

PROPOSED AGRICULTURAL WORKERS DWELLING AT
GIBBET FEN, FEN ROAD, DONINGTON, SPALDING, PE11 4XE
FLOOD RISK ASSESSMENT



View of site looking south

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 dwelling at Gibbet Fen, 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 an Agricultural Workers Dwelling in Gibbet Fen approximately 500 metres north of Fen Road (A52), Donington, PE11 4XE. The site is at present part of an agricultural field. A new roadway is planned which will lead to the proposed new poultry farm which gained planning approval in October 2022 (planning reference H04-0130-22). The manager of the poultry farm will reside in the proposed dwelling in order for the site to be monitored 24 hours a day.

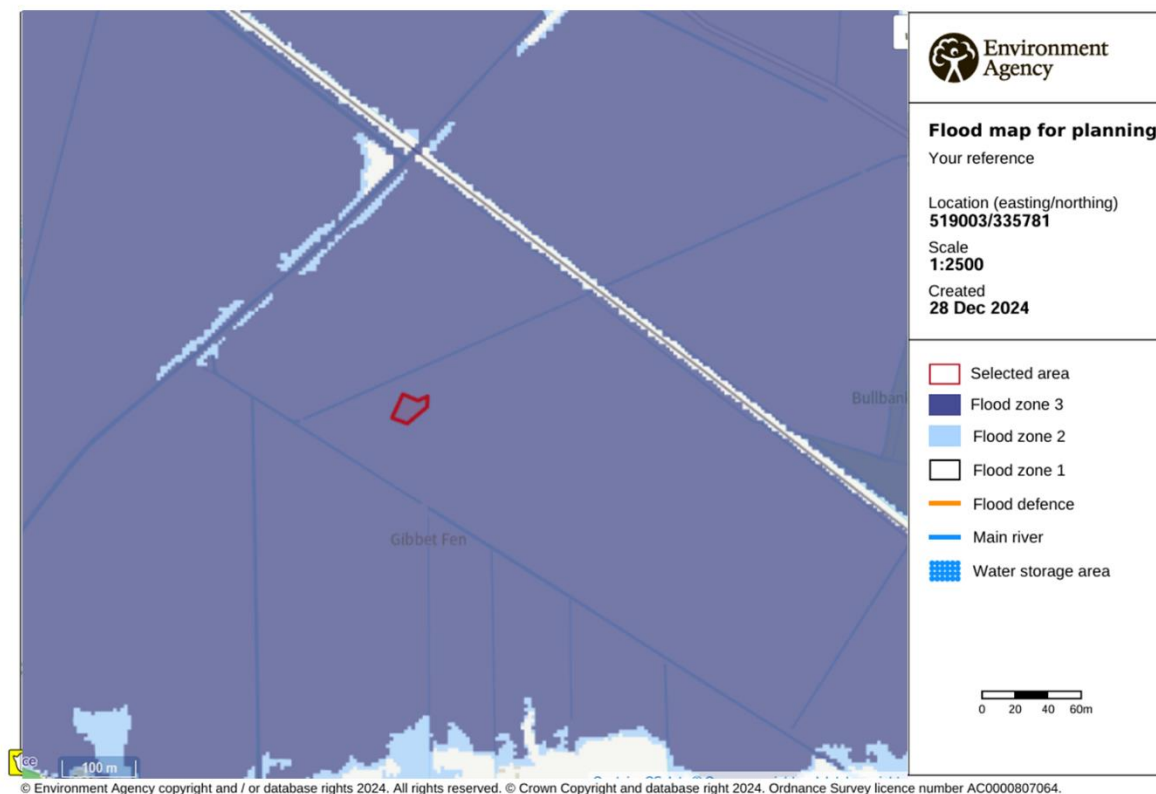
The site is within Flood Zone 3 as shown on the Environment Agency's Flood Zone map. The flood zone maps do not take into account existing flood defences.

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 all of the site is within flood zone 3.

Application Site

The site is located 1.8 km west of Donington and 1.5 km east of the South Forty Foot Drain. The National Grid Reference of the site is 519005, 335780.

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

The site is within Flood Zone 3 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:

<u>Flood Zones</u>	<u>Flood Risk Vulnerability Classification</u>				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	X	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	X	X	X	✓*

Therefore it can be seen that for “More vulnerable” development in flood zone 3 the sequential and the exception test need to be considered.

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 dwelling for an agricultural manager who is required to live near to a proposed poultry farm 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.

Exception Test

The Sequential Test has demonstrated that it is not possible, consistent with wider sustainability objectives, for the development to be located in zones with a lower probability of flooding. Therefore the Exception Test must be applied and for this to be passed:

- It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risks, informed by the Strategic Flood Risk Assessment; and
- A site-specific flood risk assessment must demonstrate that the development will be safe for its lifetime taking into account of the vulnerability of its users, without increasing flood risk elsewhere, and where possible will reduce flood risk overall.

Both parts of this test must be satisfied in order for the development to be considered appropriate in terms of flood risk. There must be robust evidence in support of every part of the test.

The first section will be demonstrated by the Supporting Planning Statement and compliance with South Holland District Council's planning policies.

This flood risk assessment will demonstrate that the development will be safe for its lifetime and it will not increase flood risk elsewhere.

Strategic Flood Risk Assessment

The Strategic Flood Risk Assessment (SFRA) written for the South Holland District Council (SHDC) in 2010 provides details of the actual flood risk in the Council's area. This information has not been updated and reference to the maps in this document give the following information for the actual flood risk and hazard at the site for the 1% fluvial event and 0.5% tidal event.

For the present day	Depth of flooding ... zero
	Extent of flooding .. Low or medium flood probability
	Peak Velocity Nil
For year 2115	Depth of flooding ... 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

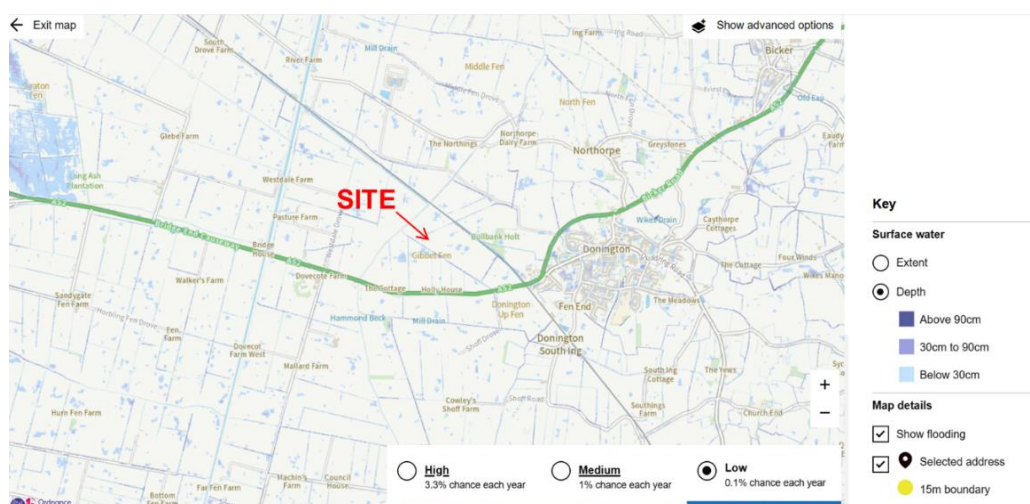
The Environment Agency has provided a map showing the modelled flood extents for the 1 in 10 year, 1 in 20 year, 1 in 100 year and 1 in 1000 year events at the present time and the 1 in 100 year and 1 in 1000 year with 20% extra added to allow for climate change. The map shows that the site of the proposed dwelling is just within the area coloured purple indicating it may be affected by flooding in a 1 in 1000 year event both at present and in 2115. This map is reproduced on page 13 and an enlarged section of the map is shown on page 9 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 below.

	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 below 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 no predicted surface water flooding for the low risk scenario on the site.

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.

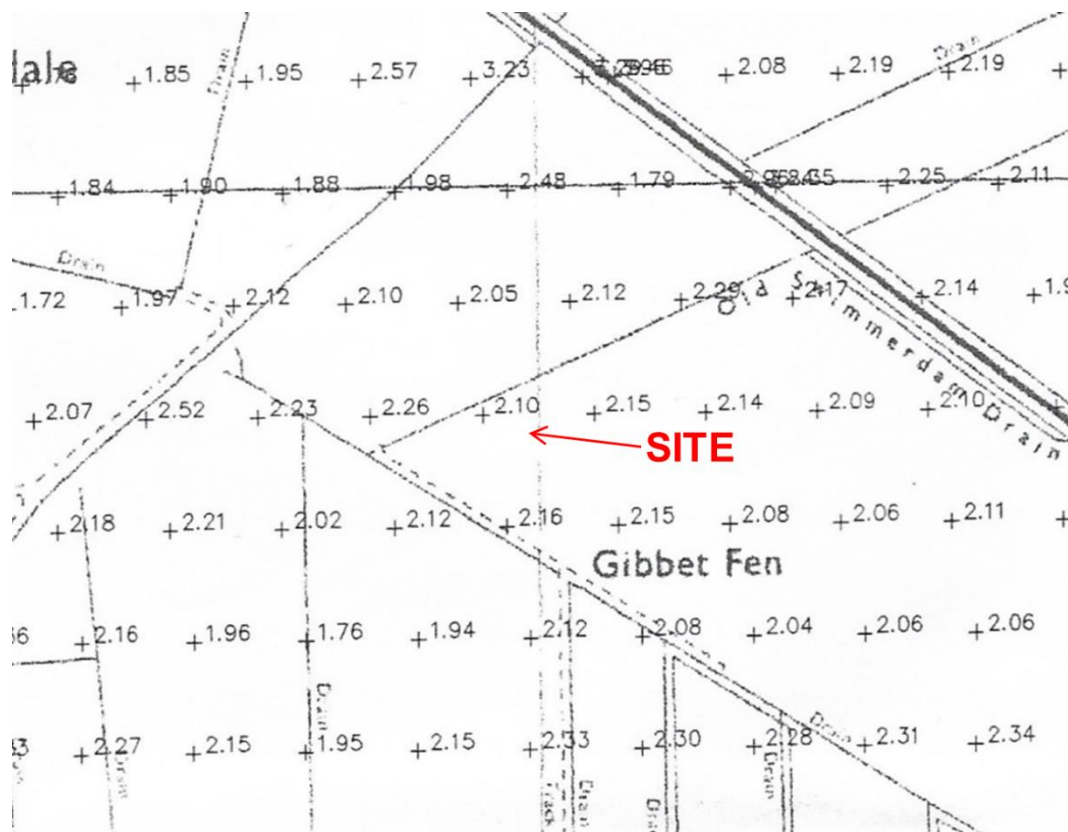
The site is located approximately 1.5 kilometres east of the South Forty Foot Drain which is maintained by the Environment Agency.

The site is located 250 metres south 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

The following plan shows LIDAR levels in Gibbet Fen.



This indicates the level on the site is approximately 2.1m OD. The normal level of the Hammond Beck Drain is approximately 0.0m ODN.

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 1.5km 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 studies undertaken 10 – 15 years ago indicated that an adequate water level could be maintained in the SFFD by discharging only through the sluices when tide levels allow and the EA decided that the pumps should not be maintained and operated in the future.

The maximum water levels recorded in the South Forty Foot Drain prior to 2013 were approximately 3.00m OD. However over the last 10 years levels of approximately 3.30m OD have been recorded at Black Hole Drove Pumping Station and recently there has been overtopping of the banks which has lead to 20 properties being flooded and banks being overtopped and damaged.

It can be concluded flooding is not predicted to the site of the proposed dwelling in a 1 in 100 year event but some low level flooding could occur in a 1 in 1000 year event.

It is concluded that raising the ground floor level of the bungalow by 500mm 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 1.8km north west 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 bungalow will be raised at least 500mm 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 by 500mm 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). Temporary bank repairs were carried out within twelve hours limiting the extent of flooding to agricultural land.

There have been a number of heavy rainfall events in Autumn 2024 and early January 2025. Overtopping occurred in one of these events which caused flooding in Dunsby Fen. The overtopping damaged the bank of the South Forty Foot Drain leading to further flooding in Dunsby Fen early this year. This is in addition to the 20 properties flooded in this event.

No land in Gibbet Fen has been flooded in the past 55 years since the Black Sluice IDB major improvement scheme was carried out.

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 14 to 17). It is concluded that no extra mitigation measures are necessary to comply with the new guidance on climate change.

South East Lincs Advice Matrix

Advice can be found on the recommended mitigation required by referring to a spreadsheet on the South East Lincolnshire website. As the development is in flood zone 3 and with a low flood hazard reference should be made to Category F8 which states:

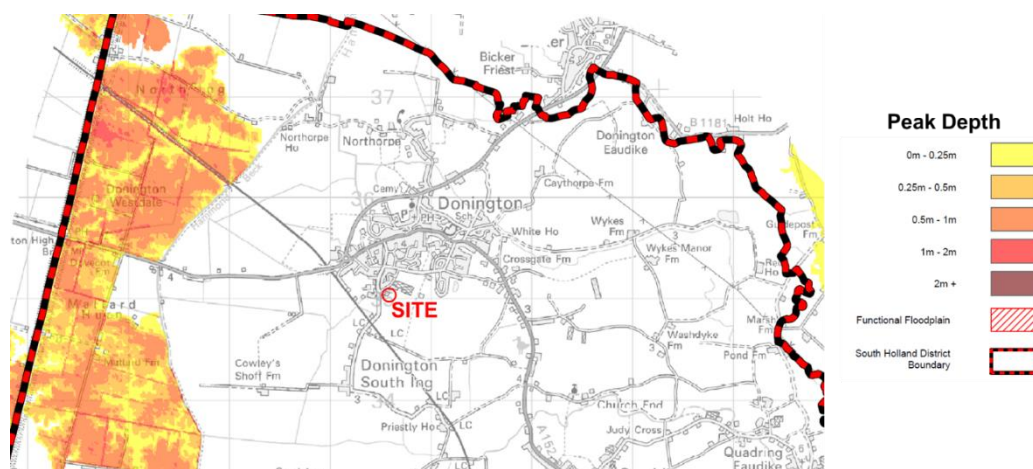
The NPPF requires that proposals are accompanied by a Flood Risk Assessment which contains evidence that appropriate mitigation measures / flood resilience techniques have been incorporated into the development.

The applicant is advised to refer to the document “Improving Flood Performance of New Buildings Flood Resilient Construction (DCLG2007).

Finished floor levels (FFL) should be set 300mm above ground level for two storey proposals. Single storey proposals must set FFL's above the 0.1% event breach in the 2115 scenario.

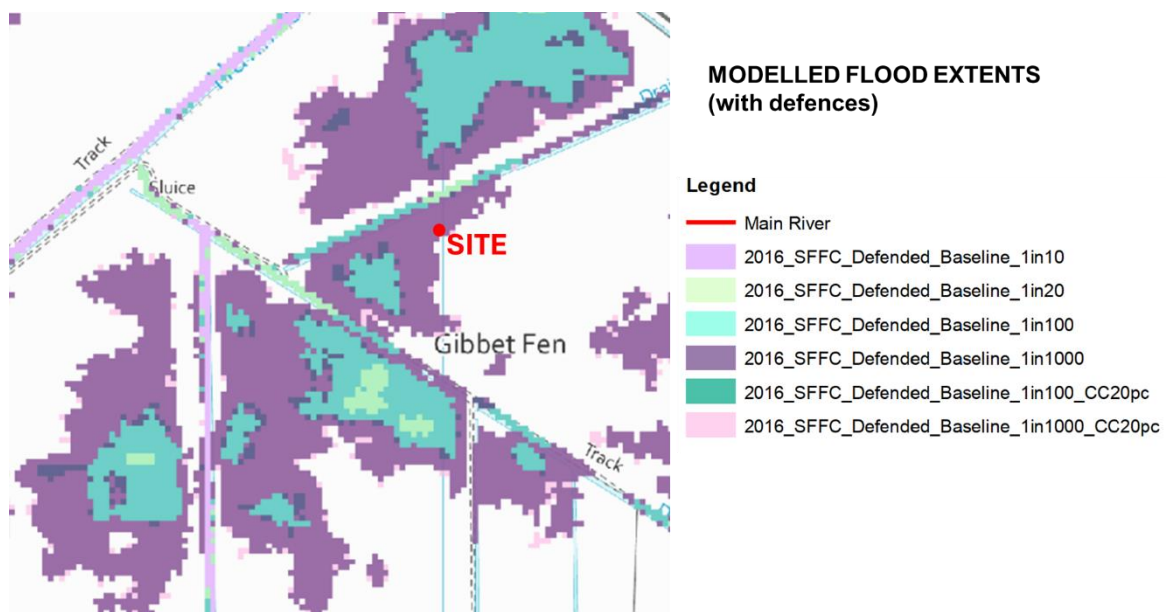
Summary of Risk of Flooding to the Site

The map of predicted flood depths in the SFRA (an extract of which is shown below) indicates that no flooding is predicted to take place in a 1 in 100 year fluvial or a 1 in 200 year tidal residual event in 2115.



It can be seen that this map shows there would be no predicted flooding east of the Hammond Beck in this scenario.

The Environment Agency have produced a map of the area which shows the modelled flood extents (with flood defences) for various return periods.



The map indicates that the site would be at the edge of the extent of flooding in a 1 in 1000 year (with 20% allowance for climate change) event. Referring to the map showing the LIDAR levels (see page 6) the predicted flood level in a 1 in 1000 year event would be approximately 2.1m OD.

Therefore it is recommended that the floor level of the proposed bungalow should be a minimum of 500mm above the existing ground level on the site to provide adequate mitigation against flooding in this area.

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 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 500mm.

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

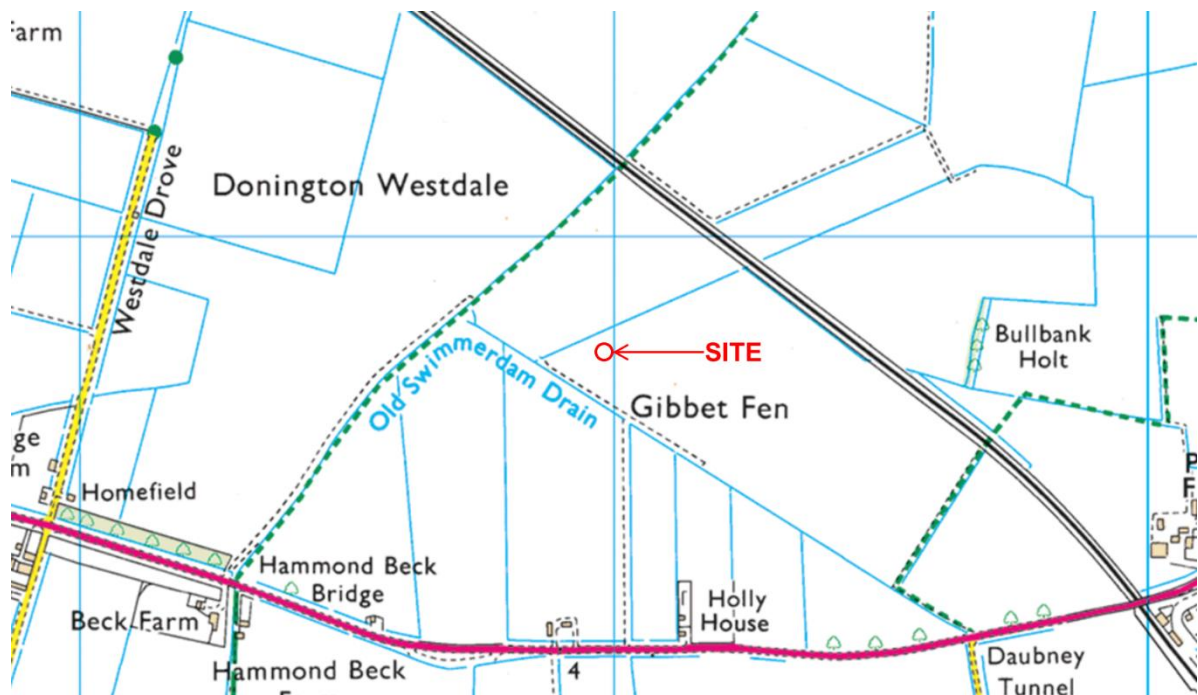
Rainwater from the roofs of the buildings should be discharged if possible into soakaways and these should be designed to BRE Digest 365 and approved under Building regulations.

S M HEMMINGS B Sc C Eng MICE MIWEM

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20th January 2025

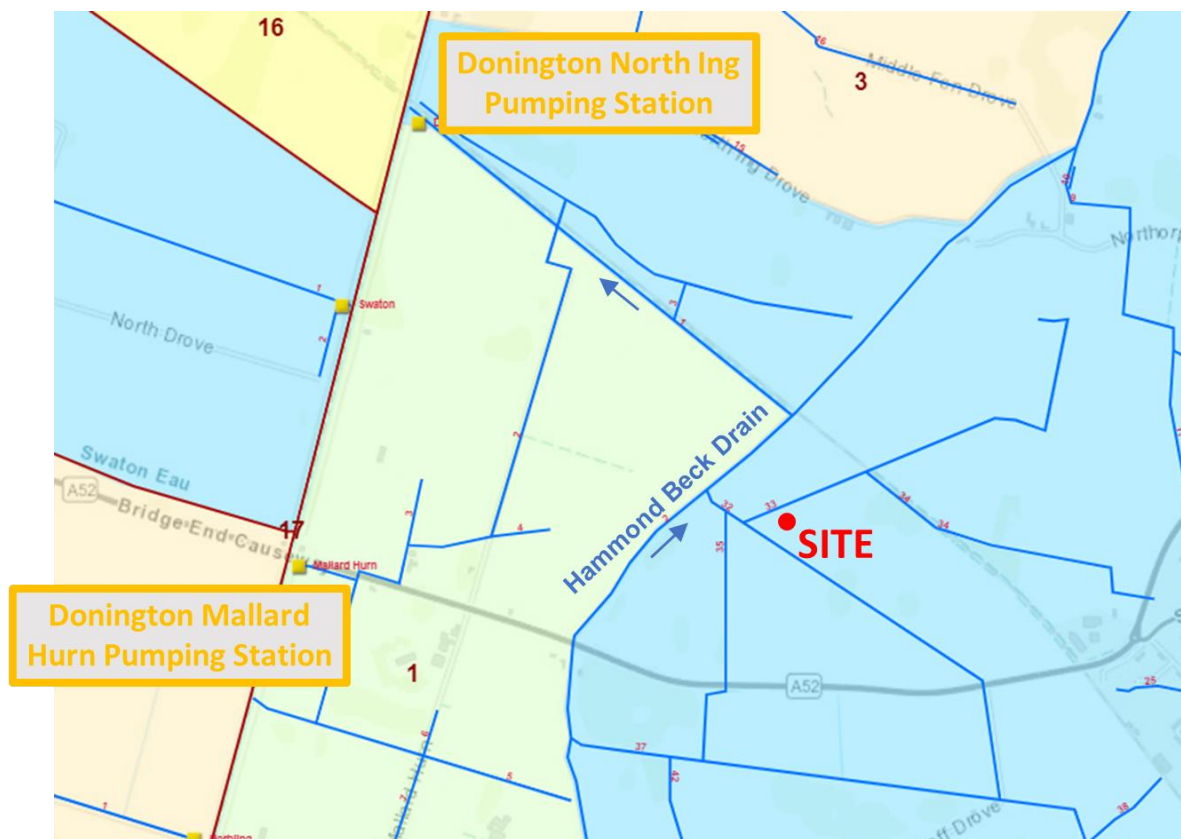
LOCATION PLAN



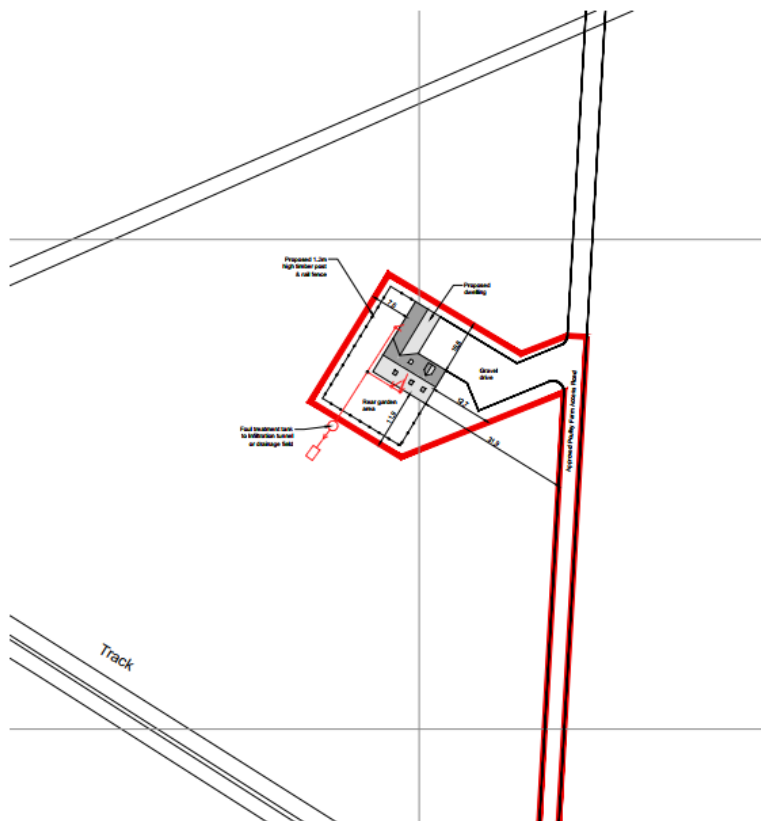
LOCATION PLAN



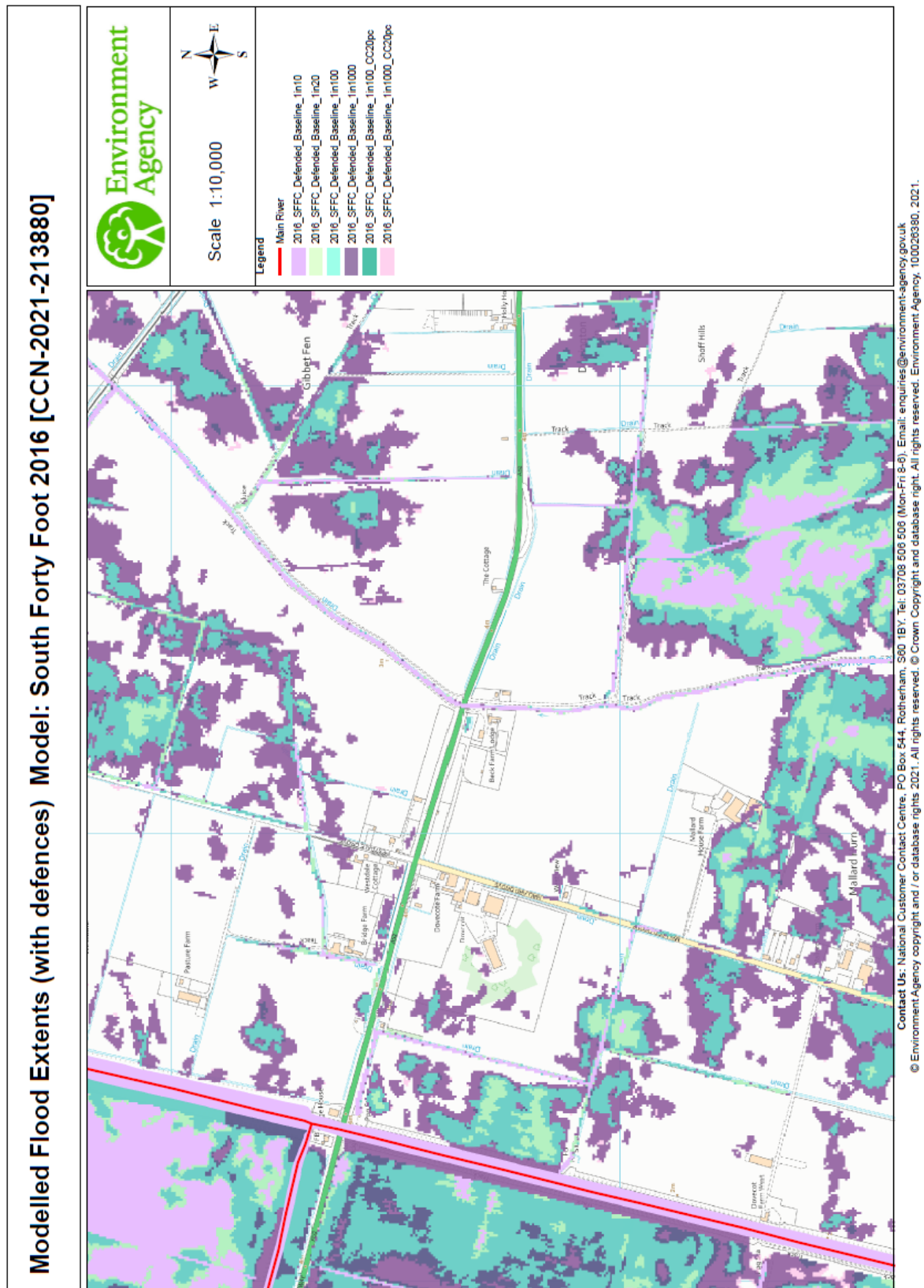
PLAN OF BLACK SLUICE IDB DRAINAGE NETWORK



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

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

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

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

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

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

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

Effects on Predictions of Flood Risk in FRA

The 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 3 and is classed as more vulnerable, the higher central climate change allowance, which is 35%, should firstly 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.

The EA have been using an allowance of 20% for climate change over the past few years in their assessments and modelling of their systems. The SHDC SFRA also has used this figure of 20%. The increase to 35% and 65% will not significantly change the conclusion in the SFRA of what might happen if a breach 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 500mm above ground level, is satisfactory.