PROPOSED RESIDENTIAL DEVELOPMENT NORTH OF 80 SEAS END ROAD, SURFLEET, SPALDING, PE11 4DQ.

FLOOD RISK ASSESSMENT

Proposed site from Seas End Road

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This flood risk assessment has been prepared solely to support the planning application for the proposed new dwelling north of 80 Seas End Road, Surfleet, 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 submitted to South Holland District Council for planning permission to demolish the existing redundant building located on the site north of 80 Seas End Road, Surfleet, Spalding and to construct a new dwelling on the site. The properties on the opposite side of the road are located on the west bank of the River Glen. The development site is 1050 metres west of the main outfall sluice from the River Glen into the tidal River Welland.

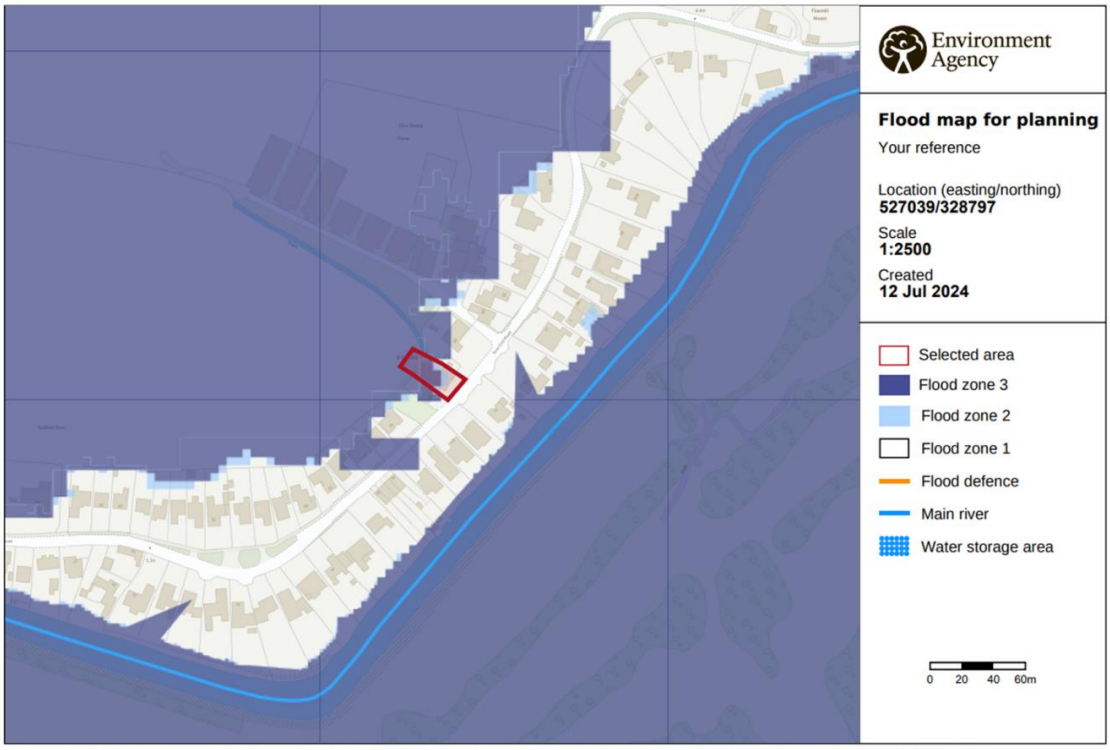
The site is within Flood Zone 1, 2 and 3 indicating a low risk on most of the site, as shown on the Environment Agency's (EA) Flood Zone map. These maps do not take into account existing flood defences.

The Planning Application requires a flood risk assessment to be carried out as required in the Technical Guidance to the National Planning Policy Framework (NPPF) 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) and is located in the Welland and Deepings Internal Drainage Board district.

Environment Agency (EA) Flood Zones

The map below is taken from the Environment Agency website and shows the flood zones in the area.



It can be seen that the site, which is immediately north west of the River Glen, is within flood zone 1, 2 and 3. The area to the north west of the site is mostly within flood zone 3.

Application Site

The development is located approximately 380 metres east of the new A16 road at Surfleet and three miles north of Spalding city centre. The National Grid Reference of the site is 527040 328800.

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 north west part of the proposed development which is within flood zone 3 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 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 for this new development the sequential and exception tests need to be applied.

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 east side of the site adjacent to Seas End Road is within flood zone 1, the central part of the site where most of the building is sited is within flood zone 2 and the western, lower part of the site is within flood zone 3. There does not seem to be any land within the Surfleet area in flood zones 1 and 2 which are available to be developed.

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

The site can be considered to be an infill site within the village of Surfleet. Clause 5.3.5 on page 61 of the South East Lincolnshire Local Plan 2011-2036, adopted in March 2019 states the following:

Within the defined boundaries there will be numerous opportunities for infill and larger-scale housing development that will be available to the local builder, self-builder, custom-builder and larger house-building companies. It is not practical to identify or anticipate all such opportunities; however, the positive tone of the Local Plan encourages such development 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

Consultants have produced a Strategic Flood Risk Assessment (SFRA) for the South Holland District Council (SHDC). This document provides details of the flood risk in

the Council's area. Reference to the maps in this document give the following information for the flood risk and hazard at the site for the 1% fluvial event and 0.5% tidal event.

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 … 0 – 500mm
Extent of flooding .. High
Peak Velocity …… Greater than 0.25m/sec

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 – 250mm
Extent of flooding …High
Hazard …… Danger for most (1.25 – 2.0)
Velocity ……. 0 – 0.3m/sec

1. **The maximum flood levels in the fluvial section of the River Glen shown in the SFRA are as follows:**

Year	2007	2115
1 in 100 year	4.13	4.65
1 in 1,000 year	4.18	4.68

The bank level on this side of the river at chainage 0.7km is shown to be 4.67m OD and at 0.8km it is 4.40m OD.

2. **The extreme tide levels in the section of the River Welland at chainage 16.1km is shown in the report as follows:**

	2007	2055	2115
1 in 100 year	5.99	6.32	7.13
1 in 1,000 year	6.32	6.65	7.46

The levels of the west bank of the tidal River Welland north and south of the River Glen outfall are at a level of approximately 7.50m OD and above, but the bank level at 16.1km, the River Glen outfall is shown to be 7.05m OD.

3. Rapid Inundation Zone:

The maps in the SFRA show that the site is not within the rapid inundation zone.

Information from the Environment Agency

The Environment Agency has provided predicted flood levels for the River Glen which are taken from the Welland Catchment Model produced in 2016. The levels quoted below are maximum predicted water levels in the River Glen directly south of the development site.

	2007	2007 including 20% climate change allowance
Peak 1 in 100 year flood level	4.19m OD	4.78mOD
Peak 1 in 1,000 year flood level	4.32m OD	4.83m OD

Information on Surface Water Flooding on Environment Agency Website

The map on the next page 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 the map shows there is no risk of flooding on the site in the low risk scenario but there is up to 300mm depth of surface water shown in the field behind the site.

Site Levels

A topographical survey has been produced showing levels of the site and surrounding areas. The relevant levels have been reproduced on the plan which is shown on page 14 of this report.

The level of Seas End Road south east of the site is between 4.28m OD.

The floor level of the existing building is estimated to be approximately 4.00m OD. No access to this building was available during the inspection of the site, and this level is not shown on the topographical survey.

The ground level at the rear of the existing building is 3.50m OD and the ground falls further to approximately 3.20m OD at the rear boundary of the site.

Existing Flood Alleviation Measures

The site is 1050 metres from the tidal sluice at Surfleet Seas End where the River Glen discharges into the tidal section of the River Welland. Both watercourses are main river and maintained by the Environment Agency.

Potential Sources of Flooding

The following sources of flooding have been identified:

1. Flooding from the River Glen.
2. Overtopping of the tidal River Welland.
3. Flooding from failure of IDB systems.
4. Surface water flooding.

1. Flooding from the River Glen

Flooding is likely to occur on the development site if the level in the River Glen exceeds 4.28m OD, which is the level of Seas End Road in front of the site. The properties on the eastern side of Seas End Road opposite the development site are sited on the bank of the river and there is no defence bank alongside this section of the river.

The maximum predicted level in the river in a 1 in 100 year event at the present time is 4.19m OD, and therefore at present time there is no flooding predicted on the site in this event.

The SFRA issued in 2010 indicates that the 1 in 100 year level for the year 2115 will be 4.65m OD. The EA have carried further modelling and the 2016 Welland Catchment model predicts the 1 in 100 year level in 2115 will be 4.78m OD. At this level the flood water would flow across the gardens of the properties on the east side of the road, and flood across Seas End Road onto the site. As the level behind the development site is lower than the road it would flow across the site onto the agricultural land west of the development site.

The 2016 catchment model allows a 20% increase of flows for climate change. Since that date further guidance recommends that this figure should be increased. However any increase in flows in the River Glen will lead to further overtopping of the flood banks upstream of Surfleet and the predicted maximum level is unlikely to rise above 4.78m OD.

Adequate mitigation will be provided by raising the ground floor level of the proposed property above the predicted flood level.

2. Flooding from the tidal River Welland

The River Welland is tidal in the section adjacent to the River Glen outfall sluice. The SFRA states that the defences are adequate to withstand a 1 in 200 year (0.5%) probability event for present day. In the future in 2115 some of the banks would be overtopped with a 0.5% probability event.

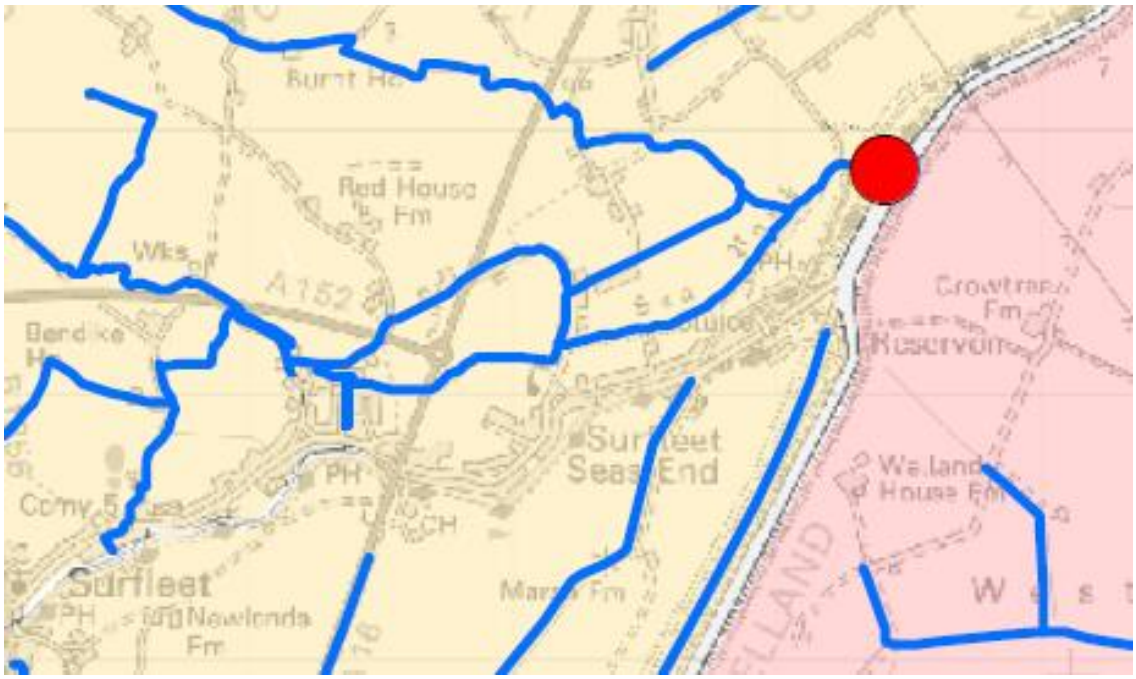
It is reasonable to assume that within the next 100 years the tidal defences will be raised to continue to provide a 1 in 200 year level of protection to this area.

The development site could be affected if the west bank of the tidal Welland north of Surfleet Seas End were to breach. Flood water would flow into Surfleet Marsh and could flow south westwards and reach the Development site. The hazard maps in the updated SFRA state that the predicted flood depth in a 1 in 200 year tidal event in 2115 could be up to 250mm in depth.

Adequate mitigation will be provided by raising the ground floor level of the proposed property to the level required to provide the mitigation required for the fluvial risk from the River Glen.

3. Flooding due to failure of IDB Systems.

There is a system of IDB drainage channels which drain the fenland area north of the site. These drainage channels flow to Surfleet Marsh Pumping Station where the water is pumped into the tidal River Welland. This pumping station provides an overall standard of protection to the area of between 1 in 50 and 1 in 100 years. There is an IDB drain, called Old Beach East Drain, immediately north of the site which runs eastwards to the pumping station. Welland and Deepings IDB have stated that the 1 in 100 year predicted maximum level at Surfleet Marsh Pumping Station is 1.75m OD, which is 1.50m lower than the lowest ground levels on the site.



It is expected that Welland and Deepings IDB will continue to review predicted 1 in 100 year levels over the next 100 years to ensure that freeboards are retained in the future.

As the proposed ground floor level of the property will be approximately 2.5 metres above the predicted maximum flood level in the IDB drain the risk of flooding from this source can be considered to be adequately mitigated.

4. <u>Surface Water Flooding</u>

There is a possibility of surface water from Seas End Road flowing onto the site following heavy rainfall. The raising of the ground floor levels above existing ground levels will provide adequate mitigation against any surface water flooding on the development site.

<u>Extent of known Flooding</u>

There is no history of flooding having occurred from overtopping or a breach in the bank in this section of the River Glen in the last thirty years. Flooding has occurred to

holiday properties at Surfleet Reservoir near the outfall sluice as these properties are at a low level and there are no flood defences. **Probabilities and Trends of Flooding**

The probability of this development flooding from Environment Agency tidal River Welland is very low. In an extreme event water levels in the River Glen could rise and flood the property but 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 – Extreme Events

The residual risk from extreme events is very low on this site. The major risk to the site is from high levels in the River Glen. The present levels of the banks of the River Glen along the stretch from Surfleet Seas End to West Pinchbeck are as low as 4.28m OD and overtopping of the river will begin to occur at these locations prior to overtopping occurring at a location which will affect the proposed development site.

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 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.

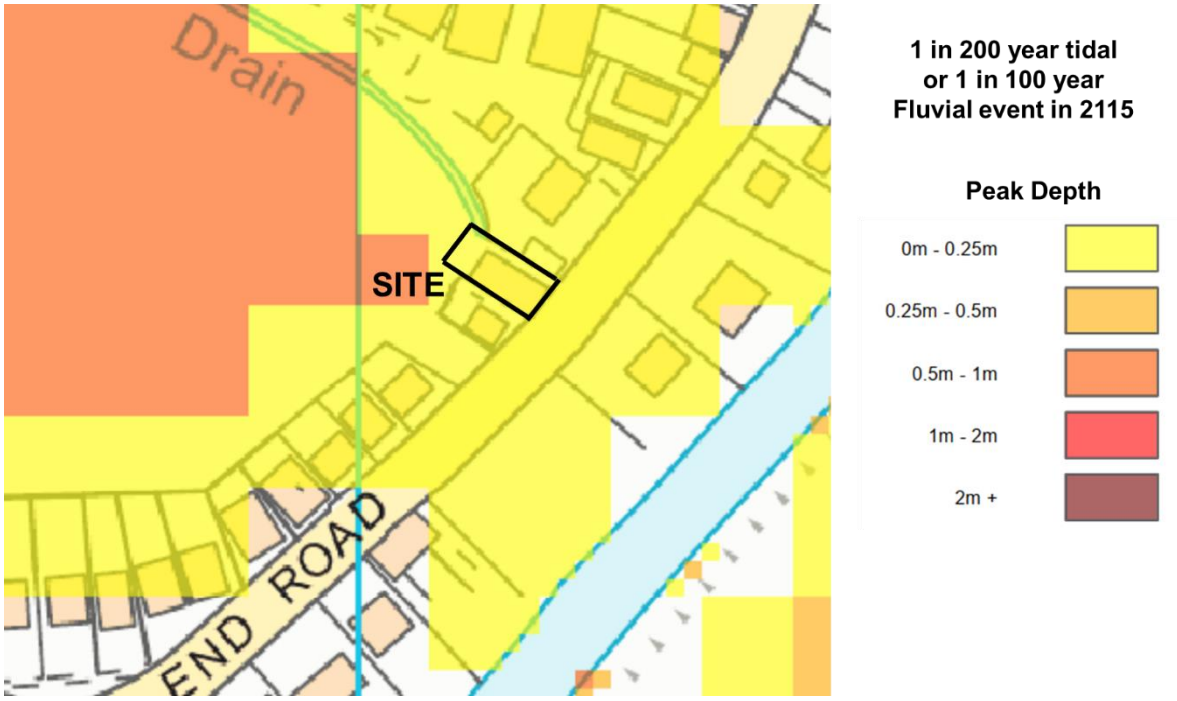
South East Lincs Advice Matrix

Advice can be found on the recommended mitigation required by referring to a spreadsheet on the South East Lincolnshire website. There is no designated advice in the Matrix for this type of development in flood zones 1 and 2.

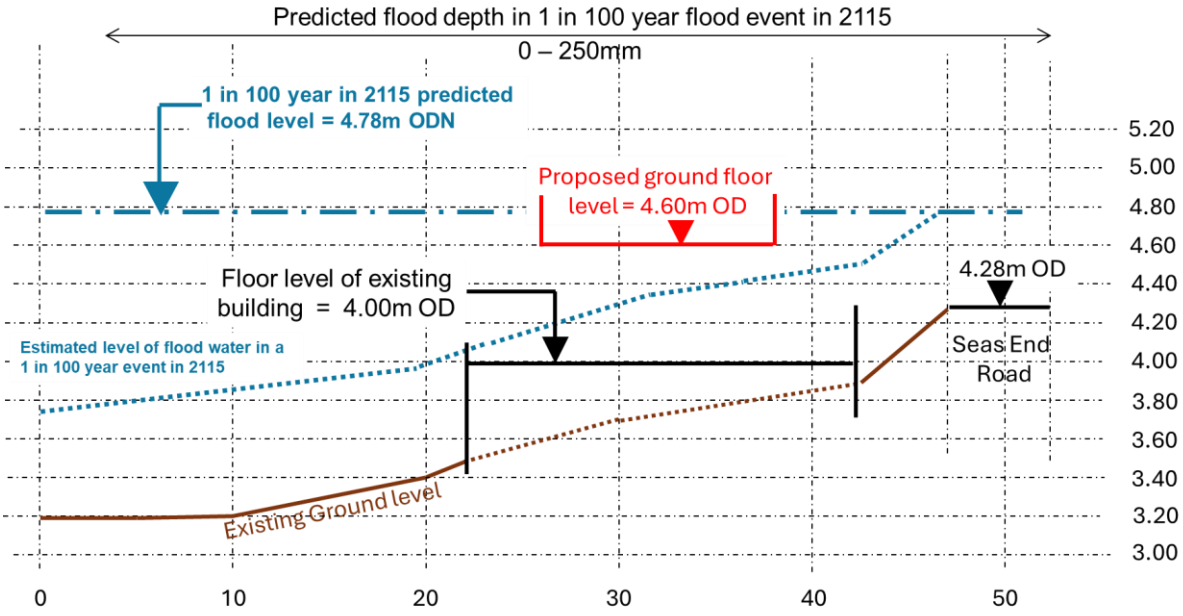
If the development were to be considered as in flood zone 3 and as the flood hazard is “danger for most” (1.25 to 2.0) reference would be made to Category D8 which states for a predicted flood depth of between 0 and 250mm the finished ground floor level should be 300mm above ground level.

Summary of Risk of Flooding to the Site

The updated SFRA indicates that the predicted depth of flood water would be 0 – 250mm depth at the development site in a 1 in 100 year event occurred in 2115. The map showing predicted flood depths in 2115 is shown on the next page.

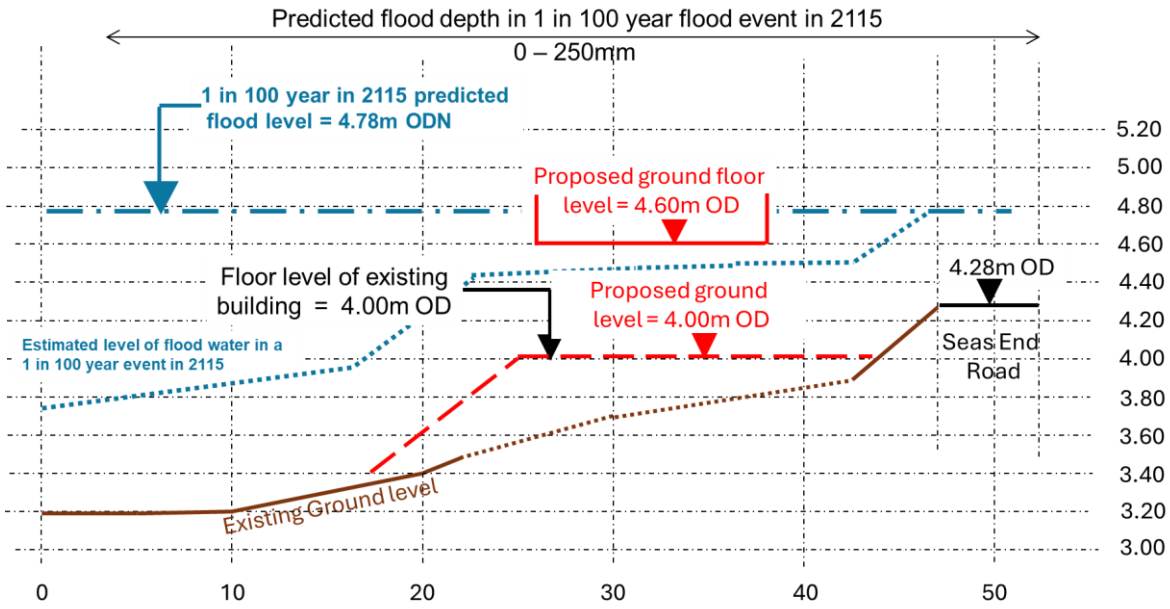


A cross section north west to south east has been produced which shows the ground levels of the site relative to the level of the road and the predicted maximum level of Seas End Road.



The cross section shows Seas End Road at a level of 4.28m OD and the floor level of the existing building at a level of approximately 4.00m OD. The site falls to a level of 3.20m OD at the rear of the plot. As far as can be seen from the road there is no flood defence at the rear of the properties on opposite side of the road.

The proposed ground level on the site around the new dwelling is 4.00m OD which is shown on the cross section below.



Therefore if the water level in the River Glen rises to a level of 4.78m OD in a 1 in 100 year event in 2115 flood water would flow over the road and would flow through the site and flood the site and the lower land. An estimated water level through the site has been shown on the cross section.

Conclusions

The maps in the updated SFRA indicate a predicted flood depth of between 0 and 250mm in a 1 in 100 year fluvial or a 1 in 200 year tidal event in 2115. It is assumed that this is the result of a tidal event.

All of the existing properties on the west side of Seas End Road are likely to suffer flooding in a 1 in 100 year event in 2115. The ground floor levels of some of the newer properties on the opposite side of the road which back onto the river have been set higher than the predicted flood level in 2115. This property should be raised to be above the predicted water level in 2115.

There is adequate mitigation for the hazard from any possible high levels in the IDB drainage system.

Any flooding that does occur will happen very slowly and residents of the building will have adequate time to monitor the water levels in the River Glen and take appropriate action.

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 a proposed new buildings should be of two story construction with all bedrooms at first floor level. This will provide a refuge for residents if the building were to become flooded in a greater than 1% probability event, and ensure there is no danger to residents when they are asleep.

The minimum ground floor level of the proposed building should be 4.60m OD.

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

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

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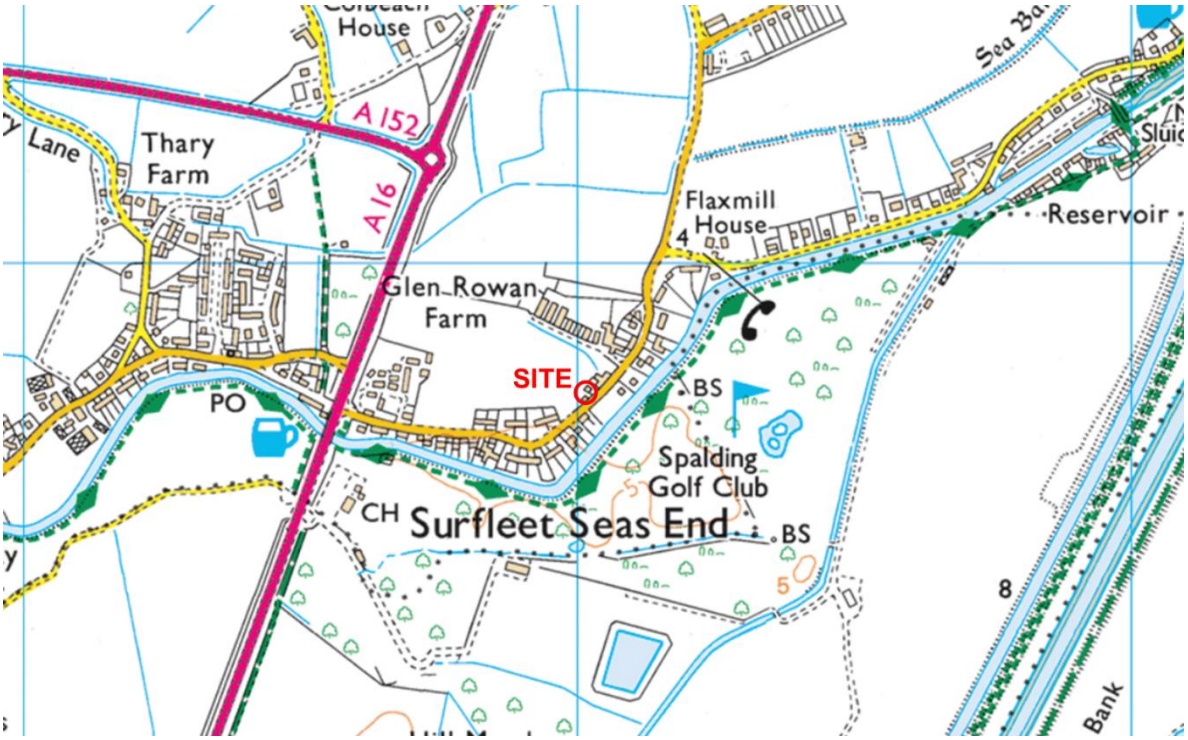
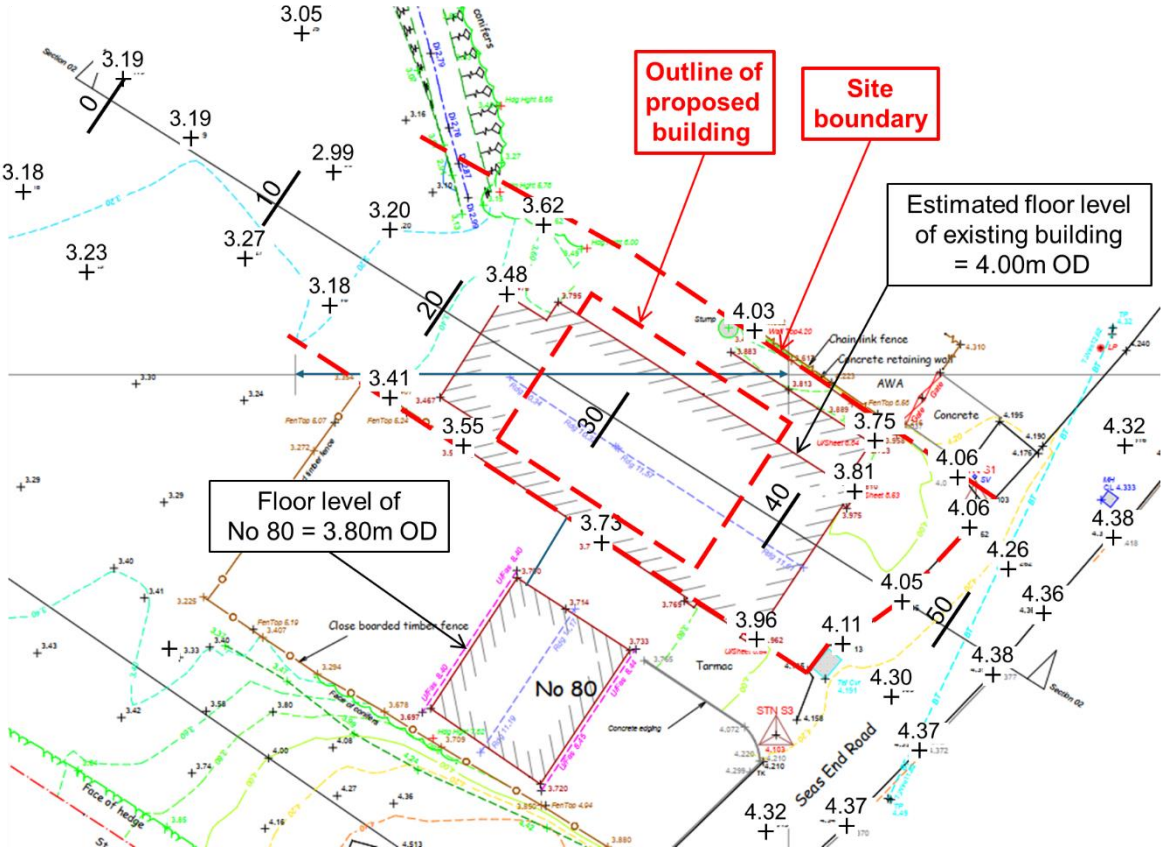
22nd July 2024.

LOCATION PLAN



SITE PLAN AND 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 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

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 the upper en and higher central category should be used to assess the range of allowances.

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

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

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

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

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

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

Effects on Predictions of Flood Risk in FRA

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 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 predicted flood level at the site in a 1 in 200 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.

Fluvial River Flooding.

As the development is in flood zone 1 and is classed as more vulnerable, the advice from the Environment Agency is that the central climate change allowance, which is 35%, should be considered. After considering the effects of this increase the higher central allowance, which is 65%, should be considered to assess the effect of this.

Maximum flood levels in the River Glen 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 effect of flooding over the long sections of bank between Surfleet and Bourne and the maximum levels will not increase significantly.

Flooding from IDB drainage system

As the development is in flood zone 1 and is classed as more vulnerable, the advice from the Environment Agency is that the central climate change allowance, which is 35%, should be considered. After considering the effects of this increase the higher central 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.

Welland and Deepings IDB, and all IDB's, are aware that climate change will affect the operations of pumping stations, sluices and drainage channels. Pumping stations and sluices only have a 30 year life and will need to be refurbished or rebuilt within this timespan. It is assumed that Welland and Deepings IDB will continue to review the modelling they have already carried out and when the Board consider these refurbishments adequate arrangements will be made to incorporate the latest climate change projections in order that 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 floor levels should be a minimum level of 4.60m OD, is satisfactory.