



# Flood Risk Management Limited

## **Detailed Flood Risk Assessment**

Proposed Residential Development  
at 27 Wharf Road  
Crowle  
North Lincolnshire  
DN17 4HS

Client : For Client

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Version Control

Revision	Remarks	Date
A	Preliminary	15/10/2010

**CONTENTS**

<b>1. Introduction .....</b>	<b>5</b>
<b>2. Approach .....</b>	<b>5</b>
2.1 National and Local Planning Policy (Flood Risk) .....	5
2.2 Scope of Report .....	5
2.3 Sources of Data .....	6
2.4 Licence Information and Attribution.....	6
<b>3. Context.....</b>	<b>6</b>
3.1 Location.....	6
3.2 Study Area.....	7
3.3 Description of Proposed Development .....	7
3.4 Topography .....	7
<b>4. Flood Risk Information .....</b>	<b>8</b>
4.1 Flood Risk Maps.....	8
<b>5. Flood Risk Map Commentary .....</b>	<b>8</b>
<b>6. Sequential and Exception Test.....</b>	<b>9</b>
<b>7. Detailed Analysis of Flood Risk .....</b>	<b>11</b>
7.1 Historic Flooding.....	11
7.2 Climate Change .....	11
7.3 Flooding from Rivers and Large Watercourses (Fluvial Flooding) due to Overtopping.....	11
7.4 Tidal Flooding.....	12
7.5 Flooding Due to Residual Risk .....	12
7.6 Flooding from Groundwater .....	13
7.7 Flooding from other Local Sources .....	13
7.8 Flooding from the Development Site Itself .....	13
<b>8. Conclusion.....</b>	<b>13</b>
8.1 Finished Floor Level (FFL).....	13
8.2 Flood Resilient Construction.....	14

9. Flood Warnings ..... 14

## **1. Introduction**

Flood Risk Management Limited has been commissioned to prepare a detailed flood risk assessment (FRA) for a proposed residential development.

A FRA is required because part of the development is identified as being in flood risk zone 3a.

This is a supplementary document to a planning application; the conditions of a planning consent are likely to refer to this document, which means the applicant must comply with specific requirements set out in this report and consider its recommendations.

The Local Planning Authority (LPA) may condition a planning consent using information set out in this report.

## **2. Approach**

### *2.1 National and Local Planning Policy (Flood Risk)*

This report complies with the requirements set out in paragraphs 2 to 12 of the Technical Guide to the National Planning Policy Framework on flood risk and the LPA Strategic Flood Risk Assessment (SFRA). It clearly considers:

- The effect of a range of flooding events including extreme events on people and property.
- How people will be kept safe from flood hazards identified.

### *2.2 Scope of Report*

This report will:

- Assess the risk of flooding to the development.
- Assess the risk of flooding that this development might present elsewhere.

This report will not:

- Set out any detailed design.
- Set out any detailed hydraulic calculations.
- Is not intended to replace the advice of a town planning expert in respect of a Sequential Test, Exception Test, or identification of sustainability benefits.

### 2.3 Sources of Data

The following publications and data sources were used in the production of this report:

- National Flood Risk Map for Planning – Rivers and Sea
- National Map for Risk of Flooding from Surface Water
- North & Northeast Lincolnshire SFRA
- LPA Development and Flood Risk Guidance Note
- National Planning Policy Framework (NPPF)
- Technical Guidance to NPPF
- Planning Practice Guidance (Planning and Flood Risk)
- Flood Risk Assessments Guide for New Development (FD2320)
- Flood Risk Assessments: Climate Change Allowances

### 2.4 Licence Information and Attribution

Contains Environment Agency information © Environment Agency and database right.

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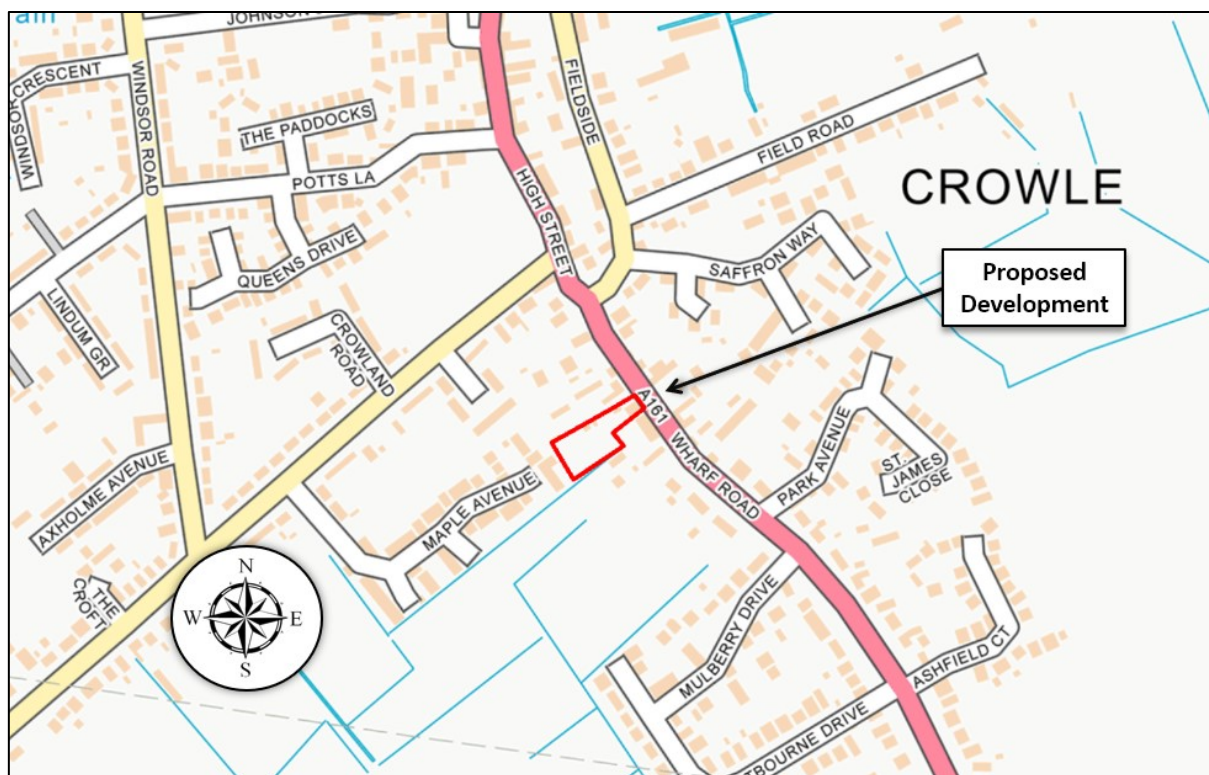
Contains extracts from North Lincolnshire Council policy documents.

## 3. Context

### 3.1 Location

At the closest points, the proposed development is situated in the village of Gunness and is 6,143m from the tidal-river Trent, 1,345m from the Stainforth and Keady Canal and 1,648m from the river Torne.

The National Grid Reference of the proposed development is **SE 77395 12438**



**Figure 1 : Location Plan**

### 3.2 Study Area

The study area will be the Isle of Axholme hydraulic catchment area and consider flood risk from the lower tidal Trent and its floodplain.

### 3.3 Description of Proposed Development

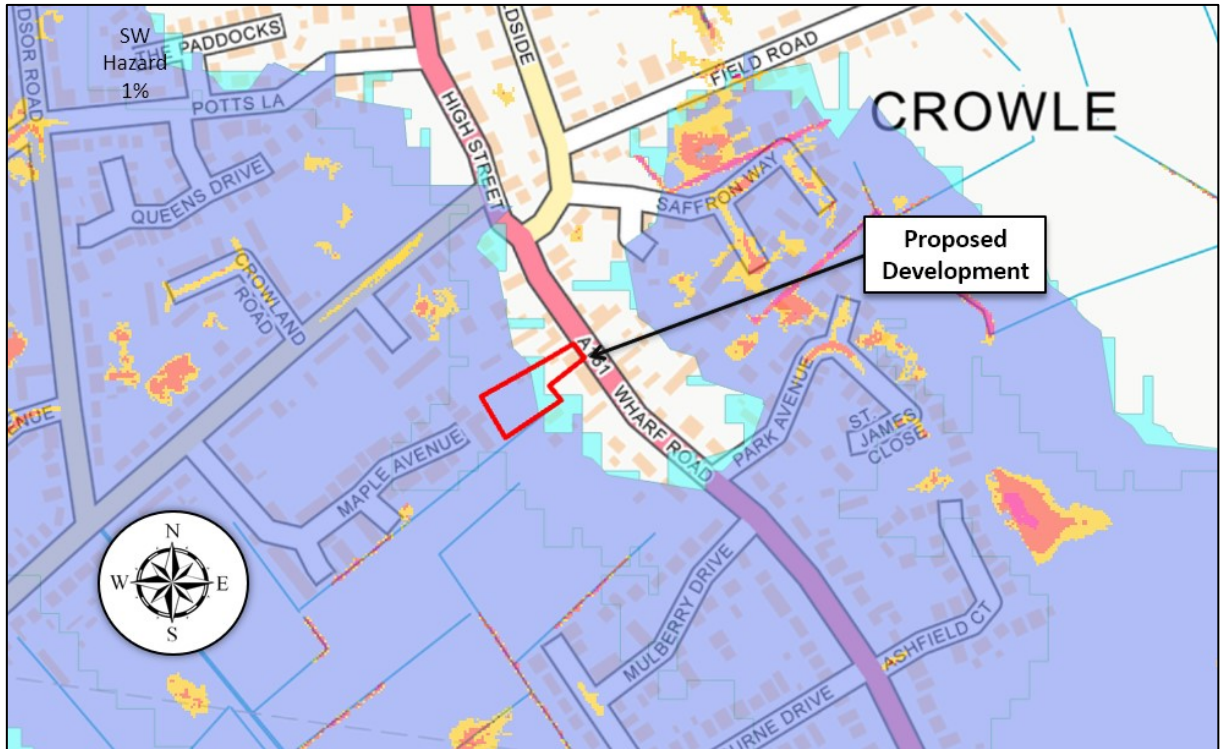
The proposal is for a small residential development on land at the rear of an existing property.

### 3.4 Topography

A topographical survey has been undertaken to Newlyn Ordnance Datum (mAOD). The site level, ranges from 3mAOD to 4.5mAOD.

## 4. Flood Risk Information

### 4.1 Flood Risk Maps

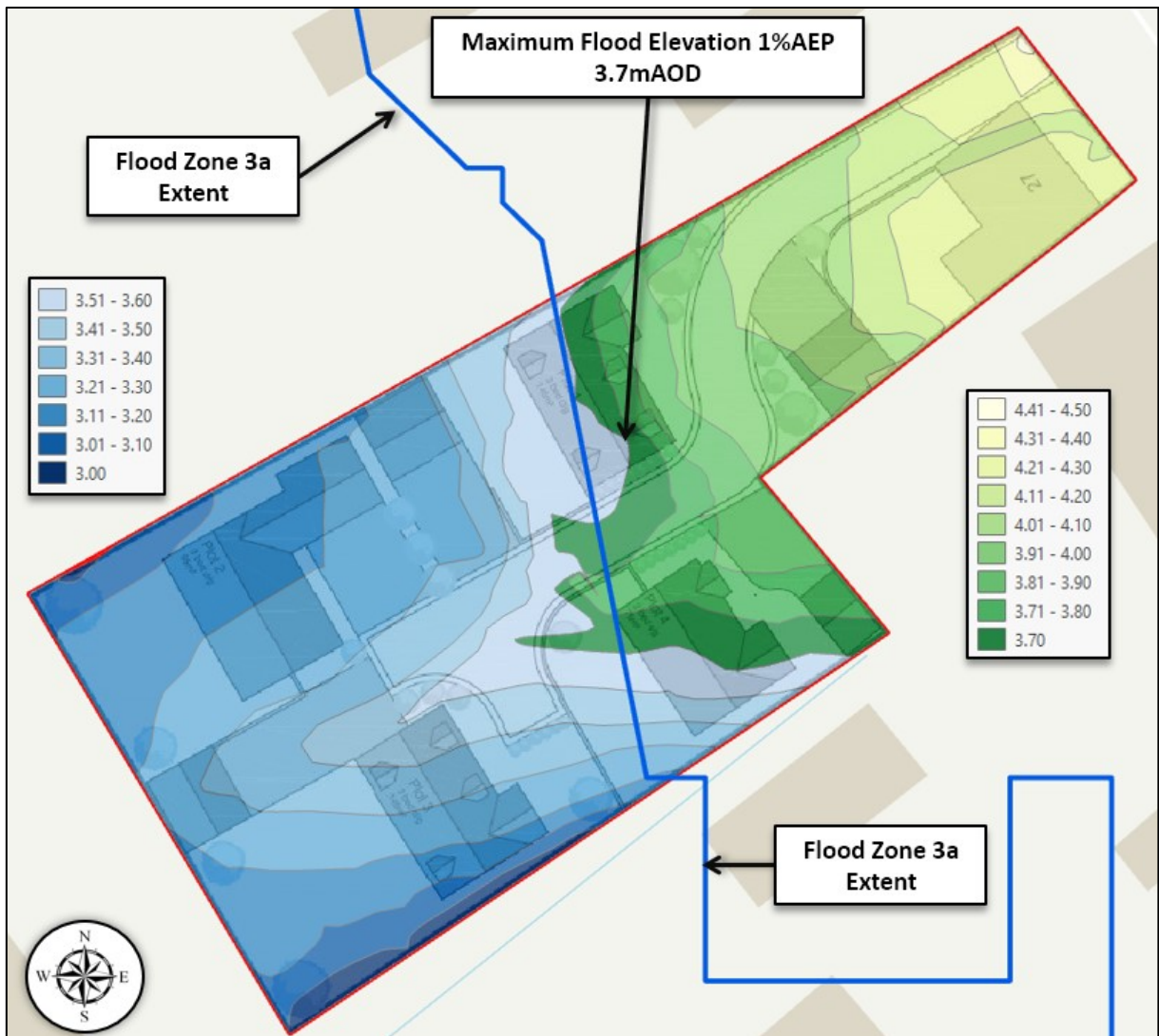


**Figure 2 : Flood Zone 2 & 3a with Surface Water Hazard 1%**

## 5. Flood Risk Map Commentary

The National flood risk map for planning - rivers and sea shows part of the development is in flood risk zone 2 and 3a.

The national surface water mapping product shows there is no modelled surface water flood risk.



*Figure 3 : Topographical Map (Existing GL) with 1% AEP Flood Extents Superimposed*

## 6. Sequential and Exception Test

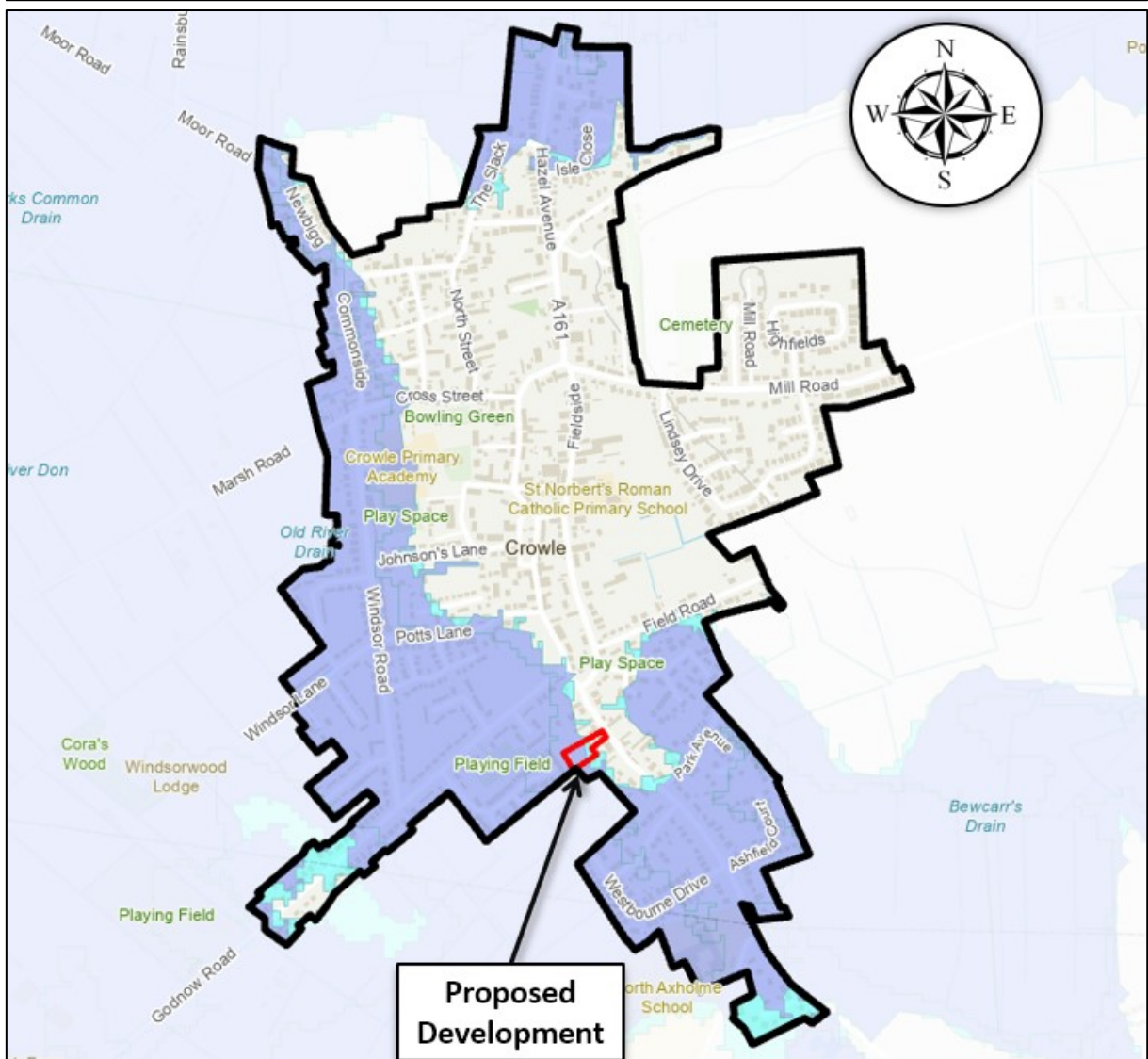
The LPAs Development and Flood Risk Guidance note advises that a sequential test is required for this development.

The note guides that that sites with lower flood risk should be considered in the "area of search" and this will be in the individual settlement development limits.

Because this is a more vulnerable development the note advises a sequential test must be passed.

**NPPF Table 3: Flood risk vulnerability and flood zone compatibility'**

Flood risk vulnerability classifications (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	✓	×	Exception Test required	✓
	Zone 3b functional floodplain	Exception Test required	✓	×	×	×



**Figure 4 : Flood Risk within Development Limits**

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The note advises that the applicant should provide evidence of the sustainability of the development so the LPA can make a decision as to whether the proposal passes the first part of the exceptions test. It is recommended that the applicant seek the advice of a town planning expert to provide this evidence.

To pass the second part of the exceptions test the LPA must be satisfied the development is safe in the event of a flood. The LPA will consider the contents of this report and assess if over its lifetime, the development and its users can be kept safe in the event of a flood.

## **7. Detailed Analysis of Flood Risk**

### *7.1 Historic Flooding*

The EAs historic flooding extent outline suggest there is no evidence of historic flood risk.

### *7.2 Climate Change*

The development is in the Idle and Torne Management catchment, the peak river flow allowances are 27% (Central) and 69% (Upper) over the lifetime of the development.

Peak rainfall volume in the 1%AEP event is predicted to increase by 40% in this catchment over the development's lifetime.

Because the development is on a very large flat floodplain that sits across the periphery of Flood Zone 1/2/3a, the impact of climate change on flood depths are likely to be marginal.

The flood depth difference due to climate change using the 1% + CC 'Modelled Fluvial Flood Depth and Climate Change Depth Difference Data' (accessed 21/10/2023) has been analysed, this typically gives increased flood depth due to climate change of 50mm – 100mm around the 3a flood extent margin, therefore an increased flood depth of 100mm is proposed to account for climate change.

### *7.3 Flooding from Rivers and Large Watercourses (Fluvial Flooding) due to Overtopping*

The development is a considerable distance from the left bank of the lower Trent, the EA advises using the modelled tidal levels with climate change to understand risk at this location which are discussed below.

To the south of Crowle is the Stainforth and Keadby Canal, this is a locked system with relatively little flow introduced into it, so this presents little risk of overtopping although because it is a raised waterbody in places this presents a risk discussed in residual risk below.

Parts of the village rely on the capacity principally afforded by two Internal Drainage Board Pumping Stations, these being, Godnow PS, which pumps the west side of the village into the canal and Bewcarrs PS which pumps the east side of the Village via the high-level warping drain into the Trent. Should the capacity of these stations be exceeded in a long duration event there is an increased risk of flooding. The increase in rainfall generated during a pluvial event due to climate change will reduce the capacity of these pumping stations in the design event.

Overtopping from the River Torne is less likely to immediately impact the village due to the presence of the canal banks, although this does not rule out flow paths through culverts and service channels.

#### *7.4 Tidal Flooding*

The modelled flood levels for the Trent in the 0.5%+CC event at the closest point to the defences near Keadby, range between 6.190mAOD and 6.204mAOD, the raised defences range between 6.2mAOD to 6.35mAOD with occasional low spots. This suggests the development will not be directly affected by tidal flooding due to overtopping during its lifetime.

#### *7.5 Flooding Due to Residual Risk*

Failure of defences on the left bank of the river Trent are unlikely to initially impact this development, however failure to fix the defences (to berm) over multiple tidal cycles may overwhelm local land drainage systems and eventually impact the village.

This area relies heavily on Internal Drainage Board pumping stations, should these fail over a prolonged period the flood plain will gradually fill and put the development at risk.

The Stainforth and Keadby canal is a raised waterbody, failure of the canal banks may result in a rapid discharge of the canal discharging into the local land drainage system impacting local low ground, this is unlikely to impact the development as although the volume discharged may be significant, it will be limited and distribute onto a wide floodplain which is at a lower elevation than the development.

### 7.6 *Flooding from Groundwater*

The areas superficial geology is locally made up of sand deposits but more widely superficial clays and other sedimentary deposits atop of mudstone bedrock which suggests groundwater flooding is less likely in this area.

### 7.7 *Flooding from other Local Sources*

There are no other significant risks from other local sources identified.

### 7.8 *Flooding from the Development Site Itself*

The development will result in increased runoff due to additional impermeable area; a sustainable drainage strategy should be prepared for the site to ensure that there is no additional runoff in the design event including allowances for climate change.

## 8. **Conclusion**

The village of Crowle was established over a millennia ago, on a raised hill surrounded by land that was once a glacial lake, surrounding land has been improved and drained over hundreds of years and now benefits from raised defences both at some distance away on the Trent and more locally on the river Torne and canal.

The village has expanded outwards to land that now permanently relies on continued maintenance of flood defences and the continued operations of the Internal Drainage Board.

The highest short-term risk is likely to be due to failure of the tidal Trent raised defences (to berm level) followed by failure to repair these over multiple tidal cycles, this would overwhelm the land drainage system and put the development at risk. This risk will increase substantially with climate change.

Another long-term risk is the local land drainage system becoming overwhelmed due to the 40% increase in peak rainfall volume due to climate change, during a long duration winter event, perhaps combined with local overtopping rivers. These circumstances may well overwhelm local pumping apparatus.

### 8.1 *Finished Floor Level (FFL)*

The SFRA defines the Critical Flood Level (CFL) as "*Light Detection and Ranging (measurement of ground level –airbourne the water level at a site assessed as having a 1 in 100 probability (1%) of flooding from a river or a 1 in 200 year probability (0.5%) of flooding*

*from the sea of occurring each year (also called the Annual Exceedance Probability), with allowance for climate change”, and goes on to state the CFL should be based on “either flood levels predicted as a product of flood risk modelling, appropriate site-specific assessment or flood levels estimated using a mix of flood risk modelling and engineering judgement”.*

Detailed topographical analysis of the development site compared to the 1%AEP modelled flood extent (the Flood Zone 3a map), shown in Figure 3, gives a maximum flood elevation of around 3.7mAOD in the development. Estimated allowances for climate change over the lifetime of the development will give a flood elevation of around 3.8mAOD. This matches exactly with the LPA policy position in section 9.16 of the SFRA which states that *“The Environment Agency has reviewed all new data available and shared this with North Lincolnshire Council. As a result, the Council proposes amending the CFL to 3.8mAOD, with finished floor levels of residential development being set 300mm above this. The Environment Agency support this approach.”*

The finished floor level should be set at or above 4.1mAOD.

## 8.2 Flood Resilient Construction

The developer should consider incorporating appropriate flood resilience measures. The measures appropriate to this development are:

- using flood resistant materials that have low permeability.
- Consider using any doors, windows or other openings that are passively flood resistant. Flood defence products should not protect the building above 600mm above finished floor level without the advice of a structural engineer.
- using flood resilient materials (for example lime plaster).
- raising all sensitive electrical equipment, wiring and sockets to at least 300mm above the finished floor level.
- making sure there is access to all spaces to enable drying and cleaning.

Standards for the installation and retrofit of resistance measures are in British Standard 851188-1:2019+A1:2021.

## 9. Flood Warnings

The applicant should register with the Government's flood information service which can be found here:

<https://flood-warning-information.service.gov.uk/warnings>

**Report Ends**