

# **FLOOD RISK ASSESSMENT**

**Residential Development  
Boston Road, Sutterton**

**Mr P Crookston  
April 2022**



## DOCUMENT ISSUE RECORD

Document Reference	RLC/0982/FRA01
--------------------	----------------

Revision		Date of Issue
1	Issued	11/04/2022

### Author



Roy Loble  
07847 482244  
[Roy.Loble@outlook.com](mailto:Roy.Loble@outlook.com)

### Limitations

The conclusions drawn by Roy Loble Consulting are based on information supplied and could differ if the information is found to be inaccurate or misleading. In which case Roy Loble Consulting accepts no liability should additional information exist or becomes available with respect to this project.

The information in this report is based on statistical data and qualitative analysis which are for guidance purposes only. This study provides no guarantee against flooding or of the absolute accuracy of water levels, flows and associated probabilities.

This report has been prepared for the sole use of Mr P Crookston and no other third parties may rely upon or reproduce the contents of this report without the written permission of Roy Loble Consulting.

## EXECUTIVE SUMMARY

This Flood Risk Assessment is compliant with the requirements set out in the National Planning Policy Framework, and the associated online Planning Practice Guidance. It has been produced on behalf of Mr P Crookston. This report demonstrates that the proposed development is not at significant flood risk, and will not increase flood risk to others, subject to the recommended flood mitigation strategies being implemented.

### Policy

Development Type	Flood Zone	Vulnerability
Dwelling Houses	3	More Vulnerable

### Climate Change Allowance

#### Peak River Flow

WELLAND MANAGEMENT CATCHMENT	
Allowance Category	Percentage Increase
Central	17

#### Sea Level Rise

Area of England	Allowance	2000-2035 (mm/year)	2036-2065 (mm/year)	2066-2095 (mm)/year	2096-2125 (mm/year)
Anglian	Higher Central	5.8	8.7	11.6	13.0
	Upper End	7.0	11.3	15.8	18.1

### Flood Risk and Mitigation

Flood Risk Source	Level of Risk Without Mitigation	Proposed Mitigation
Residual (tidal)	Low	Minimum floor level 3.65m AOD. Flood resilience to 3.95m AOD
Fluvial Tidal Groundwater Sewers	Low	
Pluvial Reservoir Canal/Artificial	None	

## CONTENTS PAGE

<b>DOCUMENT ISSUE RECORD</b>	<b>i</b>
<b>EXECUTIVE SUMMARY</b>	<b>ii</b>
Policy	ii
Climate Change Allowance	ii
Flood Risk and Mitigation	ii
<b>CONTENTS PAGE</b>	<b>iii</b>
<b>1.0 INTRODUCTION</b>	<b>1</b>
Data Used	1
Existing Site	1
Proposed Development	2
<b>2.0 FLOOD RISK PLANNING POLICY</b>	<b>3</b>
National Planning Policy Framework	3
Sequential Test	3
Flood Zone Definition	3
Flood Risk Vulnerability Classification	4
Appropriate Development	4
Exception Test	4
Development Proposals	5
<b>3.0 CLIMATE CHANGE</b>	<b>6</b>
Peak River Flow Allowances	6
Peak Rainfall Intensity Allowance	6
Sea Level Allowances	7
<b>4.0 FLOOD RISK SOURCES</b>	<b>8</b>
Fluvial	8
Tidal	8
Residual Risk	9
Pluvial	10
Groundwater	10
Sewers	11
Reservoirs	11
Canals and Artificial Water Bodies	11
<b>5.0 MITIGATION</b>	<b>12</b>
Site Layout	12
<b>6.0 CONCLUSIONS</b>	<b>13</b>

### TABLES

Table 3.1 Climate Change Allowances for Peak River Flow .....	6
Table 3.2 Climate Change Allowances for Sea Level Rise .....	7
Table 6.1 Summary of Risk and Mitigation .....	13

### FIGURES

Figure 1.1 Site Location .....	1
Figure 2.1 Flood Zones.....	5
Figure 4.1 Depth of Flooding for 0.1% (1:1000) 2115 Climate Change Event .....	9
Figure 4.2 Surface Water Flooding Extents .....	10



## 1.0 INTRODUCTION

- 1.1 This Flood Risk Assessment, (FRA), is compliant with the requirements set out in the National Planning Policy Framework, (NPPF), and the associated online Planning Practice Guidance.
- 1.2 The FRA has been produced on behalf of Mr P Crookston in respect of a planning application for a residential development at Boston Road, Sutterton.

### Data Used

- 1.3 This FRA is based on the following information:
- LiDAR 2m DTM
  - British Geological Survey Drift & Geology Maps
  - Environment Agency Consultation
  - Environment Agency Data
  - British Geological Survey Hydrogeology Data

### Existing Site

- 1.4 The site is located at grid reference TF2865335995 as shown in **Figure 1.1** below.



**Figure 1.1 Site Location**

- 1.5 LiDAR 2m DTM shows that Boston Road adjacent to the site is at approximately 3.80m AOD and the site falls from the road to approximately 3.10m AOD on the eastern boundary. A watercourse is located approximately 20m to the east where the existing land level is approximately 2.70m AOD.
- 1.6 The online British Geological Survey maps indicates that the site is located on superficial deposits of clay and silt over a bedrock of mudstone.

### **Proposed Development**

- 1.7 The proposed development consists of a residential development of two bungalows.



## 2.0 FLOOD RISK PLANNING POLICY

### National Planning Policy Framework

- 2.1 The NPPF sets out the Government's national policies on different aspects of land use planning in England in relation to flood risk. A supporting web-based Planning Practice Guidance is also available.
- 2.2 The guidance uses four Flood Zones to characterise flood risk which refer to the probability of river and sea flooding, ignoring the presence of defences.

### Sequential Test

- 2.3 The NPPF requires the application of a Sequential Test to ensure that new development is in areas with the lowest probability of flooding and the Flood Zones provide the basis for applying the Test.

### Flood Zone Definition

<b>Flood Zone 1</b>	Low probability (1 in 1000 annual probability of river or sea flooding (<0.1%)).
<b>Flood Zone 2</b>	Medium probability (between 1 in 100 and 1 in 1000 annual probability of river flooding (1.0%-.0.1%) or between 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5%-.0.1%) in any given year).
<b>Flood Zone 3a</b>	High probability (1 in 100 or greater annual probability of river flooding (>1.0%) or 1 in 200 or greater annual probability of sea flooding (>0.5%) in any given year).
<b>Flood Zone 3b</b>	This zone comprises land where water must flow or be stored in times of flood. Land which would flood with an annual probability of 1 in 20 (5.0%), or is designed to flood in an extreme flood (0.1%) should provide a starting point for discussions to identify functional floodplain.

- 2.4 The Flood Zones do not consider the projected effects of climate change and may not represent potential flooding from smaller watercourses.
- 2.5 The aim is to steer new development to Flood Zone 1 and where there are no reasonably available sites in Flood Zone 1, local planning authorities in their decision making should consider the flood risk vulnerability of land uses and consider reasonably available sites in Flood Zone 2, applying the Exception Test if required.
- 2.6 Only where there are no reasonably available sites in Flood Zones 1 or 2 should the suitability of sites in Flood Zone 3 be considered, considering the flood risk vulnerability of land uses and applying the Exception Test if required.
- 2.7 The guidance also sets out the vulnerability to flooding of different land uses and some of these are detailed below.

## Flood Risk Vulnerability Classification

<b>Essential Infrastructure</b>	Transport Infrastructure; Utility Infrastructure; Wind Turbines.
<b>Water Compatible</b>	Flood Control Infrastructure; Water and Sewage Infrastructure; Navigation Facilities.
<b>Highly Vulnerable</b>	Emergency Services (which are required in times of flood); Basement Dwellings; Caravans, Mobile Homes and Park Homes, (intended for permanent residential use); Installations requiring Hazardous Substances Consent.
<b>More Vulnerable</b>	Hospitals and other Health Services; Residential Institutions; Dwelling Houses, Drinking Establishments; Nightclubs; Hotels; Non-residential uses for Health Services; Nurseries; Educational Establishments; Landfill and Hazardous Waste Management Facilities; Sites used for Holiday or short-let Caravan and Camping sites, (subject to a specific warning and evacuation plan).
<b>Less Vulnerable</b>	Commercial Establishments; Emergency Services not required in times of flood; Land and Buildings used for Agriculture and Forestry. Waste Treatment; Minerals Working; Water Treatment Works; Sewage Treatment Works.

## Appropriate Development

- 2.8 Based on the vulnerability of a development the guidance states what Flood Zone(s) the development is appropriate within. The flood risk compatibility is summarised below.

<b>Flood Zone 1</b>	Appropriate Development – All.
<b>Flood Zone 2</b>	Exception Test - Highly vulnerable. Appropriate Development - Essential Infrastructure; More vulnerable; Less vulnerable and Water Compatible.
<b>Flood Zone 3a</b>	Should not be permitted – Highly vulnerable. Exception Test – Essential Infrastructure, More vulnerable. Appropriate Development – Less vulnerable; Water compatible.
<b>Flood Zone 3b</b>	Should not be permitted – Highly vulnerable; More vulnerable; Less vulnerable. Exception Test – Essential Infrastructure. Appropriate Development – Water compatible.

- 2.9 The Planning Practice Guidance also states that all sources of flooding should be considered when preparing a FRA.

## Exception Test

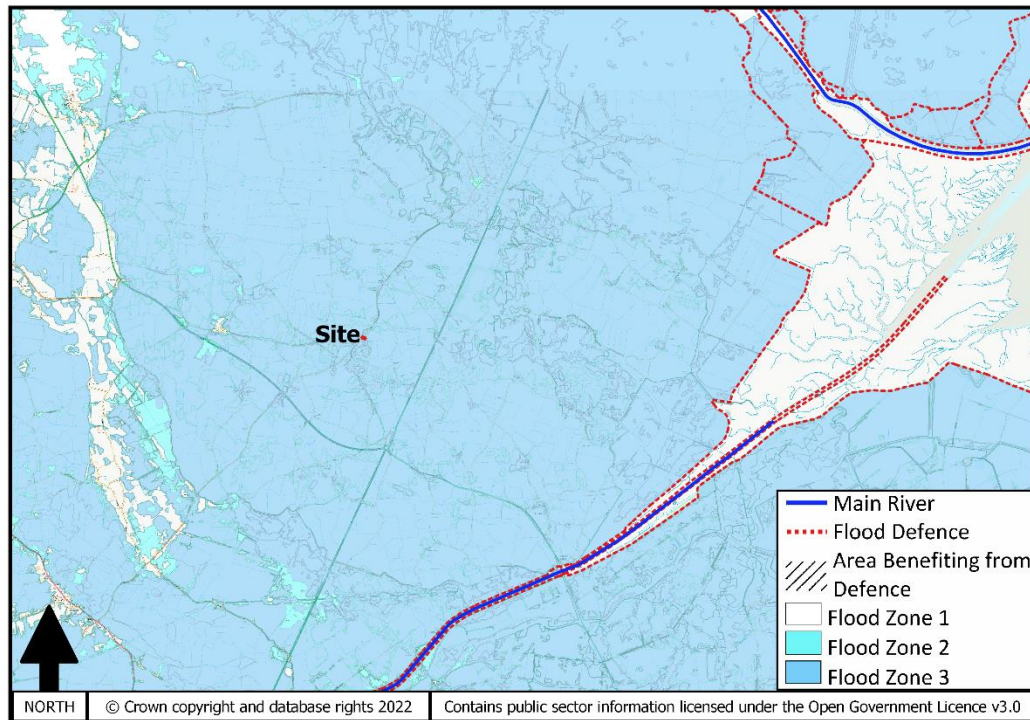
- 2.10 The Exception Test is a method to demonstrate and help ensure that flood risk to people and property will be managed satisfactorily, while allowing necessary development to go ahead in situations where suitable sites at lower risk of flooding are not available.
- 2.11 The first part of the Exception Test is to show that the proposed development will provide wider sustainability benefits to the community that outweigh flood risk. The second part is the requirement for a FRA to demonstrate that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce flood risk overall.

## Development Proposals

- 2.12 The proposed development consists of Dwelling Houses.

### Flood Zones

- 2.13 The Flood Zones are shown on **Figure 2.1** below which shows the site to be in Flood Zone 3.



**Figure 2.1 Flood Zones**

### Development Vulnerability

- 2.14 Dwelling Houses are More Vulnerable.

### Exception Test

- 2.15 A FRA is required to ensure the development will remain safe over its lifetime from all sources of flooding and not increase flood risk elsewhere.

## 3.0 CLIMATE CHANGE

- 3.1 The NPPF sets out how the planning system should help minimise vulnerability and provide resilience to the impacts of climate change.
- 3.2 As the Government's expert on flood risk on 19<sup>th</sup> February 2016 the Environment Agency, (EA), published revised climate change allowances to support the NPPF. The sea level rise allowances were revised on the 17<sup>th</sup> December 2019 and the peak river flows revised on the 20<sup>th</sup> July 2021.
- 3.3 The climate change allowances are based on projections and different scenarios of carbon dioxide (CO<sub>2</sub>) emissions to the atmosphere and provide predictions of anticipated change for:
- peak river flow by river Management Catchment;
  - peak rainfall intensity;
  - sea level rise;
  - offshore wind speed and extreme wave height.

### Peak River Flow Allowances

- 3.4 The peak river flow allowances show the anticipated changes to peak flow by Management Catchment, which are sub-catchments of River Basin Districts, with three allowances; central; higher central and upper end.
- 3.5 This proposed development is in the Welland Management Catchment.
- 3.6 The appropriate allowance depends on the Flood Zone and vulnerability classification of the development and for this proposal it is appropriate to use the Central allowance.
- 3.7 The allowances change over three periods of time over the next century. The appropriate period should be chosen based on the expected lifetime of the development and for residential that is 100 years.
- 3.8 The following climate change allowances in peak river flows therefore need to be applied:

WELLAND	
Allowance Category	Percentage Increase
Central	17

**Table 3.1 Climate Change Allowances for Peak River Flow**

### Peak Rainfall Intensity Allowance

- 3.9 Increased rainfall affects river levels and land and urban drainage and should be applied to surface water drainage systems. However, the proposed development does not increase the impermeable area enough for these allowances to apply.

### Sea Level Allowances

- 3.10 There is a range of allowances for each region and epoch or time frame for sea level rise as follows:

Area of England	Allowance	2000-2035 (mm/year)	2036-2065 (mm/year)	2066-2095 (mm)/year	2096-2125 (mm/year)
Anglian	Higher Central	5.8	8.7	11.6	13.0
	Upper End	7.0	11.3	15.8	18.1

**Table 3.2 Climate Change Allowances for Sea Level Rise**

## 4.0 FLOOD RISK SOURCES

- 4.1 The following flood risk sources have been identified and where mitigation is required to reduce the flood risk this is discussed in **Section 5**.

### Fluvial

#### Main River

- 4.2 Information provided by the EA confirms that the site is considered not to be at risk of flooding from Main Rivers.

#### Ordinary Watercourses

- 4.3 The site lies within the district of the Welland and Deepings Internal Drainage Board, (IDB), and the Boards maintained watercourse, the Three Towns Drain, is located approximately 0.20km to the east of the site.
- 4.4 Another ordinary watercourse, not maintained by the IDB, is approximately 20m from the eastern boundary of the site.
- 4.5 Flood risk from these watercourses is considered low.
- 4.6 The risk of flooding from fluvial sources is low.

### Climate Change

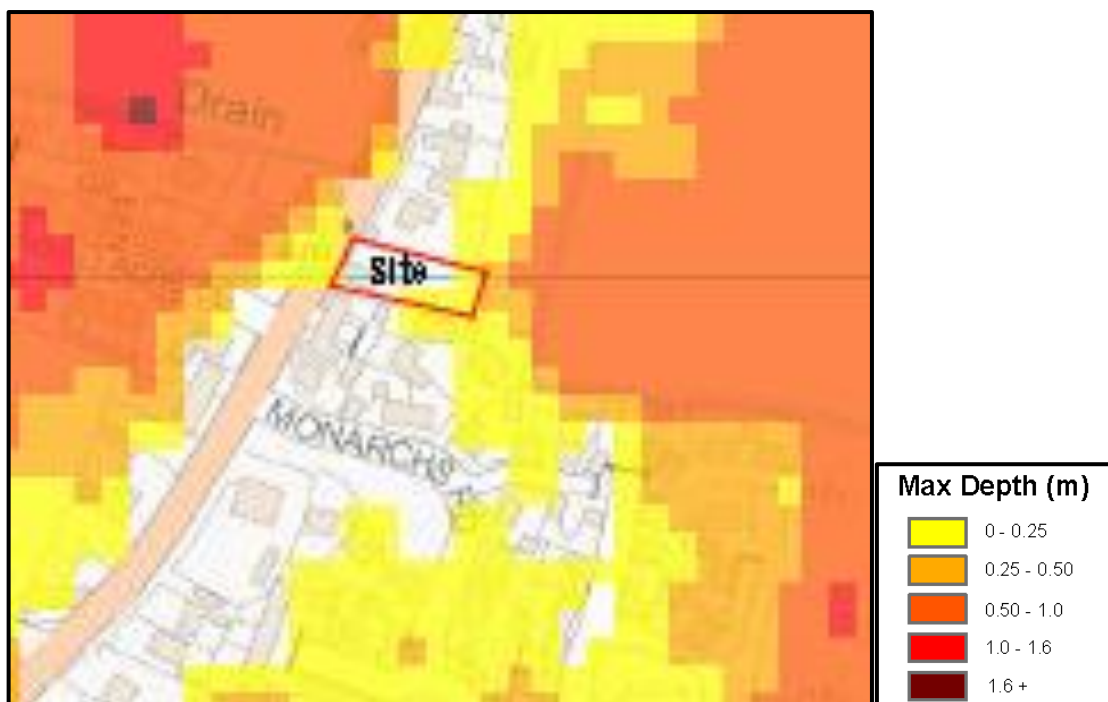
- 4.7 As the risk of flooding from fluvial sources is low and is less than the tidal risk, see below, climate change has not been considered.

### Tidal

- 4.8 The site is approximately 5.00km from the east coast.
- 4.9 Information provided by the EA states that the existing tidal defences protecting this site consist of earth embankments. They are in good condition and reduce the risk of flooding (at the defence) to a 1% (1 in 100) chance of occurring in any year. The EA inspect these defences routinely to ensure potential defects are identified.

## Residual Risk

- 4.10 The site is protected from flooding by defences, including a raised defence. Information provided by the EA confirms that the site is not affected by overtopping of the defences for the present day (2011) and climate change (2115) scenarios
- 4.11 However, if that defence was to breach then flooding could occur .
- 4.12 The EA have produced hazard mapping and **Figure 4.1** below shows the range of flood depths on, and adjacent to, the site for the 0.1% (1:1000) 2115 Climate Change Event.



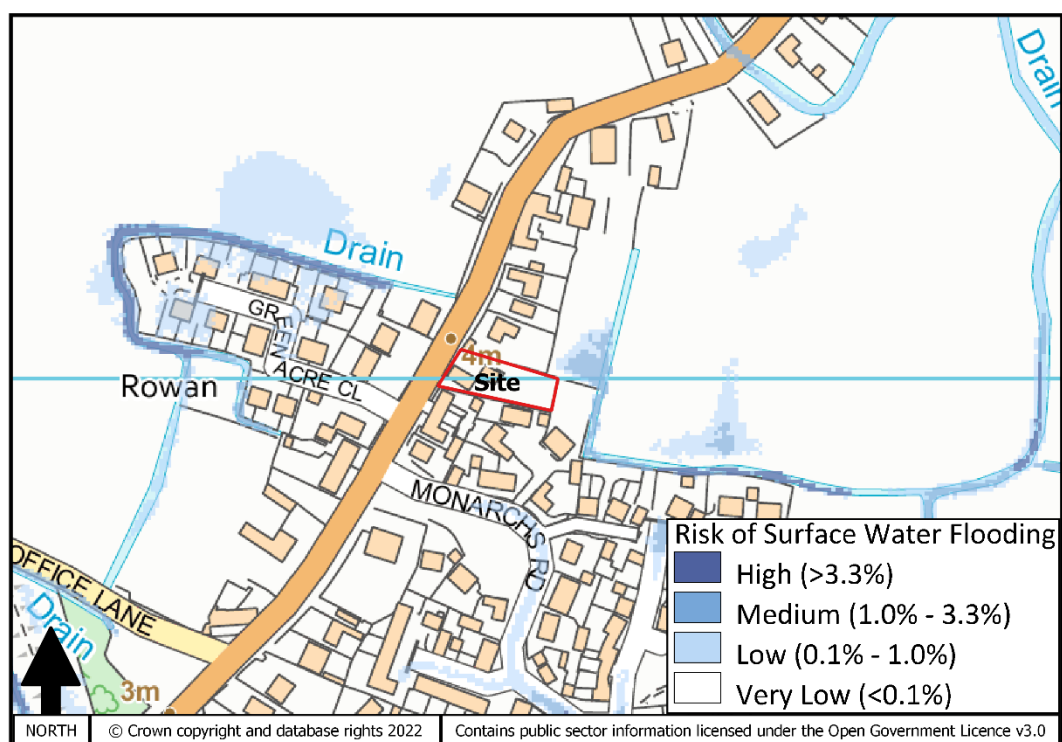
**Figure 4.1 Depth of Flooding for 0.1% (1:1000) 2115 Climate Change Event**

- 4.13 The lower part of the site is shown to have flood depths of up to 0.25m where the land level is approximately 3.10m AOD.
- 4.14 The worst case 0.1% (1:1000) 2115 Climate Change Event flood level on the site is therefore  $3.10\text{m AOD} + 0.25\text{m} = \mathbf{3.35\text{m AOD}}$ .
- 4.15 The part of the site adjacent to Boston Road is shown not to be affected by flooding where existing land levels are approximately 3.70m AOD.
- 4.16 Part of the site is at a low risk of residual flooding from tidal sources.



## Pluvial

- 4.17 The EA have produced maps showing flooding when rainwater lies or flows over the ground. The surface water flooding extents are shown below in **Figure 4.2**. Unlike the fluvial mapping, which is based on a detailed hydraulic model, this mapping is based purely on applying rainfall to a digital terrain model. As such this mapping serves to represent a worst-case scenario which may well overstate the actual probability of flooding in this area.
- 4.18 There is a caveat, as to the use of these maps and that they are not to be used to identify that an individual property will flood. Because of the way they have been produced and the fact that they are indicative these maps are not appropriate to act as the sole evidence for any specific planning or regulatory decision or assessment of risk in relation to flooding at any scale without further supporting studies or evidence.



**Figure 4.2 Surface Water Flooding Extents**

- 4.19 The site is not at risk of flooding from pluvial sources.

## Groundwater

- 4.20 The site is located on rocks with essentially no groundwater and there are no known instances of groundwater flooding in the area.
- 4.21 The risk of flooding from groundwater is low.



### **Sewers**

- 4.22 Public maintained sewers are unlikely to pose a significant flood risk as they are well maintained.
- 4.23 The risk of flooding from existing sewers is low.

### **Reservoirs**

- 4.24 The EA has prepared reservoir failure flood risk mapping to show the largest area that might be flooded if a reservoir were to fail and release the water it holds. The mapping displays two scenarios as follows:
- Dry            this is the extent when the river levels are normal,
  - Wet            this is the extent when there is also flooding from rivers.
- 4.25 The site is not at risk of flooding from reservoirs.

### **Canals and Artificial Water Bodies**

- 4.26 The site is not at risk of flooding from canals.

## 5.0 MITIGATION

- 5.1 Section 4.0 has identified the sources of flooding which could potentially pose a risk to the site and the proposed development. This section of the FRA sets out the mitigation measures which are to be incorporated within the proposed development to address and reduce the risk of flooding to within acceptable levels.

### Site Layout

- 5.2 The proposed development is only at a low residual risk of flooding from tidal sources.
- 5.3 The 0.1% (1:1000) 2115 Climate Change Event flood level is 3.35m AOD.
- 5.4 The minimum floor level of the bungalows will be **3.65m AOD**.
- 5.5 Additional flood resilience measures will be included, where required, as follows;
- Backwater valves and non-return valves.
  - Electrical installation to be above **3.95m AOD**.

## 6.0 CONCLUSIONS

- 6.1 This FRA is compliant with the requirements set out in the NPPF and the associated online Planning Practice Guidance.
- 6.2 The FRA has been produced on behalf of Mr P Crookston.
- 6.3 This report demonstrates that the proposed development is not at significant flood risk, and will not increase flood risk to others, subject to the recommended flood mitigation strategies being implemented.
- 6.4 The identified risks and mitigation measures are summarised below;

Flood Risk Source	Level of Risk Without Mitigation	Proposed Mitigation
Residual (tidal)	Low	Minimum floor level 3.65m AOD. Flood resilience to 3.95m AOD
Fluvial Tidal Groundwater Sewers	Low	
Pluvial Reservoir Canal/Artificial	None	

**Table 6.1 Summary of Risk and Mitigation**

# **ROY LOBLEY CONSULTING**

**Roy.Lobley@outlook.com**

**07847482244**

**[www.roylobleyconsulting.com](http://www.roylobleyconsulting.com)**