

PROPOSED CHANGE OF USE AT 16 COWBIT ROAD, SPALDING,
PE11 2RD.
FLOOD RISK ASSESSMENT



View looking north east at front of site

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This flood risk assessment has been prepared solely to support the planning application for a change of use at 16 Cowbit 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

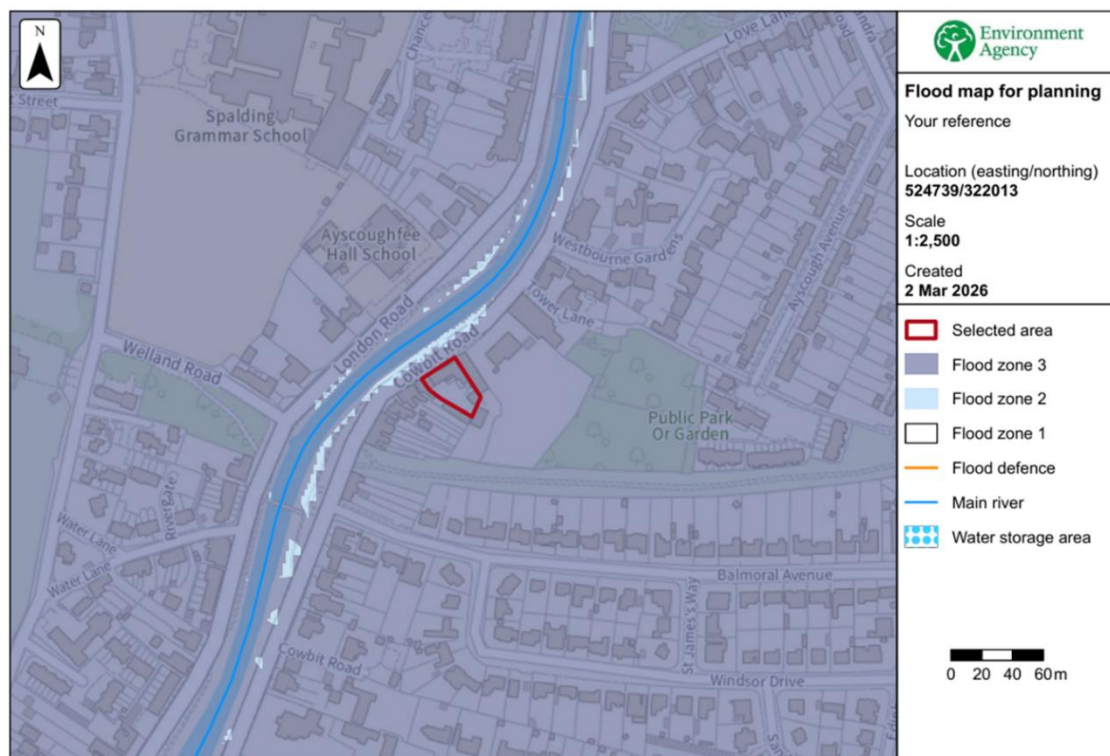
A planning application is due to be submitted to South Holland District Council for permission to change the use of 16, Cowbit Road, Spalding, PE11 2RD from commercial to residential use. Nos 15 and 16 Cowbit Road are in the same ownership, are linked, and No 15 is a residential building.

All of the site is within Flood Zone 3 as shown on the Environment Agency's Flood Zone map.

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 within a defended area as specified on 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 this area.



It can be seen that that all of this area of Spalding is in Flood Zone 3.

Application Site

The National Grid Reference of the site is 524740 322015.

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, sites used as dwelling houses are 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	✓*

The above table indicates that “More Vulnerable” development is only satisfactory within flood zone 3(a) if the sequential and exception test is passed. However this flood risk assessment is for a change of use of an existing property and the planning portal states that the sequential and exception tests are not required to be applied for an application for a change of use.

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 ...250mm – 2.0 metres
	Extent of flooding .. High
	Hazard rating..... 0.75 – 2.0 (Danger for Some/Most)
	Peak Velocity .. 0 – 0.3m/sec

For the year 2115 Depth of flooding ... 500mm – 2.0 metres
 Extent of flooding .. High
 Hazard rating..... 1.25 – 2.00 (Danger for all)
 Peak velocity 0 – 0.3m/sec

Figure 16 of the general maps show that the site is within the rapid inundation zone for the present day and 2115.

Maximum flood level and bank levels in the River Welland

Tables in the SFRA show the following details of the defence bank on the east side of the tidal section of the River Welland at chainage 22.0km immediately north of Marsh Road Sluice and 450 metres north of the development site.

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

With an average defence crest level between 7.80 and 7.90 m OD the freeboards are as follows:

	2007	2115
Peak 1 in 200 year freeboard	1870mm	730mm
Peak 1 in 1,000 year freeboard	1580mm	440mm

Tables in the SFRA show the following details for the defence bank on the west side of the Coronation Channel at chainage 2.2 km which is 270 metres east of the site.

	2007	2115
Peak 1 in 100 year flood level	4.36m OD	4.69m OD
Peak 1 in 1,000 year flood level	4.37m OD	4.69m OD

The bank levels on this section vary between 5.50m OD and 6.0m OD. Therefore it can be seen there is a minimum freeboard of 800mm to the predicted design maximum levels in 2115.

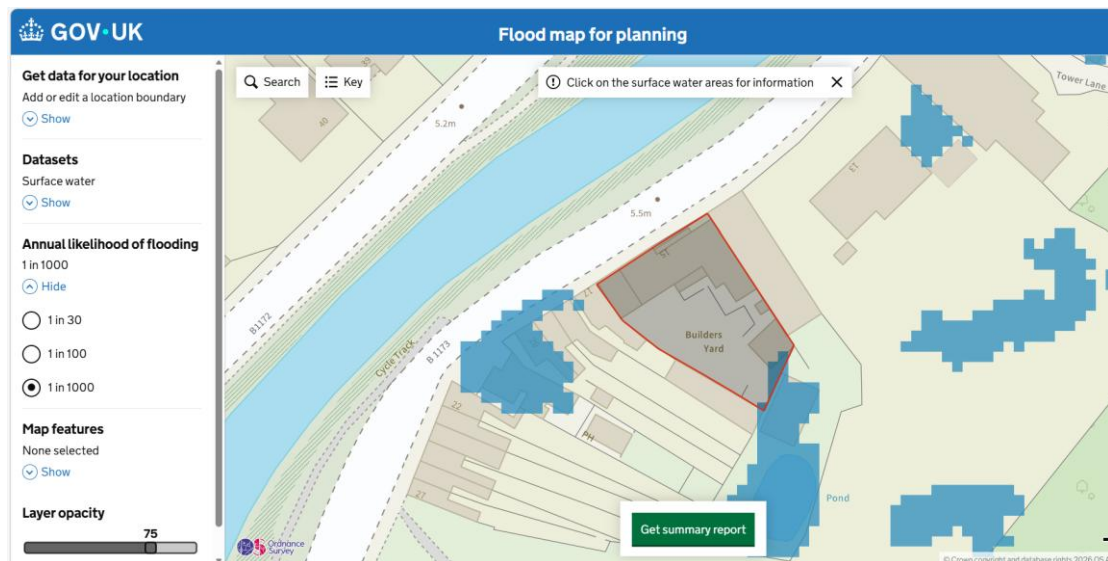
Tables in the SFRA show the following details for the defence bank on the east side of the River Welland at chainage 2.0 km immediately west of the site.

	2007	2115
Peak 1 in 100 year flood level	4.43m OD	4.67m OD
Peak 1 in 1,000 year flood level	4.45m OD	4.68m OD

The bank levels on this section vary between 5.20m OD and 5.50m OD. Therefore it can be seen there is a minimum freeboard of 800mm to the predicted design maximum levels in 2115.

Information on Surface Water Flooding on Environment Agency Website

The following map shows areas around the site which are predicted to experience surface water flooding in a 1 in 1000 year event.



The areas coloured blue indicate the areas where there could be surface water flooding in a 1 in 1000 year event. There are areas shaded blue for this event west and south of the site, but there is no predicted flooding on 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" 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 20 metres east of the River Welland, which is the main river and maintained by the Environment Agency.

The site is approximately 2.5km south of the tidal defences of the River Welland and Coronation Channel.

The site is approximately 290 metres north of the Coronation Channel.

The area between the River Welland and the Coronation Channel is drained by surface water sewers maintained by Anglian Water, which discharge either into the River Welland or into drainage channels maintained by South Holland Internal Drainage Board. The water levels in the IDB channels are controlled by Clay Lake Pumping Station, which is operated by South Holland IDB, and discharges into the Coronation channel.

Existing Ground Levels

Using a reference level of 5.50m OD on Cowbit Road in front of the building the level of the path is 5.25m OD and the site falls to a level of 3.80m OD at the rear of the yard.

The floor level of No 15 is approximately 5.25m OD and the floor level in No 16 is 4.70m OD.

All of the levels measured are shown on the plan on page 13 and there is a section west to east across the site shown on page 11 of this report.

Potential Sources of Flooding

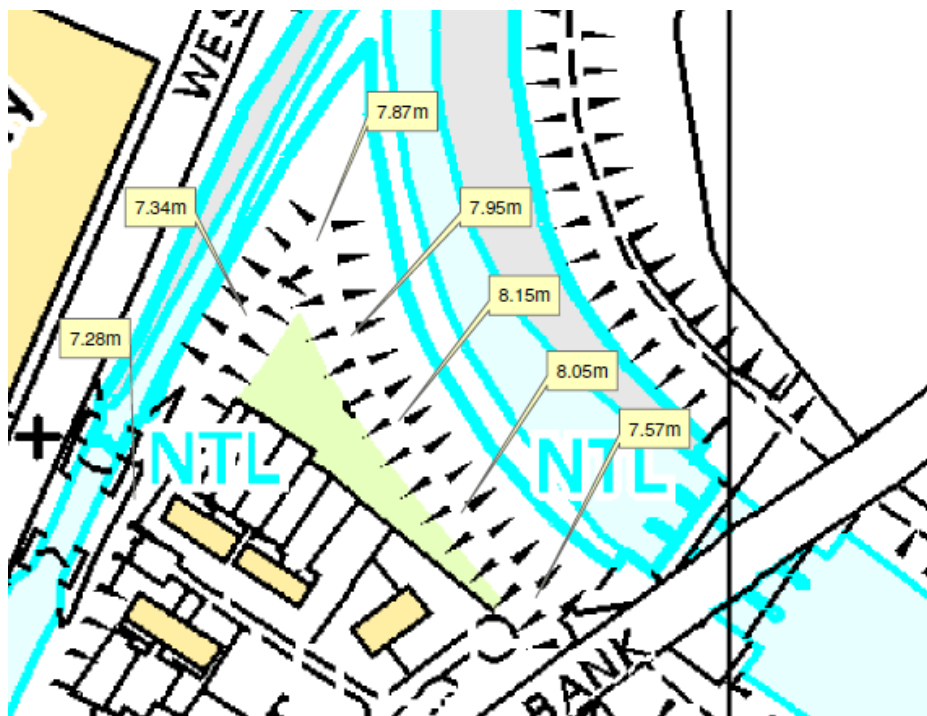
The following sources of flooding have been identified:

1. Failure or overtopping of the tidal defences.
2. Overtopping of the River Welland.
3. Overtopping or breaching of the Coronation Channel.
4. Failures of Clay Lake Pumping Station (IDB)
5. Flooding from IDB channels and piped drains
6. Blockages in local surface water sewers (highway or Anglian Water)

1. Failure or overtopping of tidal defences.

There is a short length of tidal defences on the Coronation Channel west of Marsh Road Sluice and on the River Welland north of Fulney Lock that defends the area between the River Welland and the Coronation Channel from tidal flooding. The SFRA states that the defences are adequate to withstand a 1 in 200 year (0.5%) probability event for present day but in the future (2115) some of the banks would be overtopped in a 0.5% probability event.

Crest levels of this bank have been surveyed and these are shown below. These levels range from 7.28m OD near Fulney Lock to above 8.00m OD on the main section of bank. The low level of 6.88m OD mentioned in the SFRA was not found. All the surveyed levels are higher than the 1 in 200 year extreme tide level in 2115 of 7.12m OD stated in the SFRA.



These banks are well maintained and have a top width of at least 4.0 metres, and it is reasonable to assume that during the next one hundred years, considering the assets that are protected by this bank, further maintenance and capital works will be carried out on the tidal banks to ensure a continuing minimum defence standard of 1 in 200 years.

If a breach occurred in the tidal bank during a 1 in 200 year event in the year 2115 flood water would flow southwards and start to flood the whole area between the Coronation Channel and the River Welland. The hazards of this will be considered later in the report.

Adequate mitigation against this risk will be provided by ensuring all habitable living accommodation is above the highest predicted flood level.

2. Overtopping of the River Welland.

The crest level of the east bank of the River Welland is approximately 5.50m OD west of the development site. The highest predicted fluvial level for a 1 in 100 year event in the fluvial River Welland in 2115 is 4.69m OD. The level of the east bank of the River Welland varies between 5.10 and 5.30m OD through the town of Spalding.

Cowbit Road is located on top of the east bank and the ground level slopes down at a shallow gradient from the road to the rear of the property.

There is no predicted risk of overtopping to this bank and the risk of a breach forming in this bank through the whole length through Spalding can be considered to be negligible.

3. Overtopping or Breaching of the Coronation Channel

The area between the River Welland and the Coronation Channel is protected from flooding by banks on the west side of the channel, which are approximately 2.0m to 3.0m above the land. The top level of these banks are at a level of 5.40m OD, which gives a freeboard of at least 700 mm above the 1 in 1,000 year maximum design level in the channel.

If a breach occurred in the channel the maximum water level in the flooded area could reach between 4.0 m and 4.1 m OD for the present day situation and between 4.3m and 4.4 m OD if climate change is allowed for.

Therefore the risk of flooding from this source can be considered to be low, and it is likely that the flood level following a breach would be lower than if the tidal defences were to breach.

This source of flooding will be adequately mitigated by providing mitigation for the risk of flooding from a breach in the tidal flood bank.

4. Failure of Clay Lake Pumping Station

The South Holland IDB estimate that the Clay Lake Pumping Station provides a 1 in 50 year standard with a freeboard, which in effect provides a 1 in 100 year protection against flooding. The pumping station is maintained in good condition and should a

failure occur the Drainage Board would quickly deploy temporary pumps to alleviate the situation. It is highly unlikely that any flooding from this source would extend as far as this site, as the flood water would need to rise above 3.80m OD, which is higher than the ground levels around the pumping station itself which would flood first.

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

5. Flooding from IDB channels and Piped Drains

There are two main drainage channels in the area between the coronation Channel and the River Welland. Exeter Drain flows southwards from Albert Street to Clay Lake Pumping Station. The northern section of this drain as far as Halmer Gate is piped. The upper section of the second drain is piped and flows eastwards from north of the development site as far as the Coronation Channel. The drain then flows southwards as far as Clay Lake Pumping Station as an open channel located behind the bank of the Coronation Channel.

The South Holland IDB has a regular annual maintenance programme and they remove weed growth from channels such as these twice each year. However, any flooding from this channel will not cause any flooding to the development site, as explained in (4) above.

Flooding from this source can be considered to be adequately mitigated.

6. Blockages in local surface water sewers

Both Anglian Water and the Highways Authority maintain surface water drainage systems in this area. This source of flooding will be adequately mitigated by providing mitigation for the risk of flooding from a breach in the tidal flood bank.

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.

Probabilities and Trends of Flooding

The probability of this development being flooded from either the River Welland or the Coronation Channel is very low. The highest risk to the development would be from an extremely high tide event leading to a breach in the tidal defences during that event. In such an event lower land south of Halmer Gate where land levels are 3.00m OD and lower would flood to a depth of greater than 800mm before the western end of this site would be affected.

If the breach remained unrepaired and there were subsequent high tides the level of the flood water could rise to approximately 5.20m OD. At this level the flood water would start to flow across High Street and into the River Welland. This would limit any further increase in the level of the flood water in this area. This level of flood water would lead to a depth of approximately 500mm of flood water in No 16 Cowbit Road.

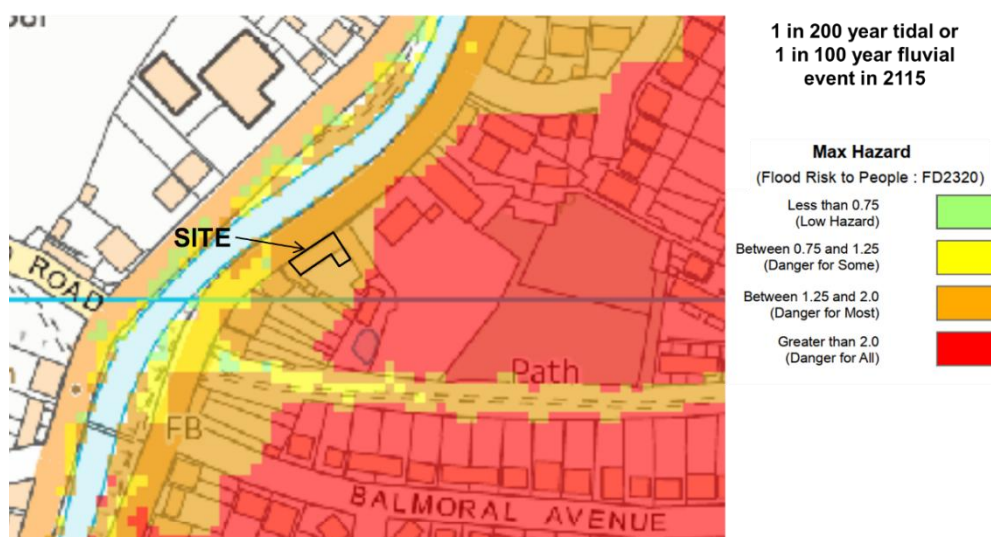
Climate Change

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 this FRA. The effects of these new recommendations are considered in the Appendix on pages 14 to 17 of this report.

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.

The map below shows that the predicted flood hazard for this site is between 1.25 and 2.0 (danger for most), for both the 1 in 200 year and 1 in 1000 year event in 2115.



As the development is in flood zone 3 and the predicted flood hazard is 1.25 – 2.0 (Danger for most) reference should be made to Category D7 which shows the following advice.

The proposal should be referred to the Environment Agency with a supporting Flood Risk Assessment which demonstrates that the proposal will be safe for its lifetime.

The Environment Agency is likely to object to proposals including ground floor habitable accommodation.

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.

The standing advice for a new build development with sleeping accommodation on the ground floor is found under D8 on the South East Lincolnshire Standing Advice Matrix.

Category D8 in the Matrix states:

The NPPF requires that the proposal is accompanied by a Flood Risk Assessment which contains evidence that appropriate mitigation measures / flood resilience techniques have been incorporated into the development.

The applicant is advised to 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 (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).

For flood depths of 1.0 – 1.6 metres, proposals must have two stories, with FFL set 1.0 metre FFL above existing ground level with flood resilient construction to a height of 300mm above the predicted flood depth, and demountable defences to 600mm above FFL.

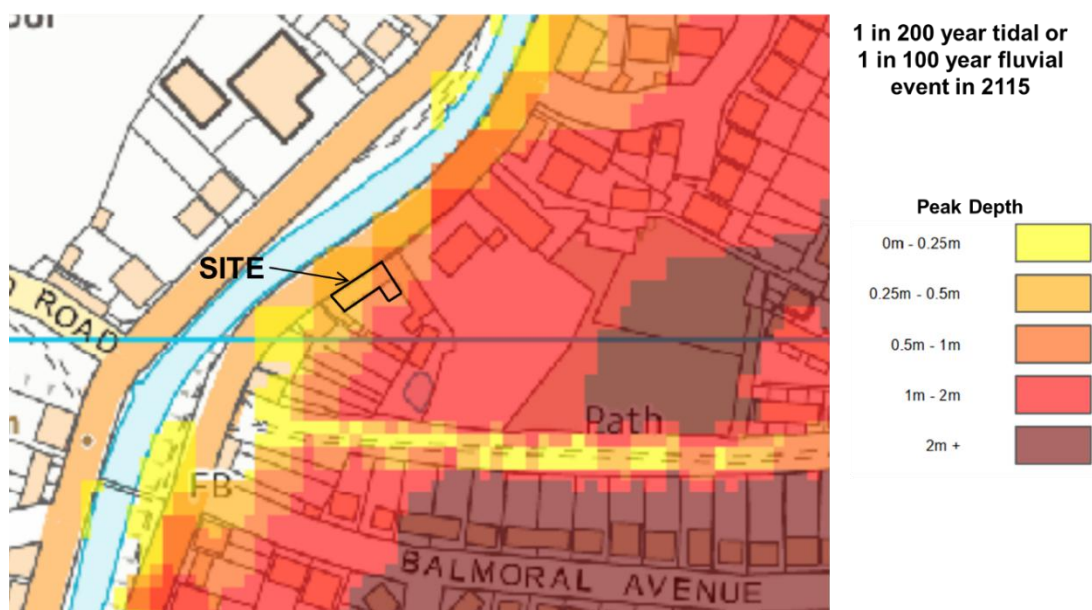
For flood depths of 500mm – 1.0m, FFL must be set 1.0m above existing ground level with flood resilient construction to a height of 300mm above the predicted flood depth.

For flood depths of 250mm – 500mm, FFL must be set 500mm above existing ground level with flood resilient construction to a height of 300mm above the predicted flood depth.

For flood depths of 0mm – 250mm, FFL must be set 300mm above existing ground level.

Summary of Flood Risk

The Environment Agency plan (shown below) of predicted depths of flooding in a 1 in 200 year fluvial or tidal event in 2115 indicates predicted flood depths of between 250mm and 500mm to Nos 15 and 16 Cowbit Road if a breach were to occur in the tidal bank of the River Welland.

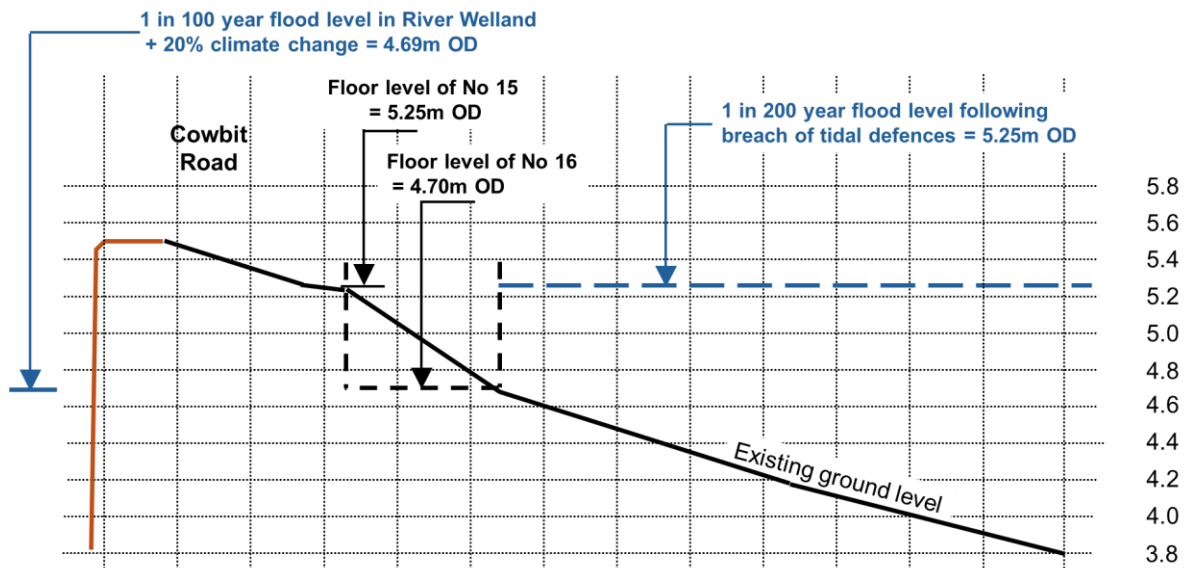


The map shown above indicates the predicted residual flood level in a 1 in 200 year event in 2115 will be higher than 5.20m ODN, as the level of Cowbit Road in front of the property is shown to be 5.5m OD.

The flood map shows higher flood depths than will actually occur, probably because the effect of flood water flowing over low sections of Cowbit Road and High Street into the River Welland has not been taken into account in the modelling.

With the alleviation of the flood water flowing into the River Welland it is concluded that the maximum flood level in the area between the River and the Coronation Channel is not likely to exceed 5.25m OD.

The predicted flood levels, and the maximum flood level in the River Welland, is shown on the section west to east below.



It is concluded that in a 1 in 200 year tidal event in 2115 there will be approximately 500mm depth of flooding to the ground floor of No 16 Cowbit Road. The flood water could be same level of the floor of No 15 Cowbit Road.

Recommendations

As the predicted flood depths to the existing ground floor are approximately 500mm in a 1 in 200 year and 1 in 1000 year event in 2115 it is recommended that there should be no habitable accommodation on the ground floor of No 16 Cowbit Road.

As the two buildings are linked residents will be able to remain safe by remaining in No 15 Cowbit Road or the upper floors of No 16.

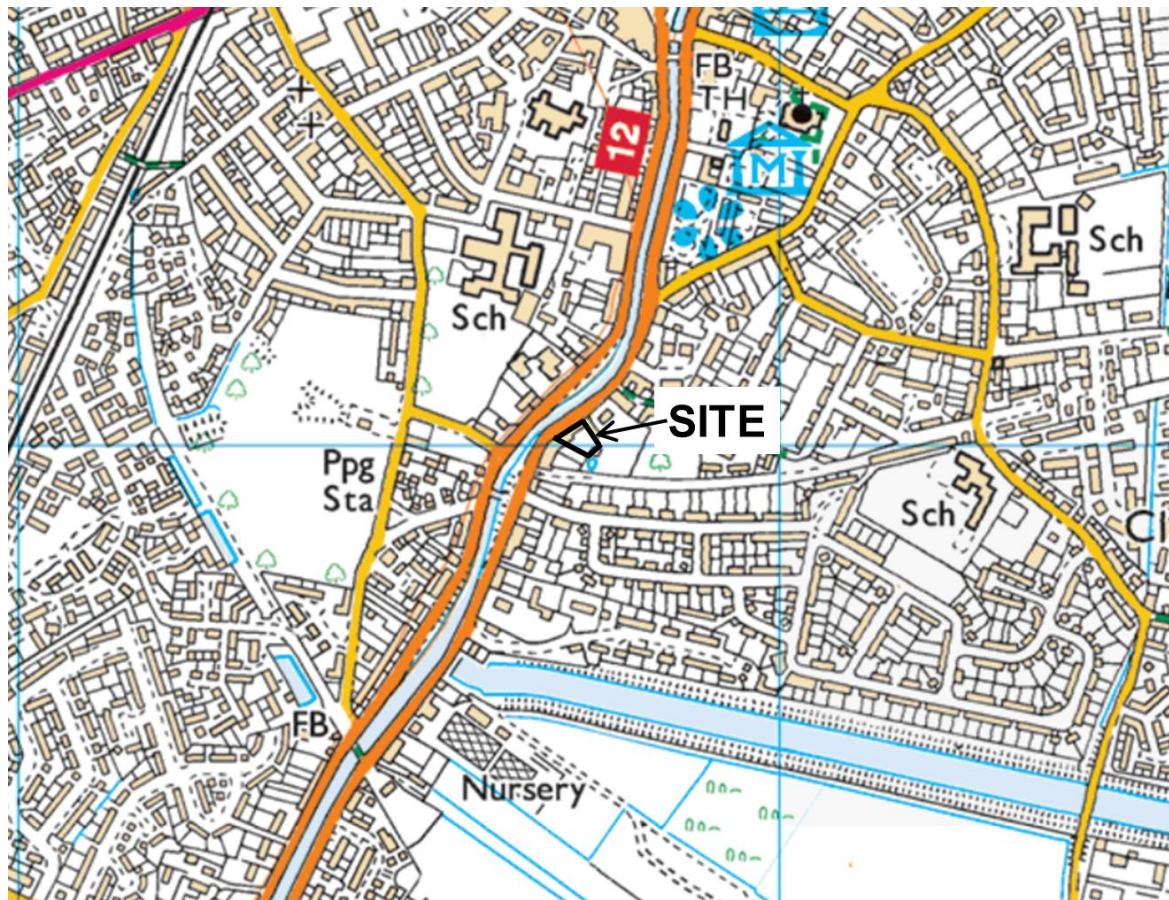
The present and future owners and occupiers of the properties should register with the Environment Agency's Floodline Warnings Direct Service.

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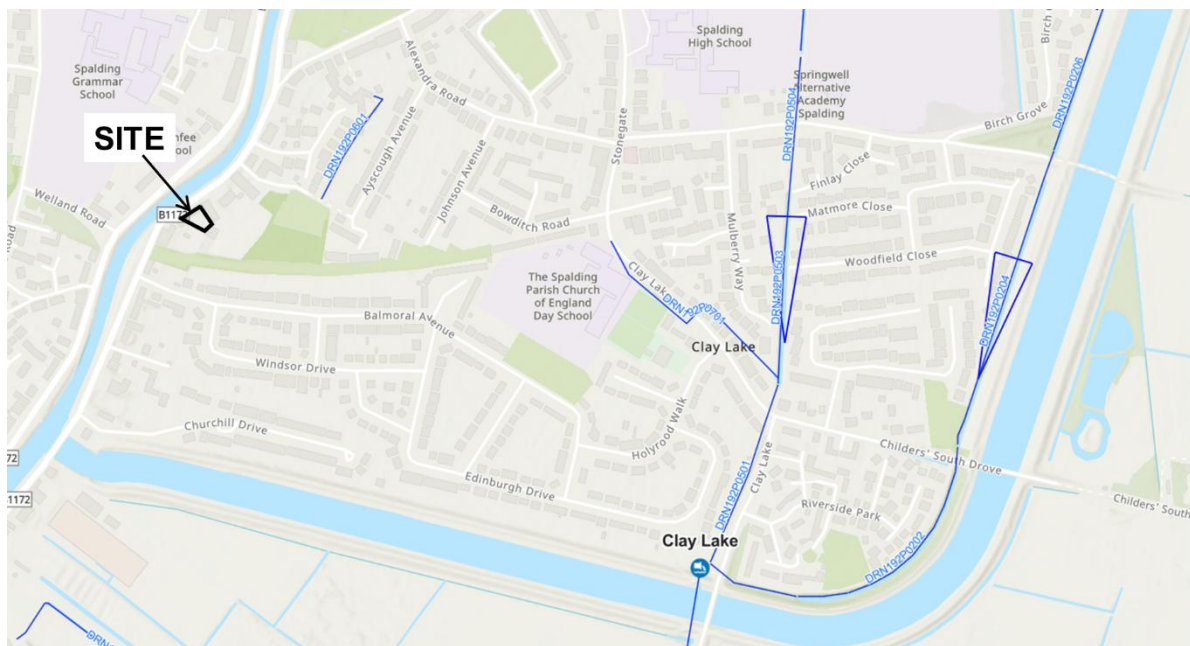
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5th March 2026

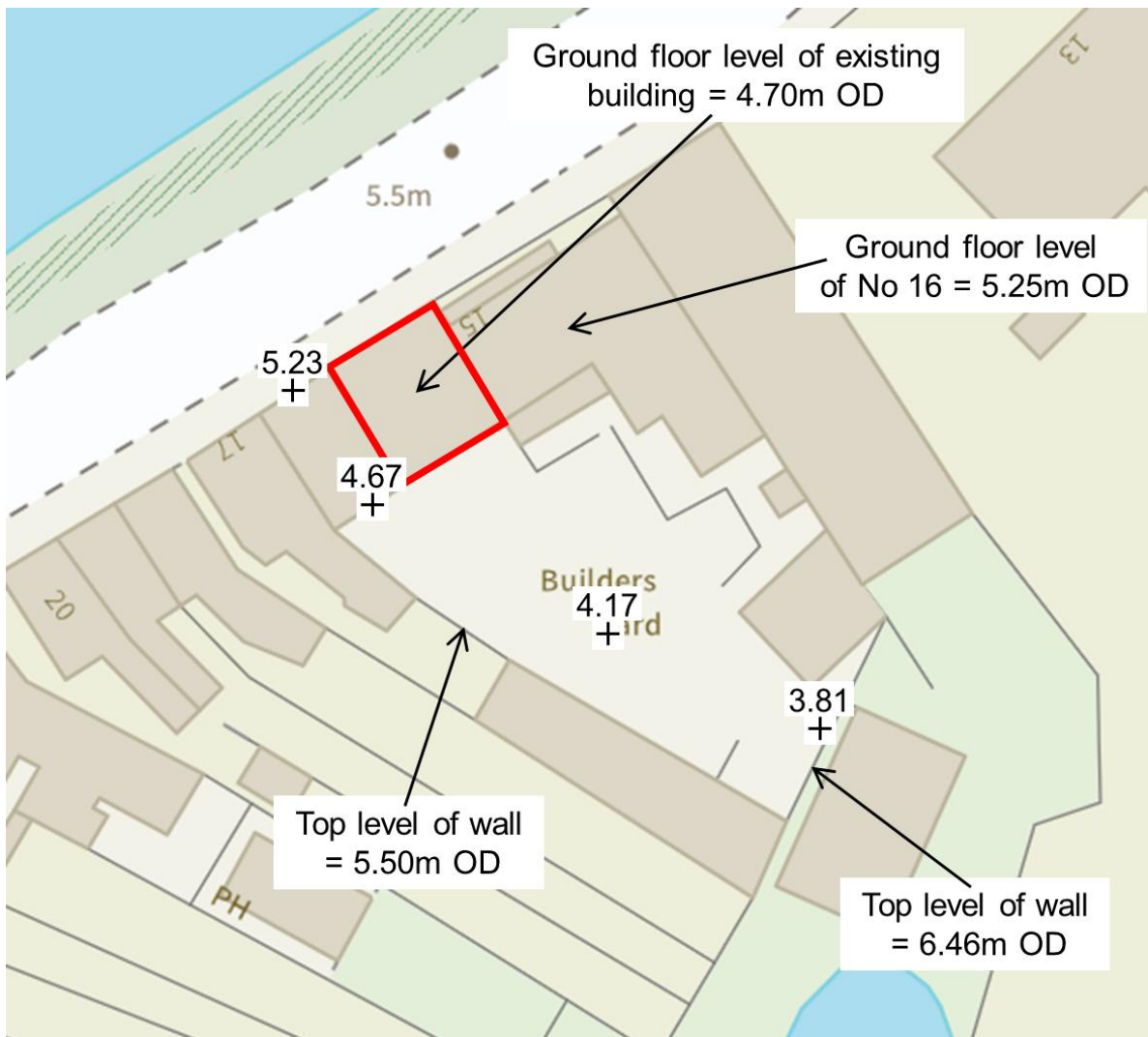
LOCATION PLAN



PLAN OF IDB DRAINS



BLOCK PLAN OF SITE WITH GROUND LEVELS



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 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 zone 3(a) the higher central and upper end should be used to assess the range of allowances.

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

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

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

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

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

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

Effects on Predictions of Flood Risk in FRA

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

- 1) Flooding from the tidal River Welland
- 2) Flooding from the fluvial section of the River Welland, the Coronation Channel or 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 may slightly increase the risk of a breach occurring in the tidal bank north of the site. It may also slightly increase the flow of water into the area between the Coronation Channel and the River Welland. However it will not change the conclusions and recommendations in this report.

Fluvial Flooding.

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.

Maximum flood levels in the River Welland and the Coronation Channel will not be increased by the increase in flows projected in the new climate change allowances. If flows increase by 65% in these systems it will have the affect of flooding over the long sections of bank between Spalding and Market Deeping and the maximum levels will not increase significantly.

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 as the major flood risk to this site is from tidal flooding then any increases in flow from fluvial sources do not need to be considered further.

Therefore it is considered that the mitigation proposed for the development, with the recommendation that that there should be no habitable accommodation on the ground floor of No 16 Cowbit Road, is satisfactory.