PROPOSED NEW DWELLING AT ONSLOW LANE, GEDNEY DROVE END, SPALDING, PE12 9RZ.

FLOOD RISK ASSESSMENT



View of site from Onslow Lane

S M Hemmings B Sc C Eng MICE MIWEM,
69 Charlotte Way,
Peterborough,
PE3 9ER.

This flood risk assessment has been prepared solely to support the planning application for the development at Onslow Lane, Gedney Drove End. 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 purposes other than for which it was originally commissioned.

Introduction

A Planning application is due to be submitted to South Holland District Council to construct a new dwelling on the east side of Onslow Lane, Gedney Drove End, Spalding, PE129RZ. Onslow Lane is located on top of a bank which used to be the sea bank before the present bank was constructed further to the east.

The site is in 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.

For the Planning Application to be valid a flood risk assessment needs to be carried out to conform with the requirements of the Technical 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 and is located in the South Holland Internal Drainage Board District.

Environment Agency (EA) Flood Zones

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



It can be seen that all of this area around Gedney Drove End is within Flood Zone 3.

Application Site

The development is located 1.15km west of the tidal defences of the Wash. The National Grid Reference of the site is 546635 328740.

The location of the site is shown on the plan at the end of this document.

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 on the next page:

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 the sequential and the exception tests need to be applied to the development.

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.

All of the area of Gedney Drove End, as can be seen from the map on page 2 of this report, is in Flood Zone 3. Therefore it would be difficult to find a similar site for development in the village of Gedney Drove End that is in a lower flood zone. The safety of the development will be delivered by ensuring the floor level of the proposed new dwellings is above the predicted residual flood levels for this area.

The South Holland District Council Core Strategy states that there is a limited number of sites outside the town of Spalding available for residential development. Some greenfield land will need to be identified to enable the Council to meet the RSS and Structure Plan requirement for 2021. Therefore there is a requirement for additional residential development to be provided in the 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

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 ... Nil
	Peak Velocity ……. None
For year 2115	Depth of flooding … 500mm – 1.0m
	Extent of flooding …High
	Peak Velocity …… Greater than 0.25m/sec

The maps also illustrate the residual flood hazard which is as follows:-

For the present day	Depth of flooding …0 – 500mm
	Extent of flooding .. High
	Peak Velocity …… assumed greater than 0.25m/sec
For the year 2115	Depth of flooding …500mm – 1.0m
	Extent of flooding .. High
	Peak Velocity …… Greater than 0.25m/sec

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

Tables in the SFRA show the following details of the defence bank of the Wash at chainage 20.0km.

	2007	2055	2115
Peak 1 in 200 year extreme tide level	5.98m OD	6.24m OD	7.05m OD
Peak 1 in 1,000 year extreme tide level	6.32m OD	6.65m OD	7.46m OD

The crest levels of the defences, which are earth banks along this length, vary between 7.68 and 7.88 m OD. With a minimum crest level of 7.68m OD the freeboards are as follows:

	2007	2055	2115
Peak 1 in 200 year freeboard	1700mm	1440mm	630mm
Peak 1 in 1,000 year freeboard	1360mm	1030mm	220mm

Information Supplied by the Environment Agency

The Environment Agency have provided maps showing the maximum hazard, depth of flooding and velocity for the 1 in 200 year and 1 in 1000 year breaching events in 2006 and 2115, and the results for the area of the road adjacent to the development site are shown below:

	Hazard	Flood Depth	Velocity
1 in 200 year event in 2006	Danger for all	1.0 – 1.6m	0 – 0.3m/sec
1 in 1000 year event in 2006	Danger for all	1.0 – 1.6m	0.3 – 1.0m/sec
1 in 200 year event in 2115	Danger for all	Greater than 1.6m	0.3 – 1.0m/sec
1 in 1000 year event in 2115	Danger for all	Greater than 1.6m	0.3 – 1.0m/sec

The Agency have also provided maps showing the maximum hazard, depth of flooding and velocity for the 1 in 200 year and 1 in 1000 year overtopping events in 2115, and the results of these are shown below:

	Hazard	Flood Depth	Velocity
1 in 200 year event in 2115	Nil	Zero	Zero
1 in 1000 year event in 2115	Nil	Zero	Zero

The maps of the flood risk supplied by the Environment Agency are reproduced on pages 12 – 17 of this report.

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", which is considered

to be passive until such time that a flood greater than the defences can withstand occurs. The likelihood of flooding occurring due to overtopping or failures of the defences is considered to be very low.

The site is located approximately 1.15 km from the main earth banks which are the defences of the Wash, which are maintained by the Environment Agency.

There are additional smaller watercourses in the area that are maintained by South Holland IDB.

Existing Ground Levels

The site slopes from the level of Onslow Lane, which is 5.10m OD down to a level of 3.91m OD on the eastern boundary. The level of the field to the east is 3.26m OD.

A topographical survey has been carried out and the plan with all the levels will be submitted with the planning application. A section through the site is shown on page 8 of this report.

Potential Sources of Flooding

The potential sources of flooding to the site are:-

1. Failure or overtopping of the tidal defences
2. Overtopping of IDB watercourses
3. Blockages or problems in local surface water systems

1. Failure or overtopping of tidal defences

The predicted levels in the SFRA indicate that the tidal defences have a satisfactory height to withstand a 1 in 200 year and 1 in 1000 year storm event in 2115. There however is only a freeboard of 220mm in the 1 in 1000 year event in 2115 and the SFRA recommends allowing for a 600mm freeboard.

The Environment Agency regularly review the standards of the defences and you would expect that if climate change projections are realised they would raise and improve the defences to retain an adequate standard of defence.

2. Overtopping of IDB watercourses

South Holland IDB maintain the sluices and the major channels in this area. Normal water levels are usually retained 1.0 metres at least below the lowest land level in the area. After heavy rainfall the levels in the drains will increase but on average the IDB drains would prevent flooding of all land and properties in a 1 in 100 year event. However the lowest land in the area is about 3.0m OD and therefore if overtopping of the IDB drains started to occur it would not affect the proposed property.

South Holland IDB have a very good maintenance regime for all their structures and watercourses, so flooding from this source can be discounted.

3. Blockages or problems in local surface water systems.

The proposed level of the new house is will be at least 1.0 metre above the level of the field to the east and therefore this source can be discounted.

Extent of known Flooding

During the preparation of this assessment, no evidence was discovered of the site or any of the adjoining properties being flooded.

Probabilities and Trends of Flooding

The probability of the site of this development being flooded from the Wash is very low, and less than 0.5% in any year. In an extreme event any effect on this location would not be sudden and there would be time for residents to take precautionary measures to limit the impact of any flooding that may occur.

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 18 to 21). It is concluded that no extra mitigation measures are necessary to comply with the new guidance on climate change.

Residual Flood Risk to the site

The major flood risk at this location is from a very high tide level in the Wash caused by circumstances that lead to the extensive flooding that occurred in 1953. However since that event the banks have been substantially raised and strengthened and one would expect the EA to continue to provide at least a 1 in 200 year standard of defence for this area.

If a breach occurred in the sea bank with tide levels predicted for a 1 in 200 year event then the EA flood maps indicate that significant flooding would occur. If the sea bank breached east of the site the area between the main sea defences and the site would quickly become full of water. When the level of flood water reached 4.00m OD it would start to flow over the lower levels of Onslow Lane and flood into land west of the development site.

The proposed development will have a ground floor with a garage and storage facilities, and maybe a garden room without any electrical sockets or heating, and with tiled floors and walls which can withstand flooding for a number of days. All living accommodation will be on the first floor of the building.

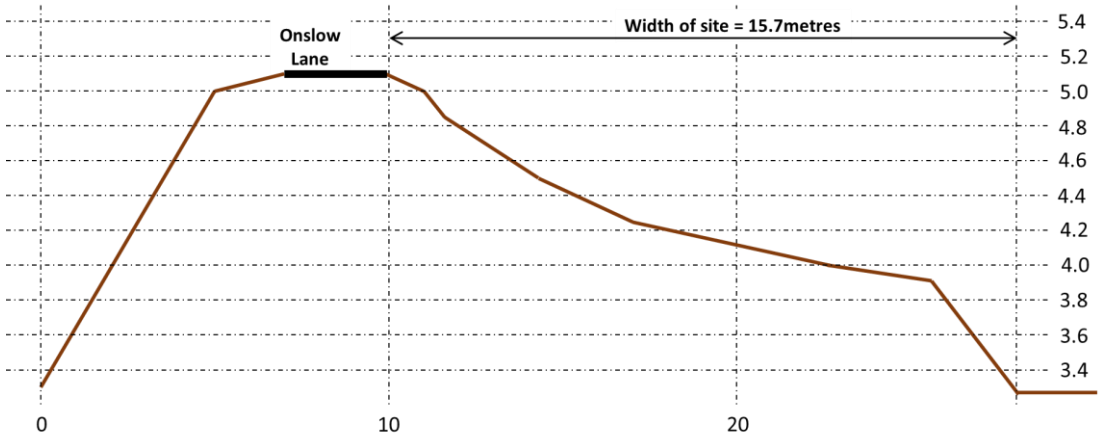
Therefore the floor level of the living accommodation on the first floor will need to be at a level so that it is 300mm above the 1 in 1000 year predicted flood level in 2115. The relevant part of this map is shown below:



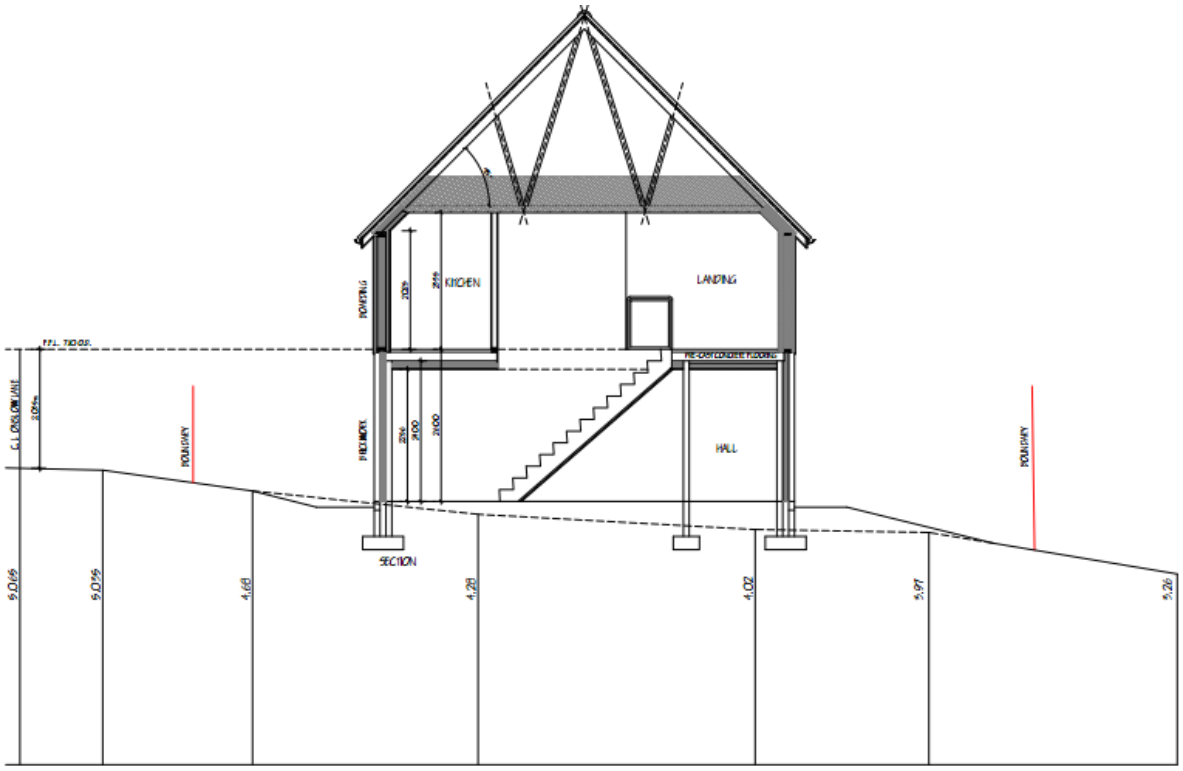
The red areas have predicted flood depths of between 1.0 metres and 1.6 metres, and the purple areas have predicted flood depths of greater than 1.6 metres. Therefore one would expect looking at the above map that there are two higher areas of land one north and one south of the site. However as can be seen the road levels are different to this indicating that the two red areas should be one long red area. From this we can take the road level on the northern end of the red area, which is approximately 4.40m OD, as the boundary between the red and purple areas, where the predicted 1 in 1000 year flood depth is 1.6 metres.

From this it can be deduced that using the EA maps the predicted 1 in 1000 year flood level in 2115 will be 6.00m OD. However 100mm should be added to this to allow for the new climate change recommendations (see Appendix A). As the first floor of the building should be considered as a single story dwelling, the EA recommend that the floor level should be 300mm above the 1 in 1000 year food level. Therefore the lowest floor level of the living space should be 6.40m OD.

A cross section of the proposed site has been drawn using the levels from the topographical study and is shown below.



The developer is proposing a floor level of 7.10m OD for the living space, and a cross section through the building is shown below.



Conclusions

All of village of Gedney Drove End is at risk of flooding if a breach occurs in the sea bank during an extreme tidal flood event.

With present day weather forecasts and communication methods occupants would receive adequate warning that a very severe tidal event is due to occur at least 24 hours before the event. They would therefore have time to decide whether to evacuate the area during the duration of the tidal event.

During daylight hours residents would be able to keep watch on the situation with the sea defences and if they saw a breach occur they would still have adequate time to evacuate the area.

It should be remembered that the risk of flooding events such as described above would only happen in a once in 200 year event, and the likelihood of this happening would be further reduced if the Environment Agency or another authority or organisation raises and strengthens the sea defences in the next 100 years.

The level of the proposed dwelling is higher than any foreseeable flooding that could occur from IDB watercourses.

The proposed development is not in a functional flood plain as defined in the SFRA.

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

If flood risk is considered to be the main planning consideration then the developer should consider designing a building with only storage facilities provided at ground floor level. All living accommodation, including kitchens, living areas and bedrooms should be located at first floor level. The developer might consider a three story building with kitchen, lounge and dining areas on the first floor and bedrooms on the second floor, and possibly a lounge area at the rear of the ground floor with patio doors for use in the summer period. All finishes on the ground floor should be flood resistant. This type of building would not suffer serious damage if a serious flood occurred.

The lowest level of the living accommodation should be 6.40m OD. However if the bedrooms are located on the floor above the living accommodation this level could be reduced to 6.10m OD. The proposed design of the building shows a finished floor level of 7.10m OD for the second floor of the building where all of the living accommodation will be located.

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

The developer should incorporate flood resistant/resilient techniques in the construction of this new property to allow the ground floor level to be refurbished after being flooded to a depth of approximately 2.0m.

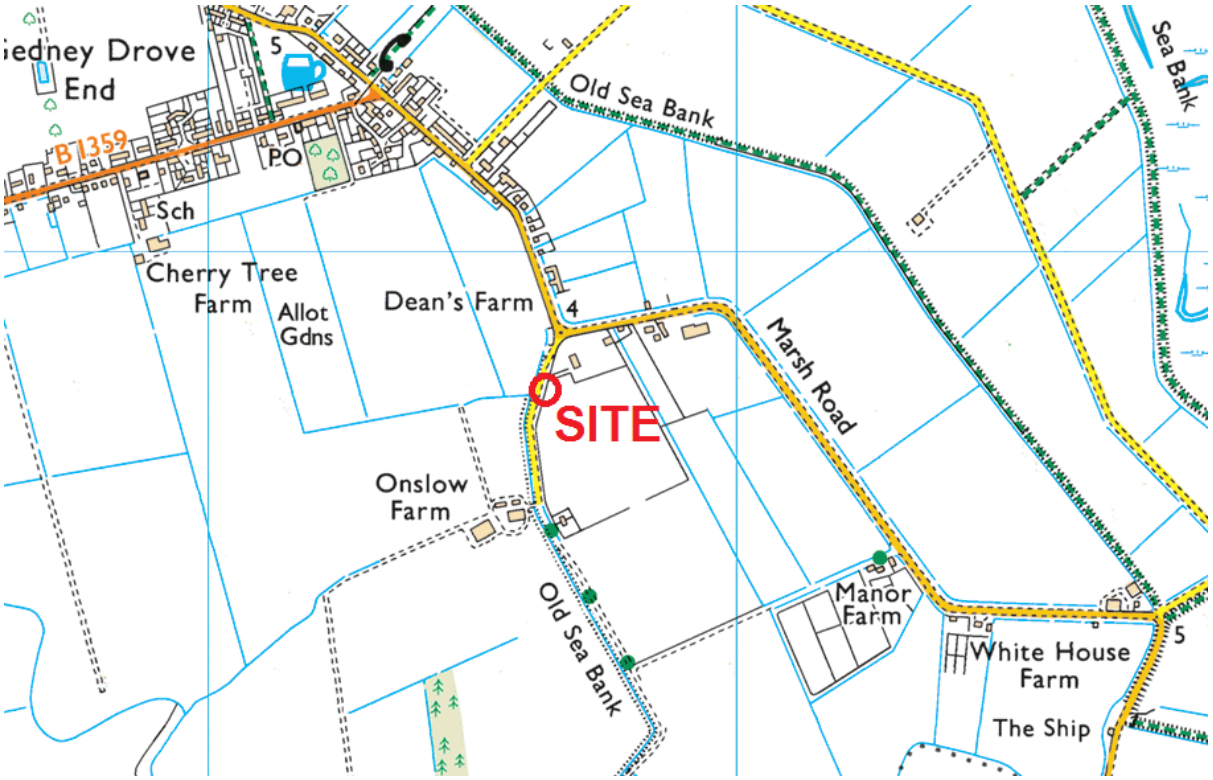
On site surface water drainage should be discharged into soakaways and these should be designed to BRE Digest 365 and approved under Building regulations.

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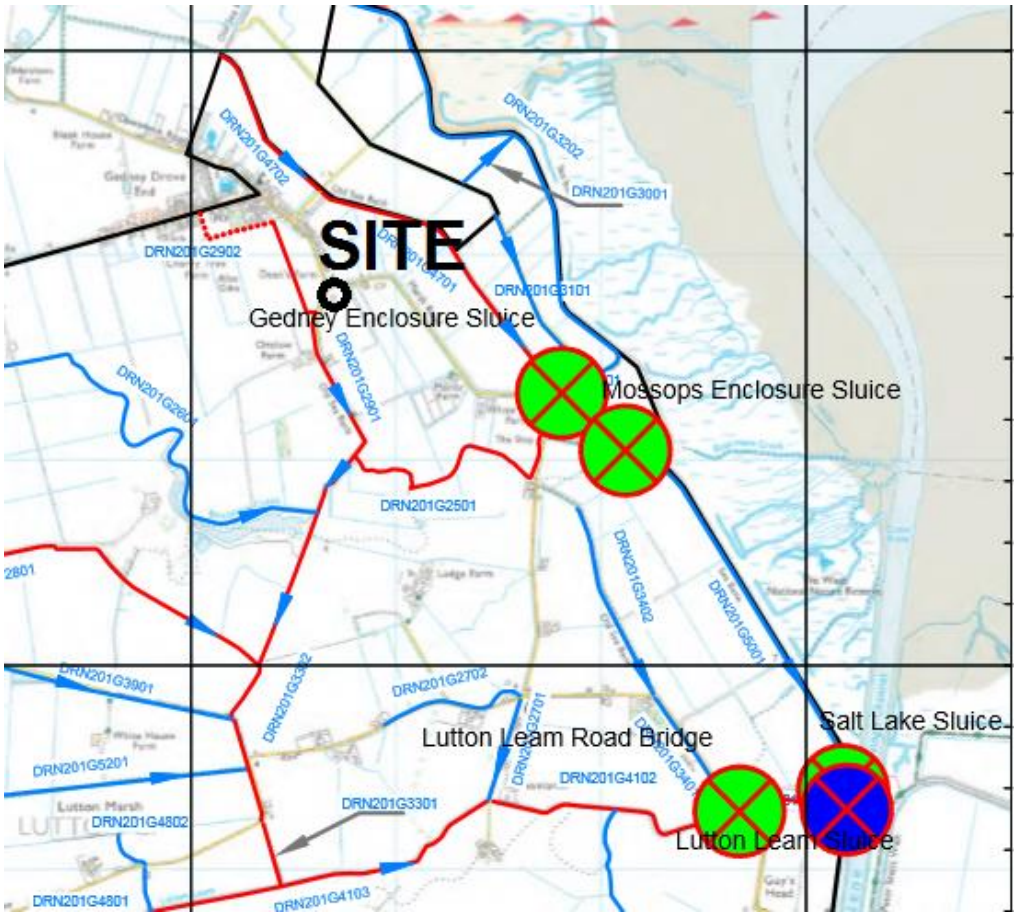
stuart.hemmings@btinternet.com

10th April 2015.

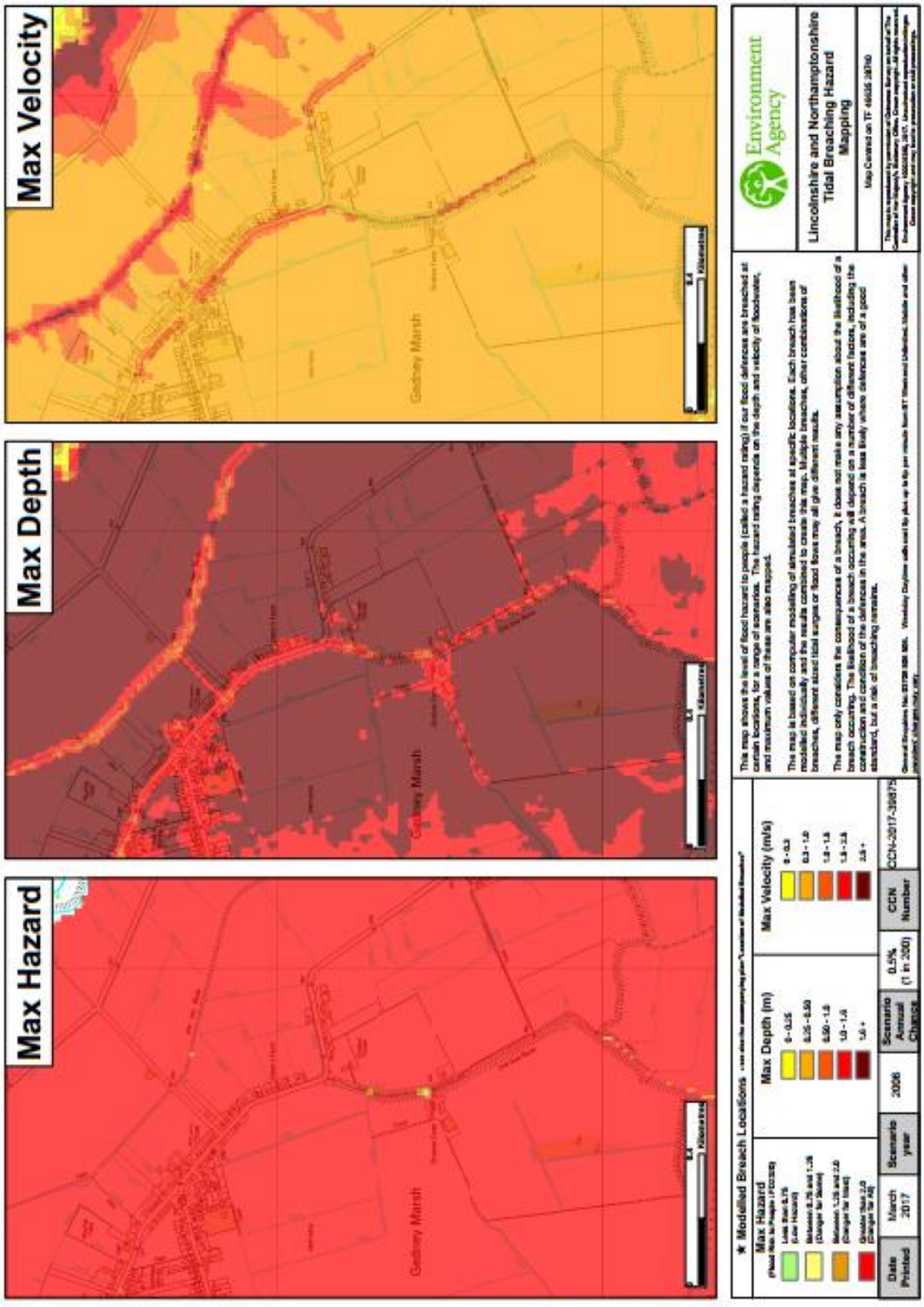
Location Plan



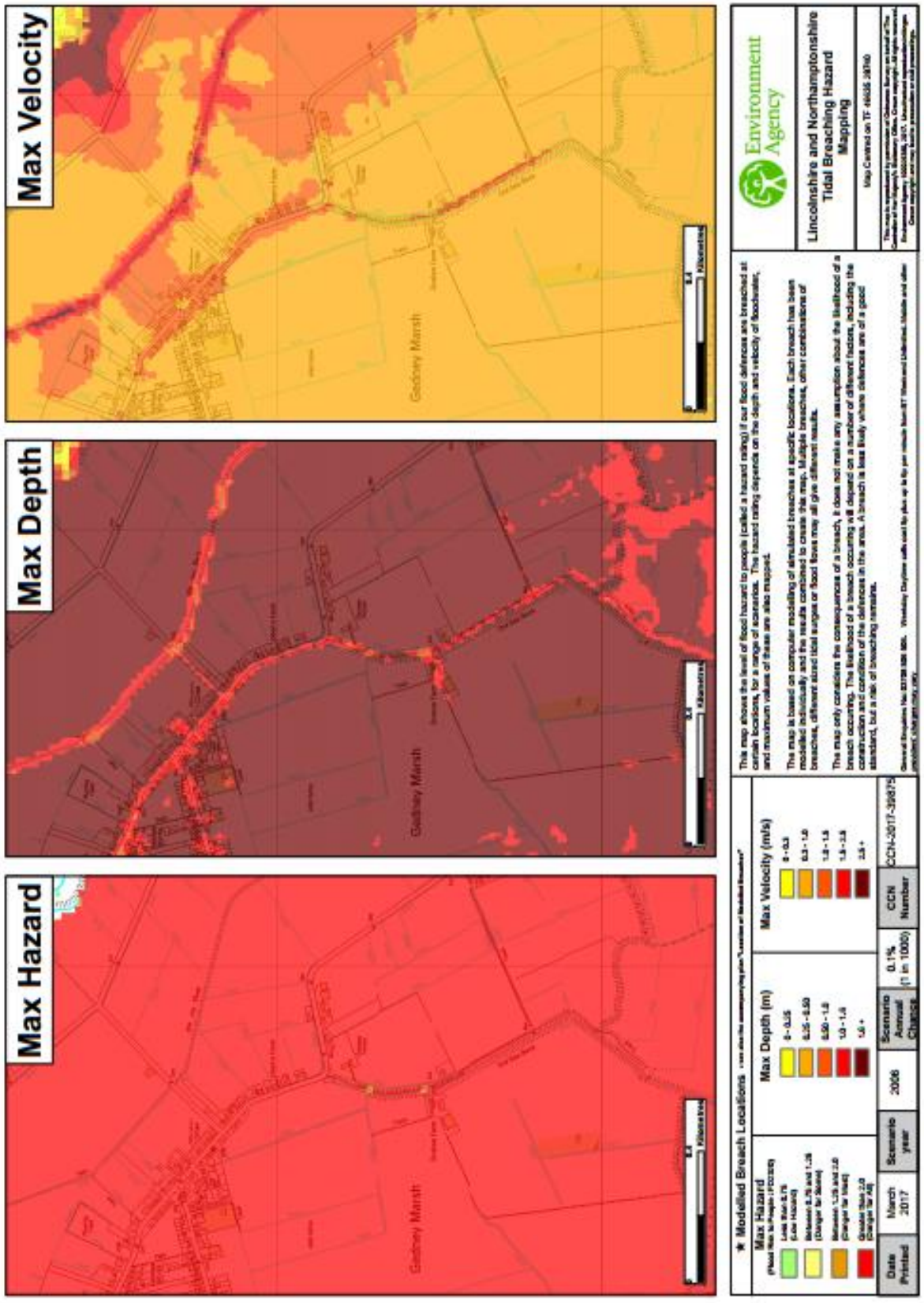
Plan of IDB Drainage Channels



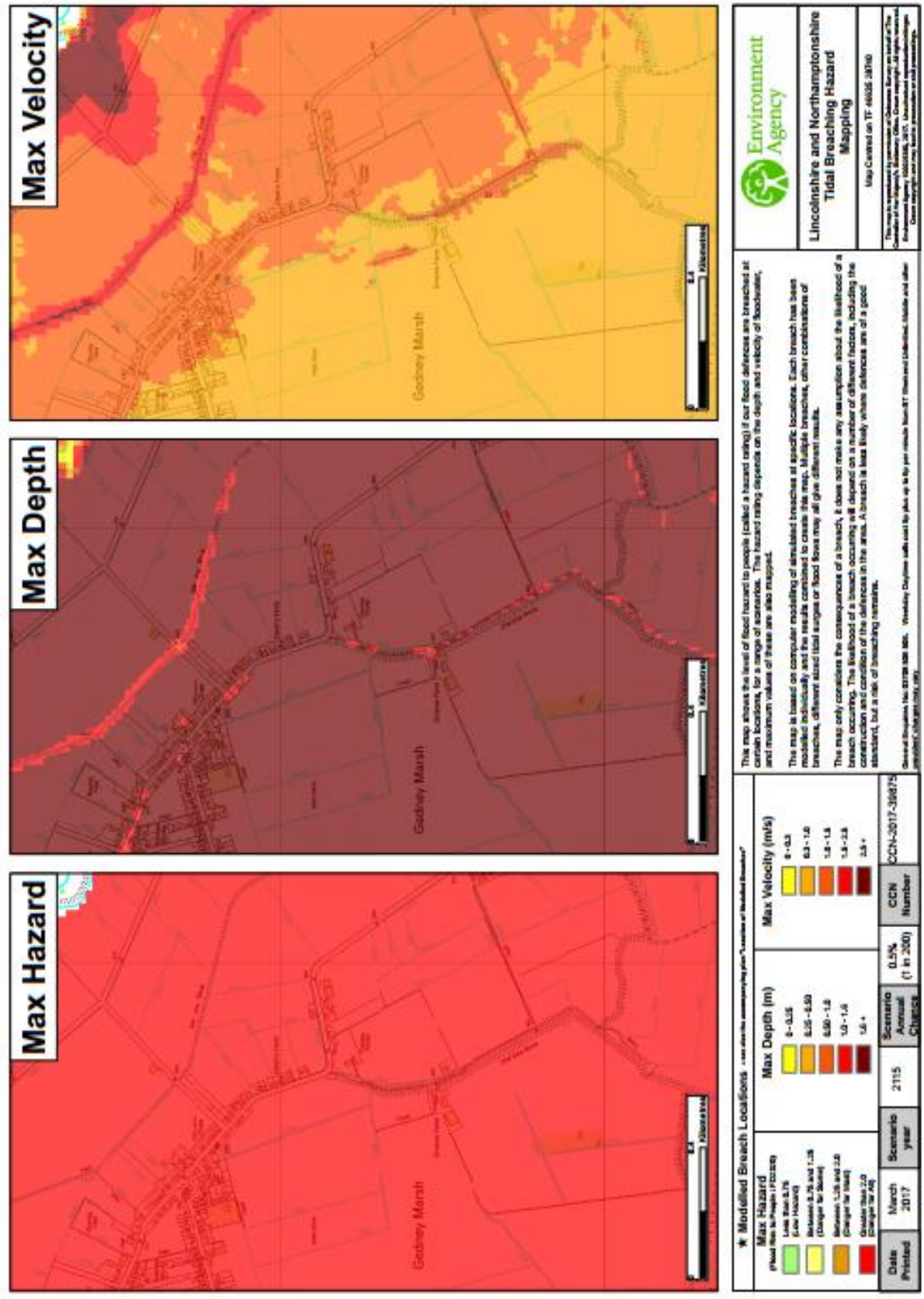
1 in 200 year Flood Risk from Breaching in 2006



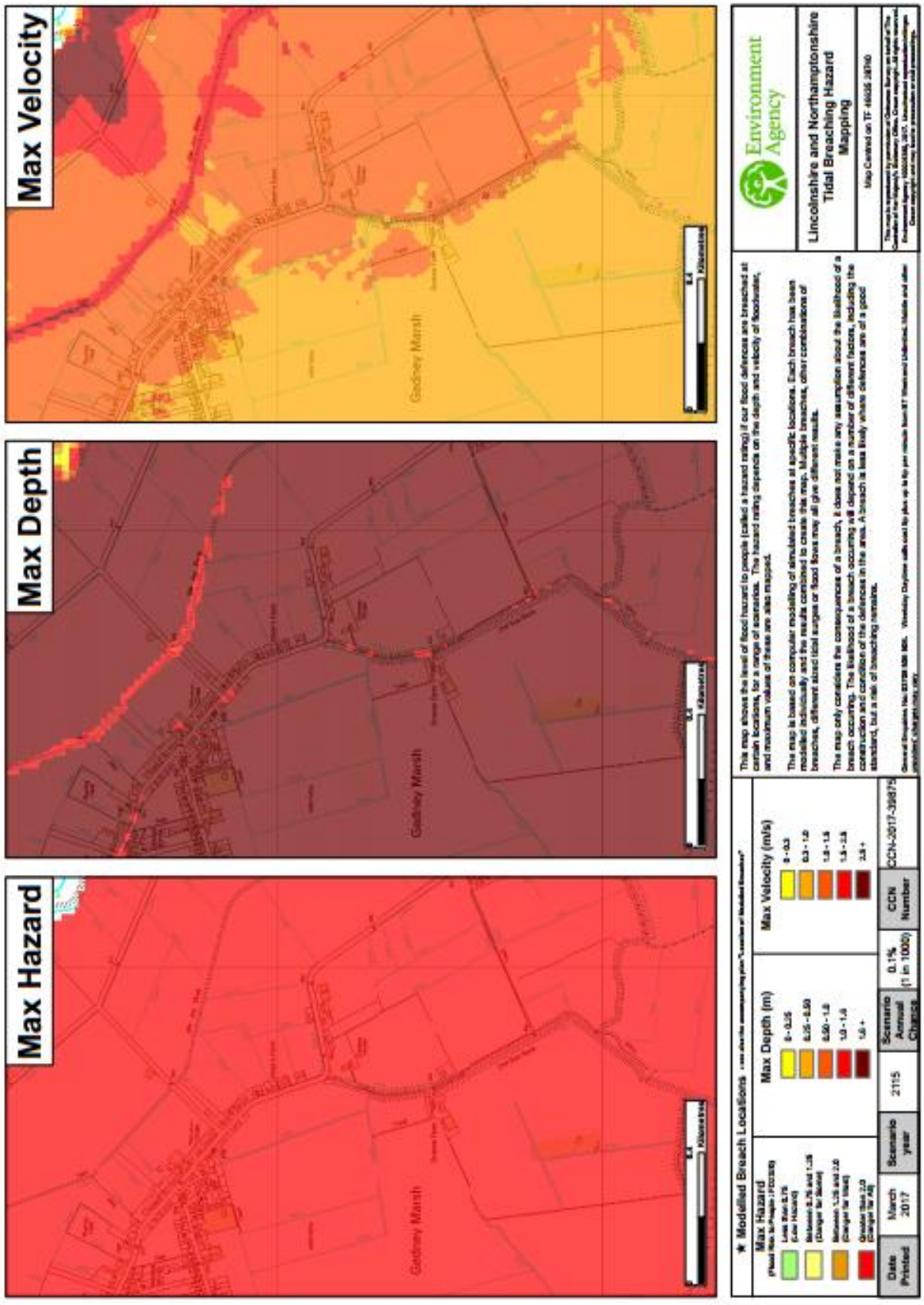
1 in 1000 year Flood Risk from Breaching in 2006



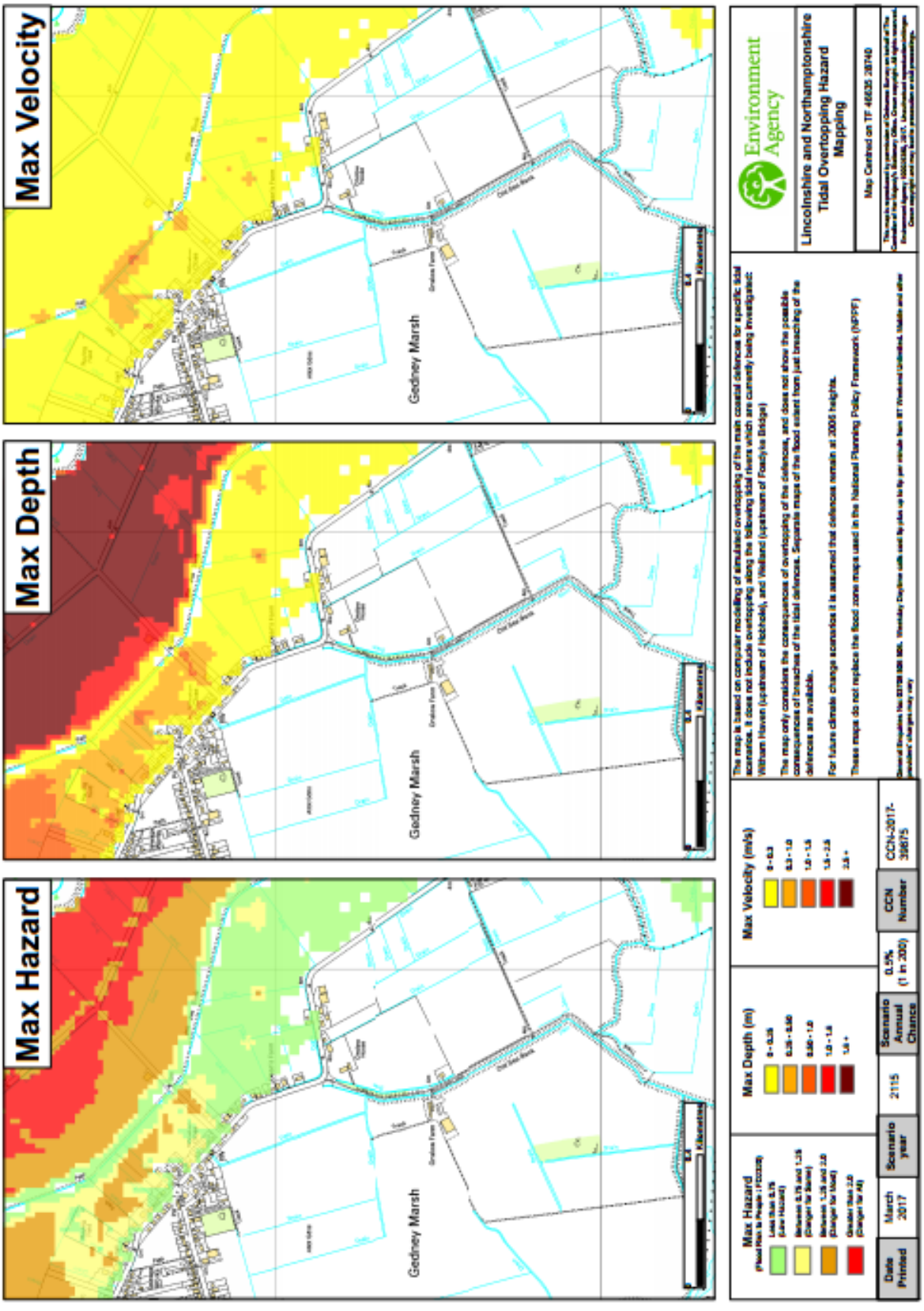
1 in 200 year Flood Risk from Breaching in 2115



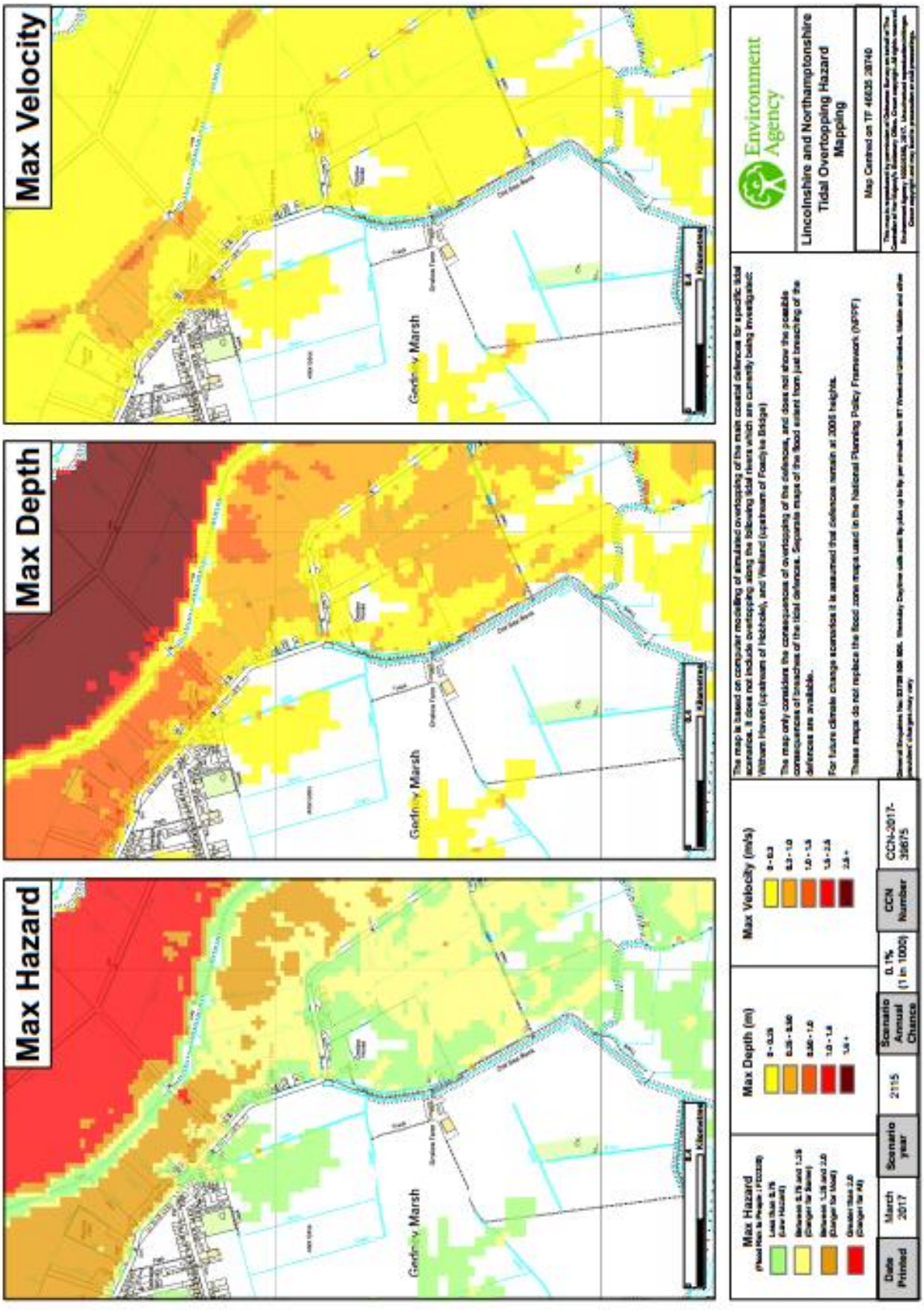
1 in 1000 year Flood Risk from Breaching in 2115



1 in 200 year Flood Risk from Overtopping in 2115



1 in 1000 year Flood Risk from Overtopping in 2115



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

document is out of date and has been withdrawn (19

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 SFRA predicts that there will be flooding to the proposed development site up to a depth of 1.6m in a 1 in 100 year fluvial or 1 in 200 year tidal event in 2115. It has been concluded that the major flood risk to the site is from a breach in the wash banks.

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 following a breach in the Wash banks.
2) Flooding from IDB watercourses.

1) Flooding following a breach in the Wash banks.

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

It can be seen that the revised guidance increases the maximum allowance for sea rise in 2115 by 100mm. This may have the effect of increasing flood levels by nearly 100mm at the site of the development. This allowance has been incorporated in the recommendations for the finished floor level of the building.

2) Flooding from IDB drains

IDB's have been using an allowance of 20% for climate change over the past few years in their assessments and modelling of their systems. Generally IDB's are happy that their systems provide a 1 in 100 year standard to most urban areas at the present time.

South Holland IDB, and all IDB's, are aware that climate change will affect the operations of pumping stations, sluices and drainage channels. Pumping stations and sluices only have a 30 year life and will need to be refurbished or rebuilt within this timespan. It is assumed that South Holland IDB will continue to review the modelling they have already carried out and when the Board consider these refurbishments adequate arrangements will be made to incorporate the latest climate change projections in order that the Board continues to provide the same standard of service as the present day.

Therefore it is considered that the mitigation proposed for the development, with the recommendation that the ground floor levels should be a minimum level of 6.40m OD is considered satisfactory.