PROPOSED DEVELOPMENT ON LAND BEHIND “THE BEECHES”, HORSESHOE ROAD, SPALDING, PE11 3JA.

FLOOD RISK ASSESSMENT



Entrance to site east of The Beeches

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This flood risk assessment has been prepared solely to support the planning application for the development south of “The Beeches”, Horseshoe Road 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 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 carry out a small residential development south of the property “The Beeches”, Horseshoe Road, Spalding, PE11 3JA. The new house east of the Beeches has been constructed in the last two or three years. The site is at present an unused area of land behind “The Beeches”.

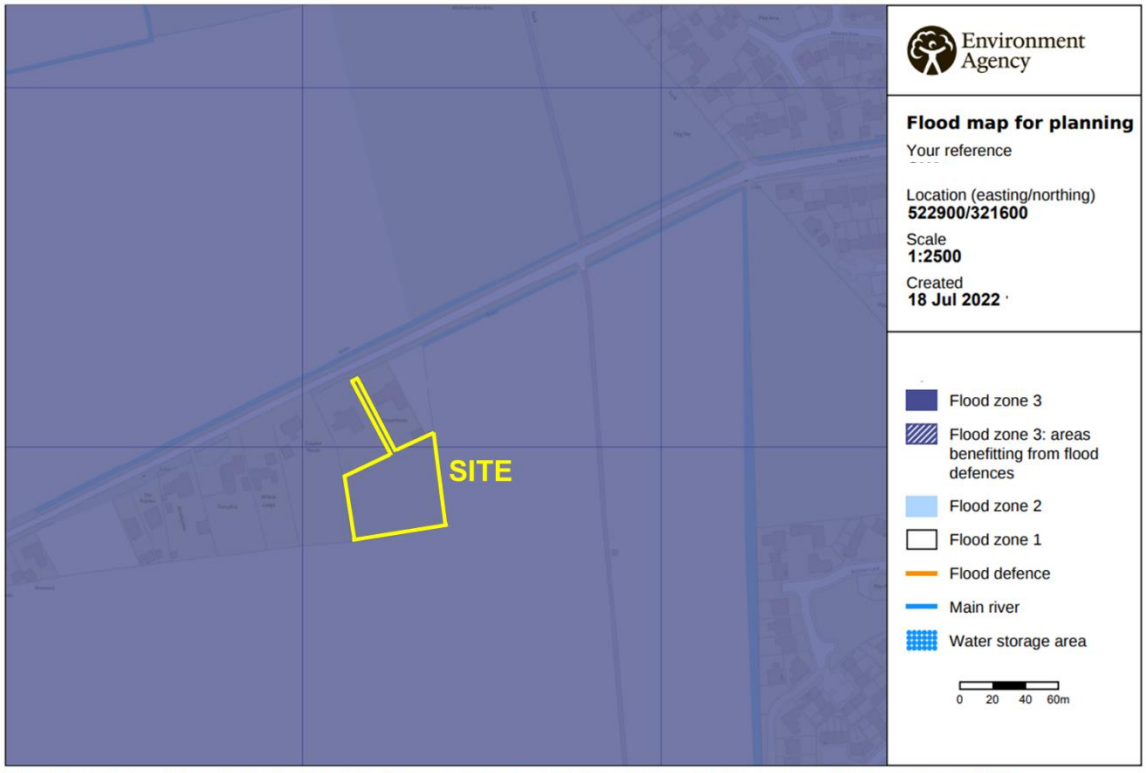
The site is within Flood Zone 3 as shown on the Environment Agency’s Flood Zone Map. These maps do not take into account existing flood defences.

The Planning Application 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 all of this area west of the centre of Spalding is in Flood Zone 3.

Application Site

The development is located on the western side of Spalding and the National Grid Reference of the site is 522875, 321585.

The position and extent 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 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 †	X	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	X	X	X	✓*

Therefore it can be seen that for “More vulnerable” development in flood zone 3(a) 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 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.

Referring to the map on page 2 of this report, it can be seen that most of the area west of Spalding is within flood zone 3, and there are unlikely to be any sites available in a lower flood zone in 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.

The safety of the development will be delivered by demonstrating that the ground floor level of the proposed buildings are 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
	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…….. None

Peak Velocity .. Nil

For the year 2115 Depth of flooding …zero

Extent of flooding .. Low or medium flood probability

Hazard……. None

Peak Velocity .. Nil

Figure 16 of the general maps shows that the site is not within the rapid inundation zone.

Tables in the SFRA show the following details of the defence bank on the west side of the tidal section of the River Welland between chainage 21.5km and the Marsh Road Sluice.

	2007	2055	2115
Peak 1 in 200 year extreme tide level	5.98m OD	6.31m OD	7.12m OD
Peak 1 in 1,000 year extreme tide level	6.32m OD	6.65m OD	7.46m OD

The defence level on this section is between 7.00m and 7.42m ODN and therefore the earth bank could be overtopped in an event in 2115.

The maximum flood levels in the fluvial section of the River Welland at chainage 1km is shown in the reports as follows:

	Peak 1 in 100 year		Peak 1 in 1000 year	
Year	2007	2115	2007	2115
Level	4.47	4.67	4.48	4.68

All of the bank levels between chainage 0.2km at Little London and 2.1km are above 6.0m OD. Further upstream top of bank levels vary between 5.80m OD and 6.00m OD.

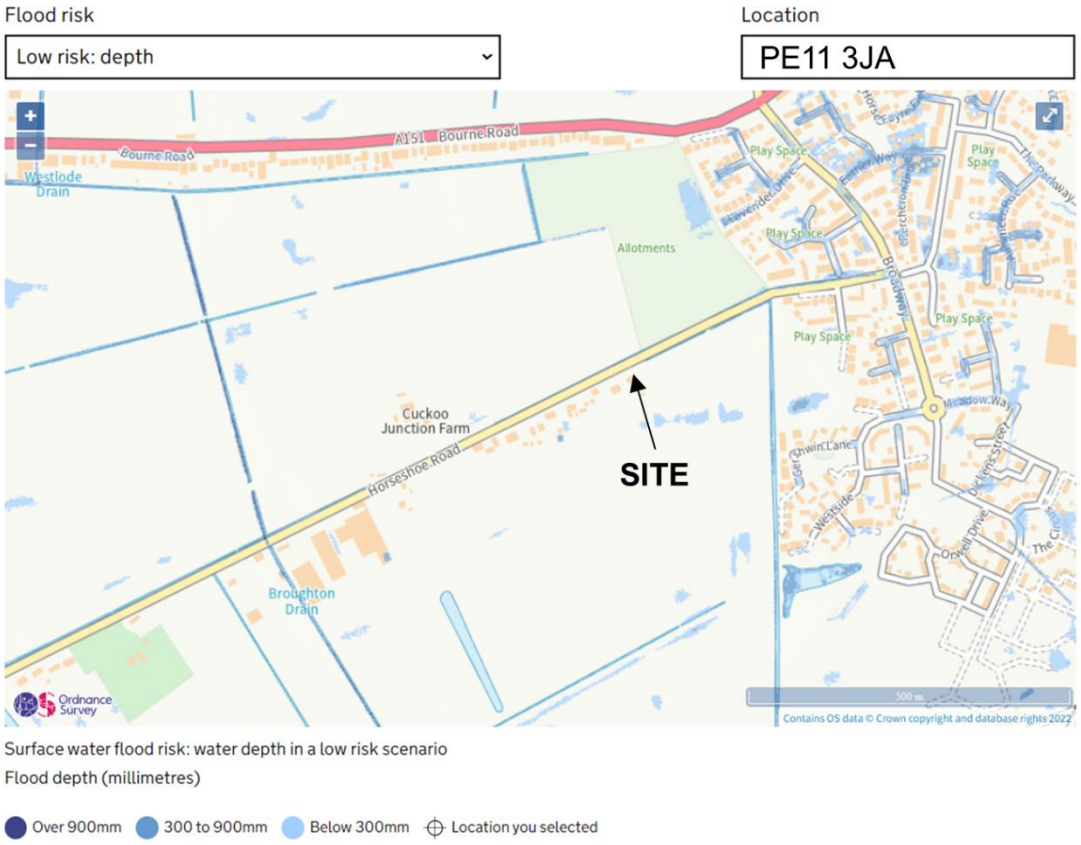
The maximum flood levels in Vernatts Drain at chainage 10.0km is shown in the reports as follows:

	Peak 1 in 100 year		Peak 1 in 1000 year	
Year	2007	2115	2007	2115
Level	3.95	3.95	3.95	3.95

The bank level is shown as 4.39m OD on this section

Information on Surface Water Flooding on Environment Agency Website

The map on the next page shows the predicted depths of surface water flooding in this area of Spalding.



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 to this site.

Site levels

The level of Horseshoe Road west of the site is 3.60m ODN and the site is approximately 150mm lower the road.

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 1.2 km east of the fluvial River Welland, which is main river and maintained by the Environment Agency.

The site is approximately 4.9 km south west of the tidal River Welland, which is main river and maintained by the Environment Agency.

The site is approximately 1.3 km south east of Vernatts Drain, which is maintained by Welland and Deepings IDB.

The site is approximately 1.05 km east of the South Drove Drain, which is maintained by Welland and Deepings IDB.

Potential Sources of Flooding

The following sources of flooding have been identified:

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

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

The tidal defences of the River Welland are approximately 4.9 km north east of the development site. If a breach occurred in the western bank of this tidal section of the River Welland it would need to flow over the railway and cross the A151 road leading from Spalding to Pode Hole. None of this area is predicted to suffer flooding in a 1 in 200 year event in 2115.

The SFRA does not predict that flood water from this source will extend as far as the site. The maps do not indicate that any flooding is predicted in this area between in a 1 in 200 year event in 2115. The defence banks of the River Welland are considered adequate for the present day and up to 2115.

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

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

The west bank of the River Welland is at a level of above 6.00m O.D. directly west of the development site. If a breach were to occur in the west bank of the River Welland when the river is at the maximum predicted level in 2115 in a 1 in 1000 year event of 4.68m OD then water would flood into the area between the river and the road called Spalding Common. The maps in the SFRA predict that the flood depth would be between 500mm and 1.0 metre in the area between the road and the river and would be contained for some time in this area, but when the flood level reached the road it would flow over the road and flow northwards.

Most breaching of river banks is caused by overtopping eroding the back of the bank and causing failure. In this case the west bank of the River Welland has a freeboard of more than 1.0 metre and the likelihood of overtopping is remote. If the river level approached 5.00m OD two large syphons which discharge water into the Cowbit and

Crowland Washes would be activated and this would immediately reduce water levels in the river.

It is unlikely that flood water would flow northwards and reach the development site and therefore this source of flooding can be considered to be adequately mitigated by raising ground floor level of the development 300mm above existing ground level.

3) Flooding from Vernatts Drain

Vernatts Drain is located 1.3km north of the site. This watercourse is maintained by Welland and Deepings IDB.

Therefore as the floor level will be approximately 3.9m ODN, which is the maximum predicted water level in Vernatts Drain, adequate mitigation will be provided by raising ground floor levels by 300mm above ground level.

4) Overtopping of IDB Systems

The water level in South Drove Drain, which is maintained by Welland and Deepings IDB (W & D IDB) is controlled by Pode Hole Pumping Station. There are both electrically operated and diesel powered pumps which are operated at this location to control water levels. W & D IDB have stated that the normal pumping level is -1.20m OD and the maximum design water level in a 1 in 100 year event would be 0.18m OD. With climate change this could increase to around 0.7m OD.

However you would expect Welland and Deepings IDB to carry out improvements to their system to ensure that the present standard of service does not reduce due to climate change over the next one hundred years.

Although the likelihood of water levels rising to 2.00m OD in South Drove Drain is remote, if this happened low land around Deeping St Nicholas would start to flood and so the level in the Drain would be unlikely to increase further.

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

5) Surface Water Flooding

The Environment Agency map of surface water flood risk (see page 7 of this report) does not show any risk of flooding on the site.

The surface water from the proposed development will be discharged into soakaways located on each individual plot. Soakaways are mostly acceptable for the disposal of roof drainage in the Spalding area.

Therefore this source of flooding is adequately mitigated.

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 could rise quickly and residents would need to take refuge in the upper floors of the building.

Residual Risk – Extreme Events

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

There are no records of the area east of Quadring 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 15 to 18). It is concluded that no extra mitigation measures are necessary to comply with the new guidance on climate change.

South East Lincs Advice Matrix

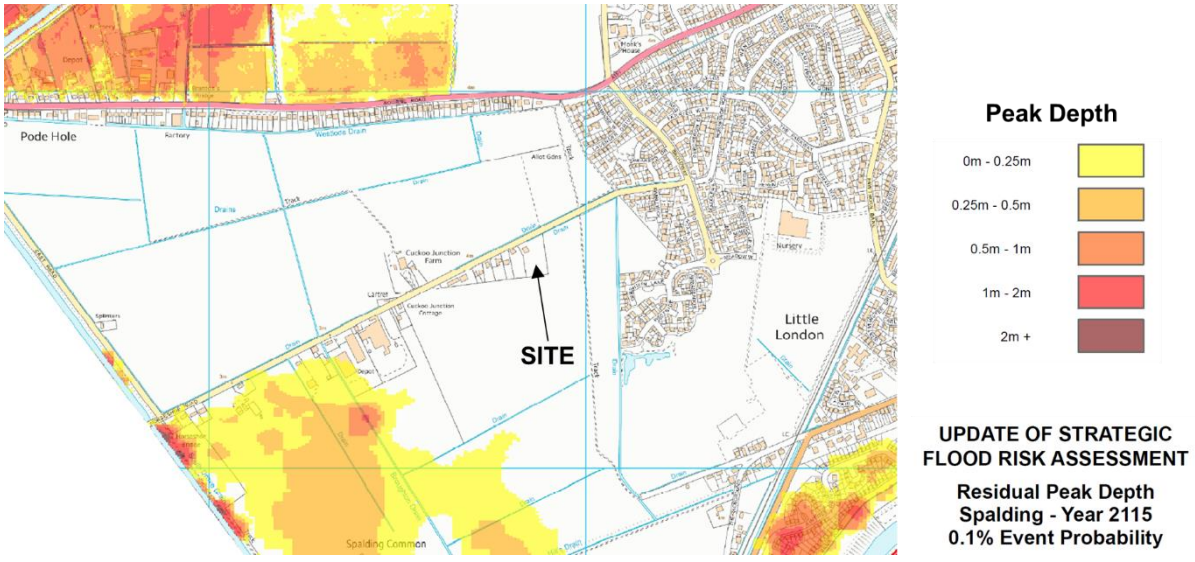
Advice can be found on the recommended mitigation required by referring to a spreadsheet on the South East Lincolnshire website.

As the development is in flood zone 3 and there is no flood hazard 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

There are no records of the site ever having been flooded in the past.

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 1000 year fluvial or tidal residual event in 2115.



The advice in the South East Lincolnshire Matrix states that the floor level of single storey buildings with sleeping accommodation on the ground floor should be above the 1 in 1000 year flood level in 2115.

Therefore it can be concluded that no flooding is predicted to the site in a 1 in 1000 year event in 2115.

Conclusions

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

The risk of the site flooding from any Environment Agency watercourse is very low.

The risk of flooding from IDB watercourses is also extremely low.

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.

However as there is no predicted risk of flooding in a 1 in 1000 year event in 2115 then it is considered satisfactory to allow a single storey development with sleeping accommodation on the ground floor if this is specified by the developer.

The ground floor level of the proposed property should be at least 300mm above the existing ground level on the site.

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

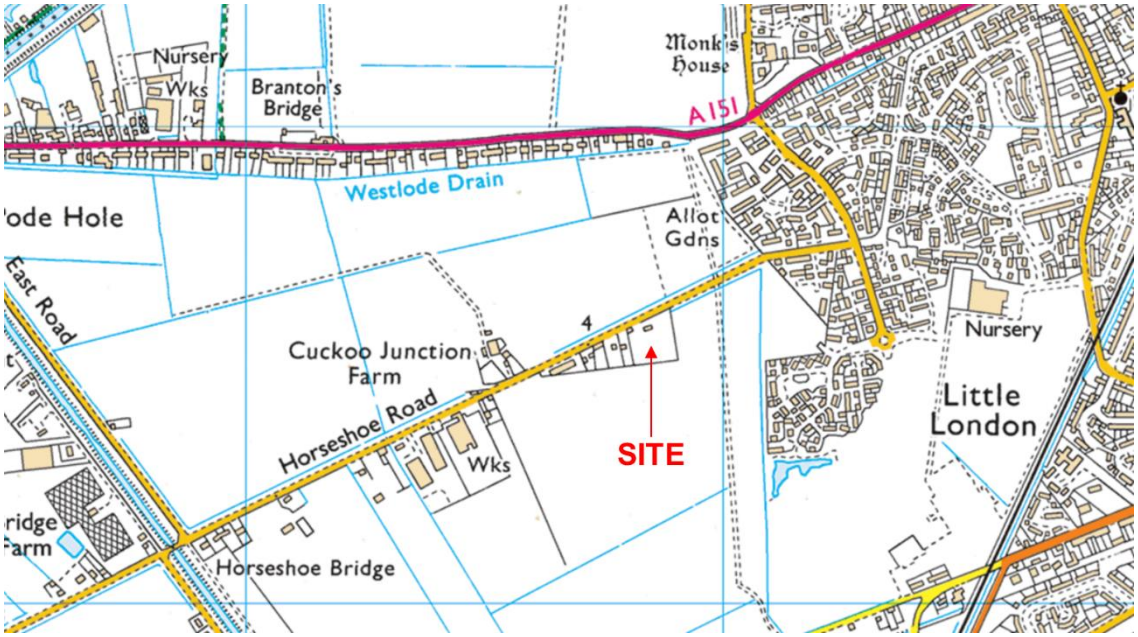
The surface water from the buildings will be discharged into soakaways and these should be designed to BRE Digest 365 and approved under Building regulations.

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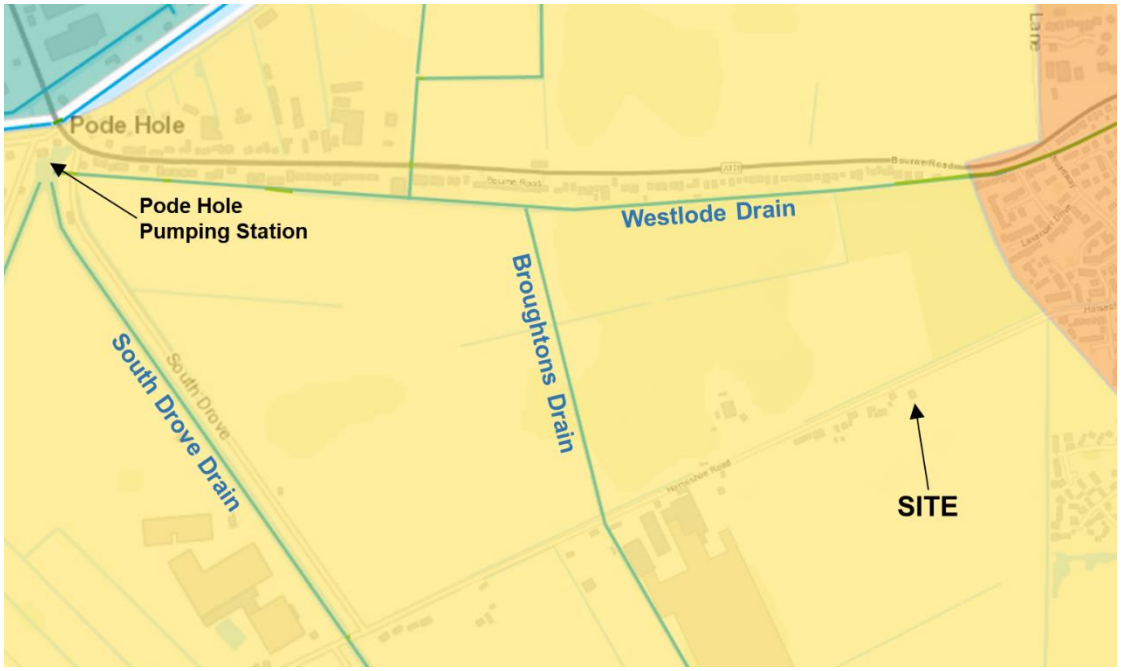
stuart.hemmings@btinternet.com

25th July 2022

LOCATION PLAN



PLAN OF IDB DRAINAGE CHANNELS



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'a

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 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 fluvial section of the River Welland
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 Welland.

As the development is in flood zone 3 and is classed as more vulnerable, the central climate change allowance, which is 35%, should firstly be considered. After considering the effects of this increase the higher central, 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 SHDC SFRA also has used this figure of 20%. The increase to 35% and 65% 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.

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 levels on the site is satisfactory.