

PROPOSED DEVELOPMENT OF A DETACHED HOUSE
BEHIND 156 BARRIER BANK, COWBIT, SPALDING PE12 6AL
FLOOD RISK ASSESSMENT



Development area (swimming pool to be demolished)

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REVISION A 6th December 2017 Paragraph re flood resilient construction added

This flood risk assessment and surface water plan has been prepared solely to support the planning application for the proposed development at 156, Barrier Bank, Cowbit. 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 submitted to South Holland District Council for planning permission to construct a detached house alongside the two existing houses approved under H01-111-15. The proposed new house will be located on the site of the existing swimming pool which is part of the existing house at 156 Barrier Bank, Cowbit, Spalding PE12 6AL.

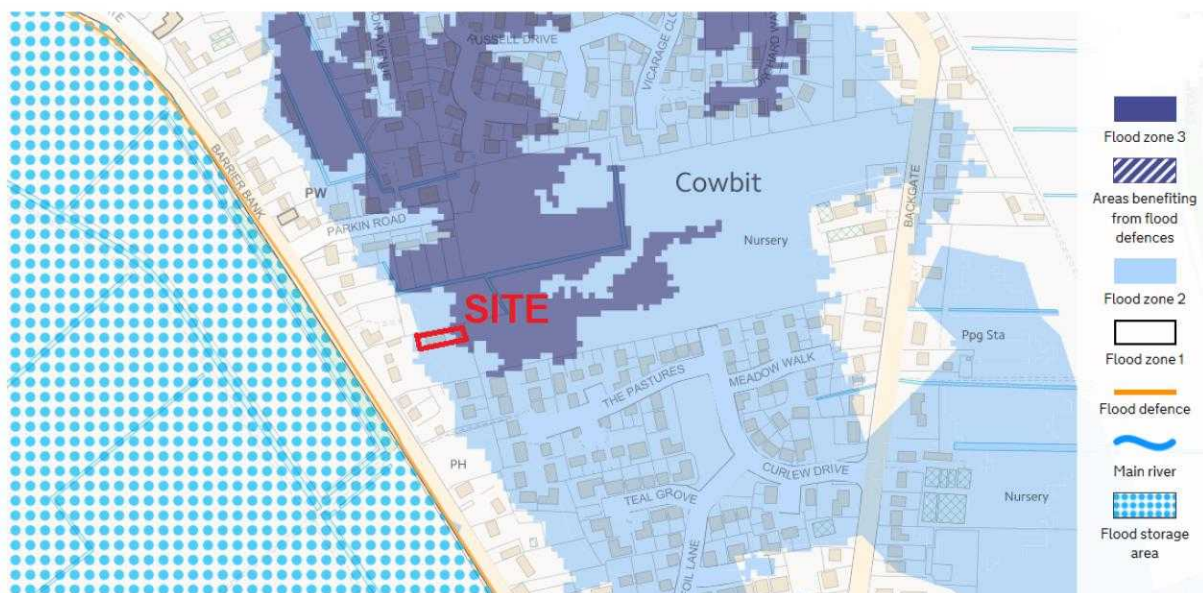
The site is mostly within Flood Zone 2 as shown on the Environment Agency's Flood Zone Map. These maps do not take into account existing flood defences.

The Planning Application requires a Flood Risk Assessment to be carried out as required in the Technical 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 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 most of the site is within flood zone 2 with a small part on the eastern side in flood zone 3. The proposed house will be sited within the area in flood zone 2.

Application Site

The development is located on the western edge of Cowbit alongside the Barrier Bank. The National Grid Reference of the site is 526235 317720.

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

The proposed development is within Flood Zone 2 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 development consisting of dwelling houses 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 is satisfactory in flood zone 2.

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 the area of Cowbit north of the site is within flood zone 3. The area alongside Barrier Bank is in flood zone 1, and the southern area of Cowbit is mostly within flood zone 2. Therefore the southern part of the village of Cowbit can be considered to be at lower flood risk than other areas and therefore an appropriate location for residential development.

The safety of the development will be delivered by ensuring the floor level of the proposed new dwelling is above the predicted residual flood levels for this area.

The South Holland District Council Core Strategy states that there is a limited number of sites outside the town of Spalding available for residential development. Therefore there is a requirement for further land to be brought forward and used for residential development.

There is a need for additional housing units in the Cowbit area and this location does not have a higher flood risk than other sites in the village. Therefore it can be concluded that the sequential test is passed.

Strategic Flood Risk Assessment

The following information about the flood risk at the location of the proposed development has been gained from the maps produced for the South Holland District Council Strategic Flood Risk Assessment:

1. Report Maps

- Map 5 indicates the site to be low or medium risk and protected by flood defences.
- Map 6 indicates the peak depth is zero for the present day 1% / 0.5% tidal event probability.
- Map 7 indicates the peak velocity is zero for the present day 1% fluvial / 0.5% tidal event probability.
- Map 12 indicates the actual risk extent for the year 2055 for the 1% fluvial / 0.5% tidal event probability is low or medium, and protected by flood defences.
- Map 13 indicates the actual risk extent site for the year 2115 for the 1% fluvial / 0.5% tidal event probability is low or medium, and protected by flood defences.
- Map 16 indicates the site is not within the rapid inundation zone.

2. Flood Maps Table D1

The maps illustrate the actual flood hazard which is as follows:

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
	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	0 – 500mm
	Extent of flooding ...	High
	Hazard	Danger for some (0.75 – 1.25)
	Velocity	0 – 0.3m/sec

The update of the SHDC SFRA included more detailed maps of the flood risk to Crowland from the Crowland Washes. These were produced by modelling breaches in the Barrier Bank at locations around Crowland. No detailed maps were produced for Cowbit and no modelling with breach scenarios seems to have been carried out for this section of the Barrier Bank. The map showing the predicted residual flood depths for 2115 does not indicate any flooding adjacent to the bank. This will be commented on further in the conclusions of this report.

3. Maximum flood levels:

Maximum fluvial flood levels in the River Welland at Crowland at chainages between 3km and 4km are shown in the reports as follows:

	Present	Present + Climate Change
1 in 100 year	4.53	4.67
1 in 1,000 year	4.54	4.67

The lowest level of the Barrier Bank of the River Welland stated in the SFRA is between 5.77m OD and 6.05m OD between chainages 3.0km and 4.0km.

Information from the Environment Agency

The Environment Agency has provided predicted flood levels for the River Welland which are taken from the Welland Catchment Model produced in 2007.

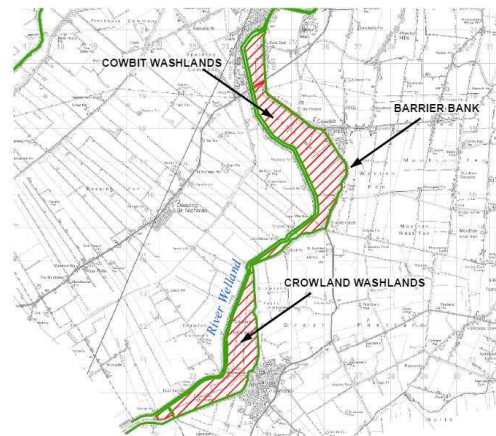
	Present Day	With 20% allowance for climate change
Peak 1 in 100 year flood level	4.61m OD	4.72m OD
Peak 1 in 1,000 year flood level	4.63m OD	4.72m OD

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 section of the River Welland from south of Crowland to the southern outskirts of Spalding has two washlands located on the east side of the River, called Crowland

Washlands and Cowbit Washlands. These areas are designed to alleviate very high flows in the River Welland. When the water level in the River Welland reaches a level of approximately 4.70m OD large syphons are activated which discharge excess water onto the Washes. The Barrier Bank is located on the east side of the Washes to contain the water in the Washlands and is the main flood defence bank on the east side of the river.

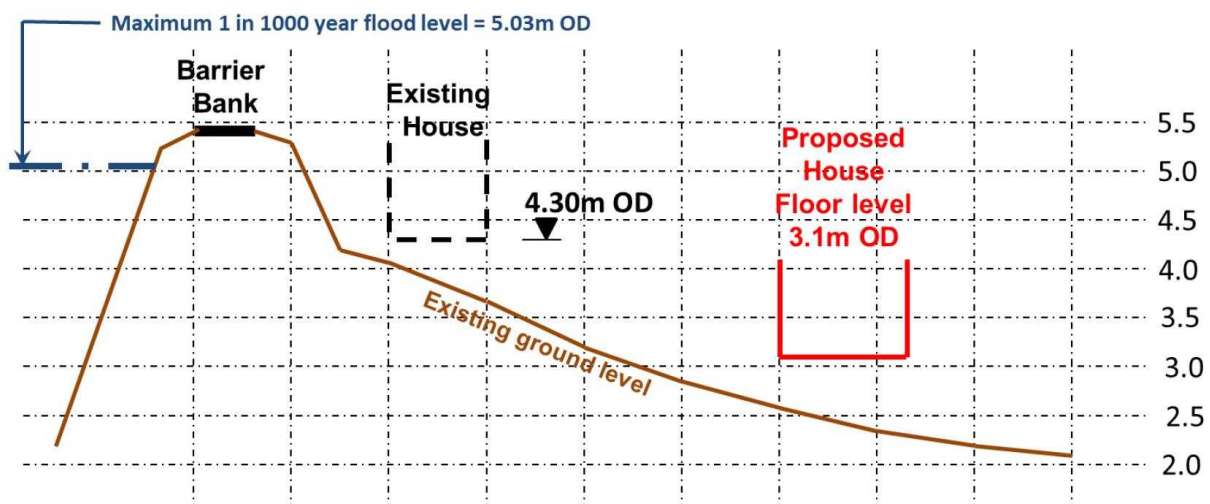


The site of the proposed house is adjacent to Barrier Bank, approximately 60 metres from the top of the bank.

Existing Ground Levels

The site is located east of the Barrier Bank and slopes from a level of 4.20m OD in the driveway in front of the existing house to a level of 2.09m OD on the eastern boundary of the site, which is approximately 90 metres from the centre of the road (Barrier Bank). The existing house has a ground floor level of approximately 4.30m OD and the proposed ground floor level of the new houses is 3.10m OD.

A section west to east across the site is shown below.



Potential Sources of Flooding

The following sources of flooding have been identified:

1. Failure or overtopping of the Barrier Bank (River Welland)
2. Failure or overtopping of Coronation Channel
3. Failure or overtopping of tidal section of the River Welland
4. Flooding from IDB Drain

1. Failure or Overtopping of the Barrier Bank.

The Barrier Bank is the eastern bank of the Cowbit Washes. The Washes are only flooded in extreme conditions (around 1 in 50 years) and are used the rest of the time as agricultural land. There are two syphons which operate automatically to allow water to flood on to the Washes and alleviate high water levels in the River Welland. When this occurs the level of water in the washes will quickly rise to a maximum of 5.00m OD.

As the road level is 5.42m OD at this location any possibility of overtopping can be discounted. There is a remote possibility that a breach could develop in the bank alongside the village, but a breach is more likely to occur north or south of the village where the back slope of the bank has a much steeper gradient and therefore the bank is more not as stable as the bank alongside the village.

At the development site the land levels fall slowly eastwards, as shown on the section on page 5. If a breach were to occur it would probably form with a base level of 4.20m OD. Therefore in Appendix 1 (pages 12 and 13) there are predictions of the hazard and water depths that could occur at the development site if a breach as described above occurred. These indicate the hazard is mainly in the "Low Caution" category with flood depths probably between 300mm and 400mm. However these predictions can be considered to be in excess of the true hazard because a breach would result in a rapid reduction in the levels in the River Welland which would reduce the computed flow through the breach.

Therefore the flood risk from this source will be adequately mitigated by raising the ground floor level by 500mm

2. Flooding from Coronation Channel

The SFRA states that the maximum design level in the Coronation Channel is 4.69m OD in a 1 in 100 year event in 2115. The minimum crest level of the south bank of the Channel on is 5.70m OD, which gives a minimum freeboard of 1.0 m. The Coronation Channel is 3.8 km north of the development site.

If the Channel were to breach water would flow southward towards the site. However, it would be retained for a short time by the A16 which is higher than the surrounding land. The extent of the residual flooding of 0 – 500mm predicted in the SFRA at the eastern boundary of the site in a 1 in 100 year event could be from this source. However the flooding would be less severe than the predictions from a breach of the Barrier Bank and therefore as the proposed level of the ground floor of the building is

1000mm above the ground level of approximately 2.10m OD on the eastern boundary of the site the risk of flooding to the house in a 1 in 100 year event from this source can be adequately mitigated.

3. Flooding from Tidal Section of River Welland

The River Welland is tidal north of the sluices near the confluence of the Coronation Channel and the River Welland on the northern side of Spalding, which is approximately 7.5km north of the development site. If a breach were to occur in the east bank of the tidal section of the river flood water would flow eastwards towards Weston rather than southwards towards Cowbit.

The SFRA states that flooding in a 1 in 200 year residual event could extend to the eastern boundary of the site and this could be the result of a failure of the tidal banks.

The raising of the floor level by approximately 1000mm above ground level at the eastern boundary of the site should provide adequate mitigation against the risk of flooding in a 1 in 200 year event in 2115 from this source.

4. Flooding from IDB Drainage system

South Holland IDB maintain drainage channels in this area. There are two watercourses, Mill Dyke (B21) and Backgate Dyke (B37) which flow eastwards from the central area of Cowbit. These flow into Wheatmere Drain (B35) which flows southwards into the South Holland Main Drain (B30). The water level in the South Holland Main Drain is controlled by Wisemans Pumping Station.

IDB drains were designed to provide at least a 1 in 10 year standard of service with a freeboard of at least 900mm. This normally provides at least a 1 in 50 year standard of service against overtopping and in many cases a 1 in 100 year standard at the present time.

South Holland IDB have a policy of monitoring standards of protection in all their catchments and will carry out improvements to pumping stations, sluices and drainage channels to ensure they do not fall due to higher run-offs predicted with climate change.

It is unlikely that any failure of assets such as pumping stations, sluices or drainage channels would lead to overtopping of the watercourse because South Holland IDB have an excellent maintenance regime and monitor all assets with a modern telemetry system.

As the floor level of the proposed house is at least 1000mm above the average ground levels in Cowbit east of the site the risk of flooding from this source can be considered so low it can almost be discounted.

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 last 50 years. The last time that a breach occurred in the River Welland was 1947, and since that date

considerable investment has been made to raise banks and provide a banks which are above the 1 in 100 year flood level.

Probabilities and Trends of Flooding

The probability of this site flooding from Environment Agency main river is very low. In an extreme event any effect on this location would not be sudden and there would be time for residents to take precautionary measures to limit the impact of any flooding that may occur.

Residual Risk

There is a residual flood risk to the site if the Barrier Bank immediately west of the site breached when the Cowbit Washland is full. If the bank breached more than 100 metres north or south of the site then it is unlikely that the proposed development would be affected.

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.

Conclusions

The proposed development is not in a functional flood plain as defined by the Guidance. Although the site is in flood zone 2, the actual risk of the site flooding from any Environment Agency water course is very low.

The SFRA states for the 1.0% fluvial and 0.5% tidal event there is no actual risk of flooding at the present time or in 2115.

The SFRA states for the 1.0% fluvial and 0.5% tidal event there is no residual risk of flooding at the present time. In 2115 the maps indicate that flooding could occur on the eastern boundary with depths of up to 500mm. The relevant part of the map is shown below



As the mapping is to such a small scale it is difficult to be able to identify the predicted depth of flooding where the house is proposed.

The possible depths of flood water if a breach occurs in the Barrier Bank immediately west of the site after the Cowbit Washes have been flooded is estimated in Appendix A on pages 13 and 14 of this report. The risk of a breach developing at this location are extremely low, and must be less than 1 in 5000 years. The section of the site on page 5 shows only the top section is likely to breach.

A precautionary approach of raising the ground floor levels of the proposed house by 500mm above ground level is recommended.

If a breach occurred in any part of the Barrier Bank more than 100 metres from the site then there would be no flooding to the proposed house because the ground floor levels are at least 1000mm above ground levels in Cowbit east of the site.

In a flood risk area there is always a risk of an event occurring of greater magnitude than has been considered in this flood risk assessment.

Recommendations

In any area at risk of flooding it is preferable that any new dwelling 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 tidal or fluvial bank, and ensure there is no danger to residents when they are asleep

The ground floor level of the proposed house should be approximately 500mm above existing ground level at a level of 3.10m OD and all bedrooms should be at first floor level.

Flood resilient construction should be incorporated to a minimum height of 300mm above the predicted flood level, and all of the electrical installation should be a similar height above finished floor level.

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

If occupiers of the building are warned of possible very high levels in the fluvial River Welland they should monitor the situation and if necessary be prepared to evacuate the area during the period when the Washes are at the maximum level.

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

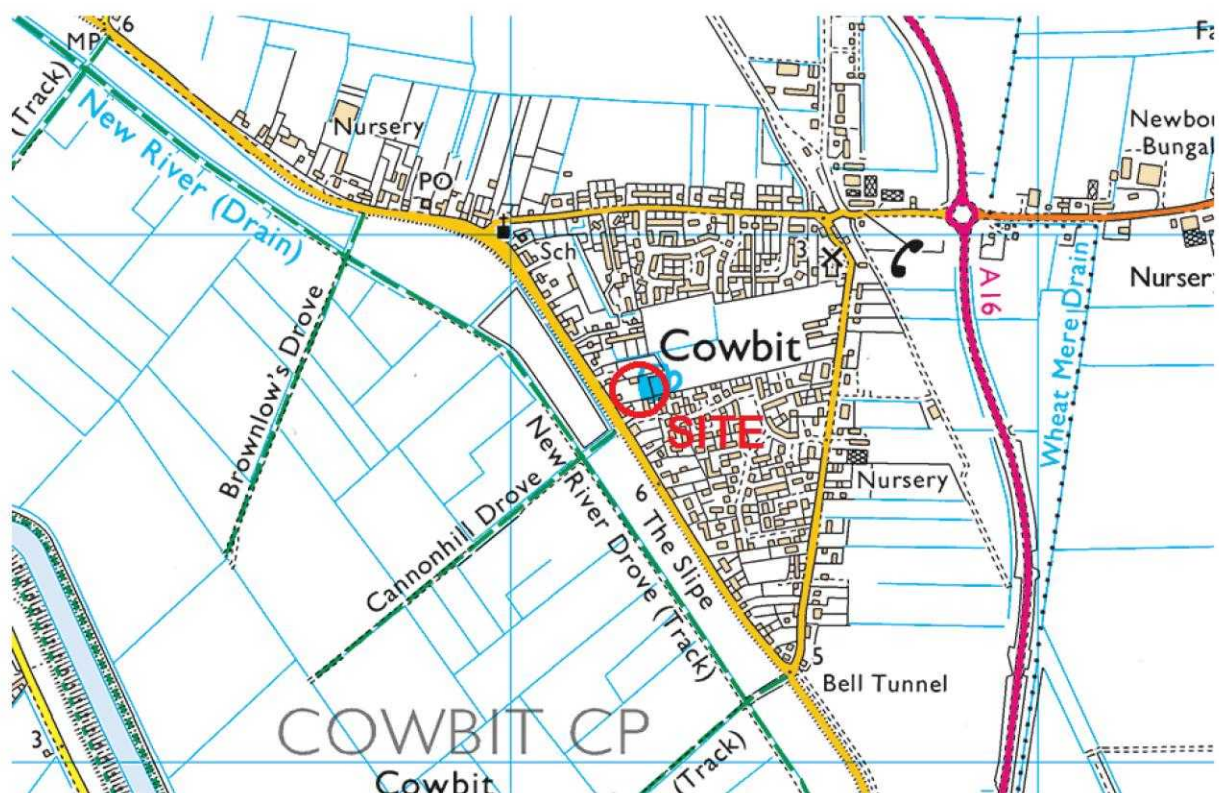
All future owners and occupiers of the building should be given a copy of the Flood Risk Assessment so that they are fully aware of the risk of flooding in this area.

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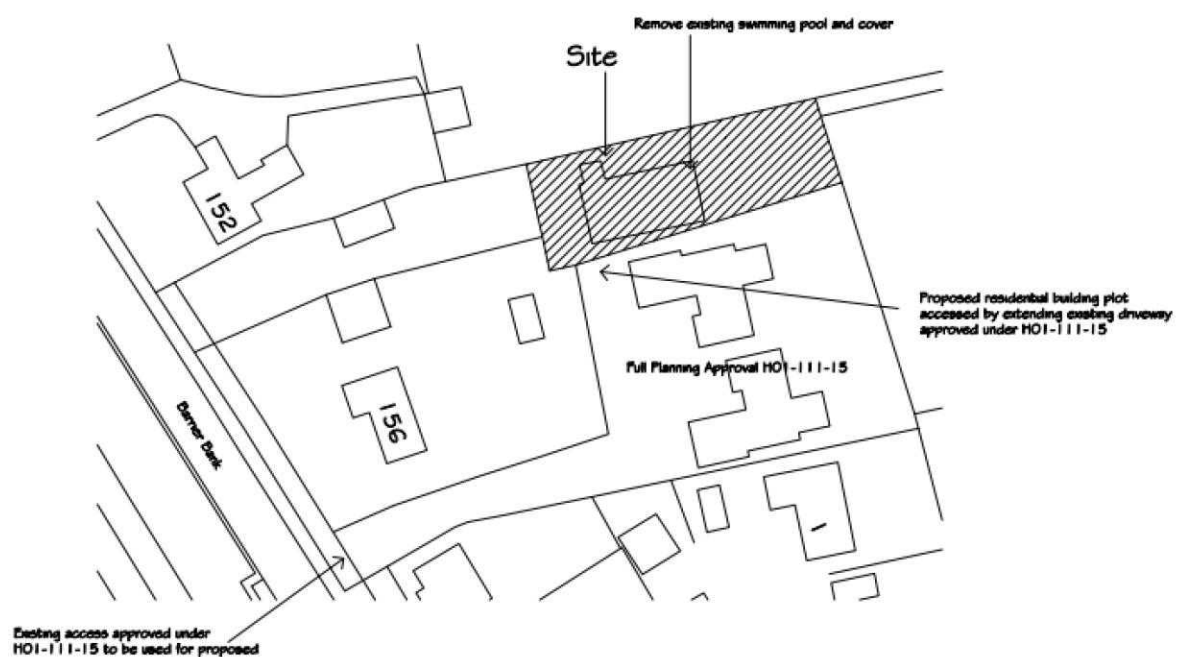
6th November 2017

Revision A: 6th December 2017 paragraph re flood resilient construction added.

LOCATION PLAN



BLOCK PLAN OF PROPOSED SITE



PLAN OF SOUTH HOLLAND IDB WATERCOURSES



APPENDIX A

BREACH CALCULATIONS FOR BARRIER BANK

This calculation will work out an assumed volume that will flow through a 20 metre wide breach of the Barrier Bank when the water level in the flood storage area is the maximum 1 in 100 year level in 2115.

A calculation of this volume will then be carried out 60 metres from the bank to work out probable water depths, velocities and hazard rating for the proposed houses.

Maximum level of the River Welland = 4.72m OD

Assume breach will only develop down to a level of 4.10m OD.

Width of breach = 20 metres

Assume the breach is a broad crested Weir

$$\begin{aligned}\text{Maximum Volume through Breach} &= 1.7 \times b \times H^{3/2} \\ &= 1.7 \times 20 \times 0.62^{3/2} \\ &= \underline{14.1 \text{ cumecs}}\end{aligned}$$

$$\text{Velocity of water through breach} = 14.1 / (20 \times 0.62) = \underline{1.14 \text{ m/sec}}$$

Assume that water will flow away from the breach and spread at a 45 degree angle.

Width of flow at first house = 140 metres

Therefore if we assume the same volume (14.1 cumecs) is flowing through line 60 metres from the breach then we can work out flood depths for different chosen velocities.

For example choose velocity of 0.2 m/sec, therefore area of flow = 70.5 sm

$$\text{Therefore flood depth} = 70.5 / 140 = \underline{0.503 \text{ metres}}$$

This can be repeated for different velocities and the hazard rating worked out for each case, using the formula

$$\text{Hazard Rating} = (\text{depth of flooding} \times (\text{velocity} + 0.5)) + \text{Debris factor}$$

The debris factor will be taken as 0.5.

Velocity	Area	Flood depth	Hazard Rating	Hazard
0.2	70.5	503mm	$(0.503 \times 0.7) + 0.5 = 0.85$	Danger for some
0.3	47.0	336mm	$(0.336 \times 0.8) + 0.5 = 0.77$	Danger for some
0.4	35.25	251mm	$(0.251 \times 0.9) + 0.5 = 0.73$	Low Hazard

0.5	28.2	201mm	$(0.201 \times 1.0) + 0.5 = 0.70$	Low Hazard
0.6	23.5	168mm	$(0.168 \times 1.1) + 0.5 = 0.68$	Low Hazard
0.7	20.1	144mm	$(0.144 \times 1.2) + 0.5 = 0.67$	Low Hazard

The hazard has been worked out following the guidance shown in the Supplementary Note to FD2320 and FD2321 on Flood Hazard Ratings and Thresholds for Development Planning.

It can be seen that for velocities of 0.4m/sec and above the hazard rating is low.

There is some discussion in the supplementary note about what value should be taken for the debris factor. One table suggests that for arable land the factor should be zero. However the final table suggests the use of a factor of 0.5. If a factor of zero were to be used it would reduce the hazard rating to below 0.75 in every case and the hazard to "Very low hazard - Caution".

Therefore it is estimated that the deepest flooding that would occur on the site would be between 300mm and 400mm in depth if a breach were to occur in the Barrier Bank in front of the site.

APPENDIX B 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 PPS25¹. 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

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%	

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 zones 1 and 2 the central and higher central 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

1) Flooding from Tidal River Welland

The FRA has identified a possible source of flooding where the new climate change recommendations could affect the predictions of flood levels in 2115 at the development site to be 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 for the maps in the SFRA and 40mm for maps issued by the Environment Agency. This small increase will not change the conclusion that the proposed house will not suffer flooding from this source.

2) Flooding from River Welland, Coronation Channel and the IDB drainage system

As the development is in flood zone 1 and 2 and is classed as more vulnerable, the central climate change allowance, which is 25%, should firstly be considered. After considering the effects of this increase the higher central, 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 SHDC SFRA also has used this figure of 20%. The increase to 25% and 35% will not significantly change the conclusion in the SFRA of what might happen if a breach occurred in the bank of the Coronation Channel. If there are additional flows along this part of the Coronation channel and 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 or in the Cowbit Washes if they are flooded.

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 ground floor level of the proposed building should be raised by approximately 500mm is satisfactory.