PROPOSED RESIDENTIAL DEVELOPMENT BETWEEN 10 AND 12 RISEGATE ROAD, GOSBERTON RISEGATE, SPALDING, PE11 4EZ.

FLOOD RISK ASSESSMENT



View of site from Risegate Road

S M Hemmings B Sc C Eng MICE MIWEM,
13 Lea Gardens,
Peterborough,
PE3 6BY.

This flood risk assessment has been prepared solely to support the planning application for the development at Risegate Road, Gosberton Risegate. The author has made every effort to provide an accurate assessment of the flood risk but accepts no liability should the information be found to be incorrect or incomplete, or if it is used for any other purposes other than for which it was originally commissioned.

Introduction

An application is due to be made to South Holland District Council for planning permission to demolish the existing redundant agricultural buildings and construct two new dwellings on a plot of land between 10 and 12 Risegate Road, Gosberton Risegate, Spalding, PE11 4EZ.

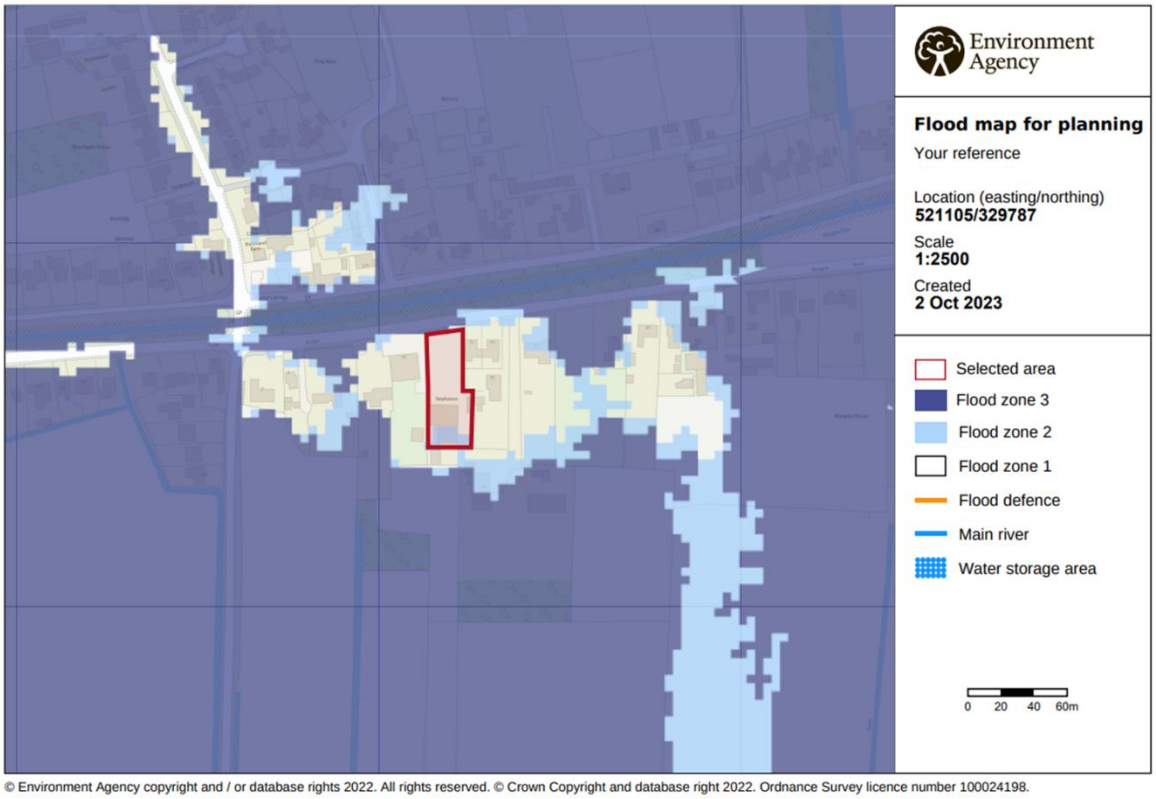
The site is within Flood Zones 1 and 2 as shown on the Environment Agency's Flood Zone Map. These maps do not take into account existing flood defences.

The Planning Application therefore requires a Flood Risk Assessment to be carried out as required in the Planning Practice Guidance to the National Planning Policy Framework.

The site is shown within the defended area of the South Holland District Council's Strategic Flood Risk Assessment (SHDC SFRA) map and is located in the Welland and Deepings Internal Drainage Board district.

Environment Agency (EA) Flood Zones

The map below is taken from the Environment Agency website and shows the flood zones in this area.



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It can be seen that that at least 95% of the area of the site is in Flood Zone 1, with a very small part in flood zone 2.

Application Site

The development is located 3.4km west of the village of Gosberton and the National Grid Reference of the site is 521105 329787.

The position and extent of the site is shown on the plan at the end of this document.

Applying the flood risk vulnerability classification in Table 2 of the Guidance, residential development is classified as “more vulnerable”. Reference to Table 3 (shown below) of the Guidance informs us that more vulnerable development is satisfactory in Flood Zones 1 and 2.

Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	✗	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	✗	✗	✗	✓*

Sequential Test

The aim of the Sequential Test, as set out in the Planning Practice Guidance, is to ensure that a sequential approach is followed to steer new development to areas with the lowest probability of flooding. The flood zones as refined in the Strategic Flood Risk Assessment for the area provide the basis for applying the Test. The aim is to steer new development to Flood Zone 1 (areas with a low probability of river or sea flooding). Where there are no reasonably available sites in Flood Zone 1, local planning authorities in their decision making should take into account the flood risk vulnerability of land uses and consider reasonably available sites in Flood Zone 2 (areas with a medium probability of river or sea flooding), applying the Exception Test if required. Only where there are no reasonably available sites in Flood Zones 1 or 2 should the suitability of sites in Flood Zone 3 (areas with a high probability of river or sea flooding) be considered, taking into account the flood risk vulnerability of land uses and applying the Exception Test if required.

As at least 95% the area of the development is within flood zone 1 and the site is level this can be considered a suitable site when the sequential test for flood risk is considered.

The site can be considered to be an infill site within the village boundary of Gosberton Risegate and Gosberton Clough. Clause 5.3.5 on page 61 of the South East Lincolnshire Local Plan 2011-2036, adopted in March 2019 states the following:

Within the defined boundaries there will be numerous opportunities for infill and larger-scale housing development that will be available to the local builder, self-builder, custom-builder and larger house-building companies. It is not practical to identify or anticipate all such opportunities; however, the positive tone of the Local Plan

encourages such development provided that the material considerations of the Local Plan and particular sites are met.

The safety of the development will be delivered by demonstrating that the finished ground floor level of the proposed development is above the predicted flood levels in this area.

Therefore I consider that the sequential test has been passed.

Strategic Flood Risk Assessment

The Strategic Flood Risk Assessment (SFRA) written for the South Holland District Council (SHDC) in 2010 provides details of the actual flood risk in the Council's area. This information has not been updated and reference to the maps in this document give the following information for the actual flood risk and hazard at the site for the 1% fluvial event and 0.5% tidal event.

For the present day	Depth of flooding … zero
	Extent of flooding .. Low or medium flood probability
	Peak Velocity ……. Nil
For year 2115	Depth of flooding … zero
	Extent of flooding…. Low or medium flood probability
	Peak Velocity …… Nil

The maps showing the residual flood hazard were revised in the 2016 update of the South Holland District Council Strategic Flood Risk Assessment which can be found on the website of the South East Lincolnshire Joint Planning Committee. The hazards are as follows for the 1% fluvial or 0.5% tidal event probability:

For the present day	Depth of flooding …zero
	Extent of flooding .. Low or medium flood probability
	Hazard rating…… Nil
	Peak Velocity .. Nil
For the year 2115	Depth of flooding … zero
	Extent of flooding .. Low or medium flood probability
	Hazard rating…… Nil
	Peak velocity ……. Nil

Figure 16 of the general maps show that the site is not within the rapid inundation zone for the present day and 2115.

Maximum flood level and bank levels in the South Forty Foot Drain

Maximum flood levels in the South Forty Foot Drain south of Kingston Bridge at chainage 26.5 km are shown in the reports as follows:

	Present	2115 (20% climate change allowance)
1 in 100 year	3.37	3.41

The earth bank level is shown to be 4.91m OD at this location, however it is widely known that there are sections of the bank south of Kingston Bridge where levels are no higher than 3.00m OD

Maximum flood and bank levels in the River Glen

Maximum flood levels in the River Glen at chainage 10.2 km are shown in the reports as follows:

	Present	Including Climate Change
1 in 100 year	4.66	4.93
1 in 1,000 year	4.94	5.16

The defences west of the A151 bridge consist of earth banks with minimum levels of 5.70m OD and some higher levels of up to 6.20m OD.

Information from the Environment Agency

The Environment Agency has provided predicted flood levels for the River Glen. The levels quoted on the next page are approximately 100 metres downstream of the road bridge at West Pinchbeck.

	2007	2115
Peak 1 in 100 year flood level	4.68m OD	5.23m OD
Peak 1 in 1,000 year flood level	4.96m OD	5.49m OD

The Environment Agency has provided the following predicted fluvial flood flows measured in cumecs for the River Glen at the same location.

	2007	2115
Peak 1 in 100 year flow	32.35	39.11
Peak 1 in 1,000 year flow	39.83	49.54

Information on Surface Water Flooding on Environment Agency Website

The map on the next page shows areas around the site where there is a low risk of surface water flooding. The light blue areas indicate the low risk of up to 300mm of surface water flooding, and the darker blue areas indicate that between 300mm and 900mm of surface water flooding could occur.



It can be seen there is no predicted risk of surface water flooding in the low risk scenario on the site.

Site Levels

The level of Risgate Eau is shown to be 3.10m ODN and the site is level and is at approximately the same level.

Existing Flood Alleviation Measures

The site is within a defended flood plain, as defined in Appendix 1 of the Environment Agency's "Policy and Practice for the Protection of Flood Plains". The area is considered to be passive until such time that a flood greater than the defences can withstand occurs. The likelihood of flooding due to overtopping or failures of the defences to the River Welland is very low.

The site is approximately 4.9 km east of the South Forty Foot Drain, which is main river and maintained by the Environment Agency.

The site is approximately 4.1 km north of the River Glen, which is main river and maintained by the Environment Agency.

The site is approximately 7.5 km west of the tidal River Welland, which is main river and maintained by the Environment Agency.

Potential Sources of Flooding

The following sources of flooding have been identified:

1) Failure or overtopping of South Forty Foot Drain
2) Failure or overtopping of tidal defences of the River Welland
3) Failure or overtopping of the River Glen
4) Overtopping of IDB drainage systems.
5) Flooding from local surface water systems.

1) Failure or Overtopping of South Forty Foot Drain

The South Forty Foot Drain is located 4.9km west of the site. This watercourse is maintained by the Environment Agency. The Drain is embanked from the southern end at Black Hole Drove Pumping station to north of Donington. The 2010 SFRA states that the maximum predicted water level in the Drain in a 1 in 100 year event in 2115 is 3.41m OD. However later reports by the EA have concluded that the watercourse only has a standard of service between 1 in 25 and 1 in 50 years and overtopping will occur in events larger than these. Therefore in practice the water level will not exceed 3.0m OD in any event, and flooding will start to occur in events greater than 1 in 50 years with overtopping of the banks of the South Forty Foot Drain south of Quadring Fen and flooding from the embanked highland watercourses that lead into the Drain from the west.

As the ground floor level of the proposed houses will be approximately 3.40m OD then this source of flooding can be considered to be adequately mitigated.

2) Failure or overtopping of tidal defences of the River Welland

The tidal defences of the River Welland are approximately 7.5 km east of the development site. The SFRA does not predict that flood water from this source will extend as far as the site. The maps indicate that flood water could extend as far as the railway line between Gosberton and Risegate, which is 1.2 metres east of the development site, but is unlikely to extend further westwards.

Therefore this source of flooding can be considered to be adequately mitigated.

3) Failure or overtopping of the River Glen

The River Glen is approximately 4.1 km south of the site. If a breach occurred in the bank in a 1 in 100 year event in 2115 flood water would flow northwards and flood low land around Northgate and Burtey Fen. The map in the SFRA showing flood depths in a 1 in 100 year residual event in 2115 indicates the flooding would extend into the low areas of land in Burtey Fen but the flood water would not extend to within 1.0km of the site.

Therefore as ground floor levels of the proposed dwellings will be raised to 3.40m OD this will provide adequate mitigation against this risk.

4) Overtopping of IDB Systems

The watercourse on the northern side of Risegate Road is the Risegate Eau, which is maintained by Welland and Deepings IDB.

This section of Risegate Eau flows in easterly direction and the water level in this drain is controlled at the outfall near Fosdyke Bridge with an outfall sluice and a pumping station, which is km east of the development site. Chesboule Lane is the boundary between Welland and Deepings and Black Sluice IDB areas. On the west side of Carter's Bridge the water flows in a westerly direction to be pumped into the South Forty Foot Drain.

Risegate Eau provides drainage for the whole fen area of Gosberton and Quadring. For most situations the water is discharged into the tidal River Welland through the sluices at low tide. However in high flow situations after heavy rainfall the pumps need to be operated to control the water levels in the catchment.

The Welland and Deeping IDB drains have been designed to a 1 in 10 year standard with a freeboard of between 800mm and 1.0 metres. This generally provides a standard of at least 1 in 50 years for flooding of the lowest land. Much of the land in the catchment is below 3.00m OD and therefore even if the pumps fail to operate for a considerable time during a rainfall event the site of the development is unlikely to flood. The normal water level in the Risegate Eau is 0.00m OD at the outfall at Risegate Eau Pumping Sation, and the normal water level in this drain north of the development site is 1.10m OD. The maximum design level in the Risegate Eau at Wargate Bridge, which is 2.0 km east of the development site is 1.05m OD and it is estimated that the water level in Risegate Eau at Carters Bridge could rise to as high as 2.50m OD in a 1 in 100 year event.

The Black Sluice IDB maintain the length of Risegate Eau west of the intersection of Beach Lane with Risegate Eau which is 140 metres west of the site. Black Sluice IDB have carried out computer modelling for the section of Risegate Eau within their District and the predicted levels in Risegate Eau on the east side of Carter's Bridge are:

1 in 100 years	1.69m OD
1 in 100 years + climate change	1.81m OD

Therefore the mitigation of raising ground floor levels to approximately 3.40m OD will provide adequate mitigation against the risk of flooding from IDB drains.

5) Flooding from local foul or surface water systems.

All of the driveways and hardstandings will be constructed with permeable gravel or similar permeable construction. Therefore the mitigation of raising ground floor levels 300mm above the existing and proposed ground level on the site will provide adequate mitigation from surface water flooding.

Extent of known Flooding

During the preparation of this assessment, no evidence was discovered of the site or any of the adjoining properties being flooded.

Probabilities and Trends of Flooding

The probability of this development flooding from Environment Agency main river is very low.

Residual Risk – Extreme Events

The residual risk from extreme events is very low on this site. There are no records of the area around Gosberton Risegate having been flooded in the last 60 years.

Climate Change

The recommendations for flood depths for this flood risk assessment use information mostly taken from the South Holland DC SFRA which was last updated in 2010. The EA have issued new guidance on recommended contingency allowances for predicted sea rises, fluvial flows and rainfall intensities which from 19th February 2016 needs to be considered in the FRA. The effects of these new recommendations are considered in Appendix A of this report (pages 12 to 15). It is concluded that no extra mitigation measures are necessary to comply with the new guidance on climate change.

South East Lincs Advice Matrix

Advice can be found on the recommended mitigation required by referring to a spreadsheet on the South East Lincolnshire website.

As the development is in flood zones 1 and 2 and there is no flood hazard reference should be made to Category G8 which shows that the matrix reference for this category is “No Comment”.

Summary of Risk of Flooding to the Site

The map in the SFRA (an extract of which is shown below) indicates that no flooding is predicted to take place in a 1 in 100 year fluvial or a 1 in 200 year tidal residual event in 2115.



The mitigation of raising the ground floor level of the new buildings to a level of approximately 3.40m OD will place the ground floor level 300mm above the average existing ground level of the site.

Conclusions

The proposed development is not in a functional flood plain as defined by PPS25.

The risk of flooding from a breach in the banks of the tidal River Welland is remote, as the site is 7.5 km from these banks.

The risk of flooding from the River Glen south of the site, is also very low, as the river is 4.1km from the site, and the agricultural land south of the development site is lower than the level of the development site.

The risk of flooding from IDB watercourses and the South Forty Foot drain is also extremely unlikely, as the proposed level of the site is above the highest predicted levels in these watercourses.

Recommendations

In any area where there is a risk of flooding, although the risk at this site is low, it is preferable to construct new buildings with two stories with all sleeping accommodation on the first floor, in order that the first floor can provide a safe refuge if any flooding were to occur.

The ground floor level of the proposed properties should be raised a minimum of 300mm above the existing ground level.

Occupiers of the properties should register with the Environment Agency's Floodline Warnings Direct Service to receive automated early warnings of potential flooding.

Although the risk of flooding is extremely low, if through any set of circumstances acting together any flooding did to begin to occur, this would happen very slowly and residents would have adequate time to evacuate the area and remain safe.

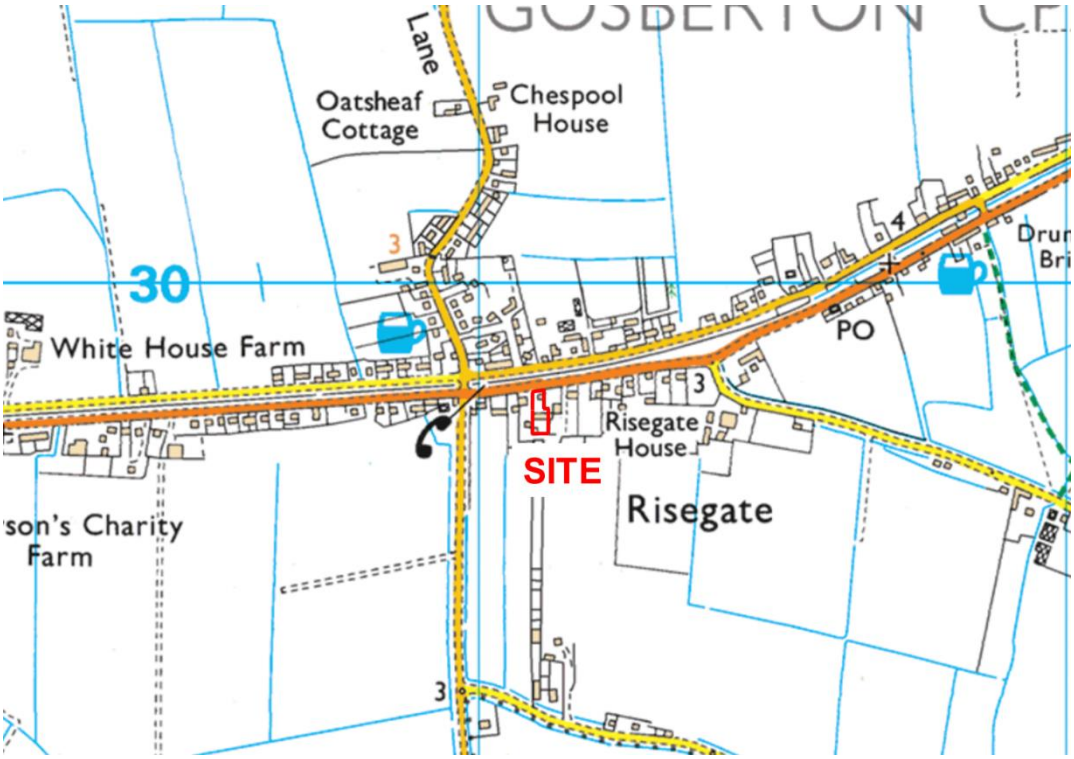
On site surface water drainage should if possible be discharged into soakaways and these should be designed to BRE Digest 365 and approved under Building regulations.

S M Hemmings B Sc C Eng MICE MIWEM

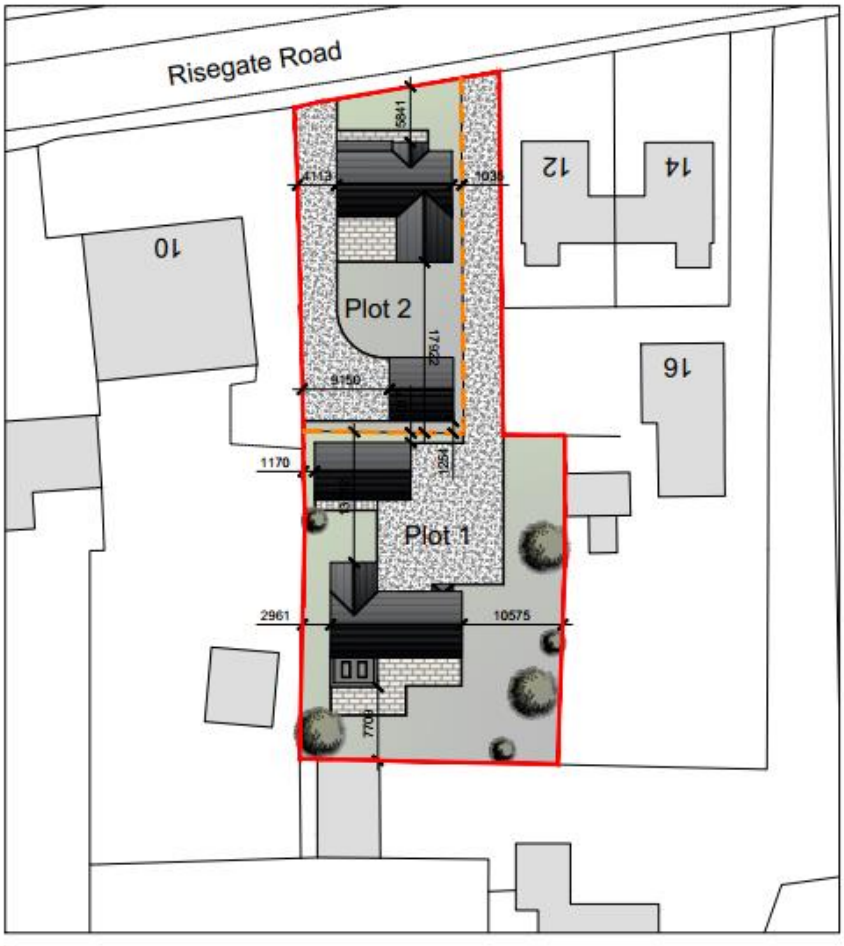
stuart.hemmings@btinternet.com

4th October 2023

LOCATION PLAN



BLOCK PLAN OF PROPOSED DEVELOPMENT



APPENDIX A CLIMATE CHANGE

The Environment Agency has issued revised guidance on climate change and have now stated that the new predictions should be considered and incorporated into all flood risk assessments produced after 19th February 2016.

Listed below are the climate change allowances in three documents:

- South Holland SFRA
- EA guidance (2013)
- Revised EA guidance

The recommendations in each document are shown below.

2010 South Holland DC SFRA

The SHDC SFRA states that the the following allowances have been made for climate change:

4.4 Climate Change

Scenarios for the years 2055 and 2115 include for climate change contingency allowances to the amount suggested by PPS25[1]. These allowances are expressed in *Table 2*. Percentage increases are relative to the present-day.

Table 2 – Adopted Climate change contingency allowances

Parameter	Year 2055	Year 2115
Sea level rise (m)	+ 0.33	+ 1.14
Extreme wave height	+ 10%	+ 10%
Peak river flow and volume	+ 20%	+ 20%
Peak rainfall intensity	+ 20%	+30%

Where flows arise from pumping rather than natural run-off, notably in the Vernatt's Drain and for the Fenland subcatchments of the South Forty Foot Drain, peak flow rates for future eras have been taken as equal to current rates since this SFRA assumes all flood risk management measures will remain in their current state.

2013 Guidance to Planners

Guidance to planners was issued by EA in September 2013

Table 1: Recommended contingency allowances for net sea level rises (Net sea level rise (mm per year) relative to 1990)

	1990 to 2025	2025 to 2055	2055 to 2085	2085 to 2115
East of England, east midlands, London, south-east England (south of Flamborough Head)	4.0	8.5	12.0	15.0
South-west England	3.5	8.0	11.5	14.5
North-west England, north-east England (north of Flamborough Head)	2.5	7.0	10.0	13.0

document is out of date

Table 2: Recommended national precautionary sensitivity ranges for peak rainfall intensity, peak river flow, offshore wind speed and wave height

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%	

s been withdrawn (19

Revised 2016 EA Guidance

Table 1 peak river flow allowances by river basin district (use 1961 to 1990 baseline)

River basin district	Allowance category	Total potential change anticipated for '2020s' (2015 to 39)	Total potential change anticipated for '2050s' (2040 to 2069)	Total potential change anticipated for '2080s' (2070 to 2115)
Anglian	Upper end	25%	35%	65%
	Higher central	15%	20%	35%
	Central	10%	15%	25%

For more vulnerable development in flood zone 3(a) the higher central and upper end should be used to assess the range of allowances.

Table 2 peak rainfall intensity allowance in small and urban catchments (use 1961 to 1990 baseline)

Applies across all of England	Total potential change anticipated for 2010 to 2039	Total potential change anticipated for 2040 to 2059	Total potential change anticipated for 2060 to 2115
Upper end	10%	20%	40%
Central	5%	10%	20%

Table 3 sea level allowance for each epoch in millimetres (mm) per year with cumulative sea level rise for each epoch in brackets (use 1990 baseline)

Area of England	1990 to 2025	2026 to 2050	2051 to 2080	2081 to 2115	Cumulative rise 1990 to 2115 / metres (m)
East, east midlands, London, south east	4 (140 mm)	8.5 (212.5 mm)	12 (360 mm)	15 (525 mm)	1.24 m

Table 4 offshore wind speed and extreme wave height allowance (use 1990 baseline)

Applies around all the English coast	1990 to 2050	2051 to 2115
Offshore wind speed allowance	+5%	+10%
Offshore wind speed sensitivity test	+10%	+10%
Extreme wave height allowance	+5%	+10%
Extreme wave height sensitivity test	+10%	+10%

Effects on Predictions of Flood Risk in FRA

The FRA has identified two sources of flooding where the new climate change recommendations could affect the predictions of flood levels in 2115 at the development site:

1) Flooding from the tidal River Welland
2) Flooding from South Forty Foot Drain and River Glen
3) Flooding from IDB drainage system

1) Flooding from the tidal River Welland

The contingency allowance in metres for the years 2055 and 2115 using 1990 as a baseline in the SFRA compared with the guidelines is as follows

Year	SFRA	2013 guidance	Revised 2016 guidance
2055	0.33	0.395	0.412
2115	1.14	1.205	1.24

Therefore it can be seen that the revised guidance increases the maximum allowance for sea rise in 2115 by 100mm. This will not have the effect of increasing the maximum flood levels in a 1 in 200 year breach event in 2115 by 100mm or the extent of the flooding. The largest increase in the flood depth will probably be between 10mm and 50mm, and this will be near to the location of the breach. Therefore this small increase will not affect the conclusions and recommendations in the report.

Fluvial Flooding from the River Glen or the South Forty Foot Drain (SFFD).

As the development is in flood zones 1 and 2 and is classed as more vulnerable, the central climate change allowance, which is 25%, should first be considered. After considering the effects of this increase the higher central allowance, which is 35%, should be considered to assess the effect of this.

The EA have been using an allowance of 20% for climate change over the past few years in their assessments and modelling of their systems. The increase to 25% will not significantly change the conclusion in the SFRA of what might happen if a breach occurred in the bank of the River Glen or the SFFD. If there are additional flows along this part of the River Glen, or the SFFD, it will lead to overtopping of banks in numerous places on both of these watercourses. This will prevent the water level rising significantly above the predicted levels for the present day and with 20% allowance for climate change.

The upper end allowance predicting a 35% increase in flows above the 1 in 100 year predicted flows now needs to be considered. This level of predicted river flows again will not lead to increased river levels as the river will be overtopping the banks in numerous places.

Effect on IDB Systems

Welland and Deepings IDB, and all IDB's, are aware that climate change will affect the operations of pumping stations, sluices and drainage channels. Pumping stations and sluices only have a 30 year life and will need to be refurbished or rebuilt within this timespan. It is assumed that Welland and Deepings IDB will continue to review the modelling they have already carried out and when the Board consider any refurbishments adequate arrangements will be made to incorporate the latest climate change projections in order that Board continues to provide the same standard of service as the present day.

Therefore it is considered that the mitigation proposed for the development, with the recommendation that the floor levels should be at least 300mm above existing ground level on the site, is satisfactory.