Flood Risk Assessment

Site:
Land adjacent to 13 Spalding Road, Gosberton, Boston PE11 4NP

Applicant:
Mr Andrew Proctor

Prepared by:
Mr R Cole of Origin Design Studio Ltd

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Revision:
A01 – 31st July 2023

RIBA
Chartered Practice

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Introduction

Origin Design Studio Ltd have been appointed by Mr Andrew Proctor to prepare a Flood Risk Assessment to accompany a planning application to South Holland District Council for a residential development.

The site is contained within all 3 Flood Zones and due to the site being in a Flood Zone 2 & 3 is the basis upon which a Flood Risk Assessment is required. The approach to flood risk is set out in the National Planning Policy Framework (NPPF), refer to Appendix A with more local planning policy set out in the South East Lincolnshire Local Plan (SELLP), refer to Appendix B. This Flood Risk Assessment assesses the site in accordance with the policy requirements of the NPPF and the SELLP.

The Site

The site is located to the southwest of Spalding Road to the southeast of Gosberton. The site is a agricultural field. The site is bookended to the north and south by residential dwellings. On the opposite side of the road are residential dwellings.



Figure 1 - Site Aerial Image (www.google.com/maps)

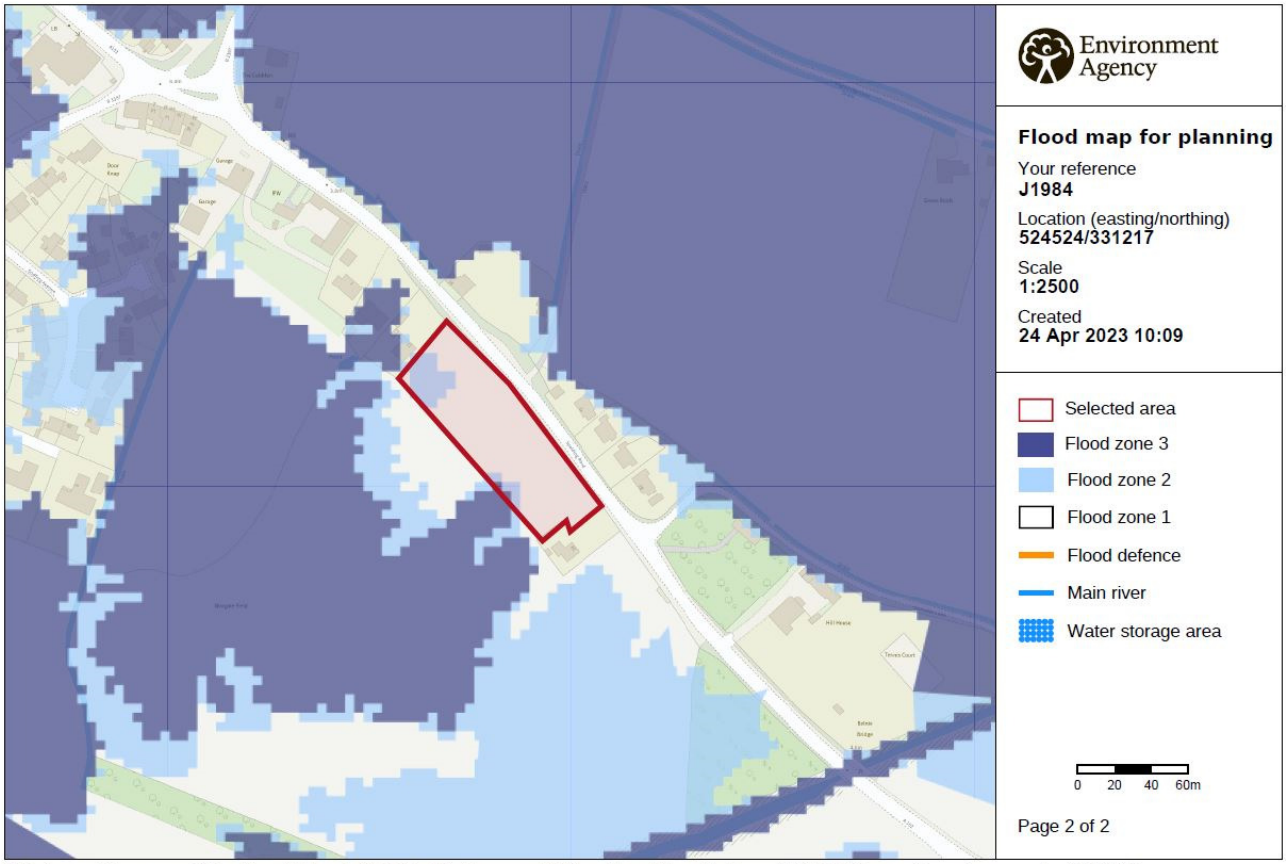
The proposed development is for 4No. two storey dwellings with a retained field access.

Findings

Risk of Flooding from River and Seas

Flood Zone

The site is contained within all three Flood Zones. Most of the site is contained in a Flood Zone 1 with only a nominal part of the site contained in a Flood Zone 3. However, for the purposes of design and flood mitigation this flood risk assessment the site is considered to be in a Flood Zone 3. Flood Zone 3 shows the area at risk of flooding for an undefended flood event with: a 1% or greater probability of flooding from rivers or 0.5% or greater probability of flooding from the sea.



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Figure 2 - Flood zone map (the site is marked with a red line).

Historic Flooding

The Environment Agency do not have any information about historical flooding on the site, refer to Appendix E.

Sequential & Exception Test

The proposed development is for new residential dwellings and will result in 4No. two storey dwellings. Therefore, flood risk is considered on this basis.

Developments need a sequential test when the development is in flood zone 2 or 3 and a sequential test hasn't already been done for a development of the type planned on the proposed site.

The purpose of the sequential test is to direct development to land of lower flood risk. The sequential test compares the proposed development site with other available sites to find out which has the lowest flood risk.

The residential use is classified as "more vulnerable" in accordance with Table 2 – Flood Risk Vulnerability Classification.

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 †	✗	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	✗	✗	✗	✓*

Key:

✓ Development is appropriate

✗ Development should not be permitted.

Figure 3 - Table 3 – Flood Risk Vulnerability and Flood Zone Compatibility (www.gov.uk)

Applying a sequential approach at the site level it is possible to ensure all dwellings are located on land that is contained within a Flood Zone 1. Parts of the amenity space to the rear of the properties will be located in a Flood Zone 2 and 3. However the guidance in the Strategic Flood Risk Assessment for application of the Sequential Test for planning applications requires reference to the defended 2115 Hazard map. Figure 4 below shows the site location as a red dot and shows the site is not impacted by the defended 2115 Hazard Map. It is considered that on this basis the scheme passes the sequential test.

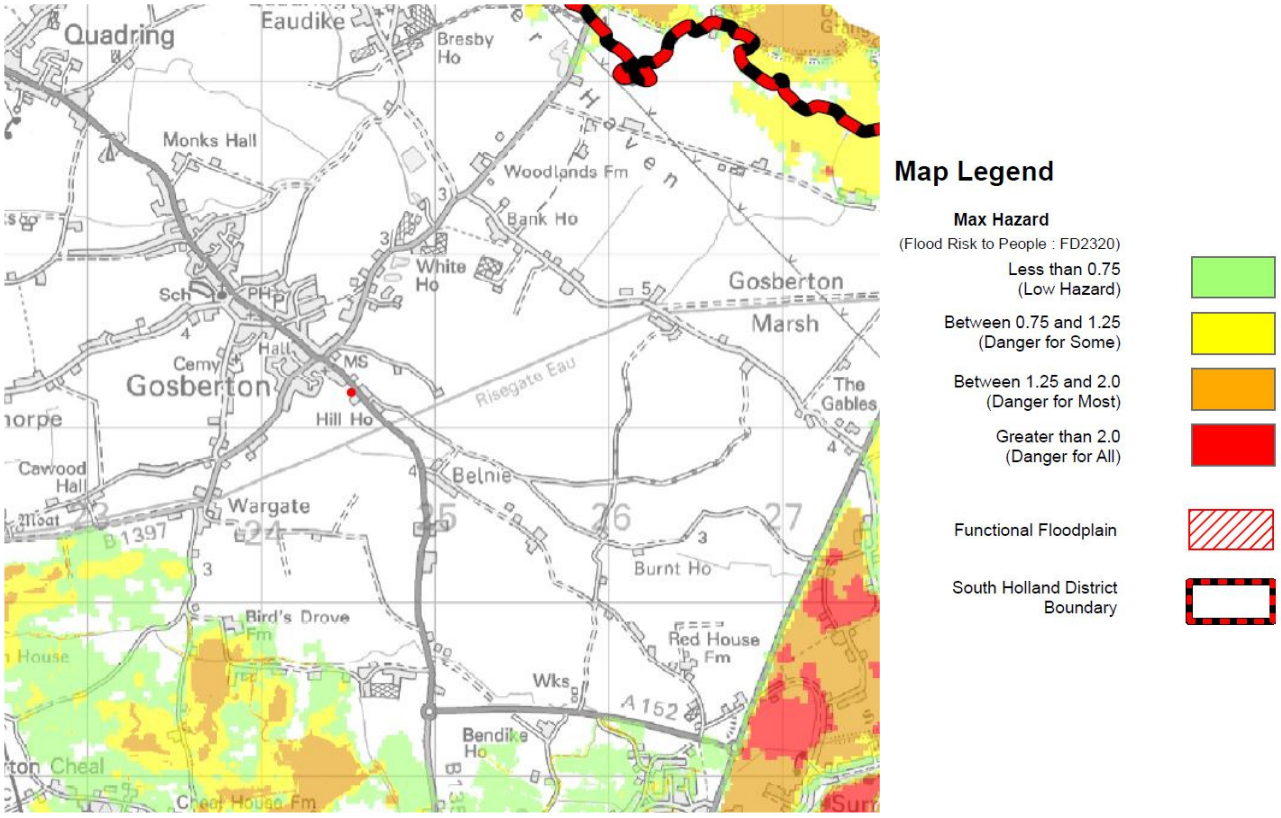


Figure 4 - 2115 Hazard Map 1% Fluvial/0.5% Tidal

Site Levels

A topographical survey has been undertaken to inform the design for the proposed development, refer to Appendix C. The lowest levels on the site are along parts of the south western boundary of the site at around +3.4mAOD with the highest levels located closer to the road at around +4.64mAOD. The road is shown to be around +4.58mAOD.

Overlaying the topographical survey with the flood map shows that the boundary for Flood Zone 2 and Flood Zone 1 would appear to be around +3.5mAOD. This is highlighted by the contours that appear to roughly follow the outline of the Flood Zone 2. It should be noted that the Flood Zones are determined as being the undefended current day model and that climate change may result in greater predicted flood levels. The extract below shows the flood map topographical overlay.



Figure 5 - Flood Map and Topographical Survey overlay

Calculating the Flood Level

Where possible all habitable floors should be above the flood level. Where the accommodation is proposed to be two storeys the 1 in 100/200-year flood level plus climate change will be used to ensure habitable floors are above the flood level. In the case where single storey buildings are proposed habitable floors should be above the 1 in 1000-year flood level plus climate change. In both cases a safe point of refuge can be established and therefore provide protection to the inhabitants of the building.

In this case it is proposed to create a 4No. two-storey dwellings. To determine the flood level the fluvial and tidal sources will be looked at to determine the worst case and an appropriate floor level.

Tidal Flood Sources

Although the site is contained in a tidal flood zone the site is not at risk from tidal sources of flooding from either overtopping or breaches of the defences. The existing tidal defences protecting this site consist of earth embankments. They are in good condition and reduce the risk of flooding (at the defence) to a 1% (1 in 100) chance of occurring in any year.

Based on current EA models the site is not at risk from overtopping or breaches of the flood defences in the current day and climate change scenarios. No further action is required.

Fluvial Flood Sources

The site is at risk of fluvial flooding from main rivers. The main risk to the site is the River Glen located some 3.0km to the south east of the site at its nearest point.

The site is protected by fluvial flood defences from the River Glen. These include earth embankments. They are in a fair condition and reduce the risk of flooding (at the defence) to a 1% (1 in 100) chance of occurring in any year.

Data from the Environment Agency includes in channel data for the River Glen, refer to Appendix E. It does not contain Hazard mapping for modelled breaches or overtopping which may affect the site. However, the South Holland SFRA does contain these maps and the hazard map shows the site is not affected by the 1:100 year fluvial flooding through either overtopping or breaches.

Global warming is now recognised that it is likely to affect the frequency and severity of extreme events such as both tidal and fluvial flooding. Updated climate change allowances in the NPPF Guidance were updated on the 19th February 2016 and again on 17th December 2019. The site lies within the Welland Catchment and allowances for climate change should be made on the following basis. For a worst-case scenario, the site shall be considered to be in a Flood Zone 3a and the use classification is 'more vulnerable' therefore Peak River flows use the higher central and upper end to assess a range of allowances.

The adjustments for peak flows can be seen in the table below. The National Planning Practice Guidance suggests that for 'more vulnerable' developments the central allowance should be used for climate change for flood risk assessments. For this flood risk assessment and design a 17% increase to peak flow will be used to determine the 1 in 100-year flood level plus climate change. It can be tested for sensitivity using both the 28% and 53% increase to peak flows for the 1 in 100-year event.

River basin district	**Allowance category**	**Total potential change anticipated for the '2020s' (2015 to 2039)**	**Total potential change anticipated for the '2050s' (2040 to 2069)**	**Total potential change anticipated for the '2080s' (2070 to 2115)**
Welland	Upper	22%	26%	53%
	Higher	10%	10%	28%
	Central	5%	4%	17%

Figure 6 - Table 1 peak river flow allowances by river basin district (use 1961 to 1990 baseline)

A flow discharge curve can be established using the increase in flow to calculate and establish in-channel levels of the River Glen for the additional climate change scenarios. Following this a simplistic breach model using the in-channel levels of the River Glen can offer a basic way to establish a the flood level including climate change for the site. The nearest-node levels for the River Glen are from node Glen 3112. A topographical survey profiling the watercourse has not been undertaken of the Glen however information available on OS maps suggest the embankment levels are around 4-5m. The simplistic model only considers an oncoming wave depth and assumes the land downstream of the breach to be taken down to 1.8m. The breach of the River Glen is discussed in this section.

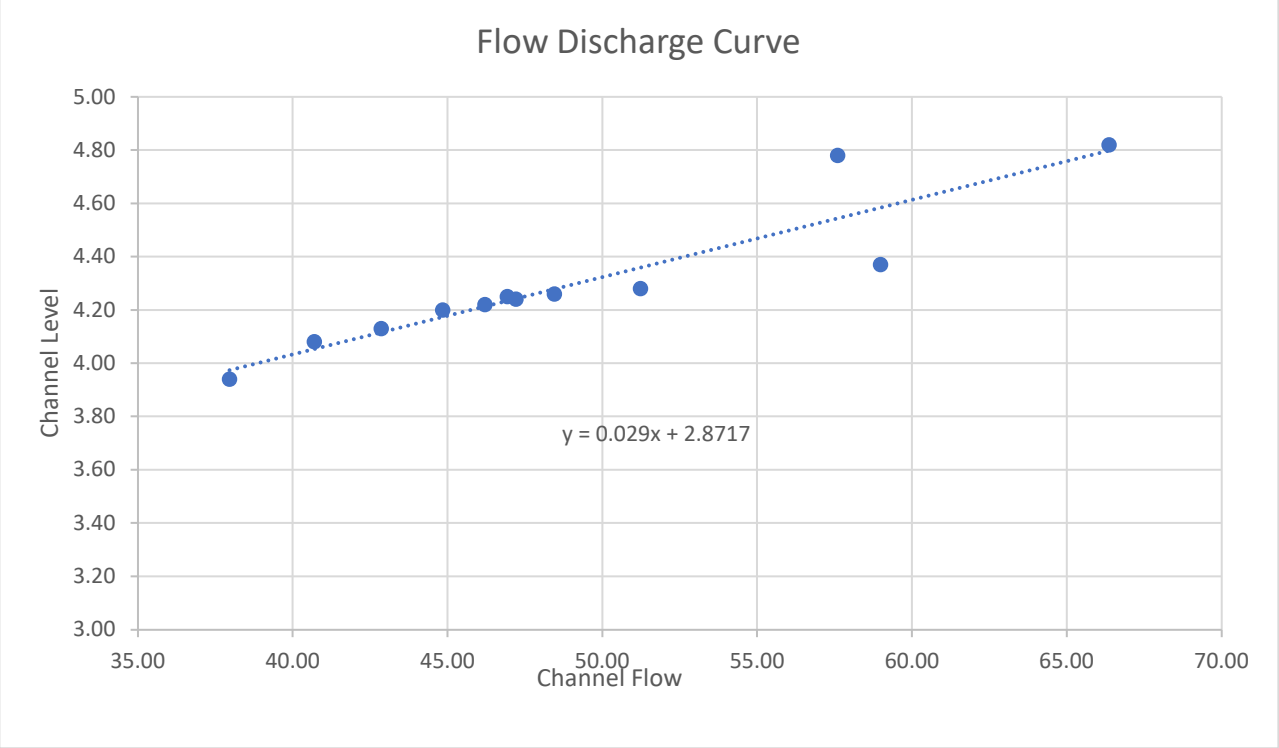


Figure 7 - Flow discharge curve for River Glen node 3112

Event & Climate Change (%)	Flow (m^3)	Level (m)
1% +17% CC	50.80	4.34
1% + 20% CC	51.22	4.37
1% +26% CC	52.33	4.39
1% +53% CC	55.81	4.49

Figure 8 - Calculated Levels for Climate Change for node LWA_05000

Guidance in the NPPG states that the SFRA should be prepared on the basis of using central and higher central allowances i.e. 17% and 28%. Therefore, the resulting hazard maps, refer to figure 4, show that the site is not affected by the design event or higher central peak flow increase from climate change. Testing for more severe events the in-channel level for 53% climate change breach analysis will use the level of +4.49mAOD from Figure 8.

A breach analysis using data for node Glen 3112 is contained in Appendix D. The 1:100-year level including 53% climate change for the site is +0.122m above ground level. This suggests that setting floor levels of 150mm above ground level will be adequate. Given the distance of the River Glen from site, the large expanse of fenland between the site and food source and the crude nature of the simplistic breach analysis it is considered that the flood level is a rough calculation.

Risk of Flooding from Surface Water

The risk of flooding from surface water is very low on the site. The following map shows the Environment Agency's Risk of Flooding from Surface Water map:

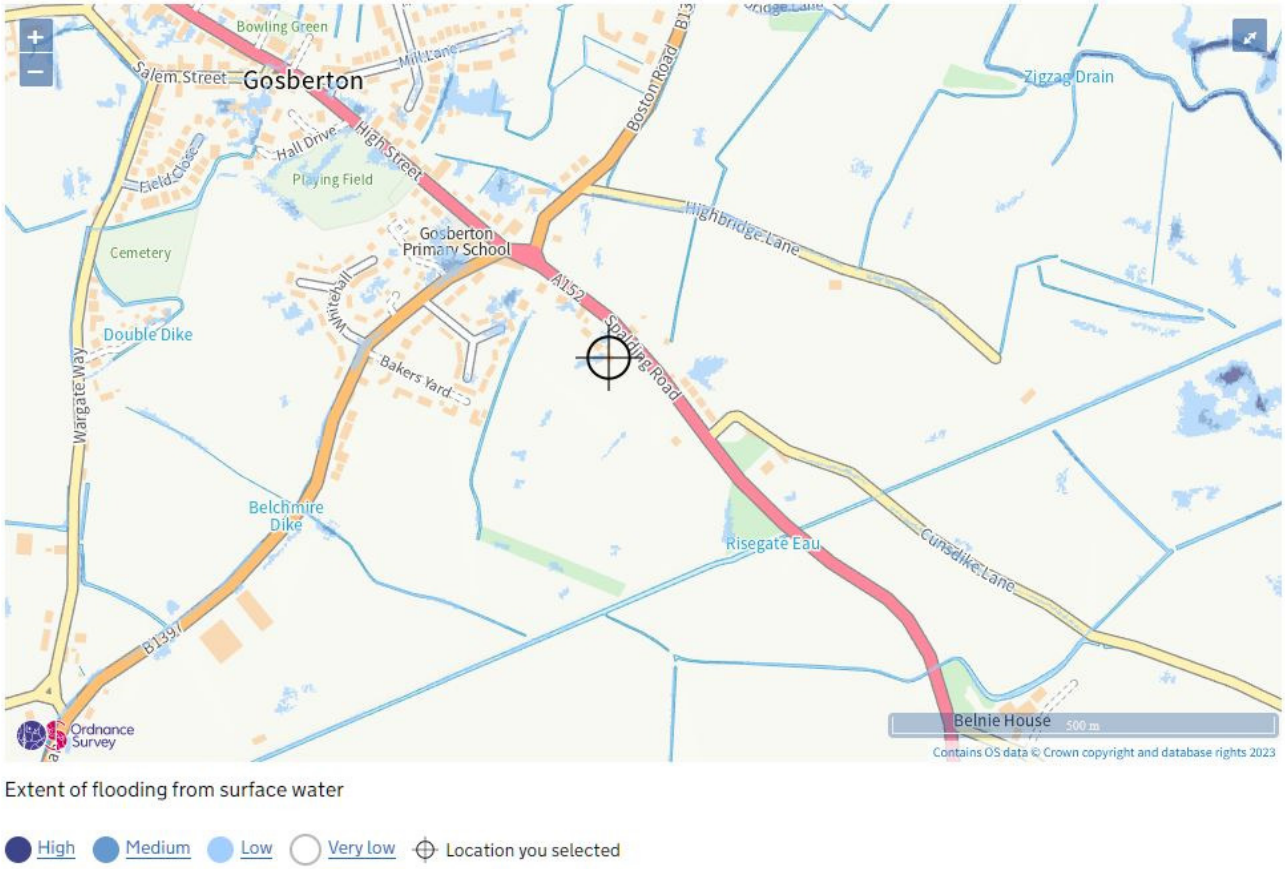


Figure 9 - Surface Water Flood Map (www.gov.uk)

The site does not suffer from surface water flooding. No further action is required.

Risk of Flooding from Reservoirs

There is no risk of flooding from reservoirs when there is flooding from rivers. The following map shows this on the Environment Agency's Risk of Flooding from Reservoirs map:

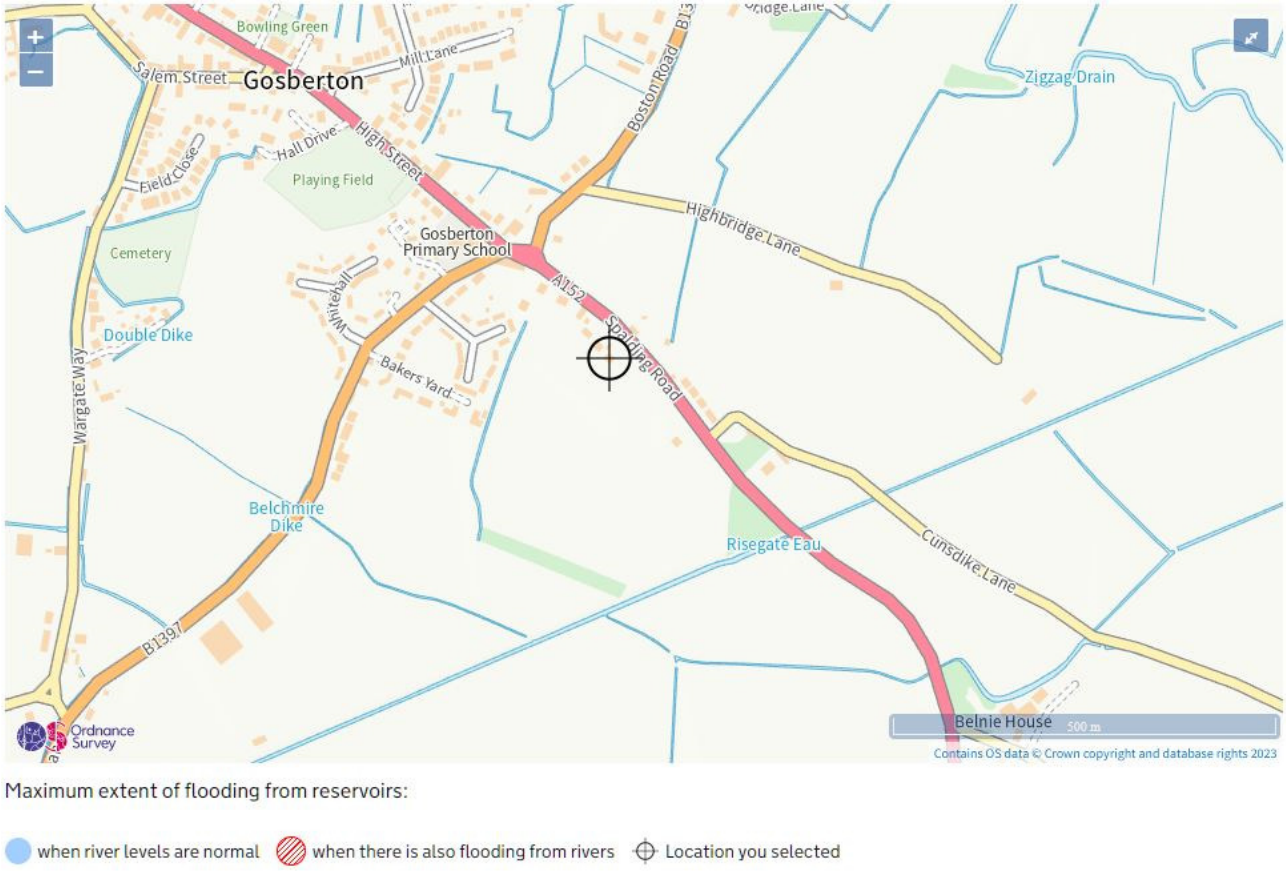


Figure 10 - Reservoir Flood Map (www.gov.uk)

The site does not suffer from flooding from reservoirs. No further action is required.

Risk of Flooding from Sewers

There are no known public surface water and foul water sewers that currently exist on the site that are known to suffer from sewer surcharging. A foul sewer exists in the road to the front of the site. All new infrastructures to service the dwelling shall be appropriately designed to the relevant standards to ensure failures do not present a problem.

Safe Access & Egress

The proposed ground floor level will be set to be above the predicted worse case flood level and provide a safe refuge. The road to the front of the site should remain clear at all times allowing for safe passage along Spalding Road away from the site.

Setting the Floor Level & Mitigation

Standing advice requires finished floor levels (FFL) should be a minimum of whichever is higher of 300mm above the:

- Average ground level of the site
- Adjacent road level to the building
- Estimated river or sea flood level

The site does not flood in the design event. Therefore, it is considered that the ground floor can be set at 150mm above existing ground level.

Based on where the dwellings are proposed to be sited this will result in a minimum ground floor level of +3.75mAOD.

At the detailed design stage of the development, advice contained in “Improving the Flood Performance of New Buildings - Flood Resilient Construction” should be followed. The scheme will include flood resilient construction to a height 300mm above the predicted flood. Whilst the dwellings are located in a flood zone 1 this level of mitigation would not seem an excessive precaution to take.

Conclusion

The proposed development is for 4No. two-storey dwellings. The site is contained within all 3 Flood Zones, with the majority being in a Flood Zone 1.

The site is protected by adequate tidal and fluvial flood defences which are maintained by the Environment Agency. A residual risk to breaching of these defences exist and this has the potential to impact the site.

The residential use falls within "more vulnerable" uses of land in Table 2 Flood Risk Vulnerability Classification and Table 3 shows that developments of this nature are appropriate in Flood Zone 3 subject to passing the Sequential and Exception Test, appropriate in a Flood Zone 2 subject to passing the Sequential Test. No tests are required for development within a Flood Zone 1.

In this case a sequential approach allows for all built form to be located in a Flood Zone 1. Accordingly, it is considered to pass the Sequential Test and does not require an Exception Test.

The site is not at risk from fluvial flooding for the design event and testing for sensitivity for 53% increase to climate change shows the dwellings should be adequately protected with a floor level set at 150mm above ground level.

It is recommended flood resilient construction to a height 300mm above the predicted flood depth shall also be installed in accordance with advice contained in “Improving the Flood Performance of New Buildings - Flood Resilient Construction”.

New foul and surface water drains will be designed to the relevant standards.

Appendices

Appendix A – National Planning Policy Framework

PLANNING AND FLOOD RISK

159. Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere.

160. Strategic policies should be informed by a strategic flood risk assessment, and should manage flood risk from all sources. They should consider cumulative impacts in, or affecting, local areas susceptible to flooding, and take account of advice from the Environment Agency and other relevant flood risk management authorities, such as lead local flood authorities and internal drainage boards.

161. All plans should apply a sequential, risk-based approach to the location of development–taking into account the current and future impacts of climate change[49] Except for applications for the repowering of existing wind turbines, a proposed wind energy development involving one or more turbines should not be considered acceptable unless itis in an area identified as suitable for wind energy development in the development plan; and, following consultation, it can be demonstrated that the planning impacts identified by the affected local community have been fully addressed and the proposal has their backing so as to avoid, where possible, flood risk to people and property. They should do this, and manage any residual risk, by:

    a) applying the sequential test and then, if necessary, the exception test as set out below;
    b) safeguarding land from development that is required, or likely to be required, for current or future flood management;
    c) using opportunities provided by new development to reduce the causes and impacts of flooding (where appropriate through the use of natural flood management techniques); and
    d) where climate change is expected to increase flood risk so that some existing development may not be sustainable in the long-term, seeking opportunities to relocate development, including housing, to more sustainable locations.

161. The aim of the sequential test is to steer new development to areas with the lowest risk of flooding. Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower risk of flooding. The strategic flood risk assessment will provide the basis for applying this test. The sequential approach should be used in areas known to be at risk now or in the future from any form of flooding.

162. If it is not possible for development to be located in zones with a lower risk of flooding (taking into account wider sustainable development objectives), the exception test may have to be applied. The need for the exception test will depend on the potential vulnerability of the site and of the development proposed, in line with the Flood Risk Vulnerability Classification set out in national planning guidance.

163. The application of the exception test should be informed by a strategic or site-specific flood risk assessment, depending on whether it is being applied during plan production or at the application stage. For the exception test to be passed it should be demonstrated that:

a) the development would provide wider sustainability benefits to the community that outweigh the flood risk; and
b) the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

165. Both elements of the exception test should be satisfied for development to be allocated or permitted.

166. There planning applications come forward on sites allocated in the development plan through the sequential test, applicants need not apply the sequential test again. However, the exception test may need to be reapplied if relevant aspects of the proposal had not been considered when the test was applied at the plan-making stage, or if more recent information about existing or potential flood risk should be taken into account.

167. When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment[50]. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:

a) within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;
b) the development is appropriately flood resistant and resilient;
c) it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;
d) any residual risk can be safely managed; and
e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan.

168. Applications for some minor development and changes of use[51] should not be subject to the sequential or exception tests but should still meet the requirements for site-specific flood risk assessments set out in footnote 50.

169. Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:

a) take account of advice from the lead local flood authority;
b) have appropriate proposed minimum operational standards;
c) have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and
d) where possible, provide multifunctional benefits.

Appendix B – South East Lincolnshire Local Plan

POLICY 4: APPROACH TO FLOOD RISK

Development proposed within an area at risk of flooding (Flood Zones 2 and 3 of the Environment Agency's flood map or at risk during a breach or overtopping scenario as shown on the flood hazard and depths maps in the Strategic Flood Risk Assessment) will be permitted, where:

1. It can be demonstrated that there are no other sites available at a lower risk of flooding (i.e. that the sequential test is passed). The sequential test will be based on a Borough or District wide search area of alternative sites within the defined settlement boundaries, unless local circumstances relating to the catchment area for the development justify a reduced search area, i.e. there is a specific need for the development in that location. The sequential test is not required for sites allocated in the Local Plan, minor development1or change of use (except for a change of use to a caravan, camping or chalet site, or to a mobile home or park home site).
2. It can be demonstrated that essential infrastructure in FZ3a & FZ3b, highly vulnerable development in FZ2 and more vulnerable development in FZ3 provide wider sustainability benefits to the community that outweigh flood risk.
3. The application is supported with a site-specific flood risk assessment, covering risk from all sources of flooding including the impacts of climate change and which:

    a) demonstrate that the vulnerability of the proposed use is compatible with the flood zone;
    b) identify the relevant predicted flood risk (breach/overtopping) level, and mitigation measures that demonstrate how the development will be made safe and that occupants will be protected from flooding from any source;
    c) propose appropriate flood resistance and resilience measures (following the guidance outlined in the Strategic Flood Risk Assessment), maximising the use of passive resistance measures (measures that do not require human intervention to be deployed), to ensure the development maintains an appropriate level of safety for its lifetime;
    d) include appropriate flood warning and evacuation procedures where necessary (referring to the County's evacuation routes plan), which have been undertaken in consultation with the authority's emergency planning staff;
    e) incorporates the use of Sustainable Drainage Systems (SuDS) (unless it is demonstrated that this is not technically feasible) and confirms how these will be maintained/managed for the lifetime of development (surface water connections to the public sewerage network will only be permitted in exceptional circumstances where it is demonstrated that there are no feasible alternatives);
    f) demonstrates that the proposal will not increase risk elsewhere and that opportunities through layout, form of development and green infrastructure have been considered as a way of providing flood betterment and reducing flood risk overall;
    g) demonstrates that adequate foul water treatment and disposal already exists or can be provided in time to serve the development;
    h) ensures suitable access is safeguarded for the maintenance of water resources, drainage and flood risk management infrastructure.

Development in all flood zones, and development over 1 hectare in size in Flood Zone 1, will need to demonstrate that surface water from the development can be managed and will not increase the risk of flooding to third parties.

Change of use of existing buildings will be supported providing they do not pose an increase in risk to people. Change of use that would result in self-contained ground floor residential accommodation in areas of hazard rating 'danger for some', 'danger for most' and 'danger for all' will not be supported. In these areas unrestricted access to a habitable room above the flood level and an emergency evacuation plan will be required.

Caravans, mobile homes and park homes intended for permanent residential use will not be permitted in areas at risk of flooding. Caravan, chalet, log cabin, camping and touring sites at risk of fluvial flooding where there is a 'danger for most' and 'danger for all' will not be permitted. Occupancy of caravan, chalet, log cabin, camping and touring sites at risk of tidal flooding will not be permitted to open between 1st November in any one year and the 14th March in the succeeding year.

No development will be permitted within a 50m buffer from the toe of the raised Witham Haven Banks (flood defences), as shown on the indicative Plan contained in Appendix 10, to allow access for construction and maintenance.

Flood risk management infrastructure shall be provided at the strategic level, where development opportunities allow, to reduce the hazard and probability of flooding.

Appendix C – Topographical Survey

Appendix D – Breach Analysis

River Glen - 1:100-year event + 53% Climate Change

Defence Crest Levels (h1)	4.49	m
Average Ground Level behind defences (h2)	1.8	m
1 in 1000 year flood level plus climate change (h3)	4.49	m
Assumed length of breach (B)	40	m
Max head over breach (h)	2.69	m
Peak flow (Q) = $1.7xBxh^{3/2}$	300.0	m^3s^{-1}

Peak flow (Q)	300.0	m^3s^{-1}
Assuming Energy Grad (S)	0.001	-
Assume % obstructions to flow	0	-
Assuming mannings (n)	0.03	-

	Scenario					
	1	2	3	4	5	6
Distance from breach	0	1000	2000	2500	3000	3500
Perimeter of Flood Wave (Assumed Channel Width)	40	3182	6324	7895	9466.0	11037
Effective perimeter (P)	40	3182	6324	7895	9466.0	11037
Normal Depth y = $((Qn/(b \times S^{0.50}))^{0.6}$	3.246	0.235	0.156	0.136	0.122	0.111

Time to Reach Development

Distance from breach above plus 1.0m	1	1001	2001	2501	3001	3501
Perimeter of Flood Wave (Assumed Channel Width)	43.1	3185.1	6327.1	7898.1	9469.1	11040.1
Normal Depth y = $(Qn/(bxS^{0.5}))^{0.6}$	3.102	0.235	0.156	0.136	0.122	0.111
Volume in Additional 1.0m	133.8	747.8	984.1	1075.4	1156.3	1229.5
Speed to cover additional 1.0m (m/s)	2.24	0.40	0.30	0.28	0.26	0.24
Average time to reach radius (secs)	-	2245.7	5907.3	8068.3	10410.0	12913.5
Average time to reach radius (mins)	-	37.4	98.5	134.5	173.5	215.2

Appendix E – Environment Agency Flood Data

Michael Orridge
michael@origindesigntudio.co.uk

Our ref: CCN-2023-300905

Date: 30/03/2023

Dear Michael,

Provision of Flood Risk Information for Spalding Road, Gosberton.

Thank you for your request for our flood risk information for the above site. The information is set out below and attached. It is important you read any contextual notes on the maps provided.

If you are preparing a Flood Risk Assessment (FRA) for this site, please note this information may not be sufficient by itself to produce an adequate FRA to demonstrate the development is safe over its lifetime. Additional information may be required to carry out an appropriate assessment of all risk, such as consequence of a breach in defences.

We aim to review our information on a regular basis, so if you are using this data more than twelve months from the date of this letter, please contact us again to check it is still valid.

Please read the letter in full as the information covered has been updated in **March 2023.**

1. Flood Map

The attached map includes the current Flood Map for your area. The Flood Map indicates the area at risk of flooding, **assuming no flood defences exist**, for a flood with a 0.5% chance of occurring in any year for flooding from the sea, or a 1% chance of occurring for fluvial (river) flooding. It also shows the extent of the Extreme Flood Outline which represents the extent of a flood with a 0.1% chance of occurring in any year, or the highest recorded historic extent if greater.

In some locations, such as around the fens and the large coastal floodplains, showing the area at risk of flooding assuming no defences may give a slightly misleading picture in that if there were no flood defences, water would spread out across these large floodplains. This flooding could cover large areas of land but to relatively shallow depths and could leave pockets of locally slightly higher land as isolated dry islands. It is important to understand the actual risk of the flooding to these dry islands, particularly in the event of defence failure.

The Flood Map also shows the location of formal raised flood defences and flood storage reservoirs. It represents areas at risk of flooding for present day only and does not take account of climate change.

The Flood Map only indicates the extent and likelihood of flooding from rivers or the sea. It should also be remembered flooding may occur from other sources such as surface water sewers, road drainage, etc.

2. Historic Flood Event Outlines

With regards to the history of flooding I can advise we do not have any records of flooding in this area. It is possible recent flooding may have occurred which we are currently investigating, therefore this information may be subject to change. It is possible other flooding may have occurred which other risk management authorities, such as the Lead Local Flood Authority (ie top tier council) or Internal Drainage Board (where they exist) have responsibility.

3. Schemes in the area

There are no ongoing capital projects to reduce or sustain the current flood risk to this site.

4. Fluvial Flood Risk Information

The site may be at risk from main rivers in the form of residual risk due to the failure of flood management infrastructure such as a breach of a raised flood defence. You may need to undertake further assessment of this residual risk using the data provided.

The site may also be at risk from local ordinary watercourses for which other risk management authorities, such as the Lead Local Flood Authority (ie top tier council) or Internal Drainage Board (where they exist) have responsibility.

4.1 Fluvial Defence Information

The existing fluvial defences reducing the risk of flooding from main river to this site consist of earth embankments. They are in fair condition and reduce the risk of flooding (at the defence) to a 1% (1 in 100) chance of occurring in any year. We inspect these defences routinely to ensure potential defects are identified.

Refer to paragraph 3 for details of any ongoing capital projects to reduce the flood risk to this site.

4.2 Fluvial Modelled Levels and Flows

Available modelled fluvial flood levels and flows for the model nodes shown on the attached map are set out in the data table attached. This data is taken from the model named on the data table, which is the most up-to-date model currently available.

Please note these levels are “in-channel” levels and therefore may not represent the flood level on the floodplain, particularly where the channel is embanked or has raised defences.

Our models may not have the most up to date climate change allowances. In time we will update our models for the latest allowances. You should refer to 'Flood risk assessments: climate change allowances' to check if the allowances modelled are appropriate for the type of development you are proposing and its location. You may need to undertake further assessment of future flood risk using different allowances to ensure your assessment of future flood risk is based on best available evidence.

4.3 Fluvial Modelled Flood Extents

Our modelled flood extents, which take into account flood defences, do not impact this site.

There may still be a residual risk of fluvial flooding to your site due to the failure of flood management infrastructure such as a breach of a raised flood defence. You may need to undertake further assessment of this residual risk using the data provided.

4.4 Fluvial Hazard Mapping

For certain locations we have carried out modelling to map the maximum values of flood depth, velocity and hazard rating (danger to people) resulting from overtopping and / or breaching of defences at specific locations for a number of scenarios.

At present this information is available for fluvial flood risk in Northampton, Lincoln, Wainfleet and some isolated rural locations.

The number of locations we have this information for is expected to increase in time.

At present this site is not covered by any Environment Agency hazard mapping, however south of your site Hazard Mapping is available from South Holland Strategic Flood Risk Assessment.

Detailed Hazard Mapping is available within the 2017 Update of South Holland Strategic Flood Risk Assessment. This can be downloaded via the following link:
http://www.southeastlincslocalplan.org/water/

5. Tidal Flood Risk Information

Whilst the site is within a tidal flood zone, ie assuming no tidal defences exist, it is not at risk of tidal flooding in either a overtopping or breaching of defences scenario, today or with an allowance for climate change.

5.1 Tidal Defence Information

The existing tidal defences protecting this site consist of earth embankments.

They are in good condition and reduce the risk of flooding (at the defence) to a 1% (1 in 100) chance of occurring in any year. We inspect these defences routinely to ensure potential defects are identified.

Refer to paragraph 3 for details of any ongoing capital projects to reduce the flood risk to this site.

5.2 Tidal Flood Levels

The attached data sheets show our current best estimate for extreme tide levels.

Please read the information notes on the data sheets.

5.3 Tidal Hazard Mapping

For certain locations we have carried out modelling to map the maximum values of flood depth, velocity and hazard rating (danger to people) resulting from overtopping and / or breaching of defences at specific locations for a number of scenarios.

At present this information is available along the full coastal / tidal floodplain, except the tidal Witham Haven in Boston (upstream of Hobhole) where only breaching and not overtopping has been modelled and the tidal River Welland upstream of Fosdyke Bridge where neither breaching nor overtopping are available.

The number of locations we have this information for is expected to increase in time.

At present this site is not covered by any hazard mapping.

6. Development Planning

If you would like local guidance on preparing a flood risk assessment for a planning application, please contact our Sustainable Places team at LNplanning@environment-agency.gov.uk. It will help if you mention this data request and attach your site location plan.

We provide free preliminary advice; additional/detailed advice, review of draft FRAs and meetings are chargeable at a rate set to cover our costs, currently £100 (plus VAT) per hour of staff time. Further details are available on our website at https://www.gov.uk/guidance/developers-get-environmental-advice-on-your-planning-proposals.

General advice on flood risk assessment for planning applications can be found on GOV.UK at https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications

Climate change will increase flood risk due to overtopping of defences. Please note, unless specified otherwise, the climate change data included has an allowance for 20% increase in flow. Updated guidance on how climate change could affect flood risk to new development - 'Flood risk assessments: climate change allowances' was published on GOV.UK in **July 2021**. The appropriate updated climate change allowance should be applied in a Flood Risk Assessment.

You should also consult the Strategic Flood Risk Assessment produced by your local planning authority.

7. Data Licence and Other Supporting Information

We respond to requests for recorded information we hold under the Freedom of Information Act 2000 (FOIA) and the associated Environmental Information Regulations 2004 (EIR).

This information is provided in accordance with the Open Government Licence which can be found here: http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/

Further information on flood risk can be found on the GOV.UK website at:
https://www.gov.uk/browse/environment-countryside/flooding-extreme-weather

8. Other Flood Risk Management Authorities

The information provided with this letter relates to flood risk from main river or the sea. The Flood Map for Surface Water can be viewed at https://www.gov.uk/check-long-term-flood-risk

Additional information may be available from other risk management authorities, such as the Lead Local Flood Authority (ie top tier council) or Internal Drainage Board (where they exist).

I hope we have correctly interpreted your request. If you have any queries or would like to discuss the content of this letter further please contact Joshua Clark using the email address below and quoting our CCN reference number above.

Yours sincerely,

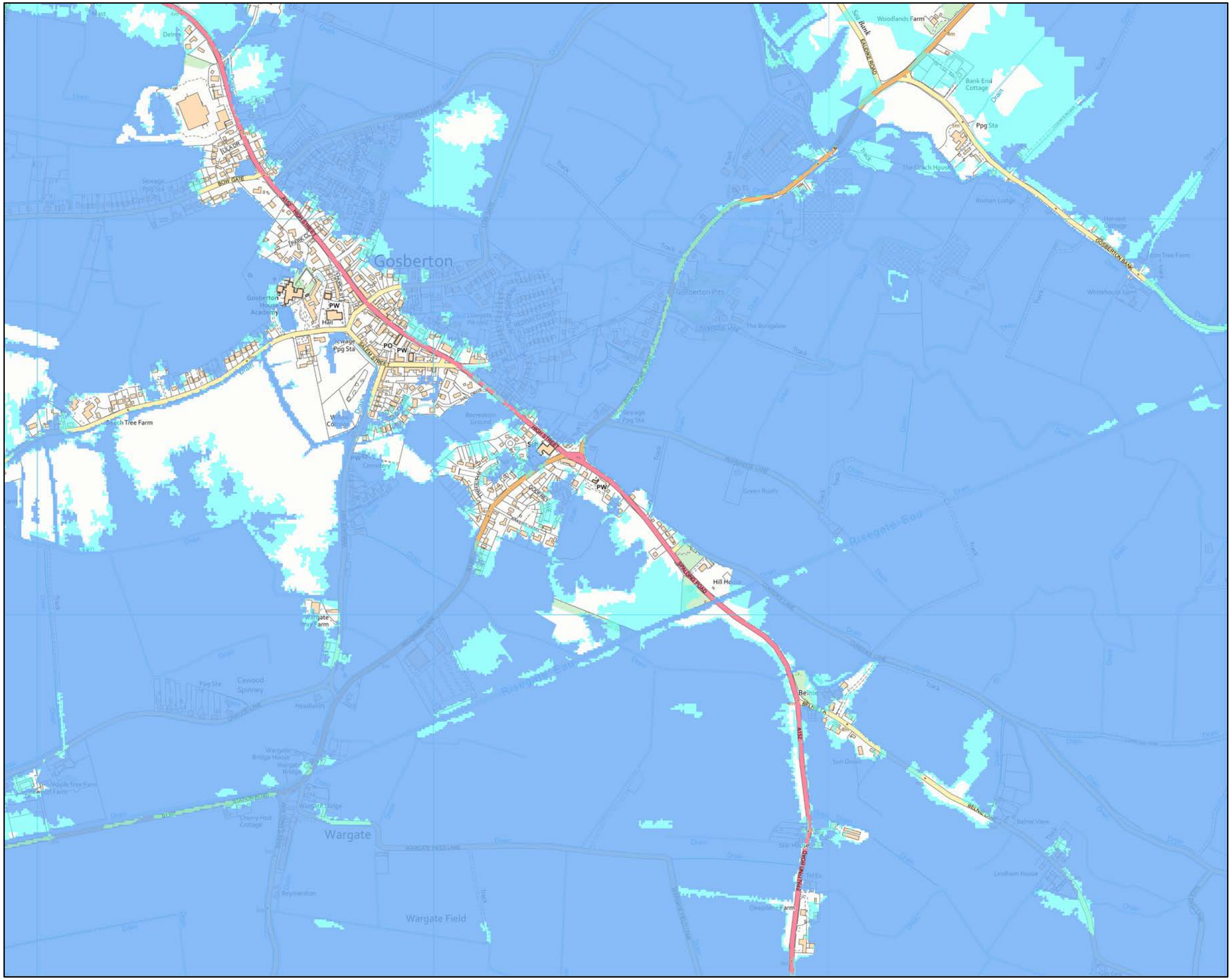


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for Alastair Windler
Welland and Nene Partnerships and Strategic Overview Team Leader
e-mail PSOWN@environment-agency.gov.uk

Enc.
Flood Map
Modelled Node Points Map
Modelled Fluvial Levels and Flows Data Sheet
Tidal Level Data Sheets - Map and Tables

Flood Map centred on TF 24532 31219 - created March 2023 [Ref: CCN-2023-300905]



Environment Agency

Scale 1:10,000

N

Legend

- Main Rivers
- Raised Defences
- Flood Storage Areas
- Areas at Risk of Flooding from Rivers or the Sea
- Extreme Flood Outline

Dark blue shows the area that could be affected by flooding, either from rivers or the sea, if there were no flood defences. This area could be flooded:

- from the sea by a flood that has a 0.5% (1 in 200) or greater chance of happening each year.

- or from a river by a flood that has a 1% (1 in 100) or greater chance of happening each year.

Light blue shows the extent of the Extreme Flood Outline, which represents the extent of a flood event with a 0.1% chance of occurring in any year, or the highest recorded historic extent if greater.

These two colours show the extent of the natural floodplain if there were no flood defences or certain other manmade structures and channel improvements. Sites outside the two extents, but behind raised defences, may be affected by flooding if the defences are overtopped or fail.

Created by the Partnerships and Strategic Overview Team, Kettering

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Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Modelled Node Map centred on TF 25252 28647 - created March 2023 [Ref: CCN-2023-300905]



Environment Agency

Scale 1:10,000

N

Legend

- Main Rivers
- Modelled Nodes - Flows
- Modelled Nodes - Levels

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Fluvial Flood Levels (mODN)

The fluvial flood levels for the model nodes shown on the attached map are set out in the table below. They are measured in metres above Ordnance Datum Newlyn (mODN).

			Annual Exceedance Probability - Maximum Water Levels (mODN)											
Node Label	Easting	Northing	50% (1 in 2)	20% (1 in 5)	10% (1 in 10)	5% (1 in 20)	3.33% (1in 30)	2% (1 in 50)	1.33% (1 in 75)	1% (1 in 100)	0.5% (1 in 200)	0.1% (1 in 1000)	1% (1 in 100) inc 20% Climate Change	0.1% (1 in 1000) inc 20% Climate Change
GLEN 1889	526690	328669	3.92	4.04	4.12	4.20	4.20	4.21	4.21	4.22	4.23	4.34	4.78	4.83
GLEN 3112	525662	328483	3.94	4.08	4.13	4.20	4.22	4.24	4.25	4.26	4.28	4.37	4.78	4.82
GLEN 3817	525080	328118	3.96	4.11	4.17	4.22	4.21	4.23	4.25	4.26	4.31	4.39	4.78	4.81
GLEN 4749.14	524276	327721	3.97	4.12	4.21	4.27	4.24	4.27	4.28	4.29	4.33	4.42	4.78	4.81

Fluvial Flood Flows (m^3/s)

The fluvial flood flows for the model nodes shown on the attached map are set out in the table below. They are measured in metres cubed per second (m^3/s).

			Annual Exceedance Probability - Maximum Flows (m^3/s)											
Node Label	**Easting**	**Northing**	**50% (1 in 2)**	**20% (1 in 5)**	**10% (1 in 10)**	**5% (1 in 20)**	**3.33% (1in 30)**	**2% (1 in 50)**	**1.33% (1 in 75)**	**1% (1 in 100)**	**0.5% (1 in 200)**	**0.1% (1 in 1000)**	**1% (1 in 100) inc 20% Climate Change**	**0.1% (1 in 1000) inc 20% Climate Change**
GLEN 2002.5	526578	328679	44.60	46.68	48.84	51.68	52.14	52.61	53.24	53.88	56.94	64.61	63.47	73.18
GLEN 3012.5	525761	328488	37.95	40.69	42.85	44.83	46.20	47.20	46.92	48.44	51.22	58.98	57.59	66.36
GLEN 3863.5	525039	328097	33.48	36.53	38.44	40.55	40.82	41.95	42.75	42.94	45.85	54.77	52.85	61.97
GLEN 4603.5	524415	327721	30.51	33.23	34.83	36.85	37.84	38.66	39.38	39.98	43.07	51.79	48.89	58.78

East Coast and Wash - 2018 Coastal Flood Boundary [CFB] Dataset
Key Node Points



Environment Agency

Scale 1:550,000

N W E S

▲ East Coast and Wash

See seperate data sheet for predicted flood levels

Created by the Partnerships and Strategic Overview Team, Lincoln

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East Coast and Wash: Immingham to the West Lighthouse

2018 Coastal Flood Boundary Extreme Sea Levels

CFB Ref	Location	Easting	Northing	Annual Chance (1 in x) of Tide Level in metres ODN																		
				1			10			50			100			200			300			1000		
				Confidence Bound			Confidence Bound			Confidence Bound			Confidence Bound			Confidence Bound			Confidence Bound			Confidence Bound		
				2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%	2.5%	50%	97.5%
3888	Immingham	520440	417625	4.16	4.17	4.19	4.50	4.53	4.62	4.73	4.80	5.00	4.83	4.93	5.19	4.93	5.06	5.41	4.98	5.14	5.55	5.15	5.38	6.01
3890	Haborough Marsh	522100	416512	4.14	4.15	4.17	4.48	4.51	4.60	4.70	4.77	4.97	4.80	4.90	5.16	4.90	5.03	5.38	4.94	5.10	5.51	5.11	5.34	5.97
3898	Grimsby	529295	413162	3.98	3.99	4.01	4.31	4.34	4.43	4.53	4.60	4.80	4.61	4.71	4.97	4.71	4.84	5.19	4.74	4.90	5.31	4.88	5.11	5.74
3906	Buck Beck	534709	407369	3.87	3.88	3.90	4.19	4.23	4.31	4.41	4.50	4.68	4.50	4.61	4.86	4.61	4.75	5.10	4.64	4.82	5.22	4.80	5.05	5.66
3910	Tetney	538035	405537	3.85	3.86	3.89	4.17	4.22	4.30	4.40	4.50	4.67	4.49	4.61	4.86	4.60	4.75	5.10	4.63	4.82	5.21	4.80	5.06	5.66
3918	Donna Nook	544641	401997	3.82	3.83	3.86	4.14	4.19	4.27	4.38	4.48	4.65	4.47	4.60	4.85	4.58	4.74	5.10	4.63	4.82	5.22	4.81	5.08	5.68
3928	Saltfleet	549131	393360	3.78	3.79	3.82	4.11	4.16	4.26	4.36	4.46	4.64	4.47	4.59	4.86	4.57	4.74	5.11	4.63	4.83	5.25	4.83	5.11	5.74
3942	Boygrift	555131	380860	3.72	3.74	3.77	4.06	4.11	4.22	4.33	4.43	4.65	4.43	4.57	4.87	4.56	4.73	5.13	4.62	4.83	5.28	4.85	5.15	5.82
3968	Gibraltar Point	557652	356181	4.16	4.17	4.20	4.51	4.56	4.67	4.76	4.85	5.08	4.85	4.97	5.27	4.94	5.10	5.49	4.99	5.18	5.63	5.14	5.41	6.09
3992_14	Hobhole	535990	340116	4.96	4.97	5.01	5.40	5.44	5.56	5.66	5.76	5.98	5.78	5.90	6.20	5.88	6.04	6.44	5.92	6.11	6.57	6.03	6.31	6.99
	Grand Sluice*	532366	344510	4.93	4.94	4.98	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3
3992_9	Boston Barrier	532754	342852	4.93	4.94	4.98	5.41	5.45	5.57	5.73	5.83	6.05	5.85	5.97	6.27	5.93	6.09	6.49	5.94	6.13	6.59	5.98	6.26	6.94
3992_5	Fosdyke Bridge	531886	332234	4.87	4.88	4.92	5.31	5.35	5.47	5.58	5.68	5.90	5.71	5.83	6.13	5.82	5.98	6.38	5.87	6.06	6.52	6.01	6.29	6.97
4008	West Lighthouse	550094	329971	4.87	4.88	4.91	5.21	5.26	5.37	5.46	5.56	5.78	5.56	5.68	5.98	5.66	5.82	6.21	5.71	5.90	6.35	5.86	6.14	6.81
-	Marsh Road	525988	324065	-	5.04	-	-	5.44	-	-	5.73	-	-	5.85	-	-	5.98	-	-	-	-	-	-	-
-	Wisbech	546110	309940	-	4.83	-	-	5.25	-	-	5.53	-	-	5.66	-	-	5.78	-	-	-	-	-	-	-
-	Dog-in-a-Doublet	527200	299287	-	3.67	-	-	4.00	-	-	4.22	-	-	4.32	-	-	4.42	-	-	-	-	-	-	-

See next page for notes

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East Coast and Wash: Immingham to the West Lighthouse

2018 Coastal Flood Boundary Extreme Sea Levels

NOTES:

The following notes apply to all CFB sites (ie all on table excluding Marsh Road, Wisbech, Dog-in-a-Doublet)

- The base date for the data is 2017.
- The levels are still water levels. Depending on the use of the data it may be necessary to consider wave heights and / or joint probability analysis of water level and other variables.
- Levels for other annual chance probabilities are available if required.
- For additional information relating to the 2018 Coastal Flood Boundary Extreme Sea Levels or to access the full dataset for the above sites or intermediate locations refer to the Defra Metadata Catalogue at https://deframetadata.com/geonetwork/srv/eng/catalog.search#/metadata/84a5c7c0-d465-11e4-b0bd-f0def148f590

The following notes apply to all Marsh Road, Wisbech, Dog-in-a-Doublet

- The base date for the data is 2006
- The levels are still water levels. Depending on the use of the data it may be necessary to consider wave heights and / or joint probability analysis of water level and other variables.
- Levels for other annual chance probabilities are available if required.
- These levels will be updated as their respective tidal river models are updated.

The following notes apply to Grand Sluice

- The data is based on CFB 2018 data for Boston Barrier site, capped at 5.3mAOD to reflect use of the barrier.
- The base date for the data is 2017
- The levels are still water levels. Depending on the use of the data it may be necessary to consider wave heights and / or joint probability analysis of water level and other variables.
- For additional information relating to the 2018 Coastal Flood Boundary Extreme Sea Levels or to access the full dataset for the above sites or intermediate locations refer to the Defra Metadata Catalogue at https://deframetadata.com/geonetwork/srv/eng/catalog.search#/metadata/84a5c7c0-d465-11e4-b0bd-f0def148f590

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