PROPOSED BARN CONVERSION AT EAST REACH FARM, MAIN ROAD, HOP POLE, DEEPING ST NICHOLAS, SPALDING PE11 3HJ

FLOOD RISK ASSESSMENT



View from north of site

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 proposed barn conversion at East Reach Farm, Hop Pole, Deeping St Nicholas, Spalding. 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 purposes other than for which it was originally commissioned.

Introduction

An application is due to be submitted to South Holland District Council for Planning Permission to convert two existing farm buildings at East Reach Farm, Main Road, Hop Pole, Deeping St Nicholas, Spalding, PE11 3HA into a residential dwellings. The buildings have not been used for a number of years and are not used in connection with any agricultural business. The building nearest the road is an old brick building and the second building on the north side of the area is a steel framed building with asbestos cladding.

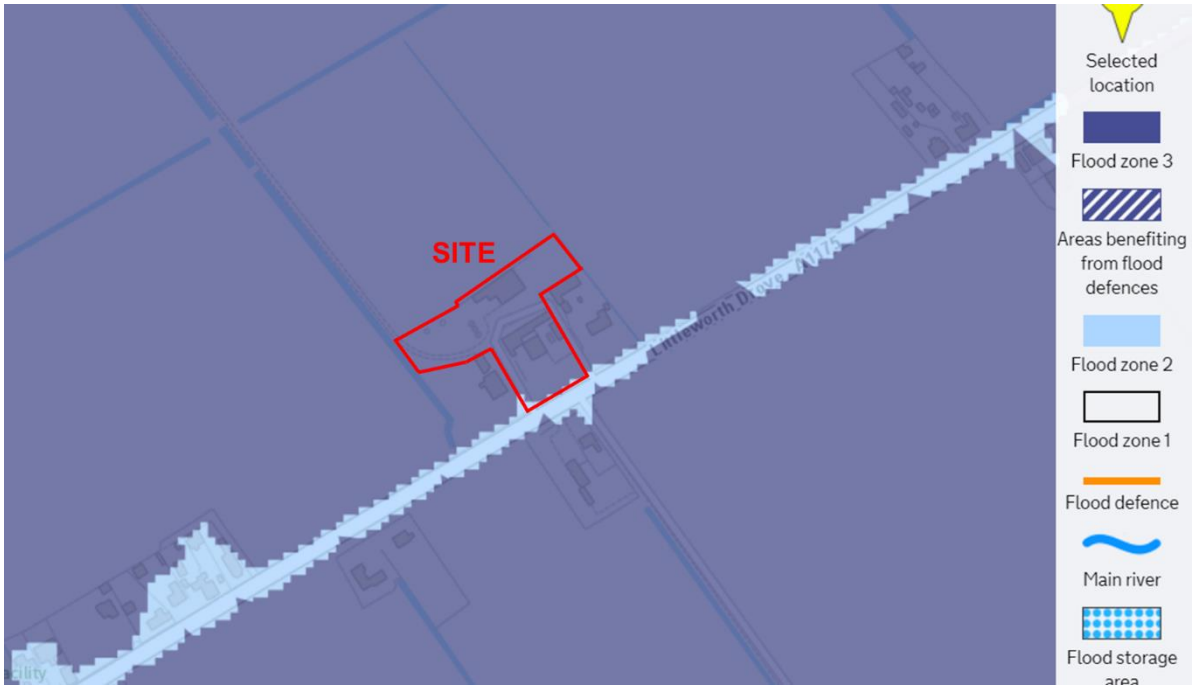
The site is within Flood Zones 2 and 3 as shown on the Environment Agency's Flood Zone Map. These maps do not take into account existing flood defences.

The Technical Guidance to the National Planning Policy Framework Development and Flood Risk states that if a development lies within Flood Zones 2 and 3 a Flood Risk Assessment should be carried out to accompany any Planning Application.

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 the area.



It can be seen that all of the area of East Reach Farm is in flood zone 3.

Application Site

The development is located on Littleworth Drove (A16) at Deeping St Nicholas. The National Grid Reference of the site is 519220 314240.

The location 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, a residential development is classified as “more vulnerable”.

Table 3 of the Guidance is shown below:

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 †	X	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	X	X	X	✓*

Therefore it can be seen that for “More Vulnerable” development the sequential and the exception tests need to be applied to the development.

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 defined 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 can be seen from the map on page 2 of this report most of this area between Spalding and Market Deeping is in Flood Zone 3(a).

It is not possible to locate the development in an alternative location because the application is for the conversion of two existing buildings.

Referring to the South East Lincolnshire Local Plan 2011-2036 adopted in March 2019, Policy 23 states the re-use and conversion of redundant buildings in the countryside for residential use will be permitted, subject to conditions on the state of the building and the design of the proposed development.

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

Therefore I consider that the sequential test has been passed.

Exception Test

The Sequential Test has demonstrated that it is not possible, consistent with wider sustainability objectives, for the development to be located in zones with a lower probability of flooding. Therefore the Exception Test must be applied and for this to be passed:

- It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risks, informed by the Strategic Flood Risk Assessment; and
- A site-specific flood risk assessment 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.

Both parts of this test must be satisfied in order for the development to be considered appropriate in terms of flood risk. There must be robust evidence in support of every part of the test.

The first section will be demonstrated by the Supporting Planning Statement and compliance with South Holland District Council's planning policies.

This flood risk assessment will demonstrate that the development will be safe for its lifetime and it will not increase flood risk elsewhere.

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
	Flood Hazard…….Zero
	Peak Velocity ……. Nil
For year 2115	Depth of flooding … Zero
	Extent of flooding…. Low or medium flood probability
	Flood Hazard…….Zero
	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
	Flood Hazard……..	Zero
	Peak Velocity ……	Nil
For the year 2115	Depth of flooding …	zero
	Extent of flooding ..	Low or medium flood probability
	Flood Hazard……	zero
	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 in 2115.

The maximum flood levels in the River Welland is shown in the reports as follows:

	Peak 1 in 100 year		Peak 1 in 1000 year	
Year	2007	2115	2007	2115
Level	4.93	4.96	4.96	4.97

The chainage of the River Welland south of the development site is between 12.0 and 14.0km. The bank levels between chainage 10 km and 12 km vary between 5.65m OD and 5.95m OD.

Site Levels

The level of Littleworth Drove east of the site is 2.90m ODN and using this level the level of the access road into the site is 2.25m ODN and the ground floor level of the existing brick building is approximately 2.15m ODN, and the level of the asbestos barn is approximately 1.90m ODN.

The level of the field north of the barns is approximately 1.15m ODN.

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" and 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 is considered to be very low.

The site is approximately 4.3 km from the River Welland, which is main river and maintained by the Environment Agency.

This area between Market Deeping and Spalding is drained by watercourses maintained by Welland and Deepings Internal Drainage Board. The water levels in the IDB channels are controlled by the water level in North and South Drove Drains which also is operated by Welland and Deepings IDB. The site is 1.6km north of the South Drove Drain and 3.5km south of the North Drove Drain.

Potential Sources of Flooding

The following sources of flooding have been identified:

1. Due to high water levels in the IDB Drainage system
2. Failure or overtopping of the west bank of the River Welland.
3. Failure or overtopping of the tidal defences of the River Welland.
4. Blockages in local surface water system

1. High Levels in the IDB Drainage System.

The North Drove Drain is 3.5km north west of the site and the South Drove Drain is 1.6km south east of the site.

North and South Drove Drains are the main IDB watercourses in this area and these are maintained by Welland and Deepings IDB (W & D IDB). The water levels in these drains is controlled by the electrically operated and diesel powered pumps at Pode Hole Pumping Station. W & D IDB have stated that the normal water level at Pode Hole Pumping Station is -1.20m OD and the design level in a 1 in 100 year event is 0.18m OD.

W & D IDB have a policy of reviewing standards of protection at regular intervals and would carry out improvements over the next 100 years to ensure that all agricultural land and properties in this catchment would continue to have a satisfactory standard, and therefore it can be assumed that the maximum design level in 2115 will be 0.18m OD.

W & D IDB have a policy of continual maintenance to all the pumps at Pode Hole to ensure that they will operate satisfactorily in a high rainfall event. The Board have contingency plans to operate the pumps if electricity supplies were compromised and have sufficient sources to repair plant and machinery if a breakdown occurred.

Drainage channels maintained by W & D IDB generally have a 1 in 10 year standard with up to 1.0 metre of freeboard, which provides between 1 in 50 year and 1 in 100 year standard against flooding.

The nearest IDB drain (Green Lane Drain) is located south west of St Nicholas House and flows in a north westerly direction to discharge into the North Drove Drain 3.4 km north west of the site.

Therefore the risk of flooding from this source in a 1 in 1000 year event both now and in 2115 can be considered to be adequately mitigated.

2. **Failure or Overtopping of the west bank of the River Welland.**

The River Welland is located approximately 4.3 km south east of the site.

The maximum 1 in 1000 design level in the River Welland is 4.80m OD. The minimum level of the west bank of the River Welland at this location is 5.65m OD. The bank of the River Welland east of the site of the development is wide with the Crowland to Deeping St James road on top of the bank. Therefore it is more substantial than an ordinary earth bank with a smaller top width.

If the west bank of the River Welland breached at a location south east of the site the flood water would initially flow into the South Drove Drain, which would then rapidly increase the water levels in the South Drove and the North Drove Drain. Although W & D IDB would operate the pumps at Pode Hole to try to alleviate the situation water levels would rise and flooding would start to taken place onto lower agricultural land. As flood levels increased then flood water would flow towards the site from the river and the maps in the SFRA predict that up to 500mm of flooding could occur to the lower parts of the site in a 1 in 100 year and 1 in 1000 year event in 2115.

There is adequate mitigation provided as the existing floor level is approximately 1.0 metre above the surrounding farmland.

3. **Failure or Overtopping of the tidal defences of the River Welland.**

The tidal defences are 8 km north east of the site, to the north of Spalding. The Environment Agency flood mapping indicates that flood water from a breach of these defences would not flow as far as Deeping St Nicholas.

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

4. **Blockages in local surface water drainage systems**

Surface water from the roof of these buildings will if possible be disposed of into soakaways. Adequate mitigation will be provided by ensuring the ground levels surrounding the building are lower than the proposed ground floor level.

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. However in an extreme event at this location water levels would only rise slowly and residents would have sufficient time to assess the situation and take any action necessary.

Residual Risk – Extreme Events

The residual risk from extreme events is very low on this site.

There are no records of this area of Deeping St Nicholas having been flooded in the last 60 years.

Climate Change

The recommendations for predicted 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 13 to 16). 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 zone 3 and there is no flood hazard in a 1 in 100 year event in 2115 reference should be made to Category G7 in the matrix which shows the advice for this category is "No Comment".

If the flood hazard of 0 – 0.75 (low hazard) is considered the advice is shown in category F7 as follows:

The Environment Agency recommends that the proposal is accompanied by a Flood Risk Assessment which confirms that appropriate mitigation measures / flood resilience techniques have been incorporated into the development up to the predicted flood level (see maximum depth map for 2115 scenarios.

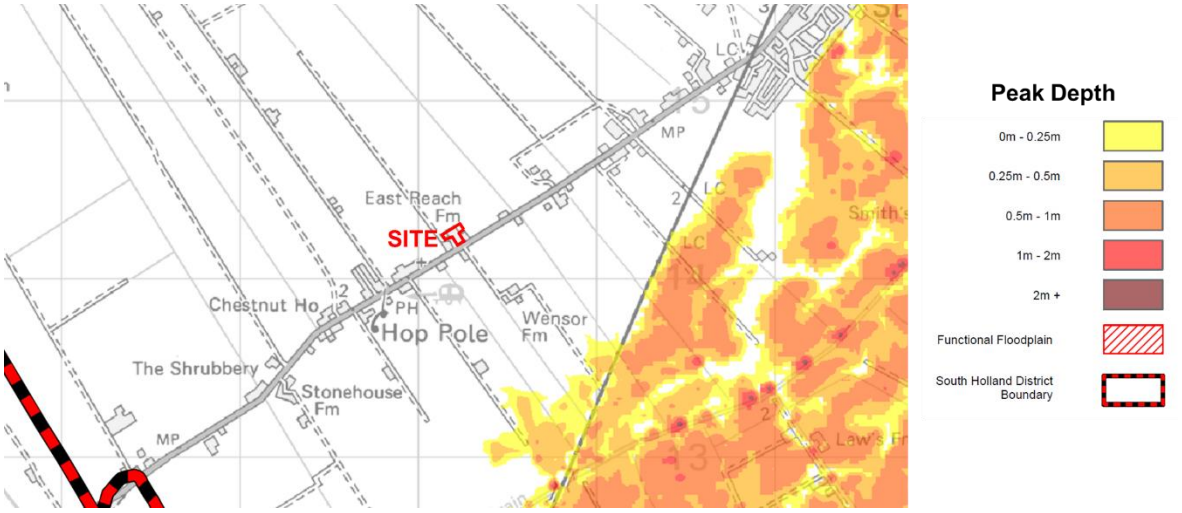
Please refer to the following document for information on flood resilience and resistance techniques to be included: "Improving Flood Performance of New Buildings Flood Resilient Construction (DCLG2007).

The FRA should aim to identify mitigation measures in line with those required for new build development of the same type, as far as practicable.

Summary of flood risk to the Site.

The major flood risk to the site is if a breach were to occur in the south western bank of the River Welland, which is 4.3km from the site. If this were to occur flood water would flow away from the breach and then it would flow into the South Drove Drain which would quickly fill to bank level. This drain would flow southwards and northwards spreading the water over a larger area. Other IDB channels would react in the same way.

Part of the most recent map in the 2017 SFRA showing peak residual flood depths in 2115 for the 1% fluvial and 0.5% tidal event probability is reproduced below.



This does not predict any flooding in a 1 in 100 year event in 2115 in any of the area near Hop Pole.

Conclusions

The proposed development is not in a functional flood plain as defined by the Technical Guidance.

Although the site is in flood zone 3, the actual risk of the site flooding from any Environment Agency watercourse is very low.

Reference to other flood risk information in the South East Lincolnshire planning website indicates that predicted levels in the River Welland in the 1 in 100 year and 1 in 1000 year scenarios in 2115 are very similar.

Adequate mitigation against flooding from the River Welland will be provided due to the following reasons:

- The west bank of the River Welland nearest to the site has a wide top and a road is located on top of this bank.
- The South Drove Drain is between the site and the river, which will reduce the risk of flood water from reaching the site.
- Littleworth Drove is higher than the surrounding land and will act as a bank which will prevent any flood water reaching the site

The map showing the predicted flood depths in a 1 in 100 year event in 2115 indicates that no flooding is predicted to any part of this area. Therefore the predicted flood depth is lower than the field levels of 1.20m ODN.

There is always a risk of an event occurring of greater magnitude than a 1 in 100 year event in 2115 which could increase the risk of flooding at the site. However even if lower farmland east of the site were to flood after a breach in the bank of the River Welland it is extremely unlikely that flood water will reach the development site.

Recommendations

In any area at risk of flooding it is preferable that dwellings should be of two story construction with all bedrooms at first floor level. This is to provide a refuge for residents if the building becomes flooded after a major breach of the River Welland, and ensure there is no danger to residents when they are asleep.

However as the risk of flooding is low in this area it is considered that bedrooms on the ground floor would be satisfactory.

Ideally the finished ground floor level of the refurbished buildings should be raised a minimum of 300mm above existing ground level .

The above requirement could be achieved by lowering the level of the surrounding hardstandings to ensure that the proposed ground floor level is 300mm above the outside pavings or hardstandings, as long as the ground floor level is a minimum of 300mm above all of the area between the barns and the fields to the north of the barn.

The occupier of the property should register with the Environment Agency's Floodline Warnings Direct Service.

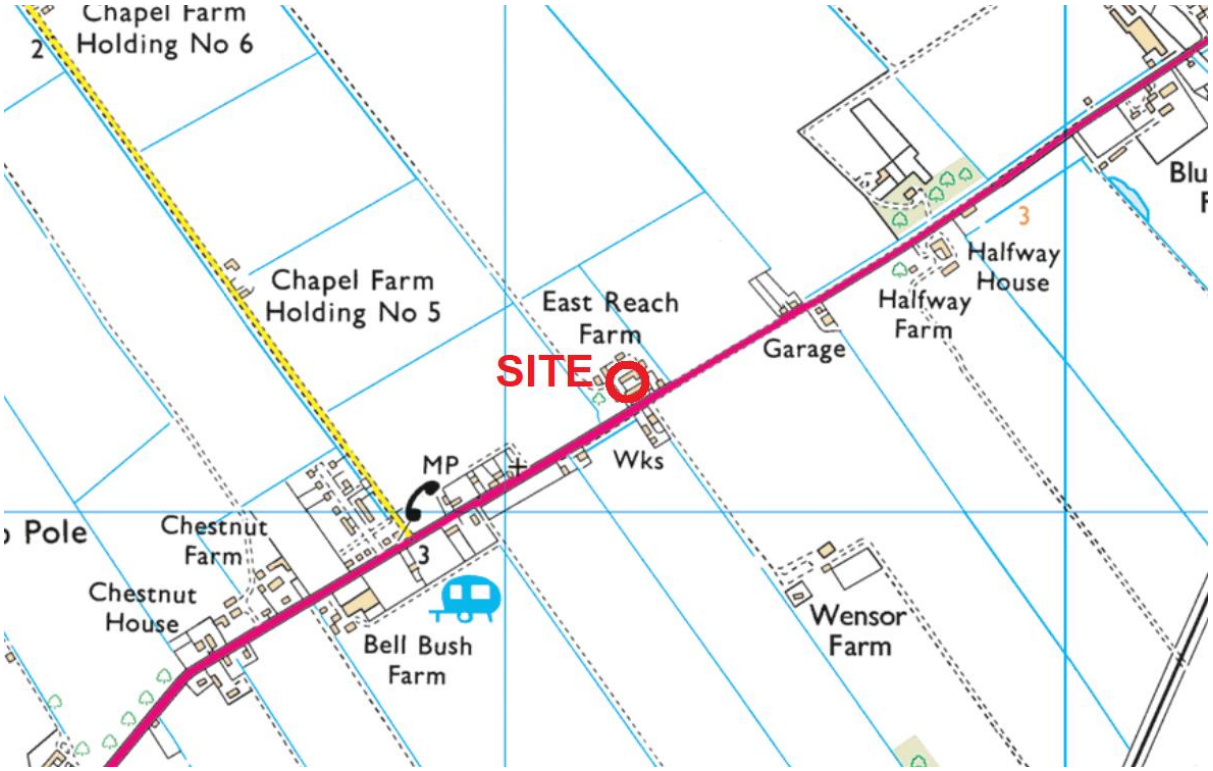
On site surface water drainage from the buildings should be if possible discharged into soakaways and these should be designed to BRE Digest 365 and approved under Building regulations.

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25th October 2021

LOCATION PLAN



PLAN OF IDB DRAINS



PROPOSED SITE PLAN



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 the higher central and upper end category 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

Fluvial Flooding from River Welland.

As a small part of the development is in flood zone 3 and is classed as more vulnerable, the higher central climate change allowance, which is 35%, should first be considered. After considering the effects of this increase the upper end allowance, which is 65%, 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 35% will not significantly change the conclusion in the SFRA of what might happen if a breach occurred in the bank of the River Welland. If there are additional flows along this part of the River Welland it will lead to the storage systems of the Cowbit and Crowland Washes operating and additional overtopping over lower banks rather than any significant increase in levels in the river.

The higher central allowance predicting a 65% increase in flows above the 1 in 100 year predicted flows now needs to be considered. The River Welland is an embanked watercourse between Spalding and Market Deeping. There are flood reservoirs on the east side of the River called the Cowbit and the Crowland Washes. Excess water

would flow into these Washes through two large syphons. In this scenario the Washes would fill up and also water would be flooding over lower banks of the River. The increases in rainfall leading to this would also lead to significant flooding in the upper part of the River Welland Catchment. It is unlikely that there will be any significant increase in the water level in the River. Therefore the consequence will not be significantly different to the maps produced in the SFRA.

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 these 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 ground floor levels should be a minimum of 300mm above the level of the surrounding hardstandings, is satisfactory.