukdid001

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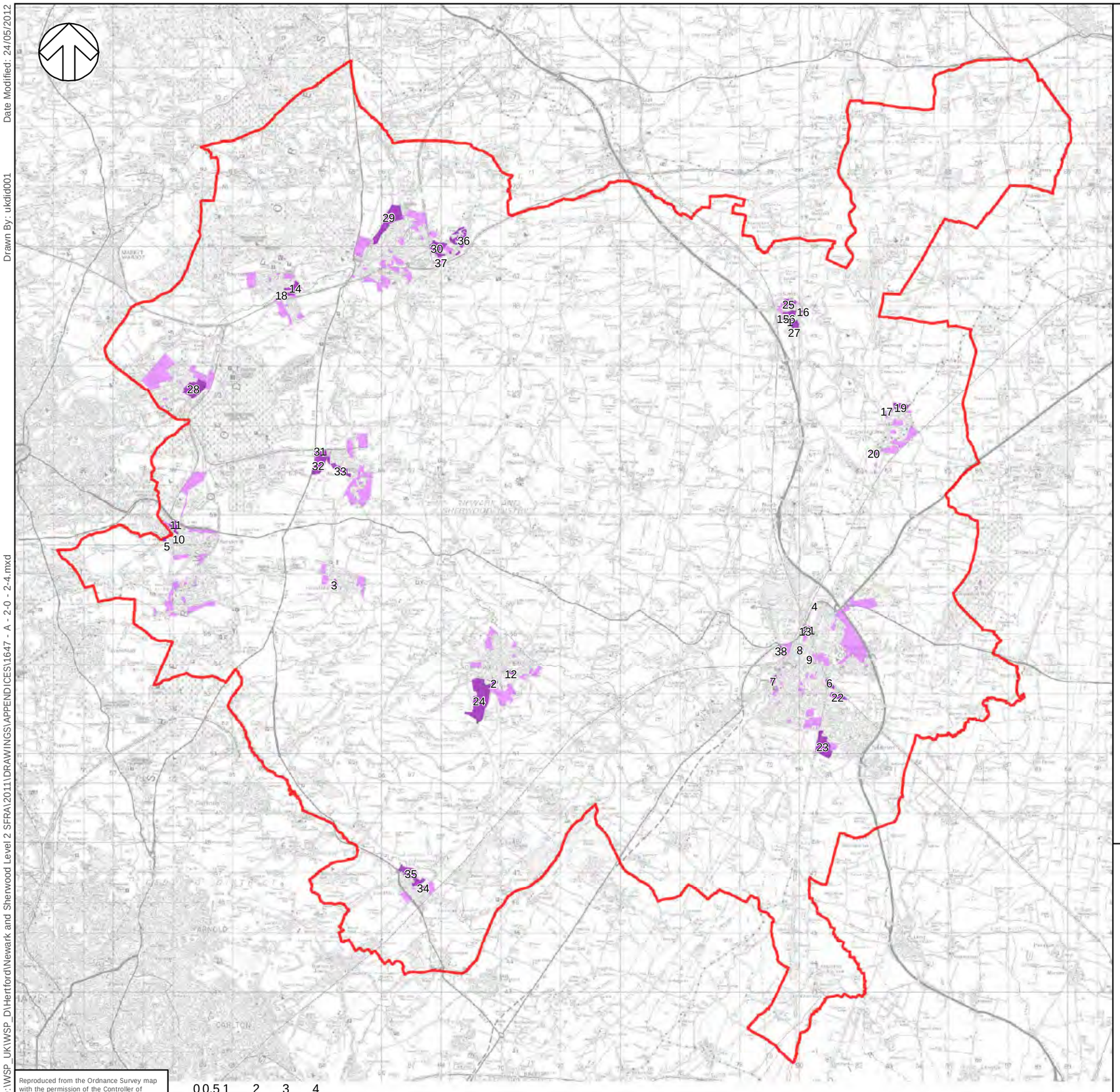

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0 0.5 1 2 3 4 Kilometres

Scale: 1:135,000

Development Sites:

1. Palmer Road
2. Land at Nottingham Road
3. South of Mansfield Road
4. North of Alexander Avenue
5. North of Lake View School
6. North of Barnby Road
7. Millgate
8. North Gate
9. North of Sleaford Road
10. Kirklington Road
11. West of Rufford Colliery
12. Church Street
13. North of Maltkin Lane
14. Land South of Lansbury Road
15. Land between Barrel Hill Road and Great North Road
16. Land off First Holme Lane
17. North of Brooklands Close
18. North of Boy Lane
19. Land East of A1133 / East of Rio Drive
20. Field to the South of South End, Collingham / West of Cottage Lane
21. Seven Hills / Quibells Lane
22. Land South of Barnby Road
23. Flowserve, Hawton Lane / West of Lowfield Lane
24. Brackenhurst Campus, Nottingham Road / Land off Halloughton Road / Land south of Westhorpe
25. Land between Bulham Lane and High Street / Land to rear of "Newlands", Bulham Lane
26. Land rear of Holme View / Land at Hemplands Land / Land off Great North Road
27. Milfield, Main Street
28. Former Clipstone Colliery
29. Land off Whinney Lane
30. Land at East of Harrow Lane
31. North of Mickledale Lane
32. South of Mickledale Lane
33. Land South of Bilsthorpe / Land off Scarborough Road / West of New Road
34. Land off Southwell Road
35. Land off Barkey Ridge / Ridge Hill / Land at Barker Hill / North of Epperstone Road

36-38. Employment Sites 1 to 3

KEY

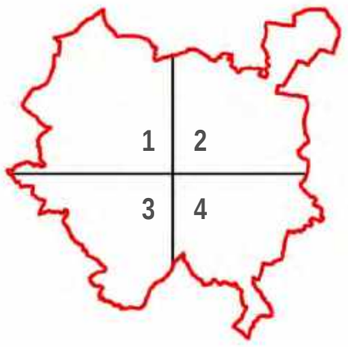
- District Boundary
- All Sites
- Assessed Development Sites

NOTES:

1. The full sites list has been taken from the Allocations and Development Management Options Report produced by Newark and Sherwood District Council.

2. The Assessed Development Sites are those taken from the full site list which have been assessed as at risk from flooding. These sites have been further assessed in the site specific assessments in Appendix G of this report.

3. The development site numbers relate to page numbers in the Appendix G site specific sheets.



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TITLE:

NEWARK AND SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

ALLOCATIONS AND DEVELOPMENT MANAGEMENT OPTIONS REPORT DEVELOPMENT SITES
1647 - A - 2-0

Date Modified: 24/05/2012

Drawn By: ukdid001

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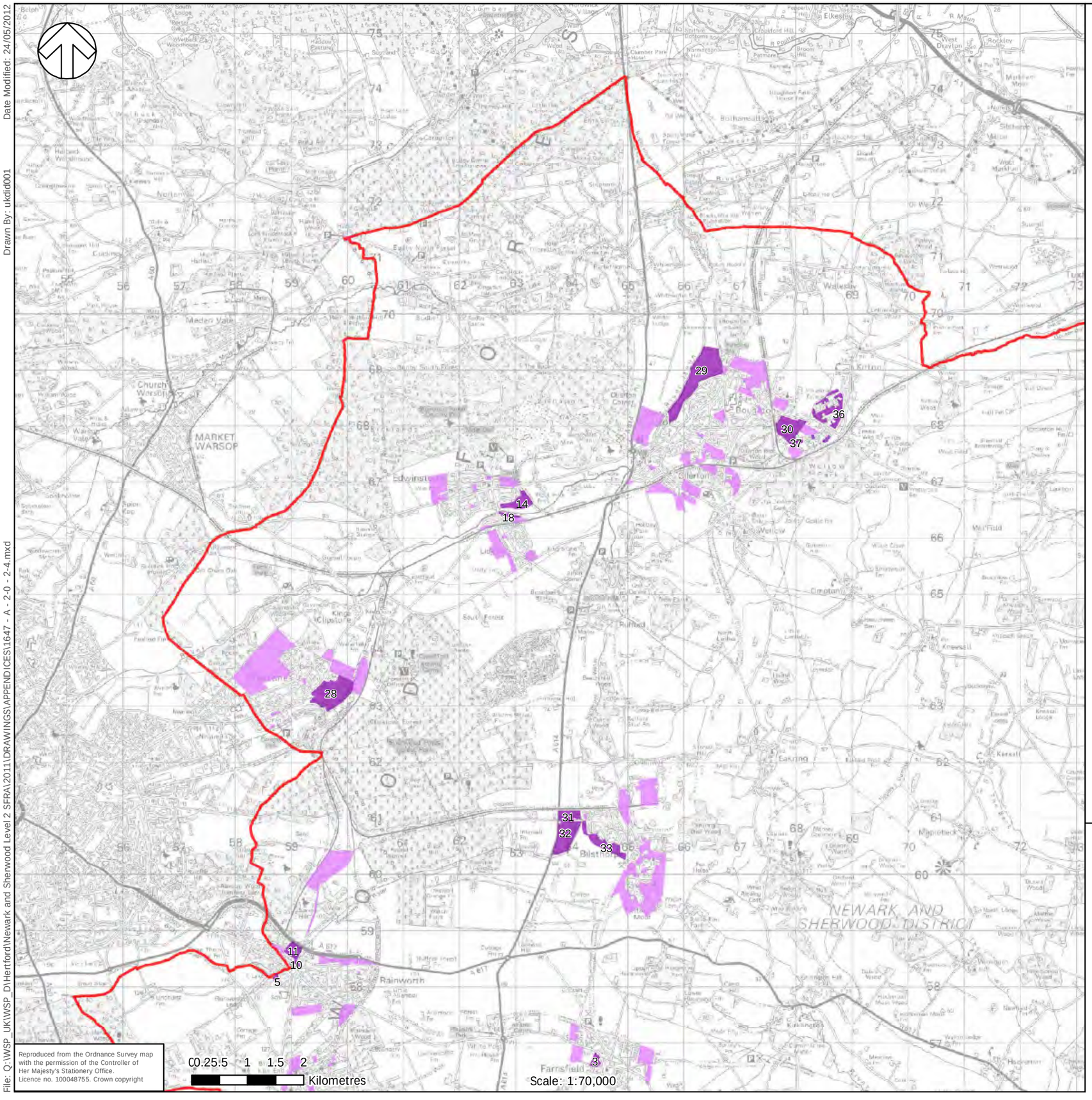

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23. Flowserve, Hawton Lane / West of Lowfield Lane
24. Brackenhurst Campus, Nottingham Road / Land off Halloughton Road / Land south of Westhorpe
25. Land between Bulham Lane and High Street / Land to rear of "Newlands", Bulham Lane
26. Land rear of Holme View / Land at Hemplands Land / Land off Great North Road
27. Milfield, Main Street
28. Former Clipstone Colliery
29. Land off Whinney Lane
30. Land at East of Harrow Lane
31. North of Mickledale Lane
32. South of Mickledale Lane
33. Land South of Bilsthorpe / Land off Scarborough Road / West of New Road
34. Land off Southwell Road
35. Land off Barkey Ridge / Ridge Hill / Land at Barker Hill / North of Epperstone Road

36-38. Employment Sites 1 to 3

KEY

- District Boundary
- All Sites
- Assessed Development Sites

NOTES:

1. The full sites list has been taken from the Allocations and Development Management Options Report produced by Newark and Sherwood District Council.

2. The Assessed Development Sites are those taken from the full site list which have been assessed as at risk from flooding. These sites have been further assessed in the site specific assessments in Appendix G of this report.

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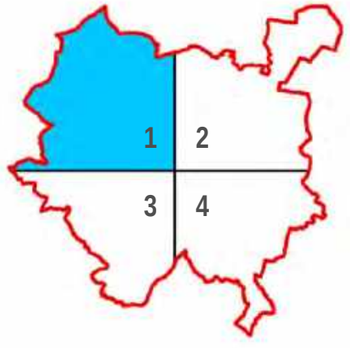


WSP

TITLE:

NEWARK AND SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

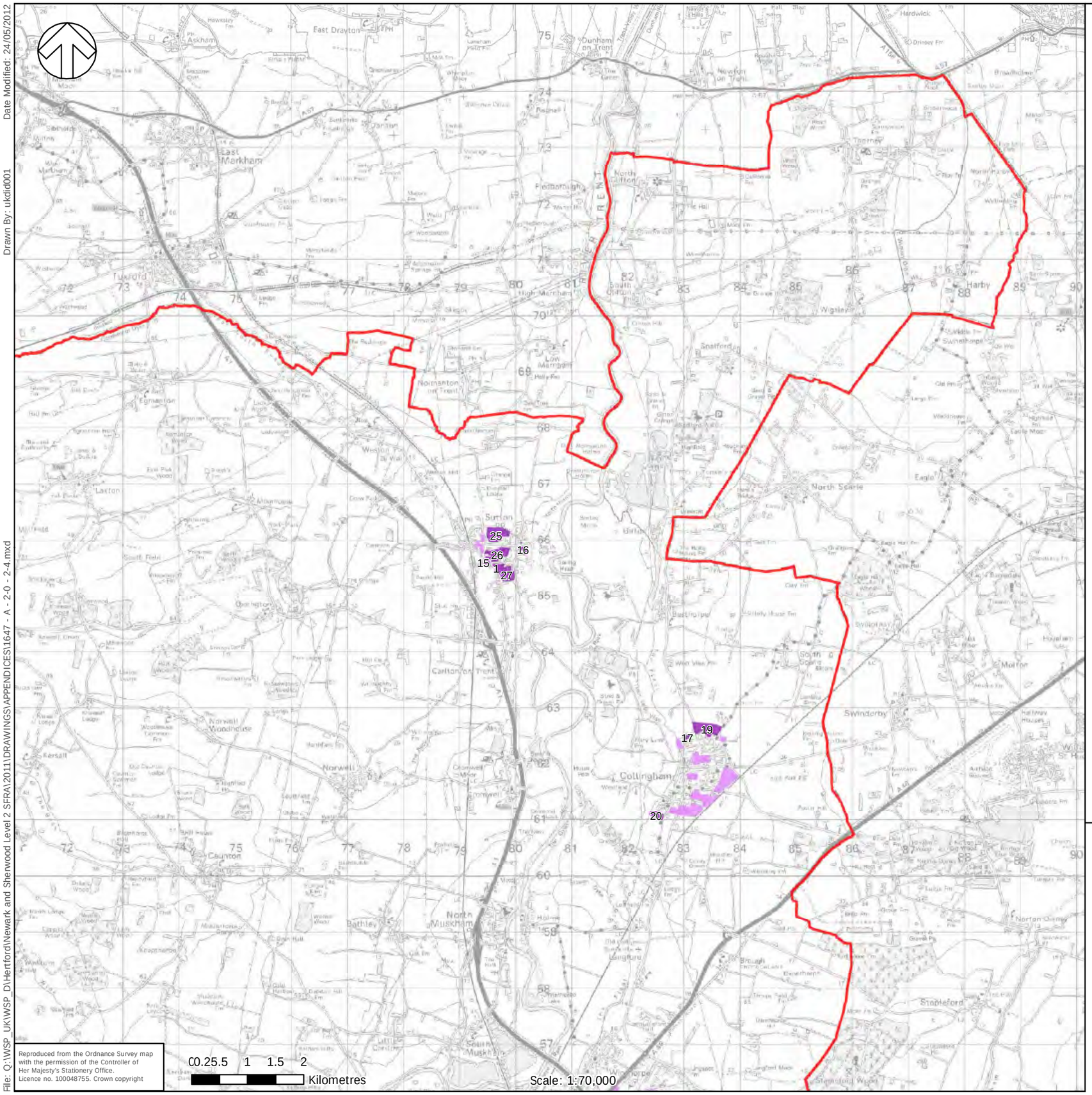
FIGURE No:

ALLOCATIONS AND DEVELOPMENT MANAGEMENT OPTIONS REPORT
DEVELOPMENT SITES
1647 - A - 2-1

Date Modified: 24/05/2012

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - A - 2-0 - 2-4.mxd



Scale: 1:70,000

Development Sites:

1. Palmer Road
2. Land at Nottingham Road
3. South of Mansfield Road
4. North of Alexander Avenue
5. North of Lake View School
6. North of Barnby Road
7. Millgate
8. North Gate
9. North of Sleaford Road
10. Kirklington Road
11. West of Rufford Colliery
12. Church Street
13. North of Maltkin Lane
14. Land South of Lansbury Road
15. Land between Barrel Hill Road and Great North Road
16. Land off First Holme Lane
17. North of Brooklands Close
18. North of Boy Lane
19. Land East of A1133 / East of Rio Drive
20. Field to the South of South End, Collingham / West of Cottage Lane
21. Seven Hills / Quibells Lane
22. Land South of Barnby Road
23. Flowserve, Hawton Lane / West of Lowfield Lane
24. Brackenhurst Campus, Nottingham Road / Land off Halloughton Road / Land south of Westhorpe
25. Land between Bulham Lane and High Street / Land to rear of "Newlands", Bulham Lane
26. Land rear of Holme View / Land at Hemplands Land / Land off Great North Road
27. Milfield, Main Street
28. Former Clipstone Colliery
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30. Land at East of Harrow Lane
31. North of Mickledale Lane
32. South of Mickledale Lane
33. Land South of Bilsthorpe / Land off Scarborough Road / West of New Road
34. Land off Southwell Road
35. Land off Barkey Ridge / Ridge Hill / Land at Barker Hill / North of Epperstone Road

36-38. Employment Sites 1 to 3

KEY

- District Boundary
- All Sites
- Assessed Development Sites

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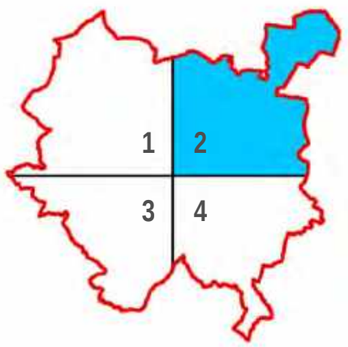


WSP

TITLE:

NEWARK AND SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

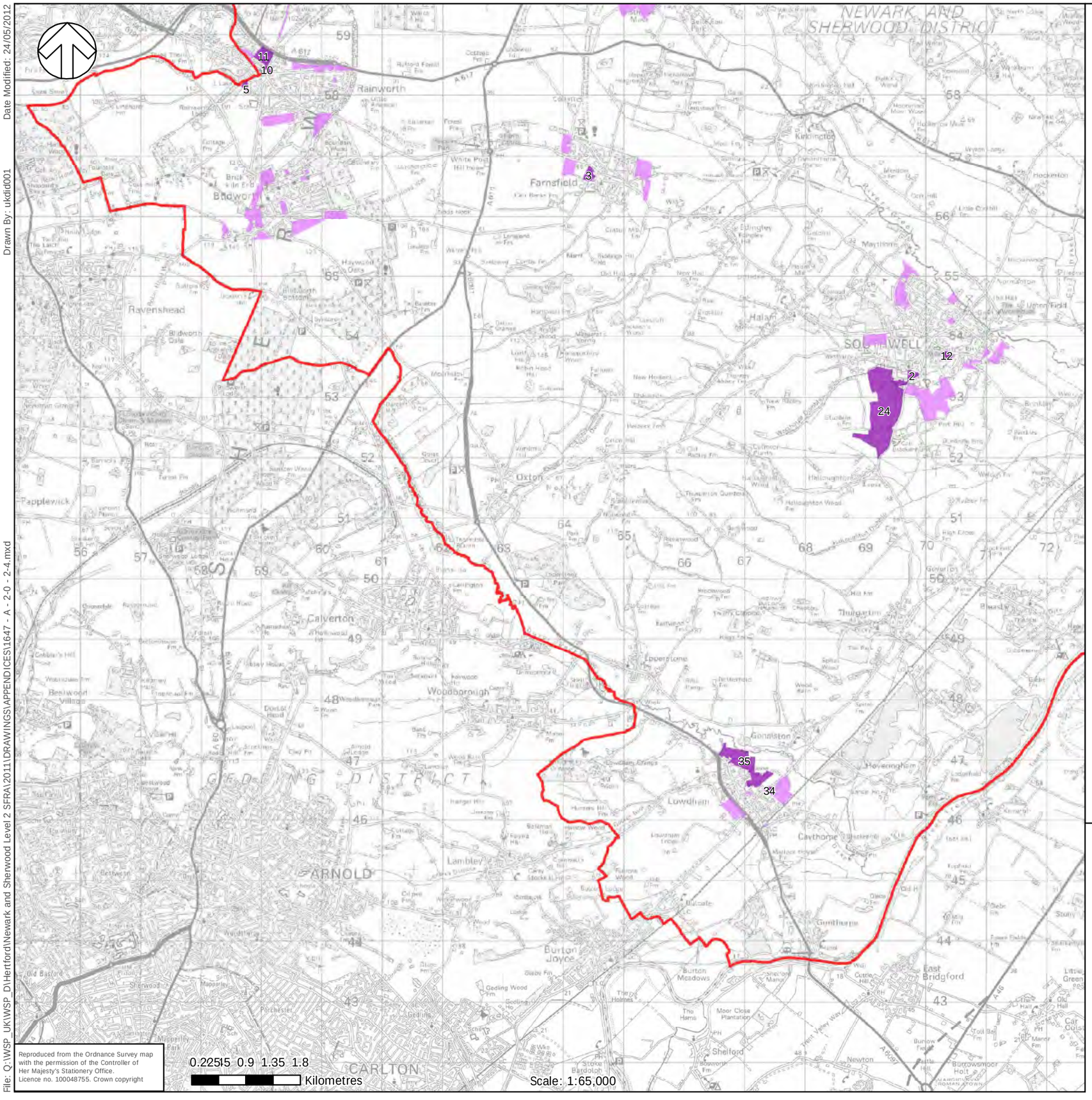
FIGURE No:

ALLOCATIONS AND DEVELOPMENT MANAGEMENT OPTIONS REPORT DEVELOPMENT SITES
1647 - A - 2-2

Date Modified: 24/05/2012

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - A - 2-0 - 2-4.mxd



Reproduced from the Ordnance Survey map with the permission of the Controller of Her Majesty's Stationery Office. Licence no. 100048755. Crown copyright

0.225 15 0.9 1.35 1.8 Kilometres

Scale: 1:65,000

Development Sites:

1. Palmer Road
2. Land at Nottingham Road
3. South of Mansfield Road
4. North of Alexander Avenue
5. North of Lake View School
6. North of Barnby Road
7. Millgate
8. North Gate
9. North of Sleaford Road
10. Kirklington Road
11. West of Rufford Colliery
12. Church Street
13. North of Maltkin Lane
14. Land South of Lansbury Road
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32. South of Mickledale Lane
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34. Land off Southwell Road
35. Land off Barkey Ridge / Ridge Hill / Land at Barker Hill / North of Epperstone Road

36-38. Employment Sites 1 to 3

KEY

- District Boundary
- All Sites
- Assessed Development Sites

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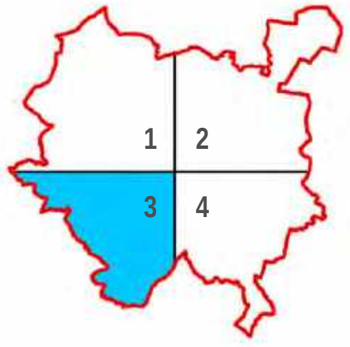

WSP

TITLE:

NEWARK AND SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

ALLOCATIONS AND DEVELOPMENT MANAGEMENT OPTIONS REPORT DEVELOPMENT SITES
1647 - A - 2-3

Date Modified: 24/05/2012

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - A - 2-0 - 2-4.mxd

Development Sites:

1. Palmer Road
2. Land at Nottingham Road
3. South of Mansfield Road
4. North of Alexander Avenue
5. North of Lake View School
6. North of Barnby Road
7. Millgate
8. North Gate
9. North of Sleaford Road
10. Kirklington Road
11. West of Rufford Colliery
12. Church Street
13. North of Maltkin Lane
14. Land South of Lansbury Road
15. Land between Barrel Hill Road and Great North Road
16. Land off First Holme Lane
17. North of Brooklands Close
18. North of Boy Lane
19. Land East of A1133 / East of Rio Drive
20. Field to the South of South End, Collingham / West of Cottage Lane
21. Seven Hills / Quibells Lane
22. Land South of Barnby Road
23. Flowserve, Hawton Lane / West of Lowfield Lane
24. Brackenhurst Campus, Nottingham Road / Land off Halloughton Road / Land south of Westhorpe
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36-38. Employment Sites 1 to 3

KEY

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- All Sites
- Assessed Development Sites

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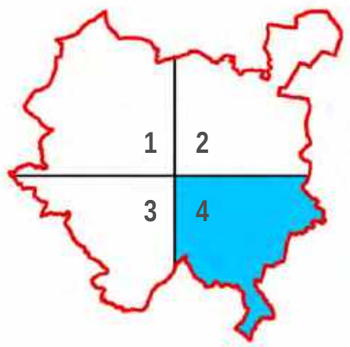


0 0.225 0.45 0.9 1.35 1.8 Kilometres

Scale: 1:65,000

WSP

TITLE:

NEWARK AND SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

ALLOCATIONS AND DEVELOPMENT MANAGEMENT OPTIONS REPORT DEVELOPMENT SITES
1647 - A - 2-4

Appendix B Historical Flooding Map

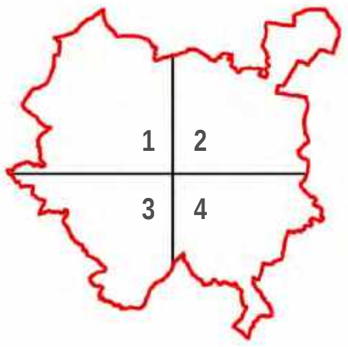
Date Modified: 02/11/2011

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - B - 1-0-1-4.mxd

KEY

- District Boundary
- Potential Development Sites
- Historic Flood Map
- Historic Flooding (Fluvial / Tidal)
- Historic Flooding (Sewer)
- Historic Flooding (Pluvial)



WSP

TITLE:

NEWARK AND SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

HISTORICAL FLOOD MAPPING
1647 - B - 1-0

0 1 2 4 6 8 Kilometres

Scale: 1:135,000

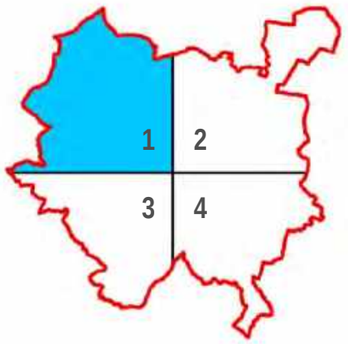
Date Modified: 02/11/2011

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - B - 1-0-1-4.mxd

KEY

- District Boundary
- Potential Development Sites
- Historic Flood Map
- Historic Flooding (Fluvial / Tidal)
- Historic Flooding (Sewer)
- Historic Flooding (Pluvial)



0 0.5 1 2 3 4 Kilometres

Scale: 1:65,000

WSP

TITLE:

NEWARK AND SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

HISTORICAL FLOOD MAPPING
1647 - B - 1-1

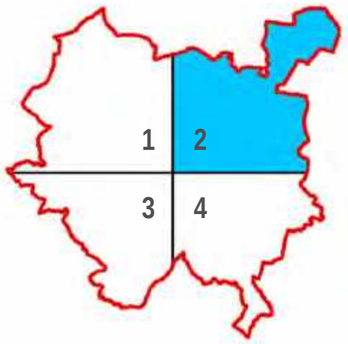
Date Modified: 02/11/2011

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - B - 1-0-1-4.mxd

KEY

- District Boundary
- Potential Development Sites
- Historic Flood Map
- Historic Flooding (Fluvial / Tidal)
- Historic Flooding (Sewer)
- Historic Flooding (Pluvial)



0 0.5 1 2 3 4 Kilometres

Scale: 1:65,000

WSP

TITLE:

NEWARK AND SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

HISTORICAL FLOOD MAPPING
1647 - B - 1-2

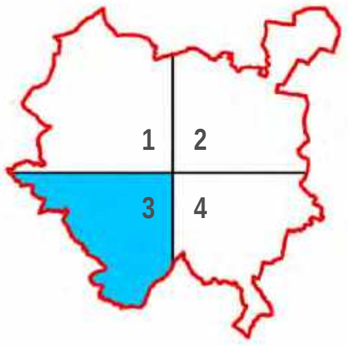
Date Modified: 02/11/2011

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - B - 1-0-1-4.mxd

KEY

- District Boundary
- Potential Development Sites
- Historic Flood Map
- Historic Flooding (Fluvial / Tidal)
- Historic Flooding (Sewer)
- Historic Flooding (Pluvial)



WSP

TITLE:

NEWARK AND SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

HISTORICAL FLOOD MAPPING
1647 - B - 1-3

0 0.45 0.9 1.8 2.7 3.6 Kilometres

Scale: 1:55,000

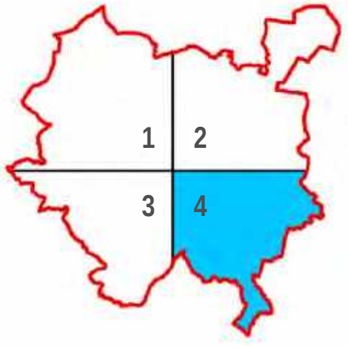
Date Modified: 02/11/2011

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPEND\CES\1647 - B - 1-0-1-4.mxd

KEY

- District Boundary
- Potential Development Sites
- Historic Flood Map
- Historic Flooding (Fluvial / Tidal)
- Historic Flooding (Sewer)
- Historic Flooding (Pluvial)



WSP

TITLE:

NEWARK AND SHERWOOD
DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

HISTORICAL FLOOD MAPPING
1647 - B - 1-4

0 0.5 1 2 3 4 Kilometres

Scale: 1:65,000

Appendix C Existing Watercourses Plan, National Flood and Coastal Defence Database, Data Register

Date Modified: 23/05/2012

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - C - 1-0-1-4.mxd

River Meden

River Maun

River Trent

Grassthorpe

Slough Dyke

River Trent

River Trent

River Trent

River Trent

River Greet/Marlock Dyke

Middle Beck

Shire Dyke

Lowfield Drain

River Trent

Dover Beck

Cocker Beck

River Devon

River Devon

MANSFIELD

NOTTINGHAM

KEY

- District Boundary
- Environment Agency Main Rivers
- Other Watercourses
- Potential Development Sites
- Upper Witham IDB Region
- Trent Valley IDB Region

1 2
3 4

0 1 2 4 6 8 Kilometres

Scale: 1:135,000

WSP

TITLE:

NEWARK AND SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

EXISTING WATERCOURSES
1647 - C - 1-0

Date Modified: 23/05/2012

Drawn By: ukdid001

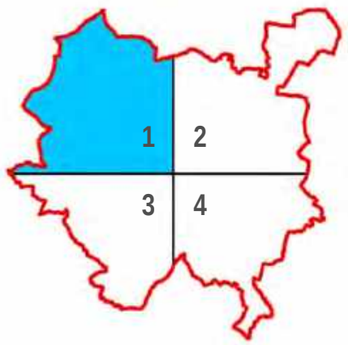
File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - C - 1-0-1-4.mxd

River Meden

River Meden

KEY

- District Boundary
- Environment Agency Main Rivers
- Other Watercourses
- Potential Development Sites
- Upper Witham IDB Region
- Trent Valley IDB Region



0 0.5 1 2 3 4 Kilometres

Scale: 1:65,000

WSP

TITLE:

NEWARK AND SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

EXISTING WATERCOURSES
1647 - C - 1-1

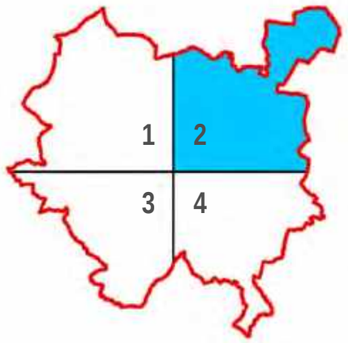
Date Modified: 23/05/2012

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - C - 1-0-1-4.mxd

KEY

- District Boundary
- Environment Agency Main Rivers
- Other Watercourses
- Potential Development Sites
- Upper Witham IDB Region
- Trent Valley IDB Region



WSP

TITLE:

NEWARK AND SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

EXISTING WATERCOURSES
1647 - C - 1-2

0 0.5 1 2 3 4 Kilometres

Scale: 1:65,000

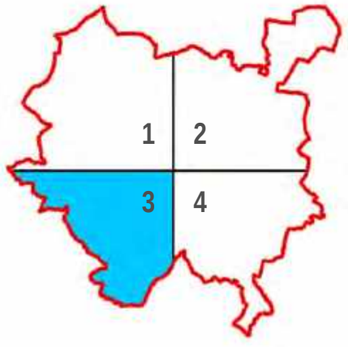
Date Modified: 23/05/2012

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - C - 1-0-1-4.mxd

KEY

- District Boundary
- Environment Agency Main Rivers
- Other Watercourses
- Potential Development Sites
- Upper Witham IDB Region
- Trent Valley IDB Region



WSP

TITLE:

NEWARK AND SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

EXISTING WATERCOURSES
1647 - C - 1-3

0 0.425 0.85 1.7 2.55 3.4 Kilometres

Scale: 1:55,000

Date Modified: 23/05/2012

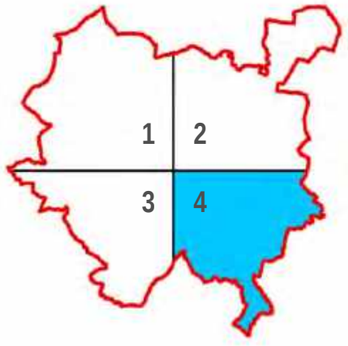
Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - C - 1-0-1-4.mxd

River Trent
River Trent
River Trent
River Trent
Slough Dyke
River Greet
Marlock Dyke
River Trent
River Devon
Middle Beck
Lowfield Drain
Shire Dyke
River Trent
River Devon

KEY

- District Boundary
- Environment Agency Main Rivers
- Other Watercourses
- Potential Development Sites
- Upper Witham IDB Region
- Trent Valley IDB Region



0 0.5 1 2 3 4 Kilometres

Scale: 1:65,000

WSP

TITLE:

NEWARK AND SHERWOOD DISTRICT COUNCIL LEVEL 2 SFRA PHASE 2

FIGURE No:

EXISTING WATERCOURSES 1647 - C - 1-4

Date Modified: 23/05/2012

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - C - 2-0 - 2-4.mxd

KEY

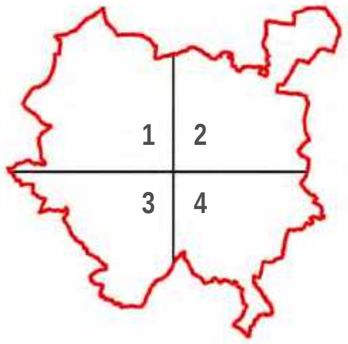
- District Boundary
- Potential Development Sites

Upper Witham IDB

- Region
- Watercourses
- Pumping Stations

Trent Valley IDB

- Region
- Watercourses
- Pumping Stations



WSP

TITLE:

NEWARK AND SHERWOOD
DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

IDB INFORMATION
1647 - C - 2-0

0 1 2 4 6 8 Kilometres

Scale: 1:135,000

Date Modified: 23/05/2012

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - C - 2-0 - 2-4.mxd

KEY

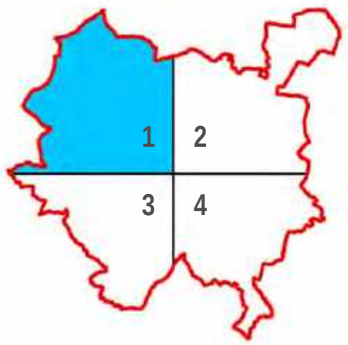
- District Boundary
- Potential Development Sites

Upper Witham IDB

- Region
- Watercourses
- Pumping Stations

Trent Valley IDB

- Region
- Watercourses
- Pumping Stations



WSP

TITLE:

NEWARK AND SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

IDB INFORMATION
1647 - C - 2-1

0 0.5 1 2 3 4 Kilometres

Scale: 1:65,000

Date Modified: 23/05/2012

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - C - 2-0 - 2-4.mxd

KEY

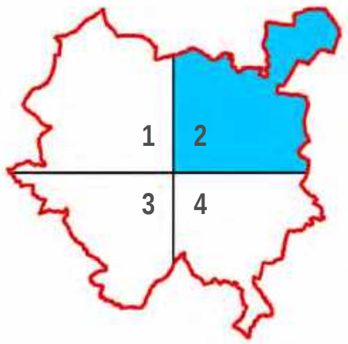
- District Boundary
- Potential Development Sites

Upper Witham IDB

- Region
- Watercourses
- Pumping Stations

Trent Valley IDB

- Region
- Watercourses
- Pumping Stations



WSP

TITLE:

NEWARK AND SHERWOOD
DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

IDB INFORMATION
1647 - C - 2-2

0 0.5 1 2 3 4 Kilometres

Scale: 1:65,000

Date Modified: 23/05/2012

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - C - 2-0 - 2-4.mxd

KEY

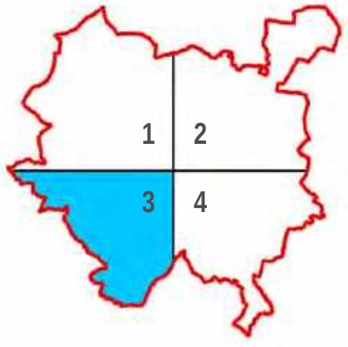
- District Boundary
- Potential Development Sites

Upper Witham IDB

- Region
- Watercourses
- Pumping Stations

Trent Valley IDB

- Region
- Watercourses
- Pumping Stations



WSP

TITLE:

NEWARK AND SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

IDB INFORMATION
1647 - C - 2-3

0 0.425 0.85 1.7 2.55 3.4 Kilometres

Scale: 1:55,000

Date Modified: 23/05/2012

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - C - 2-0 - 2-4.mxd

KEY

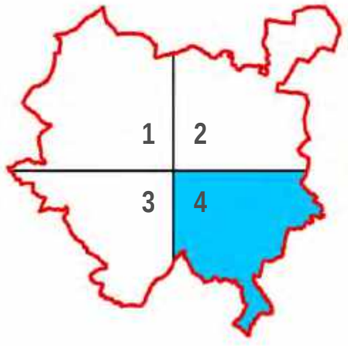
- District Boundary
- Potential Development Sites

Upper Witham IDB

- Region
- Watercourses
- Pumping Stations

Trent Valley IDB

- Region
- Watercourses
- Pumping Stations



WSP

TITLE:

NEWARK AND SHERWOOD
DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

IDB INFORMATION
1647 - C - 2-4

0 0.5 1 2 3 4 Kilometres

Scale: 1:65,000

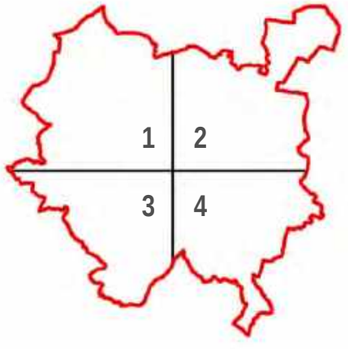
Date Modified: 14/12/2011

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - C - 3-0 - 3-4.mxd

KEY

- District Boundary
- Raised Defences
- Potential Development Sites



WSP

TITLE:

NEWARK AND SHERWOOD
DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

NATIONAL FLOOD AND COASTAL
DEFENCES DATABASE
FLOOD DEFENCES
1647 - C - 3-0

0 1 2 4 6 8 Kilometres

Scale: 1:135,000

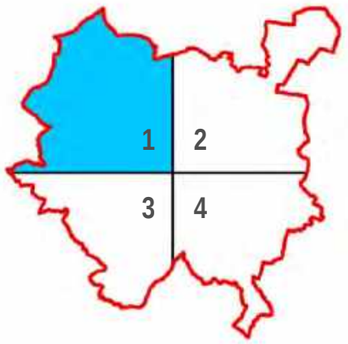
Date Modified: 14/12/2011

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - C - 3-0 - 3-4.mxd

KEY

- District Boundary
- Raised Defences
- Potential Development Sites



WSP

TITLE:

NEWARK AND SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

NATIONAL FLOOD AND COASTAL DEFENCES DATABASE
FLOOD DEFENCES
1647 - C - 3-1

0 0.5 1 2 3 4 Kilometres

Scale: 1:65,000

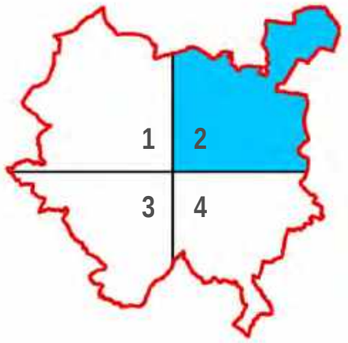
Date Modified: 14/12/2011

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - C - 3-0 - 3-4.mxd

KEY

- District Boundary
- Raised Defences
- Potential Development Sites



WSP

TITLE:

NEWARK AND SHERWOOD
DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

NATIONAL FLOOD AND COASTAL
DEFENCES DATABASE
FLOOD DEFENCES
1647 - C - 3-2

0 0.5 1 2 3 4 Kilometres

Scale: 1:65,000

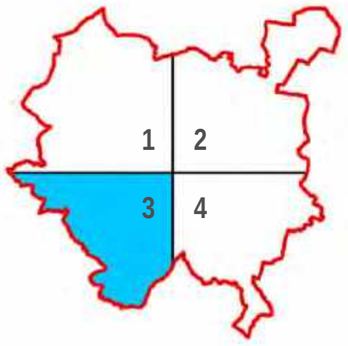
Date Modified: 14/12/2011

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - C - 3-0 - 3-4.mxd

KEY

- District Boundary
- Raised Defences
- Potential Development Sites



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TITLE:

NEWARK AND SHERWOOD
DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

NATIONAL FLOOD AND COASTAL
DEFENCES DATABASE
FLOOD DEFENCES
1647 - C - 3-3

0 0.425 0.85 1.7 2.55 3.4 Kilometres

Scale: 1:55,000

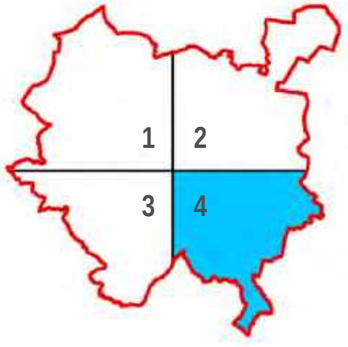
Date Modified: 14/12/2011

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPEND\CES1647 - C - 3-0 - 3-4.mxd

KEY

- District Boundary
- Raised Defences
- Potential Development Sites



WSP

TITLE:

NEWARK AND SHERWOOD
DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

NATIONAL FLOOD AND COASTAL
DEFENCES DATABASE
FLOOD DEFENCES
1647 - C - 3-4

0 0.5 1 2 3 4 Kilometres

Scale: 1:65,000

Newark and Sherwood Level 2 SFRA Phase 2
National Flooding and Coastal Defences Database
Existing Flood Defence Details

ID	Asset Reference	Asset Type	Asset Description
1	0341440350101L01	raised defence (man-made)	Ness Farm Flood Bank
2	0341440350101L02	raised defence (man-made)	Manor House Farm Flood Bank
3	0341440350101L04	raised defence (man-made)	Embankment
4	0341440350101L06	raised defence (man-made)	Embankment
5	0341440350101R01	raised defence (man-made)	Embankment
6	0341440350101R02	raised defence (man-made)	Embankment
7	0341440350101R03	raised defence (man-made)	Embankment
8	0341440350101R04	raised defence (man-made)	Embankment
9	0341440350201L02	raised defence (man-made)	South Muskham Embankment
10	0341440350201L04	raised defence (man-made)	Ollerton Road Embankment
11	0341440350201L05	raised defence (man-made)	Weydale Farm Flood Bank
12	0341440350201L06	raised defence (man-made)	Weydale Farm Flood Wall
13	0341440350201L07	raised defence (man-made)	Ollerton Road Embankment
14	0341440350201R01	raised defence (man-made)	Embankment
15	0341440350201R03	raised defence (man-made)	Embankment
16	0341440350301L10	raised defence (man-made)	Temporary Hesco Basket
17	0341440350301R02	raised defence (man-made)	Embankment
18	0341440350301R03	raised defence (man-made)	Embankment
19	0341440350401L01	raised defence (man-made)	Embankment
20	0341440350401L02	raised defence (man-made)	Embankment - Road Crossing
21	0341440350401L03	raised defence (man-made)	Fiskerton Mill Embankment
22	0341440350401R01	raised defence (man-made)	Farndon Harbour Embankment
23	0341440350401R02	raised defence (man-made)	Sea Scouts Flood Bank
24	0341440350401R03	raised defence (man-made)	Embankment
25	0341440350401R05	raised defence (man-made)	Low embankment
26	0341440350401R06	raised defence (man-made)	Embankment
27	0341440350501L01	raised defence (man-made)	Riverlyn House Embankment
28	0341440350501L02	raised defence (man-made)	Main Road Crossing Embankment
29	0341440350501L03	raised defence (man-made)	Fiskerton Mill Embankment
30	0341440350501L07	raised defence (man-made)	Bromley Arms Flood Wall
31	0341440350501L08	raised defence (man-made)	Bromley Arms Stopboards
32	0341440350501L09	raised defence (man-made)	Bromley Arms Warehouse
33	0341440350501L10	raised defence (man-made)	Merton Cottage Flood Wall
34	0341440350501L11	raised defence (man-made)	Trent Lane Embankment
35	0341440350501L12	raised defence (man-made)	Main Street Embankment
36	0341440350501L13	raised defence (man-made)	Holme Dyke Embankment
37	0341440350501L16	raised defence (man-made)	Flood bank
38	0341440350501L17	raised defence (man-made)	Flood bank
39	0341440350502L01	raised defence (man-made)	Ladies Piece Embankment
40	0341440350502L02	raised defence (man-made)	Embankment
41	0341440350502L03	raised defence (man-made)	Embankment
42	0341440350502L04	raised defence (man-made)	Embankment
43	0341440350502L05	raised defence (man-made)	Channel/High Ground
44	0341440350502L06	raised defence (man-made)	Embankment
67	0341440360101L01	raised defence (man-made)	Embankment
68	0341440360101L02	raised defence (man-made)	Allotments Embankment
69	0341440360201R02	raised defence (man-made)	Embankment
71	0341440370301L04	raised defence (man-made)	Concrete Wall
72	0341440370301R01	raised defence (man-made)	Embankment
73	0341440370302L02	raised defence (man-made)	Flood bank with pile cap
74	0341440370303L02	raised defence (man-made)	Golf Course Embankment
75	0341440370303L03	raised defence (man-made)	Embankment
76	0341440370303L04	raised defence (man-made)	Masonry Wall
77	0341440370303R02	raised defence (man-made)	Concrete Wall U/S Of Mill
78	0341440370303R03	raised defence (man-made)	Embankment
79	0341440370303R04	raised defence (man-made)	Embankment
80	0341440370303R05	raised defence (man-made)	Masonry Wall
81	0341440370304R01	raised defence (man-made)	Mill Bypass Embankment - Right Bank
82	0341440370304R02	raised defence (man-made)	Mill Bypass Embankment - Right Bank

Newark and Sherwood Level 2 SFRA Phase 2
National Flooding and Coastal Defences Database
Existing Flood Defence Details

ID	Asset Reference	Asset Type	Asset Description
83	0341440370305L02	raised defence (man-made)	Mill Culvert - Left Wall
84	0341440370305R02	raised defence (man-made)	Mill Culvert - Right Wall
85	0341440370305R04	raised defence (man-made)	Embankment
86	0341440370403R01	raised defence (man-made)	Mill Race Channel Wall
87	0341440370403R03	raised defence (man-made)	Mill Race - Right Wall
88	0341440370404L02	raised defence (man-made)	Flour Mill Culvert - Left Wall
89	0341440370404R03	raised defence (man-made)	Channel Side Masonary Wall
102	0341441840101L05	raised defence (man-made)	FLOODBANK
103	0341441840101L06	raised defence (man-made)	Floodbank in gardens
104	0341441840101R01	raised defence (man-made)	FLOODBANK
105	0341441840101R03	raised defence (man-made)	Low concrete floodwall with NCC outfalls
106	0341441840101R05	raised defence (man-made)	Flood bank to complete Flood Storage area
107	0341441840101R07	raised defence (man-made)	floodbank and floodwall
108	0341442000101B01	raised defence (man-made)	FLOODBANK
173	0341740300106R06	raised defence (man-made)	Flood Embankment
174	0341740300106R07	raised defence (man-made)	Flood Embankment - CS 70R
175	0341740300106R08	raised defence (man-made)	Flood Embankment
176	0341740300106R09	raised defence (man-made)	Hard Defence
177	0341740300107R01	raised defence (man-made)	Flood Embankment
178	0341740300107R02	raised defence (man-made)	Flood Embankment - CS 71R
179	0341740300107R03	raised defence (man-made)	Flood Embankment
180	0341740300107R04	raised defence (man-made)	Flood Embankment - CS 73R
181	0341740300107R05	raised defence (man-made)	Flood Embankment
182	0341740300107R06	raised defence (man-made)	Flood Embankment - CS 74R
183	0341740300107R07	raised defence (man-made)	Flood Embankment
184	0341740300107R08	raised defence (man-made)	Flood Embankment
185	0341740300107R09	raised defence (man-made)	Flood Embankment
186	0341740300107R10	raised defence (man-made)	Flood Embankment - CS 109
187	0341740300107R11	raised defence (man-made)	Flood Embankment
188	0341740300108R01	raised defence (man-made)	Flood Embankment - CS 75R
189	0341740300108R02	raised defence (man-made)	Flood Embankment
190	0341740300108R03	raised defence (man-made)	Flood Embankment
191	0341740300108R04	raised defence (man-made)	Flood Embankment - CS 76R
192	0341740300108R05	raised defence (man-made)	Flood Embankment - CS 77R
193	0341740300108R06	raised defence (man-made)	Flood Embankment
194	0341740300108R07	raised defence (man-made)	Flood Embankment
195	0341740300108R08	raised defence (man-made)	Flood Embankment
196	0341740300109R01	raised defence (man-made)	Flood Embankment
197	0341740300109R02	raised defence (man-made)	Flood Embankment - CS 78R
198	0341740300109R03	raised defence (man-made)	Flood Embankment
199	0341740300109R04	raised defence (man-made)	Flood Embankment
200	0341740300109R05	raised defence (man-made)	Flood Embankment - CS 79R
201	0341740300109R06	raised defence (man-made)	Flood Embankment
202	0341740300109R07	raised defence (man-made)	Flood Embankment - CS 81R
203	0341740300109R08	raised defence (man-made)	Flood Embankment
204	0341740300109R09	raised defence (man-made)	Flood Embankment
205	0341740300109R10	raised defence (man-made)	Minor Flood Embankment.
259	0341740300208L01	raised defence (man-made)	Flood Embankment
260	0341740300208L02	raised defence (man-made)	Flood Embankment - CS 75L
261	0341740300208L03	raised defence (man-made)	Flood Embankment
262	0341740300208L04	raised defence (man-made)	Flood Embankment - CS 76L
263	0341740300208L05	raised defence (man-made)	Flood Embankment
264	0341740300208L06	raised defence (man-made)	Flood Embankment
265	0341740300208L07	raised defence (man-made)	Flood Embankment
266	0341740300208L08	raised defence (man-made)	Flood Embankment - CS 78L
267	0341740300208L09	raised defence (man-made)	Hard Defence
268	0341740300208L10	raised defence (man-made)	Flood Embankment - CS 111
269	0341740300208L11	raised defence (man-made)	Flood Embankment
270	0341740300209L01	raised defence (man-made)	Flood Embankment-CS78L/Hard DefenceCS78L

Newark and Sherwood Level 2 SFRA Phase 2
National Flooding and Coastal Defences Database
Existing Flood Defence Details

ID	Asset Reference	Asset Type	Asset Description
271	0341740300209L02	raised defence (man-made)	Flood Embankment
272	0341740300209L04	raised defence (man-made)	Flood Embankment
273	0341740300209L07	raised defence (man-made)	Flood Embankment - CS 79L
274	0341740300209L08	raised defence (man-made)	Flood Embankment - CS 80L
275	0341740300209L09	raised defence (man-made)	Flood Embankment
276	0341740300209L10	raised defence (man-made)	Flood Embankment
277	0341740300209L13	raised defence (man-made)	Flood Embankment
282	0341740330101L02	raised defence (man-made)	Flood Embankment
283	0341740330101R01	raised defence (man-made)	Flood Embankment
284	0341740330101R02	raised defence (man-made)	Flood Embankment
285	0341740330101R03	raised defence (man-made)	Flood Embankment

Date Modified: 13/01/2012

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - C - 5-0.mxd

KEY

District Boundary

Condition

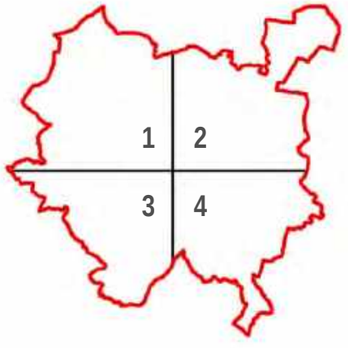
1 - Very Good

2 - Good

3 - Fair

4 - Poor

Potential Development Sites



WSP

TITLE:

NEWARK AND SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

NATIONAL FLOOD AND COASTAL DEFENCES DATABASE
FLOOD DEFENCES
1647 - C - 5-0

0 1 2 4 6 8 Kilometres

Scale: 1:135,000

Date Modified: 13/01/2012

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - C - 5-0.mxd

KEY

District Boundary

Condition

1 - Very Good

2 - Good

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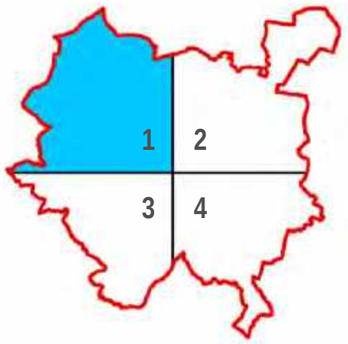
Potential Development Sites



WSP

TITLE:

NEWARK AND SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

NATIONAL FLOOD AND COASTAL DEFENCES DATABASE
FLOOD DEFENCES
1647 - C - 5-1

0 0.5 1 2 3 4 Kilometres

Scale: 1:65,000

Date Modified: 13/01/2012

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - C - 5-0.mxd

KEY

District Boundary

Condition

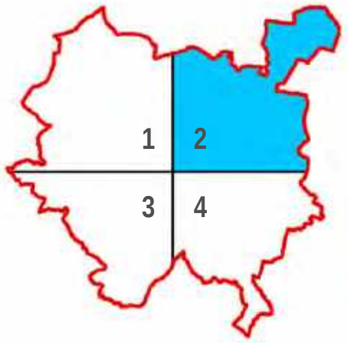
1 - Very Good

2 - Good

3 - Fair

4 - Poor

Potential Development Sites



WSP

TITLE:

NEWARK AND SHERWOOD
DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

NATIONAL FLOOD AND COASTAL
DEFENCES DATABASE
FLOOD DEFENCES
1647 - C - 5-2

0 0.5 1 2 3 4 Kilometres

Scale: 1:65,000

Date Modified: 13/01/2012

Drawn By: ukdid001

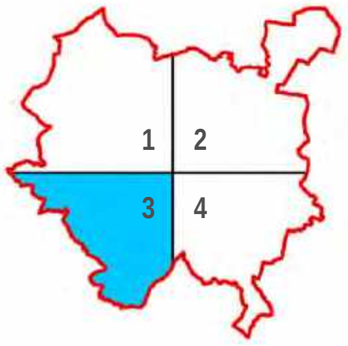
File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - C - 5-0.mxd

KEY

- District Boundary

Condition

- 1 - Very Good
- 2 - Good
- 3 - Fair
- 4 - Poor
- Potential Development Sites



WSP

TITLE:

NEWARK AND SHERWOOD
DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

NATIONAL FLOOD AND COASTAL
DEFENCES DATABASE
FLOOD DEFENCES
1647 - C - 5-3

0 0.425 0.85 1.7 2.55 3.4 Kilometres

Scale: 1:55,000

Date Modified: 13/01/2012

Drawn By: ukdid001

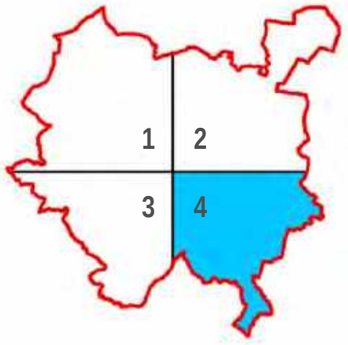
File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - C - 5-0.mxd

KEY

- District Boundary

Condition

- 1 - Very Good
- 2 - Good
- 3 - Fair
- 4 - Poor
- Potential Development Sites



WSP

TITLE:

NEWARK AND SHERWOOD
DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

NATIONAL FLOOD AND COASTAL
DEFENCES DATABASE
FLOOD DEFENCES
1647 - C - 5-4

0 0.5 1 2 3 4 Kilometres

Scale: 1:65,000

Appendix D Infiltration Feasibility, Source Protection Zone, Groundwater Flooding Information

Date Modified: 02/11/2011

Drawn By: ukdid001

WALESBY
OLLERTON & BOUGHTON
EDWINSTOWE
CLIPSTONE
EAKRING
BILSTHORPE
RAINWORTH
FARNSFIELD
BLIDWORTH
HALAM
SOUTHWELL
SUTTON ON TRENT
NORWELL
CAUNTON
NORTH MUSKHAM
HARBY
COLLINGHAM
WINTHORPE
CODDINGTON
NEWARK
FARNDON
BALDERTON
FISKERTON
FERNWOOD
BLEASBY
ELSTON
LOWDHAM
GUNTHORPE

KEY

- District Boundary
- High Potential for Infiltration
- Uncertain Potential for Infiltration
- Low Potential for Infiltration

NOTES:

1. This drawing looks at the infiltration potential within the Newark and Sherwood District boundary. The SuDS hierachy must be applied to all potential developments. Intrusive ground investigations to determine the viability of infiltration must still be undertaken as part of a site specific FRA. Should infiltration SuDS devices prove to be unsuitable based on intrusive ground investigations and BRE 365 soakage tests, then alternative SuDS should be used.

2. Areas listed as having a low infiltration potential does not automatically preclude the use of infiltration devices or further investigations. Ground investigations should still be undertaken at the site to determine the infiltration potential and should be scoped with the Environment Agency.

3. In areas with potential for infiltration, reference should be made to the location of various Groundwater Source Protection Zones, see plan 1647 - D - 2.0.

4. This drawing has been produced using information transcribed from the British Geological Survey; Solid and Drift Editions 113, 114 and 126, and the NRA Groundwater Vulnerability Edition 18.

0 1 2 4 6 8 Kilometres

Scale: 1:125,000

WSP

TITLE:

NEWARK & SHERWOOD DISTRICT COUNCIL LEVEL 2 SFRA PHASE 2

FIGURE No:

GEOLOGICAL MAP WITH INFILTRATION POTENTIAL 1647 - D - 1.0

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Shenwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - D - 1-0.mxd

Date Modified: 02/11/2011

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - D - 2-0.mxd

KEY

- District Boundary
- Zone 1 - Inner Protection Zone
- Zone 2 - Outer Protection Zone
- Zone 3 - Total Catchment
- Zone of Special Interest

WALESBY
HARBY
OLLERTON & BOUGHTON
EDWINSTOWE
SUTTON ON TRENT
CLIPSTONE
EAKRING
NORWELL
COLLINGHAM
CAUNTON
BILSTHORPE
NORTH MUSKHAM
RAINWORTH
WINTHORPE
FARNSFIELD
CODDINGTON
BLIDWORTH
HALAM
SOUTHWELL
NEWARK
FARNDON
BALDERTON
FISKERTON
FERNWOOD
BLEASBY
ELSTON
LOWDHAM
GUNTHORPE

0 1 2 4 6 8 Kilometres

Scale: 1:125,000

WSP

TITLE:

NEWARK & SHERWOOD
DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

SOURCE PROTECTION ZONES
1647 - D - 2.0

Date Modified: 15/12/2011

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - D - 3-0.mxd

KEY

District Boundary

Areas Susceptible to Groundwater Flooding

RISK

>= 75%

>= 50% <75%

>= 25% <50%

< 25%

WALESBY

HARBY

OLLERTON & BOUGHTON

EDWINSTOWE

SUTTON ON TRENT

EAKRING

NORWELL

COLLINGHAM

CAUNTON

BILSTHORPE

NORTH MUSKHAM

FARNSFIELD

WINTHORPE

BLIDWORTH

CODDINGTON

HALAM

SOUTHWELL

NEWARK

FARNDON

BALDERTON

FISKERTON

FERNWOOD

BLEASBY

ELSTON

LOWDHAM

0 1 2 4 6 8 Kilometres

Scale: 1:125,000

WSP

TITLE:

NEWARK & SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

GROUNDWATER FLOODING INFORMATION
1647 - D - 3.0

Appendix E Flood Maps, Flood Maps For Surface Water

Date Modified: 02/11/2011

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - E - 1-0-1-4.mxd

WALESBY
OLLERTON & BOUGHTON
EDWINSTOWE
CLIPSTONE
EAKRING
BILSTHORPE
RAINWORTH
FARNSFIELD
BLIDWORTH
HALAM
SOUTHWELL
HARBY
SUTTON ON TRENT
NORWELL
COLLINGHAM
CAUNTON
NORTH MUSKHAM
WINTHORPE
CODDINGTON
NEWARK
FARNDON
BALDERTON
FISKERTON
FERNWOOD
BLEASBY
ELSTON
LOWDHAM
GUNTHORPE

KEY

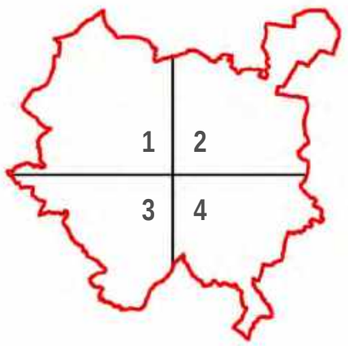
- District Boundary
- Potential Development Sites
- Functional Floodplain
- Flood Zone 2
- Flood Zone 3

NOTES:

1. Functional Floodplain has been taken from a number of hydraulic models of different rivers within the District. These include models of the River Meden, River Maun, River Greet, River Trent (Fluvial), and Upper Witham.

2. The River Trent area to the north of Cromwell Lock is tidally influenced and does not have a modelled functional floodplain outline.

3. Where potential development falls within Flood Zone 3a further modelling should be undertaken on a site specific basis to determine the extent of the functional floodplain.



0 1 2 4 6 8 Kilometres

Scale: 1:135,000

WSP

TITLE:

NEWARK AND SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

FLOOD MAP
1647 - E - 1-0

Date Modified: 02/11/2011

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - E - 1-0-1-4.mxd

WALESBY

OLLERTON & BOUGHTON

EDWINSTOWE

CLIPSTONE

RAINWORTH

BILSTHORPE

EAKRING

FARNSFIELD

MARKET WARSOP

REBROOK

NEWARK AND SHERWOOD DISTRICT

KEY

- District Boundary
- Potential Development Sites
- Functional Floodplain
- Flood Zone 2
- Flood Zone 3

NOTES:

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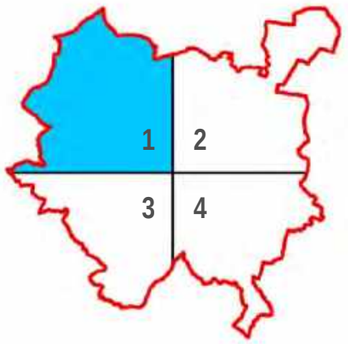

0 0.5 1 2 3 4 Kilometres

Scale: 1:65,000

WSP

TITLE:

NEWARK AND SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

FLOOD MAP
1647 - E - 1-1

Date Modified: 02/11/2011

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - E - 1-0-1-4.mxd

HARBY

SUTTON ON TRENT

NORWELL

COLLINGHAM

CAUNTON

NORTH MUSKHAM

0 0.5 1 2 3 4 Kilometres

Scale: 1:65,000

KEY

- District Boundary
- Potential Development Sites
- Functional Floodplain
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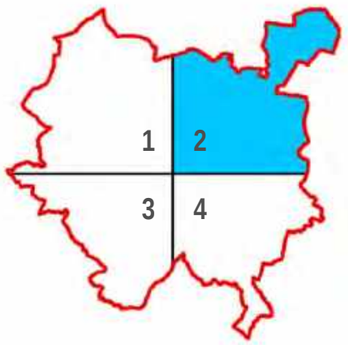


WSP

TITLE:

NEWARK AND SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

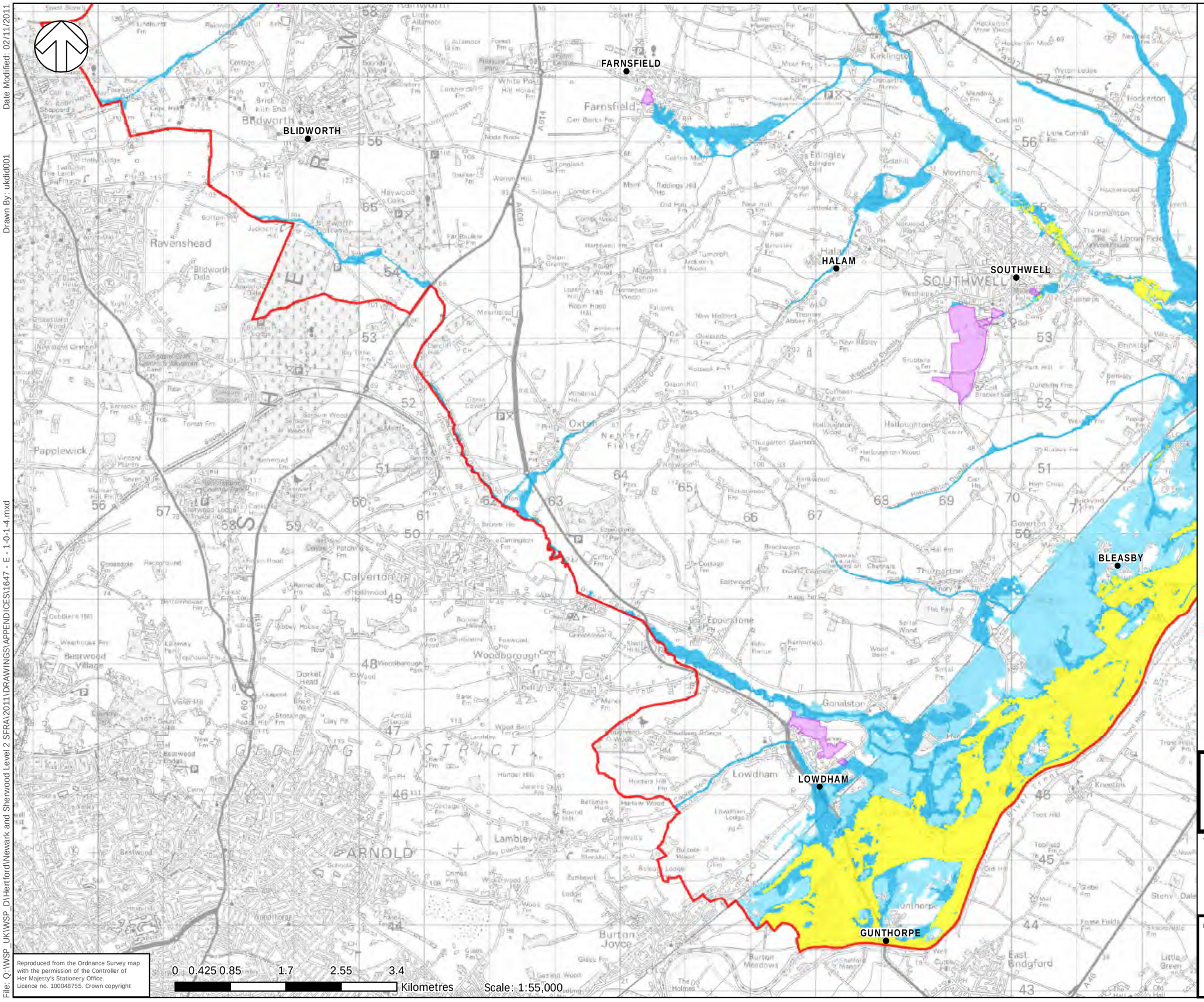
FIGURE No:

FLOOD MAP
1647 - E - 1-2

Date Modified: 02/11/2011

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - E - 1-0-1-4.mxd



KEY

- District Boundary
- Potential Development Sites
- Functional Floodplain
- Flood Zone 2
- Flood Zone 3

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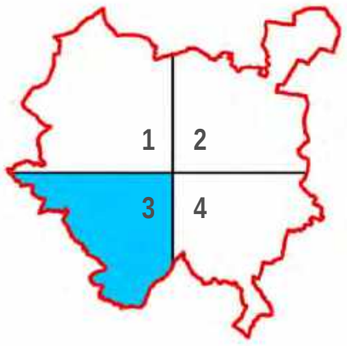

0 0.425 0.85 1.7 2.55 3.4 Kilometres

Scale: 1:55,000

WSP

TITLE:

NEWARK AND SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

FLOOD MAP
1647 - E - 1-3

Date Modified: 02/11/2011

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - E - 1-0-1-4.mxd

WINTHORPE

CODDINGTON

SOUTHWELL

NEWARK

FARNDON

BALDERTON

FISKERTON

FERNWOOD

BLEASBY

ELSTON

KEY

- District Boundary
- Potential Development Sites
- Functional Floodplain
- Flood Zone 2
- Flood Zone 3

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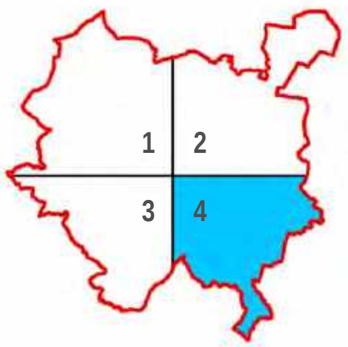


0 0.5 1 2 3 4 Kilometres

Scale: 1:65,000

WSP

TITLE:

NEWARK AND SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

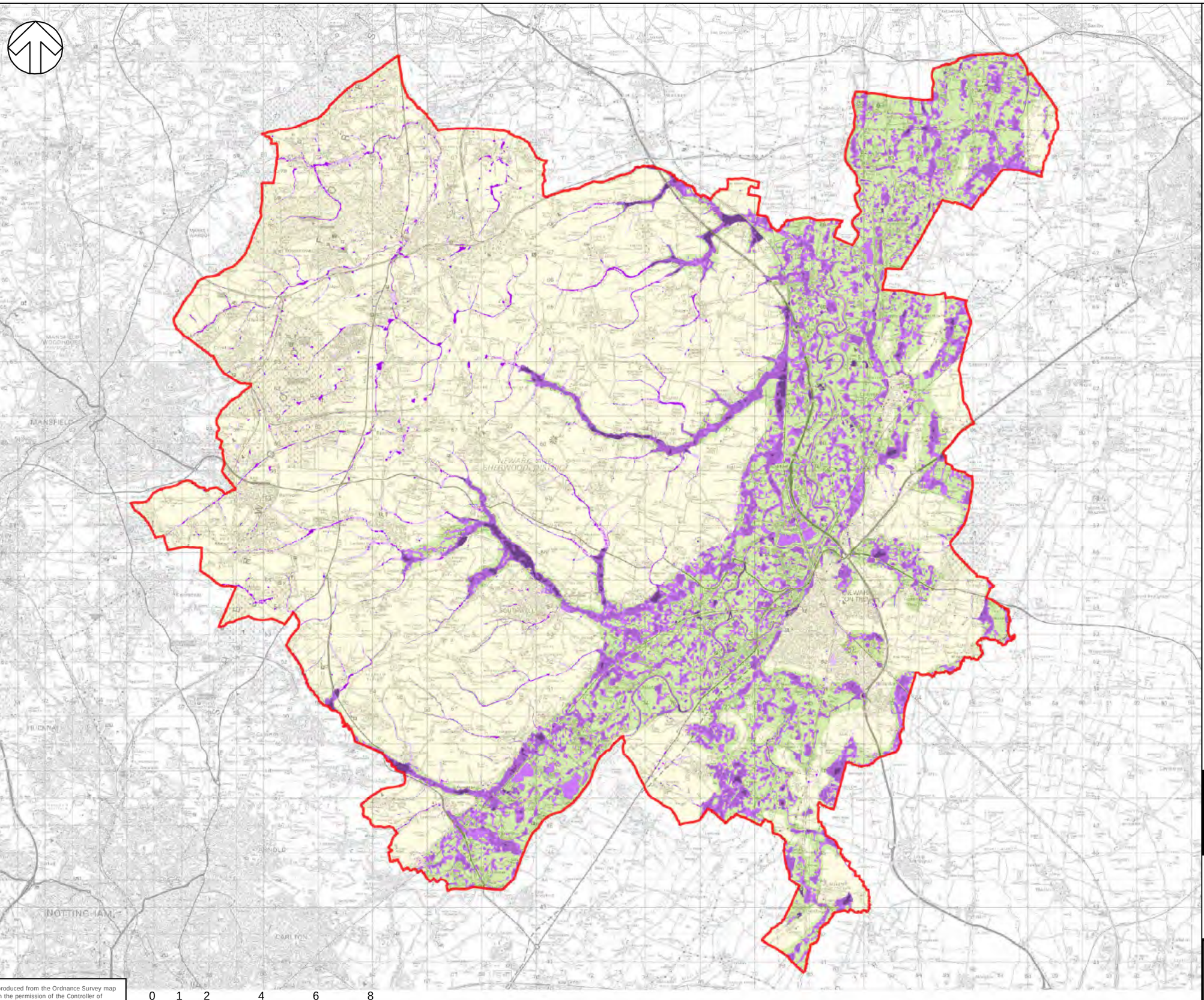
FIGURE No:

FLOOD MAP
1647 - E - 1-4

Date Modified: 23/05/2012

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - E - 2-0-0-2-0-4.mxd



KEY

District Boundary

Area Susceptible to Surface Water Flooding

More

Intermediate

Less

Flood Map for Surface Water (30 Year)

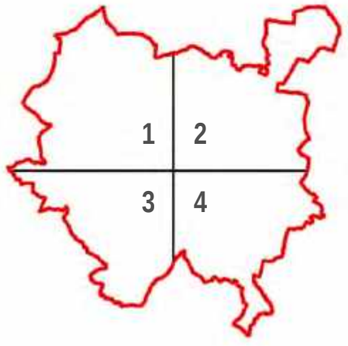
Deeper (>0.3m)

Shallower (0.1-0.3m)

NOTES

1. The Nottinghamshire Preliminary FRA states that the locally agreed surface water information for the District is based on the Areas Susceptible to Surface Water Flooding (AStSWF) and Flood Map for Surface Water (FMfSW). The AStSWF should be shown within the IDB areas (Trent Valley and Upper Witham IDBs) due to being relatively flat and low-lying. The FMfSW should be shown for all other areas within the District.

2. This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale.



WSP

TITLE:

NEWARK AND SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

LOCALLY AGREED SURFACE WATER INFORMATION (WITH 30 YEAR FLOOD RISK)
1647 - E - 2.0.0

0 1 2 4 6 8 Kilometres

Scale: 1:135,000

Date Modified: 23/05/2012

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - E - 2-0-0-2-0-4.mxd

KEY

District Boundary

Area Susceptible to Surface Water Flooding

More

Intermediate

Less

Flood Map for Surface Water (30 Year)

Deeper (>0.3m)

Shallower (0.1-0.3m)

NOTES

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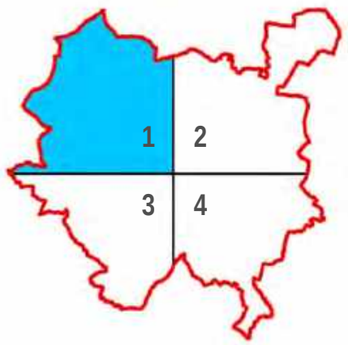

0 0.5 1 2 3 4 Kilometres

Scale: 1:65,000

WSP

TITLE:

NEWARK AND SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

LOCALLY AGREED SURFACE WATER INFORMATION (WITH 30 YEAR FLOOD RISK)
1647 - E - 2.0.1

Date Modified: 23/05/2012

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - E - 2-0-0-2-0-4.mxd

KEY

District Boundary

Area Susceptible to Surface Water Flooding

- More
- Intermediate
- Less

Flood Map for Surface Water (30 Year)

- Deeper (>0.3m)
- Shallower (0.1-0.3m)

NOTES

1. The Nottinghamshire Preliminary FRA states that the locally agreed surface water information for the District is based on the Areas Susceptible to Surface Water Flooding (AStSWF) and Flood Map for Surface Water (FMfSW). The AStSWF should be shown within the IDB areas (Trent Valley and Upper Witham IDBs) due to being relatively flat and low-lying. The FMfSW should be shown for all other areas within the District.

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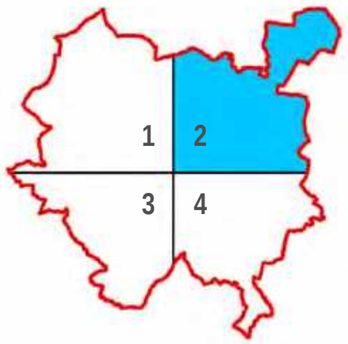

0 0.5 1 2 3 4 Kilometres

Scale: 1:65,000

WSP

TITLE:

NEWARK AND SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

LOCALLY AGREED SURFACE WATER INFORMATION (WITH 30 YEAR FLOOD RISK)
1647 - E - 2.0.2

Date Modified: 23/05/2012

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - E - 2-0-0-2-0-4.mxd

KEY

District Boundary

Area Susceptible to Surface Water Flooding

More

Intermediate

Less

Flood Map for Surface Water (30 Year)

Deeper (>0.3m)

Shallower (0.1-0.3m)

NOTES

1. The Nottinghamshire Preliminary FRA states that the locally agreed surface water information for the District is based on the Areas Susceptible to Surface Water Flooding (AStSWF) and Flood Map for Surface Water (FMfSW). The AStSWF should be shown within the IDB areas (Trent Valley and Upper Witham IDBs) due to being relatively flat and low-lying. The FMfSW should be shown for all other areas within the District.

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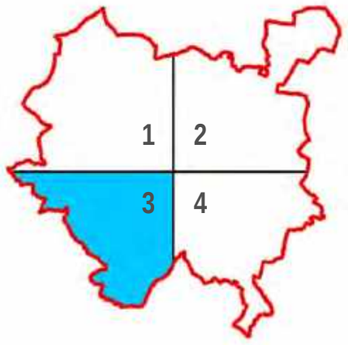

WSP

TITLE:

NEWARK AND SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

LOCALLY AGREED SURFACE WATER INFORMATION (WITH 30 YEAR FLOOD RISK)
1647 - E - 2.0.3

0 0.425 0.85 1.7 2.55 3.4 Kilometres

Scale: 1:55,000

Date Modified: 23/05/2012

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - E - 2-0-0-2-0-4.mxd

KEY

District Boundary

Area Susceptible to Surface Water Flooding

More

Intermediate

Less

Flood Map for Surface Water (30 Year)

Deeper (>0.3m)

Shallower (0.1-0.3m)

NOTES

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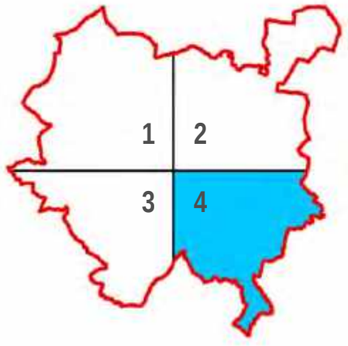

0 0.5 1 2 3 4 Kilometres

Scale: 1:65,000

TITLE:

NEWARK AND SHERWOOD DISTRICT COUNCIL LEVEL 2 SFRA PHASE 2

FIGURE No:

LOCALLY AGREED SURFACE WATER INFORMATION (WITH 30 YEAR FLOOD RISK)

1647 - E - 2.0.4

Date Modified: 23/05/2012

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - E - 2-1-0-2-1-4.mxd

KEY

District Boundary

Area Susceptible to Surface Water Flooding

More

Intermediate

Less

Flood Map for Surface Water (200 Year)

Deeper (>0.3m)

Shallower (0.1-0.3m)

NOTES

1. The Nottinghamshire Preliminary FRA states that the locally agreed surface water information for the District is based on the Areas Susceptible to Surface Water Flooding (AStSWF) and Flood Map for Surface Water (FMfSW). The AStSWF should be shown within the IDB areas (Trent Valley and Upper Witham IDBs) due to being relatively flat and low-lying. The FMfSW should be shown for all other areas within the District.

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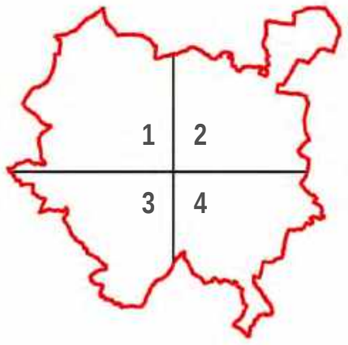

WSP

TITLE:

NEWARK AND SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

LOCALLY AGREED SURFACE WATER INFORMATION (WITH 200 YEAR FLOOD RISK)
1647 - E - 2.1.0

0 1 2 4 6 8 Kilometres

Scale: 1:135,000

Date Modified: 23/05/2012

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - E - 2-1-0-2-1-4.mxd

KEY

District Boundary

Area Susceptible to Surface Water Flooding

More

Intermediate

Less

Flood Map for Surface Water (200 Year)

Deeper (>0.3m)

Shallower (0.1-0.3m)

NOTES

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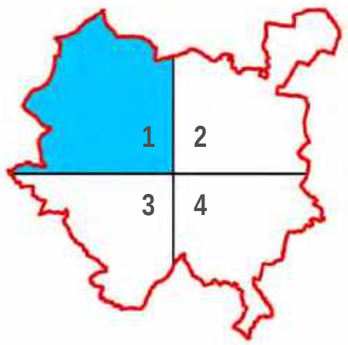

0 0.5 1 2 3 4 Kilometres

Scale: 1:65,000

WSP

TITLE:

NEWARK AND SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

LOCALLY AGREED SURFACE WATER INFORMATION (WITH 200 YEAR FLOOD RISK)
1647 - E - 2.1.1

Date Modified: 23/05/2012

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - E - 2.1-0-2.1-4.mxd

KEY

District Boundary

Area Susceptible to Surface Water Flooding

- More
- Intermediate
- Less

Flood Map for Surface Water (200 Year)

- Deeper (>0.3m)
- Shallower (0.1-0.3m)

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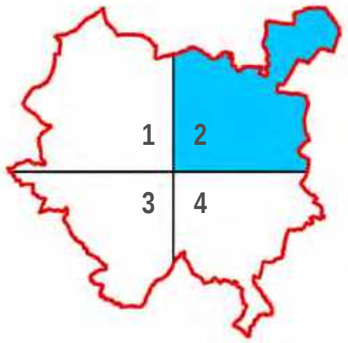

0 0.5 1 2 3 4 Kilometres

Scale: 1:65,000

WSP

TITLE:

NEWARK AND SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

LOCALLY AGREED SURFACE WATER INFORMATION (WITH 200 YEAR FLOOD RISK)
1647 - E - 2.1.2

Date Modified: 23/05/2012

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - E - 2.1-0-2.1-4.mxd

KEY

District Boundary

Area Susceptible to Surface Water Flooding

More

Intermediate

Less

Flood Map for Surface Water (200 Year)

Deeper (>0.3m)

Shallower (0.1-0.3m)

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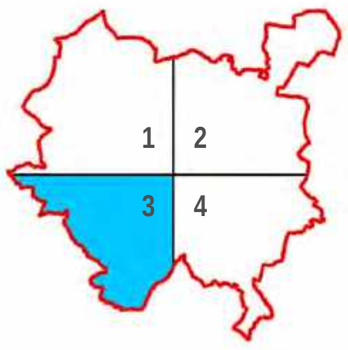

WSP

TITLE:

NEWARK AND SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

LOCALLY AGREED SURFACE WATER INFORMATION (WITH 200 YEAR FLOOD RISK)
1647 - E - 2.1.3

0 0.425 0.85 1.7 2.55 3.4 Kilometres

Scale: 1:55,000

Date Modified: 23/05/2012

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - E - 2-1-0-2-1-4.mxd

KEY

District Boundary

Area Susceptible to Surface Water Flooding

More

Intermediate

Less

Flood Map for Surface Water (200 Year)

Deeper (>0.3m)

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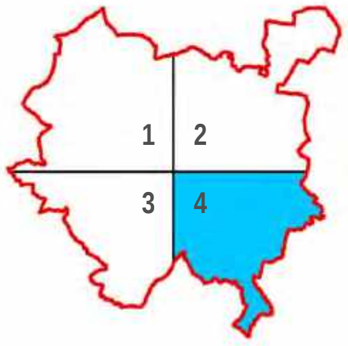
NOTES

1. The Nottinghamshire Preliminary FRA states that the locally agreed surface water information for the District is based on the Areas Susceptible to Surface Water Flooding (AStSWF) and Flood Map for Surface Water (FMfSW). The AStSWF should be shown within the IDB areas (Trent Valley and Upper Witham IDBs) due to being relatively flat and low-lying. The FMfSW should be shown for all other areas within the District.

2. This map gives an indication of the broad areas likely to be at risk of surface water flooding. It is not suitable for use at an individual property scale.



0 0.5 1 2 3 4 Kilometres

Scale: 1:65,000

TITLE:

NEWARK AND SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

LOCALLY AGREED SURFACE WATER INFORMATION (WITH 200 YEAR FLOOD RISK)
1647 - E - 2.1.4

Appendix F Hazard Mapping

Date Modified: 07/06/2012

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - F - 1-0.mxd

EAKRING
NORWELL
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NORTH MUSKHAM
RAINWORTH
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FARNDON
BALDERTON
FISKERTON
FERNWOOD
BLEASBY
ELSTON
LOWDHAM
GUNTHORPE

KEY

District Boundary

Potential Development Sites

Max Depth (m)

0 - 0.25

0.25 - 0.5

0.5 - 1

1.0 - 2

2+

NOTES:

1. Taken from the River Trent & Tributaries at Newark Flood Risk and Hazard Mapping Study (2011) between Radcliffe Viaduct and Cromwell Lock

0 0.5 1 2 3 4 Kilometres

Scale: 1:85,000

WSP

TITLE:

NEWARK & SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

FLUVIAL TRENT DEPTH MAPPING
1% (1 IN 100) AEP - PRESENT DAY
1647 - F - 1.0

Date Modified: 07/06/2012

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - F - 1-1.mxd

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BALDERTON
FISKERTON
FERNWOOD
BLEASBY
ELSTON
LOWDHAM
GUNTHORPE

KEY

- District Boundary
- Potential Development Sites

Max Depth (m)

- 0 - 0.25
- 0.25 - 0.5
- 0.5 - 1
- 1.0 - 2
- 2+

NOTES:

1. Information taken from the River Trent & Tributaries at Newark Flood Risk and Hazard Mapping Study (2011) between Radcliffe Viaduct and Cromwell Lock

0 0.5 1 2 3 4 Kilometres

Scale: 1:85,000

WSP

TITLE:

NEWARK & SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

FLUVIAL TRENT DEPTH MAPPING
1% (1 in 100) AEP - WITH CLIMATE CHANGE
1647 - F - 1.1

Date Modified: 07/06/2012

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - F - 1-2.mxd

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FERNWOOD
BLEASBY
ELSTON
LOWDHAM
GUNTHORPE

KEY

- District Boundary
- Potential Development Sites

Max Depth (m)

- 0 - 0.25
- 0.25 - 0.5
- 0.5 - 1
- 1.0 - 2
- 2+

NOTES

1. Information taken from the River Trent & Tributaries at Newark Flood Risk and Hazard Mapping Study (2011) between Radcliffe Viaduct and Cromwell Lock

0 0.5 1 2 3 4 Kilometres

Scale: 1:85,000

WSP

TITLE:

NEWARK & SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

FLUVIAL TRENT DEPTH MAPPING
0.1% (1 in 1000) AEP - PRESENT DAY
1647 - F - 1.2

Date Modified: 07/06/2012

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - F - 2-0.mxd

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FISKERTON
FERNWOOD
BLEASBY
ELSTON
LOWDHAM
GUNTHORPE
ARNOLD
CARLTON

KEY

- District Boundary
- Potential Development Sites

Max Velocity (m/s)

- 0 - 0.3
- 0.3 - 1
- 1.0 - 1.5
- 1.5 - 2.5
- 2.5+

NOTES:

1. Information taken from the River Trent & Tributaries at Newark Flood Risk and Hazard Mapping Study (2011) between Radcliffe Viaduct and Cromwell Lock

0 0.5 1 2 3 4 Kilometres

Scale: 1:85,000

WSP

TITLE:

NEWARK & SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

FLUVIAL TRENT VELOCITY MAPPING
1% (1 in 100) AEP - PRESENT DAY
1647 - F - 2.0

Date Modified: 07/06/2012

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - F - 2-1.mxd

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FISKERTON
FERNWOOD
BLEASBY
ELSTON
LOWDHAM
GUNTHORPE

KEY

- District Boundary
- Potential Development Sites

Max Velocity (m/s)

- 0 - 0.3
- 0.3 - 1
- 1.0 - 1.5
- 1.5 - 2.5
- 2.5+

NOTES:

1. Information taken from the River Trent & Tributaries at Newark Flood Risk and Hazard Mapping Study (2011) between Radcliffe Viaduct and Cromwell Lock

0 0.5 1 2 3 4 Kilometres

Scale: 1:85,000

WSP

TITLE:

NEWARK & SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

FLUVIAL TRENT VELOCITY MAPPING
1% (1 in 100) AEP - with CLIMATE CHANGE
1647 - F - 2.1

Date Modified: 07/06/2012

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - F - 2-2.mxd

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GUNTHORPE

KEY

- District Boundary
- Potential Development Sites

Max Velocity (m/s)

- 0 - 0.3
- 0.3 - 1
- 1.0 - 1.5
- 1.5 - 2.5
- 2.5+

NOTES:

1. Information taken from the River Trent & Tributaries at Newark Flood Risk and Hazard Mapping Study (2011) between Radcliffe Viaduct and Cromwell Lock

0 0.5 1 2 3 4 Kilometres

Scale: 1:85,000

WSP

TITLE:

NEWARK & SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

FLUVIAL TRENT VELOCITY MAPPING
0.1% (1 in 1000) AEP - PRESENT DAY
1647 - F - 2.2

Date Modified: 07/06/2012

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - F - 3-0.mxd

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FERNWOOD
BLEASBY
ELSTON
LOWDHAM
GUNTHORPE

KEY

- District Boundary
- Potential Development Sites

Max Hazard (Flood Risk to People : FD2320)

- Less than 0.75 (Low Hazard)
- Between 0.75 and 1.25 (Danger for Some)
- Between 1.25 and 2 (Danger for Most)
- Greater than 2 (Danger for All)

NOTES:

1. Information taken from the River Trent & Tributaries at Newark Flood Risk and Hazard Mapping Study (2011) between Radcliffe Viaduct and Cromwell Lock

0 0.5 1 2 3 4 Kilometres

Scale: 1:85,000

WSP

TITLE:

NEWARK & SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

FLUVIAL TRENT HAZARD MAPPING
1% (1 in 100) AEP - PRESENT DAY
1647 - F - 3.0

Date Modified: 07/06/2012

Drawn By: ukdid001

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LOWDHAM
GUNTHORPE

KEY

- District Boundary
- Potential Development Sites

Max Hazard (Flood Risk to People : FD2320)

- Less than 0.75 (Low Hazard)
- Between 0.75 and 1.25 (Danger for Some)
- Between 1.25 and 2 (Danger for Most)
- Greater than 2 (Danger for All)

NOTES:

1. Information taken from the River Trent & Tributaries at Newark Flood Risk and Hazard Mapping Study (2011) between Radcliffe Viaduct and Cromwell Lock

0 0.5 1 2 3 4 Kilometres

Scale: 1:85,000

WSP

TITLE:

NEWARK & SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

FLUVIAL TRENT HAZARD MAPPING
1% (1 in 100) AEP - with CLIMATE CHANGE
1647 - F - 3.1

Date Modified: 07/06/2012

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - F - 3-2.mxd

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KEY

- District Boundary
- Potential Development Sites

Max Hazard (Flood Risk to People : FD2320)

- Less than 0.75 (Low Hazard)
- Between 0.75 and 1.25 (Danger for Some)
- Between 1.25 and 2 (Danger for Most)
- Greater than 2 (Danger for All)

NOTES:

1. Information taken from the River Trent & Tributaries at Newark Flood Risk and Hazard Mapping Study (2011) between Radcliffe Viaduct and Cromwell Lock

0 0.5 1 2 3 4 Kilometres

Scale: 1:85,000

WSP

TITLE:

NEWARK & SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

FLUVIAL TRENT HAZARD MAPPING
0.1% (1 in 1000) AEP - PRESENT DAY
1647 - F - 3.2

Date Modified: 07/06/2012

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - F - 4-0.mxd

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FARNDON
BALDERTON
FISKERTON
FERNWOOD
BLEASBY
ELSTON
LOWDHAM
GUNTHORPE
GEDLING DISTRICT
ARNOLD
CARLTON

KEY

- District Boundary
- Potential Development Sites

Time (hours)

- Up to 40
- 41 - 50
- 51 - 60
- 61 - 70
- 71 - 80
- 81 - 90
- 91 - 100
- 101 - 110
- 111 - 120
- Above 120

NOTES:

1. Information taken from the River Trent & Tributaries at Newark Flood Risk and Hazard Mapping Study (2011) between Radcliffe Viaduct and Cromwell Lock

0 0.5 1 2 3 4 Kilometres

Scale: 1:85,000

WSP

TITLE:

NEWARK & SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

FLUVIAL TRENT
TIME TO INUNDATION MAPPING
1% (1 in 100) AEP - PRESENT DAY
1647 - F - 4.0

Date Modified: 07/06/2012

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - F - 4-1.mxd

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GUNTHORPE
GEDLING DISTRICT
ARNOLD
CARLTON

KEY

- District Boundary
- Potential Development Sites

Time (hours)

- Up to 40
- 41 - 50
- 51 - 60
- 61 - 70
- 71 - 80
- 81 - 90
- 91 - 100
- 101 - 110
- 111 - 120
- Above 120

NOTES:

1. Information taken from the River Trent & Tributaries at Newark Flood Risk and Hazard Mapping Study (2011) between Radcliffe Viaduct and Cromwell Lock

0 0.5 1 2 3 4 Kilometres

Scale: 1:85,000

WSP

TITLE:

NEWARK & SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

FLUVIAL TRENT
TIME TO INUNDATION MAPPING
1% (1 in 100) AEP - with CLIMATE CHANGE
1647 - F - 4.1

Date Modified: 07/06/2012

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Newark and Sherwood Level 2 SFRA\2011\DRAWINGS\APPENDICES\1647 - F - 4-2.mxd

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ELSTON
LOWDHAM
GUNTHORPE

KEY

- District Boundary
- Potential Development Sites

Time (hours)

- Up to 40
- 41 - 50
- 51 - 60
- 61 - 70
- 71 - 80
- 81 - 90
- 91 - 100
- 101 - 110
- 111 - 120
- Above 120

NOTES:

1. Information taken from the River Trent & Tributaries at Newark Flood Risk and Hazard Mapping Study (2011) between Radcliffe Viaduct and Cromwell Lock

0 0.5 1 2 3 4 Kilometres

Scale: 1:85,000

WSP

TITLE:

NEWARK & SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

FLUVIAL TRENT
TIME TO INUNDATION MAPPING
0.1% (1 in 100) AEP - PRESENT DAY
1647 - F - 4.2

Appendix G Site Specific Assessments

Appendix G – Site Specific Assessment

As part of the SFRA review Newark and Sherwood District Council required flood risk information to be produced relating to 38 potential development sites which have been determined as being at risk of flooding or within areas that have wider flood risk issues. The locations of the 38 sites within the district are illustrated in Appendix A of this SFRA.

Information collected for this SFRA and extracts from the mapping within Appendices E and F has been used to allow for assessment for each individual site. The tables produced show elements of the flood risk associated with the sites and flood risk recommendations to aid the production of a site specific FRA. The sheets have been split into two with the velocity, hazard and time to inundation mapping shown on sheet two, or if this information is not available a single sheet relating for flood risk is provided.

Below is the key legend for the site specific mapping, an additional pull out key legend is contained at the end of Appendix G so that the maps can be viewed simultaneously with the site specific information.

Key - Sheet 1

Panel 1 - Flood Map

- Flood Zone 2
- Flood Zone 3

Panel 2 - Functional Floodplain

- Functional Floodplain

Panel 3 - Historical Flooding

- Historic Flood Map
- Historic Flooding (Fluvial / Tidal)
- Historic Flooding (Pluvial)
- Historic Flooding (Sewer)

Panel 4 - Flood Warning Areas

- Flood Warning Areas

Panel 5 - Flood Defences

- Raised Defences

Key - Sheet 2

Depth Mapping

Max Depth (m)

- 0 - 0.25
- 0.25 - 0.5
- 0.5 - 1
- 1.0 - 2
- 2+

Key - Sheet 2 cont.

Velocity Mapping

Max Velocity (m/s)

- 0 - 0.3
- 0.3 - 1
- 1.0 - 1.5
- 1.5 - 2.5
- 2.5+

Hazard Mapping

Max Hazard (Flood Risk to People : FD2320)

- Less than 0.75 (Low Hazard)
- Between 0.75 and 1.25 (Danger for Some)
- Between 1.25 and 2 (Danger for Most)
- Greater than 2 (Danger for All)

Time to Inundation Mapping

All Sites - Time (hours)

- Up to 40
- 41 - 50
- 51 - 60
- 61 - 70
- 71 - 80
- 81 - 90
- 91 - 100
- 101 - 110
- 111 - 120
- Above 120

Site 29 - Time (hours)

- 0 - 5
- 5 - 10
- 10 - 15
- 15 - 20
- 20 - 25
- 25 - 30
- 30 - 35
- 35 - 40
- 40 - 45

WSP

TITLE:
NEWARK AND SHERWOOD DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:
KEY FOR SITE SPECIFIC DEVELOPMENT INFORMATION

Site Name: 1 - Palmer Road
Location: Sutton on Trent (OS Grid Ref: 479705, 365500)

Site Size: 1.88 hectares

Existing Site Use: Greenfield

Proposed Site Use: 53 Dwellings

Vulnerability Classification: More Vulnerable

Surface Water Flood Risk:

The locally agreed surface water information maps indicate the site is located in an area susceptible to surface water flooding to an intermediate level. Therefore, further assessment of surface water flood risk should be included with the site specific flood risk assessment.

Proposed surface water drainage is a key factor to the viability of the project and must not place extra pressure on the existing drainage regime. The drainage is subject to EA and IDB consent.

Safe Access and Egress:

Not relevant to this site

Minimum Finished Floor Levels:

It is advisable for finished floor levels to be 150mm to 300mm above ground levels to ensure that any surface water flooding would not enter properties and cause damage.

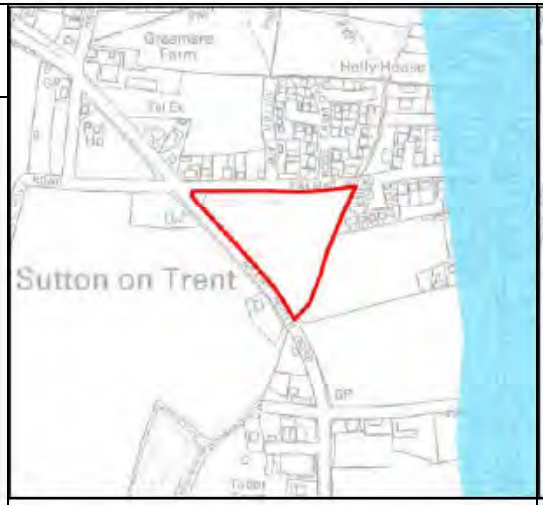
Flood Risk Assessment Requirements:

A Flood Risk Assessment (FRA) will be required by the Environment Agency for any site over 1 hectare in size.

Climate change should be taken in to account when assessing flood risk from any source. The lifetime of the development will guide the allowance required for climate change, in accordance with the NPPF.

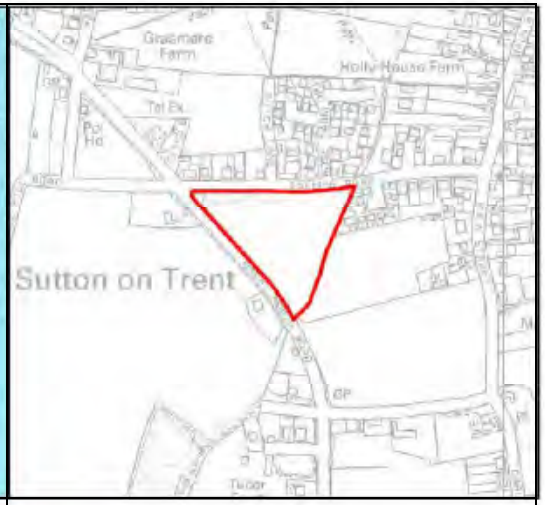
Flood risk from surface water will need to be assessed as part of any FRA, with a drainage strategy provided to ensure that the development does not flood during low annual probability rainfall events or exacerbate the flood risk off site.

The site is located within the Trent Valley Internal Drainage Board's (TVIDB) district and has a board maintained watercourse along its eastern boundary. The TVIDB will seek to establish an easement strip alongside this watercourse. The Board's consent will be required to any works in, over, under or within 9.0m of top, or, where the watercourse is culverted, the outside edge of the pipe. The IDB consent will be required prior to any increases in surface water discharge from the site being made to any increase in surface water discharge from the site being made to any watercourse, other than designated main river, which would require EA consent.



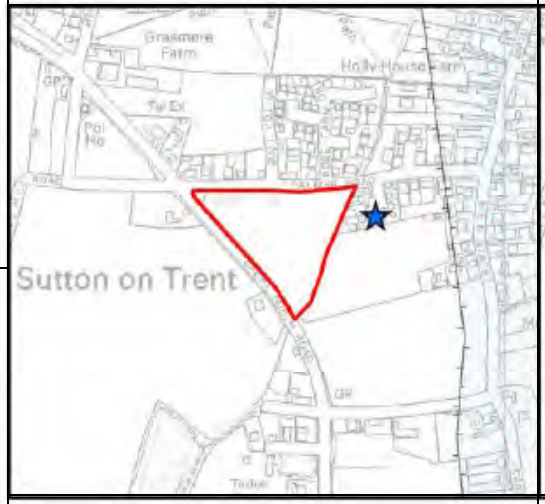
Flood Map

Site is located in Flood Zone 1 – Low probability of flooding from fluvial and tidal sources.



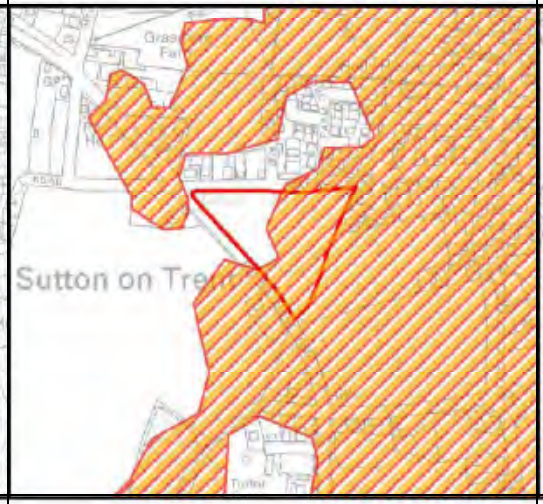
Functional Floodplain

The site is located out of the functional floodplain.



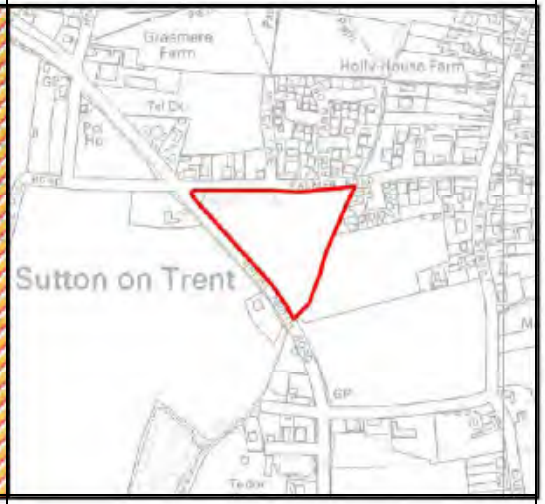
Historical Flooding

No records of historical flooding have been received for the site. Investigations into historical flooding of the area should be undertaken as part of a site specific FRA. NAIDB has records that 22 properties in Sutton on Trent reported flooding during the June 2007 event.



Flood Warning Areas

A flood warning area covers most of the site.



Flood Defences

There are no flood defences close to the site.

The IDB maintain a number of raised defences which developers should identify within a site specific FRA.

Site Name: 2 – Land at Nottingham Road
Location: Southwell (OS Grid Ref: 469771, 353376)

Site Size: 1.67 hectares

Existing Site Use: Greenfield

Proposed Site Use: 25 to 30 Dwellings

Vulnerability Classification: More Vulnerable

Surface Water Flood Risk:

The locally agreed surface water information maps indicate the site is located within close proximity to an area susceptible to surface water flooding. Therefore, further assessment of surface water flood risk should be included with the site specific flood risk assessment.

Proposed surface water drainage is a key factor to the viability of the project and must not place extra pressure on the existing drainage regime.

Safe Access and Egress:

The approach should be taken whereby access to and from the site is away from the area shown as located within the flood extent. This area should be free from development.

Minimum Finished Floor Levels:

Finished floor levels must be set above the maximum flood depth, the EA general requirement is a 600mm freeboard for residential. If single storey dwellings are proposed this is essential. Where this is not possible then a range of measures including flood resilient construction must be considered.

This is subject to EA approval and discussions.

Flood Risk Assessment Requirements:

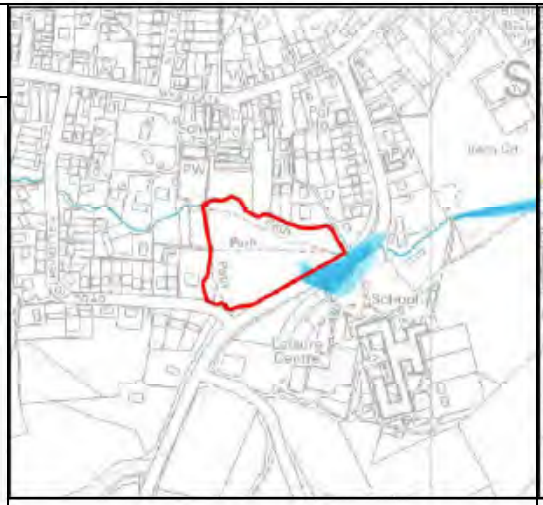
Any sites located within Flood Zone 2 or 3 regardless of size will require an FRA.

Climate change should be taken in to account when assessing flood risk from any source. The lifetime of the development will guide the allowance required for climate change, in accordance with the NPPF.

Flood risk from surface water will need to be assessed as part of any FRA, with a drainage strategy provided to ensure that the development does not flood during low annual probability rainfall events or exacerbate the flood risk off-site.

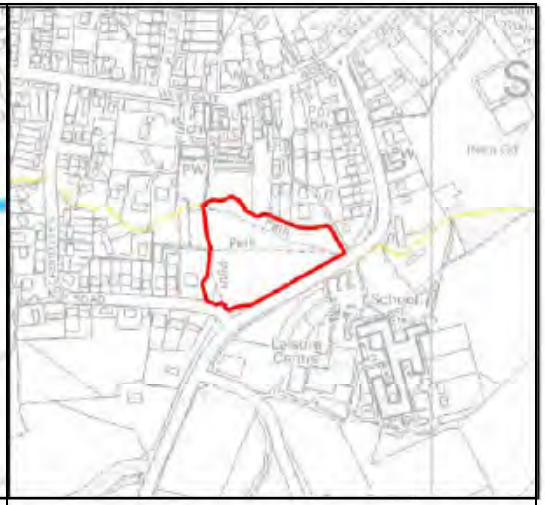
The sequential approach should be applied to the site to avoid development within any areas likely to flood.

An easement free from development may also be required within the development layout for the adjacent watercourse. The easement should be agreed with NSDC, the EA and/or the LLFA or IDB. Approval will be required from either the LLFA the IDB if there is an increase in surface water discharge from the site to any watercourse other than a designated main river. Any discharge of surface water to a main river will require EA consent.



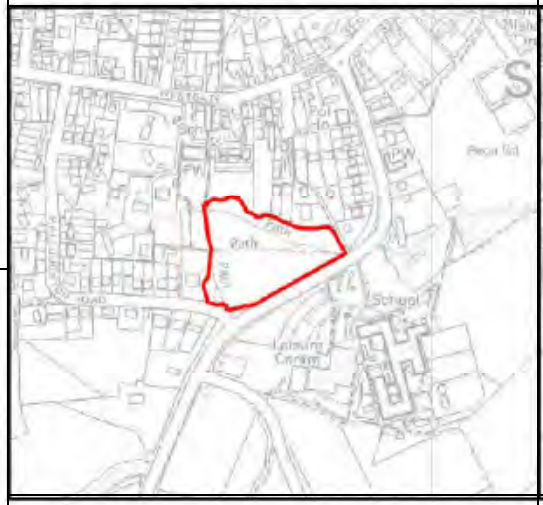
Flood Map

The site is located primarily within Flood Zone 1 – Low probability of flooding from fluvial and tidal sources, with a small area (<5% of the site area) located in Flood Zones 2 and 3 (medium and high probability respectively). The site will therefore need to be assessed based on Flood Zone 3 criteria.



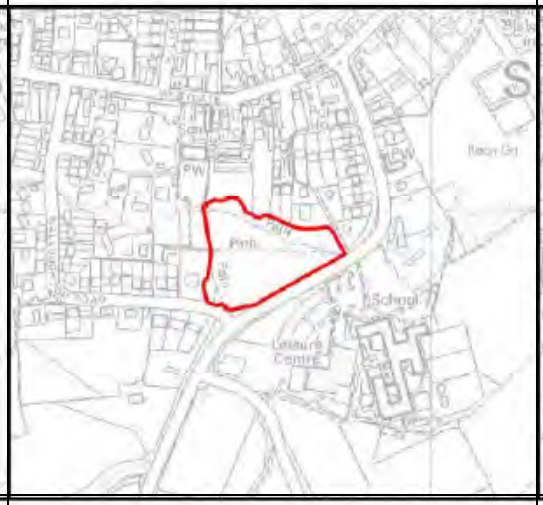
Functional Floodplain

The site is located out of the functional floodplain.



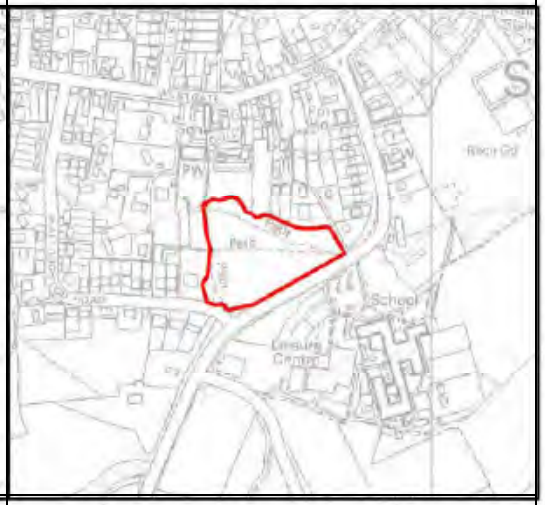
Historical Flooding

No records of historical flooding have been received for the site. This does not mean that flooding has not occurred as these events may not have been recorded. Investigations into historical flooding of the area should be undertaken as part of a site specific FRA.



Flood Warning Areas

There is no flood warning area covering the site. A Flood Plan should be provided detailing what residents / occupants should do to prepare for flood events, and what to do if the development floods. Safe escape / safe refuge details should be provided as part of a Flood Plan along with information on the EA Flood Warning system.



Flood Defences

There are no flood defences close to the site.

The IDB maintain a number of raised defences which developers should identify in a site specific FRA.

Site Name: 3 – Land South of Mansfield Road
Location: Farnsfield (OS Grid Ref: 464426, 356685)

Site Size: 2.59 hectares

Existing Site Use: Greenfield

Proposed Site Use: 12 Dwellings

Vulnerability Classification: More Vulnerable

Surface Water Flood Risk:

The locally agreed surface water information maps indicate the site is located within close proximity to an area susceptible to surface water flooding. Therefore, further assessment of surface water flood risk should be included within any site specific flood risk assessment.

Proposed surface water drainage is a key factor to the viability of any development that may be located on this land project and must not place extra pressure on the existing drainage regime.

Safe Access and Egress:

Not relevant to this site

Minimum Finished Floor Levels:

Finished floor levels must be set above the maximum flood depth, the EA general requirement is a 600mm freeboard for residential. If single storey dwellings are proposed this is essential. Where this is not possible then a range of measures including flood resilient construction must be considered.

This is subject to EA approval and discussions.

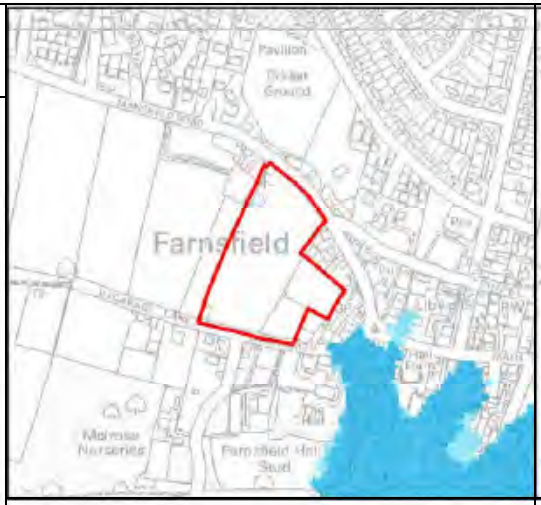
Flood Risk Assessment Requirements:

A Flood Risk Assessment (FRA) will be required by the Environment Agency for any site over 1 hectare in size.

Climate change should be taken in to account when assessing flood risk from any source. The lifetime of the development will guide the allowance required for climate change, in accordance with the NPPF.

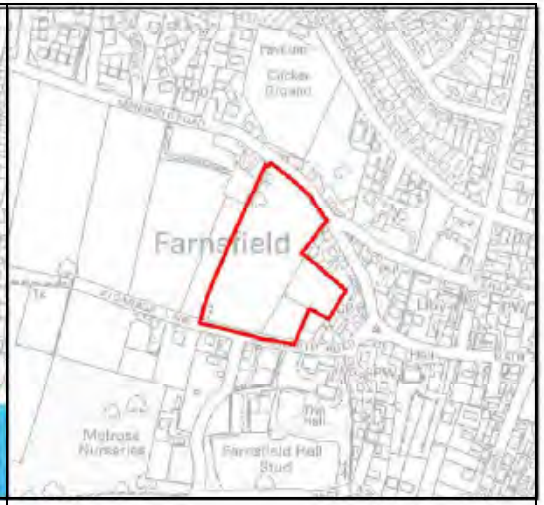
Flood risk from surface water will need to be assessed as part of any FRA, with a drainage strategy provided to ensure that the development does not flood during low annual probability rainfall events or exacerbate the flood risk off site.

Approval will be required from either the LLFA or the IDB if there is an increase in surface water discharge from the site to any watercourse other than a designated main river. Any discharge of surface water to a main river will require EA consent.



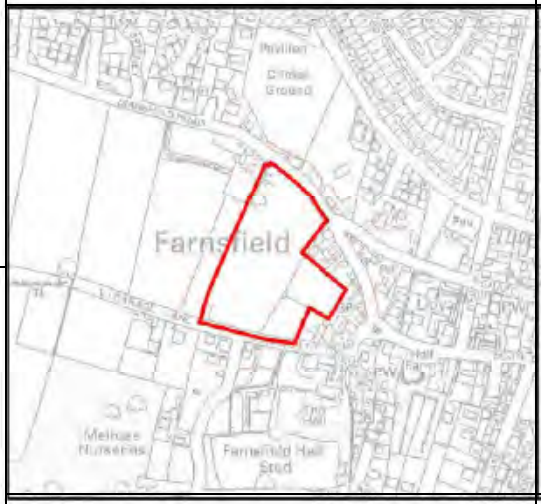
Flood Map

Site is located in Flood Zone 1 – Low probability of flooding from fluvial and tidal sources.



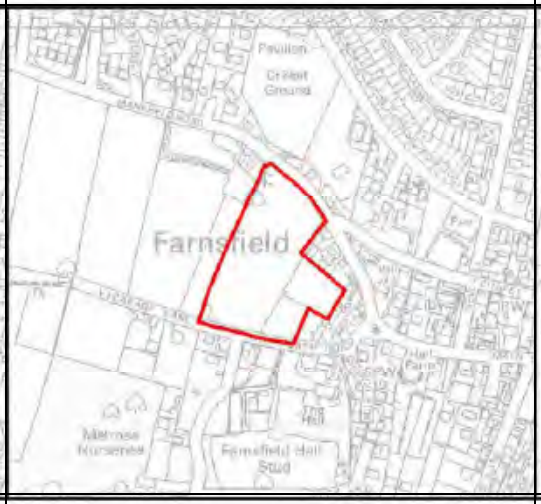
Functional Floodplain

The site is located out of the functional floodplain.



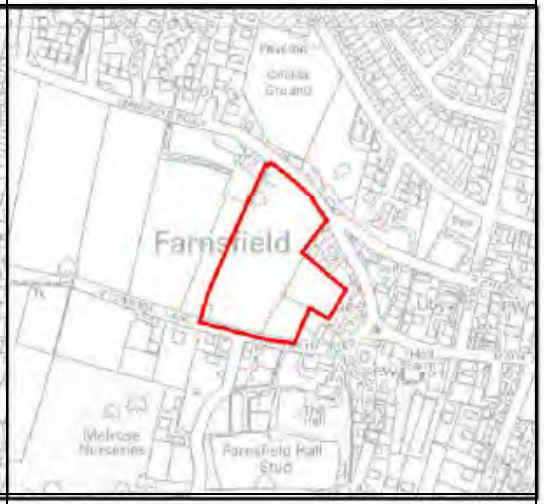
Historical Flooding

No records of historical flooding have been received for the site. This does not mean that flooding has not occurred as these events may not have been recorded. Investigations into historical flooding of the area should be undertaken as part of a site specific FRA.



Flood Warning Areas

Not shown as being located within a Flood Warning Area.



Flood Defences

There are no flood defences close to the site.

The IDB maintain a number of raised defences which developers should identify in a site specific FRA.

Site Name: 4 – North of Alexander Avenue
Location: Newark on Trent (OS Grid Ref: 480520, 355948)

Site Size: 0.813 hectares

Existing Site Use: Greenfield

Proposed Site Use: 17 Dwellings

Vulnerability Classification: More Vulnerable

Surface Water Flood Risk:

The locally agreed surface water information maps indicate the site is located within close proximity to an area susceptible to surface water flooding. Therefore, further assessment of surface water flood risk should be included within any site specific flood risk assessment.

Proposed surface water drainage is a key factor to the viability of any development that may occur on this site and must not place extra pressure on the existing drainage regime.

Safe Access and Egress:

The approach should be taken whereby access to and from the site is away from the area shown as located within the flood extent. This area should be free from development.

Safe access looks viable to the east of the site based on hazard mapping within this SFRA.

Minimum Finished Floor Levels:

Finished floor levels must be set above the maximum flood depth, the EA general requirement is a 600mm freeboard for residential. If single storey dwellings are proposed this is essential. Where this is not possible then a range of measures including flood resilient construction must be considered.

This is subject to EA approval and discussions.

Flood Risk Assessment Requirements:

Any sites located within Flood Zone 2 or 3 regardless of size will require an FRA.

Climate change should be taken in to account when assessing flood risk from any source. The lifetime of the development will guide the allowance required for climate change, in accordance with the NPPF.

Flood risk from surface water will need to be assessed as part of any FRA, with a drainage strategy provided to ensure that the development does not flood during low annual probability rainfall events or exacerbate the flood risk off-site.

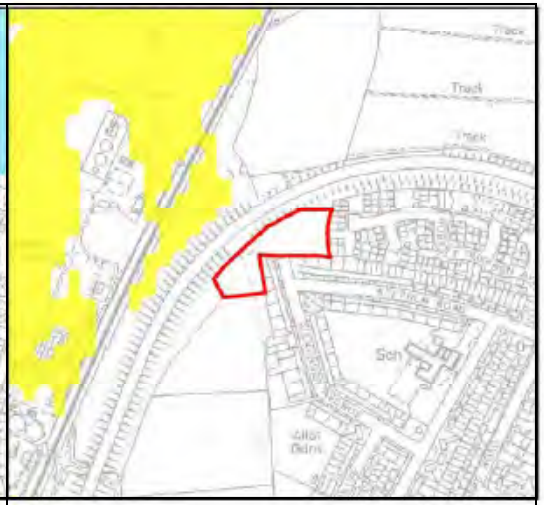
The sequential approach should be applied to the site to avoid development within any areas likely to flood. Flood resilient construction should also be considered.

Approval will be required from the LLFA or IDB if there is an increase in surface water discharge from the site to any watercourse other than a designated main river. Any discharge of surface water to a main river will require EA consent.

Residual risk using hazard mapping should be included within the FRA.

Flood Map

The site is located primarily within Flood Zone 1 – Low probability of flooding from fluvial and tidal sources, with approximately 40% of the western end of the site in Flood Zone 2 (medium probability).



Functional Floodplain

The site is not located within functional floodplain.

Historical Flooding

The western end of the site is located in an area that has flooded historically, lining up with the Flood Zone 2 extent from the Flood Map.

Flood Warning Areas

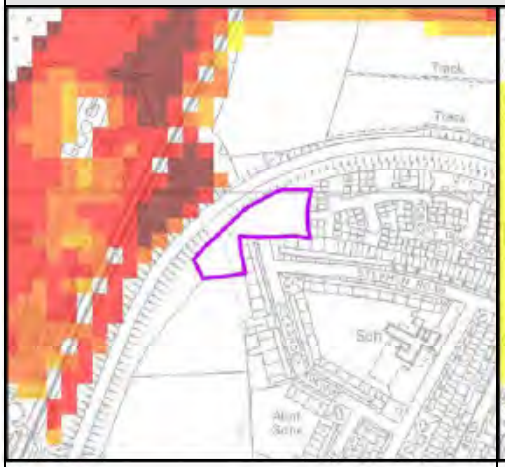
There is no flood warning area covering the site. A Flood Plan should be provided detailing what residents / occupants should do to prepare for flood events, and what to do if the development floods. Safe escape / safe refuge details should be provided as part of a Flood Plan along with information on the EA Flood Warning system.

Flood Defences

There are no flood defences close to the site. Embankments associated with the railway track do provide some form of informal protection of the site, this can be seen on the hazard mapping.

The IDB maintain a number of raised defences which developers should identify in a site specific FRA.

Site Name: 4 – North of Alexander Avenue
Location: Newark on Trent (OS Grid Ref: 480520, 355948)



100CC - Depth

It can be seen on Figure 1647-F-1.1 that the site is not located within a hazard extent therefore there are no flood depths associated with the site during the 1 in 100 year plus climate change event.

100CC - Velocity

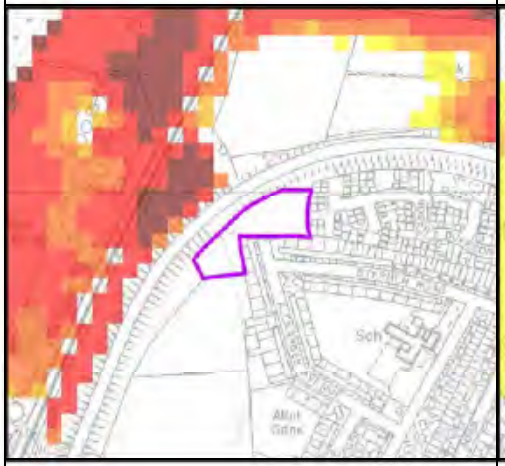
It can be seen on Figure 1647-F-2.1 that the site is not located within a hazard extent therefore there are no flood depths associated with the site during the 1 in 100 year plus climate change event.

100CC - Hazard

It can be seen on Figure 1647-F-3.1 that the site is not located within a hazard extent therefore there are no flood depths associated with the site during the 1 in 100 year plus climate change event.

100CC - Time to Inundation

It can be seen on Figure 1647-F-4.1 that the site is not located within the flood extent.



1000 - Depth

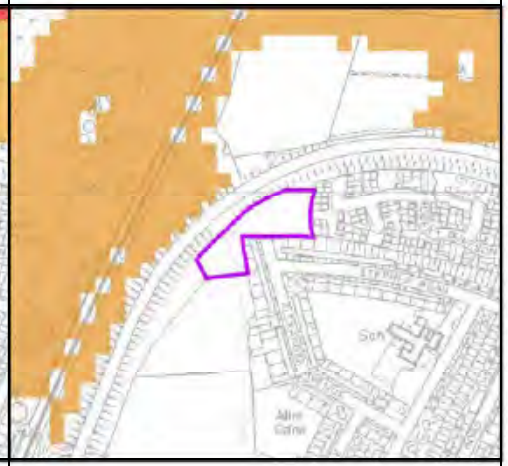
It can be seen on Figure 1647-F-1.2 that the site is not located within a hazard extent therefore there are no flood depths associated with the site during the 1 in 1000 year event.

1000 - Velocity

It can be seen on Figure 1647-F-2.2 that the site is not located within a hazard extent therefore there are no flood depths associated with the site during the 1 in 1000 year event.

1000 - Hazard

It can be seen on Figure 1647-F-3.2 that the site is not located within a hazard extent therefore there are no flood depths associated with the site during the 1 in 1000 year event.



1000 - Time to Inundation

It can be seen on Figure 1647-F-4.2 that the site is not located within the flood extent.

Site Name: 5 – North of Lake View School
Location: Rainworth (OS Grid Ref: 458735, 358161)

Site Size: 0.84 hectares

Existing Site Use: Greenfield

Proposed Site Use: Residential

Vulnerability Classification: More Vulnerable

Surface Water Flood Risk:

The locally agreed surface water information maps indicate the site is located within close proximity to an area susceptible to surface water flooding. Therefore, further assessment of surface water flood risk should be included within any site specific flood risk assessment.

Proposed surface water drainage is a key factor to the viability of the project and must not place extra pressure on the existing drainage regime.

Safe Access and Egress:

The approach should be taken whereby access to and from the site is away from the area shown as located within the flood extent. This area should be free from development.

Safe access looks viable to the east of the site based on hazard mapping within this SFRA.

Minimum Finished Floor Levels:

Hazard mapping included within this SFRA shows the site does not suffer from flooding therefore FFL should be at least 300mm above existing ground level.

This is subject to EA approval and discussions.

Flood Risk Assessment Requirements:

Any sites located within Flood Zone 2 or 3 regardless of size will require an FRA.

Climate change should be taken in to account when assessing flood risk from any source. The lifetime of the development will guide the allowance required for climate change, in accordance with the NPPF.

Flood risk from surface water will need to be assessed as part of any FRA, with a drainage strategy provided to ensure that the development does not flood during low annual probability rainfall events or exacerbate the flood risk off-site.

The sequential approach should be applied to the site to avoid development within any areas likely to flood. An easement free from development may also be required within the development layout for the adjacent watercourse.

Approval will be required from the LLFA or IDB if there is an increase in surface water discharge from the site to any watercourse other than a designated main river. Any discharge of surface water to a main river will require EA consent.

Flood Map

The site is located primarily within Flood Zone 1 – Low probability of flooding from fluvial and tidal sources, with approximately 20% of the site in Flood Zone 2 and 3 (medium and high probability respectively). The site will therefore need to be assessed based on Flood Zone 3 criteria.

Functional Floodplain

The site is not located within functional floodplain.

Historical Flooding

No records of historical flooding have been received for the site. This does not mean that flooding has not occurred as these events may not have been recorded. Investigations into historical flooding of the area should be undertaken as part of a site specific FRA.

Flood Warning Areas

There is no flood warning area covering the site. A Flood Plan should be provided detailing what residents / occupants should do to prepare for flood events, and what to do if the development floods. Safe escape / safe refuge details should be provided as part of a Flood Plan along with information on the EA Flood Warning system.

Flood Defences

There are no flood defences close to the site.

Site Name: 5 – North of Lake View School
Location: Rainworth (OS Grid Ref: 458735, 358161)

100CC - Depth

It can be seen on Figure 1647-F-1.1 that the site is not located within a hazard extent therefore there are no flood depths associated with the site during the 1 in 100 year plus climate change event.

100CC - Velocity

It can be seen on Figure 1647-F-2.1 that the site is not located within a hazard extent therefore there are no flood depths associated with the site during the 1 in 100 year plus climate change event.

100CC - Hazard

It can be seen on Figure 1647-F-3.1 that the site is not located within a hazard extent therefore there are no flood depths associated with the site during the 1 in 100 year plus climate change event.

100CC - Time to Inundation

It can be seen on Figure 1647-F-4.1 that the site is not located within the flood extent.

1000 - Depth

It can be seen on Figure 1647-F-1.2 that the site is not located within a hazard extent therefore there are no flood depths associated with the site during the 1 in 1000 year event.

1000 - Velocity

It can be seen on Figure 1647-F-2.2 that the site is not located within a hazard extent therefore there are no flood depths associated with the site during the 1 in 1000 year event.

1000 - Hazard

It can be seen on Figure 1647-F-3.2 that the site is not located within a hazard extent therefore there are no flood depths associated with the site during the 1 in 1000 year event.

1000 - Time to Inundation

It can be seen on Figure 1647-F-4.2 that the site is not located within the flood extent.

Site Name: 6 – North of Barnby Road
Location: Newark-on-Trent (OS Grid Ref: 481025, 353312)

Site Size: 3.07 hectares

Existing Site Use: Greenfield

Proposed Site Use: Residential

Vulnerability Classification: More Vulnerable

Surface Water Flood Risk:

The locally agreed surface water information maps indicate the site is located within close proximity to an area susceptible to surface water flooding. Therefore, further assessment of surface water flood risk should be included with the site specific flood risk assessment.

Proposed surface water drainage is a key factor to the viability of the project and must not place extra pressure on the existing drainage regime.

Safe Access and Egress:

The site is located in Flood Zone 1 and is not affected by or surrounded by flooding, therefore safe access and egress is not applicable.

Minimum Finished Floor Levels:

It is advisable for finished floor levels to be 150mm to 300mm above ground levels to ensure that any surface water flooding would not enter properties and cause damage.

Flood Risk Assessment Requirements:

A Flood Risk Assessment (FRA) will be required by the Environment Agency for any site over 1 hectare in size.

Climate change should be taken in to account when assessing flood risk from any source. The lifetime of the development will guide the allowance required for climate change, in accordance with the NPPF.

Flood risk from surface water will need to be assessed as part of any FRA, with a drainage strategy provided to ensure that the development does not flood during low annual probability rainfall events or exacerbate the flood risk off site.

Approval will be required from the LLFA or IDB if there is an increase in surface water discharge from the site to any watercourse other than a designated main river. Any discharge of surface water to a main river will require EA consent.

Flood Map

Site is located in Flood Zone 1 – Low probability of flooding from fluvial and tidal sources.

Functional Floodplain

The site is not located within functional floodplain.

Historical Flooding

No records of historical flooding have been received for the site. This does not mean that flooding has not occurred as these events may not have been recorded. Investigations into historical flooding of the area should be undertaken as part of a site specific FRA.

Flood Warning Areas

Not shown as being located within a Flood Warning Area.

Flood Defences

There are no flood defences close to the site.

The IDB maintain a number of raised defences which developers should identify in a site specific FRA.

Site Name: 6 – North of Barnby Road
Location: Newark-on-Trent (OS Grid Ref: 481025, 353312)

100CC - Depth

It can be seen on Figure 1647-F-1.1 that the site is not located within a hazard extent therefore there are no flood depths associated with the site during the 1 in 100 year plus climate change event.

100CC - Velocity

It can be seen on Figure 1647-F-2.1 that the site is not located within a hazard extent therefore there are no flood depths associated with the site during the 1 in 100 year plus climate change event.

100CC - Hazard

It can be seen on Figure 1647-F-3.1 that the site is not located within a hazard extent therefore there are no flood depths associated with the site during the 1 in 100 year plus climate change event.

100CC - Time to Inundation

It can be seen on Figure 1647-F-4.1 that the site is not located within the flood extent.

1000 - Depth

It can be seen on Figure 1647-F-1.2 that the site is not located within a hazard extent therefore there are no flood depths associated with the site during the 1 in 1000 year event.

1000 - Velocity

It can be seen on Figure 1647-F-2.2 that the site is not located within a hazard extent therefore there are no flood depths associated with the site during the 1 in 1000 year event.

1000 - Hazard

It can be seen on Figure 1647-F-3.2 that the site is not located within a hazard extent therefore there are no flood depths associated with the site during the 1 in 1000 year event.

1000 - Time to Inundation

It can be seen on Figure 1647-F-4.2 that the site is not located within the flood extent.

Site Name: 7 – Millgate
Location: Newark-on-Trent (OS Grid Ref: 479131, 353456)

Site Size: 2.2 hectares

Existing Site Use: Greenfield

Proposed Site Use: 69 Dwellings

Vulnerability Classification: More Vulnerable

Surface Water Flood Risk:

The locally agreed surface water information maps indicate the site is located in an area susceptible to surface water flooding to an intermediate level. Therefore, further assessment of surface water flood risk should be included with the site specific flood risk assessment.

Proposed surface water drainage is a key factor to the viability of the project and must not place extra pressure on the existing drainage regime.

Safe Access and Egress:

Safe / dry access and egress should be provided for all future residents of the site. Residents should be directed away from offsite flood areas.

Safe access appears viable to the south-east of the site based on the hazard mapping for the site.

Minimum Finished Floor Levels:

Finished floor levels must be set above the maximum flood depth, the EA general requirement is a 600mm freeboard for residential. If single storey dwellings are proposed this is essential. Where this is not possible then a range of measures including flood resilient construction must be considered.

This is subject to EA approval and discussions.

Flood Risk Assessment Requirements:

Any sites located within Flood Zone 2 or 3 regardless of size will require an FRA.

Climate change should be taken in to account when assessing flood risk from any source. The lifetime of the development will guide the allowance required for climate change, in accordance with the NPPF.

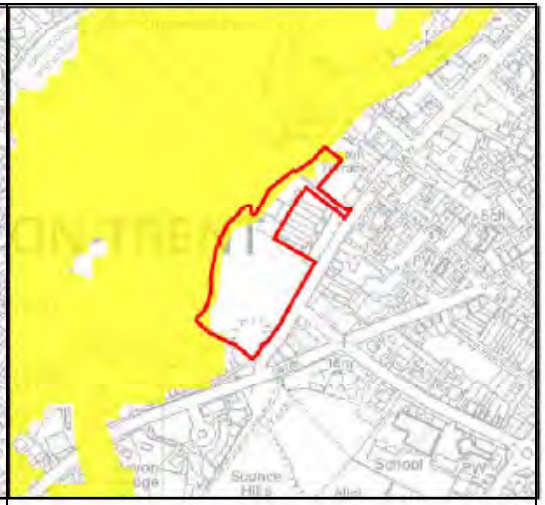
Flood risk from surface water will need to be assessed as part of any FRA, with a drainage strategy provided to ensure that the development does not flood during low annual probability rainfall events or exacerbate the flood risk off-site.

The sequential approach should be applied to the site whereby development is to be located in Zone 1 area of the site only and to avoid developing within any areas likely to flood. No development should be located within the functional floodplain. Flood resilient construction should be considered.

Approval will be required from the LLFA or IDB if there is an increase in surface water discharge from the site to any watercourse other than a designated main river. Any discharge of surface water to a main river will require EA consent. A Flood Plan is also required for the site.

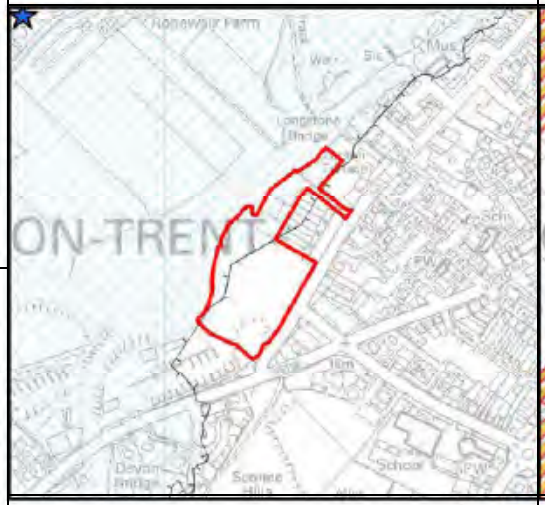
Flood Map

The site is located partly within Flood Zone 1 – Low probability of flooding from fluvial and tidal sources, with approximately 50% of the site to the north / west in Flood Zone 2 and 3 (medium and high probability respectively).



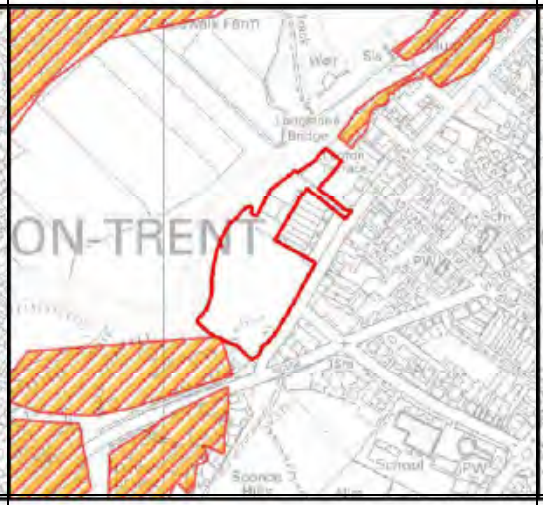
Functional Floodplain

The north west of the site is located within functional floodplain.



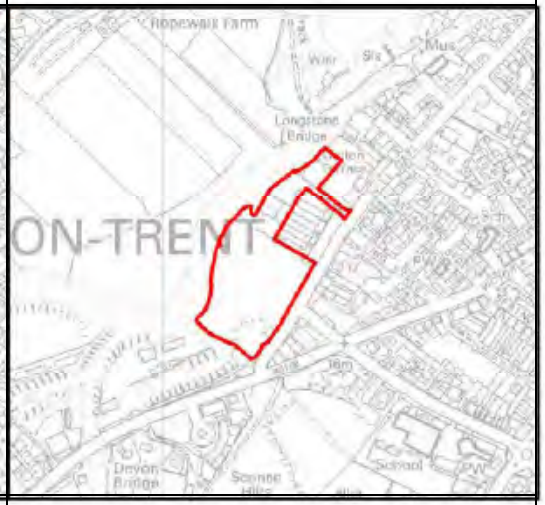
Historical Flooding

Historic flood records show previous flooding occurring within the northern part of the site.



Flood Warning Areas

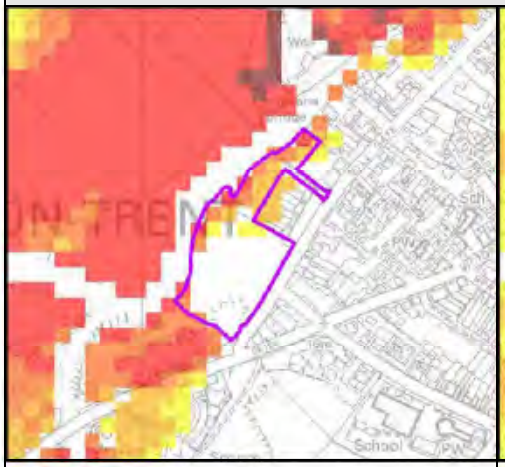
There is no flood warning area covering the site. A Flood Plan should be provided detailing what residents / occupants should do to prepare for flood events, and what to do if the development floods. Safe escape / safe refuge details should be provided as part of a Flood Plan along with information on the EA Flood Warning system.



Flood Defences

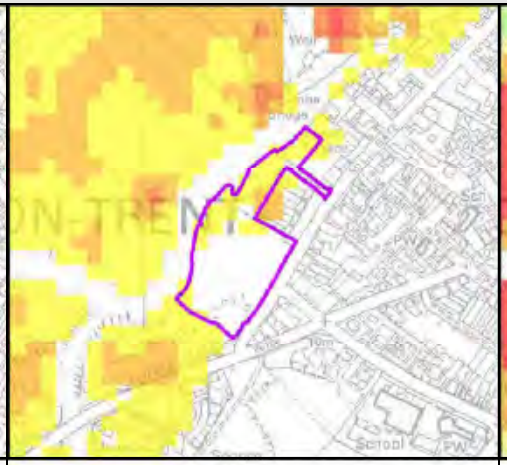
There are no flood defences close to the site.

Site Name: 7 – Millgate
Location: Newark-on-Trent (OS Grid Ref: 479131, 353456)



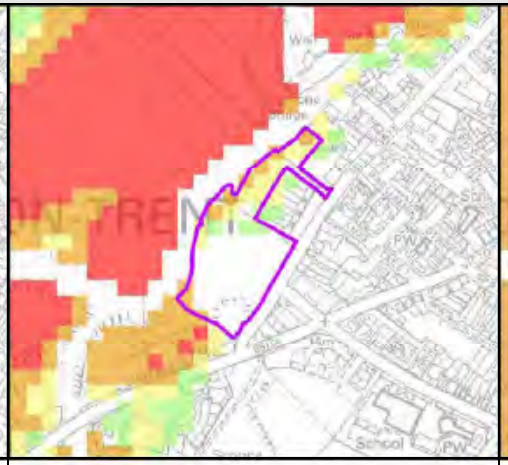
100CC - Depth

It can be seen on Figure 1647-F-1.1 that the site is located within an area that would be inundated by water to a depth of between 0.5 and 2.0m.



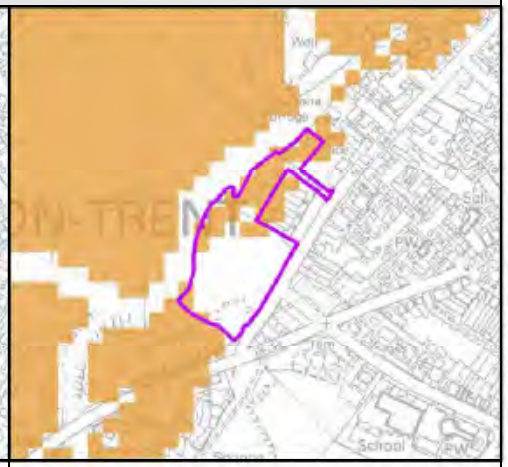
100CC - Velocity

When referencing Figure 1647-F-2.1 it can be seen that the site experiences velocities of flood water between 0.3 to 1.5 m/s.



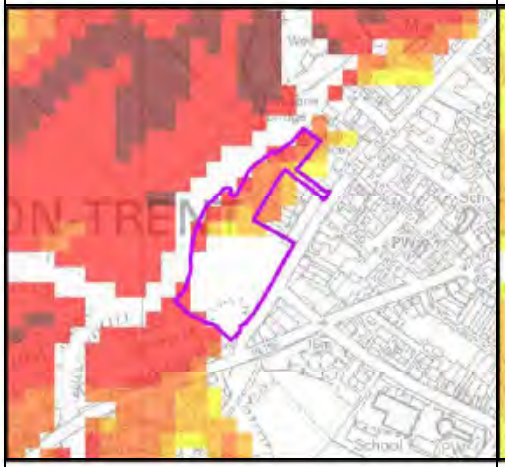
100CC - Hazard

With reference to Figure 1647-F-3.1 it can be seen that the site is located within an area of greater than 2m (Danger for All) as defined by FD2320 Flood Risk to People.



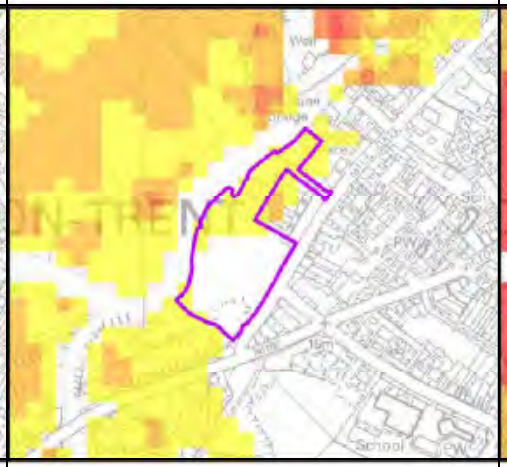
100CC - Time to Inundation

Figure 1647-F-4.1 shows that the time to inundation for the areas of site affected by flooding is between 80 and 90 hours from the initial rainfall event.



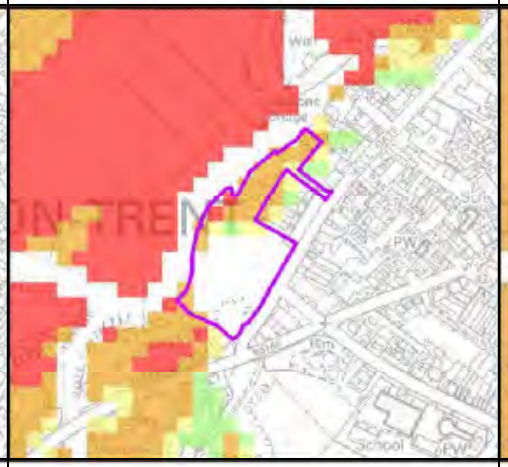
1000 - Depth

It can be seen on Figure 1647-F-1.2 that the site is located within an area that would be inundated by water to a depth of between 0.5 and 2.0m.



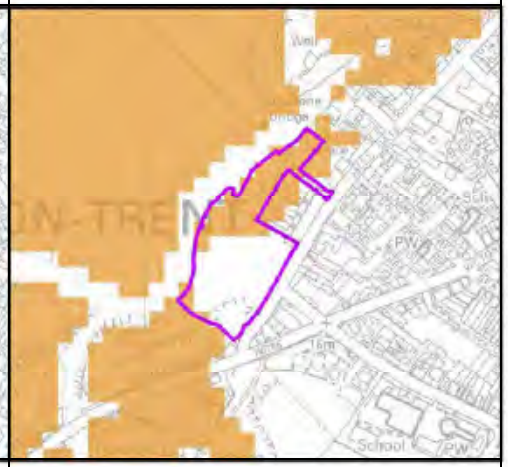
1000 - Velocity

When referencing Figure 1647-F-2.2 it can be seen that the site experiences velocities of flood water between 0.3 to 1.5 m/s.



1000 - Hazard

With reference to Figure 1647-F-3.2 it can be seen that the site is located within an area of greater than 2m (Danger for All) as defined by FD2320 Flood Risk to People.



1000 - Time to Inundation

Figure 1647-F-4.2 shows that the time to inundation for the areas of site affected by flooding is between 80 and 90 hours from the initial rainfall event.

Site Name: 8 – North Gate
Location: Newark-on-Trent (OS Grid Ref: 480034, 354494)

Site Size: 1.65 hectares

Existing Site Use: Greenfield

Proposed Site Use: 53 Dwellings

Vulnerability Classification: More Vulnerable

Surface Water Flood Risk:

The locally agreed surface water information maps indicate the site is located in an area susceptible to surface water flooding to an intermediate level. Therefore, further assessment of surface water flood risk should be included with the site specific flood risk assessment.

Proposed surface water drainage is a key factor to the viability of the project and must not place extra pressure on the existing drainage regime.

Safe Access and Egress:

Safe / dry access and egress should be provided for all future residents of the site. Residents should be directed away from offsite flood areas.

Safe access appears viable to the south-east of the site based on the hazard mapping for the site.

Minimum Finished Floor Levels:

Finished floor levels must be set above the maximum flood depth, the EA general requirement is a 600mm freeboard for residential. If single storey dwellings are proposed this is essential. Where this is not possible then a range of measures including flood resilient construction must be considered.

This is subject to EA approval and discussions.

Flood Risk Assessment Requirements:

Any sites located within Flood Zone 2 or 3 regardless of size will require an FRA.

Climate change should be taken in to account when assessing flood risk from any source. The lifetime of the development will guide the allowance required for climate change, in accordance with the NPPF.

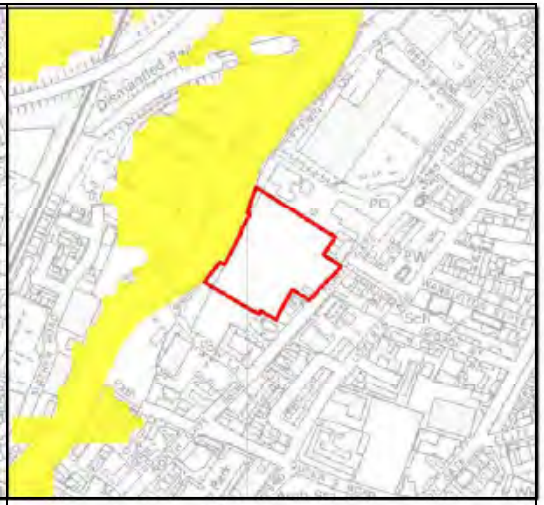
Flood risk from surface water will need to be assessed as part of any FRA, with a drainage strategy provided to ensure that the development does not flood during low annual probability rainfall events or exacerbate the flood risk off-site.

The sequential approach should be applied to the site whereby development is to be located in areas not likely to flood and to avoid developing within any areas likely to flood. Flood resilient construction should also be considered.

Approval will be required from the LLFA or IDB if there is an increase in surface water discharge from the site to any watercourse other than a designated main river. Any discharge of surface water to a main river will require EA consent.

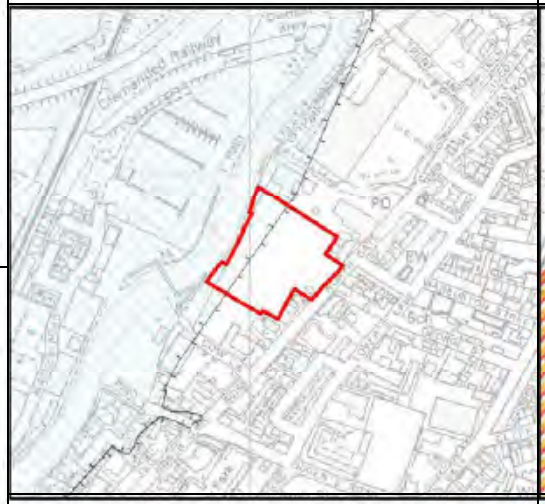
Flood Map

The site has approximately 5% of its site area within Flood Zone 3 and approximately 75% of the site area within Flood Zone 2.



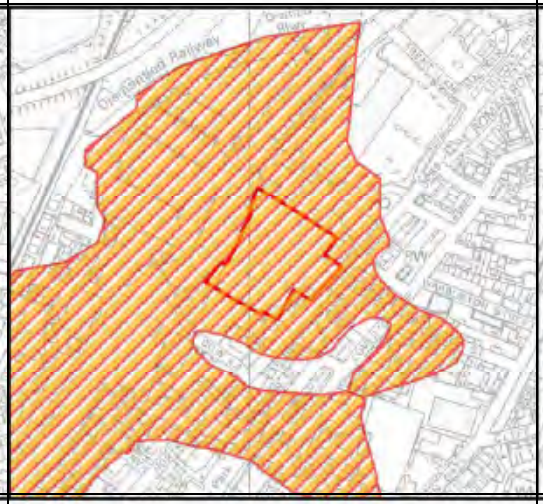
Functional Floodplain

The north west of the site borders on functional floodplain.



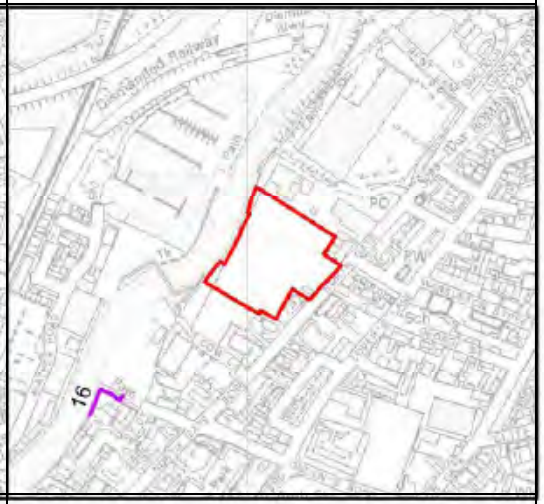
Historical Flooding

Historic flood records show previous flooding occurring within the northern and western parts of the site.



Flood Warning Areas

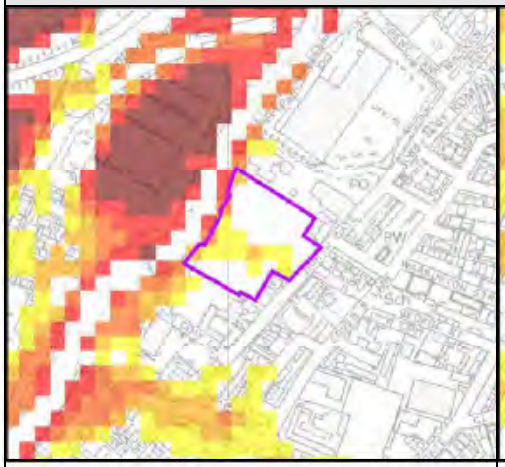
The site is located within a Flood Warning Area. There is no flood warning area covering the site. A Flood Plan should be provided detailing what residents / occupants should do to prepare for flood events, and what to do if the development floods. Safe escape / safe refuge details should be provided as part of a Flood Plan along with information on the EA Flood Warning system.



Flood Defences

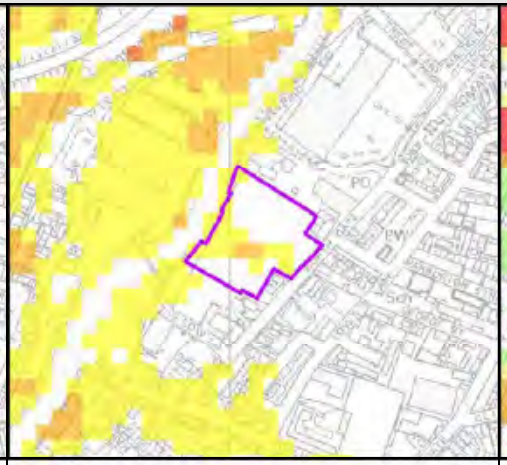
There are no flood defences close to the site which have an impact on the flooding on site.

Site Name: 8 – North Gate
Location: Newark-on-Trent (OS Grid Ref: 480034, 354494)



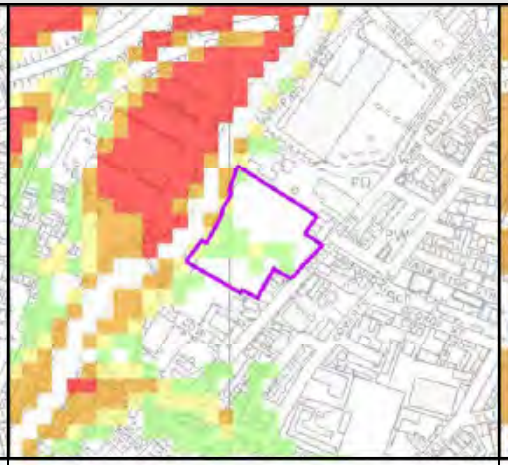
100CC - Depth

It can be seen on Figure 1647-F-1.1 that the site is located within an area that would be inundated by water to a depth of between 0.5 and 2.0m.



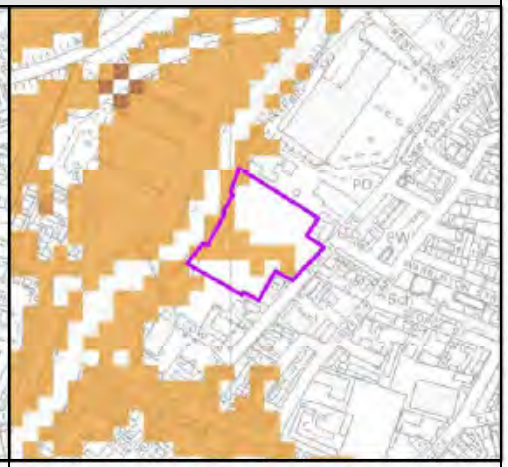
100CC - Velocity

When referencing Figure 1647-F-2.1 it can be seen that the site experiences velocities of flood water between 0 to 1 m/s.



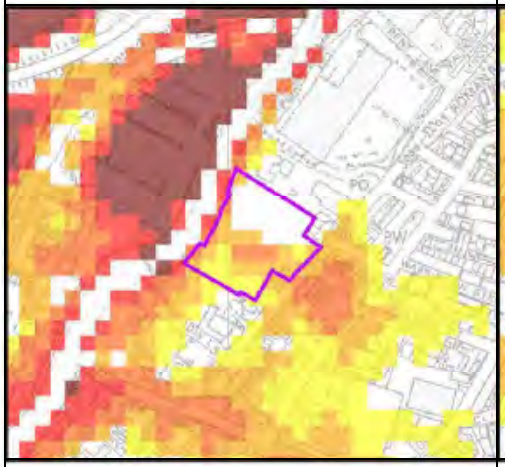
100CC - Hazard

With reference to Figure 1647-F-3.1 it can be seen that the site is located within an area which experiences a range of hazards from Less than 0.75 (Low Hazard) to Greater than 2 (Danger for All), as defined by FD2320 Flood Risk to People.



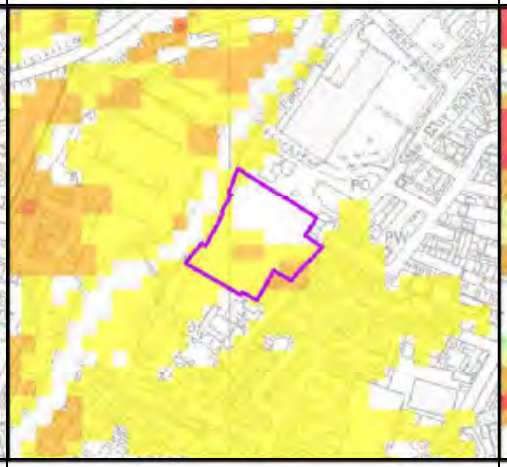
100CC - Time to Inundation

Figure 1647-F-4.1 shows that the time to inundation for the areas of site affected by flooding is between 80 and 90 hours from the initial rainfall event.



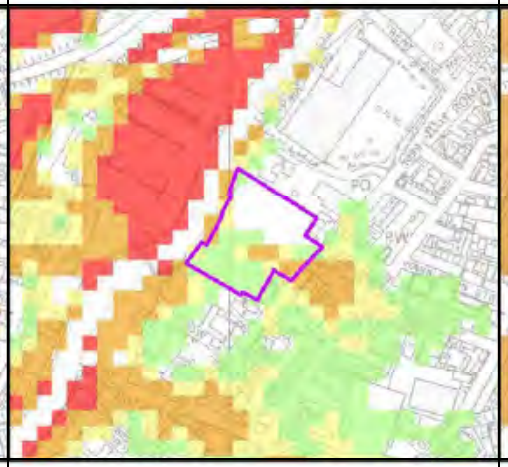
1000 - Depth

It can be seen on Figure 1647-F-1.2 that the site is located within an area that would be inundated by water to a depth of between 0.5 and 2.0m.



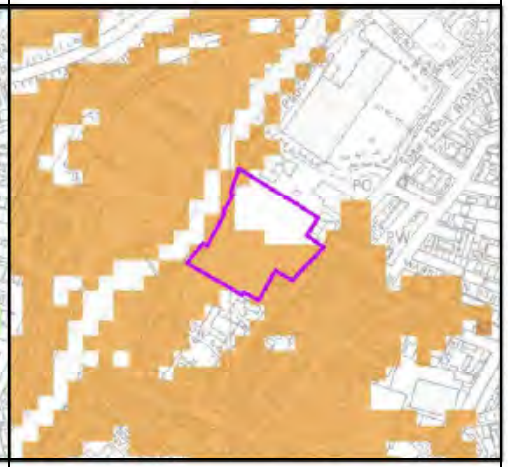
1000 - Velocity

When referencing Figure 1647-F-2.2 it can be seen that the site experiences velocities of flood water between 0 to 1 m/s.



1000 - Hazard

With reference to Figure 1647-F-3.2 it can be seen that the site is located within an area which experiences a range of hazards from 0.75 (Danger to Some) to Greater than 2 (Danger for All), as defined by FD2320 Flood Risk to People.



1000 - Time to Inundation

Figure 1647-F-4.2 shows that the time to inundation for the areas of site affected by flooding is between 80 and 90 hours from the initial rainfall event.

Site Name: 9 – North of Sleaford Road
Location: Newark-on-Trent (OS Grid Ref: 480359, 354179)

Site Size: 0.69 hectares

Existing Site Use: Brownfield (currently in use)

Proposed Site Use: Residential

Vulnerability Classification: More Vulnerable

Surface Water Flood Risk:

The locally agreed surface water information maps indicate the site is located within close proximity to an area susceptible to surface water flooding to a level classed as Less. Therefore, further assessment of surface water flood risk should be included with the site specific flood risk assessment.

Proposed surface water drainage is a key factor to the viability of the project and must not place extra pressure on the existing drainage regime.

Safe Access and Egress:

Safe / dry access and egress should be provided for all future residents of the site. Residents should be directed away from offsite flood areas.

Safe access appears viable to the south-east of the site based on the hazard mapping for the site.

Minimum Finished Floor Levels:

Finished floor levels must be set above the maximum flood depth, the EA general requirement is a 600mm freeboard for residential. If single storey dwellings are proposed this is essential. Where this is not possible then a range of measures including flood resilient construction must be considered.

This is subject to EA approval and discussions.

Flood Risk Assessment Requirements:

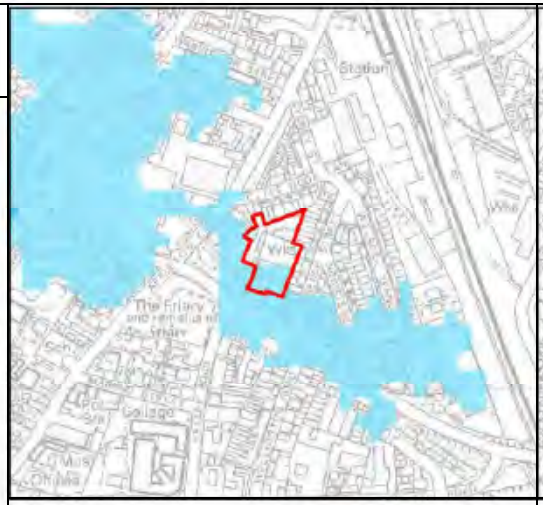
Any sites located within Flood Zone 2 or 3 regardless of size will require an FRA.

Climate change should be taken in to account when assessing flood risk from any source. The lifetime of the development will guide the allowance required for climate change, in accordance with the NPPF.

Flood risk from surface water will need to be assessed as part of any FRA, with a drainage strategy provided to ensure that the development does not flood during low annual probability rainfall events or exacerbate the flood risk off-site.

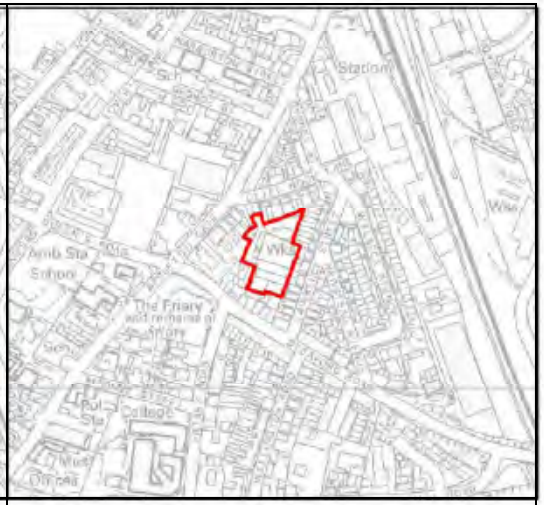
The sequential approach should be applied to the site whereby development is to be located in Zone 1 area of the site only and to avoid developing within any areas likely to flood. Flood resilient construction should also be considered.

Approval will be required from the LLFA or IDB if there is an increase in surface water discharge from the site to any watercourse other than a designated main river. Any discharge of surface water to a main river will require EA consent.



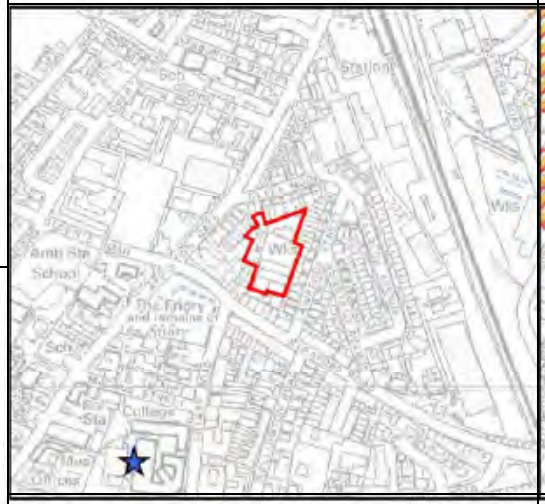
Flood Map

The site has approximately 40% of its area located within Flood Zone 2 based on the current flood map (medium probability of flooding).



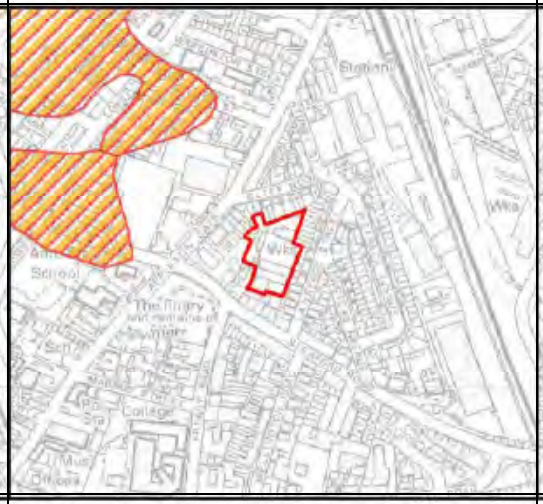
Functional Floodplain

The site is located away from the functional floodplain.



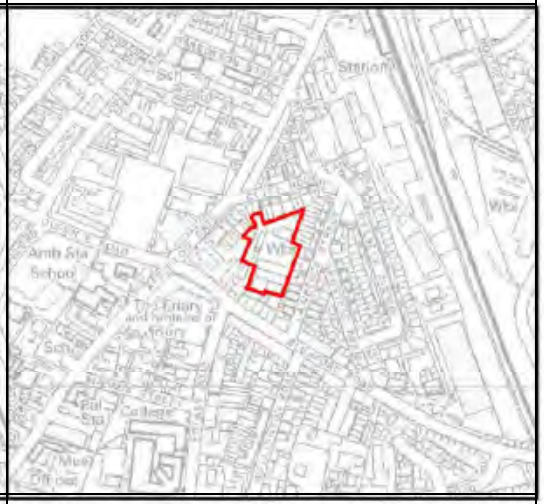
Historical Flooding

No records of historical flooding have been received for the site. This does not mean that flooding has not occurred as these events may not have been recorded. Investigations into historical flooding of the area should be undertaken as part of a site specific FRA.



Flood Warning Areas

There is no flood warning area covering the site. A Flood Plan should be provided detailing what residents / occupants should do to prepare for flood events, and what to do if the development floods. Safe escape / safe refuge details should be provided as part of a Flood Plan along with information on the EA Flood Warning system.

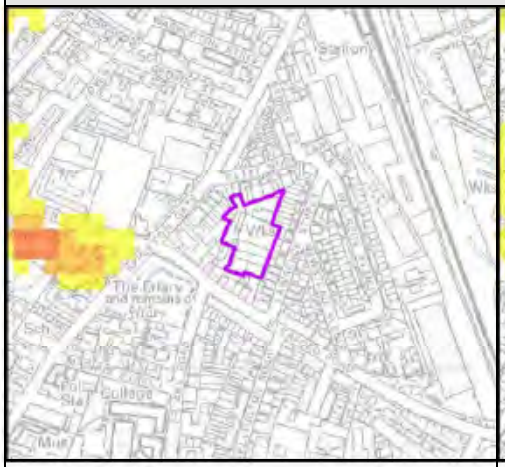


Flood Defences

There are no flood defences close to the site.

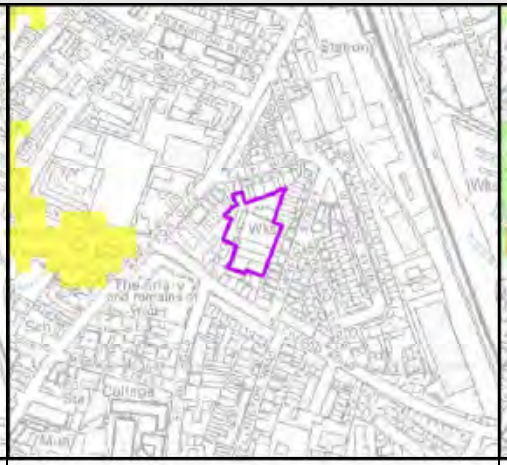
The IDB maintain a number of raised defences which developers should identify in a site specific FRA.

Site Name: 9 – North of Sleaford Road
Location: Newark-on-Trent (OS Grid Ref: 480359, 354179)



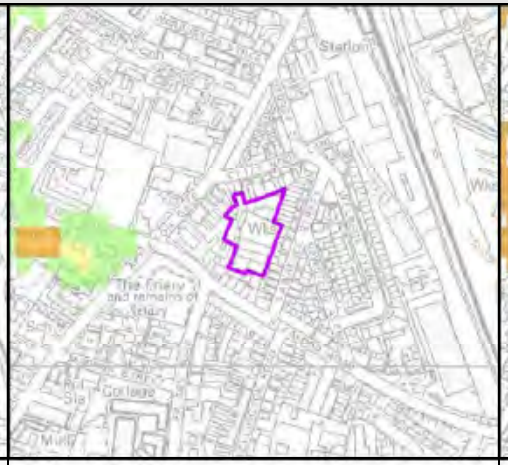
100CC - Depth

It can be seen on Figure 1647-F-1.1 that the site is not located within a hazard extent therefore there are no flood depths associated with the site during the 1 in 100 year plus climate change event.



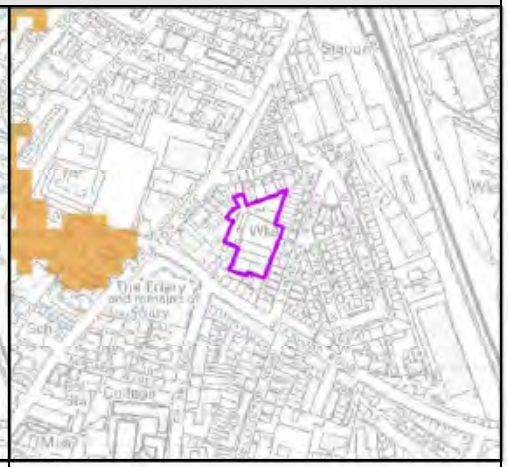
100CC - Velocity

It can be seen on Figure 1647-F-2.1 that the site is not located within a hazard extent therefore there are no flood depths associated with the site during the 1 in 100 year plus climate change event.



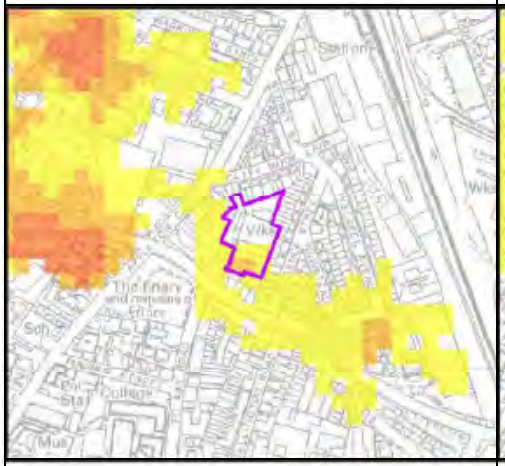
100CC - Hazard

It can be seen on Figure 1647-F-3.1 that the site is not located within a hazard extent therefore there are no flood depths associated with the site during the 1 in 100 year plus climate change event.



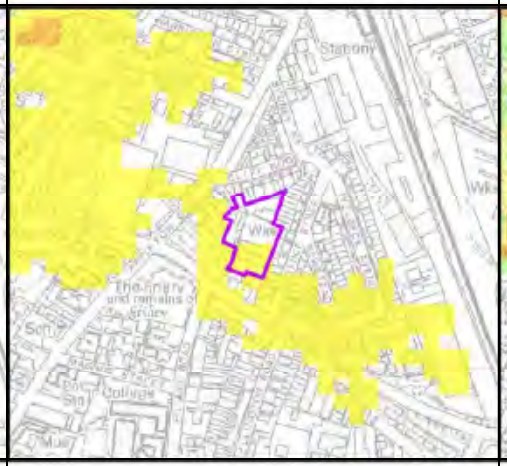
100CC - Time to Inundation

Figure 1647-F-4.1 shows that the site is not affected by flooding.



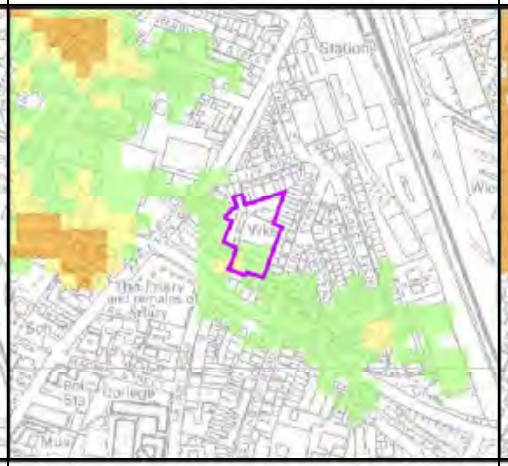
1000 - Depth

It can be seen on Figure 1647-F-1.2 that the site is located within an area that would be inundated by water to a depth of between 0 and 0.5m.



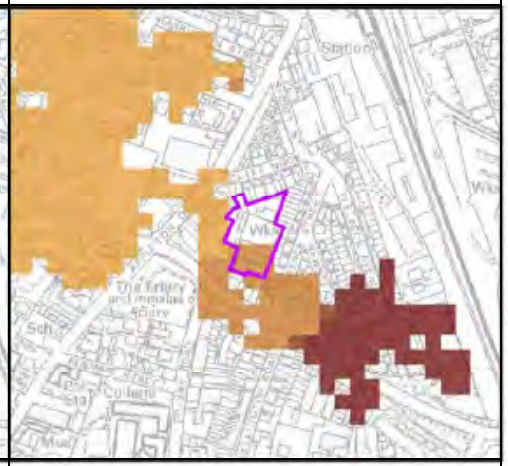
1000 - Velocity

It can be seen on Figure 1647-F-2.2 that the site is experiences velocities of flood water between 0 and 0.3m/s.



1000 - Hazard

It can be seen on Figure 1647-F-3.2 that the site is located in an area between Less than 0.75 (Low Hazard) and 1.25 (Danger to Some) as defined by DF 2320 Flood Risk to People.



1000 - Time to Inundation

Figure 1647-F-4.2 shows that the time to inundation for the areas of site affected by flooding is approximately 90 hours from the initial rainfall event.

Site Name: 10 – Kirklington Road
Location: Rainworth (OS Grid Ref: 459102, 358429)

Site Size: 0.62 hectares

Existing Site Use: Greenfield

Proposed Site Use: 6 dwellings

Vulnerability Classification: More Vulnerable

Surface Water Flood Risk:

The locally agreed surface water information maps indicate the site is located within an area susceptible to surface water flooding. Therefore, further assessment of surface water flood risk should be included with the site specific flood risk assessment.

Proposed surface water drainage is a key factor to the viability of the project and must not place extra pressure on the existing drainage regime.

Safe Access and Egress:

The approach should be taken whereby access to and from the site is away from the area shown as located within the flood extent. This area should be free from development.

Minimum Finished Floor Levels:

Finished floor levels must be set above the maximum flood depth, the EA general requirement is a 600mm freeboard for residential. If single storey dwellings are proposed this is essential. Where this is not possible then a range of measures including flood resilient construction must be considered.

This is subject to EA approval and discussions.

Flood Risk Assessment Requirements:

A Flood Risk Assessment (FRA) will be required by the Environment Agency for the site due to the Flood Zone 2 extent and proximity to an existing culvert.

Climate change should be taken in to account when assessing flood risk from any source. The lifetime of the development will guide the allowance required for climate change, in accordance with the NPPF.

Flood risk from surface water will need to be assessed as part of any FRA, with a drainage strategy provided to ensure that the development does not flood during low annual probability rainfall events or exacerbate the flood risk off site.

The sequential approach should be applied to the site whereby development is to be located in Zone 1 area of the site only and to avoid developing within any areas likely to flood. Flood resilient construction should also be considered.

A Culvert which is located at the site needs to be investigated as part of the site specific FRA and flood risk associated to the site by this culvert. The EA should be consulted regarding this.

Flood Map

The site is primarily located entirely within Flood Zone 1 based on the existing flood map with a marginal amount located in Zone 2 to the north.

Functional Floodplain

The site is located away from the functional floodplain.

Historical Flooding

No records of historical flooding have been received for the site. This does not mean that flooding has not occurred as these events may not have been recorded. Investigations into historical flooding of the area should be undertaken as part of a site specific FRA.

Flood Warning Areas

Not shown as being located within a Flood Warning Area.

Flood Defences

There are no flood defences close to the site.

Site Name: 11 – West of Rufford Colliery
Location: Rainworth (OS Grid Ref: 459042, 358652)

Site Size: 5.5 hectares

Existing Site Use: Greenfield

Proposed Site Use: 125 dwellings

Vulnerability Classification: More Vulnerable

Surface Water Flood Risk:

The locally agreed surface water information maps indicate the site is located in an area susceptible to surface water flooding. Therefore, further assessment of surface water flood risk should be included with the site specific flood risk assessment.

Proposed surface water drainage is a key factor to the viability of the project and must not place extra pressure on the existing drainage regime.

Safe Access and Egress:

The approach should be taken whereby access to and from the site is away from the area shown as located within the flood extent. This area should be free from development.

Minimum Finished Floor Levels:

Finished floor levels must be set above the maximum flood depth, the EA general requirement is a 600mm freeboard for residential. If single storey dwellings are proposed this is essential. Where this is not possible then a range of measures including flood resilient construction must be considered.

This is subject to EA approval and discussions.

Flood Risk Assessment Requirements:

Any sites located within Flood Zone 2 or 3 regardless of size will require an FRA.

Climate change should be taken in to account when assessing flood risk from any source. The lifetime of the development will guide the allowance required for climate change, in accordance with the NPPF.

Flood risk from surface water will need to be assessed as part of any FRA, with a drainage strategy provided to ensure that the development does not flood during low annual probability rainfall events or exacerbate the flood risk off-site.

The sequential approach should be applied to the site whereby development is to be located in Zone 1 area of the site only and to avoid developing within any areas likely to flood. Flood resilient construction should also be considered.

Approval will be required from the LLFA or IDB if there is an increase in surface water discharge from the site to any watercourse other than a designated main river. Any discharge of surface water to a main river will require EA consent.

Flood Map

The site is predominantly located within Flood Zone 1 based on the existing flood map, with approximately 10% of the area of the site located in Flood Zone 2 and 3.

Functional Floodplain

The site is located away from the functional floodplain.

Historical Flooding

No records of historical flooding have been received for the site. This does not mean that flooding has not occurred as these events may not have been recorded. Investigations into historical flooding of the area should be undertaken as part of a site specific FRA.

Flood Warning Areas

There is no flood warning area covering the site. A Flood Plan should be provided detailing what residents / occupants should do to prepare for flood events, and what to do if the development floods. Safe escape / safe refuge details should be provided as part of a Flood Plan along with information on the EA Flood Warning system. (EA to confirm).

Flood Defences

There are no flood defences close to the site.

Site Name: 12 – Church Street
Location: Southwell (OS Grid Ref: 470352, 353697)

Site Size: 0.9 hectares

Existing Site Use: Greenfield

Proposed Site Use: Permission Granted

Vulnerability Classification: More Vulnerable

Surface Water Flood Risk:

The locally agreed surface water information maps indicate the site is located in an area susceptible to surface water flooding. Therefore, further assessment of surface water flood risk should be included with the site specific flood risk assessment.

Proposed surface water drainage is a key factor to the viability of the project and must not place extra pressure on the existing drainage regime.

Safe Access and Egress:

The approach should be taken whereby access to and from the site is away from the area shown as located within the flood extent. This area should be free from development.

Minimum Finished Floor Levels:

Finished floor levels must be set above the maximum flood depth, the EA general requirement is a 600mm freeboard for residential. If single storey dwellings are proposed this is essential. Where this is not possible then a range of measures including flood resilient construction must be considered.

This is subject to EA approval and discussions.

Flood Risk Assessment Requirements:

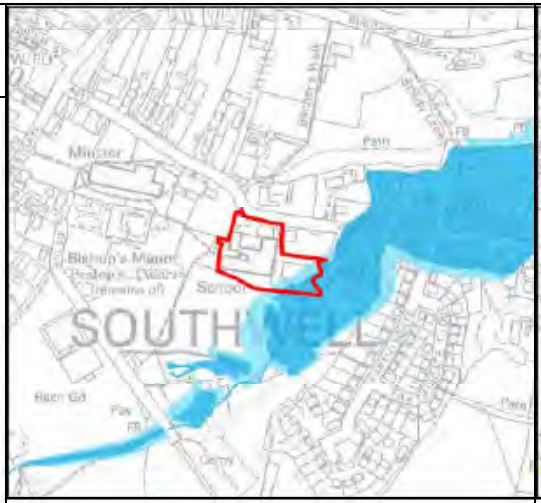
Any sites located within Flood Zone 2 or 3 regardless of size will require an FRA.

Climate change should be taken in to account when assessing flood risk from any source. The lifetime of the development will guide the allowance required for climate change, in accordance with the NPPF.

Flood risk from surface water will need to be assessed as part of any FRA, with a drainage strategy provided to ensure that the development does not flood during low annual probability rainfall events or exacerbate the flood risk off site.

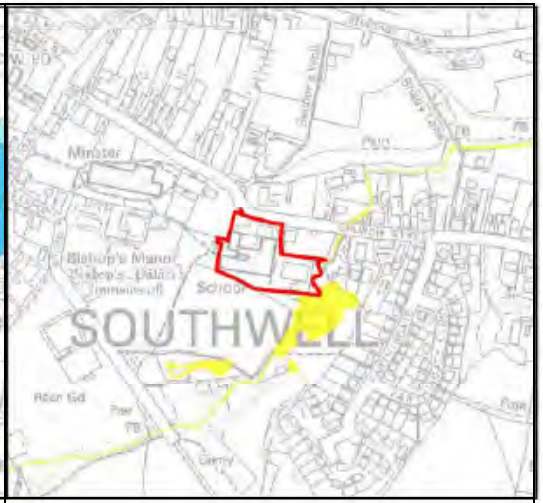
The sequential approach should be applied to the site whereby development is to be located in Zone 1 area of the site only and to avoid developing within any areas likely to flood. Flood resilient construction should also be considered.

Approval will be required from the LLFA or IDB if there is an increase in surface water discharge from the site to any watercourse other than a designated main river. Any discharge of surface water to a main river will require EA consent.



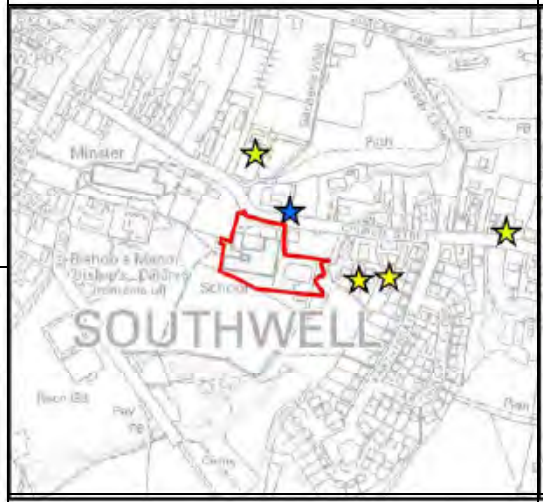
Flood Map

The site is predominantly located within Flood Zone 1 based on the existing flood map, with approximately 20% of the total site area located within Flood Zone 2, and 10% of the total site area located in Flood Zone 3.



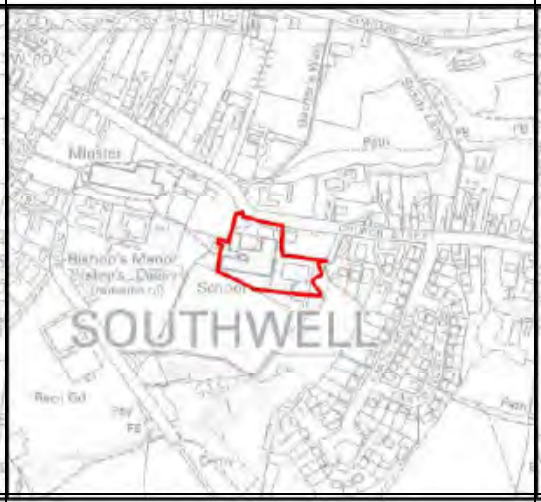
Functional Floodplain

The site is not located within functional floodplain, however the south east of the site is located next to functional floodplain.



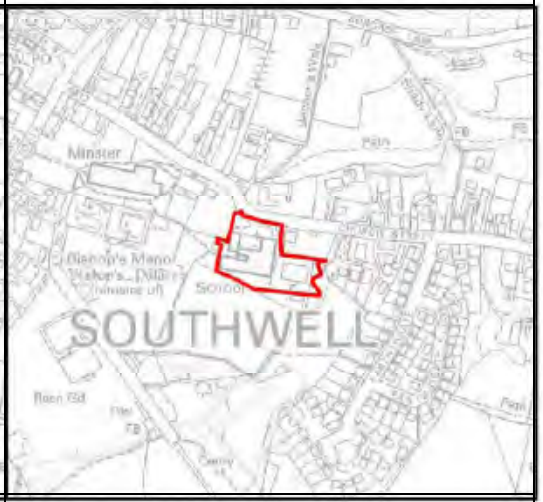
Historical Flooding

No records of historical flooding have been received for the site. However there is a fluvial flooding event and four sewer flooding events recorded close to the site within Southwell. Further investigation should be included within a site specific FRA.



Flood Warning Areas

There is no flood warning area covering the site. A Flood Plan should be provided detailing what residents / occupants should do to prepare for flood events, and what to do if the development floods. Safe escape / safe refuge details should be provided as part of a Flood Plan along with information on the EA Flood Warning system.



Flood Defences

There are no flood defences close to the site.

The IDB maintain a number of raised defences which developers should identify in a site specific FRA.

Site Name: 13 – North of Maltkin Lane
Location: Newark-on-Trent (OS Grid Ref: 480215, 355119)

Site Size: 2.03 hectares

Existing Site Use: Brownfield (Scrap Yard)

Proposed Site Use: 60 Dwellings

Vulnerability Classification: More Vulnerable

Surface Water Flood Risk:

The locally agreed surface water information maps indicate the site is located in an area susceptible to surface water flooding to an intermediate level. Therefore, further assessment of surface water flood risk should be included with the site specific flood risk assessment.

Proposed surface water drainage is a key factor to the viability of the project and must not place extra pressure on the existing drainage regime.

Safe Access and Egress:

Safe / dry access and egress should be provided for all future residents of the site. Residents should be directed away from off-site flood areas.

Safe access appears viable to the south / east of the site based on the hazard mapping for the site.

Minimum Finished Floor Levels:

Finished floor levels must be set above the maximum flood depth, the EA general requirement is a 600mm freeboard for residential. If single storey dwellings are proposed this is essential. Where this is not possible then a range of measures including flood resilient construction must be considered.

This is subject to EA approval and discussions.

Flood Risk Assessment Requirements:

Any sites located within Flood Zone 2 or 3 regardless of size will require an FRA.

Climate change should be taken in to account when assessing flood risk from any source. The lifetime of the development will guide the allowance required for climate change, in accordance with the NPPF.

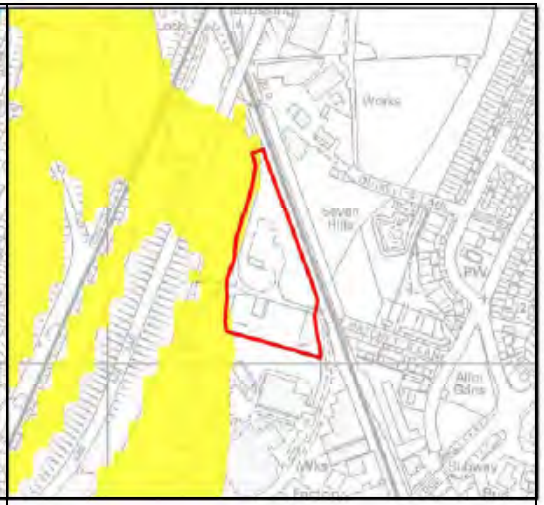
Flood risk from surface water will need to be assessed as part of any FRA, with a drainage strategy provided to ensure that the development does not flood during low annual probability rainfall events or exacerbate the flood risk off-site.

The sequential approach should be applied to the site whereby development is to be located in Zone 1 area of the site only and to avoid developing within any areas likely to flood. Flood resilient construction should also be considered.

Approval will be required from the LLFA or IDB if there is an increase in surface water discharge from the site to any watercourse other than a designated main river. Any discharge of surface water to a main river will require EA consent.

Flood Map

The site is predominantly located within Flood Zone 2 and 3 having 60% of its area located in Flood Zone 2 and 40% of its area located within Flood Zone 3 based on the existing flood map. The site will therefore need to be assessed based on Flood Zone 3 criteria.



Functional Floodplain

The western edge of the site is located within functional floodplain.

Historical Flooding

The northern / western parts of the site are located within an area shown to have flooded historically. Investigations in to historical flooding should be carried out as part of a site specific FRA.

Flood Warning Areas

There is no flood warning area covering the site. A Flood Plan should be provided detailing what residents / occupants should do to prepare for flood events, and what to do if the development floods. Safe escape / safe refuge details should be provided as part of a Flood Plan along with information on the EA Flood Warning system.

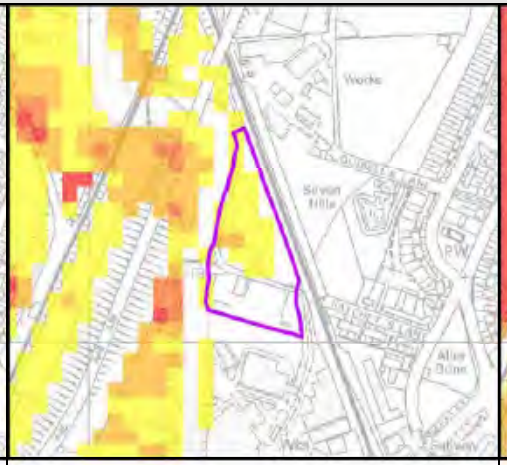
Flood Defences

There are no flood defences close to the site.

Site Name: 13 – North of Maltkin Lane
Location: Newark-on-Trent (OS Grid Ref: 480215, 355119)

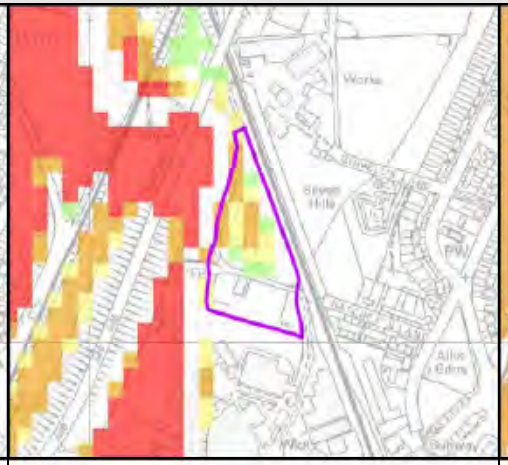
100CC - Depth

It can be seen on Figure 1647-F-1.1 that the site is located within an area that would be inundated by water to a depth of between 0.25 and 2.0m+.



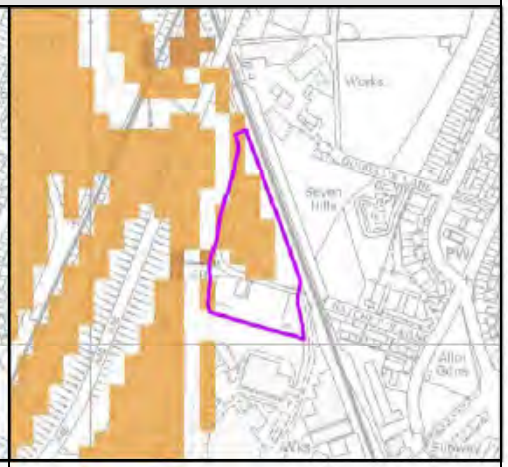
100CC - Velocity

When referencing Figure 1647-F-2.1 it can be seen that the site experiences velocities of flood water between 0 to 1.0 m/s.



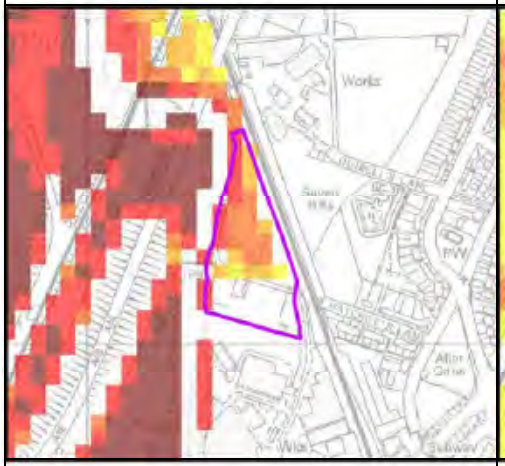
100CC - Hazard

With reference to Figure 1647-F-3.1 it can be seen that the site is located within an area of greater than 2m (Danger for All) as defined by FD2320 Flood Risk to People.



100CC - Time to Inundation

Figure 1647-F-4.1 shows that the time to inundation for the areas of site affected by flooding is approximately 90 hours from the initial rainfall event.



1000 - Depth

It can be seen on Figure 1647-F-1.2 that the site is located within an area that would be inundated by water to a depth of between 0.5 and 2.0m+.

1000 - Velocity

When referencing Figure 1647-F-2.2 it can be seen that the site experiences velocities of flood water between 0 to 1 m/s.

1000 - Hazard

With reference to Figure 1647-F-3.2 it can be seen that the site is located within an area of greater than 2 (Danger for All) as defined by FD2320 Flood Risk to People.

1000 - Time to Inundation

Figure 1647-F-4.2 shows that the time to inundation for the areas of site affected by flooding is between 80 and 90 hours from the initial rainfall event.

Site Name: 14 – Land South of Lansbury Road
Location: Edwinstowe (OS Grid Ref: 463067, 366630)

Site Size: 8.31 hectares

Existing Site Use: Greenfield

Proposed Site Use: 150-250 Dwellings

Vulnerability Classification: More Vulnerable

Surface Water Flood Risk:

The locally agreed surface water information maps indicate the site is located in an area susceptible to surface water flooding. Therefore, further assessment of surface water flood risk should be included with the site specific flood risk assessment.

Proposed surface water drainage is a key factor to the viability of the project and must not place extra pressure on the existing drainage regime.

Safe Access and Egress:

The approach should be taken whereby access to and from the site is away from the area shown as located within the flood extent. This area should be free from development.

Minimum Finished Floor Levels:

Finished floor levels must be set above the maximum flood depth, the EA general requirement is a 600mm freeboard for residential. If single storey dwellings are proposed this is essential. Where this is not possible then a range of measures including flood resilient construction must be considered.

This is subject to EA approval and discussions.

Flood Risk Assessment Requirements:

Any sites located within Flood Zone 2 or 3 regardless of size will require an FRA.

Climate change should be taken in to account when assessing flood risk from any source. The lifetime of the development will guide the allowance required for climate change, in accordance with the NPPF.

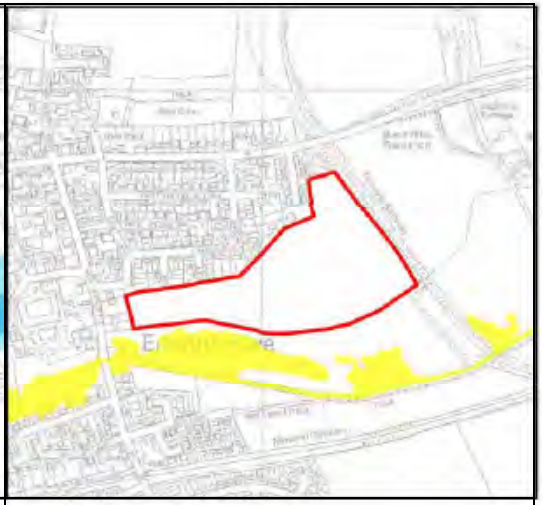
Flood risk from surface water will need to be assessed as part of any FRA, with a drainage strategy provided to ensure that the development does not flood during low annual probability rainfall events or exacerbate the flood risk off-site.

The sequential approach should be applied to the site whereby development is to be located in Zone 1 area of the site only and to avoid developing within any areas likely to flood. Flood resilient construction should also be considered.

Approval will be required from the LLFA or IDB if there is an increase in surface water discharge from the site to any watercourse other than a designated main river. Any discharge of surface water to a main river will require EA consent.

Flood Map

The majority of the site is located within Flood Zone 1, with the southern edge of the site (approximately 7.5% of the total area) located within Flood Zone 2.

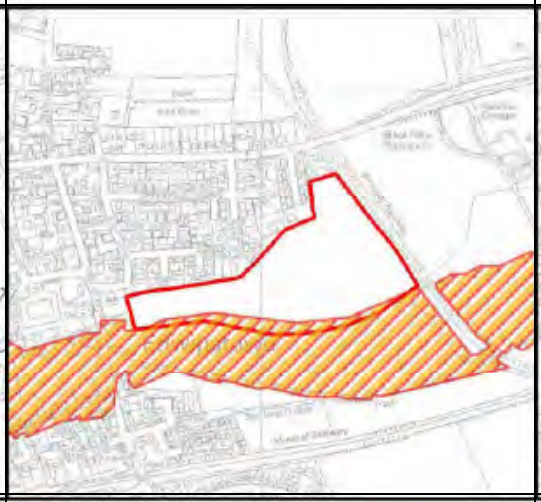


Functional Floodplain

The site is located outside the functional floodplain.

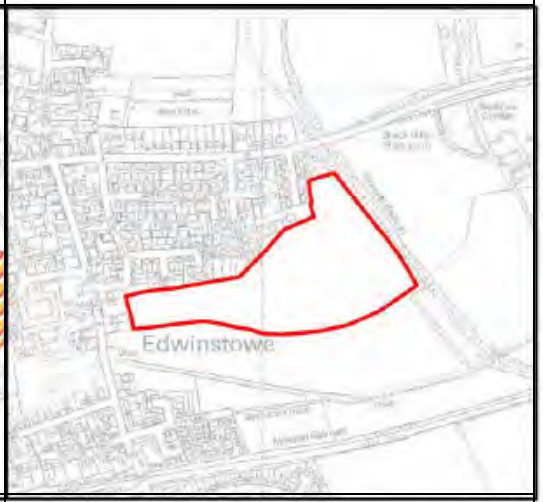
Historical Flooding

The southern edge of the site is located within an area shown to have flooded historically. Investigations in to historical flooding should be included within any site specific FRA.



Flood Warning Areas

The southern edge of the site is shown as being located within a Flood Warning Area. A Flood Plan should be provided detailing what residents / occupants should do to prepare for flood events, and what to do if the site floods. Safe escape / safe refuge details should be provided as part of a Flood Plan with information on the EA Flood Warning system.



Flood Defences

There are no flood defences close to the site.

Site Name: 15 – Land between Barrel Hill Road and Great North Road
Location: Sutton-on-Trent (OS Grid Ref: 479475, 365605)

Site Size: 0.69 hectares

Existing Site Use: Greenfield

Proposed Site Use: Residential

Vulnerability Classification: More Vulnerable

Surface Water Flood Risk:

The locally agreed surface water information maps indicate the site is located in an area susceptible to surface water flooding to an intermediate level. Therefore, further assessment of surface water flood risk should be included with the site specific flood risk assessment.

Proposed surface water drainage is a key factor to the viability of the project and must not place extra pressure on the existing drainage regime.

Safe Access and Egress:

Not relevant to this site.

Minimum Finished Floor Levels:

It is advisable for finished flood levels to be 150-300mm above ground levels to ensure that any surface water flooding would not enter properties and cause damage.

Flood Risk Assessment Requirements:

As the site is less than 1ha in size the EA will not require an FRA, however Newark and Sherwood DC may require an assessment on the impacts from surface water, with a drainage strategy provided to ensure that the development does not flood during low annual probability rainfall events or exacerbate the flood risk off site.

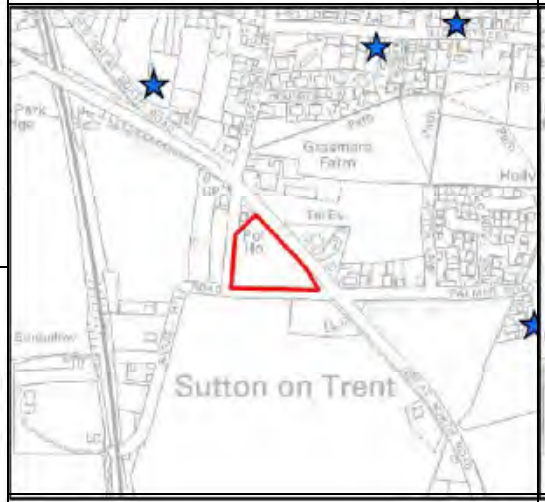
The LLFA or IDB consent will be required prior to any increases in surface water discharge from the site being made to any increase in surface water discharge from the site being made to any watercourse, other than designated main river, which would require EA consent.

Flood Map

The site is located entirely within Flood Zone 1.

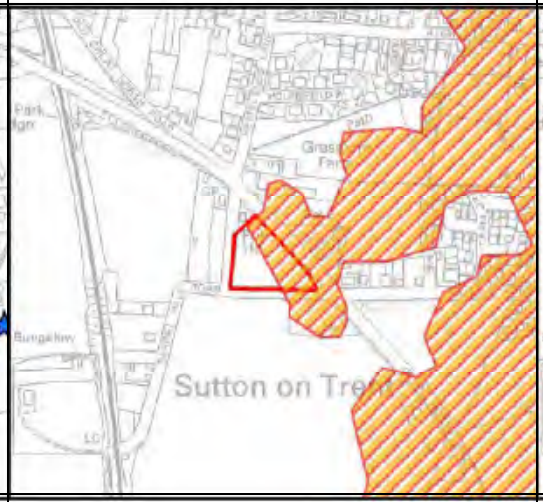
Functional Floodplain

The site is located outside the functional floodplain.



Historical Flooding

No records of historical flooding have been received for the site. This does not mean that flooding has not occurred as these events may not have been recorded. Investigations into historical flooding of the area should be undertaken as part of a site specific FRA. NAIDB has records that 22 properties in Sutton on Trent reported flooding during the June 2007 event.



Flood Warning Areas

The eastern edge of the site is shown as being located within a Flood Warning Area.

Flood Defences

There are no flood defences close to the site.

The IDB maintain a number of raised defences which developers should identify in a site specific FRA.

Site Name: 16 – Land off First Holme Lane
Location: Sutton-on-Trent (OS Grid Ref: 480142, 365821)

Site Size: 0.92 hectares

Existing Site Use: Greenfield

Proposed Site Use: 17 Dwellings

Vulnerability Classification: More Vulnerable

Surface Water Flood Risk:

The locally agreed surface water information maps indicate the site is located in an area susceptible to surface water flooding to an intermediate level. Therefore, further assessment of surface water flood risk should be included with the site specific flood risk assessment.

Proposed surface water drainage is a key factor to the viability of the project and must not place extra pressure on the existing drainage regime.

Safe Access and Egress:

Safe / dry access and egress should be provided for all future residents of the site. Residents should be directed away from off-site flood areas.

It is likely land raising will be required to levels above the associated flood depth to provide safe refuge during times of flood (should safe access and egress not be possible).

Hazard Mapping is not available for the site therefore flood depths, velocities and time to inundation is not available. Should the site be put forward for development hazard mapping will required for safe access and egress to be assessed.

Minimum Finished Floor Levels:

Finished floor levels must be set above the maximum flood depth, the EA general requirement is a 600mm freeboard for residential. If single storey dwellings are proposed this is essential. Where this is not possible then a range of measures including flood resilient construction must be considered.

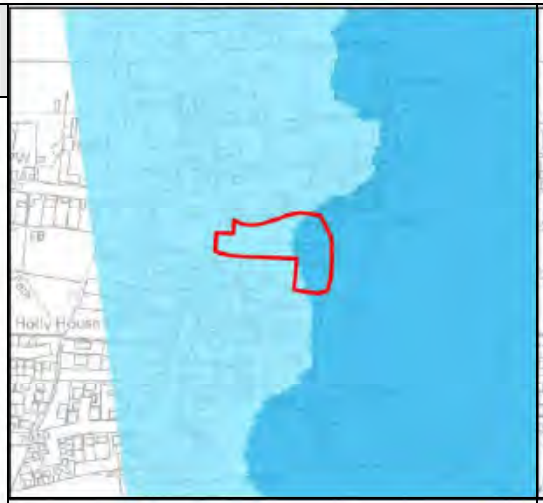
This is subject to EA approval and discussions.

Flood Risk Assessment Requirements:

Any sites located within Flood Zone 2 or 3 regardless of size will require an FRA. Climate change should be taken in to account when assessing flood risk from any source. The lifetime of the development will guide the allowance required for climate change, in accordance with the NPPF.

Flood risk from surface water will need to be assessed as part of any FRA, with a drainage strategy provided to ensure that the development does not flood during low annual probability rainfall events or exacerbate the flood risk off site. The sequential Approach will need to be applied with no development located within the Zone 3 extent.

The site is located within the TVIDB district and has a board maintained watercourse along its northern boundary. The TVIDB will seek to establish an easement strip alongside this watercourse. The Board's consent will be required to any works in, over, under or within 9.0m of top, or, where the watercourse is culverted, the outside edge of the pipe. The LLFA or IDB consent will be required prior to any increases in surface water discharge from the site being made to any watercourse, other than designated main river, which would require EA consent.

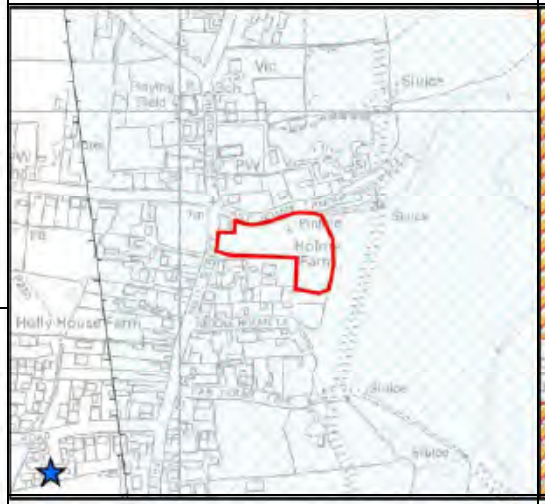


Flood Map

The site is located entirely within Flood Zone 2 and 3. Approximately 45% of the site is located within Flood Zone 3.

Functional Floodplain

The site is located outside the functional floodplain.

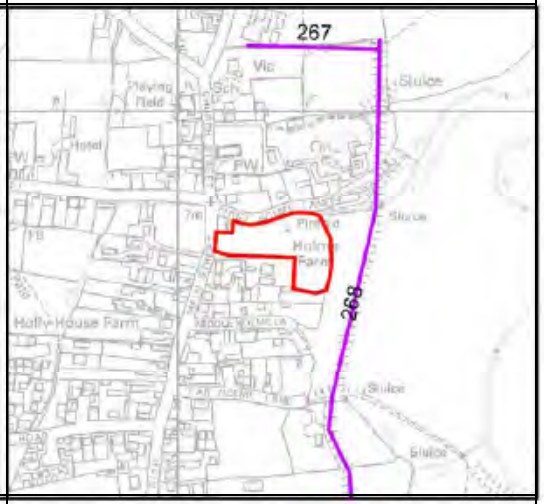


Historical Flooding

No records of historical flooding have been received for the site. This does not mean that flooding has not occurred as these events may not have been recorded. Investigations into historical flooding of the area should be undertaken as part of a site specific FRA. NAIDB has records that 22 properties in Sutton on Trent reported flooding during the June 2007 event

Flood Warning Areas

The site is entirely located within a Flood Warning Area. A Flood Plan should be provided detailing what residents / occupants should do to prepare for flood events, and what to do if the development floods. Safe escape / safe refuge details should be provided as part of a Flood Plan along with information on the EA Flood Warning system.



Flood Defences

Flood defences are located to the east and north of the site.

The IDB maintain a number of raised defences which developers should identify in a site specific FRA.

Site Name: 17 – North Brooklands Close
Location: Collingham (OS Grid Ref: 483072, 362488)

Site Size: 0.54 hectares

Existing Site Use: Greenfield

Proposed Site Use: Residential

Vulnerability Classification: More Vulnerable

Surface Water Flood Risk:

The locally agreed surface water information maps indicate the site is located in an area susceptible to surface water flooding between intermediate to more level. Therefore, further assessment of surface water flood risk should be included with the site specific flood risk assessment.

Proposed surface water drainage is a key factor to the viability of the project and must not place extra pressure on the existing drainage regime.

Safe Access and Egress:

Safe / dry access and egress should be provided for all future residents of the site. Residents should be directed away from off-site flood areas.

It is likely land raising will be required to levels above the associated flood depth to provide safe refuge during times of flood (should safe access and egress not be possible). Hazard Mapping is not available for the site therefore flood depths, velocities and time to inundation is not available. Should the site be put forward for development hazard mapping will required for safe access and egress to be assessed.

Minimum Finished Floor Levels:

Finished floor levels must be set above the maximum flood depth, the EA general requirement is a 600mm freeboard for residential. If single storey dwellings are proposed this is essential. Where this is not possible then a range of measures including flood resilient construction must be considered.

This is subject to EA approval and discussions.

Flood Risk Assessment Requirements:

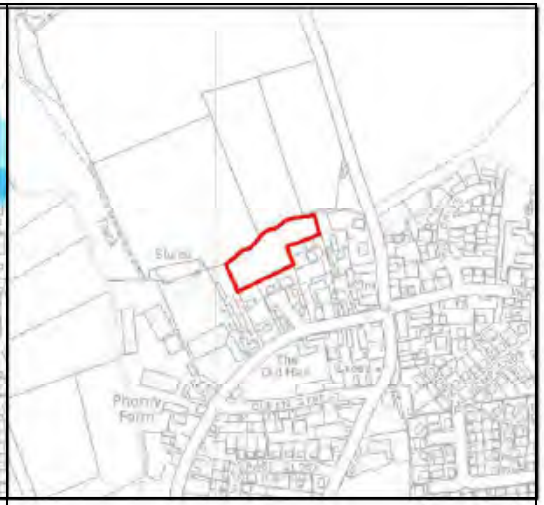
Any sites located within Flood Zone 2 or 3 regardless of size will require an FRA. Climate change should be taken in to account when assessing flood risk from any source. The lifetime of the development will guide the allowance required for climate change, in accordance with the NPPF.

Flood risk from surface water will need to be assessed as part of any FRA, with a drainage strategy provided to ensure that the development does not flood during low annual probability rainfall events or exacerbate the flood risk off site. The sequential Approach will need to be applied with no development located within the Zone 3 extent.

The site is located within Trent Valley Internal Drainage Board's (TVIDB) district and has a board maintained watercourse along its northern boundary. The TVIDB will seek to establish an easement strip alongside this watercourse. The Board's consent will be required to any works in, over, under or within 9.0m of top, or, where the watercourse is culverted, the outside edge of the pipe. The LLFA or IDB consent will be required prior to any increases in surface water discharge from the site being made to any watercourse, other than a designated main river, which would require EA consent.

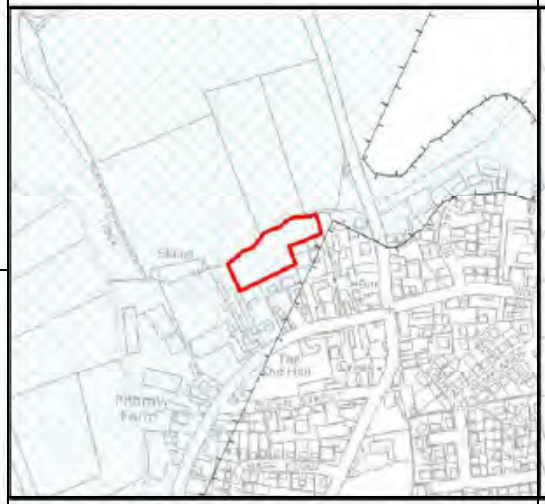
Flood Map

The site is located entirely within Flood Zone 2 and 3. Approximately 45% of the site is located within Flood Zone 3.



Functional Floodplain

The site is located outside the functional floodplain.

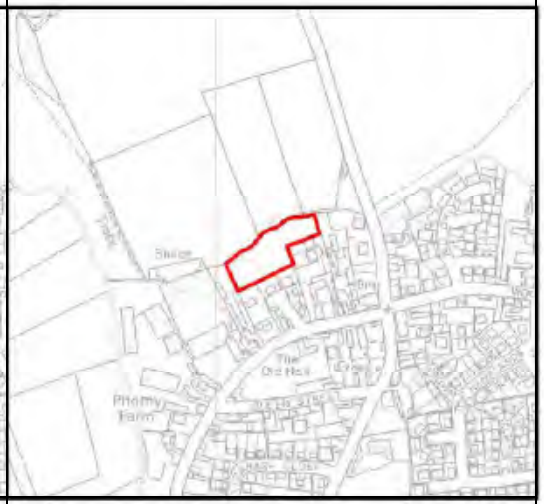


Historical Flooding

The entire site is located within areas recorded as flooding historically. Investigations of historical flooding will be required as part of a site specific FRA.

Flood Warning Areas

The eastern end of the site is located within a Flood Warning Area. A Flood Plan should be provided detailing what residents / occupants should do to prepare for flood events, and what to do if the development floods. Safe escape / safe refuge details should be provided as part of a Flood Plan along with information on the EA Flood Warning system.



Flood Defences

No flood defences are located close to the site.

The IDB maintain a number of raised defences which developers should identify in a site specific FRA.

Site Name: 18 – North of Boy Lane
Location: Edwinstowe (OS Grid Ref: 462888, 366404)

Site Size: 1.62 hectares

Existing Site Use: Greenfield

Proposed Site Use: 39 Dwellings

Vulnerability Classification: More Vulnerable

Surface Water Flood Risk:

The locally agreed surface water information maps indicate the site is located in an area susceptible to surface water flooding to an intermediate level. Therefore, further assessment of surface water flood risk should be included with the site specific flood risk assessment incorporating SuDS.

Proposed surface water drainage is a key factor to the viability of the project and must not place extra pressure on the existing drainage regime.

Safe Access and Egress:

Safe / dry access and egress should be provided for all future residents of the site. Residents should be directed away from off-site flood areas.

Minimum Finished Floor Levels:

Finished floor levels must be set above the maximum flood depth, the EA general requirement is a 600mm freeboard for residential. If single storey dwellings are proposed this is essential. Where this is not possible then a range of measures including flood resilient construction must be considered.

This is subject to EA approval and discussions.

Flood Risk Assessment Requirements:

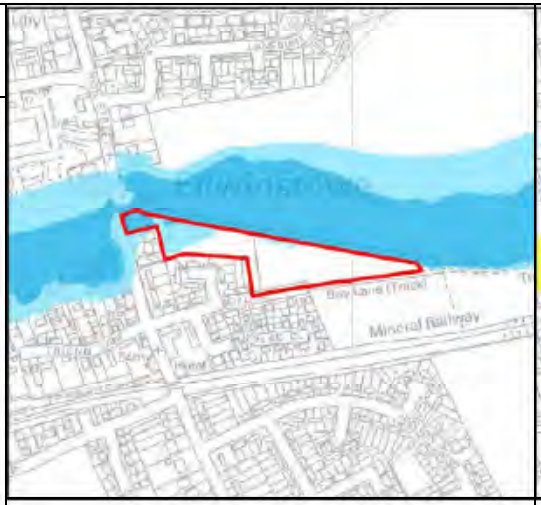
Any sites located within Flood Zone 2 or 3 regardless of size will require an FRA.

Climate change should be taken in to account when assessing flood risk from any source. The lifetime of the development will guide the allowance required for climate change, in accordance with the NPPF.

Flood risk from surface water will need to be assessed as part of any FRA, with a drainage strategy provided to ensure that the development does not flood during low annual probability rainfall events or exacerbate the flood risk off-site.

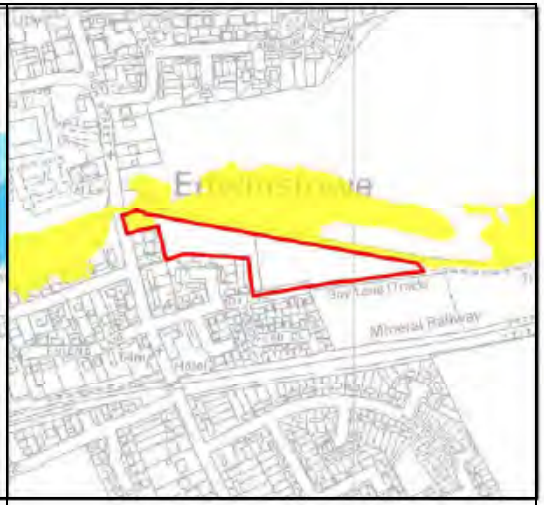
The sequential approach should be applied to the site whereby development is to be located in Zone 1 area of the site only and to avoid developing within any areas likely to flood. Flood resilient construction should also be considered.

Approval will be required from the LLFA or IDB if there is an increase in surface water discharge from the site to any watercourse other than a designated main river. Any discharge of surface water to a main river will require EA consent.



Flood Map

The site is located primarily within Flood Zone 1, with approximately 25% of the site within Flood Zone 2 and 3.



Functional Floodplain

The north west end of the site is located within functional floodplain.

Historical Flooding

The north western end of the site is located within an area historically recorded as at risk from flooding.

Flood Warning Areas

The north-eastern end of the site is located within a Flood Warning Area. A Flood Plan should be provided detailing what residents / occupants should do to prepare for flood events, and what to do if the development floods. Safe escape / safe refuge details should be provided as part of a Flood Plan along with information on the EA Flood Warning system.

Flood Defences

No flood defences are located close to the site.

Site Name: 19 – Land East of A1133, North of Collingham / East of Rio Drive
Location: Collingham (OS Grid Ref: 483105,361179)

Site Size: 1.62 hectares

Existing Site Use: Greenfield

Proposed Site Use: Residential

Vulnerability Classification: More Vulnerable

Surface Water Flood Risk:

The locally agreed surface water information maps indicate the site is located in an area susceptible to surface water flooding to an intermediate level. Therefore, further assessment of surface water flood risk should be included with the site specific flood risk assessment.

Proposed surface water drainage is a key factor to the viability of the project and must not place extra pressure on the existing drainage regime.

Safe Access and Egress:

Safe / dry access and egress should be provided for all future residents of the site. Residents should be directed away from off-site flood areas.

Hazard Mapping is not available for the site therefore flood depths, velocities and time to inundation is not available. Should the site be put forward for development hazard mapping will required for safe access and egress to be assessed.

Minimum Finished Floor Levels:

Finished floor levels must be set above the maximum flood depth, the EA general requirement is a 600mm freeboard for residential. If single storey dwellings are proposed this is essential. Where this is not possible then a range of measures including flood resilient construction must be considered.

This is subject to EA approval and discussions.

Flood Risk Assessment Requirements:

Any sites located within Flood Zone 2 or 3 regardless of size will require an FRA. Climate change should be taken in to account when assessing flood risk from any source. The lifetime of the development will guide the allowance required for climate change, in accordance with the NPPF.

Flood risk from surface water will need to be assessed as part of any FRA, with a drainage strategy provided to ensure that the development does not flood during low annual probability rainfall events or exacerbate the flood risk off site. The sequential Approach will need to be applied with no development located within the Zone 3 extent.

The site is located within Trent Valley Internal Drainage Board's (TVIDB) district and has a board maintained watercourse along its eastern boundary. The TVIDB will seek to establish an easement strip alongside this watercourse. The Board's consent will be required to any works in, over, under or within 9.0m of top, or, where the watercourse is culverted, the outside edge of the pipe. The LLFA or IDB consent will be required prior to any increases in surface water discharge from the site being made to any watercourse, other than designated main river, which would require EA consent.

Flood Map

The site is located partly within Flood Zone 1, with approximately 40% of the site within Flood Zone 2 and 20% of the site within Flood Zone 3.

Functional Floodplain

The site is not located within functional floodplain.

Historical Flooding

Records of historical flooding show flooding within the western half of the site. Investigations in to historical flooding are required as part of a site specific FRA.

Flood Warning Areas

There is no flood warning area covering the site. A Flood Plan should be provided detailing what residents / occupants should do to prepare for flood events, and what to do if the development floods. Safe escape / safe refuge details should be provided as part of a Flood Plan along with information on the EA Flood Warning system.

Flood Defences

No flood defences are located close to the site.

The IDB maintain a number of raised defences which developers should identify in a site specific FRA.

Site Name: 20 – Field to South of South End, Collingham / West of Cottage Lane
Location: Collingham (OS Grid Ref: 482514, 361088)

Site Size: 2.03 hectares

Existing Site Use: Greenfield

Proposed Site Use: Residential

Vulnerability Classification: More Vulnerable

Surface Water Flood Risk:

The locally agreed surface water information maps indicate the site is in close proximity to an area susceptible to surface water flooding to an intermediate level. Therefore, further assessment of surface water flood risk should be included with the site specific flood risk assessment.

Proposed surface water drainage is a key factor to the viability of the project and must not place extra pressure on the existing drainage regime.

Safe Access and Egress:

Safe / dry access and egress should be provided for all future residents of the site. Residents should be directed away from off-site flood areas.

Safe access appears viable to the south-east of the site based on the hazard mapping for the site.

Minimum Finished Floor Levels:

Finished floor levels must be set above the maximum flood depth, the EA general requirement is a 600mm freeboard for residential. If single storey dwellings are proposed this is essential. Where this is not possible then a range of measures including flood resilient construction must be considered.

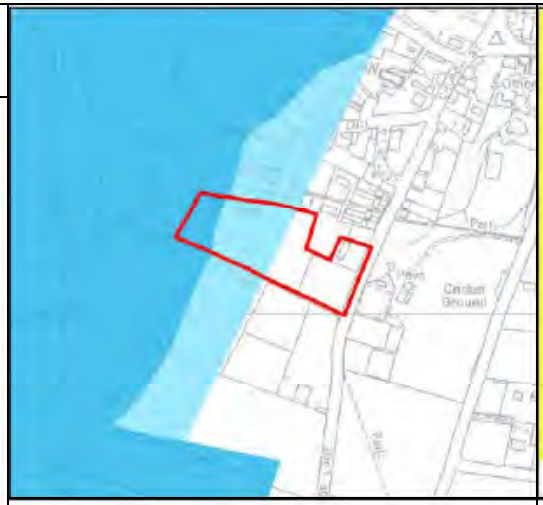
This is subject to EA approval and discussions.

Flood Risk Assessment Requirements:

Any sites located within Flood Zone 2 or 3 regardless of size will require an FRA. Climate change should be taken in to account when assessing flood risk from any source. The lifetime of the development will guide the allowance required for climate change, in accordance with the NPPF.

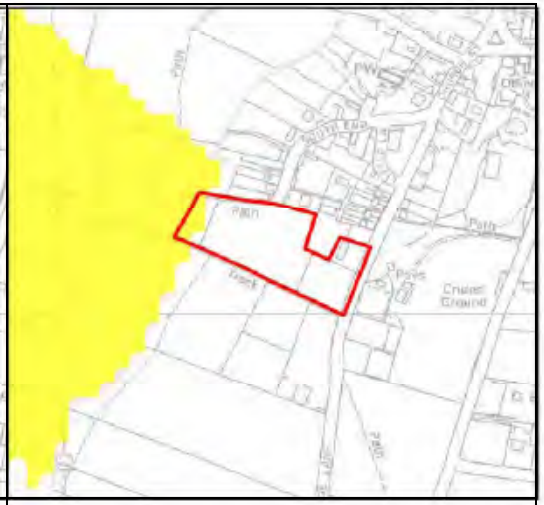
Flood risk from surface water will need to be assessed as part of any FRA, with a drainage strategy provided to ensure that the development does not flood during low annual probability rainfall events or exacerbate the flood risk off site. The sequential Approach will need to be applied with no development located within the Zone 3 extent.

The site is located within Trent Valley Internal Drainage Board's (TVIDB) district and has a board maintained watercourse along its eastern boundary. The TVIDB will seek to establish an easement strip alongside this watercourse. The Board's consent will be required to any works in, over, under or within 9.0m of top, or, where the watercourse is culverted, the outside edge of the pipe. The LLFA or IDB consent will be required prior to any increases in surface water discharge from the site being made to any watercourse, other than designated main river, which would require EA consent.



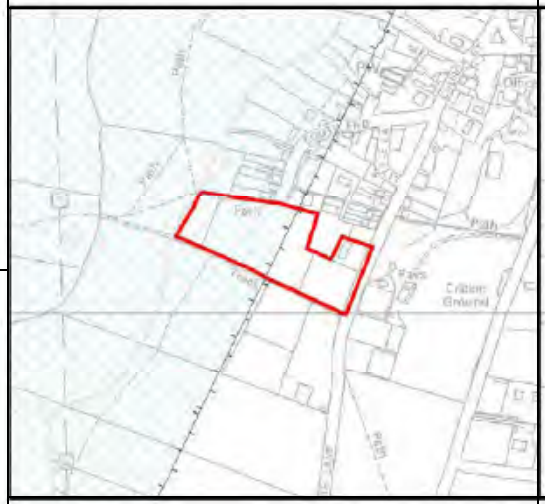
Flood Map

The site is located partly within Flood Zone 1, with approximately 50% of the site within Flood Zone 2 and 15% of the site within Flood Zone 3.



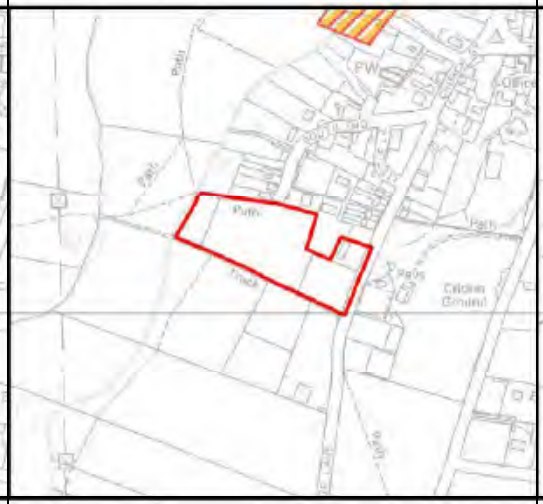
Functional Floodplain

The western end of the site is located within functional floodplain.



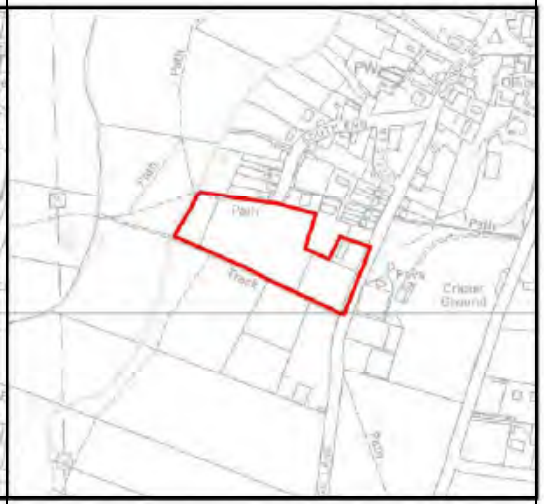
Historical Flooding

Records of historical flooding show flooding within the western half of the site.



Flood Warning Areas

There is no flood warning area covering the site. A Flood Plan should be provided detailing what residents / occupants should do to prepare for flood events, and what to do if the development floods. Safe escape / safe refuge details should be provided as part of a Flood Plan along with information on the EA Flood Warning system.

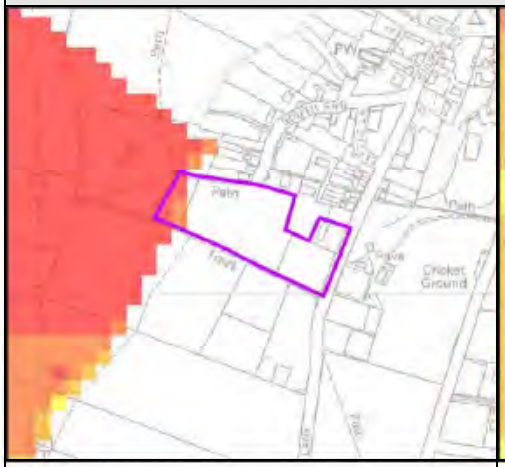


Flood Defences

No flood defences are located close to the site.

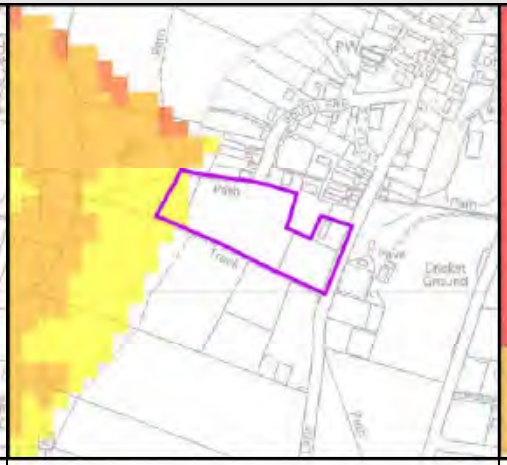
The IDB maintain a number of raised defences which developers should identify in a site specific FRA.

Site Name: 20 – Field to South of South End, Collingham / West of Cottage Lane
Location: Collingham (OS Grid Ref: 482514, 361088)



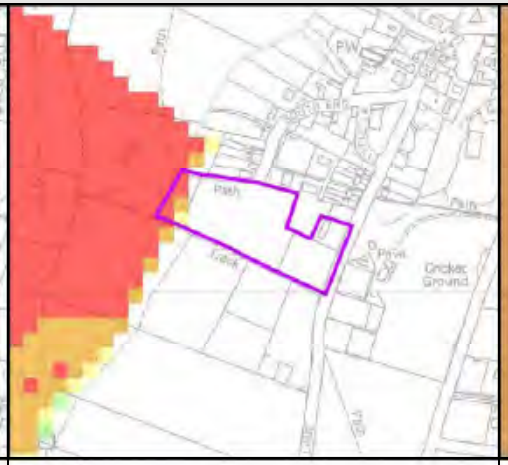
100CC - Depth

It can be seen on Figure 1647-F-1.1 that the site is located within an area that would be inundated by water to a depth of between 1 and 2m+.



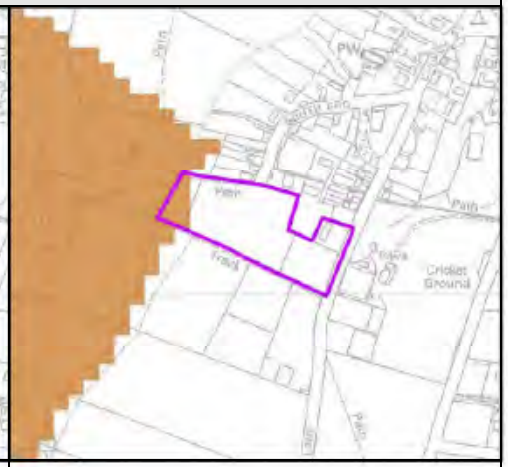
100CC - Velocity

When referencing Figure 1647-F-2.1 it can be seen that the site experiences velocities of flood water between 0.3 to 1.0 m/s.



100CC - Hazard

With reference to Figure 1647-F-3.1 it can be seen that the site is located within an area of greater than 2m (Danger for All) as defined by FD2320 Flood Risk to People.

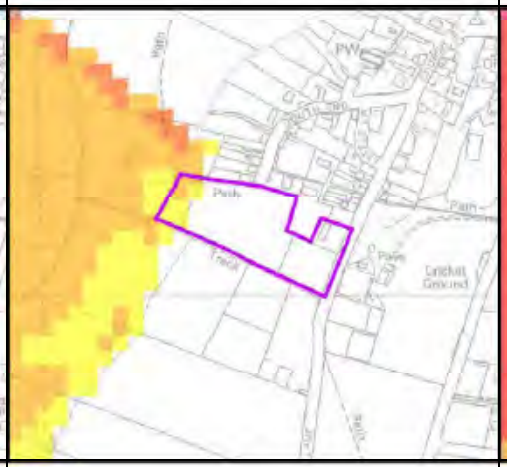


100CC - Time to Inundation

Figure 1647-F-4.1 shows that the time to inundation for the areas of site affected by flooding is between 90 and 100 hours from the initial rainfall event.

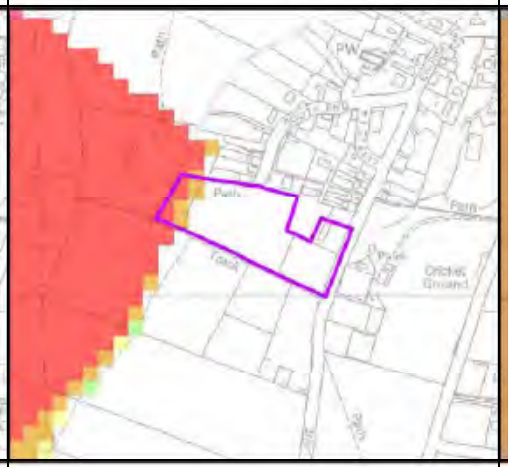
1000 - Depth

It can be seen on Figure 1647-F-1.2 that the site is located within an area that would be inundated by water to a depth of between 1 and 2m+.



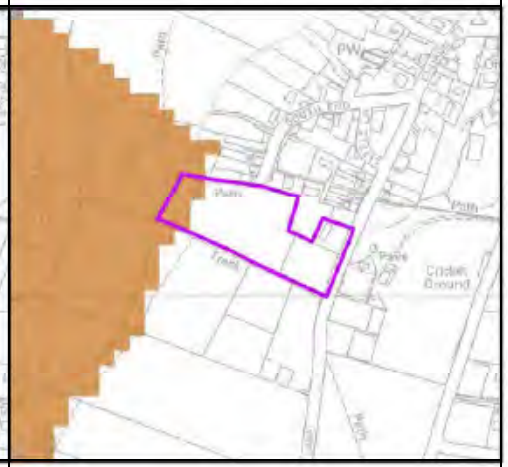
1000 - Velocity

When referencing Figure 1647-F-2.2 it can be seen that the site experiences velocities of flood water between 0.3 to 2.5 m/s.



1000 - Hazard

With reference to Figure 1647-F-3.2 it can be seen that the site is located within an area of greater than 2m (Danger for All) as defined by FD2320 Flood Risk to People.



1000 - Time to Inundation

Figure 1647-F-4.2 shows that the time to inundation for the areas of site affected by flooding is between 90 and 100 hours from the initial rainfall event.

Site Name: 21 – Seven Hills / Quibells Lane
Location: Newark-on-Trent (OS Grid Ref: 480343,355158)

Site Size: 2.33 hectares

Existing Site Use: Brownfield

Proposed Site Use: 37 / 49 Dwellings

Vulnerability Classification: More Vulnerable

Surface Water Flood Risk:

The locally agreed surface water information maps indicate the site is located in proximity to an area susceptible to surface water flooding to an intermediate level. Therefore, further assessment of surface water flood risk should be included with the site specific flood risk assessment.

Proposed surface water drainage is a key factor to the viability of the project and must not place extra pressure on the existing drainage regime.

Safe Access and Egress:

The approach should be taken whereby access to and from the site is away from the area shown as located within the flood extent. This area should be free from development.

Safe access appears viable to the south-east of the site based on the hazard mapping for the site.

Minimum Finished Floor Levels:

Finished floor levels must be set above the maximum flood depth, the EA general requirement is a 600mm freeboard for residential. If single storey dwellings are proposed this is essential. Where this is not possible then a range of measures including flood resilient construction must be considered.

This is subject to EA approval and discussions.

Flood Risk Assessment Requirements:

Any sites located within Flood Zone 2 or 3 regardless of size will require an FRA.

Climate change should be taken in to account when assessing flood risk from any source. The lifetime of the development will guide the allowance required for climate change, in accordance with the NPPF.

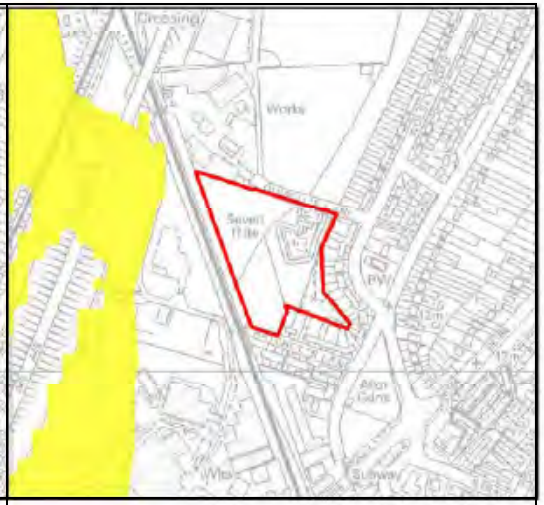
Flood risk from surface water will need to be assessed as part of any FRA, with a drainage strategy provided to ensure that the development does not flood during low annual probability rainfall events or exacerbate the flood risk off-site.

The sequential approach should be applied to the site whereby more vulnerable development is to be located in lower risk flood areas and to avoid developing within any areas likely to flood. Flood resilient construction should also be considered.

Approval will be required from the LLFA or IDB if there is an increase in surface water discharge from the site to any watercourse other than a designated main river. Any discharge of surface water to a main river will require EA consent.

Flood Map

The site is primarily located (approximately 80%) within Flood Zone 2, with a small portion of the site within Flood Zone 1. The site will therefore need to be assessed based on Flood Zone 2 criteria.

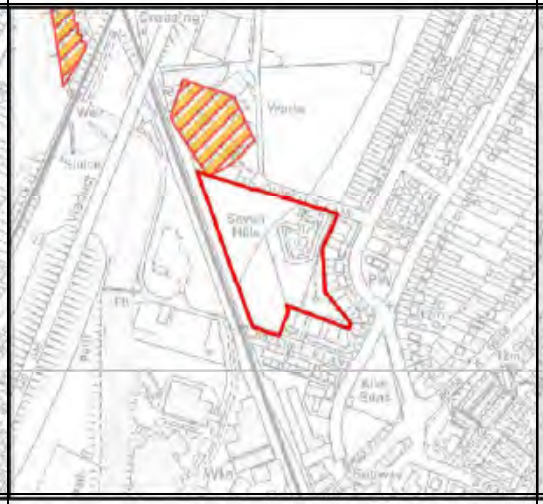


Functional Floodplain

The site is located outside the functional floodplain.

Historical Flooding

Records of historical flooding show flooding within the northern part of the site.



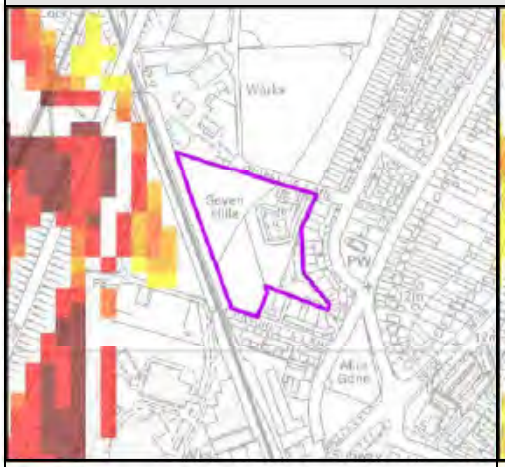
Flood Warning Areas

There is no flood warning area covering the site. A Flood Plan should be provided detailing what residents / occupants should do to prepare for flood events, and what to do if the development floods. Safe escape / safe refuge details should be provided as part of a Flood Plan along with information on the EA Flood Warning system.

Flood Defences

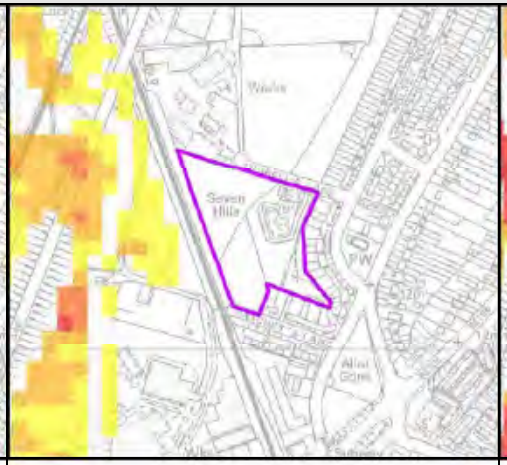
No flood defences are located close to the site.

Site Name: 21 – Seven Hills / Quibells Lane
Location: Newark-on-Trent (OS Grid Ref: 480343,355158)



100CC - Depth

It can be seen on Figure 1647-F-1.1 that the site is not located within a hazard extent therefore there are no flood depths associated with the site during the 1 in 100 year plus climate change event.

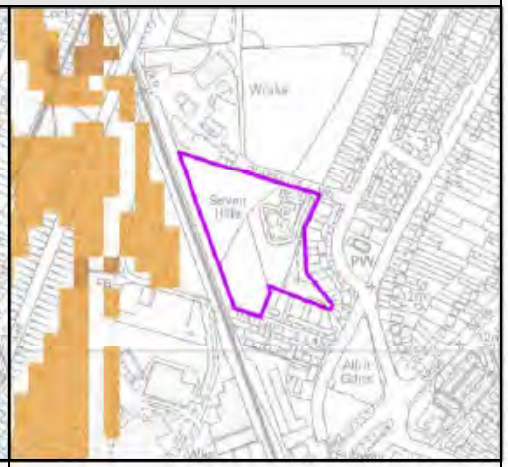


100CC - Velocity

It can be seen on Figure 1647-F-2.1 that the site is not located within a hazard extent therefore there are no flood depths associated with the site during the 1 in 100 year plus climate change event.

100CC - Hazard

It can be seen on Figure 1647-F-3.1 that the site is not located within a hazard extent therefore there are no flood depths associated with the site during the 1 in 100 year plus climate change event.



100CC - Time to Inundation

It can be seen on Figure 1647-F-4.1 that the site is not located within the flood extent.

1000 - Depth

It can be seen on Figure 1647-F-1.2 that the site is not located within a hazard extent therefore there are no flood depths associated with the site during the 1 in 1000 year event.

1000 - Velocity

It can be seen on Figure 1647-F-2.2 that the site is not located within a hazard extent therefore there are no flood depths associated with the site during the 1 in 1000 year event.

1000 - Hazard

It can be seen on Figure 1647-F-3.2 that the site is not located within a hazard extent therefore there are no flood depths associated with the site during the 1 in 1000 year event.

1000 - Time to Inundation

It can be seen on Figure 1647-F-4.2 that the site is not located within the flood extent.

Site Name: 22 – Land South of Barnby Road / South of Barnby Road
Location: Newark-on-Trent (OS Grid Ref: 481297, 352917)

Site Size: 6.7 hectares

Existing Site Use: Greenfield

Proposed Site Use: 37 / 49 Dwellings

Vulnerability Classification: More Vulnerable

Surface Water Flood Risk:

The locally agreed surface water information maps indicate the site is located in an area susceptible to surface water flooding to an intermediate level. Therefore, further assessment of surface water flood risk should be included with the site specific flood risk assessment incorporating SuDS.

Proposed surface water drainage is a key factor to the viability of the project and must not place extra pressure on the existing drainage regime.

Safe Access and Egress:

Safe / dry access and egress should be provided for future residents of the site. Residents should be directed away from off-site flood areas.

Safe access appears viable to the west / north / south of the site based on the hazard mapping for the site.

Minimum Finished Floor Levels:

Finished floor levels must be set above the maximum flood depth, the EA general requirement is a 600mm freeboard for residential. If single storey dwellings are proposed this is essential. Where this is not possible then a range of measures including flood resilient construction must be considered.

This is subject to EA approval and discussions.

Flood Risk Assessment Requirements:

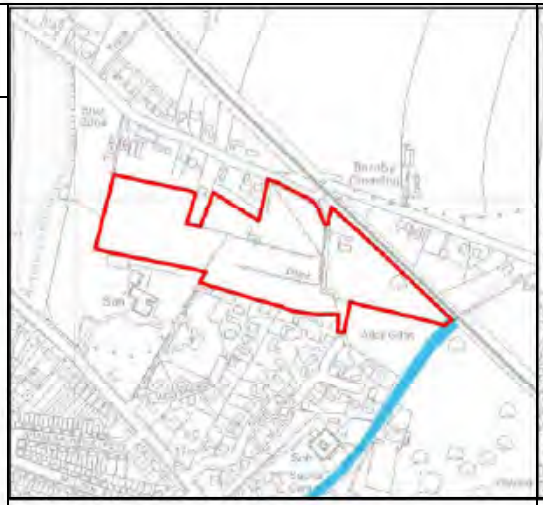
Any sites located within Flood Zone 2 or 3 regardless of size will require an FRA.

Climate change should be taken in to account when assessing flood risk from any source. The lifetime of the development will guide the allowance required for climate change, in accordance with the NPPF.

Flood risk from surface water will need to be assessed as part of any FRA, with a drainage strategy provided to ensure that the development does not flood during low annual probability rainfall events or exacerbate the flood risk off-site.

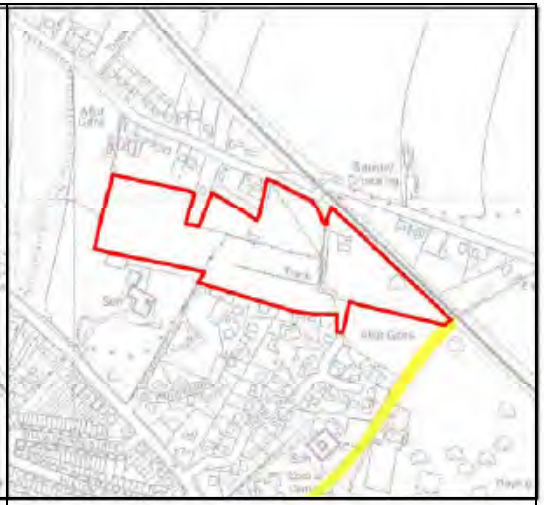
The sequential approach should be applied to the site whereby more vulnerable development is to be located in lower risk flood areas and to avoid developing within any areas likely to flood. Flood resilient construction should also be considered.

Approval will be required from the LLFA or IDB if there is an increase in surface water discharge from the site to any watercourse other than a designated main river. Any discharge of surface water to a main river will require EA consent.



Flood Map

The site is predominantly located within Flood Zone 1, with a small eastern corner of the site within Flood Zone 3.

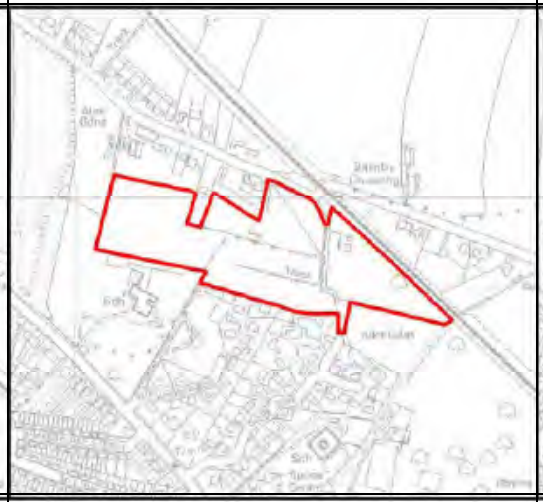


Functional Floodplain

The site is located outside the functional floodplain.

Historical Flooding

Records of historical flooding show flooding within the northern part of the site.



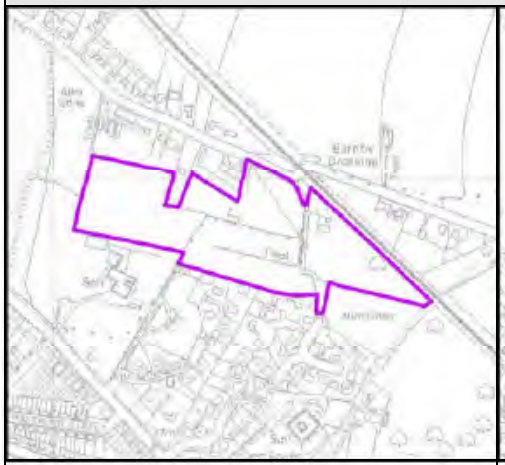
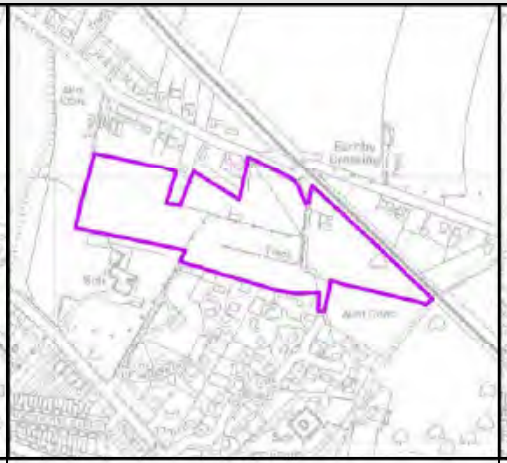
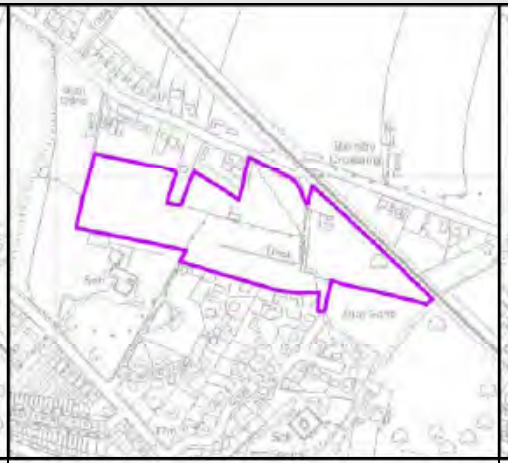
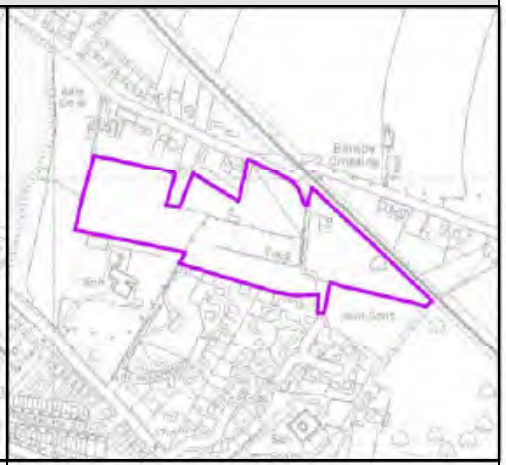
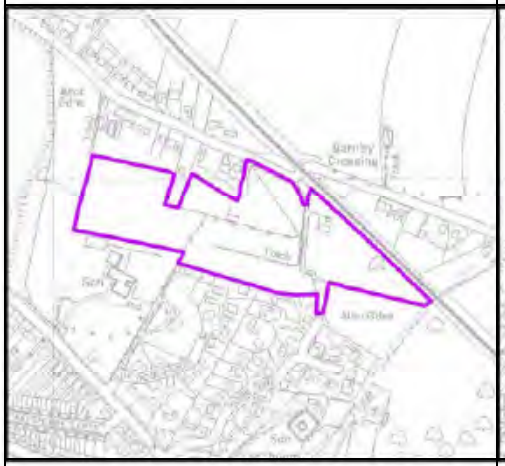
Flood Warning Areas

There is no flood warning area covering the site. A Flood Plan should be provided detailing what residents / occupants should do to prepare for flood events, and what to do if the development floods. Safe escape / safe refuge details should be provided as part of a Flood Plan along with information on the EA Flood Warning system.

Flood Defences

No flood defences are located close to the site.

Site Name: 22 – Land South of Barnby Road / South of Barnby Road
Location: Newark-on-Trent (OS Grid Ref: 481297, 352917)

			
100CC - Depth It can be seen on Figure 1647-F-1.1 that the site is not located within a hazard extent therefore there are no flood depths associated with the site during the 1 in 100 year plus climate change event.	**100CC - Velocity** It can be seen on Figure 1647-F-2.1 that the site is not located within a hazard extent therefore there are no flood depths associated with the site during the 1 in 100 year plus climate change event.	**100CC - Hazard** It can be seen on Figure 1647-F-3.1 that the site is not located within a hazard extent therefore there are no flood depths associated with the site during the 1 in 100 year plus climate change event.	**100CC - Time to Inundation** It can be seen on Figure 1647-F-4.1 that the site is not located within the flood extent.
			
1000 - Depth It can be seen on Figure 1647-F-1.2 that the site is not located within a hazard extent therefore there are no flood depths associated with the site during the 1 in 1000 year event.	**1000 - Velocity** It can be seen on Figure 1647-F-2.2 that the site is not located within a hazard extent therefore there are no flood depths associated with the site during the 1 in 1000 year event.	**1000 - Hazard** It can be seen on Figure 1647-F-3.2 that the site is not located within a hazard extent therefore there are no flood depths associated with the site during the 1 in 1000 year event.	**1000 - Time to Inundation** It can be seen on Figure 1647-F-4.2 that the site is not located within the flood extent.

Site Name: 23 – Flowserve, Hauton Lane / West of Lowfield Lane
Location: Newark-on-Trent (OS Grid Ref: 480801, 351244)

Site Size: 26.80 hectares

Existing Site Use: Greenfield

Proposed Site Use: 210 Dwellings & Employment

Vulnerability Classification: More Vulnerable and Less Vulnerable

Surface Water Flood Risk:

The locally agreed surface water information maps indicate the site is located in an area susceptible to surface water flooding to an intermediate level. Therefore, further assessment of surface water flood risk should be included with the site specific flood risk assessment.

Proposed surface water drainage is a key factor to the viability of the project and must not place extra pressure on the existing drainage regime.

Safe Access and Egress:

Safe / dry access and egress should be provided for future residents of the site. Residents should be directed away from off-site flood areas.

Safe access appears viable to the north-east of the site based on the hazard mapping for the site.

Minimum Finished Floor Levels:

Finished floor levels must be set above the maximum flood depth, the EA general requirement is a 600mm freeboard for residential and 300mm for commercial. If single storey dwellings are proposed this is essential. Where this is not possible then a range of measures including flood resilient construction must be considered.

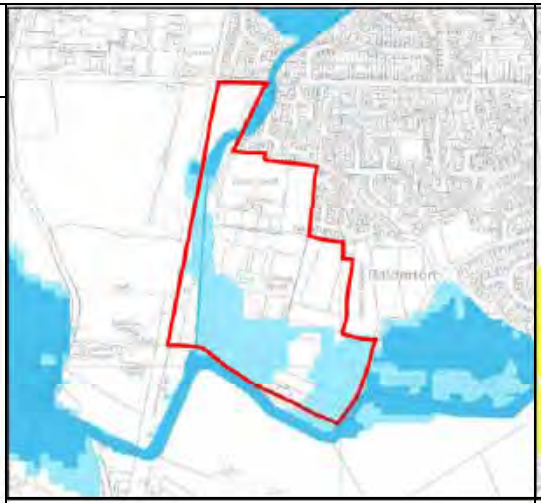
This is subject to EA approval and discussions.

Flood Risk Assessment Requirements:

Any sites located within Flood Zone 2 or 3 regardless of size will require an FRA. Climate change should be taken in to account when assessing flood risk from any source. The lifetime of the development will guide the allowance required for climate change, in accordance with the NPPF.

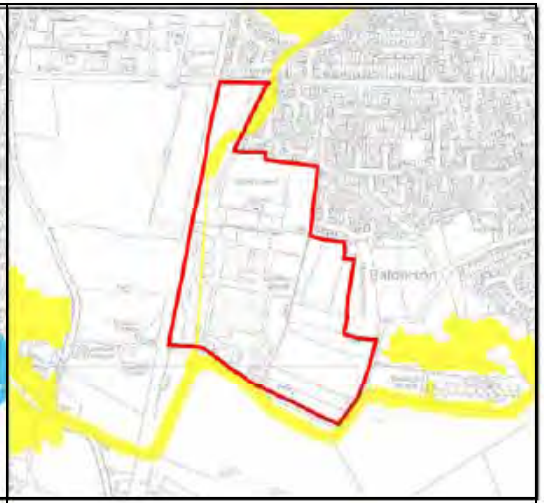
Flood risk from surface water will need to be assessed as part of any FRA, with a drainage strategy provided to ensure that the development does not flood during low annual probability rainfall events or exacerbate the flood risk off site. The sequential Approach will need to be applied with no development located within the Zone 3 extent.

The site is located within Trent Valley Internal Drainage Board's (TVIDB) district and has a board maintained watercourse along its eastern boundary. The TVIDB will seek to establish an easement strip alongside this watercourse. The Board's consent will be required to any works in, over, under or within 9.0m of top, or, where the watercourse is culverted, the outside edge of the pipe. The LLFA or IDB consent will be required prior to any increases in surface water discharge from the site being made to any watercourse, other than designated main river, which would require EA consent.



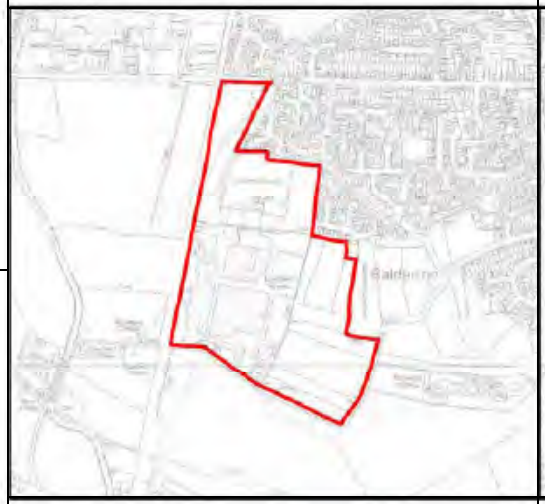
Flood Map

The site is partly located within Flood Zone 1, with approximately 30% of the site within Flood Zone 2 and 5% of the site within Flood Zone 3. The site will therefore need to be assessed based on Flood Zone 3 criteria.



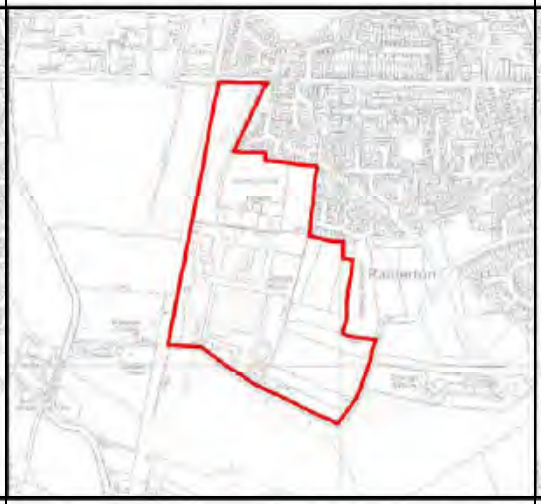
Functional Floodplain

Functional floodplain runs through the western side of the site.



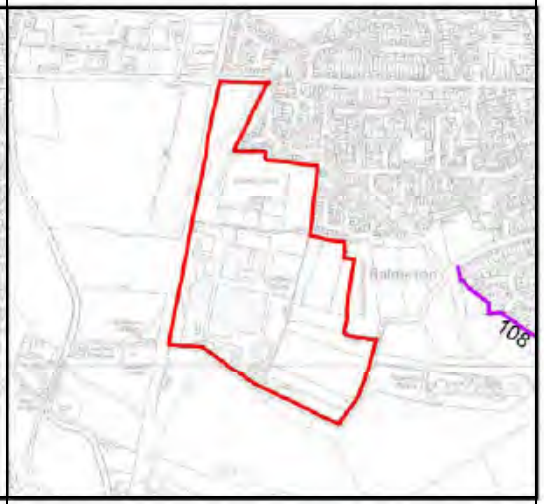
Historical Flooding

Records of historical flooding show flooding within the northern part of the site.



Flood Warning Areas

There is no flood warning area covering the site. A Flood Plan should be provided detailing what residents / occupants should do to prepare for flood events, and what to do if the development floods. Safe escape / safe refuge details should be provided as part of a Flood Plan along with information on the EA Flood Warning system.

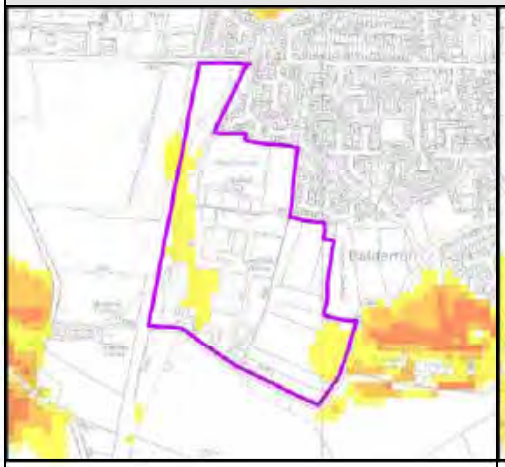


Flood Defences

No flood defences are located close to the site.

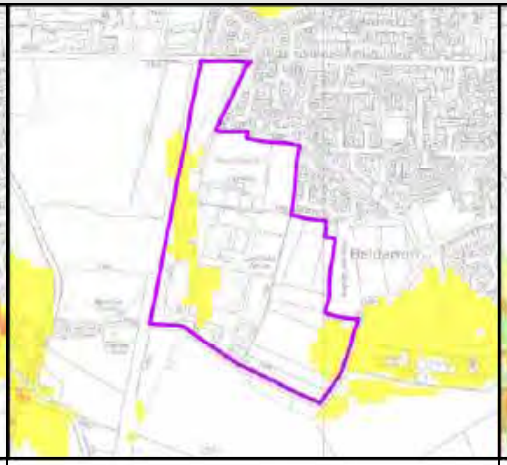
The IDB maintain a number of raised defences which developers should identify in a site specific FRA.

Site Name: 23 – Flowserve, Hauton Lane / West of Lowfield Lane
Location: Newark-on-Trent (OS Grid Ref: 480801, 351244)



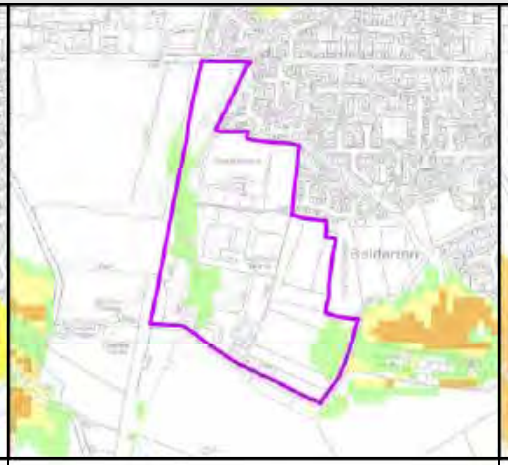
100CC - Depth

It can be seen on Figure 1647-F-1.1 that the site is located within an area that would be inundated by water to a depth of 0.25m apart from a small area to the east which is affected up to 0.5m depth of water.



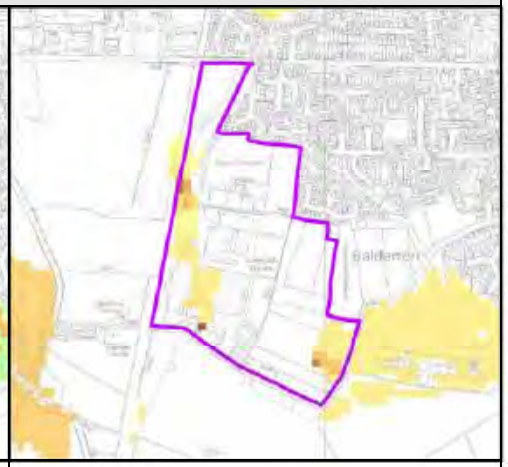
100CC - Velocity

When referencing Figure 1647-F-2.1 it can be seen that the site experiences velocities of flood water between 0 to 0.3 m/s.



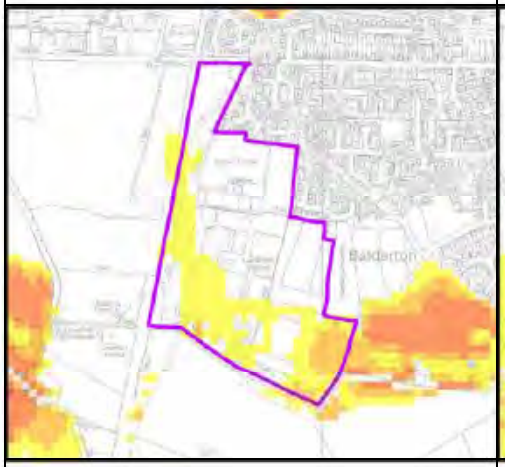
100CC - Hazard

With reference to Figure 1647-F-3.1 it can be seen that the site is located within an area with a hazard rating of up to 1.25 (Danger for Some) as defined by FD2320 Flood Risk to People.



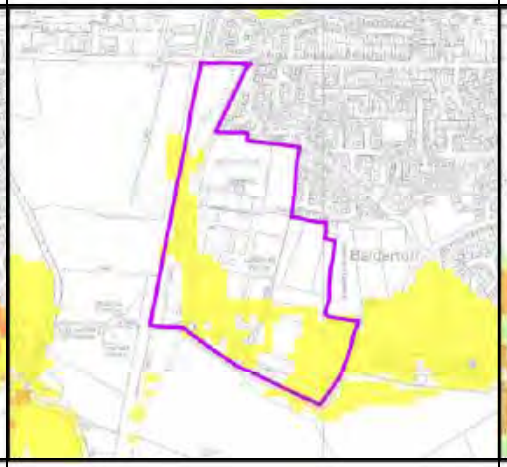
100CC - Time to Inundation

Figure 1647-F-4.1 shows that the time to inundation for the areas of site affected by flooding is between 40 and 80 hours from the initial rainfall event.



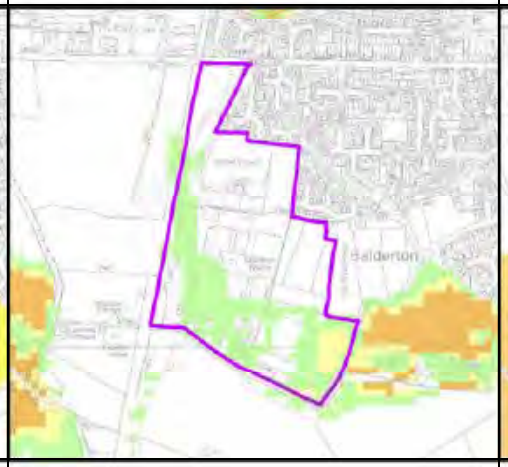
1000 - Depth

It can be seen on Figure 1647-F-1.2 that the site is located within an area that would be inundated by water to a depth of up to 0.5m.



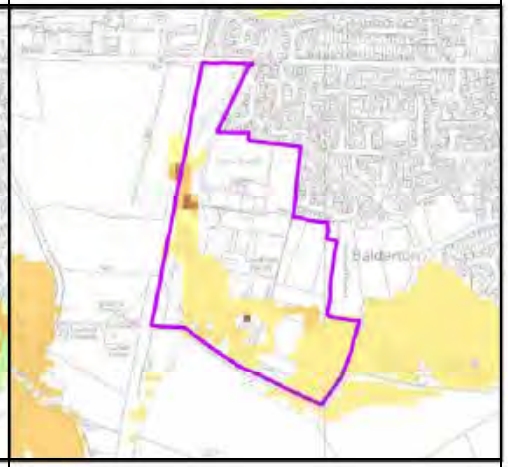
1000 - Velocity

When referencing Figure 1647-F-2.2 it can be seen that the site experiences velocities of flood water between 0 to 0.3 m/s.



1000 - Hazard

With reference to Figure 1647-F-3.2 it can be seen that the site is located within an area with a hazard rating of up to than 2 (Danger for All) as defined by FD2320 Flood Risk to People.



1000 - Time to Inundation

Figure 1647-F-4.2 shows that the time to inundation for the areas of site affected by flooding is between 40 and 80 hours from the initial rainfall event.

Site Name: 24 – Brackenhurst Campus, Nottingham Road / Land off Halloughton Road / South Westhorpe

Location: Southwell (OS Grid Ref: 469291, 352813)

Site Size: 59.72 hectares

Existing Site Use: Greenfield

Proposed Site Use: Residential

Vulnerability Classification: More Vulnerable

Surface Water Flood Risk:

The locally agreed surface water information maps indicate the site is located adjacent to an area susceptible to surface water flooding to an intermediate level. Therefore, further assessment of surface water flood risk should be included with the site specific flood risk assessment.

Proposed surface water drainage is a key factor to the viability of the project and must not place extra pressure on the existing drainage regime.

Safe Access and Egress:

Not relevant to this site.

Minimum Finished Floor Levels:

It is advisable for finished floor levels to be 150 to 300mm above ground levels to ensure that any surface water flooding would not enter properties and cause damage. This is subject to the results from groundwater investigations to the site and agreement with the EA.

Flood Risk Assessment Requirements:

A FRA will be required by the Environment Agency for any site over 1 hectare in size. Climate change should be taken in to account when assessing flood risk from any source. The lifetime of the development will guide the allowance required for climate change, in accordance with the NPPF.

Flood risk from surface water will need to be assessed as part of any FRA, with a drainage strategy provided to ensure that the development does not flood during low annual probability rainfall events or exacerbate the flood risk off site.

Groundwater flooding has been reported an issue at the site and therefore the proposed FRA must incorporate detail investigations and mitigation to allow for development of the site.

The site is located outside of the TVIDB district but within the catchment. The LLFA or IDB consent will be required prior to any increases in surface water discharge from the site being made to any watercourse, other than designated main river, which would require EA consent. IDB consent will only be required if changes to the flow of surface water into IDB watercourses occurs.

Flood Map

The site is located entirely within Flood Zone 1.

Functional Floodplain

There is no functional floodplain located within this site.

Historical Flooding

No records of historical flooding are shown for this site. This does not mean that flooding has not occurred as these events may not have been recorded. Investigations into historical flooding of the area should be undertaken as part of a site specific FRA.

Flood Warning Areas

There is no flood warning area covering the site.

Flood Defences

No flood defences are located close to the site.

The IDB maintain a number of raised defences which developers should identify in a site specific FRA.

Site Name: 25 – Land between Bulham Lane & High Street / Land to rear of "Newlands"
Location: Sutton-on-Trent (OS Grid Ref: 479660, 366105)

Site Size: 7.83 hectares

Existing Site Use: Greenfield

Proposed Site Use: 154 / 15 Dwellings

Vulnerability Classification: More Vulnerable

Surface Water Flood Risk:

The locally agreed surface water information maps indicate the site is located in an area susceptible to surface water flooding to an intermediate level. Therefore, further assessment of surface water flood risk should be included with the site specific flood risk assessment incorporating SuDS.

Proposed surface water drainage is a key factor to the viability of the project and must not place extra pressure on the existing drainage regime. The drainage is subject to EA and IDB consent.

Safe Access and Egress:

The approach should be taken whereby access to and from the site is away from the area shown as located within the flood extent. This area should be free from development.

Minimum Finished Floor Levels:

Finished floor levels must be set above the maximum flood depth, the EA general requirement is a 600mm freeboard for residential. If single storey dwellings are proposed this is essential. Where this is not possible then a range of measures including flood resilient construction must be considered.

This is subject to EA approval and discussions.

Flood Risk Assessment Requirements:

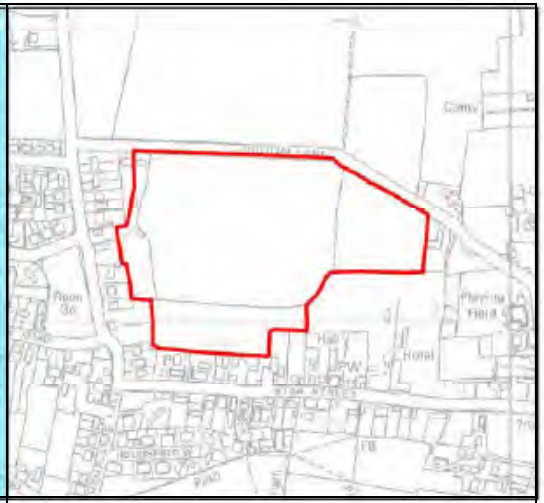
Any sites located within Flood Zone 2 or 3 regardless of size will require an FRA. Climate change should be taken in to account when assessing flood risk from any source. The lifetime of the development will guide the allowance required for climate change, in accordance with the NPPF.

Flood risk from surface water will need to be assessed as part of any FRA, with a drainage strategy provided to ensure that the development does not flood during low annual probability rainfall events or exacerbate the flood risk off site. The sequential Approach will need to be applied with development located within the Zone 1 extent only.

The site is located within Trent Valley Internal Drainage Board's (TVIDB) district and has a board maintained watercourse along its eastern and southern boundaries. The TVIDB will seek to establish an easement strip alongside this watercourse. The Board's consent will be required to any works in, over, under or within 9.0m of top, or, where the watercourse is culverted, the outside edge of the pipe. The LLFA or IDB consent will be required prior to any increases in surface water discharge from the site being made to any watercourse, other than designated main river, which would require EA consent.

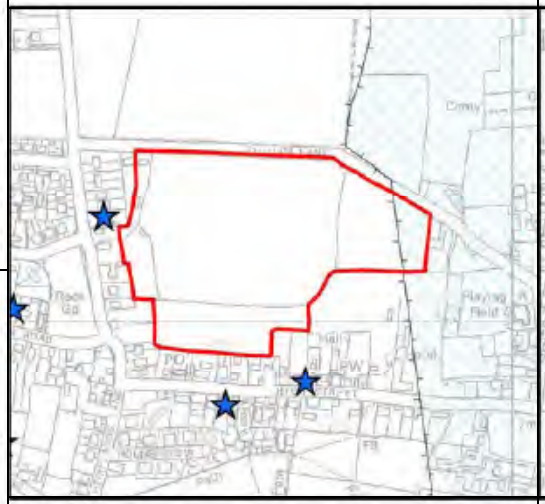
Flood Map

The site is primarily located within Flood Zone 1, with the eastern 5%of the site being located within Flood Zone 2.



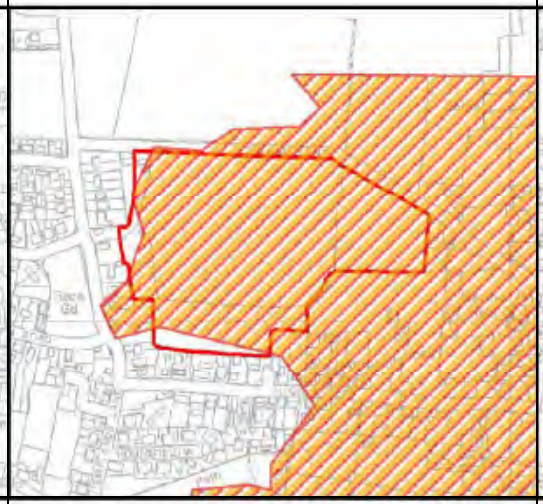
Functional Floodplain

There is no functional floodplain located within this site.



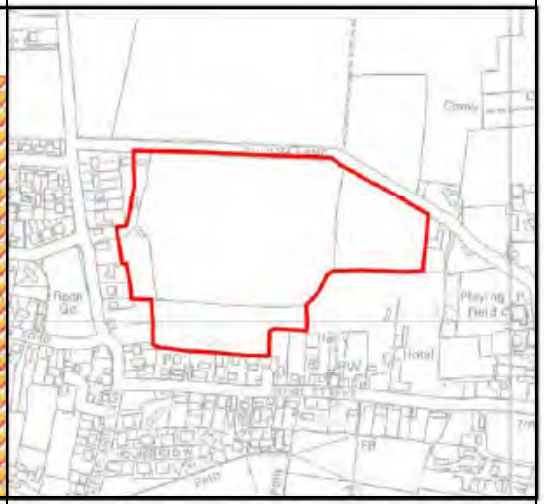
Historical Flooding

Records of historical flooding show flooding within the western part of the site. Investigations into historical flooding of the area should be undertaken as part of a site specific FRA. NAIDB has records that 22 properties in Sutton on Trent reported flooding during the June 2007 event



Flood Warning Areas

Most of the site is located within a Flood Warning Area. A Flood Plan should be provided detailing what residents / occupants should do to prepare for flood events, and what to do if the development floods. Safe escape / safe refuge details should be provided as part of a Flood Plan along with information on the EA Flood Warning system.



Flood Defences

No flood defences are located close to the site.

The IDB maintain a number of raised defences which developers should identify in a site specific FRA.

Site Name: 26 – Land Rear of Holme View / Hemplands Land, Land off Great North Rd
Location: Sutton on Trent (OS Grid Ref: 479676, 365745)

Site Size: 5.96 hectares

Existing Site Use: Greenfield

Proposed Site Use: Residential

Vulnerability Classification: More Vulnerable

Surface Water Flood Risk:

The locally agreed surface water information maps indicate the site is located in an area susceptible to surface water flooding to an intermediate level. Therefore, further assessment of surface water flood risk should be included with the site specific flood risk assessment.

Proposed surface water drainage is a key factor to the viability of the project and must not place extra pressure on the existing drainage regime. The drainage is subject to EA and IDB consent.

Safe Access and Egress:

The approach should be taken whereby access to and from the site is away from the area shown as located within the flood extent. This area should be free from development.

Minimum Finished Floor Levels:

Finished floor levels must be set above the maximum flood depth, the EA general requirement is a 600mm freeboard for residential. If single storey dwellings are proposed this is essential. Where this is not possible then a range of measures including flood resilient construction must be considered.

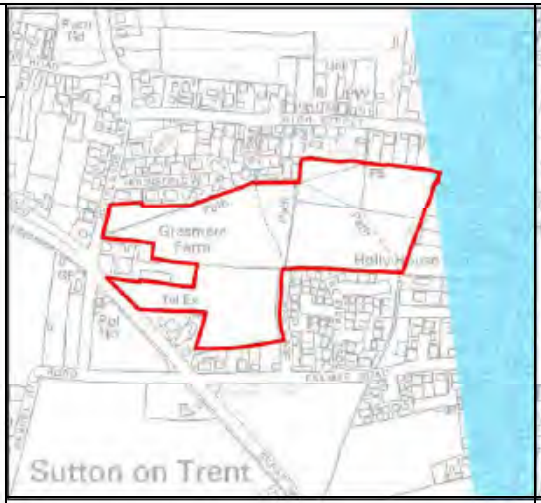
This is subject to EA approval and discussions.

Flood Risk Assessment Requirements:

Any sites located within Flood Zone 2 or 3 regardless of size will require an FRA. Climate change should be taken in to account when assessing flood risk from any source. The lifetime of the development will guide the allowance required for climate change, in accordance with the NPPF.

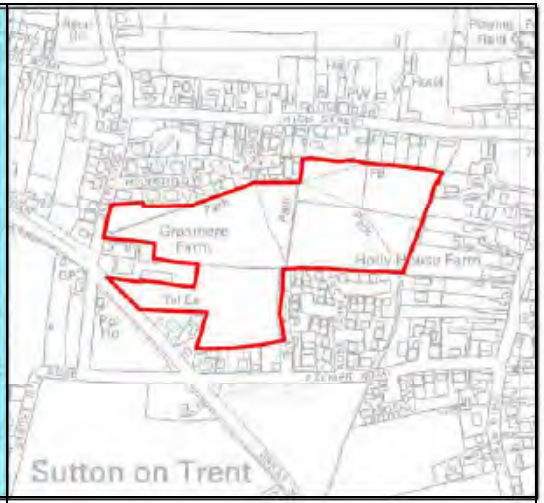
Flood risk from surface water will need to be assessed as part of any FRA, with a drainage strategy provided to ensure that the development does not flood during low annual probability rainfall events or exacerbate the flood risk off site. The sequential Approach will need to be applied with development located within the Zone 1 extent only.

The site is located within Trent Valley Internal Drainage Board's (TVIDB) district and has a board maintained watercourse along its eastern boundary. The TVIDB will seek to establish an easement strip alongside this watercourse. The Board's consent will be required to any works in, over, under or within 9.0m of top, or, where the watercourse is culverted, the outside edge of the pipe. The LLFA or IDB consent will be required prior to any increases in surface water discharge from the site being made to any watercourse, other than designated main river, which would require EA consent.



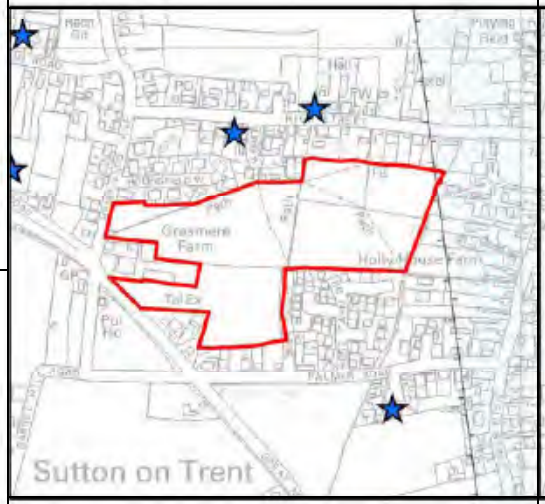
Flood Map

The site is primarily located within Flood Zone 1, with less than 1% of the western edge of the site being located within Flood Zone 2.



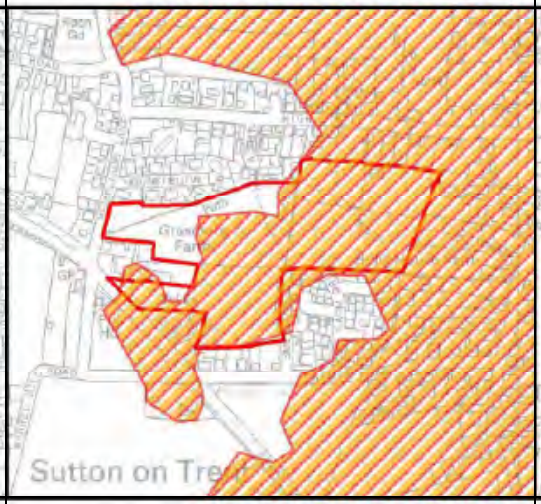
Functional Floodplain

There is no functional floodplain located within this site.



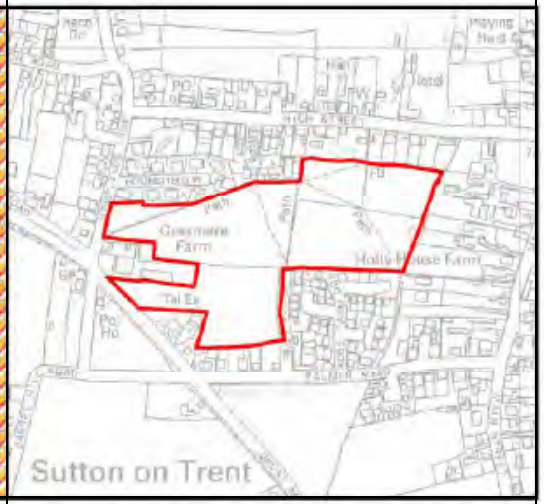
Historical Flooding

Records of historical flooding show flooding within the western part of the site. A full investigation of these fluvial flood records should be carried out within a site specific FRA. NAIDB has records that 22 properties in Sutton on Trent reported flooding during the June 2007 event



Flood Warning Areas

Most of the site is located within a Flood Warning Area. A Flood Plan should be provided detailing what residents / occupants should do to prepare for flood events, and what to do if the development floods. Safe escape / safe refuge details should be provided as part of a Flood Plan along with information on the EA Flood Warning system.



Flood Defences

No flood defences are located close to the site.

The IDB maintain a number of raised defences which developers should identify in a site specific FRA.

Site Name: 27 – Millfield, Main Street / Land at Rear of 24 Main Street
Location: Sutton-on-Trent (OS Grid Ref: 479858, 365383)

Site Size: 4.84 hectares

Existing Site Use: Greenfield

Proposed Site Use: Residential

Vulnerability Classification: More Vulnerable

Surface Water Flood Risk:

The locally agreed surface water information maps indicate the site is located in an area susceptible to surface water flooding to an intermediate level. Therefore, further assessment of surface water flood risk should be included with the site specific flood risk assessment.

Proposed surface water drainage is a key factor to the viability of the project and must not place extra pressure on the existing drainage regime. The drainage is subject to EA and IDB consent.

Safe Access and Egress:

The approach should be taken whereby access to and from the site is away from the area shown as located within the flood extent. This area should be free from development.

Minimum Finished Floor Levels:

Finished floor levels must be set above the maximum flood depth, the EA general requirement is a 600mm freeboard for residential. If single storey dwellings are proposed this is essential. Where this is not possible then a range of measures including flood resilient construction must be considered.

This is subject to EA approval and discussions.

Flood Risk Assessment Requirements:

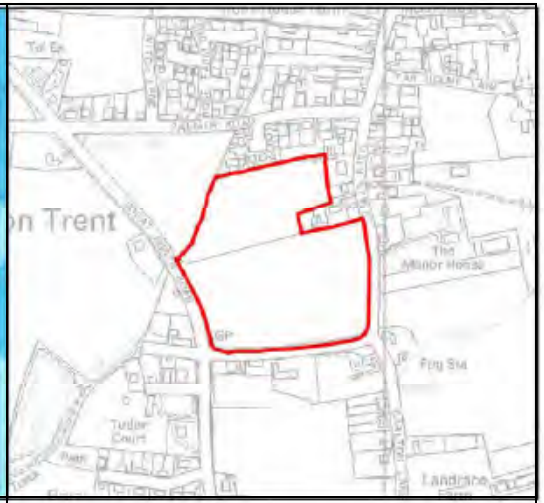
Any sites located within Flood Zone 2 or 3 regardless of size will require an FRA. Climate change should be taken in to account when assessing flood risk from any source. The lifetime of the development will guide the allowance required for climate change, in accordance with the NPPF.

Flood risk from surface water will need to be assessed as part of any FRA, with a drainage strategy provided to ensure that the development does not flood during low annual probability rainfall events or exacerbate the flood risk off site. The sequential Approach will need to be applied with development located within the Zone 1 extent only.

The site is located within Trent Valley Internal Drainage Board's (TVIDB) district and has a board maintained watercourse along its north western boundary. The TVIDB will seek to establish an easement strip alongside this watercourse. The Board's consent will be required to any works in, over, under or within 9.0m of top, or, where the watercourse is culverted, the outside edge of the pipe. The LLFA or IDB consent will be required prior to any increases in surface water discharge from the site being made to any watercourse, other than designated main river, which would require EA consent.

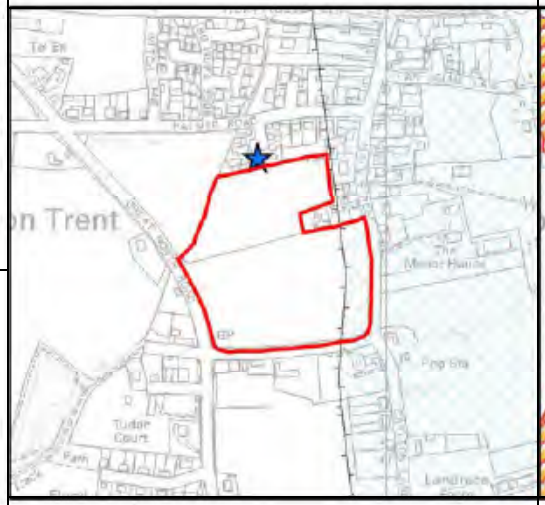
Flood Map

The site is primarily located within Flood Zone 1, with approximately 10% of the site being located within Flood Zone 2.



Functional Floodplain

There is no functional floodplain located within this site.

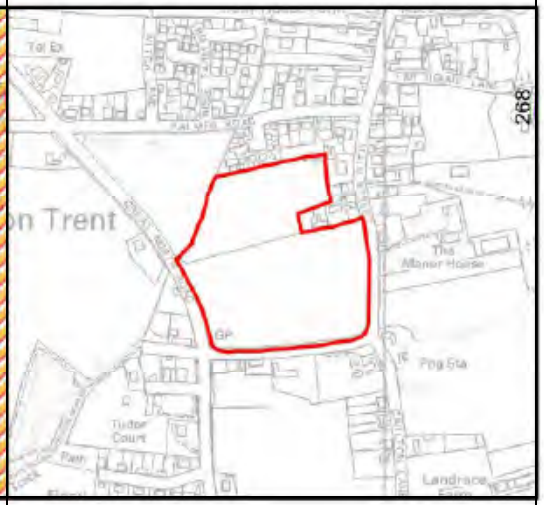


Historical Flooding

Records of historical flooding show flooding within the eastern part of the site. A fluvial flood event has also been recorded to the north of the site. A full investigation of this fluvial flood records should be carried out within a site specific FRA. NAIDB has records that 22 properties in Sutton on Trent reported flooding during the June 2007 event

Flood Warning Areas

The site is covered by a Flood Warning Area. A Flood Plan should be provided detailing what residents / occupants should do to prepare for flood events, and what to do if the development floods. Safe escape / safe refuge details should be provided as part of a Flood Plan along with information on the EA Flood Warning system.



Flood Defences

No flood defences are located close to the site.

The IDB maintain a number of raised defences which developers should identify in a site specific FRA.

Site Name: 28 – Former Clipstone Colliery
Location: Clipstone (OS Grid Ref: 459735, 363241)

Site Size: 28.03 hectares

Existing Site Use: Greenfield

Proposed Site Use: 800 Dwellings

Vulnerability Classification: More Vulnerable

Surface Water Flood Risk:

Proposed surface water drainage is a key factor to the viability of the project and must not place extra pressure on the existing drainage regime. The drainage is subject to EA consent.

Safe Access and Egress:

The approach should be taken whereby access to and from the site is away from the area shown as located within the flood extent. This area should be free from development.

Minimum Finished Floor Levels:

Finished floor levels must be set above the maximum flood depth, the EA general requirement is a 600mm freeboard for residential. If single storey dwellings are proposed this is essential. Where this is not possible then a range of measures including flood resilient construction must be considered.

This is subject to EA approval and discussions.

Flood Risk Assessment Requirements:

Any sites located within Flood Zone 2 or 3 regardless of size will require an FRA.

Climate change should be taken in to account when assessing flood risk from any source. The lifetime of the development will guide the allowance required for climate change, in accordance with the NPPF.

Flood risk from surface water will need to be assessed as part of any FRA, with a drainage strategy provided to ensure that the development does not flood during low annual probability rainfall events or exacerbate the flood risk off-site.

The sequential approach should be applied to the site whereby development is to be located in Zone 1 area of the site only and to avoid developing within any areas likely to flood. Flood resilient construction should also be considered.

Approval will be required from the LLFA or IDB if there is an increase in surface water discharge from the site to any watercourse other than a designated main river. Any discharge of surface water to a main river will require EA consent.

Flood Map

The site is primarily located within Flood Zone 1, with approximately 3% of the site along the eastern edge being located within Flood Zone 2 and 3.

Functional Floodplain

There is no functional floodplain located within this site.

Historical Flooding

No records of historical flooding have been received for the site. This does not mean that flooding has not occurred as these events may not have been recorded. Investigations into historical flooding of the area should be undertaken as part of a site specific FRA.

Flood Warning Areas

The site is not covered by a Flood Warning Area. A flood Plan should be provided detailing what residents / occupants should do to prepare for flood events, and what to do if the development floods. Safe escape / safe refuge details should be provided as part of a Flood Plan.

Flood Defences

No flood defences are located close to the site.

Site Name: 29 – Land off Whinney Lane
Location: Ollerton and Boughton (OS Grid Ref: 466256, 368875)

Site Size: 37.75 hectares

Existing Site Use: Greenfield

Proposed Site Use: 900-1500 Dwellings

Vulnerability Classification: More Vulnerable

Surface Water Flood Risk:

The locally agreed surface water information maps indicate the site is located in an area that has suffered from surface water flooding. Therefore, further assessment of surface water flood risk should be included with the site specific flood risk assessment.

Proposed surface water drainage is a key factor to the viability of the project and must not place extra pressure on the existing drainage regime. The drainage is subject to EA consent.

Safe Access and Egress:

The approach should be taken whereby access to and from the site is away from the area shown as located within the flood extent. This area should be free from development.

Safe Access and Egress should be directed to the east of the site.

Minimum Finished Floor Levels:

Finished floor levels must be set above maximum flood depth (100cc) with an allowance of 600mm freeboard for residential (see following page for further information). If single storey dwellings are proposed this is essential. Where this is not possible then a range of measures including flood resilient construction must be considered.

This is subject to EA approval and discussions.

Flood Risk Assessment Requirements:

Any sites located within Flood Zone 2 or 3 regardless of size will require an FRA.

Climate change should be taken in to account when assessing flood risk from any source. The lifetime of the development will guide the allowance required for climate change, in accordance with the NPPF.

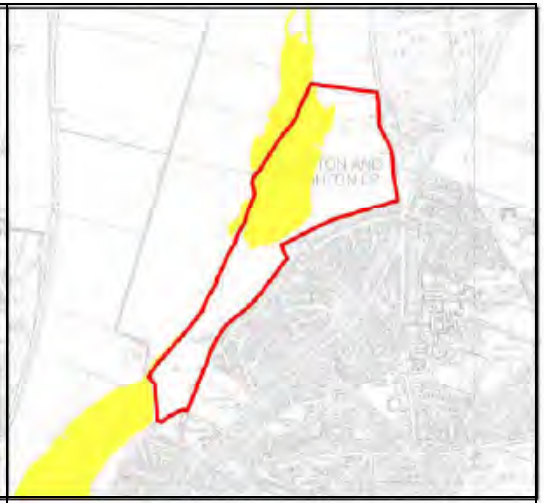
Flood risk from surface water will need to be assessed as part of any FRA, with a drainage strategy provided to ensure that the development does not flood during low annual probability rainfall events or exacerbate the flood risk off-site.

The sequential approach should be applied to the site whereby development is to be located in Zone 1 area of the site only and to avoid developing within any areas likely to flood. Flood resilient construction should also be considered.

Approval will be required from the LLFA or IDB if there is an increase in surface water discharge from the site to any watercourse other than a designated main river. Any discharge of surface water to a main river will require EA consent.

Flood Map

The site is partly located within Flood Zone 1, with approximately 50% of the site being located within Flood Zone 2 and 40% of the site being located within Flood Zone 3.

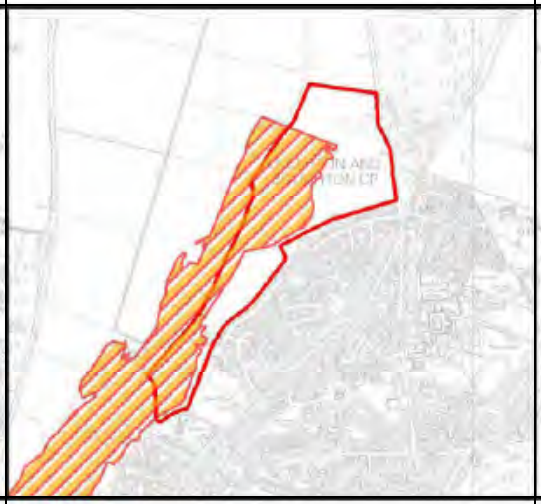


Functional Floodplain

A large part of the northern half of the site is located within functional floodplain. This area should be kept free from development.

Historical Flooding

Historical flooding is indicated along the western side of the site, with a historical sewer flooding record located just to the east of the site.



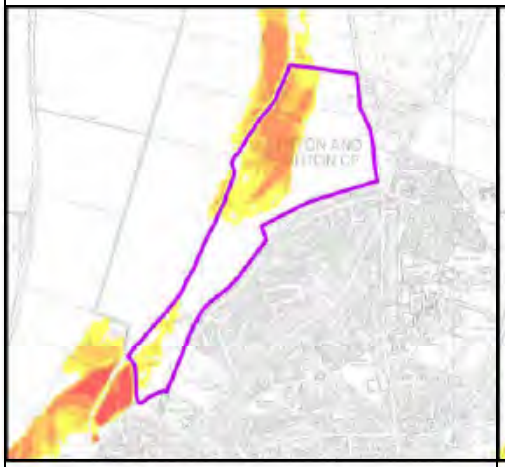
Flood Warning Areas

The site is covered by a Flood Warning Area. A Flood Plan should be provided detailing what residents / occupants should do to prepare for flood events, and what to do if the development floods. Safe escape / safe refuge details should be provided as part of a Flood Plan along with information on the EA Flood Warning system.

Flood Defences

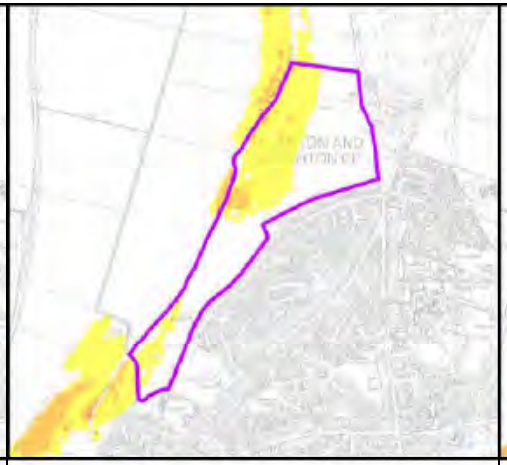
No flood defences are located close to the site.

Site Name: 29 – Land off Whinney Lane
Location: Ollerton and Boughton (OS Grid Ref: 466256, 368875)



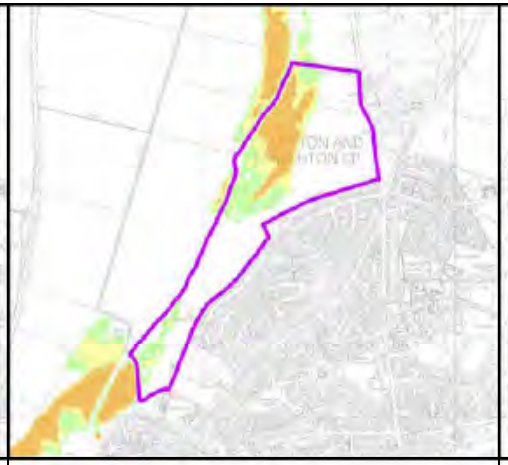
100CC - Depth

It can be seen on figure F1.1 that the north-western end of the site is shown as being inundated by water to a depth of up to 1.0m during the 1 in 100 year plus climate change flood event. The southern end of the site is less affected, with flood waters up to 0.5m depth experienced.



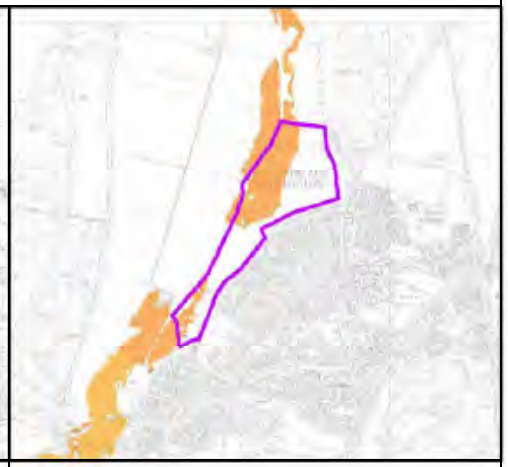
100CC - Velocity

When referencing figure F2.1 it can be seen that the velocities of flood waters within the site are low. Within the southern part of the site the flood waters reach a maximum velocity of 0.3m/s, and in the northern part of the site the flood waters reach a maximum velocity of 1.0m/s



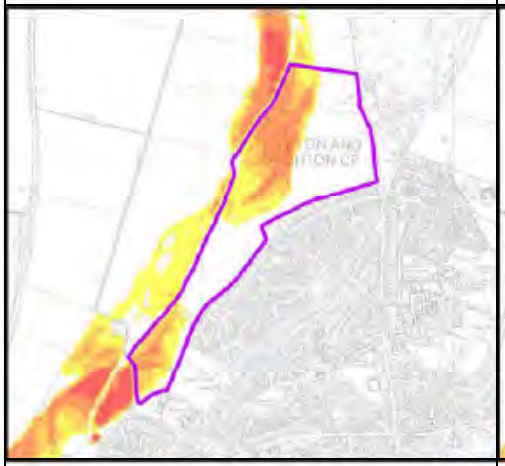
100CC - Hazard

With reference to figure F3.1 it can be seen that the site experiences a medium flood hazard, with hazard ratings from FD2320 of up to 2.0 (Danger for Most) in the northern part of the site and hazards up to 1.25 (Danger for Some) in the southern part of the site.



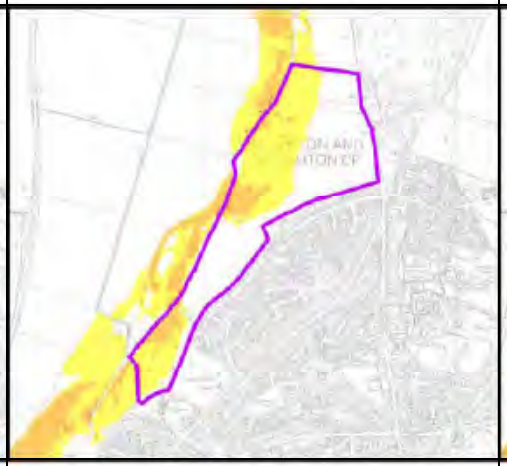
100CC - Time to Inundation

This time to inundation mapping shows the time it takes for flooding to occur at the site from the start of the critical storm event. The time to inundation for the site is approximately 20 to 21 hours from the beginning of the flood event, with both the southern and northern parts of the site being inundated at similar times.



1000 - Depth

It can be seen on figure F1.2 that the north-western end of the site is shown as being inundated by water to a depth of up to 1.5m during the 1 in 1000 year flood event. The southern end of the site is less affected, with flood waters up to 1.0m depth experienced.

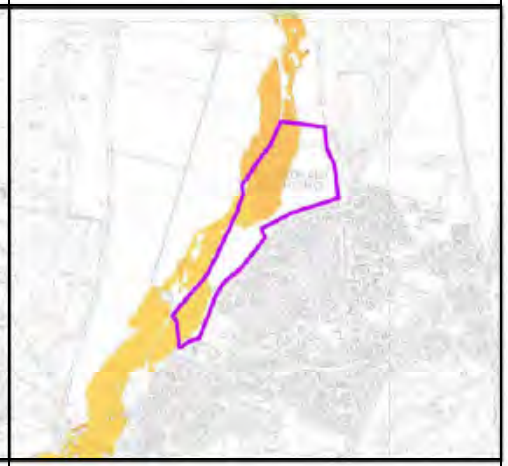


1000 - Velocity

When referencing figure F2.2 it can be seen that the velocities of flood waters within the site are low. Within the southern part of the site the flood waters reach a maximum velocity of 1.0m/s, and in the northern part of the site the flood waters reach a maximum velocity of 1.0m/s

1000 - Hazard

With reference to figure F3.2 it can be seen that the site experiences a medium flood hazard, with hazard ratings from FD2320 of up to 2.0 (Danger for Most) in the northern part of the site and hazards up to 2.0 (Danger for Most) in the southern part of the site.



1000 - Time to Inundation

This time to inundation mapping shows the time it takes for flooding to occur at the site from the start of the critical storm event. The time to inundation for the site is approximately 19 to 20 hours from the beginning of the flood event, with both the southern and northern parts of the site being inundated at similar times.

Site Name: 30 – Land east of Harrow Lane
Location: Ollerton and Boughton (OS Grid Ref: 467876, 367961)

Site Size: 14.79 hectares

Existing Site Use: Greenfield

Proposed Site Use: 400 Dwellings

Vulnerability Classification: More Vulnerable

Surface Water Flood Risk:

Proposed surface water drainage is a key factor to the viability of the project and must not place extra pressure on the existing drainage regime. The drainage is subject to EA consent.

Safe Access and Egress:

The approach should be taken whereby access to and from the site is away from the area shown as located within the flood extent. This area should be free from development.

Minimum Finished Floor Levels:

Finished floor levels must be set above the maximum flood depth, the EA general requirement is a 600mm freeboard for residential. If single storey dwellings are proposed this is essential. Where this is not possible then a range of measures including flood resilient construction must be considered.

This is subject to EA approval and discussions.

Flood Risk Assessment Requirements:

Any sites located within Flood Zone 2 or 3 regardless of size will require an FRA.

Climate change should be taken in to account when assessing flood risk from any source. The lifetime of the development will guide the allowance required for climate change, in accordance with the NPPF.

Flood risk from surface water will need to be assessed as part of any FRA, with a drainage strategy provided to ensure that the development does not flood during low annual probability rainfall events or exacerbate the flood risk off-site.

The sequential approach should be applied to the site whereby development is to be located in Zone 1 area of the site only and to avoid developing within any areas likely to flood. Flood resilient construction should also be considered.

Approval will be required from the LLFA or IDB if there is an increase in surface water discharge from the site to any watercourse other than a designated main river. Any discharge of surface water to a main river will require EA consent.

Flood Map

The site is primarily located within Flood Zone 1, with approximately 5% of the site at the eastern edge being located within Flood Zone 2 and 3.

Functional Floodplain

The site is not located within functional floodplain.

Historical Flooding

No records of historical flooding have been received for the site. This does not mean that flooding has not occurred as these events may not have been recorded. Investigations into historical flooding of the area should be undertaken as part of a site specific FRA.

Flood Warning Areas

The site is not located within a Flood Warning Area. A Flood Plan should be provided detailing what residents / occupants should do to prepare for flood events, and what to do if the development floods. Safe escape / safe refuge details should be provided as part of a Flood Plan along with information on the EA Flood Warning system.

Flood Defences

No flood defences are located close to the site.

Site Name: 31 – North of Mickledale Lane
Location: Bilsthorpe (OS Grid Ref: 463951, 361049)

Site Size: 6.5 hectares

Existing Site Use: Greenfield

Proposed Site Use: 140 Dwellings

Vulnerability Classification: More Vulnerable

Surface Water Flood Risk:

Proposed surface water drainage is a key factor to the viability of the project and must not place extra pressure on the existing drainage regime. The drainage is subject to EA consent.

Safe Access and Egress:

The approach should be taken whereby access to and from the site is away from the area shown as located within the flood extent. This area should be free from development.

Minimum Finished Floor Levels:

Finished floor levels must be set above the maximum flood depth, the EA general requirement is a 600mm freeboard for residential. If single storey dwellings are proposed this is essential. Where this is not possible then a range of measures including flood resilient construction must be considered.

This is subject to EA approval and discussions.

Flood Risk Assessment Requirements:

Any sites located within Flood Zone 2 or 3 regardless of size will require an FRA.

Climate change should be taken in to account when assessing flood risk from any source. The lifetime of the development will guide the allowance required for climate change, in accordance with the NPPF.

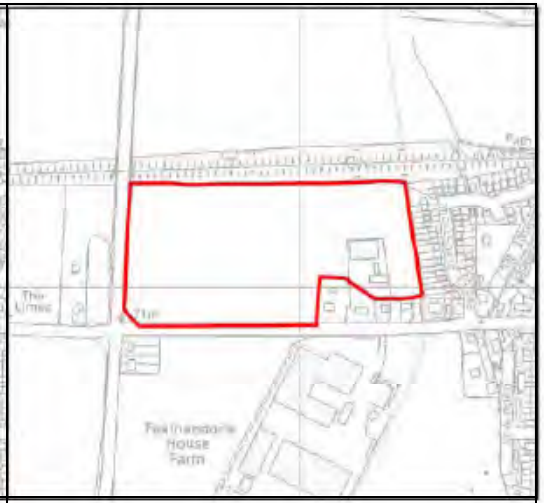
Flood risk from surface water will need to be assessed as part of any FRA, with a drainage strategy provided to ensure that the development does not flood during low annual probability rainfall events or exacerbate the flood risk off-site.

The sequential approach should be applied to the site whereby development is to be located in Zone 1 area of the site only and to avoid developing within any areas likely to flood. Flood resilient construction should also be considered.

Approval will be required from the LLFA or IDB if there is an increase in surface water discharge from the site to any watercourse other than a designated main river. Any discharge of surface water to a main river will require EA consent.

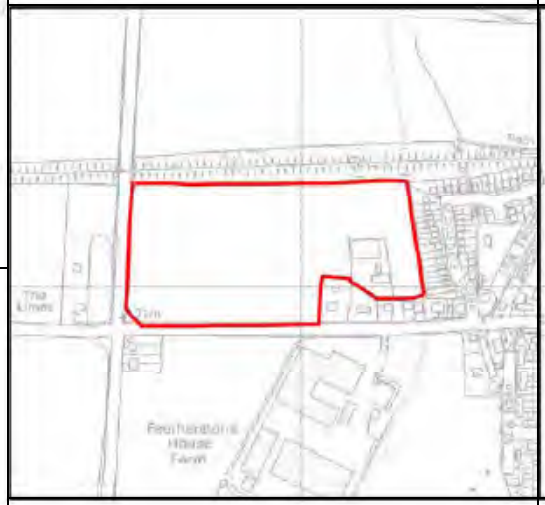
Flood Map

The site is primarily located within Flood Zone 1, with approximately 7.5% of the site along the eastern edge being located within Flood Zone 2 and 3.



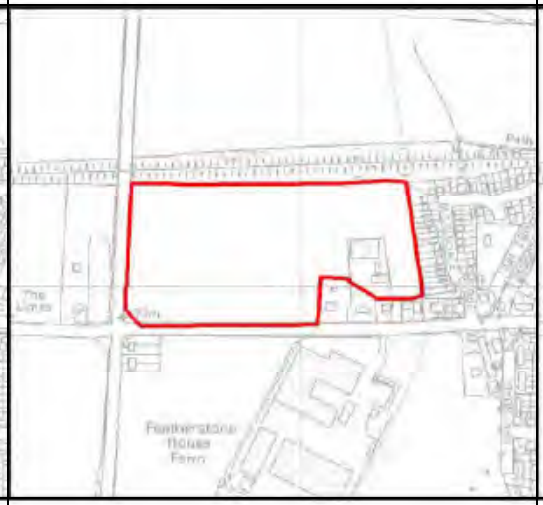
Functional Floodplain

The site is not located within functional floodplain.



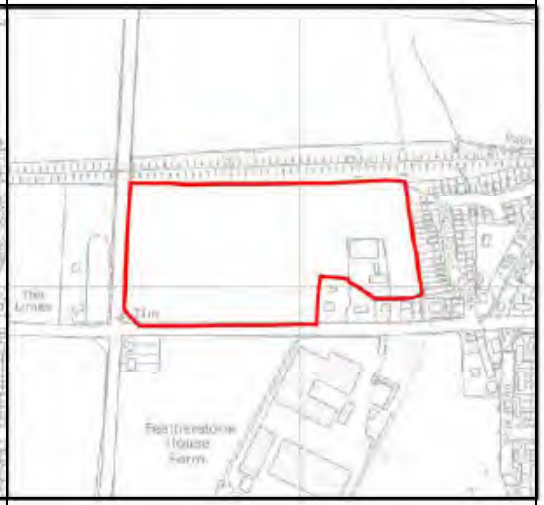
Historical Flooding

No records of historical flooding have been received for the site. This does not mean that flooding has not occurred as these events may not have been recorded. Investigations into historical flooding of the area should be undertaken as part of a site specific FRA.



Flood Warning Areas

The site is not located within a Flood Warning Area. A Flood Plan should be provided detailing what residents / occupants should do to prepare for flood events, and what to do if the development floods. Safe escape / safe refuge details should be provided as part of a Flood Plan along with information on the EA Flood Warning system.



Flood Defences

No flood defences are located close to the site.

Site Name: 32 – South of Mickledale Lane / Hawton Road
Location: Bilsthorpe (OS Grid Ref: 463893, 360681)

Site Size: 6.5 hectares

Existing Site Use: Greenfield and Brownfield

Proposed Site Use: 354 Dwellings

Vulnerability Classification: More Vulnerable

Surface Water Flood Risk:

Proposed surface water drainage is a key factor to the viability of the project and must not place extra pressure on the existing drainage regime. The drainage is subject to EA consent.

Safe Access and Egress:

The approach should be taken whereby access to and from the site is away from the area shown as located within the flood extent. This area should be free from development.

Minimum Finished Floor Levels:

Finished floor levels must be set above the maximum flood depth, the EA general requirement is a 600mm freeboard for residential. If single storey dwellings are proposed this is essential. Where this is not possible then a range of measures including flood resilient construction must be considered.

This is subject to EA approval and discussions.

Flood Risk Assessment Requirements:

Any sites located within Flood Zone 2 or 3 regardless of size will require an FRA.

Climate change should be taken in to account when assessing flood risk from any source. The lifetime of the development will guide the allowance required for climate change, in accordance with the NPPF.

Flood risk from surface water will need to be assessed as part of any FRA, with a drainage strategy provided to ensure that the development does not flood during low annual probability rainfall events or exacerbate the flood risk off-site.

The sequential approach should be applied to the site whereby development is to be located in Zone 1 area of the site only and to avoid developing within any areas likely to flood. Flood resilient construction should also be considered.

Approval will be required from the LLFA or IDB if there is an increase in surface water discharge from the site to any watercourse other than a designated main river. Any discharge of surface water to a main river will require EA consent.

Flood Map

The site is primarily located within Flood Zone 1, with approximately 7.5% of the site along the eastern edge being located within Flood Zone 2 and 5% of the site being located within Flood Zone 3. The site will therefore need to be assessed based on Flood Zone 3 criteria.

Functional Floodplain

The site is not located within functional floodplain.

Historical Flooding

No records of historical flooding have been received for the site. This does not mean that flooding has not occurred as these events may not have been recorded. Investigations into historical flooding of the area should be undertaken as part of a site specific FRA.

Flood Warning Areas

The site is not located within a Flood Warning Area. A Flood Plan should be provided detailing what residents / occupants should do to prepare for flood events, and what to do if the development floods. Safe escape / safe refuge details should be provided as part of a Flood Plan along with information on the EA Flood Warning system.

Flood Defences

No flood defences are located close to the site.

Site Name: 33 – Land South of Bilsthorpe / Land off Scarborough Rd / West of New Rd
Location: Bilsthorpe (OS Grid Ref: 464573, 360562)

Site Size: 10.43 hectares

Existing Site Use: Greenfield and Brownfield

Proposed Site Use: Residential

Vulnerability Classification: More Vulnerable

Surface Water Flood Risk:

The locally agreed surface water information maps indicate the site is located in an area susceptible to surface water flooding. Therefore, further assessment of surface water flood risk should be included with the site specific flood risk assessment.

Proposed surface water drainage is a key factor to the viability of the project and must not place extra pressure on the existing drainage regime. The drainage is subject to EA consent.

Safe Access and Egress:

The approach should be taken whereby access to and from the site is away from the area shown as located within the flood extent. This area should be free from development.

Minimum Finished Floor Levels:

Finished floor levels must be set above the maximum flood depth, the EA general requirement is a 600mm freeboard for residential. If single storey dwellings are proposed this is essential. Where this is not possible then a range of measures including flood resilient construction must be considered.

This is subject to EA approval and discussions.

Flood Risk Assessment Requirements:

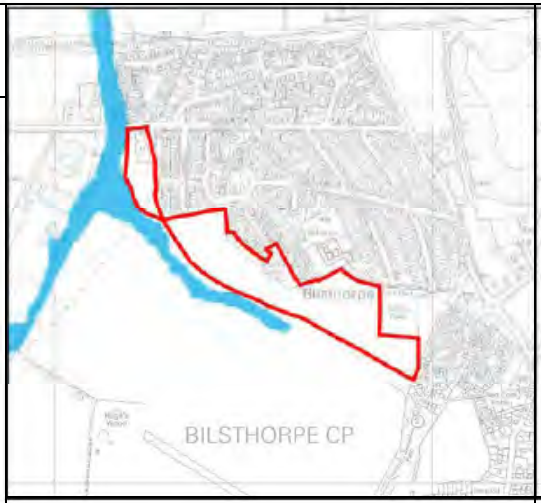
Any sites located within Flood Zone 2 or 3 regardless of size will require an FRA.

Climate change should be taken in to account when assessing flood risk from any source. The lifetime of the development will guide the allowance required for climate change, in accordance with the NPPF.

Flood risk from surface water will need to be assessed as part of any FRA, with a drainage strategy provided to ensure that the development does not flood during low annual probability rainfall events or exacerbate the flood risk off-site.

The sequential approach should be applied to the site whereby development is to be located in Zone 1 area of the site only and to avoid developing within any areas likely to flood. Flood resilient construction should also be considered.

Approval will be required from the LLFA or IDB if there is an increase in surface water discharge from the site to any watercourse other than a designated main river. Any discharge of surface water to a main river will require EA consent.



Flood Map

The site is primarily located within Flood Zone 1, with less than 1% of the site along the western edge being located within Flood Zone 2 and 3.

Functional Floodplain

The site is not located within functional floodplain.

Historical Flooding

No records of historical flooding have been received for the site. This does not mean that flooding has not occurred as these events may not have been recorded. Investigations into historical flooding of the area should be undertaken as part of a site specific FRA.

Flood Warning Areas

The site is not located within a Flood Warning Area. Where sites are within Flood Zone 3, a Flood Plan should be provided detailing what residents / occupants should do to prepare for flood events, and what to do if the development floods. Safe escape / safe refuge details should be provided as part of a Flood Plan.

Flood Defences

No flood defences are located close to the site.

Site Name: 34 – Land off Southwell Road
Location: Lowdham (OS Grid Ref: 467417, 346501)

Site Size: 0.94 hectares

Existing Site Use: Greenfield and Brownfield

Proposed Site Use: 15 Dwellings

Vulnerability Classification: More Vulnerable

Surface Water Flood Risk:

The locally agreed surface water information maps indicate the site is located in an area susceptible to surface water flooding to an intermediate level. Therefore, further assessment of surface water flood risk should be included with a site specific flood risk assessment.

Proposed surface water drainage is a key factor to the viability of the project and must not place extra pressure on the existing drainage regime. The drainage is subject to EA consent.

Safe Access and Egress:

Any development brought forward on this site should provide safe access and egress for residents. The approach should be taken whereby access to and from the site is away from the area shown as located within the flood extent. This area should be free from development.

It is likely land raising will be required to levels above the associated flood depth to provide safe refuge during times of flood (should safe access and egress not be possible).

Minimum Finished Floor Levels:

Finished floor levels must be set above the maximum flood depth, the EA general requirement is a 600mm freeboard for residential. If single storey dwellings are proposed this is essential. Where this is not possible then a range of measures including flood resilient construction must be considered.

This is subject to EA approval and discussions.

An initial estimate of flood levels has been carried out, indicating that the level of flood water is at approximately 19.2m AOD for the extent of Flood Zone 3. The minimum finished floor level to be set 600mm above this level, is at approximately 19.8m AOD.

Flood Risk Assessment Requirements:

Any sites located within Flood Zone 2 or 3 regardless of size will require an FRA. Climate change should be taken in to account when assessing flood risk from any source. The lifetime of the development will guide the allowance required for climate change, in accordance with the NPPF.

Flood risk from surface water will need to be assessed as part of any FRA, with a drainage strategy provided to ensure that the development does not flood during low annual probability rainfall events or exacerbate the flood risk off site. The sequential Approach will need to be applied with no development located within the Zone 3 extent.

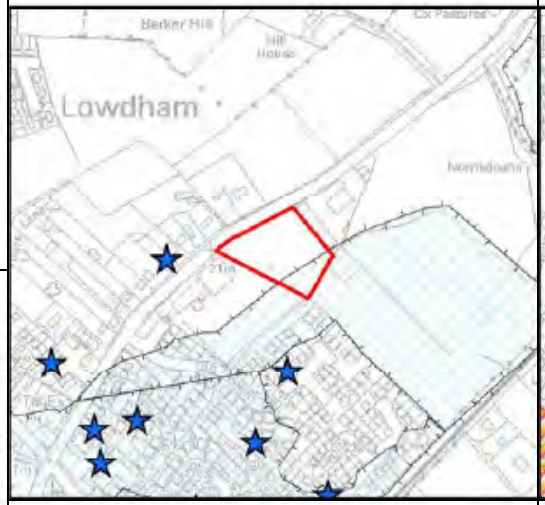
The site is located within Trent Valley Internal Drainage Board's (TVIDB) district and has a board maintained watercourse along its south eastern and south western boundaries. The TVIDB will seek to establish an easement strip alongside this watercourse. The Board's consent will be required to any works in, over, under or within 9.0m of top, or, where the watercourse is culverted, the outside edge of the pipe. The LLFA or IDB consent will be required prior to any increases in surface water discharge from the site being made to any watercourse, other than designated main river, which would require EA consent.

Flood Map

The site is located within Flood Zones 1, 2 and 3a. Approximately 10% of the site is located within Flood Zone 2, approximately 50% of the site at the eastern edge is located within Flood Zone 3a, and the other 40% of the site is located in Flood Zone 1.

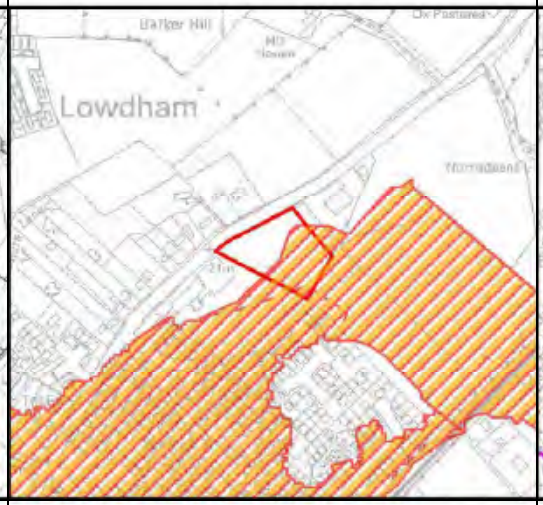
Functional Floodplain

The site is not located within functional floodplain.



Historical Flooding

The eastern part of the site is located within an area which has flooded historically. There are a number of specific fluvial flood events close to the site to the south-west. NAIDB has records that flooding has occurred in the village of Lowdham.



Flood Warning Areas

The site is located within a Flood Warning Area. Where sites are within Flood Zone 3, a Flood Plan should be provided detailing what residents / occupants should do to prepare for flood events, and what to do if the development floods. Safe escape / safe refuge details should be provided as part of a Flood Plan.

Flood Defences

No flood defences are located close to the site.

The IDB maintain a number of raised defences which developers should identify in a site specific FRA.

Site Name: 34 – Land off Southwell Road
Location: Lowdham (OS Grid Ref: 467417, 346501)

Introduction

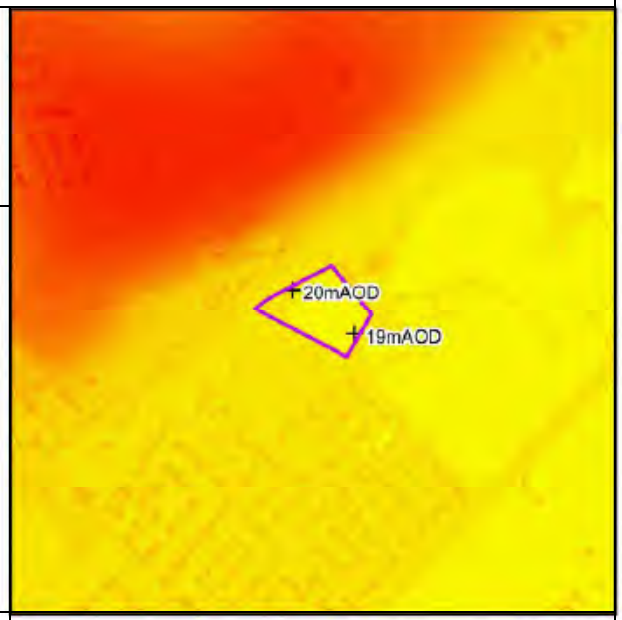
In the absence of a detailed hydraulic model for this site an analysis has been undertaken based on first principles whereby the flood depth has been estimated based upon a comparison between the predicted flood extent (obtained from the Environment Agency Flood Maps) and the ground level information available using LiDAR. Refer to the site specific information on the previous page for more detailed information. This data does not supersede the need for site specific modelling should the EA request it as part of a site specific FRA.

Contour Information

Existing Contours for the site have been taken from LiDAR data for the area. This shows the site slopes from north to south by approximately 1m. The contours show that Barker Hill is located to the north-west of the site, with a very flat area located between the base of the hill and the River Trent which is located approximately 3km to the south-east.

The site slopes from a level of approximately 19m AOD close to the Car Dyke which runs across the south-east of the site, to a level of approximately 20m AOD close to the road. The site is reasonably flat in between these levels, with the majority of the difference in level being made up by a slope at the north-west end of the site.

A full topographical survey of the site should be carried out as part of a site specific FRA to ensure accurate analysis of any flood depths and water flow paths can be carried out.



Flooding Information

Approximately 50%of the site is situated in Flood Zone 3, 10% of the site within Flood Zone 2, with the remainder located in Flood Zone 1. Indicative maximum water depths across the site range from 0.3m to 0.4m.

Due to the depth of flood waters at the site it is recommended that development occur only within the lower risk areas of the site and no development to occur within the Flood Zone 3 extent. This will cause approximately 50-60% of the site to be undeveloped.

If any 'more vulnerable' development (as defined by PPS25) were proposed within the Flood Zone 3 extent then the exception test would need to be passed. Any development within this area would need to be raised to be above the modelled flood level and therefore flood compensation would have to be provided to ensure no off-site impacts.

Height Key (mAOD)

- 17 - 19
- 19 - 21
- 21 - 23
- 23 - 25
- 25 - 27
- 27 - 29
- 29 - 31
- 31 - 33
- 33 - 35
- 35 - 37
- 37 - 39
- 39 - 41
- 41 - 43
- 43 - 45
- 45 - 47
- 47 - 49
- 49 - 51
- 51 - 53
- 53 - 55
- 55 - 57

Flood Zone Key

- Flood Zone 2
- Flood Zone 3

The flood levels shown are indicative only and should be confirmed through site specific investigations.

Site Name: 35 – Land off Barker Ridge / Ridge Hill / Barker Hill/ North of Epperstone Rd
Location: Lowdham (OS Grid Ref:467004, 346923)

Site Size: 18.96 hectares

Existing Site Use: Greenfield

Proposed Site Use: Residential

Vulnerability Classification: More Vulnerable

Surface Water Flood Risk:

The locally agreed surface water information maps indicate the site is located in an area susceptible to surface water flooding to an intermediate level. Therefore, further assessment of surface water flood risk should be included with the site specific flood risk assessment.

Proposed surface water drainage is a key factor to the viability of the project and must not place extra pressure on the existing drainage regime. The drainage is subject to EA consent.

Safe Access and Egress:

The approach should be taken whereby access to and from the site is away from the area shown as located within the flood extent. This area should be free from development.

Minimum Finished Floor Levels:

Finished floor levels must be set above the maximum flood depth, the EA general requirement is a 600mm freeboard for residential. If single storey dwellings are proposed this is essential. Where this is not possible then a range of measures including flood resilient construction must be considered.

This is subject to EA approval and discussions.

Flood Risk Assessment Requirements:

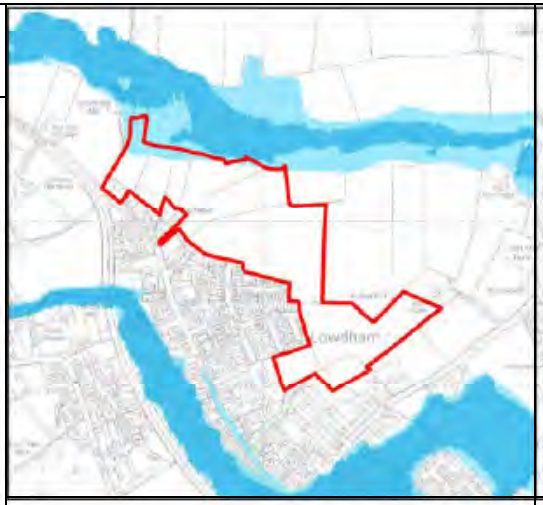
Any sites located within Flood Zone 2 or 3 regardless of size will require an FRA.

Climate change should be taken in to account when assessing flood risk from any source. The lifetime of the development will guide the allowance required for climate change, in accordance with the NPPF.

Flood risk from surface water will need to be assessed as part of any FRA, with a drainage strategy provided to ensure that the development does not flood during low annual probability rainfall events or exacerbate the flood risk off-site.

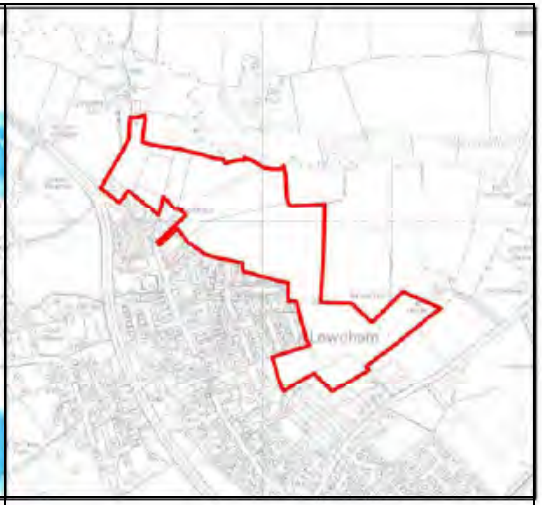
The sequential approach should be applied to the site whereby development is to be located in Zone 1 area of the site only and to avoid developing within any areas likely to flood. Flood resilient construction should also be considered.

Approval will be required from the LLFA or IDB if there is an increase in surface water discharge from the site to any watercourse other than a designated main river. Any discharge of surface water to a main river will require EA consent.



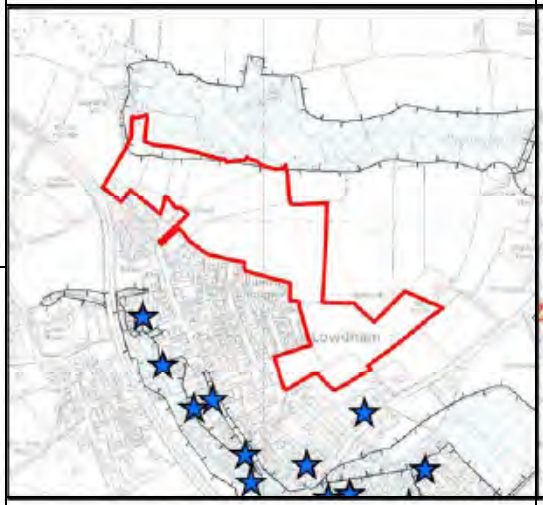
Flood Map

The site is mainly located within Flood Zone 1, with approximately 5% of the site along the north-western edge being located within Flood Zone 2 and 3.



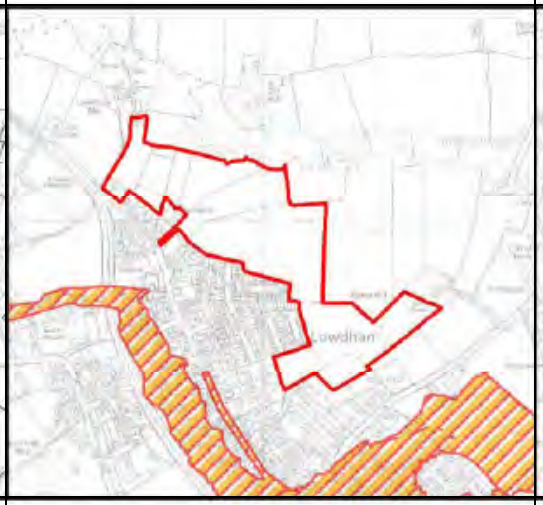
Functional Floodplain

The site is not located within functional floodplain.



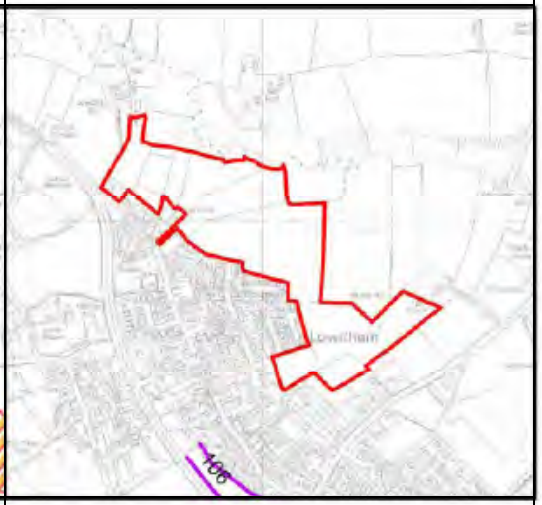
Historical Flooding

The northern part of the site is located within an area which has flooded historically. There are a number of specific fluvial flood events within the town of Lowdham to the south, however these relate to a different watercourse. NAIDB has records that flooding has occurred within the Village of Lowdham.



Flood Warning Areas

The site is not located within a Flood Warning Area. A Flood Plan should be provided detailing what residents / occupants should do to prepare for flood events, and what to do if the development floods. Safe escape / safe refuge details should be provided as part of a Flood Plan along with information on the EA Flood Warning system.



Flood Defences

No flood defences are located close to the site.

The IDB maintain a number of raised defences which developers should identify in a site specific FRA.

Site Name: 36 – OB\E\1
Location: Ollerton and Boughton (OS Grid Ref: 468614, 367745)

Site Size: 11.36 hectares

Existing Site Use: Industrial / Commercial

Proposed Site Use: Employment

Vulnerability Classification: Less Vulnerable

Surface Water Flood Risk:

The locally agreed surface water information maps indicate the site is located in an area susceptible to surface water flooding. Therefore, further assessment of surface water flood risk should be included with the site specific flood risk assessment.

Proposed surface water drainage is a key factor to the viability of the project and must not place extra pressure on the existing drainage regime.

Safe Access and Egress:

Safe / dry access and egress should be provided for all future residents of the site. Residents should be directed away from offsite flood areas.

Minimum Finished Floor Levels:

It is advisable for finished floor levels to be 150mm to 300mm above ground levels to ensure that any surface water flooding would not enter buildings and cause damage.

This is subject to EA discussions and approval.

Flood Risk Assessment Requirements:

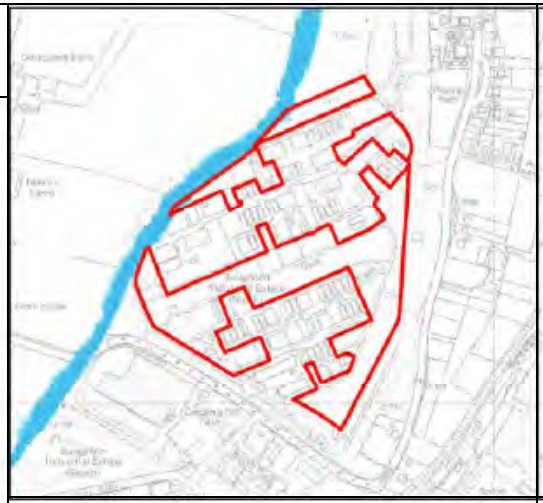
Any sites located within Flood Zone 2 or 3 regardless of size will require an FRA.

Climate change should be taken in to account when assessing flood risk from any source. The lifetime of the development will guide the allowance required for climate change, in accordance with the NPPF.

Flood risk from surface water will need to be assessed as part of any FRA, with a drainage strategy provided to ensure that the development does not flood during low annual probability rainfall events or exacerbate the flood risk off-site.

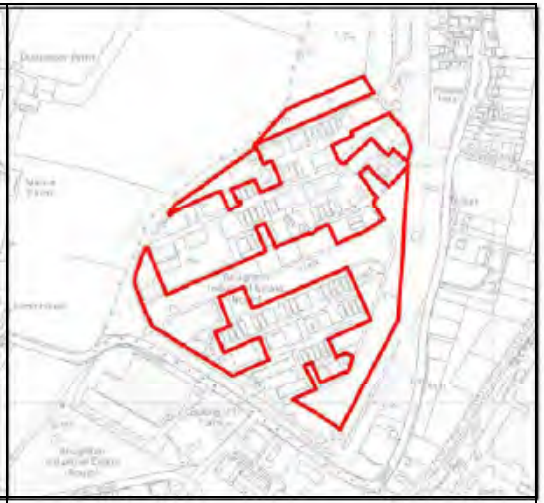
The sequential approach should be applied to the site whereby development is to be located in Zone 1 area of the site only and to avoid developing within any areas likely to flood. Flood resilient construction should also be considered.

Approval will be required from the LLFA or IDB if there is an increase in surface water discharge from the site to any watercourse other than a designated main river. Any discharge of surface water to a main river will require EA consent.



Flood Map

The site is predominantly located within Flood Zone 1, with an area of the site of less than 1% along the northern edge being located within Flood Zone 2 and 3.

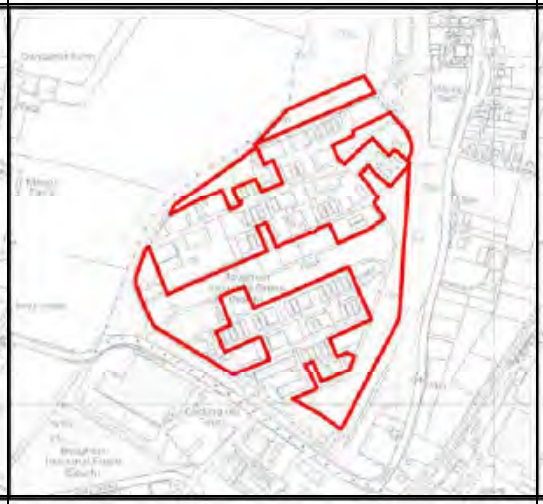


Functional Floodplain

The site is not located within functional floodplain.

Historical Flooding

No records of historical flooding have been received for the site. This does not mean that flooding has not occurred as these events may not have been recorded. Investigations into historical flooding of the area should be undertaken as part of a site specific FRA.



Flood Warning Areas

The site is not located within a Flood Warning Area. A Flood Plan should be provided detailing what residents / occupants should do to prepare for flood events, and what to do if the development floods. Safe escape / safe refuge details should be provided as part of a Flood Plan.

Flood Defences

No flood defences are located close to the site.

Site Name: 37 – OB\E\2
Location: Ollerton and Boughton (OS Grid Ref: 468227, 367745)

Site Size: 2.09 hectares

Existing Site Use: Industrial / Commercial

Proposed Site Use: Employment

Vulnerability Classification: Less Vulnerable

Surface Water Flood Risk:

The locally agreed surface water information maps indicate the site is located in an area susceptible to surface water flooding to an intermediate level. Therefore, further assessment of surface water flood risk should be included with the site specific flood risk assessment incorporating SuDS.

Proposed surface water drainage is a key factor to the viability of the project and must not place extra pressure on the existing drainage regime.

Safe Access and Egress:

Safe / dry access and egress should be provided for all future residents of the site. Residents should be directed away from offsite flood areas.

Minimum Finished Floor Levels:

It is advisable for finished floor levels to be 150mm to 300mm above ground levels to ensure that any surface water flooding would not enter buildings and cause damage.

This is subject to EA discussions and approval.

Flood Risk Assessment Requirements:

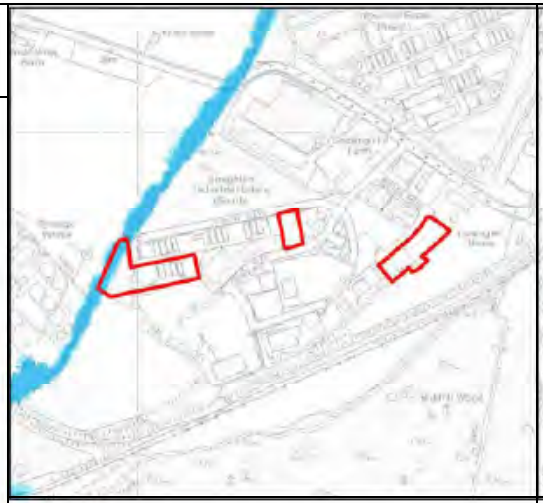
Any sites located within Flood Zone 2 or 3 regardless of size will require an FRA.

Climate change should be taken in to account when assessing flood risk from any source. The lifetime of the development will guide the allowance required for climate change, in accordance with the NPPF.

Flood risk from surface water will need to be assessed as part of any FRA, with a drainage strategy provided to ensure that the development does not flood during low annual probability rainfall events or exacerbate the flood risk off-site.

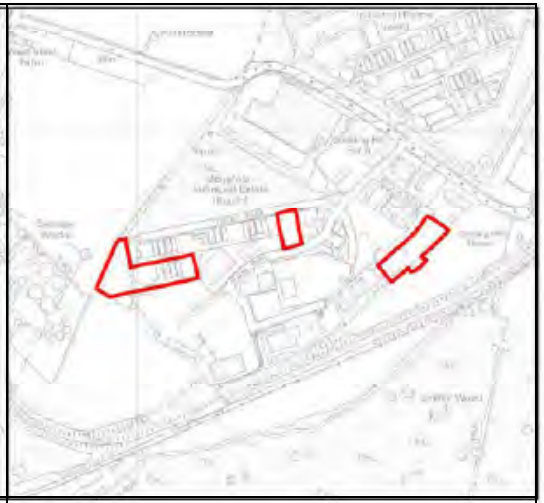
The sequential approach should be applied to the site whereby development is to be located in Zone 1 area of the site only and to avoid developing within any areas likely to flood. Flood resilient construction should also be considered.

Approval will be required from the LLFA or IDB if there is an increase in surface water discharge from the site to any watercourse other than a designated main river. Any discharge of surface water to a main river will require EA consent.



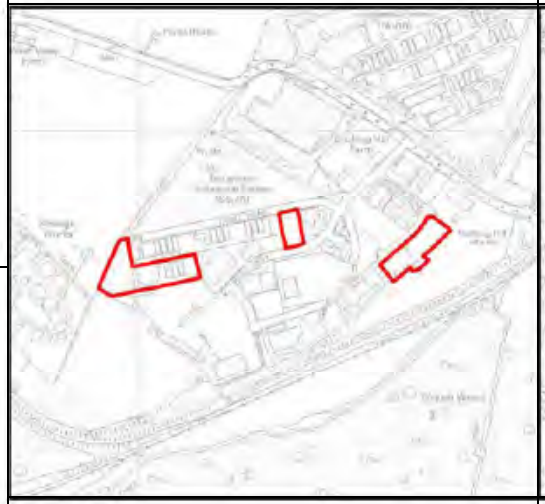
Flood Map

The site is predominantly located within Flood Zone 1, with less than 5% of the site area along the western edge being located within Flood Zone 2 and 3.



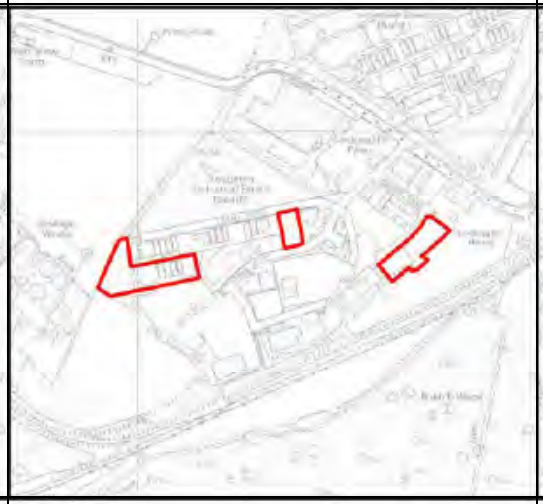
Functional Floodplain

The site is not located within functional floodplain.



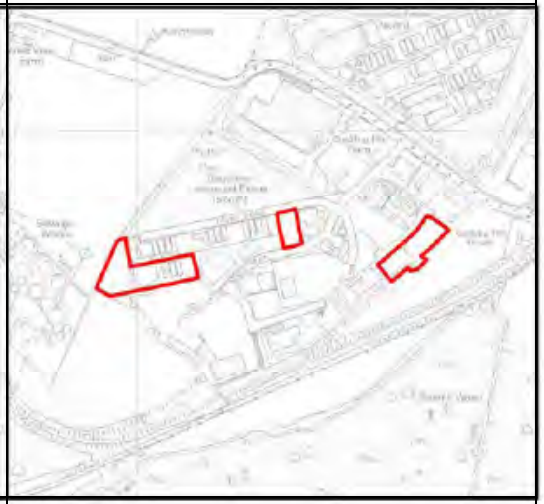
Historical Flooding

No records of historical flooding have been received for the site. This does not mean that flooding has not occurred as these events may not have been recorded. Investigations into historical flooding of the area should be undertaken as part of a site specific FRA



Flood Warning Areas

The site is not located within a Flood Warning Area. Where sites are within Flood Zone 3, a Flood Plan should be provided detailing what residents / occupants should do to prepare for flood events, and what to do if the development floods. Safe escape / safe refuge details should be provided as part of a Flood Plan.



Flood Defences

No flood defences are located close to the site.

Site Name: 38 – NUA\E\1
Location: Newark-on-Trent (OS Grid Ref: 479402, 354459)

Site Size: 2.06 hectares

Existing Site Use: Industrial / Commercial

Proposed Site Use: Employment

Vulnerability Classification: Less Vulnerable

Surface Water Flood Risk:

The locally agreed surface water information maps indicate the site is located in an area susceptible to surface water flooding to an intermediate level. Therefore, further assessment of surface water flood risk should be included with the site specific flood risk assessment.

Proposed surface water drainage is a key factor to the viability of the project and must not place extra pressure on the existing drainage regime.

Safe Access and Egress:

Safe / dry access and egress should be provided for all future residents of the site. Residents should be directed away from offsite flood areas.

Safe escape does not appear viable from the hazard mapping associated with the site. Safe refuge should be investigated as part of a Flood Risk Assessment / Flood Plan for the site.

Minimum Finished Floor Levels:

Finished floor levels must be set above the maximum flood depth, the EA general requirement is a 300mm freeboard for commercial. Where this is not possible then a range of measures including flood resilient construction must be considered.

This is subject to EA approval and discussions.

Flood Risk Assessment Requirements:

Any sites located within Flood Zone 2 or 3 regardless of size will require an FRA. Climate change should be taken in to account when assessing flood risk from any source. The lifetime of the development will guide the allowance required for climate change, in accordance with the NPPF.

Flood risk from surface water will need to be assessed as part of any FRA, with a drainage strategy provided to ensure that the development does not flood during low annual probability rainfall events or exacerbate the flood risk off site. The sequential Approach will need to be applied with no development located within the Zone 3 extent.

The site is located within Trent Valley Internal Drainage Board's (TVIDB) district and has a board maintained watercourse along its southern boundary. The TVIDB will seek to establish an easement strip alongside this watercourse. The Board's consent will be required to any works in, over, under or within 9.0m of top, or, where the watercourse is culverted, the outside edge of the pipe. The LLFA or IDB consent will be required prior to any increases in surface water discharge from the site being made to any watercourse, other than designated main river, which would require EA consent.

Flood Map

The site is entirely located within Flood Zone 3

Functional Floodplain

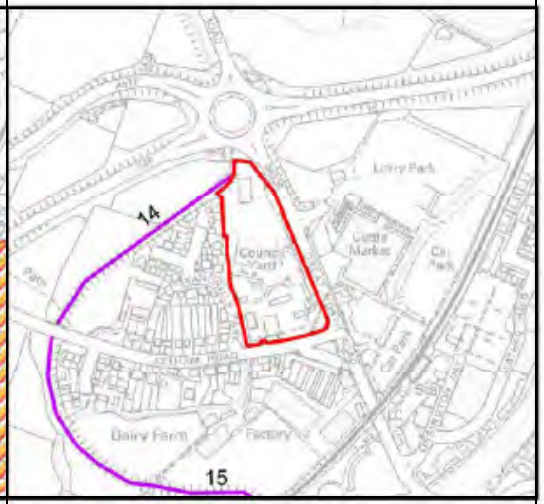
The site is not located within functional floodplain.

Historical Flooding

The whole site is covered by historical flooding records. A single fluvial flooding record has been noted to the south-west of the site.

Flood Warning Areas

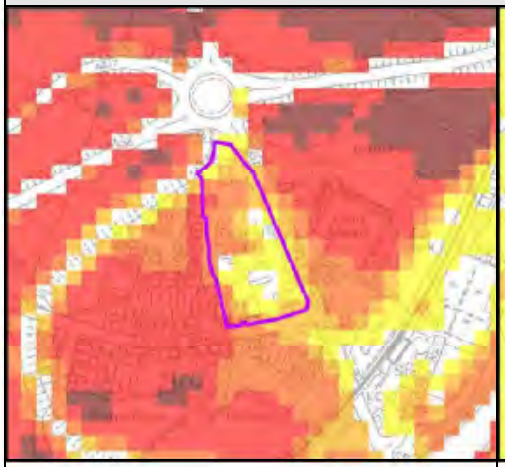
The site is located within a Flood Warning Area. A Flood Plan should be provided detailing what residents / occupants should do to prepare for flood events, and what to do if the development floods. Safe escape / safe refuge details should be provided as part of a Flood Plan.



Flood Defences

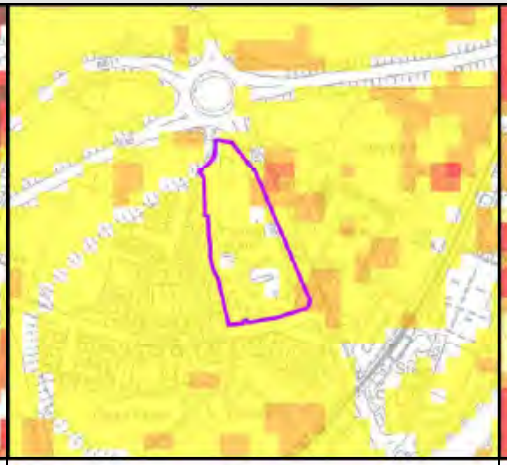
A flood defence runs to the west of the site, providing a barrier between the functional floodplain and the site. .

Site Name: 38 – NUA\E\1
Location: Newark-on-Trent (OS Grid Ref: 479402, 354459)



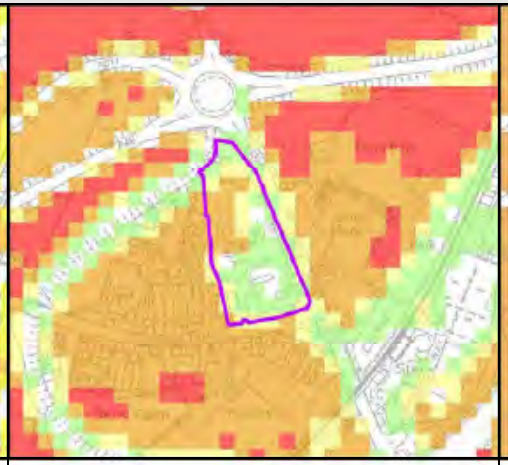
100CC - Depth

It can be seen on Figure 1647-F-1.1 that the site is located within an area that would be inundated by water to a depth up to 2m.



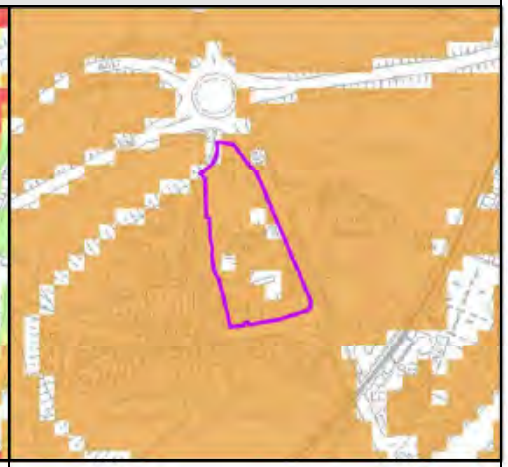
100CC - Velocity

When referencing Figure 1647-F-2.1 it can be seen that the site experiences velocities of flood water between 0 and 2.5 m/s.



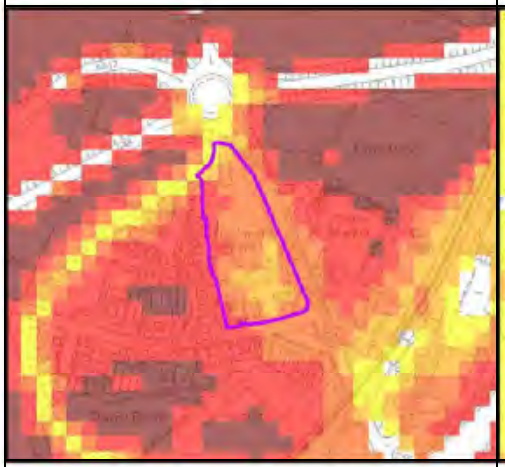
100CC - Hazard

With reference to Figure 1647-F-3.1 it can be seen that the site is located within an area with a hazard rating of up to and greater than 2 (Danger for All) as defined by FD2320 Flood Risk to People.



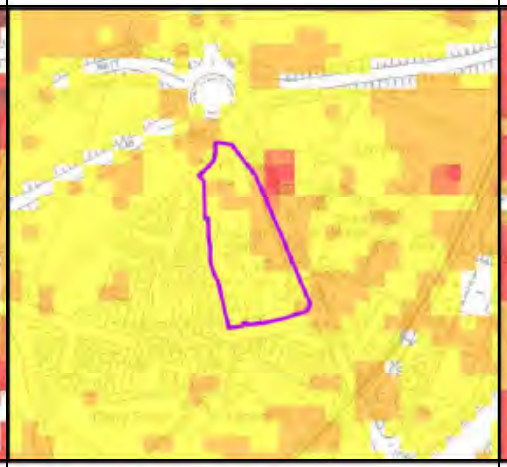
100CC - Time to Inundation

Figure 1647-F-4.1 shows that the time to inundation for the areas of site affected by flooding is between 80 and 90 hours from the initial rainfall event.



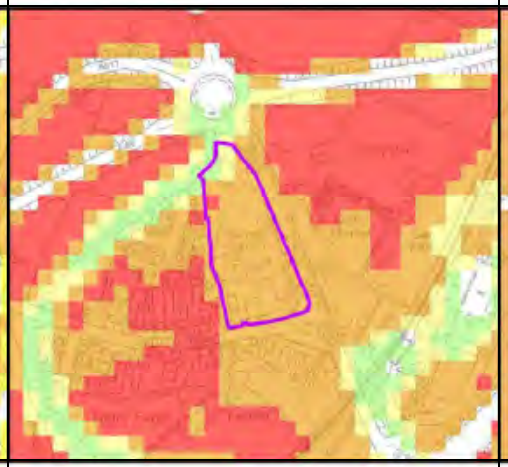
1000 - Depth

It can be seen on Figure 1647-F-1.2 that the site is located within an area that would be inundated by water to a depth up to 2m.



1000 - Velocity

When referencing Figure 1647-F-2.2 it can be seen that the site experiences velocities of flood water between 0 and 2.5 m/s.



1000 - Hazard

With reference to Figure 1647-F-3.2 it can be seen that the site is located within an area with a hazard rating of up to and greater than 2 (Danger for All) as defined by FD2320 Flood Risk to People.

1000 - Time to Inundation

Figure 1647-F-4.2 shows that the time to inundation for the areas of site affected by flooding is between 80 and 90 hours from the initial rainfall event.

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Key - Sheet 1

Panel 1 - Flood Map

- Flood Zone 2
- Flood Zone 3

Panel 2 - Functional Floodplain

- Functional Floodplain

Panel 3 - Historical Flooding

- Historic Flood Map
- Historic Flooding (Fluvial / Tidal)
- Historic Flooding (Pluvial)
- Historic Flooding (Sewer)

Panel 4 - Flood Warning Areas

- Flood Warning Areas

Panel 5 - Flood Defences

- Raised Defences

Key - Sheet 2

Depth Mapping

Max Depth (m)

- 0 - 0.25
- 0.25 - 0.5
- 0.5 - 1
- 1.0 - 2
- 2+

Velocity Mapping

Max Velocity (m/s)

- 0 - 0.3
- 0.3 - 1
- 1.0 - 1.5
- 1.5 - 2.5
- 2.5+

Hazard Mapping

Max Hazard (Flood Risk to People : FD2320)

- Less than 0.75 (Low Hazard)
- Between 0.75 and 1.25 (Danger for Some)
- Between 1.25 and 2 (Danger for Most)
- Greater than 2 (Danger for All)

Time to Inundation Mapping

All Sites - Time (hours)

- Up to 40
- 41 - 50
- 51 - 60
- 61 - 70
- 71 - 80
- 81 - 90
- 91 - 100
- 101 - 110
- 111 - 120
- Above 120

Site 29 - Time (hours)

- 0 - 5
- 5 - 10
- 10 - 15
- 15 - 20
- 20 - 25
- 25 - 30
- 30 - 35
- 35 - 40
- 40 - 45

WSP

TITLE:

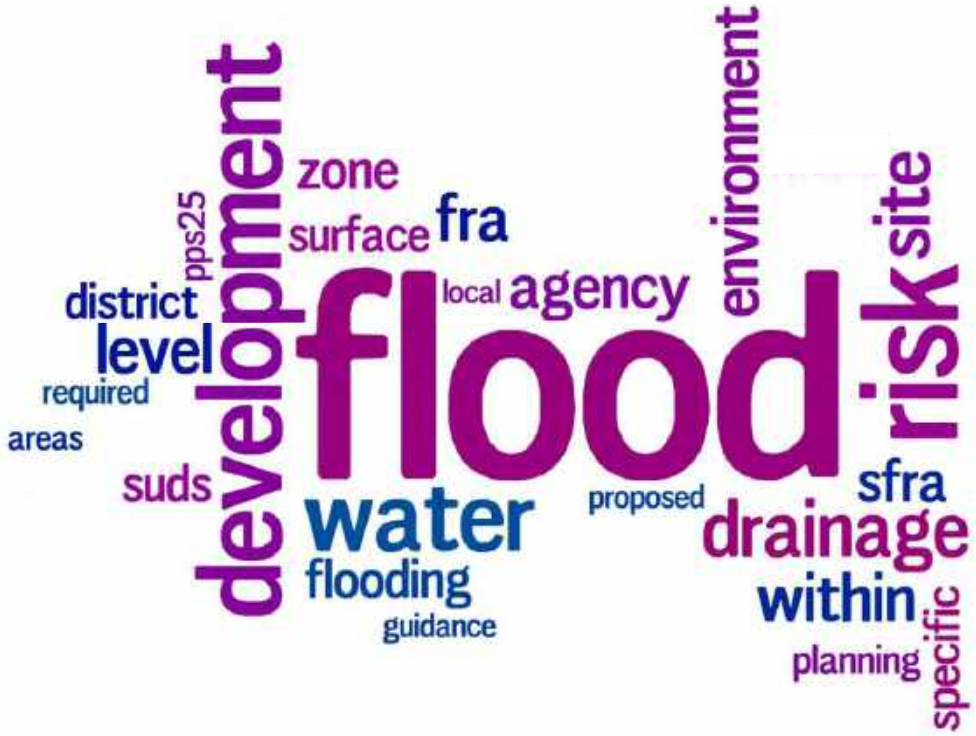
NEWARK AND SHERWOOD
DISTRICT COUNCIL
LEVEL 2 SFRA
PHASE 2

FIGURE No:

KEY FOR SITE SPECIFIC
DEVELOPMENT INFORMATION

Pull Out

Appendix H FRA Toolkit



UNITED BY OUR DIFFERENCE

WSP

Site Specific Flood Risk Assessment Toolkit

Newark and Sherwood Phase 2 Level 2 Strategic Flood Risk Assessment

Newark District Council

September 2012

QM

Issue/revision	Issue 1	Revision 1	Revision 2	Revision 3
Remarks	Draft 1	Draft 2	Final	
Date	December 2011	December 2011	September 2012	
Prepared by	D Duke	D Duke	D Duke	
Signature				
Checked by	S Knowles	S Knowles	S Knowles	
Signature				
Authorised by	For Team Comment	S Purcell	S Purcell	
Signature				
Project number		11501501	11501501	
File reference	T\R\Reports\Tool kit	T\R\Reports\Tool kit	T\R\Reports\Tool kit	

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Site Specific FRA 'Toolkit'

This Toolkit should be used as local guidance for new developments in the Newark and Sherwood Study Area to establish in what circumstances a Site Specific Flood Risk Assessment (FRA) will be required, what issues will need to be considered, who should be consulted, and what will need to be provided.

1.1 OVERVIEW OF FLOOD RISK

SFRA Message and General Findings

1.1.1 Mapping within Appendix E of the Newark and Sherwood Level 2 SFRA provides a graphical representation of the variation in flood risk across the study area. These maps highlight the fluvial / tidal extent of Flood Zones 1 (Low Probability), 2 (Medium Probability) and 3 (High Probability). The National Planning Policy Framework (NPPF) and associated Technical Guide provides guidance on how sustainable development should be implemented within these various flood risk areas. Flood hazard mapping has also been provided from the River Trent Hazard Mapping Study (2011) carried out by the Environment Agency. This hazard mapping relates to breaching and overtopping events along the Tidal River Nene, as illustrated by the depth, velocity and hazard maps in Appendix E of the SFRA.

1.1.2 Newark and Sherwood District Council should review the risk of flooding posed to a particular site by reference to the maps in Appendices E, F and G of the Newark and Sherwood Level 2 Phase 2 SFRA. Clear planning and development recommendations have been provided in Section 1.4 of this Toolkit. These should be applied only once the Sequential Test has been undertaken in accordance with the NPPF (refer to section 1.2 of this note and section 2.11 of the SFRA).

1.1.3 One of the key recommendations of the Pitt Review "Learning lessons from the 2007 floods" was that Local Authorities should lead on the management of local flood risk, with the support of relevant organisations. The Flood and Water Management Act (2010), also highlights how a Lead Local Flood Authority (LLFA) in England must develop, maintain, apply and monitor a strategy for local flood risk management in its area.

1.1.4 The LLFA for Newark and Sherwood is Nottinghamshire County Council who has produced a Preliminary Assessment Report and identification of any Flood Risk Areas (PFRA) report dated June 2011. Refer to section 2.9 of the Level 2 Phase 2 SFRA for further information on this report. Nottinghamshire County Council are also working with organisations from across the county, including the seven Districts / Boroughs, Internal Drainage Boards, Environment Agency and Water Companies to develop a Local Flood Risk Management Strategy for Nottinghamshire.

1.1.5 The Act highlights that, in addition to a risk of flooding from fluvial and tidal sources, there is also a potential risk of flooding from localised sources, including sewers, blocked gullies and culverts, and surface water runoff. This is more difficult to predict and may occur at any location and / or point in time. It is essential that all future development is designed to minimise the potential impacts of localised flooding (e.g. through the provision of SuDS, overland flow routing of flood waters, and careful location of on-site detention areas). All sources of flooding should be taken into consideration as part of a site specific Flood Risk Assessment (FRA).

1.1.6 The Act also introduces the role of a SuDS Approving Body (SAB) which will be the responsibility of the LLFA. Precise details of how this will be implemented are not known at present, but new developments will need to accord with the SAB requirements.

1.1.7 Flood Risk Assessments should take in to consideration the requirements of all relevant stakeholders, not just the Environment Agency and Newark and Sherwood District Council. Where appropriate local Internal Drainage Board(s) (IDBs) should be consulted to ensure their requirements are met.

Current Policy

1.1.8 Site specific Flood Risk Assessments are primarily guided by the National Policy Planning Framework and Flood Risk and its associated Technical Guide.

1.1.9 Reference should be made within a site specific FRA to the Newark and Sherwood District Level 1 and Newark and Sherwood Level 2 SFRA reports. Further guidance on current policy is detailed within the main body of the Level 2 SFRA.

1.2 GENERAL SCOPE OF FLOOD RISK ASSESSMENTS

1.2.1 The Level 2 SFRA is a strategic document that provides an overview of flood risk throughout the study area.

1.2.2 Site specific FRAs should be carried out in line with the guidance provided in the NPPF and the NPPF Technical Guide. Paragraph 9 of the NPPF Technical Guide summarises the requirements for a site specific FRA The FRA should be submitted as an integral part of the planning application. Paragraph 9 of the NPPF Technical Guide is quoted below:

"As set out in the National Planning Policy Framework, local planning authorities should only consider development in flood risk areas appropriate where informed by a site-specific flood risk assessment. This should identify and assess the risks of all forms of flooding to and from the development and demonstrate how these flood risks will be managed so that the development remains safe throughout its lifetime, taking climate change into account. Those proposing developments should take advice from the emergency services when producing an evacuation plan for the development as part of the flood risk assessment."

1.2.3 This site specific FRA Toolkit has been based upon planning policies and information available at the time of report issue.

1.2.4 Flood risk will need to be considered by developers as part of any specific development proposals in the future. Developers must consult relevant stakeholders and operating authorities and seek guidance on the requirements for an FRA from the outset.

1.2.5 It should also be noted that the exact parameters of a Flood Zone for a site may be subject to change in line with future planning policy. It should also be noted that Flood Zones may be subject to change following consideration of detailed topographical information, or following investigation of site specific flood risk issues.

1.2.6 Any site specific FRA should be in line with the scale, nature and location of the proposed development.

1.2.7 The NPPF and the NPPF Technical Guide contains information on where to locate development in relation to flood risk and the assessment of flood risk. and/or other bodies have indicated that there may be drainage problems.

1.2.8 Individual IDB guidance on flood risk can be found on their specific websites or through contacting them directly. The Environment Agency website provides flood risk standing advice at the below link:

http://www.environment-agency.gov.uk/research/planning/82584.aspx

1.2.9 The vulnerability of a development in relation to the level of flood risk should be taken into consideration. Reference should be made to the tables 1, 2 and 3 of the NPPF Technical Guide. Reliable site level information, preferably in the form of a topographical survey, will be required in the first instance to determine finished floor levels. It is advised that any relevant stakeholders are contacted prior to the carrying out of a topographical survey to ensure their requirements are taken into account.

1.2.10 The FRA should consider the appropriateness of proposed development uses in flood risk areas in line with Table 3 of the NPPF Technical Guide. This is shown in section 7.2.6 of the Level 2 Phase 2 SFRA.

SEQUENTIAL TEST

1.2.11 A risk-based Sequential Test should be applied at all stages of the planning process on a case by case basis (see the NPPF Technical Guide paragraphs 3 to 5). Reference should be made to the Flood Zones provided in Appendix E, F and G of the Level 2 Phase 2 SFRA and the EA website. In areas at risk from fluvial or tidal flooding, preference should be given to locating new development in Flood Zone 1. If there is no reasonably available site in Flood Zone 1, the flood vulnerability of the proposed development can be taken into account in locating development in Flood Zone 2 and Flood Zone 3. If, following the application of the Sequential Test, it is not possible or consistent with wider sustainability objectives for the development to be located in zones of lower probability of flooding, the Exception Test can be applied.

EXCEPTION TEST

1.2.12 Paragraph 102 of the NPPF states that for the Exception Test to be passed:

- 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
- A site-specific FRA must demonstrate that the development will be safe for its lifetime taking into account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

1.2.13 Both parts of the Exception Test must be passed for development to be acceptable.

1.3 DETAILED SCOPE OF FRA

1.3.1 This Level 2 Phase 2 SFRA provides specific recommendations with respect to the provision of sustainable flood risk mitigation opportunities. This addresses both the risk to life and the residual risk of flooding to development within particular Flood Zones in the study area. These recommendations should form the basis for a site specific FRA and have been briefly set out below. Recommendations have also been provided in a checklist included in the Newark and Sherwood District Level 1 SFRA.

All Developments

1.3.2 Foul water and surface water flows resulting from the development should be assessed to ensure that their impact on any receiving system is managed responsibly, does not cause downstream flooding, or increase the risk of flooding elsewhere. Liaison with the relevant body (IDB(s), Environment Agency, Anglian Water, Severn Trent or approving Local Authority) should be carried out to ensure the resulting flows are managed in the correct way.

1.3.3 All potential sources of flood risk should be considered within a site specific FRA. Where a site is located within Flood Zone 1, the site should be checked to see whether it is at risk of flooding in the case of overtopping or breach of defences. If a site shown to at risk, then a FRA will need to be prepared to assess this.

Future Development within Flood Zone 1 'Low Probability'

1.3.4 All proposed 'Major' future development within Flood Zone 1 will require a basic Flood Risk Assessment (FRA), in compliance with the NPPF, current guidance and policy. Major development is typically defined as exceeding 1 hectare. The FRA will need to focus primarily upon drainage impact assessment, implementation of appropriate forms of SUDS, and control of surface water runoff. See the Environment Agency Flood Maps in Appendix G of the level 2 SFRA for areas identified as Flood Zone 1.

Future Development within Flood Zone 2 'Medium Probability'

1.3.5 All proposed future development within Zone 2 will require a Flood Risk Assessment (FRA) in compliance with the NPPF, current guidance and policy that is commensurate with the risk posed to the proposed development. All potential sources of flood risk are to be considered. See the Environment Agency Flood Maps in Appendix G of the level 2 SFRA for areas identified as Flood Zone 2.

1.3.6 A Flood Warning and Evacuation Plan is a key document to accompany FRAs in Flood Zone 2. This will help to ensure that there is safe management of residents in the event of flooding. This document, where necessary, will set out potential evacuation routes and information relating to flood warnings. This document should make reference to Newark and Sherwood District Council's Emergency Plan.

1.3.7 There is no statutory requirement for the Environment Agency or emergency services to approve evacuation plans. Newark and Sherwood District Council emergency planners should be contacted when undertaking evacuation plans.

1.3.8 Planning Policy Statement 25 and its associated practice guide gave guidance on flood risk for development sites; in accordance with Annexe 3 of the NPPF the practice guide has not been superseded by the NPPF. Therefore as the NPPF does not give any specific guidance on flood warning and evacuation plans, Figure 7.2 of the PPS25 Practice Guide has been reproduced below to provide an initial indication of what should be included within an evacuation plan. This does not replace the NPPF recommendation that advice should be sought from the emergency services when an evacuation plan is being prepared.

Figure 7.2 Flood warning and evacuation plans should include:

How flood warning is to be provided, such as:

- availability of existing flood warning systems;
- rate of onset of flooding and available flood warning time; and
- how flood warning is given.

What will be done to protect the development and contents, such as:

- how easily damaged items (including parked cars) will be relocated;
- the availability of staff/occupants/users to respond to a flood warning, including preparing for evacuation, deploying flood barriers across doors etc; and
- the time taken to respond to a flood warning.

Ensuring safe occupancy and access to and from the development, such as:

- occupant awareness of the likely frequency and duration of flood events;
- safe access to and from the development;
- ability to maintain key services during an event;
- vulnerability of occupants, and whether rescue by emergency services will be necessary and feasible; and
- expected time taken to re-establish normal use following a flood event (clean-up times, time to re-establish services etc.).

1.3.9 The flood warning and evacuation plan is a living document and will need to be reviewed annually and updated by residents or a management company, depending on the ownership of the site. Any updates to the plan will need to conform to Newark and Sherwood District Council's emergency plan and approved by the emergency planners.

Future Development within Flood Zone 3 'High Probability'

1.3.10 All proposed future development within Flood Zone 3 will require a detailed site specific Flood Risk Assessment (FRA), in compliance with the NPPF, current guidance and policy. See the Environment Agency Flood Maps in Appendix G of the SFRA for areas identified as Flood Zone 3. Any development in Flood Zone 3 should be discussed with the local council's Emergency Planning team.

1.3.11 Finished floor levels must be set above maximum flood depth (from maps in Appendix F and G). Where this is not possible then a range of measures including safe refuge must be considered. This could be achieved by, but is not restricted to:

- Adding a first floor;
- The addition of a mezzanine floor;
- Altering a bungalow to become a chalet bungalow; or
- Providing room within an easily accessible loft space with velux windows added.

1.3.12 The safe refuge should be provided above the predicted flood levels. We advise early consultation with Newark and Sherwood District Council delivery management planners and emergency planners if safe access and egress is not achievable.

1.3.13 In some instances, where finished floor levels cannot be raised high enough, sleeping accommodation on the ground floor levels may not be permitted. If there is doubt about what would be appropriate, early discussion with Newark and Sherwood District Council and the Environment Agency is required.

1.3.14 A Flood Warning and Evacuation Plan is a key document to accompany FRAs in Flood Zone 3. This will help to ensure that there is safe management of residents in the event of flooding. This document, where necessary, will set out potential evacuation routes and information relating to flood warnings. This document should make reference to Newark and Sherwood District Council's Emergency Plan. Refer to section 1.3.6 to 1.3. 9 of this toolkit for further information on the requirements for a flood warning and evacuation plan.

1.3.15 In line with the Pitt Review recommendations, key services such as substations and pumping stations should be safeguarded. Where possible this should be done through siting them above predicted high water levels. Where this is not possible they should incorporate flood risk mitigation such as water proofing, resistance or resilience measures.

1.3.16 Proposed development shall not result in an increase in flood risk to third parties i.e. no increase in maximum flood levels within adjoining properties. Flood plain compensation should be discussed with the District Council where required.

1.4 MITIGATION MEASURES & DEVELOPMENT RECOMMENDATIONS

SURFACE WATER AND SUSTAINABLE DRAINAGE SYSTEMS

Surface Water

There is impending legislation due to come into force relating to SuDS as as result of the Flood Water Management Act (2010). As it is currently proposed the SuDS Approval Body, (The County Council) will become a significant organisation in the approval, adoption and maintenance of SuDS. Draft Standards and Regulations have been consulted on nationally and a final document will be available upon publication.

1.4.1 Surface water runoff needs to be managed to ensure that it does not pose a flood risk to existing or proposed development; the management of surface water is primarily carried out by Severn Trent Water, Anglian Water, Newark and Sherwood District Council, the Environment Agency and local Internal Drainage Boards.

1.4.2 The developer should seek to manage runoff rates and volumes to the receiving surface water drainage system and watercourses in a post development situation in order to reduce the flood risk to downstream areas. Nil detriment (i.e. no change) should be viewed as the standard for surface water discharge rates within the study area, although a reduction may be required in some locations. The use of SuDS should be implemented to ensure that runoff from the site is managed; any SuDS design must take due account of groundwater and geological conditions. Refer to 1.4.7 below for further details on SuDS.

1.4.3 A surface water drainage strategy should be provided as part of a site specific FRA where necessary (e.g. when the site is greater than 1 hectare or located within Flood Zones 2 and/or 3 or where the Environment Agency, Internal Drainage Board and / or other bodies have indicated that there may be drainage problems) and should provide information on how surface water will be managed as part of the development. The Newark and Sherwood District Level 1 SFRA contains a checklist stating when an FRA is required. Consultation with the Environment Agency and IDB(s) should be carried out prior to submitting an application to ensure surface water is being managed in an appropriate manner. If the drainage strategy shows discharge in to an IDB system then correspondence with the relevant IDB should be included as part of the FRA to confirm the arrangements made.

1.4.4 There is the potential for siltation of drainage systems to occur if too little flow is provided especially along existing systems. This can cause maintenance issues and reduce the effectiveness of the surface water drainage system. Discharge rates should be agreed with the relevant body (IDB, LLFA, Environment Agency, Anglian Water, Severn Trent Water or Local Planning Authority).

1.4.5 All developments must carefully consider surface water disposal, even if it is proposed to discharge to the public sewer, as even the public sewer can discharge to a watercourse(s) which may not be able to accept as great a discharge as the public sewer can accept.

1.4.6 For those sites that may cross approving authority / stakeholder boundaries there should be recognition that the LLFA may have different arrangements across the boarder and therefore the appropriate relevant body should be approached.

1.4.7 An initial overview of flooding from surface water can be gained from the Flood Map for Surface Water provided in Appendix E of this SFRA. These maps should not be used to identify surface water flooding on an individual property scale.

Sustainable Drainage Systems

1.4.8 Sustainable Drainage Systems (SuDS) is a term used to describe the various approaches that can be used to manage surface water drainage in a way that mimics the natural environment. Reference should be made to section 7.3 of the SFRA. The management of surface water runoff is considered an essential element of reducing flood risk to both the site and its surroundings.

1.4.9 SuDS may improve the sustainable management of water for a site by:

- Reducing peak flows to watercourses or sewers and potentially reducing the risk of flooding downstream;
- Reducing volumes and the frequency of water flowing directly to watercourses or sewers from developed sites;
- Improving water quality over conventional surface water sewers by removing pollutants from diffuse pollutant sources;
- Reducing potable water demand through rainwater harvesting;
- Improving amenity through the provision of public open space and wildlife habitat; and
- Replicating natural drainage patterns, including the recharge of groundwater so that base flows are maintained.

1.4.10 There are numerous different ways that SuDS can be incorporated into a development; information relating to the most commonly found components of a SuDS system can be found in the various documents listed below. The appropriate application of a SuDS scheme to a specific development is heavily dependent upon the topography and geology of the site and its surrounds. Careful consideration of the site characteristics must be undertaken to ensure the feasibility of the sustainable drainage design. SuDS Infiltration Feasibility mapping based on underlying ground conditions has been provided in Appendix D. This information has been taken from Newark and Sherwood District Council's Level 1 SFRA. This mapping should only be used as a guide, and does not replace the need for detailed ground investigations.

1.4.11 The location of Source Protection Zones should be taken into consideration, when considering the application of SuDS. However, there are no Source Protection Zones within the study area.

1.4.12 A ground investigation should be carried out to determine if the land the development site is located on is contaminated and to confirm whether the ground conditions are suitable for the use of SuDS. If SuDS are proposed in areas containing contaminated ground then the Environment Agency must be consulted.

1.4.13 For more guidance on SuDS the following documents and websites are recommended as a starting point:

- Anglian Water SuDS Guidance
  http://www.anglianwater.co.uk/developers/sewer-connection/suds.aspx
- Building Regulations Part H: Drainage and Waste
  http://www.planningportal.gov.uk/buildingregulations/approveddocuments/parth/
- CIRIA SuDS Manual (C697)
  http://www.ciria.com/suds/index.htm
- Environment Agency Website - SuDS
  http://www.environment-agency.gov.uk/business/sectors/36998.aspx
- Planning Policy Statement 25: Development and Flood Risk Practice Guide
  http://www.communities.gov.uk/publications/planningandbuilding/pps25guideupdate

1.4.14 The Environment Agency issues best practice guidance for Sustainable Drainage Systems, available from the Environment Agency development and flood risk teams. This provides a clear hierarchy for SuDS, reflecting the degree of sustainability offered by the SuDS application as captured in Table A1 on the next page. Table A1 is provided as a hierarchy from most sustainable options at the top to least sustainable options at the bottom.

Table A1 – SuDS Hierarchy

SuDS Technique	Flood Reduction	Water Quality Improvement	Landscape & Wildlife Benefit
Living Roofs	✓	✓	✓
Basins and Ponds ■ Constructed Wetlands ■ Balancing Ponds ■ Detention Basins ■ Retention Ponds	✓	✓	✓
Filter Strips and Swales	✓	✓	✓
Infiltration Devices ■ Soakaways ■ Infiltration Trenches and Basins	✓	✓	✓
Permeable Surfaces and Filter Drains ■ Gravelled Areas ■ Solid Paving Blocks ■ Porous Paving	✓	✓	
Tanked systems ■ Over-sized Pipes / Tanks ■ Geocellular Storage	✓		
Discharge to Surface Water Sewers			

RESILIENCE AND FLOOD WARNINGS

1.4.15 Where properties are deemed to be at 'significant' risk of flooding (i.e. situated in Flood Zone 3) it is essential to provide the community with the knowledge and tools that will enable them to help themselves should a flood event occur. This Level 2 SFRA and the Newark and Sherwood District Council Level 1 SFRA are key sources of flood risk information in the public domain.

1.4.16 Details of flood warning and flood resilience have been set out within the following community based measures which local communities may introduce to minimise the damage sustained to their own homes in the event of flooding.

Floodline Warnings Direct

1.4.17 Where available, communities in flood risk areas should be registered with the Environment Agency Floodline Warnings Direct facility. While this may not always cover the specific local watercourses that pose the greatest risk to the locale, advance warning of the onset of extreme weather conditions may be gathered and actions taken by residents at a local level. See section 8 of this Level 2 SFRA.

1.4.18 Further detail on flood warnings and the Flood Warnings Direct service can be found on the Environment Agency website at:

http://www.environment-agency.gov.uk/homeandleisure/floods/31618.aspx

1.4.19 In some instances for development in Flood Zone 2 and 3, a Flood Warning and Evacuation Plan will be required. See sections 1.3.6 to 1.3.9 of this Toolkit for more information on Flood Warning and Evacuation Plans.

Flood Resilience / Resistance

1.4.20 Flood resistance involves constructing a building in such a way so as to prevent floodwater entering the structure and damaging its fabric. Flood resilience involves constructing a building so as to permit floodwater to enter the structure but to reduce the impact of any damage caused (i.e. no permanent damage is caused, structural integrity is maintained and drying and cleaning are facilitated). The NPPF Technical Guide Provides an overview of flood residence and resistance (paragraphs 17 to 19). Details of flood resilient construction can be found within the Department for Communities and Local Government publication; 'Improving the Flood Performance of New Buildings' published in May 2007. The design of new developments should accord with the guidance in this toolkit, to the satisfaction of Newark and Sherwood District Council.

1.4.21 One of the key recommendations of the Pitt Review; "Learning lessons from the 2007 floods", was that Building Regulations should be revised to ensure that all new or refurbished buildings in high flood-risk areas are flood resistant or resilient. Examples of flood resilient and resistant measures that can be adopted are listed below;

Raising of electrical wiring (Resilience)

1.4.22 The raising of electrical wiring and sockets within flood affected buildings reduces the risks to health and safety, and reduces the time required after a flood to rectify the damage sustained.

Use of sacrificial construction materials (Resilience)

1.4.23 These are materials used in housing fittings that are likely to be damaged in case of flooding but can also be repaired i.e. gypsum plaster board. This would be used for a 'water entry' strategy where the emphasis is placed on allowing water into the building, facilitating draining and consequent drying.

Flood boards / gates (Resistance)

1.4.24 The placement of a temporary watertight seal across doors, windows and air bricks to avoid inundation of the building interior. This may be suitable for relatively short periods of flooding, however the porosity of brickwork may result in damage being sustained should water levels remain elevated for an extended period of time.

Boundary walls and fencing (Resistance)

1.4.25 Boundary walls and fencing can be designed with high water resistance materials and/or effective seals to minimise water penetration for low depth, short duration floods (but not for groundwater flooding). Consideration of flow paths should be made when deciding on what walls or fencing type to implement, as these elements may fail in the event of a flood creating additional debris and hazard.

Raising Floor Levels

1.4.26 The raising of floor levels above the anticipated maximum flood level ensures that the interior of the property is not directly affected by flooding, avoiding damage to furnishings, wiring and interior walls. It is highlighted that plumbing may still be impacted as a result of mains sewer failure. In some parts of the study area, especially in areas close to the River Trent, the raising of flood levels above an anticipated maximum flood level is unreasonable due to the depth of water expected. Please see paragraph 1.3.6, 1.3.7 and 1.3.8 for further details on finished floor levels and safe refuge / escape.

Basements

1.4.27 Due to the topography and flood risk within the study area it is generally inappropriate to provide basements in developments in Flood Zone 2 and 3.

1.4.28 Consultation should be carried out with Newark and Sherwood District Council at the earliest opportunity to ensure that the proper steps are carried out when assessing the feasibility of a basement, and to ensure no undue hazard is generated through provision of a basement.

Raising Ground Levels

1.4.29 Raising of ground levels on a site specific basis should be avoided where possible. Any change in ground levels will affect the flow paths for flood waters in the surrounding area, potentially changing the hazard / risk in these areas. Strategic raising of ground levels with suitable compensation / mitigation may be acceptable. This is subject to being agreed through a strategic assessment of flood risk incorporated as part of masterplanning for the relevant site which will need to consider the residual risk and the risk to third parties.

Floodplain Compensation

1.4.30 Flood plain compensation may be appropriate in some circumstances but proposed development must not result in an increase in maximum flood levels for adjoining or surrounding properties. This may be achieved by ensuring (for example in the case of the re-development of a site) that the existing building footprint is not increased. Due to the defended nature of the study area it is not reasonable to provide compensation in every situation. Consultation should be carried out with the Environment Agency and the District Council for major developments to ascertain whether floodplain compensation is required and what form it will take.

1.5 CONSENTS

1.5.1 Under the terms of the Water Resources Act 1991, the prior written consent of the Lead Local Authority is required for any proposed works or structures, in, under, over or within nine metres of the top of the bank of a Main River. Where there are flood defences in place the nine metres is measured from the landward toe of the bank / wall. Obtaining this consent is not part of the FRA process however, designers and developers should be aware of this when producing a site layout and drainage design.

Flow Control Structures and Culverting of Watercourses

1.5.2 Erection of flow control structures or any culverting of a watercourse requires the prior written approval of the Drainage Authority (Lead Local Flood Authority or IDB for Ordinary Watercourses and EA for Main Rivers) under s.23 of the Land Drainage Act 1991 or s.109 of the Water Resources Act 1991.

1.5.3 Culverting and the filling in of watercourses is resisted by many authorities on nature conservation and other grounds and consent for such works will not normally be granted except for exceptional circumstances.

1.5.4 It should be noted that under the Flood and Water Management Act 2012, that consenting powers (as outlined in 1.5.2) will be transferred to the LLFA on 6th April 2012. This applies to ordinary watercourses outside the rateable area of an IDB and not to ordinary watercourses within the rateable area of an IDB. Anyone proposed works to ordinary watercourses should consult with the LLFA prior to submitting the application. Main Rivers will still be under the jurisdiction of the Environment Agency.

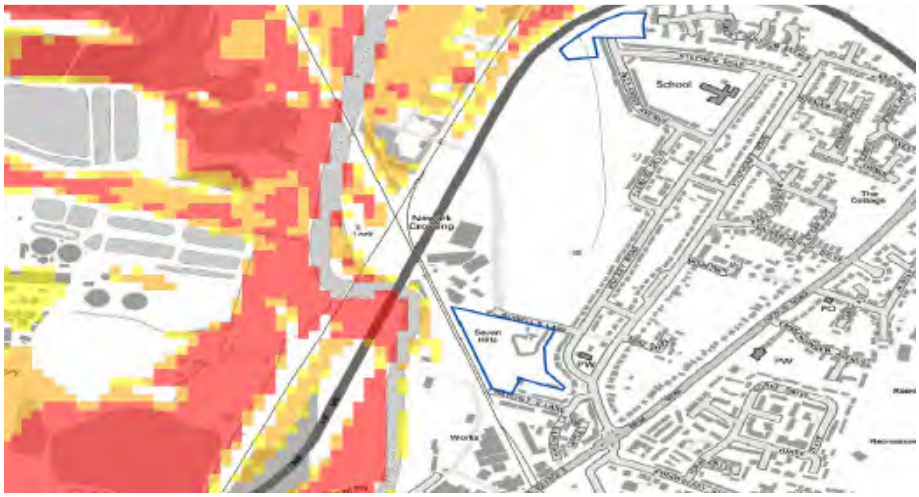
1.5.5 Under the Land Drainage Act 1991, Trent Valley IDB, Upper Witham IDB and the Environment Agency have bye-laws for governing the watercourses they are responsible for. The Land Drainage Act (1991) states that: 'these are considered necessary for securing the efficient working of the drainage system in their district'. The byelaws include reference to control systems, operations, obstacles, set back distances and safety. The IDB policies in relation to development control are stated within their planning response. Copies of the IDB byelaws can be viewed on their websites. Obtaining this consent is not part of the FRA process however, designers and developers should be aware of this when producing a site layout and drainage design.

Appendix I Modelling Reports

Newark Trent Strategic Flood Risk Assessment Hazard Mapping

Newark & Sherwood District Council

- Aid
- Aviation
- Commercial
- Communications and Technology
- Defence
- Education
- Energy and Natural Resources
- Government
- Healthcare
- Industrial
- Legal and Finance
- Rail
- Residential
- Retail
- Roads and Bridges
- Sports and Leisure
- Urban Regeneration
- Water and Waste



PROJECT DESCRIPTION

Newark and Sherwood District Council commissioned WSP to produce flood hazard and time to inundation mapping to inform the councils Strategic Flood Risk Assessment (SFRA).

WSP acquired the SFRM Level 2 hydraulic model from the Environment Agency for the River Trent and its tributaries at Newark. The model reach extends between Colwick and North Muskam and it includes the River Devon. The linked hydro dynamic 1D-2D model was built using ISIS-TUFLOW flood modelling software.

WSP carried out simulations using the hydraulic model in order to produce flood extent, depth, level, hazard and time to inundation mapping for inclusion in the SFRA. The SFRA recommends a sequential approach to developing the site directing land uses with higher vulnerability to flooding away from areas at highest risk.

Key Facts

Date:
June 2012

Sources of Flooding:
Fluvial

Software:
ISIS-TUFLOW

WSP Water Modelling
Tom Sampson
+44 (0)1256 318882
tom.sampson@wspgroup.com

TECHNICAL INFORMATION

Data & Survey

- No new survey.
- WSP obtained the existing 1D-2D ISIS-TUFLOW Environment Agency model of the River Trent and its tributaries, developed by Halcrow in 2011. Provided under licence in May 2012.

Hydrology & Boundary Conditions

- No new hydrological assessment.
- WSP have used the hydraulic model suppled by the Environment with no changes made to the inflows and downstream boundaries.

Hydraulic Modelling

- Software versions
  - ISIS: 3.5
  - TUFLOW: 2009-07-DB-iSP
- 2D TUFLOW model parameters:
  - Grid cell size: 20m

Flood Mitigation & Management

- Modelling of possible flood mitigation measures is beyond the scope of this work.

Calibration, Validation & Accuracy

- As the model is based on the calibrated Environment Agency model no new calibration was undertaken of the 1D-2D model.
- Model results were compared to flood maps generated by Halcrow and found to be fairly consistent.
- Sensitivity testing was not undertaken as part of the study.
- Indicative model performance for the 1 in 100 year model scenario:
  - Run time: 180 hours
  - Time step: 5 seconds for the 1D and 10 seconds for the 2D
  - Convergence at peak: Good
  - Convergence throughout: Good
  - Mass balance: Good

Mapping, GIS & Analysis

- Flood model outputs processed in Mapinfo Vertical Mapper.

Outputs Available

- Model runs: 1 in 20, 1 in 100, 1 in 100 (PPS25 climate change) & 1 in 1,000.
- Flood hazard, extent, level, depth and velocity mapping produced.
- ISIS and TUFLOW model files available for future use.

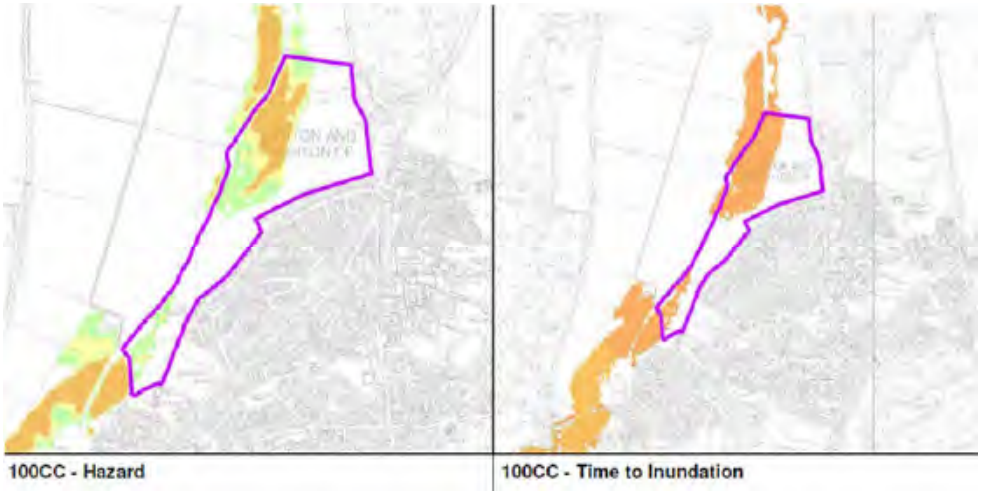
Suitable Uses

- The model is suitable for defining Flood Zones, flood hazard, depth and time to inundation for strategic level decision making and development planning.
- Further refinement of the model is required for use in site specific flood risk assessment and to inform development masterplanning.

Newark Strategic Flood Risk Assessment Hazard Mapping

Newark & Sherwood District Council

- Aid
- Aviation
- Commercial
- Communications and Technology
- Defence
- Education
- Energy and Natural Resources
- **Government**
- Healthcare
- Industrial
- Legal and Finance
- Rail
- Residential
- Retail
- Roads and Bridges
- Sports and Leisure
- Urban Regeneration
- **Water and Waste**



PROJECT DESCRIPTION

Newark and Sherwood District Council commissioned WSP to produce flood hazard and time to inundation mapping to inform the council Strategic Flood Risk Assessment (SFRA). The proposed development site for over 900 new houses (37.75ha) in Ollerton and Boughton, required flood modelling to produce the flood hazard and time to inundation mapping.

WSP refined the existing Environment Agency model to represent fluvial flood risk from the River Maun through Ollerton and Boughton in detail. We converted the model into a linked hydrodynamic 1D-2D model using ISIS-TUFLOW flood modelling software.

WSP produced flood extent, depth, level, hazard and time to inundation mapping for inclusion in the SFRA. The SFRA recommends a sequential approach to developing the site directing land uses with higher vulnerability to flooding away from areas at highest risk.

To enable strategic decision making, WSP followed PPS25 climate change requirements to quantify the potential flood risk to the site for the lifetime of the proposed development.

WSP implemented an innovative way of mapping the time to peak inundation, linking the flood times to flood warning trigger levels at the nearby flood warning telemetry sites. We have recommended flood warning trigger levels are reviewed if the site is developed.

Key Facts

Date:
March 2012

Sources of Flooding:
Fluvial

Software:
ISIS-TUFLOW

WSP Water Modelling
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TECHNICAL INFORMATION

Data & Survey

- No new survey.
- WSP obtained the existing 1D ISIS Environment Agency model of the River Maun, developed by JBA in 2007. Provided under licence in January 2012.
- LiDAR data covering the area and watercourse and structure survey supplied by the Environment Agency in January 2012.
- Flood warning trigger levels supplied by the Environment Agency in January 2012.

Hydrology & Boundary Conditions

- No new hydrological assessment.
- WSP have used the same inflows and downstream boundaries as the Environment Agency 2007 model.

Hydraulic Modelling

- Around the area of interest WSP have converted the 1D ISIS model to a linked 1D-2D ISIS-TUFLOW model.
- The WSP 1D-2D ISIS-TUFLOW model upstream extent is node 17215.236 (at NGR 463722, 366675 upstream of Ollerton STW and downstream at node 8629.172 (at NGR 466461, 372335 downstream of the confluence with River Meden).
- Outside of the area of interest the 1D ISIS model has been kept to ensure consistency in the flood routing and boundary conditions.
- Software versions
  - ISIS: 3.5
  - TUFLOW: 2010-10-AF-iSP-w32
- A small farm track bridge upstream of the development site that was not included in the Environment Agency 2007 model has been included in the 1D ISIS model.
- 1D-2D boundary modelled as an HX line with bank crest levels taken from 1D ISIS model cross section data.
- 2D TUFLOW model parameters:
  - Grid cell size: 7.5m
  - Roughness data: Buildings (1.0), Roads (0.025), Grass (0.040) and Woodlands (0.1)

Flood Mitigation & Management

- Modelling of possible flood mitigation measures is beyond the scope of this work.

Calibration, Validation & Accuracy

- As the model is based on the calibrated Environment Agency model no new calibration was undertaken of the 1D-2D model.
- Model results were compared to previous model results at Whitewater Bridge gauge and found to be fairly consistent with only a 70mm difference.
- Sensitivity testing was not undertaken as part of the study.
- Detailed review of 1D-2D boundary conditions at the location of the development site has highlighted that the model can be further refined through detailed site topographic survey and long section survey of the bank crest heights.
- Indicative model performance for the 1 in 100 year model scenario:
  - Run time: 42 hours
  - Time step: 2 seconds for both 1D and 2D
  - Convergence at peak: Good
  - Convergence throughout: Good
  - Mass balance: Good

Mapping, GIS & Analysis

- Flood model outputs processed in Mapinfo Vertical Mapper.

Outputs Available

- Model runs: 1 in 25, 1 in 100, 1 in 100 (PPS25 climate change) & 1 in 1,000.
- Flood hazard, extent, level, depth and velocity mapping produced.
- ISIS and TUFLOW model files available for future use.
- The Environment Agency modelled the 1 in 25 annual probability flood event, for the approved 2007 River Maun model. This was used to define the functional floodplain (Flood Zone 3b). WSP have therefore used this approved methodology from the 2007 model for defining the functional floodplain.

Suitable Uses

- The model is suitable for defining Flood Zones, flood hazard, depth and time to inundation for strategic level decision making and development planning.
- Further refinement of the model is required for use in site specific flood risk assessment and to inform development masterplanning.