

PROPOSED REPLACEMENT DWELLING AT
BECK FARMHOUSE, FEN ROAD, DONINGTON, PE11 4XE
FLOOD RISK ASSESSMENT



View from South Side of Site

S M Hemmings B Sc C Eng MICE MIWEM,
13 Lea Gardens
Peterborough
PE3 6BY

This flood risk assessment has been prepared solely to support the planning application for a replacement dwelling at Beck Farmhouse, Fen Road, Donington. The author has made every effort to provide an accurate assessment of the flood risk but accepts no liability should the information be found to be incorrect or incomplete, or if it is used for any other purposes other than for which it was originally commissioned.

Introduction

An application is due to be made to South Holland District Council for planning permission to construct a bungalow immediately north of the existing house at Beck Farmhouse, Fen Road (A52), Donington, PE11 4XE. The site is at present a grassed area between the existing house and the road.

Most of the site is within Flood Zone 2 as shown on the Environment Agency's Flood Zone map. The flood zone maps do not take into account existing flood defences.

The Planning Application requires a flood risk assessment to be carried out as specified in the Practice Guidance to the National Planning Policy Framework Development and Flood Risk. The site is within a defended area as specified in the South Holland District Council's Strategic Flood Risk Assessment (SHDC SFRA) map and is located in the Black Sluice Internal Drainage Board District.

The main flood risk to this area is from high water levels in the South Forty Foot Drain and the Old Hammond Beck.

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 a greater part of the site is within flood zone 2 and the southern and western edges of the site are within flood zone 1.

Application Site

The site is located 2.6 km west of Donington and 1 km east of the South Forty Foot Drain. The National Grid Reference of the site is 518305, 335290.

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

The site is within Flood Zone 2 as defined in Table 1 of the Technical Guidance, and Table 2 of the Guidance defines the vulnerability of a residential development 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 2 is satisfactory.

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.

It can be seen that most of the area around Donington is within Flood zone 3, and therefore this location can be better than most sites in this area. As the proposed development is a replacement dwelling for the existing house then the development can be considered satisfactory.

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

Therefore I consider that the sequential test has been passed.

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 ... 0 – 500mm
	Extent of flooding....high
	Peak Velocity 0 – 0.1 m/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 flood probability
	Hazard zero
	Peak Velocity .. Nil
For the year 2115	Depth of flooding ...zero
	Extent of flooding .. Low or medium flood probability
	Hazard zero
	Peak Velocity .. Nil

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

Information Supplied by the Environment Agency

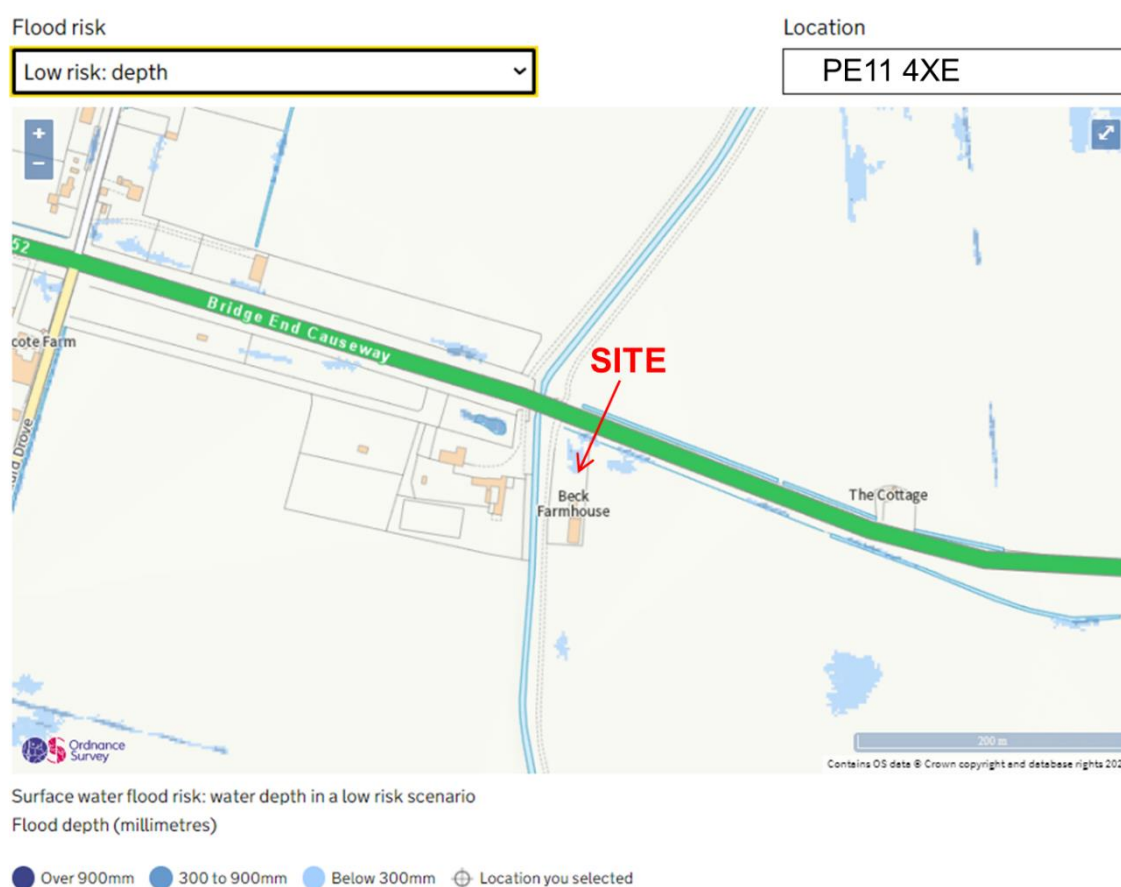
The Environment Agency has provided a map showing the modelled flood extents for the 1 in 10 year, 1 in 20 year, 1 in 100 year and 1 in 1000 year events at the present time and the 1 in 100 year and 1 in 1000 year with 20% extra added to allow for climate change. The map indicates that there is no predicted flooding to the site in any of the above scenarios. This map is reproduced on page 11 of this report.

The Environment Agency has provided predicted flood levels for the South Forty Foot Drain which are taken from the South Forty Foot Model, dated 2016. These levels are shown on the next page.

	2016	2016 including 20% CC
Peak 1 in 100 year flood level	3.08m OD	3.10m OD
Peak 1 in 1,000 year flood level	3.13m OD	3.13m 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 there is a predicted low risk of surface water flooding (below 300mm depth) around the proposed building.

Existing and Proposed Flood Alleviation Measures

The site is within a defended flood plain, as defined in Appendix 1 of the Environment Agency's "Policy and Practice for the Protection of Flood Plains", which is considered to be passive until such time that a flood greater than the defences can withstand occurs.

The site is located approximately 1.0 kilometre east of the South Forty Foot Drain which is maintained by the Environment Agency.

The site is located immediately east of the Old Hammond Beck which is a watercourse maintained by Black Sluice IDB.

There are piped and open watercourses in this area that are maintained by Black Sluice IDB.

Levels of the Site

Levels have been taken on the grass area where the development is proposed and these were found to be approximately 2.42m ODN. The datum used for this survey was a level of 3.50m ODN on the track which is located alongside the Hammond Beck Drain. The level of the Hammond Beck Drain on 23rd April 2021 was found to be approximately 0.0m ODN which is understood to be the normal level of this watercourse.

Potential Sources of Flooding

The following sources of flooding have been identified:

- 1) Fluvial flooding from the South Forty Foot Drain
- 2) Flooding from IDB drainage system
- 3) Flooding from local surface water systems.

1. Fluvial Flooding from South Forty Foot Drain

The site is 1.0km east of the South Forty Foot Drain (SFFD), which is the main arterial watercourse which conveys drainage water from the whole of the Black Sluice area to the Haven. The flows in the SFFD are controlled by two large sluices at Black Sluice Pumping Station which allow the water to discharge into the Haven when the tide is low. There are five large pumps at Black Sluice Pumping Station which used to be operated when flows were high. However recent studies have shown that an adequate water level can be maintained in the SFFD by discharging only through the sluices when tide levels allow and the BSIDB and the EA have agreed that the pumps are not required in the future.

The maximum water level recorded in the South Forty Foot Drain over the last 20 to 30 years is 3.00m ODN at the southern end of the Drain and probably 200mm lower than this at the outfall. This is approximately 300mm above the proposed minimum level of the proposed new bungalow.

Therefore it is concluded this will provide satisfactory mitigation against flooding from the South Forty Foot Drain.

2. Flooding from IDB Drainage system

The site is within the Donington North Ing Catchment of the Black Sluice IDB area. The water levels in this catchment area are controlled by Donington North Ing Pumping Station which is located on the east bank of the South Forty Foot Drain approximately 2.0km north of the development site.

There are 3 No electrically driven pumps at the pumping station and the total capacity of the pumping station is 3.05 cumecs. In an emergency one pump can be operated with a tractor through a PTO and there is also the facility to operate all of the pumps with a generator if the electricity supply fails. In low flow situations the water can flow by gravity into the South Forty Foot Drain through a gravity sluice.

The Black Sluice IDB has modelled the catchment and the results demonstrate there is no predicted flooding to any properties in the catchment in a 1 in 100 year event.

Mitigation against this flood risk will be provided as the ground floor level of the proposed buildings will be raised at least 300mm above the existing ground level on the site.

3. Surface Water Flooding

The map showing predicted surface water flooding on the Environment Agency website indicates there is a risk of surface water flooding to the site with a predicted depth of up to 300mm. As the finished floor level of the proposed development will be raised at least 300mm above the existing ground this will provide adequate mitigation against the risk of surface water flooding.

Extent of known Flooding

The South Forty Foot Drain has risen to a maximum level of 3.00m ODN a number of times in the past twenty or thirty years. No significant flooding has resulted in the area of the proposed development in these events.

In 1998 the east bank of the South Forty Foot Drain (SFFD) just north of Black Hole Drove failed (breached) and water flooded onto the adjacent fields. The Drainage Board and the EA managed the situation by switching off all of the IDB pumps in the area which significantly reduced the level of the SFFD (which was 3.00m ODN at the peak). The temporary bank was carried out within twelve hours limiting the extent of flooding to agricultural land.

Climate Change

The recommendations for flood depths for this flood risk assessment use information provided by the Environment Agency which was produced in 2006. The EA have issued new guidance on recommended contingency allowances for predicted sea 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 12 to 15). 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 2 and there is no predicted flood hazard reference should be made to Category H8 which states "No Comment"

Conclusions

The following maps have been considered to assess the risk of flooding to the site:

- 1 in 100 year predicted flood depth in 2115 on South East Lincs website
- 1 in 1000 year predictions for flood extent shown on the Environment Agency map (reproduced on page 11 of this report).

Neither of these maps indicate any predicted flooding to this area east of the Hammond Beck Drain.

Recommendations

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

However the flood risk at this location can be considered to be low and therefore it is considered that adequate mitigation against flooding would be provided to a single storey bungalow with bedrooms on the ground floor as long as the floor levels are raised by a minimum of 300mm.

The developer should advise owners and occupiers of the properties to register with the Environment Agency's Floodline Warnings Direct Service.

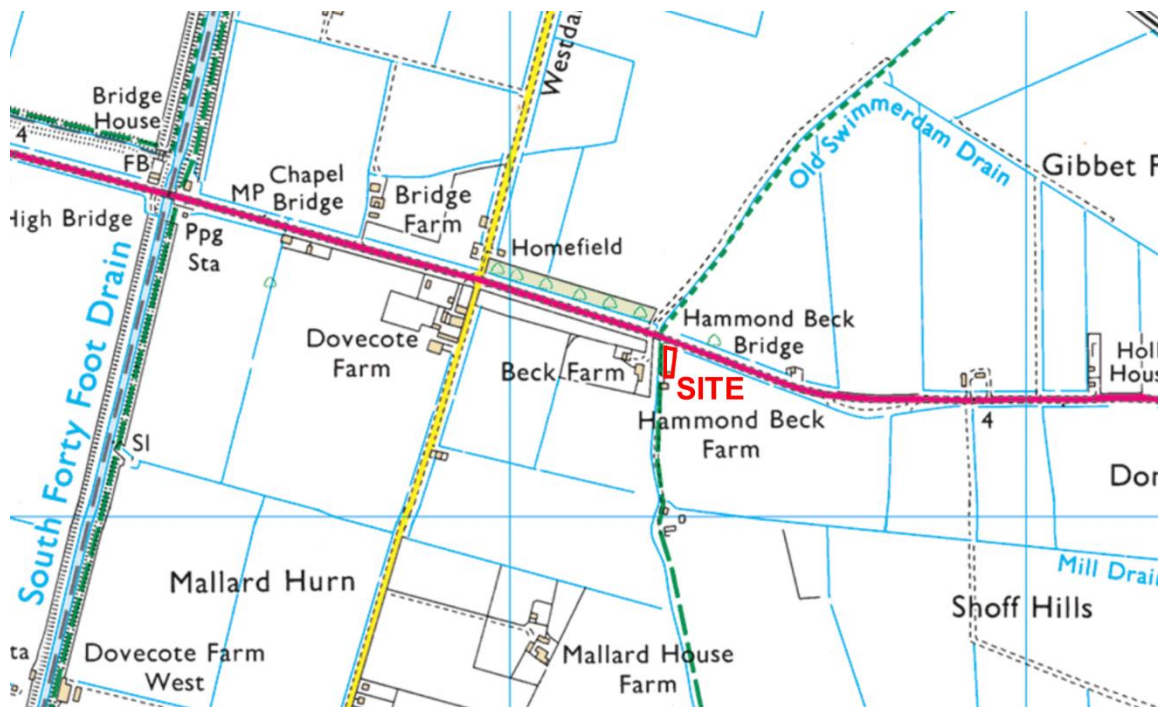
Rainwater from the roofs of the buildings should be discharged if possible into soakaways and these should be designed to BRE Digest 365 and approved under Building regulations.

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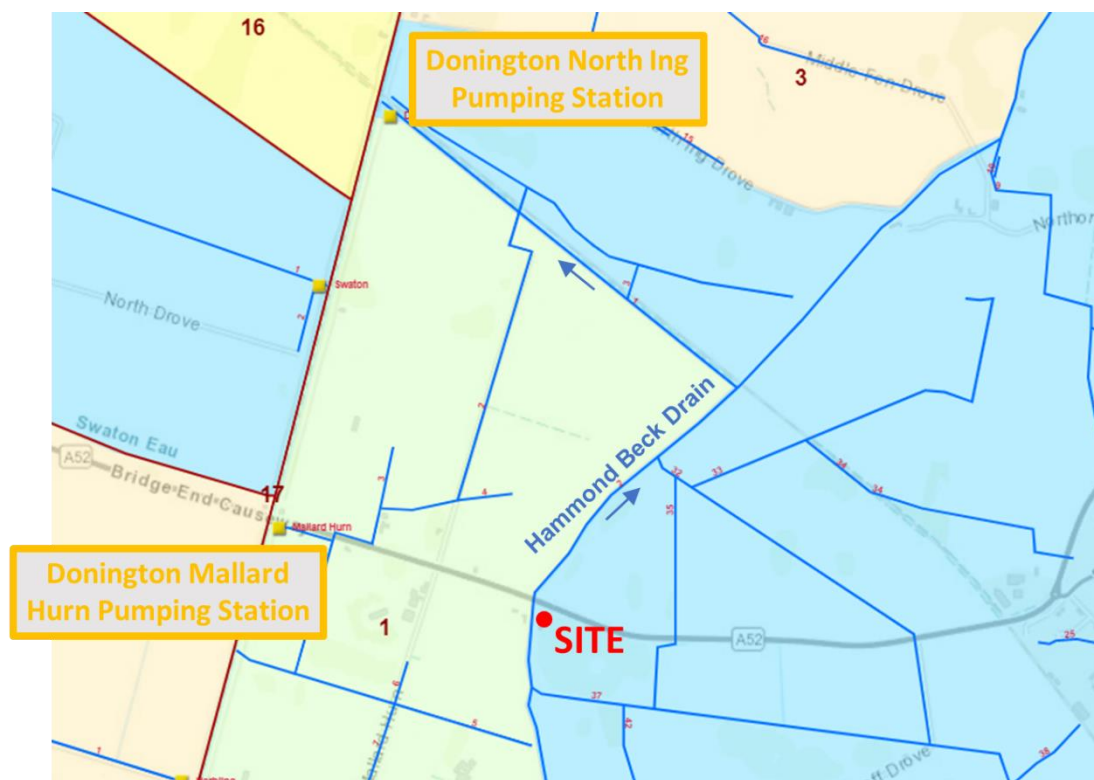
stuart.hemmings@btinternet.com

8th May 2021

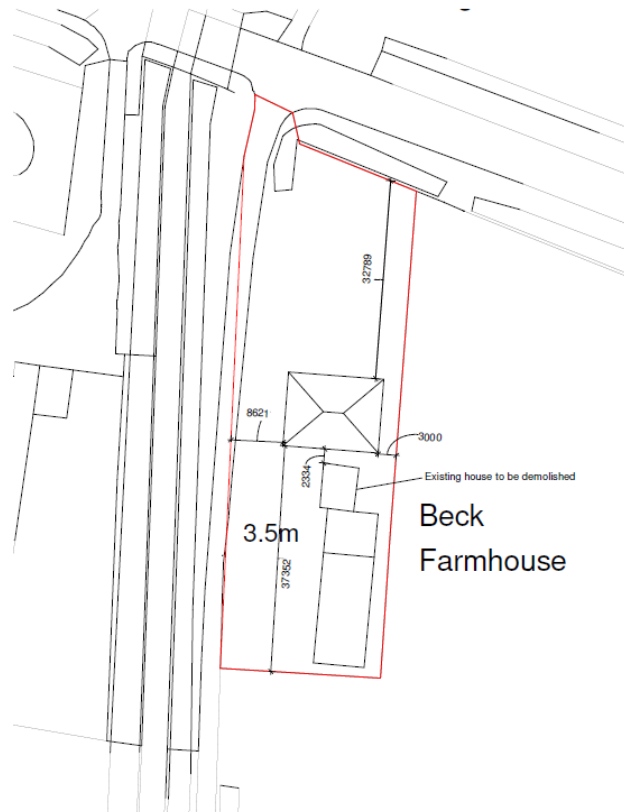
LOCATION PLAN



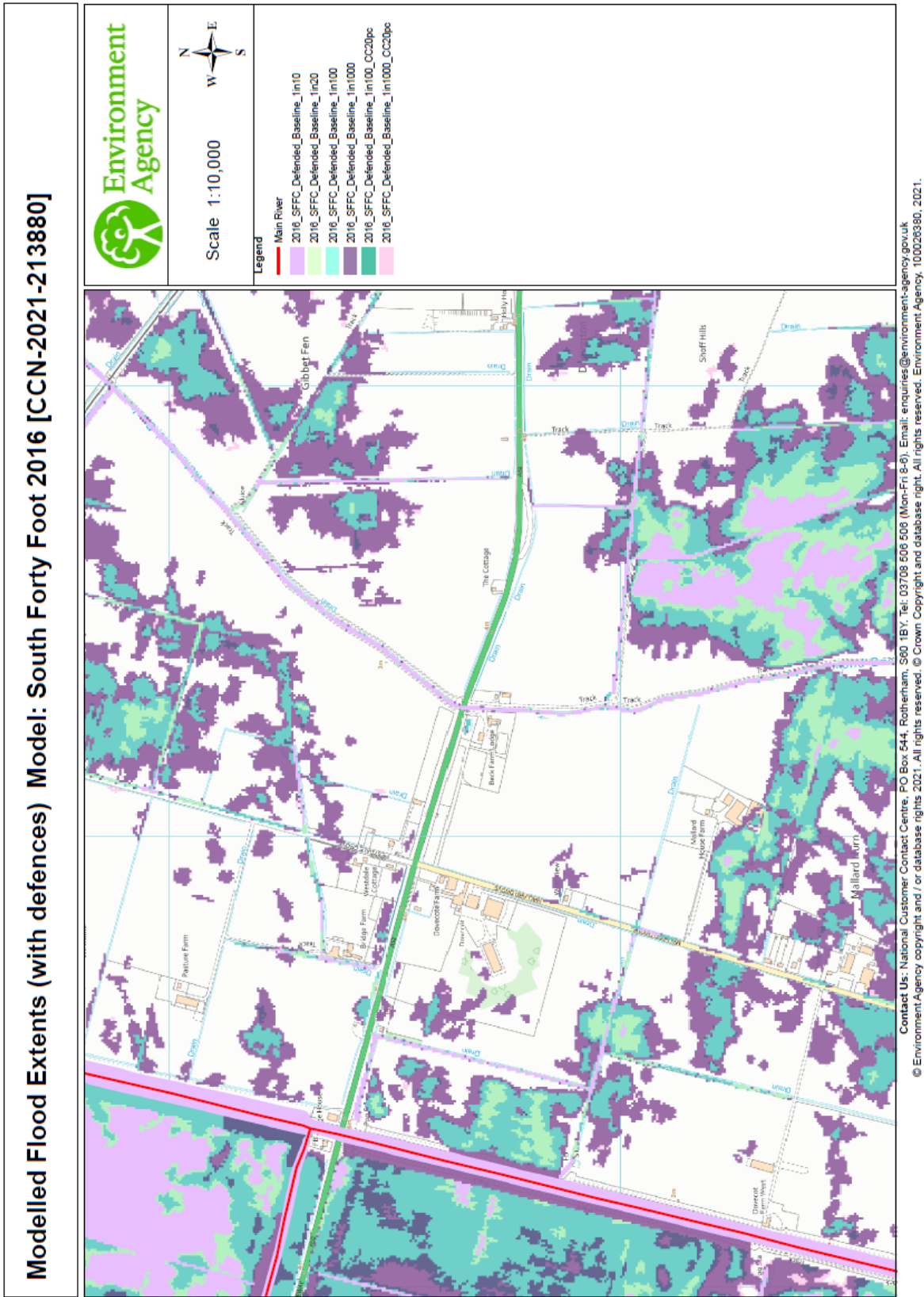
PLAN OF BLACK SLUICE IDB DRAINAGE NETWORK



PLAN OF PROPOSED DEVELOPMENT



ENVIRONMENT AGENCY MODELLED FLOOD EXTENTS



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 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

The report has identified that the main sources of flooding to the proposed development are from the South Forty Foot Drain and the IDB drainage system

As the development is in flood zone 2 and are 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 allowance, 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 or overtopping were to occur in the South Forty Foot Drain (SFFD). If there are additional flows along this part of the SFFD it will lead to overtopping in the upper reaches of the highland drains west of the SFFD. There will be no additional flows from the IDB pumping stations into the SFFD and these additional flows will be stored in the IDB system.

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.

Black Sluice 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 Black Sluice 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 level should be raised by a minimum of 300mm above ground level, is satisfactory.