PROPOSED DEVELOPMENT BEHIND 16 WASHWAY ROAD, HOLBEACH, SPALDING, PE12 7PP

FLOOD RISK ASSESSMENT



View from south end of rear garden

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 a development at 16 Washway Road, Holbeach. 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 construct a single storey dwelling in the rear garden south of the existing house at 16 Washway Road, Holbeach, Spalding PE12 7PP. The site is north of the A17 north of Holbeach.

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

The Planning Application requires a Flood Risk Assessment to be carried out as specified in the Practice Guidance to the National Planning Policy Framework Development and Flood Risk. 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 South Holland 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 the whole of this area is in Flood Zone 3.

Application Site

The development is located west of the tidal River Nene, south of the Wash banks and east of the tidal River Welland. The National Grid Reference of the site is 537220 325810.

The location of the site is shown on the plan at the end of this document.

As the site is within a defended area the proposed development can be considered to be within Flood Zone 3(a) as detailed on the Environment Agency's flood zone maps without defences, as defined in Table 1 of the Technical Guidance.

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

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.

The whole of this area north of Holbeach on the north side of A17, as can be seen from the map on page 2 of this report, is in Flood Zone 3. Therefore it would be difficult to find a similar site for a residential development that would be suitable for this dwelling in this area that is in a lower flood zone. The safety of the development will be delivered by ensuring the floor level of the proposed new dwelling is above the predicted residual flood level for this area.

The South East Lincolnshire Local Plan adopted in March 2019 recognises in paragraph 5.3.5 that infill and speculative applications will come forward within the South Holland District Council area. It states that there will be numerous opportunities for infill developments which it is not practical to identify, and the plan encourages these type of developments provided that the material considerations of the Local Plan and particular sites are met.

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
	Velocity ……. Nil
For year 2115	Depth of flooding … zero
	Extent of flooding .. Low or Medium
	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
	Hazard ……. zero
	Velocity …….. zero
For the year 2115	Depth of flooding ….500mm – 1.0 metre
	Extent of flooding …High
	Hazard …… 1.25 – 2.0 (Danger for most)
	Velocity ……. 0 – 0.3 metres/second

Figure 16 of the general maps shows that the site is not within the rapid inundation zone for the present day or in 2115.

Maximum flood level and bank levels in the River Nene

The maximum levels in this tidal section of the River Nene 12.3km east of the site are as follows:

	2007	2115
Peak 1 in 200 year level	5.86m OD	6.20m OD
Peak 1 in 1000 year level	7.00m OD	7.35m OD

Levels of the defence banks north of the A17 bridge are approximately 6.30m OD.

Maximum flood level and bank levels in the River Welland

The maximum levels in this tidal section of the River Welland 9.9km west of the site are as follows:

	2007	2115
Peak 1 in 200 year level	5.99m OD	7.13m OD
Peak 1 in 1000 year level	6.32m OD	7.46m OD

The defence level (top of right bank) east of the Fosdyke (A17) Bridge is between 7.50m and 7.70m OD.

Maximum flood level and bank levels in the Wash

Tables in the SFRA show the following details of the defence bank of the Wash at chainage 12.0km.

	2007	2055	2115
Peak 1 in 200 year extreme tide level	5.98m OD	6.24m OD	7.05m OD
Peak 1 in 1,000 year extreme tide level	6.32m OD	6.65m OD	7.46m OD

The crest levels of the defences, which are earth banks along this length, vary between 7.68 and 7.88 m OD. With a minimum crest level of 7.68m OD the freeboards are as follows:

	2007	2055	2115
Peak 1 in 200 year freeboard	1700mm	1440mm	630mm
Peak 1 in 1,000 year freeboard	1360mm	1030mm	220mm

Information from Environment Agency

The Environment Agency has produced mapping which shows the maximum hazard, depth and velocity predicted following breaching of any of the tidal defences. The EA have stated that the site would not be affected by overtopping of the defences.

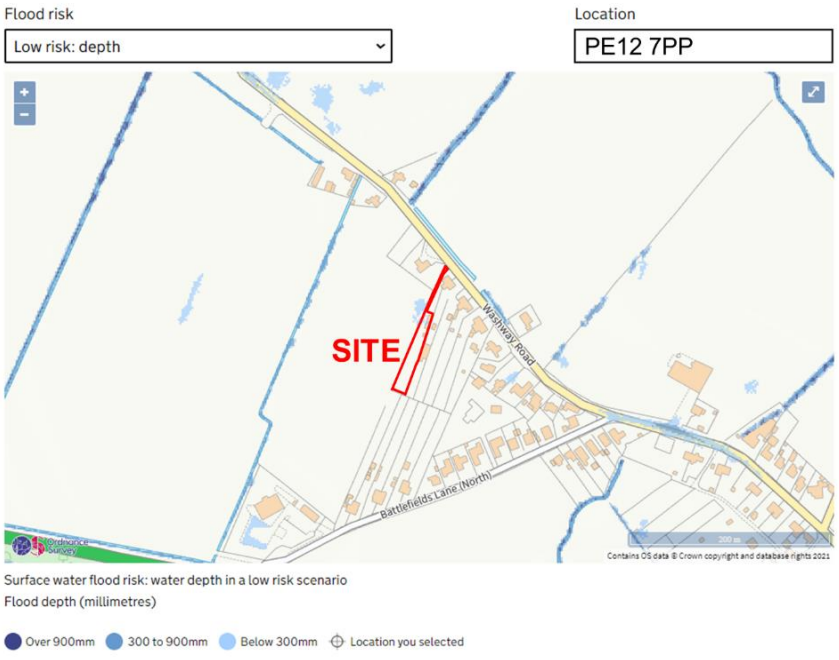
The maps of breaching show the following predictions for hazard, maximum depth and maximum velocity at the development site:

	Maximum Hazard	Maximum Depth	Maximum Velocity
1 in 1000 year in 2006	none	zero	zero
1 in 200 year in 2115	1.25 – 2.0	500mm – 1.0m	0 – 0.3m/sec
1 in 1000 year in 2115	1.25 – 2.0	500mm – 1.0m	0 – 0.3m/sec

The maps supplied by the Environment Agency are reproduced on pages 15 and 16 of this report.

Information on Surface Water Flooding on Environment Agency Website

The map below 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 a predicted risk of up to 300mm of surface water flooding in a small area around the eastern boundary of the site.

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", which is considered to be passive until such time that a flood greater than the defences can withstand occurs. The likelihood of flooding occurring due to overtopping or failures of the defences is considered to be very low.

The site is located approximately 9.9 km from the tidal section of the River Welland to the north west, which is maintained by the Environment Agency.

The site is located approximately 12.3 km from the tidal section of the River Nene at Sutton Bridge, which is maintained by the Environment Agency.

The site is located approximately 9.3 km from the Wash banks north of Holbeach St Matthew, which are maintained by the Environment Agency.

There are watercourses in the area that are maintained by South Holland IDB.

Existing Ground Levels

Levels have been taken on the site and these show that the site is almost level with only a variation of 200mm in the levels taken. These levels have been referenced to Ordnance Datum by using the bench mark on No 7 Washway Road.

The level of the house is 3.27m ODN which is higher than the levels on the site which vary between 3.03m and 3.19m ODN.

A plan of these levels is shown on page 14 of this report, and a section through the site is shown on page 11 of this report.

Potential Sources of Flooding

The potential sources of flooding to the site are:-

1. Failure or overtopping of tidal defences.
2. High water levels in IDB drainage channels.
3. Localised flooding on the site.

1. Failure or overtopping of tidal defences.

The Wash Bank is approximately 9.3km north of the site, the tidal River Welland is 9.9km west of the site and the River Nene is approximately 12.3 km east of the site of the proposed development. The hazard from a breach of one of these tidal banks will be considered to be the major risk to the site.

The maps in the SFRA and the information provided by the Environment Agency predicts that flood depths of between 500mm and 1.0 metre could occur following a breach or multiple breaches in a 1 in 200 year and a 1 in 1000 year event in 2115.

Mitigation will be delivered by raising the ground floor level of the proposed dwelling above the predicted flood level in 2115.

2. **High Water Levels in IDB drains**

Although the whole of this area is below high tide level in the Wash and the River Nene, the retained water levels in the drainage channels ensure that the risk of flooding is extremely low. South Holland IDB maintains a system of sluices, pumping stations, and drainage channels which convey surface water into the River Nene and the wash and control water levels throughout the South Holland IDB area.

The development site is on the southern boundary of the Holbeach River Catchment of South Holland IDB. There is an IDB drainage channel on the western side of the field adjacent to the site which flows northwards and then westwards and joins a drain north of Holbeach Clough which flows in a northerly direction into the Whaplode River. This discharges into the tidal River Welland east of Fosdyke Bridge through Holbeach River Sluice during low tide periods.

The channels maintained by South Holland IDB in urban areas are classified as high priority watercourses and as such receive a higher maintenance priority.

There are possibilities of failure of outfall sluices, but these are mitigated by the high level of maintenance given to these structures by the IDB. If a failure did occur the IDB would immediately be warned of the problem by their telemetry system and take action to repair the fault or to bring in temporary pumps to reduce the risk of any flooding in the area. Similarly any failures of culverts or other blockages would be dealt with immediately.

IDB systems are designed to provide a freeboard of between 600mm and 1000mm to all land in a 1 in 10 year return period rainfall event. This normally provides a standard of service of between 1 in 50 years and 1 in 100 years against flooding. In an extreme event water levels will rise but this will be a slow process and it would be at least 24 hours before levels were high enough to begin to flood low land in the area, and after this the level of the flood water would need to rise another 1.0 metre before the development site would be affected.

Therefore the risk of flooding from IDB drainage channels can be considered to be extremely low, and will be mitigated by the raising the ground floor levels to the levels required to be above the level of the 1 in 1000 year tidal flood.

3. **Localised Flooding on then site**

The roof water from the proposed new building will be discharged into soakaways. As the building will be at least 500mm above ground level this will ensure that there is adequate mitigation against flooding from surface water on the site.

Extent of known Flooding

During the preparation of this assessment, no evidence was discovered of the site or any of the adjoining properties having been flooded in the past.

Probabilities and Trends of Flooding

The probability of this development flooding from a breach or overtopping of the tidal defences is very low.

Residual Risk – Extreme Events

The residual risk from extreme events is very low on this site. The major risk to the site is from a breach or overtopping of the tidal defences.

Climate Change

The predictions of flood depths for this flood risk assessment use information provided by the Environment Agency which was produced in 2006. The EA have issued new guidance on recommended contingency allowances for predicted sea level 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 17 to 20). 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 the flood hazard is 1.25 – 2.0 (Danger for Most) reference should be made to Category D9 which states:

The Environment Agency requires direct consultation on proposals in this hazard zone. The NPPF requires that proposals are accompanied by a flood risk assessment which contains evidence that appropriate mitigation measures / flood resilient techniques have been incorporated into the development. The Environment Agency also wish to be consulted on the Sequential Test evidence. Applicants will need to demonstrate that the housing proposals are required to meet an identified local housing need.

The applicant is advised to refer to the document "Improving Flood Performance of New Buildings – Flood Resilient Construction (DCLG 2007).

Finished floor levels (FFL) should be informed by the predicted flood depth maps (refer to the relevant 2115 1% fluvial or 0.5% tidal maximum depth map) and set as required below (single storey proposals must use the 0.1% event, 2115 scenario, for setting FFLs).

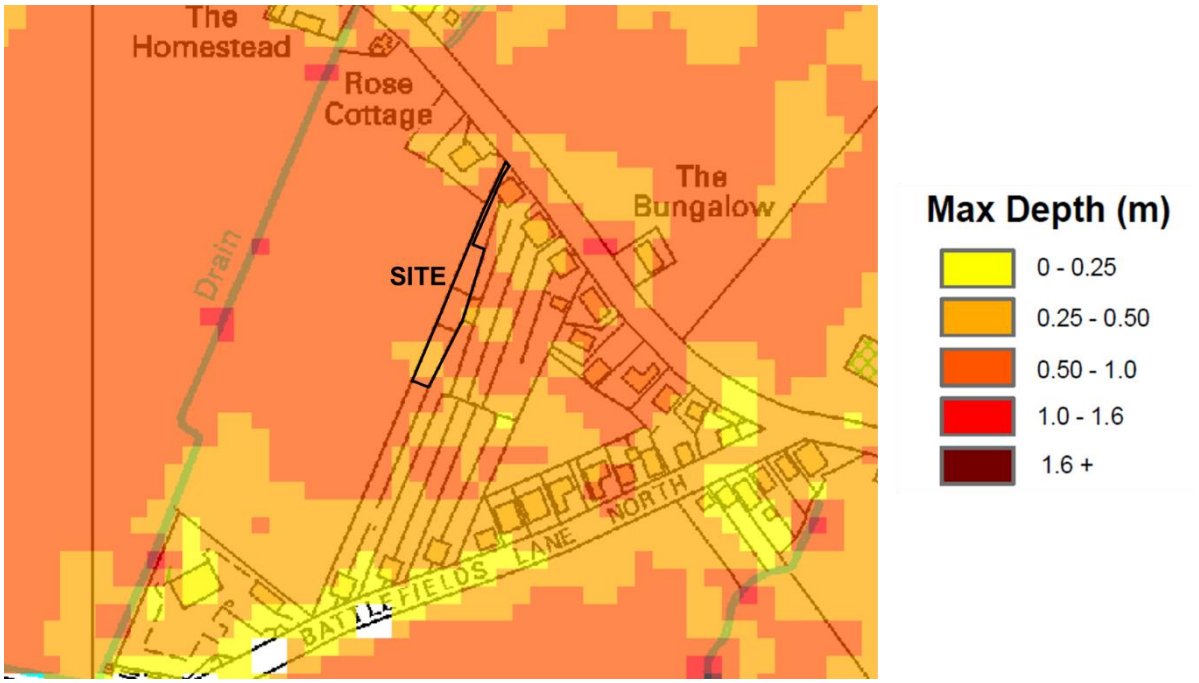
Depths 500mm to 1.0m

> *FFL must be set 1.0m above ground level with flood resilient construction to a height of 300mm above the predicted flood depth.*

Summary of Risk of Flooding to the Site

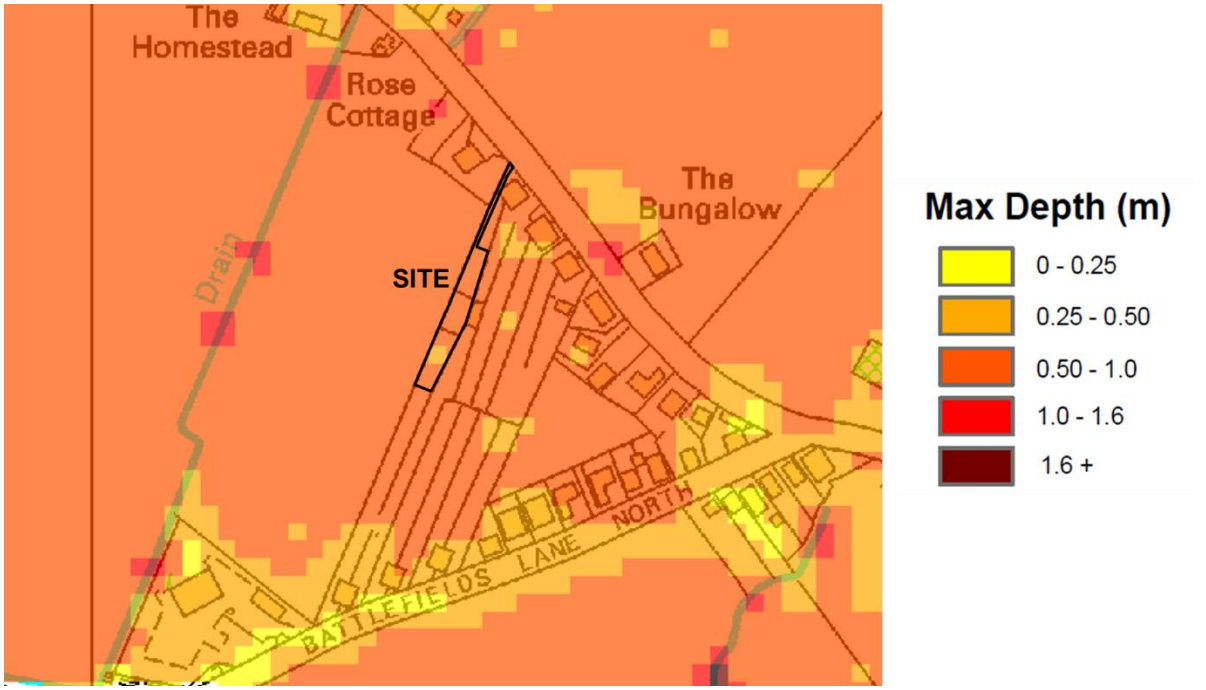
The main risk of flooding to the site is if a breach were to occur in a tidal bank. The risk of this can be considered to be low.

The relevant part of the Environment Agency map showing the predicted peak depths in this area if a breach occurred in a 1% fluvial and 0.5% tidal event probability is shown below.



It can be seen that the predicted flood depth on a greater part of the site is between 500mm and 1.0 metre, but an area in the southern part of the site has a predicted flood depth of between 250mm and 500mm.

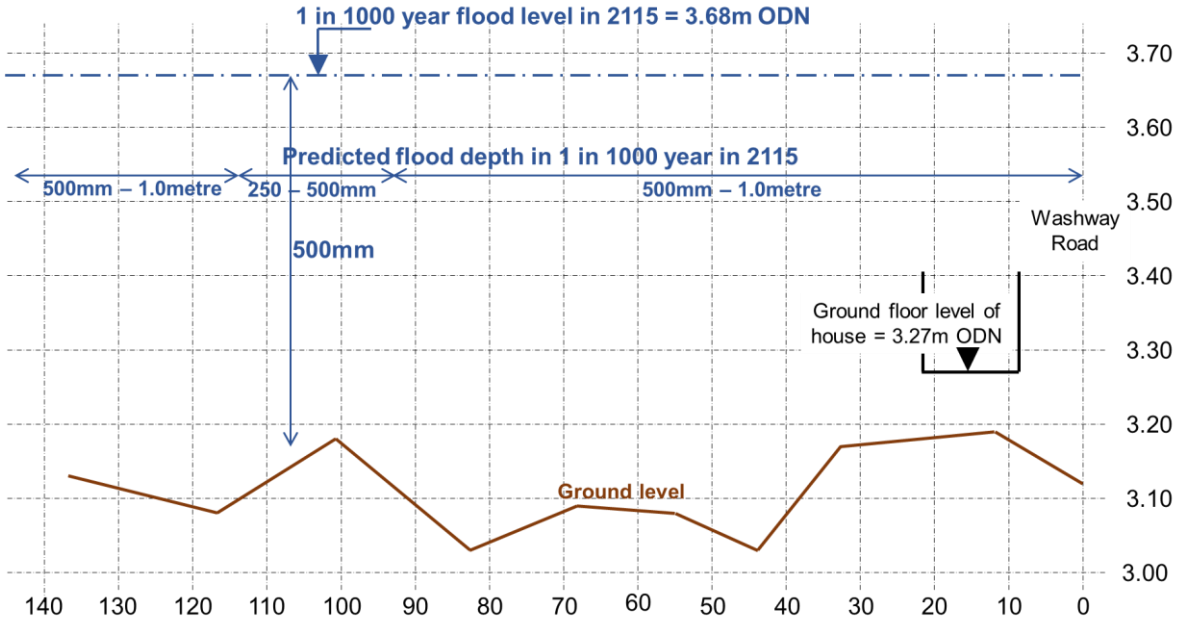
The relevant part of the Environment Agency map showing the predicted peak depths in this area if a breach occurred in the tidal banks in a 0.1% fluvial and tidal event probability in 2115 is shown below.



It can be seen that the map shows flood depths of between 500mm and 1.0 metre across most of the area and there is a small area in the south of site where the flood depth of between 250mm and 500mm is predicted.

A plan of the site showing the land levels is shown on page 14 of this report.

A section has been drawn from south to north which is shown below.



I can be assumed that the level where the predicted flood depth is 500mm in a 1 in 1000 year event in 2115 is 3.18m ODN. Therefore it can be estimated that the maximum flood level in this event is 3.68m ODN, as shown on the cross section.

Therefore taking account the latest climate change recommendations it is recommended that the minimum finished ground floor level should be 3.75m ODN, which is 480mm above the level of the existing house and 630mm above the level of the footpath immediately north of the house.

Recommendations

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

As the development that is proposed is a single storey building with sleeping accommodation on the ground floor then the finished ground floor level should be raised above the predicted flood level in a 1 in 1000 year event in 2115.

It is recommended that the finished ground floor level of the proposed single storey dwelling should be raised to a minimum level of 3.75m OD which is between 550mm and 750mm above the ground levels on the site. By using the methodology shown on pages 10 and 11 the predicted flood level on the site of the proposed development has been estimated which enables a more accurate proposed finished ground floor

level than using the general guidance shown in the South East Lincolnshire Advice Matrix.

Flood resilient construction should be included to a height of 300mm above the predicted flood depth.

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

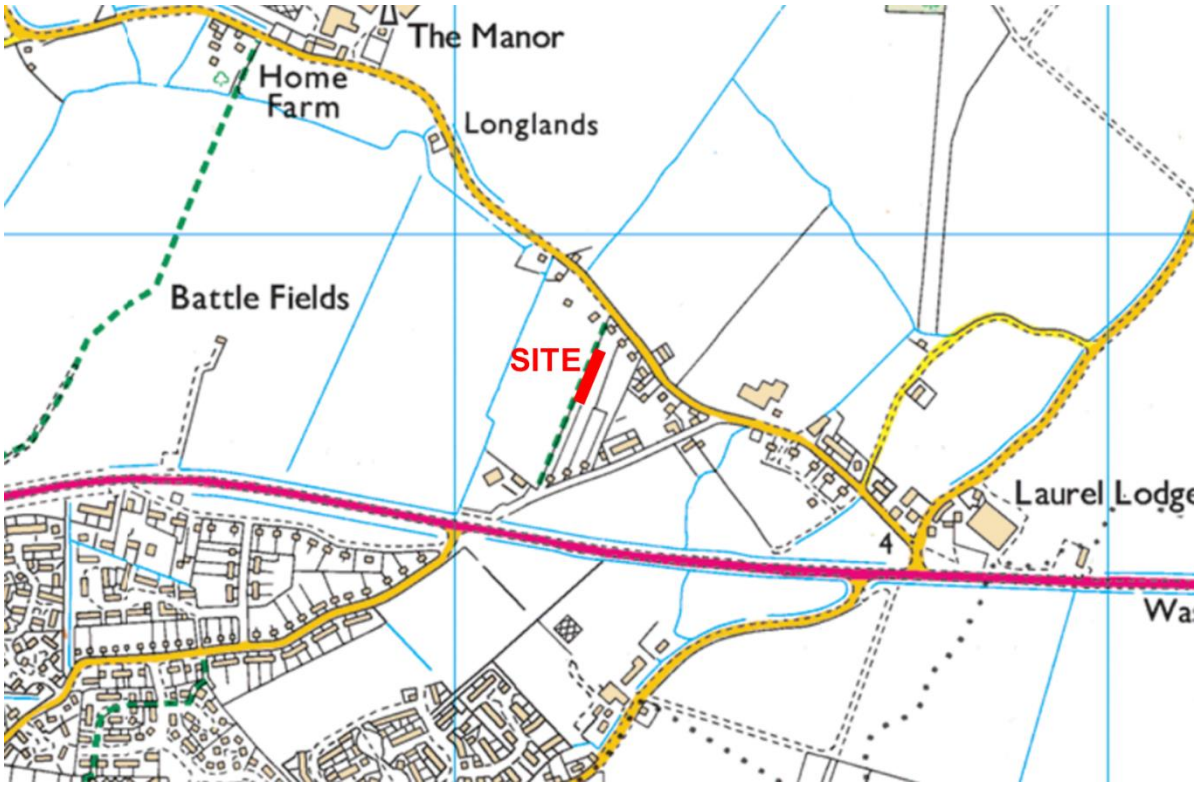
Surface water from the roof of the proposed property should be discharged into a soakaway and this should be designed to BRE Digest 365 and approved under Building regulations.

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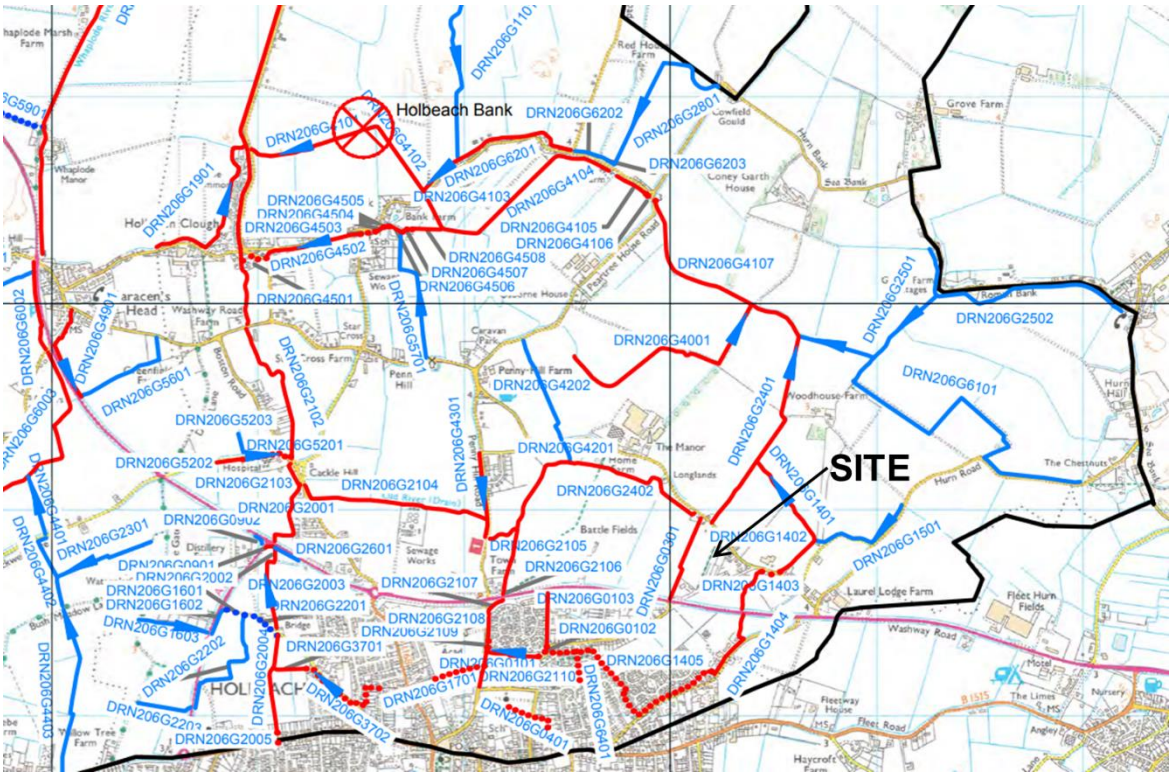
stuart.hemmings@btinternet.com

17th November 2021

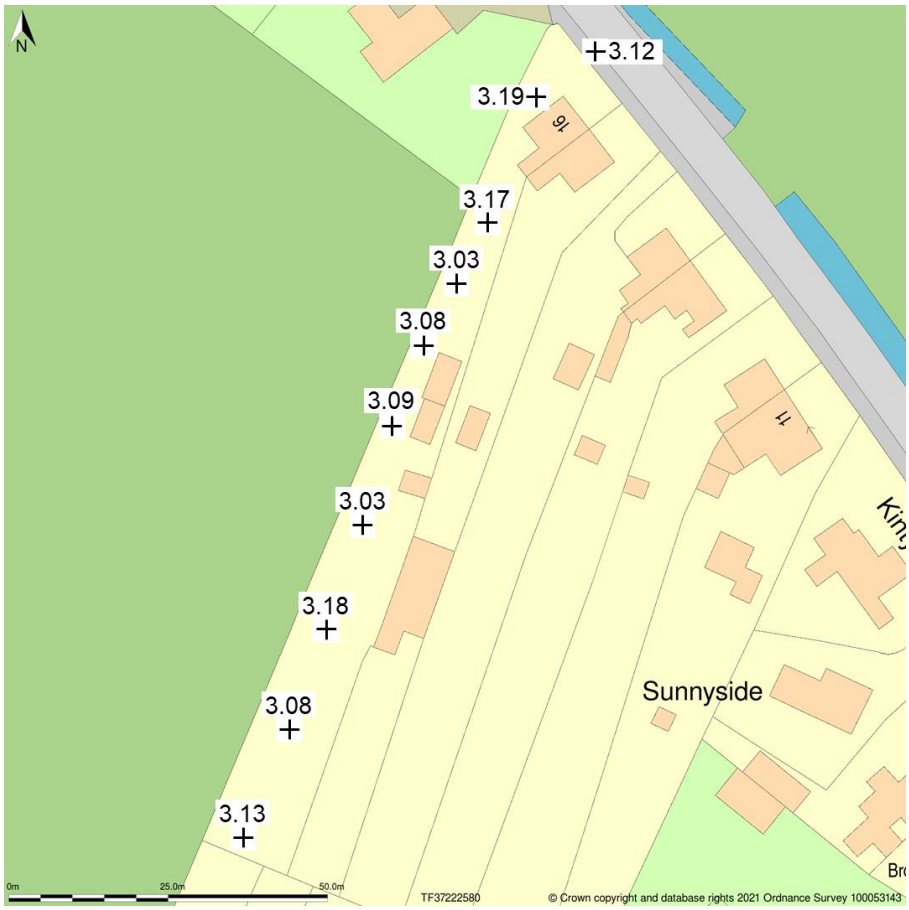
LOCATION PLAN



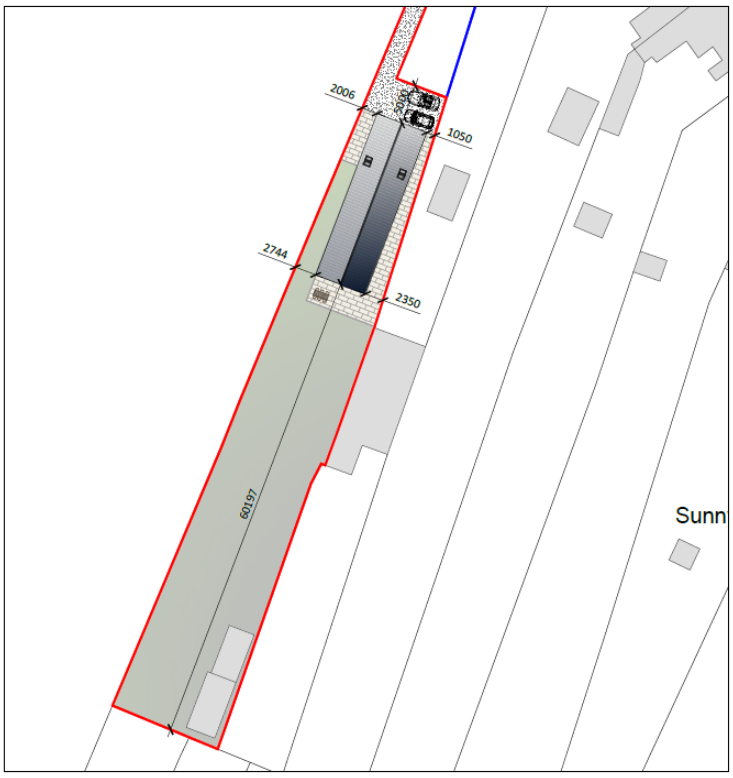
PLAN OF IDB DRAINS



PLAN OF SITE LEVELS

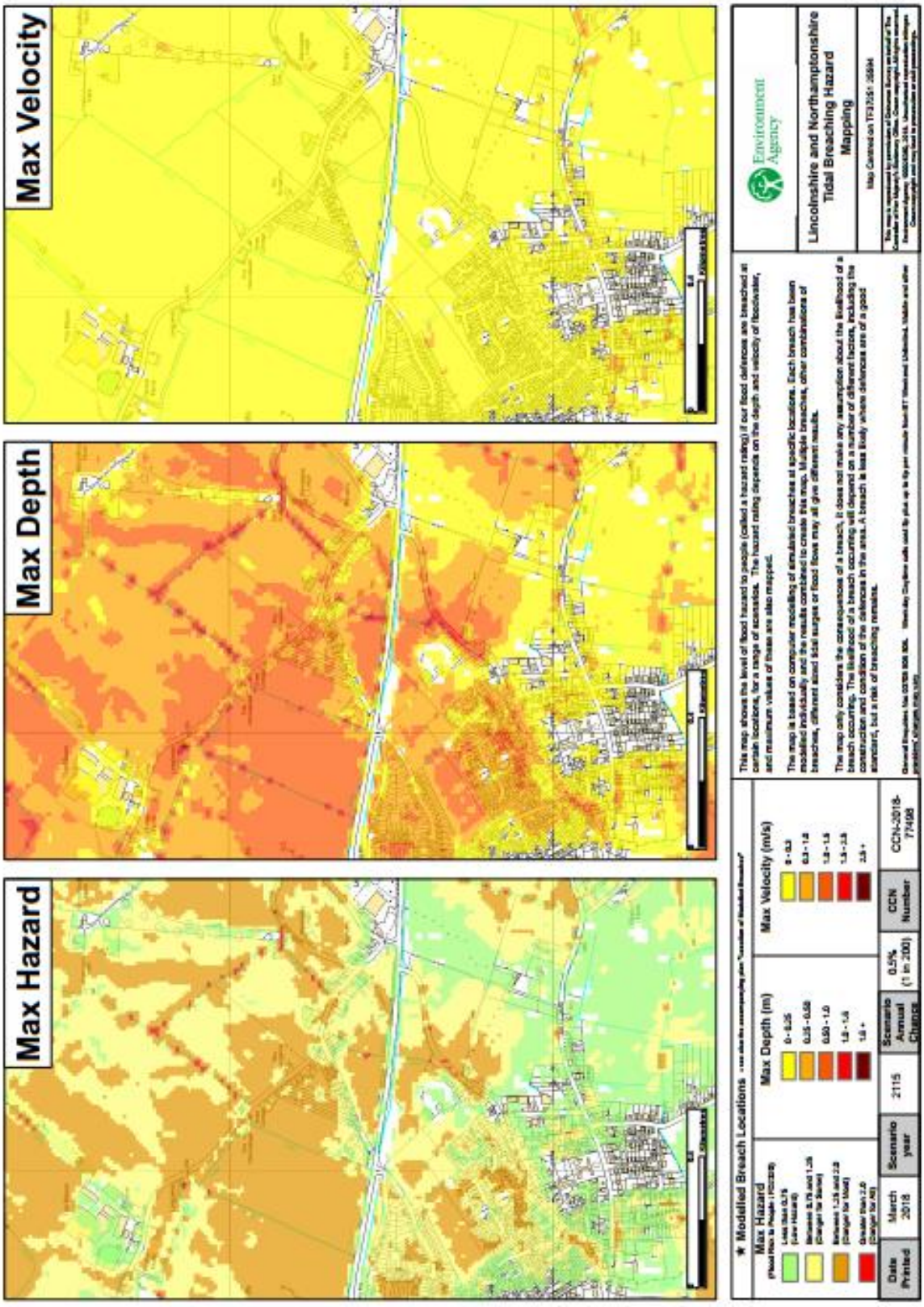


PROPOSED BLOCK PLAN



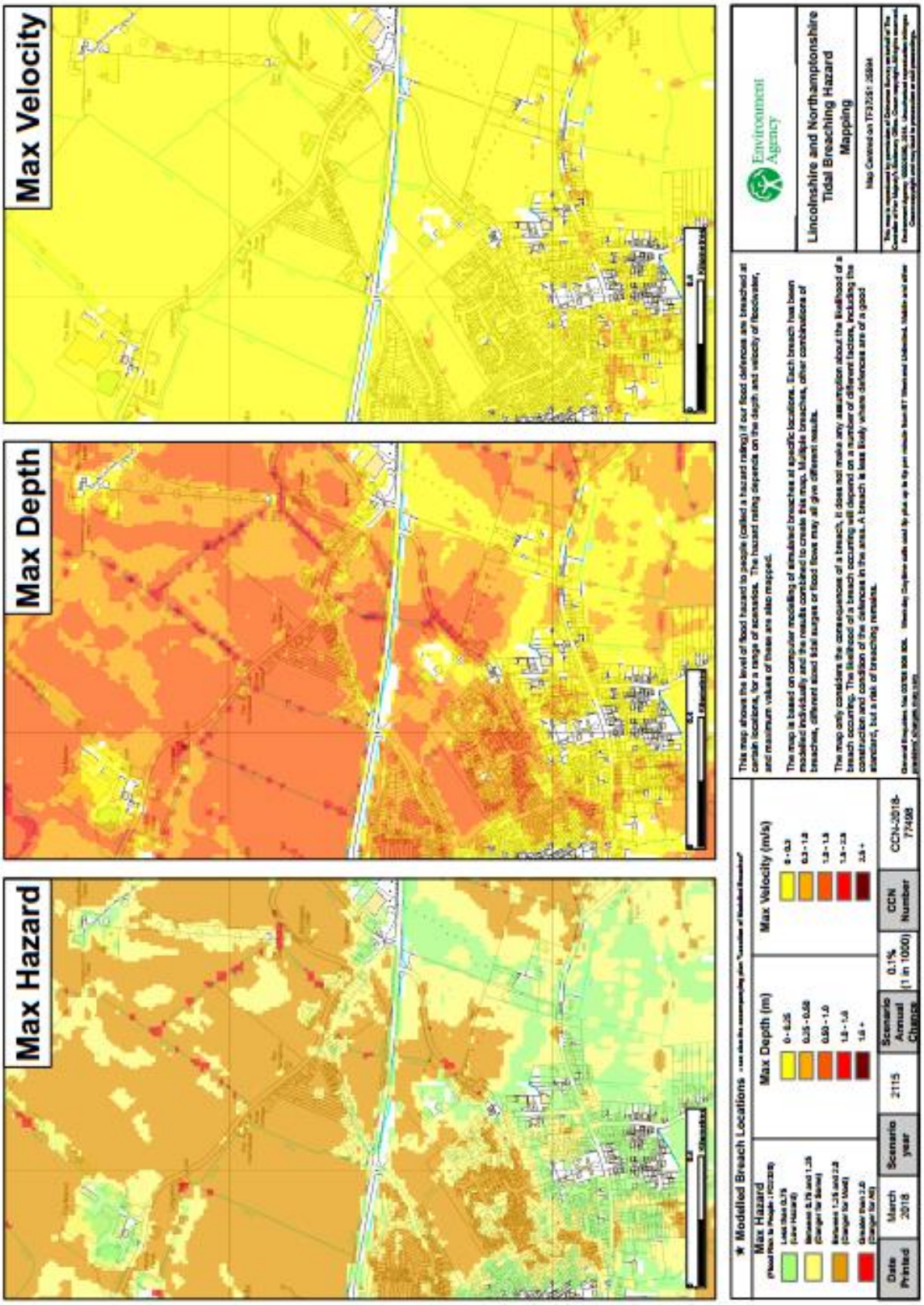
EA MAP SHOWING TIDAL BREACHING HAZARDS IN

1 in 200 YEAR EVENT IN 2115



EA MAP SHOWING TIDAL BREACHING HAZARDS IN

1 in 1000 YEAR EVENT IN 2115



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 the main source of flooding where the new climate change recommendations could affect the predictions of flood levels in 2115 at the development site is flooding from the tidal banks of the River Welland or the Wash.

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 predicted flood level at the site in a 1 in 1000 year breach event in 2115 by the maximum of 100mm, but it will probably be only between 10mm and 50mm. It is unlikely that this increase will significantly change the maps of flood risk at present issued by the Environment Agency.

Flooding from IDB drainage system

As the development is in flood zone 3 and is classed as more vulnerable, the advice from the Environment Agency is that the higher central climate change allowance, which is 35%, should 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.

IDB's have been using an allowance of 20% for climate change over the past few years in their assessments and modelling of their systems. Generally IDB's are happy that their systems provide a 1 in 100 year standard to most urban areas at the present time.

South Holland 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 South Holland 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 the 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 finished ground floor level of the proposed dwelling should be raised to a level of 3.75m ODN, is satisfactory.