



Flood Risk Assessment
AEG4130_PE12_SuttonBridge_01

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Site Address: Cadent Gas
Bridge Road
Sutton Bridge
South Holland
PE12 9EG

UK Experts in Flood Modelling, Flood Risk Assessments, and Surface Water Drainage Strategies

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Document Issue Record

Project: Flood Risk Assessment

Prepared for: Dalcour Maclaren

Reference: AEG4130_PE12_SuttonBridge_01

Site Location: Cadent Gas, Bridge Road, Sutton Bridge, South Holland, PE12 9EG

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Summary

Development Description	Existing	Proposed
Development Type	Gas infrastructure	The construction of a Glass Reinforced Plastic (GRP) building to house additional gas supply metering infrastructure.
EA Vulnerability Classification	Essential Infrastructure	Essential Infrastructure
Ground Floor Level	EA 1m LiDAR data shows the ground elevation of the site varies between approximately 2.51m AOD and 4.13m AOD.	No change. New metering equipment should be set no lower than existing metering equipment on site.
Impermeable Surface Area	N/A[2]	Proposed causes a negligible change
Site Size	Approximately 3,250m²	No change
Risk to Development	**Summary**	**Comment**
EA Flood Zone	Flood Zone 3	River Nene
Flood Source	Tidal	
SFRA Available	South East Lincolnshire Strategic Flood Risk Assessment (South East Lincolnshire Joint Strategic Planning Committee, 2017)	
Management Measures	**Summary**	**Comment**
Ground floor level above extreme flood levels	No	Affected in the modelled climate change breach events. Due to the due to the nature of the development the client has advised that the gas supply will remain operational even during flood, and the loss of metering would not affect operation.
Safe Access/Egress Route	N/A[2]	The gas metering infrastructure would likely remain unmanned for the majority of its use, though on receipt of a Met Office Severe

		Weather Warning or EA Flood Warning the site should be evacuated and any planned maintenance to site should only continue after the warning is lifted.
Flood Resilient Design	No	It can be considered that the site would still be functional in a flood event, irrespective of whether the proposed metering infrastructure is in operation or not, and therefore the proposed development does not need to consider a flood resistant/resilient design.
Site Drainage Plan	N/A[1]	Proposed development is an addition to an existing site and thus could discharge via existing system.
Flood Warning and Evacuation Plan	Yes	Recommended to sign up to the Wash Frontage and the left bank of the Tidal River Nene from Wisbech to Holbeach St Matthew Environment Agency (EA) flood warning service.
Offsite Impacts	**Summary**	**Comment**
Displacement of floodwater	No	As per Paragraph 049 of the NPPG, the loss of floodplain storage is less likely to be a concern in areas benefitting from appropriate flood risk management infrastructure or where the source of flood risk is solely tidal
Increase in surface run-off generation	N/A[1]	Proposed development is an addition to an existing site and thus could discharge via existing system.
Impact on hydraulic performance of channels	No	Nearest unnamed drain approximately 20m from the site.

[1] not required for this assessment

[2] data not available

1. Introduction

1.1. Aegaea were commissioned by Dalcour Maclaren to undertake a Flood Risk Assessment (FRA) to facilitate a planning application for the proposed development. This FRA has been prepared in accordance with the requirements set out in the National Planning Policy Framework (NPPF) and the associated Planning Practice Guidance.

1.2. This FRA is intended to support a full planning application and as such the level of detail included is commensurate and subject to the nature of the proposals.

Site Overview

1.3. The site of the proposed development is Cadent Gas, Bridge Road, Sutton Bridge, South Holland, PE12 9EG (Figure 1).



Figure 1: Site Location (Base map and data from Google Hybrid ©)

1.4. It is understood that the proposed development is for the construction of a Glass Reinforced Plastic (GRP) building to house additional gas supply metering infrastructure.

1.5. In the absence of a topographical survey, Environment Agency Light Detection and Ranging (LiDAR) data Digital Terrain Model has been used to review the topography of the site. The LiDAR data shows the ground elevation of the site varies between approximately 2.51m AOD (metres Above Ordnance Datum) and 4.13m AOD (Figure 2).

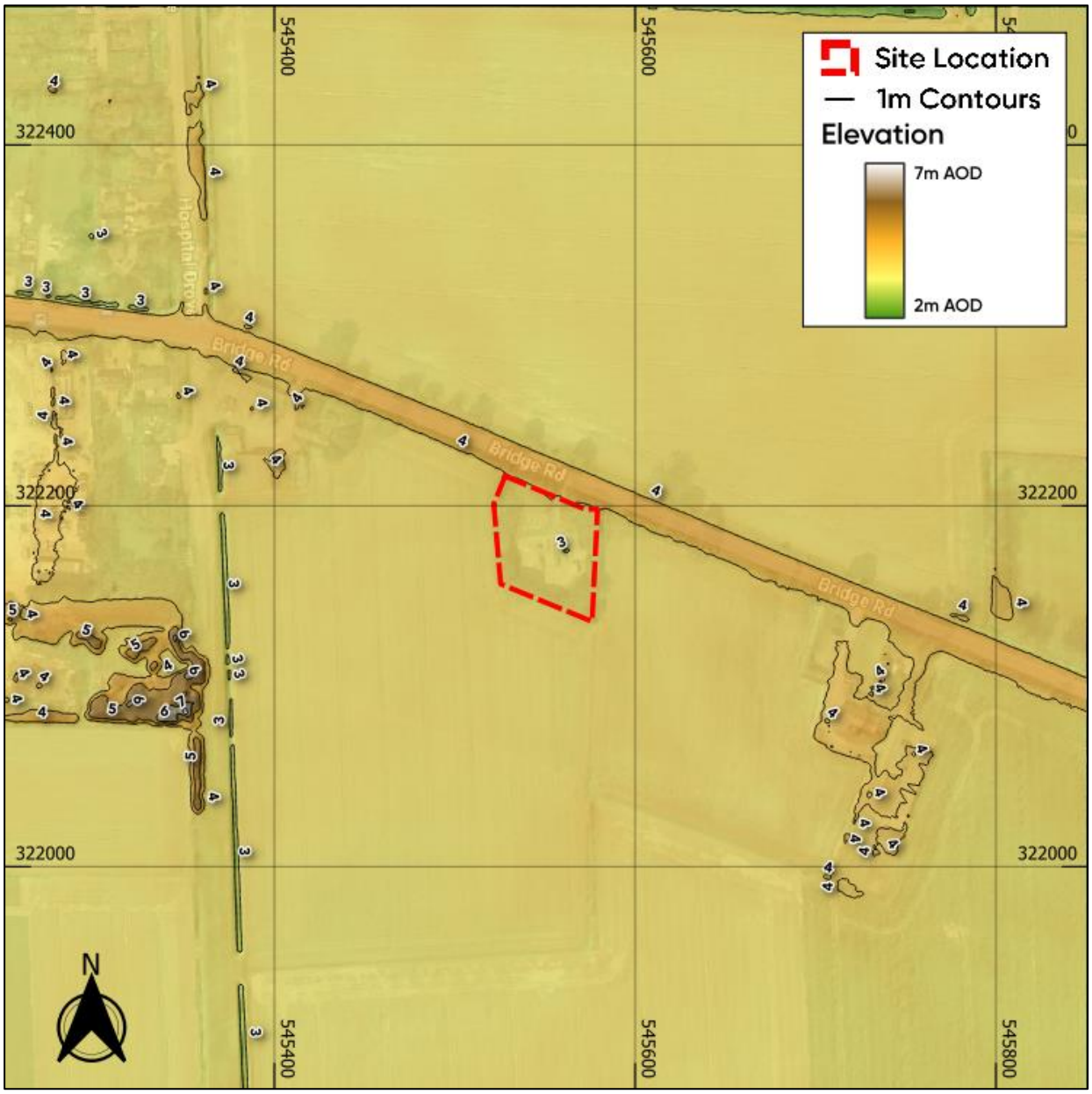


Figure 2: Site Topography (Base map and data from Google Hybrid © Contains public sector information licensed under the Open Government Licence v3.0)

1.6. South Holland District Council is the Local Planning Authority (LPA) for the site and Lincolnshire County Council is the designated Lead Local Flood Authority (LLFA). The site sits within the Environment Agency (EA)'s Lincolnshire and Northamptonshire region.

Planning Policy and Guidance

1.7. UK government planning guidance states[1] that an FRA is required for developments which are:

- *in flood zone 2 or 3 including minor development and change of use*
- *more than 1 hectare (ha) in flood zone 1*
- *less than 1 ha in flood zone 1, including a change of use in development type to a more vulnerable class (for example from commercial to residential), where they could be affected by sources of flooding other than rivers and the sea (for example surface water drains, reservoirs)*
- *in an area within flood zone 1 which has critical drainage problems as notified by the Environment Agency*

1.8. The site is located within Flood Zone 3. According to NPPF Footnote 59 an FRA is required.

1.9. The objective of this FRA is to demonstrate that the proposals are acceptable in terms of flood risk. This report summarises the findings of the study and specifically addresses the following issues in the context of the current legislative regime:

- Fluvial/ tidal flood risk
- Surface water flood risk
- Risk of flooding from other sources

[1]**https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications#when-you-need-an-assessment**

2. Planning Policy

2.1. Inappropriate development in a flood risk area could pose significant risk in terms of personal safety and damage to property for the occupiers of the development or for people elsewhere. The approach taken in the assessment of flood risk at the planning stage is set out in national, regional, and local planning policy and associated guidance. This section summarises the key policies and guidance relevant to the proposed development.

National Planning Policy Framework (NPPF)

2.2. The National Planning Policy Framework[2] (NPPF) (DLUHC, 2023) which includes UK Government policy on development and flood risk states:

> *165. 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.*
>
> *173. 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. 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 such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment;*
>
> *c) it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;*

[2] https://www.gov.uk/guidance/national-planning-policy-framework, **last updated Dec 2023**

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.*

174. Applications for some minor development and changes of use 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 59.

2.3. Paragraph 051 of the NPPG defines Minor Developments:

What is meant by "minor development" in relation to flood risk?

Minor development means:

- ***minor non-residential extensions (industrial/commercial/leisure etc): extensions with a floorspace not in excess of 250 square metres.***
- *alterations: development that does not increase the size of buildings, e.g. alterations to external appearance.*
- *householder development: for example, sheds, garages, games rooms etc. within the curtilage of the existing dwelling, in addition to physical extensions to the existing dwelling itself. This definition excludes any proposed development that would create a separate dwelling within the curtilage of the existing dwelling (e.g. subdivision of houses into flats) or any other development with a purpose not incidental to the enjoyment of the dwelling*

2.4. The proposal is for the installation of additional gas metering within a new kiosk in the existing gas infrastructure site. As such, the proposal could be considered a Minor Development in terms of flood risk, given it is for the extension of the existing gas infrastructure site use within the site curtilage.

2.5. Footnote 59 of the NPPF states:

A site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that

may be subject to other sources of flooding, where its development would introduce a more vulnerable use.

2.6. Flood Zones in England are defined as follows:

Table 1: Flood Zone Definitions

Flood Zone	Definition
Zone 1 Low Probability	Land having less than 1 in 1,000 annual probability of river or sea flooding (all land outside Zones 2 and 3).
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding.
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding.
Zone 3b The Functional Floodplain	This zone comprises land where water from rivers or the sea has to flow or be stored in times of flood. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. Functional floodplain will normally comprise: land having a 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively; or land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding). Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

2.7. An FRA should be appropriate to the scale, nature, and location of the development. It should identify and assess the risk from all sources of flooding to and from the development and demonstrate how any flood risks will be managed over the lifetime of the development.

2.8. An assessment of hydrological impacts should be undertaken, including to surface water runoff and impacts to drainage networks in order to demonstrate how flood risk to others will be managed following development and taking climate change into account.

Local Plan

2.9. The Local Plan prepared by the Local Planning Authority, South Holland District Council, sets out the policies for development in the local area.

2.10. Policy 4: Approach to Flood Risk outlines the requirements for new development within the area. It states:

> *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 development1 or 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.

Sequential and Exception Tests

2.11. The Sequential and Exception Tests are applied in specific cases defined by UK Government policy. Their purpose is to drive development to areas of low flood risk and to support developments which improve flood risk for developments in areas at risk of flooding.

Sequential Test

2.12. The overall aim of the Sequential Test is to ensure that areas at little or no risk of flooding from any source are developed in preference to areas at higher risk.

2.13. However, it is noted that the proposed development is categorised as Essential Infrastructure (Glass Reinforced Plastic (GRP) building to house additional gas supply metering infrastructure) and thus there is an overriding need for the development to be located within the immediate vicinity of the site/ area it is to provide for. As such, it may not be appropriate to locate the development on another site at a lower risk of flooding.

2.14. Paragraph 027 of the NPPG also states:

a pragmatic approach needs to be taken where proposals involve comparatively small extensions to existing premises (relative to their existing size), where it may be impractical to accommodate the additional space in an alternative location.

2.15. Therefore, the sequential test is not considered to be applicable in this instance.

2.16. Furthermore, the proposal could be considered a Minor Development in terms of flood risk and under Paragraph 168 of the NPPF:

*174. Applications for some **minor development** and changes of use 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 59.*

2.17. Therefore, the proposal should not be subject to the Sequential or Exception Tests.

2.18. The Flood Risk Vulnerability Classification table[4] provided below in Table 2 shows which vulnerabilities are appropriate in each Flood Zone.

2.19. The proposed development sits wholly within Flood Zone 3 and the proposed development is considered 'Essential Infrastructure'. Table 2 shows Flood Zone 3 is only an appropriate location for 'Essential Infrastructure' uses with an Exception Test.

Table 2: Flood risk vulnerability and flood zone 'incompatibility'

	Flood Risk Vulnerability Classification				
Flood Zones	**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	✓

4 https://www.gov.uk/guidance/flood-risk-and-coastal-change#table2

2.20. For the Exception Test to be passed, the proposed development must meet the following criteria:

A. It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh the flood risk, as informed by a Strategic Flood Risk Assessment;

B. A Flood Risk Assessment demonstrates that the development will be safe, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

2.21. Part A of the Exception Test is outside the scope of this FRA. The planning application submitted by the client is required is to be accompanied by an FRA which shows that the development can meet the requirements of the Part B of the Exception Test, with an overall reduction of flood risk to the site and surrounding area.

2.22. Furthermore, Paragraph 79 of the PPG[5] states that:

In Flood Zone 3b (functional floodplain) essential infrastructure that has passed the Exception Test, and water-compatible uses, should be designed and constructed to:

- *remain operational and safe for users in times of flood;*
- *result in no net loss of floodplain storage;*
- *not impede water flows and not increase flood risk elsewhere.*

Summary

2.23. This flood risk assessment has been prepared with due consideration to the above local and national policy.

[5] **https://www.gov.uk/guidance/flood-risk-and-coastal-change**

3. Consultation and Review

Consultation

3.1. The Environment Agency have provided Aegaea with the Product 4 Data set for the East Coast and Wash – 2018 Coastal Flood Boundary Data. This will be discussed further in Section 4.

Documents and Online Mapping

3.2. Local Governments and Lead Local Flood Authorities provide documents which contain data and policies on flood risk and new development in their areas. These documents are introduced and briefly summarised below. For the purposes of this FRA, these documents have been reviewed for relevant information and any relevant data is discussed within the appropriate sub heading of this report.

3.3. The following sources of information have been reviewed for this assessment:

- Flood Map for Planning on the Environment Agency website *https://flood-map-for-planning.service.gov.uk/*
- Long Term Flood Risk Information on the Environment Agency website *https://www.gov.uk/check-long-term-flood-risk*
- National Planning Policy Framework (NPPF) (Department for Levelling Up, Housing and Communities, 2023)
- Planning Practice Guidance - Flood Risk and Coastal Change (Department for Levelling Up, Housing and Communities, 2022)
- Geoindex Onshore (British Geological Survey, 2023)
- South East Lincolnshire Local Plan 2011-2036 (South East Lincolnshire Joint Strategic Planning Committee, 2019)[6]
- Lincolnshire County Council Preliminary Flood Risk Assessment (Lincolnshire County Council, 2011 & 2017)[7]

[6] **https://www.southeastlincslocalplan.org/wp-content/uploads/2019/02/Local-Plan-text-March-2019.pdf**

[7] **https://www.lincolnshire.gov.uk/downloads/file/4382/preliminary-flood-risk-assessment-report**

- South East Lincolnshire Strategic Flood Risk Assessment (South East Lincolnshire Joint Strategic Planning Committee, 2017)[8]
- Lincolnshire Flood Risk and Water Management Strategy 2019-2050 (Lincolnshire County Council, 2019)[9]

Preliminary Flood Risk Assessment (PFRA)

3.4. The PFRA is a high-level appraisal of flood risk across Lead Local Flood Authority Lincolnshire County Council. The flood risk from all sources, including fluvial, surface water, groundwater, and surcharged sewers is evaluated. It is the basis upon which the Local Flood Risk Management Strategy is produced.

3.5. The PFRA summarises historical flood incidents in Lincolnshire County Council. The site is not recorded as having been affected by any flood event.

Strategic Flood Risk Assessment (SFRA)

3.6. The SFRA, published in 2017, provides the evidence base for the Local Planning Authority South Holland District Council Local Plan and guidance for consideration when determining planning applications. The SFRA seeks to place new development into areas of lower flood risk taking into account current flood risk, future flood risk, and the effect a proposed development would have on the risk of flooding.

3.7. The SFRA mapping provided by South Holland District Council has been used throughout production of this report as a source of information, particularly pertaining to historical flood incidents.

[8] https://southeastlincslocalplan.org/wp-content/uploads/2018/01/SE-Lincolnshire-SFRA-2017-v6-24th-Jan-2018.pdf

[9] https://www.lincolnshire.gov.uk/downloads/file/3390/joint-flood-risk-and-water-management-strategy-2019-2050-strategic-visio-

Local Flood Risk Management Strategy (LFRMS)

3.8. The Local Flood Risk Management Strategy sets out roles and responsibilities for flood risk management, assesses the risk of flooding in the area, where funding can be found to manage flood risk, and the policies, objectives, and actions of the Lead Local Flood Authority.

3.9. The Lincolnshire County Council LFRMS is used within this report to identify any flood management infrastructure and historical incidences of flooding.

4. Sources of Flood Risk

Fluvial/Tidal

4.1. Flooding from watercourses arises when flows exceed the capacity of the channel, or where a restrictive structure is encountered, resulting in water overtopping the banks into the floodplain.

Main Rivers

4.2. The River Nene is located approximately 2800m west of the site.

Ordinary Watercourses/IDB Drains

4.3. An unnamed drain is located approximately 20m north of the site, on the opposite side of the higher elevated road and an Internal Drainage Board (IDB) Ordinary Watercourse (DRN199G4408) is located 150m west of the site (Figure 3).

4.4. The South Holland Drainage Board Policy Statement[10] states that:

> *The District is at some risk from flooding, but that risk is managed wherever it is practical, environmentally and financially viable.*

4.5. The site is not located in the vicinity of a IDB pumping station. As such, the risk of flooding from the IDB drains can be considered low.

[10] **https://www.wlma.org.uk/uploads/SHIDB_Policy_Statement_November_2022.pdf**

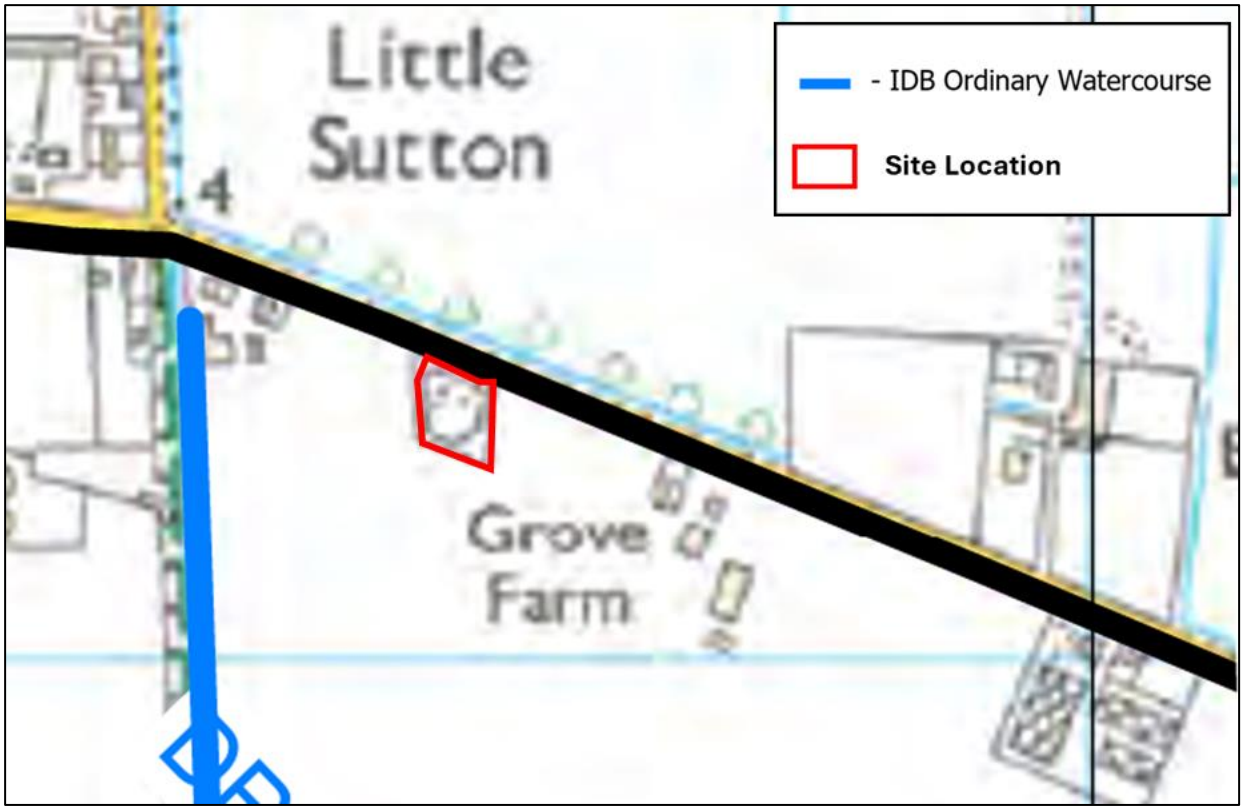


Figure 3: Location of IDB Ordinary Watercourse (South Holland Drainage Board)

EA Flood Map for Planning

4.6. The site is located within Flood Zone 3 (Figure 4). Flood Zone 3 denotes a risk of flooding from fluvial sources greater than 1 in 100 (1%) or from tidal sources greater than 1 in 200 (0.5%).

4.7. Review of the EA's flood zone data set indicates that the flood zones sources are derived from tidal and fluvial models. However, the EA product 4 data set states that:

> *This site is not considered to be at risk of flooding from main rivers.*
>
> *The site may 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.*

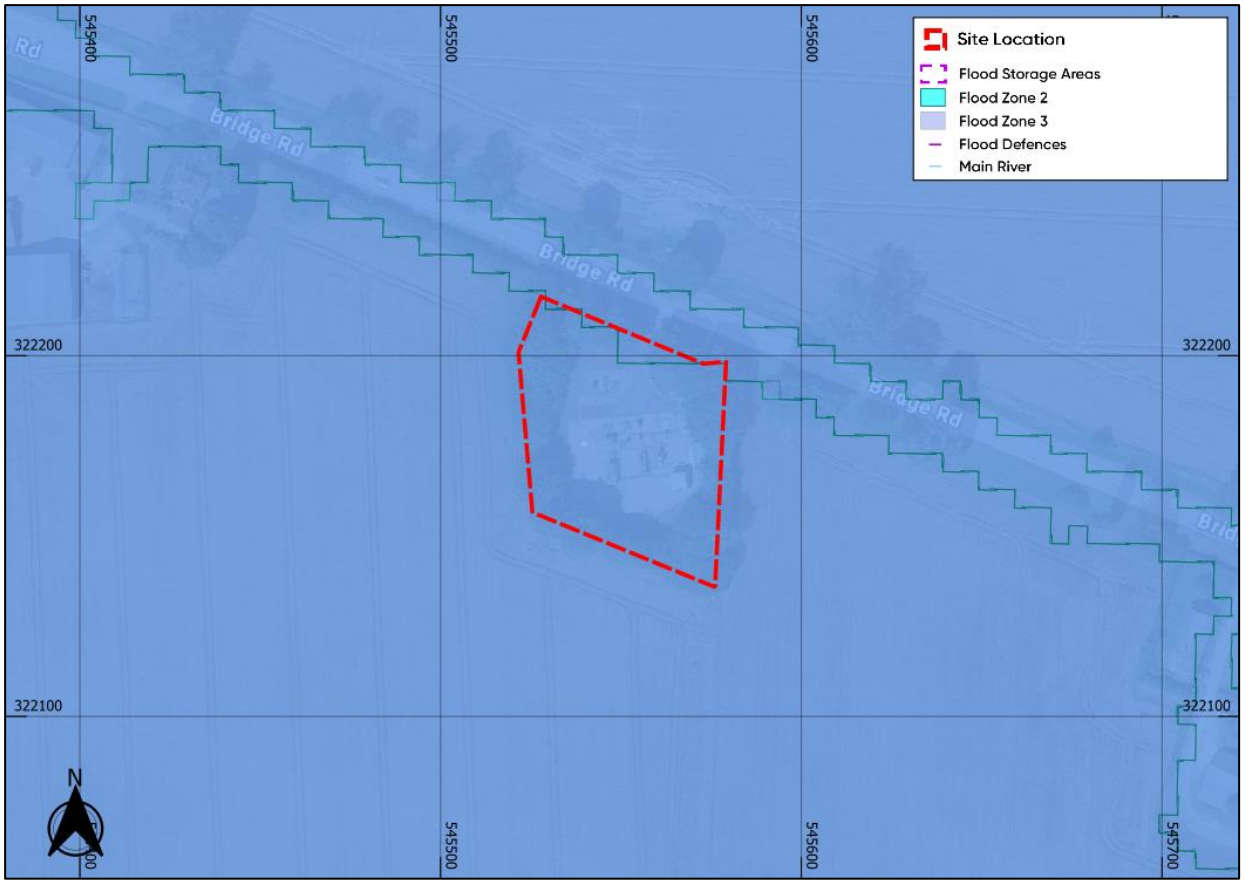


Figure 4: EA Flood Map for Planning (Base map and data from Google Hybrid © Contains public sector information licensed under the Open Government Licence v3.0)

SFRA Mapping

4.8. It is noted that, through the Fluvial and Tidal Source Mapping provided in the SFRA, the site has been identified as being in an area solely affected by tidal sources. As such, the risk from fluvial sources can be considered low.

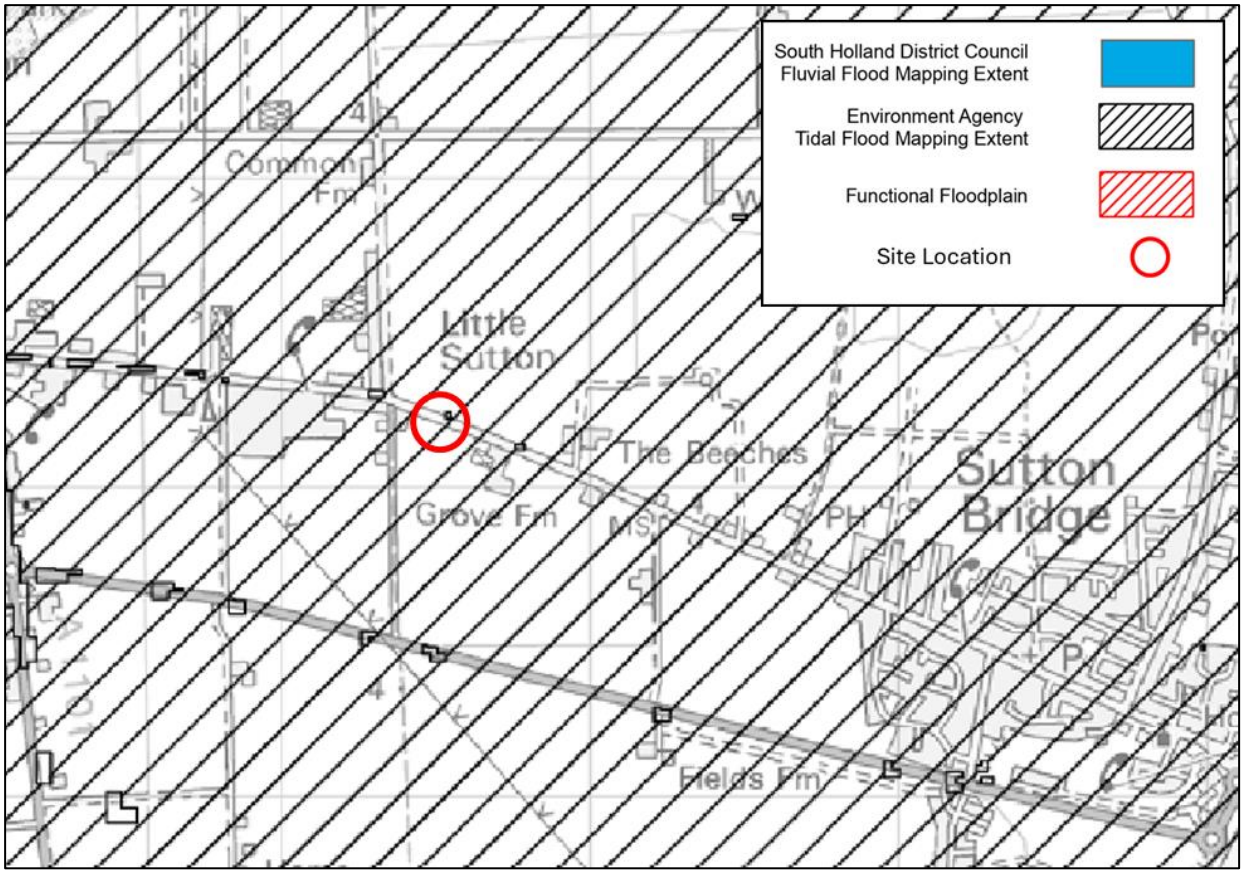


Figure 5: SFRA Fluvial and Tidal Source Mapping in the District - Year 2115 1% Fluvial/0.5% Tidal (South East Lincolnshire SFRA, 2017)

4.9. Tidal flooding occurs when a high tide and high winds combine to elevate sea levels. An area behind coastal flood defences can still flood if waves overtop the defences or break through them. Tidal flooding can also occur a long way from the coast by raising river levels. Water may overtop the riverbank or river defences when tide levels are high.

Historical Fluvial Flooding

4.10. There is no record of historical fluvial/tidal flooding on-site based on the EA's recorded flood outline dataset (Figure 6)



Figure 6: EA Historic Flood Mapping (Base map and data from Google Hybrid © Contains public sector information licensed under the Open Government Licence v3.0)

East Coast and Wash - 2018 Coastal Flood Boundary Data

4.11. Aegaea have been provided with Product 4 data for this area by the Environment Agency from the East Coast and Wash - 2018 Coastal Flood Boundary Data. It is understood that this is the best available modelled flood data for this area. The EA also provided Aegaea with the Product 5 data for the Tidal Nene and Tidal Welland Mapping; however, this study area did not cover the site.

Defences

4.12. The EA Product 4 data set states:

> *The existing tidal defences protecting this site consist of earth embankments.*
>
> *They are in fair condition and reduce the risk of flooding (at the defence) to a 0.67% (1 in 150) chance of occurring in any year. We inspect these defences routinely to ensure potential defects are identified.*

4.13. These flood defences are located along the River Nene to the west of the site. The East Coast and Wash - 2018 Coastal Flood Boundary Data includes overtopping and breach data for the present day (2006) and climate change (2115) scenarios. It is noted that, the EA state that:

> *site is not affected by overtopping of the defences for the present day (2006) and climate change (2115) scenarios, though may be at risk from breaching.*

4.14. As such, the breach scenarios will be analysed further.

Present Day (2006) Breach

4.15. The location of the modelled breaches in relation to the site can be seen in Figure 7.

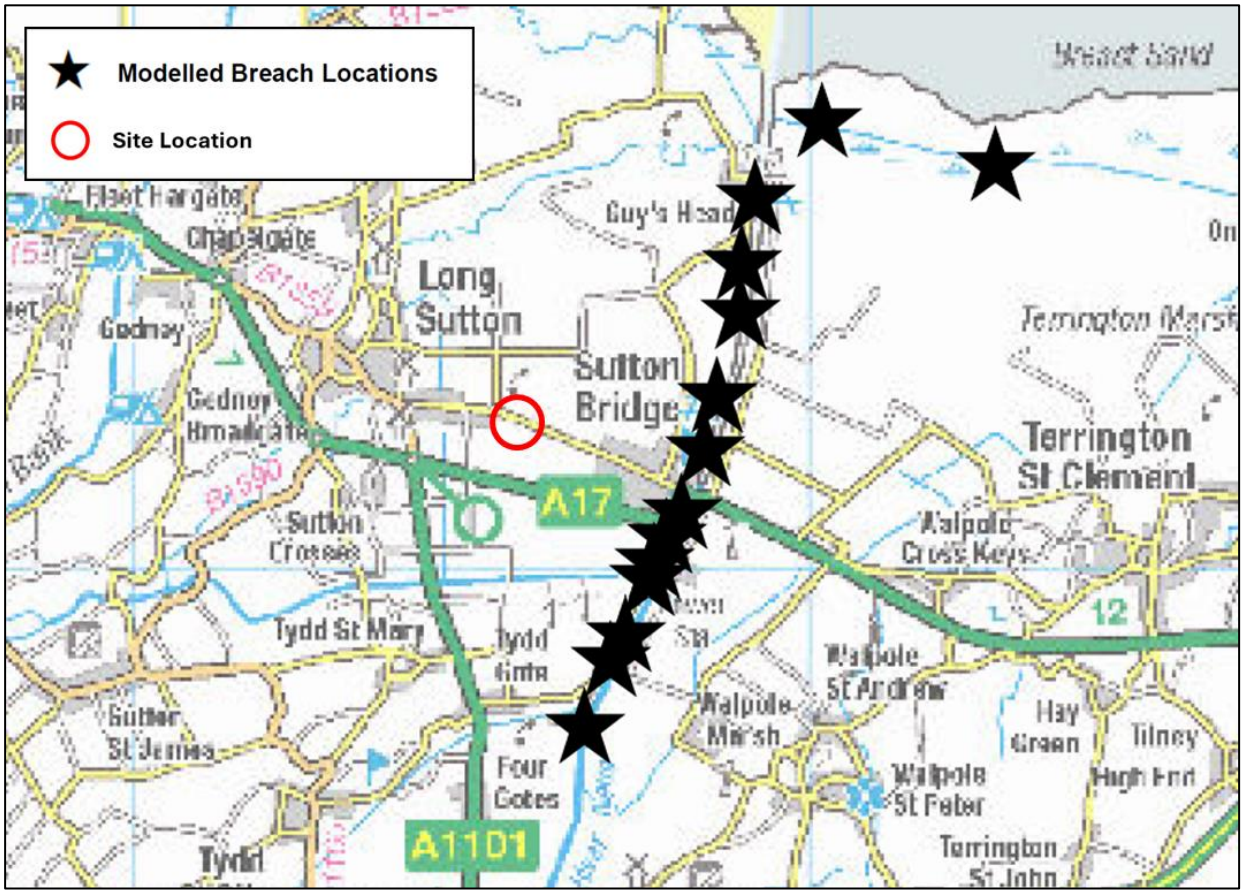


Figure 7: Location of Modelled Breach Locations in Relations to the Site Location (East Coast and Wash - 2018 Coastal Flood Boundary Data)

4.16. Analysis of the modelled 1 in 200 year (0.5% AEP) and 1 in 1000 year (0.1% AEP) present day (2006) breach events (Figure 8 and Figure 9) indicate that the site is not affected by flood depths in these events. This is due to the higher elevated Bridge Road (Figure 2), to the north of the site, protecting the site from flooding.

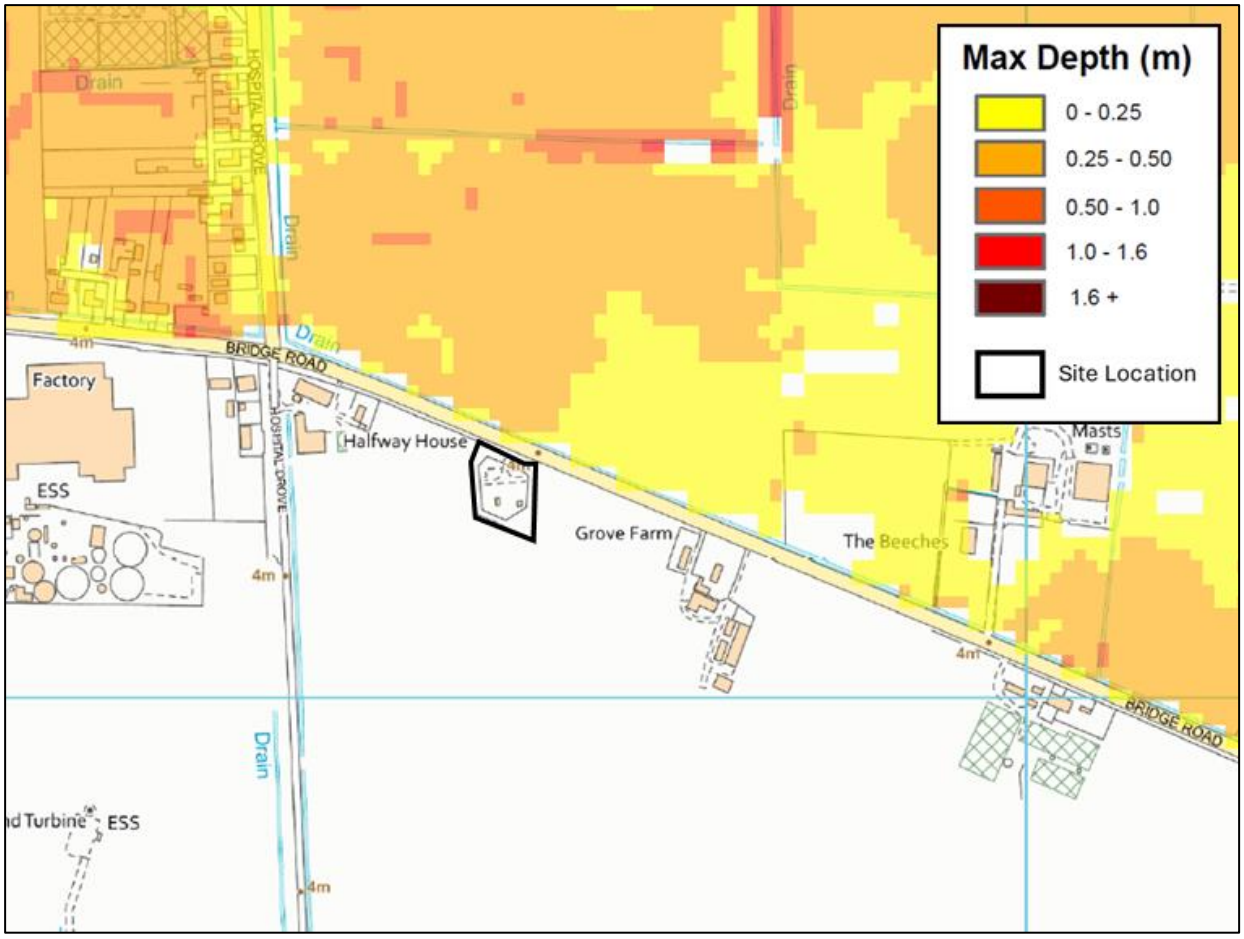


Figure 8: East Coast and Wash - 2018 Coastal Flood Boundary Data 0.5% AEP Present Day Breach Event Flood Depth (East Coast and Wash - 2018 Coastal Flood Boundary Data)

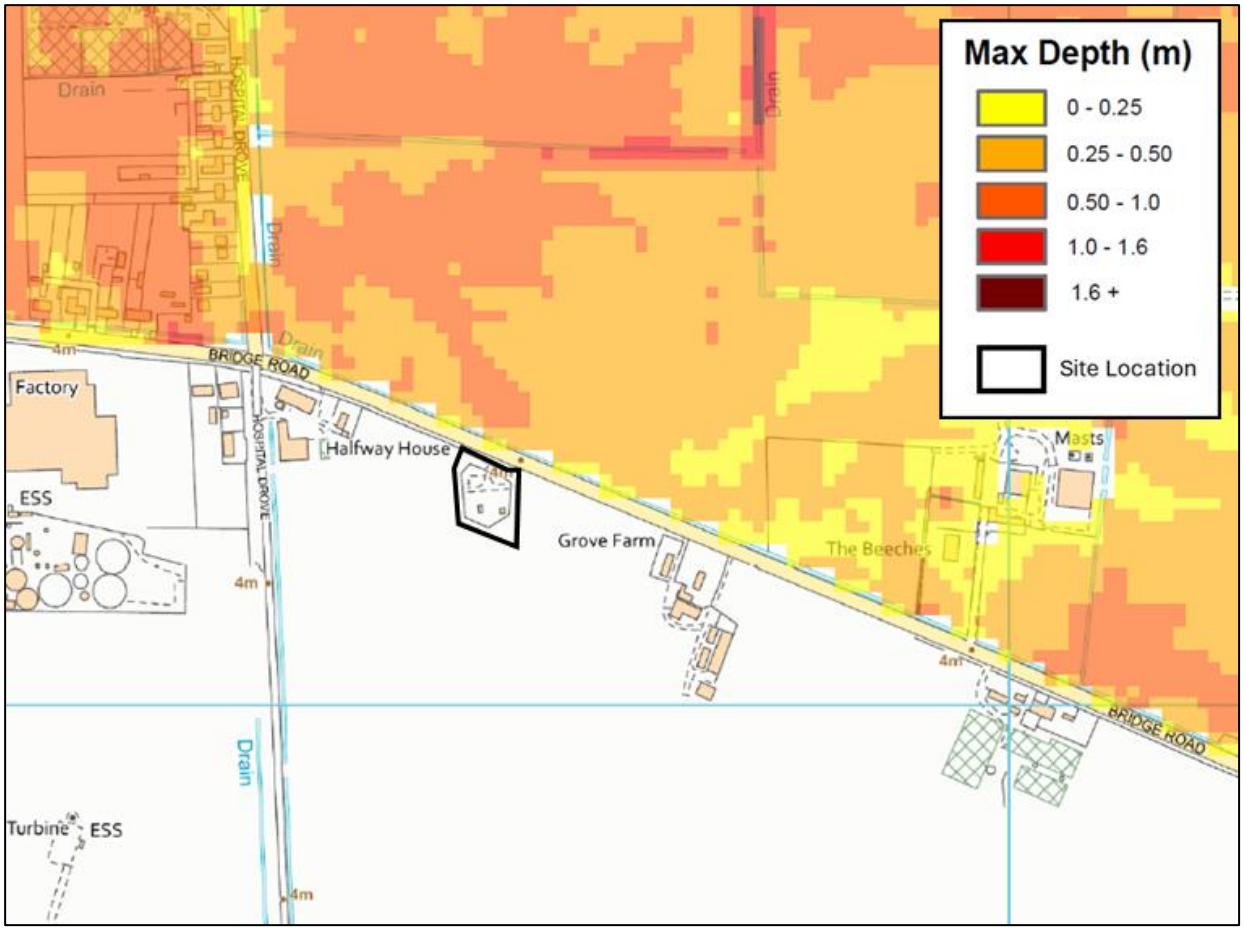


Figure 9: East Coast and Wash - 2018 Coastal Flood Boundary Data 0.1% AEP Breach Event Flood Depth (East Coast and Wash - 2018 Coastal Flood Boundary Data)

Climate Change (2115) Breach

4.17. Analysis of the modelled 0.5% AEP plus climate change (2115) breach event shows that the site could be affected by flood depths of between 0.50m to 1.0m (Figure 10). The Hazard rating in this event can be seen to be between 1.25 and 2.0 (Danger to Most) (Figure 11).

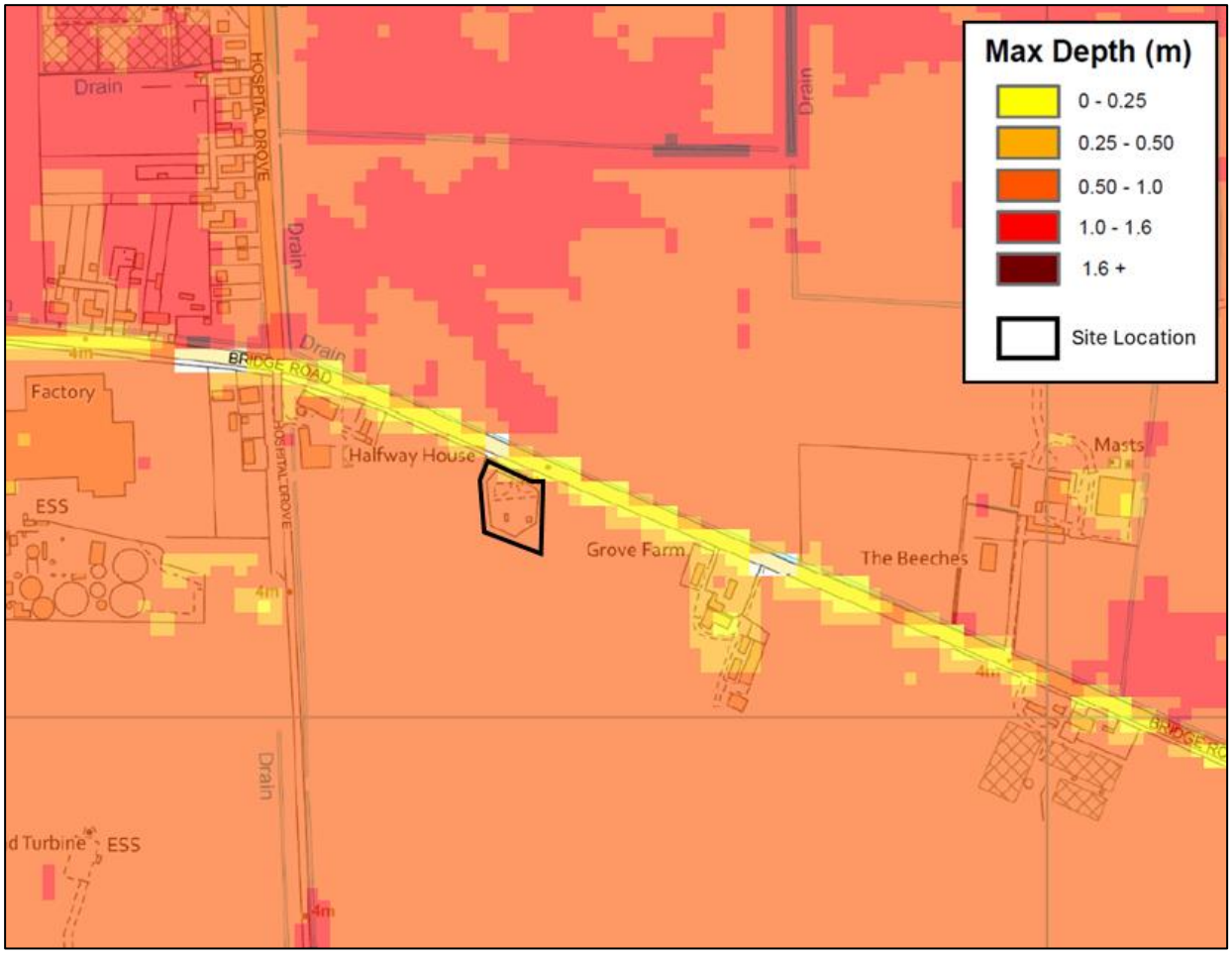


Figure 10: East Coast and Wash - 2018 Coastal Flood Boundary Data 0.5% AEP Climate Change Breach Event Flood Depth (East Coast and Wash - 2018 Coastal Flood Boundary Data)

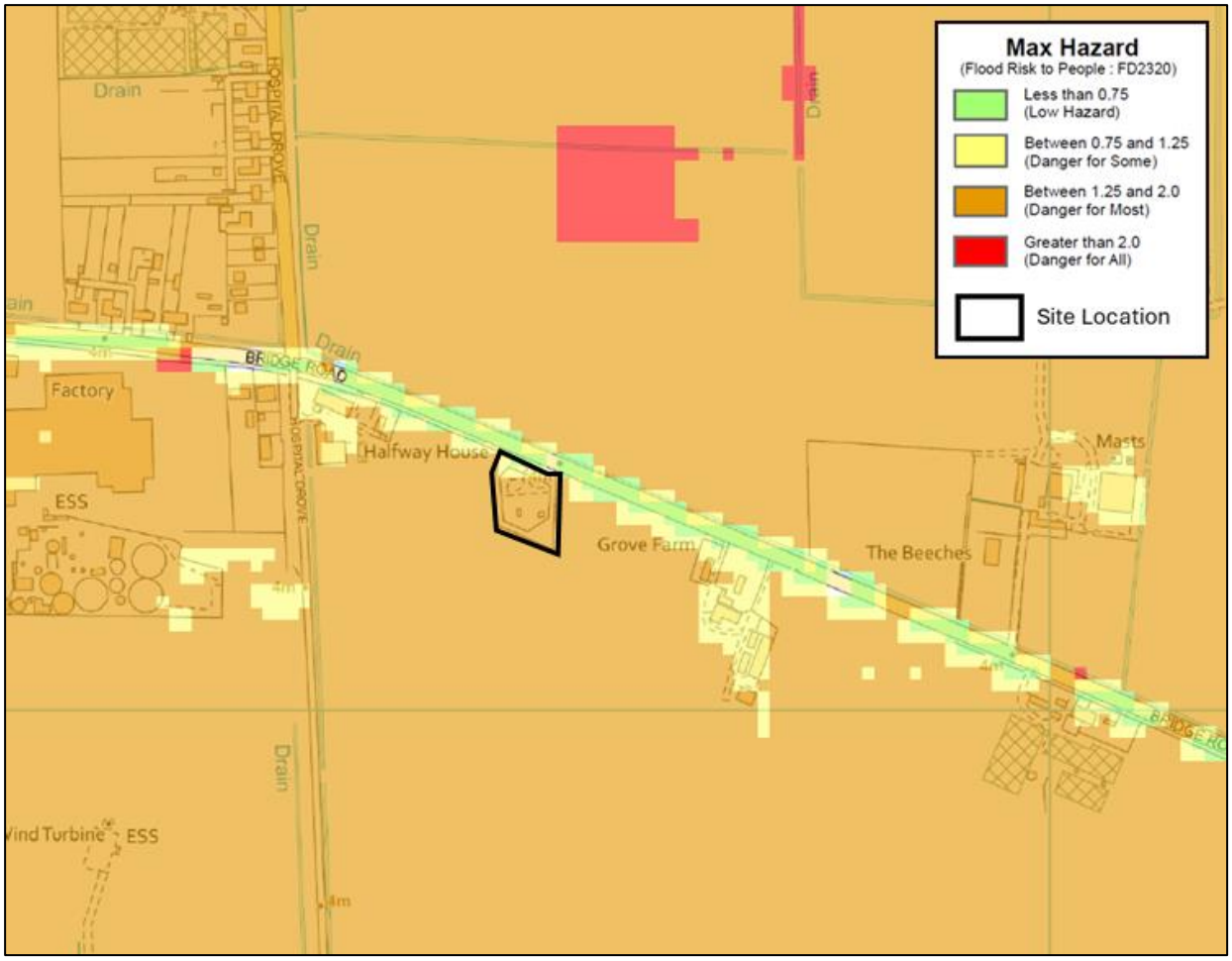


Figure 11: East Coast and Wash - 2018 Coastal Flood Boundary Data 0.5% AEP Climate Change Breach Event Flood Hazard (East Coast and Wash - 2018 Coastal Flood Boundary Data)

4.18. Analysis the modelled 0.1% AEP plus climate change (2115) breach event shows that the site could be affected by flood depth of between 0.5m to 1.6m (Figure 12). The Hazard rating in this event can be seen to be between 1.25 and 2.0 (Danger to Most) (Figure 13).

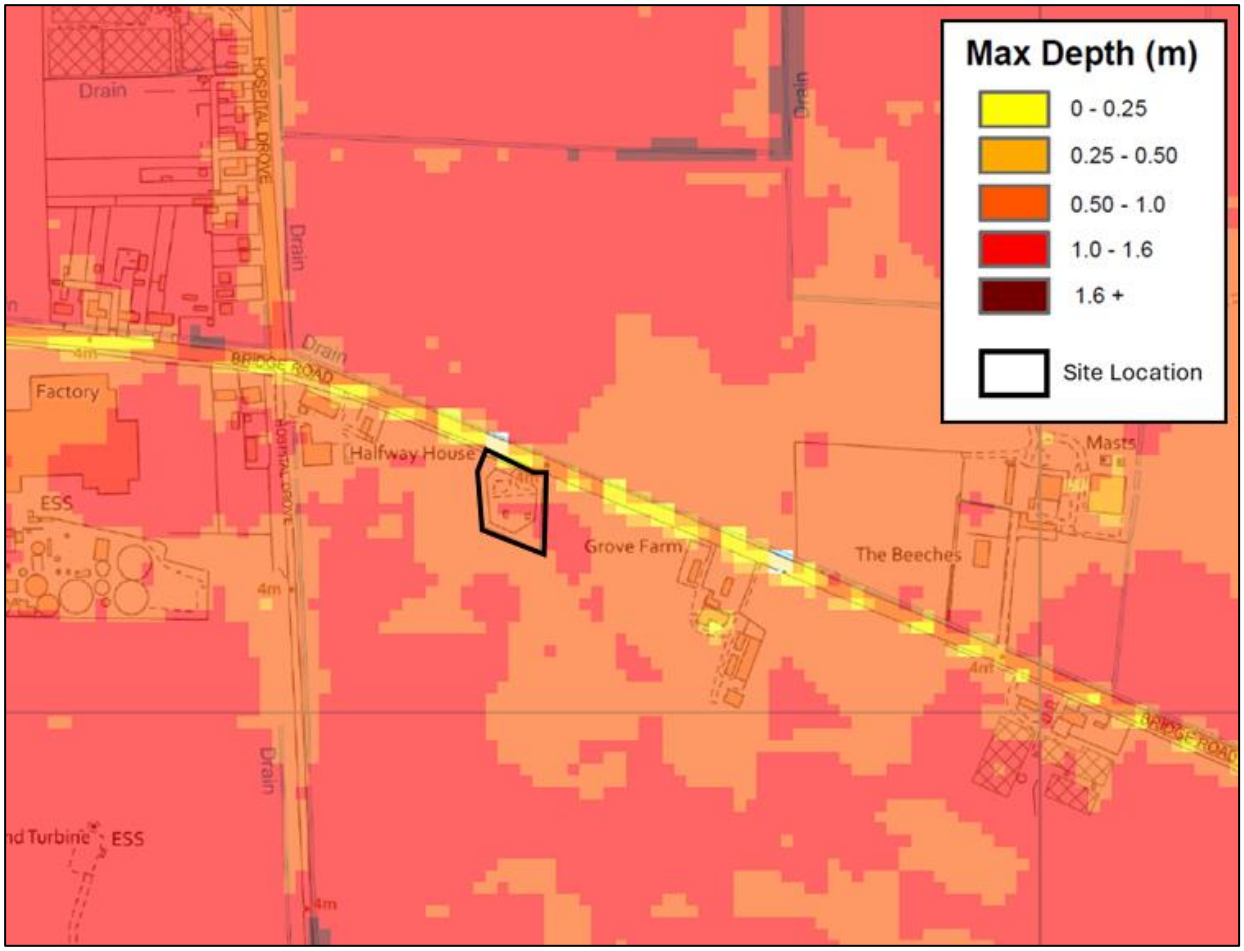


Figure 12: East Coast and Wash - 2018 Coastal Flood Boundary Data 0.1% AEP Climate Change Breach Event Flood Depth (East Coast and Wash - 2018 Coastal Flood Boundary Data)

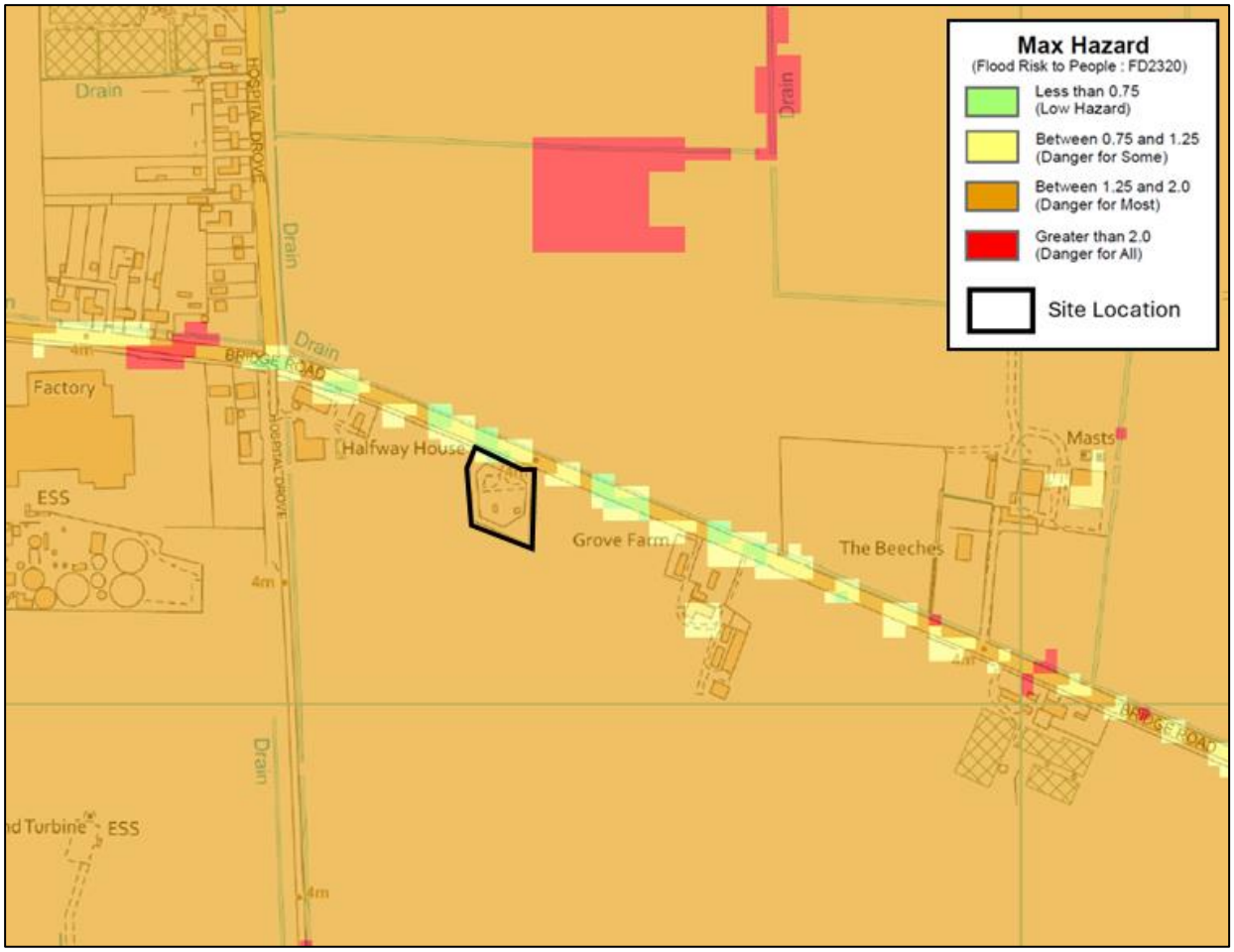


Figure 13: East Coast and Wash - 2018 Coastal Flood Boundary Data 0.1% AEP Climate Change Breach Event Flood Hazard (East Coast and Wash - 2018 Coastal Flood Boundary Data)

Summary

4.19. The SFRA mapping indicated that the site is located in a tidally dominated area.

4.20. As such the risk from fluvial sources is considered low.

4.21. The site is located in an area benefiting from flood defences. The EA Product 4 data has shown that the site is not at risk of flooding in the modelled present day (2006) and climate change (2115) overtopping flood scenarios. As such, the risk to the site in an overtopping scenario is considered low.

4.22. The site is also not flooded in the in the modelled present day (2006) breach scenarios. However, the site is affected by flood depths of 0.50m to 1.0m in the climate change (2115) 0.5% AEP and flood depths of 0.5m to 1.6m in the climate change (2115) 0.1% AEP breach scenarios. The site

is affected by a hazard rating of 1.25 and 2.0 (Danger to Most) both scenarios. As such, the residual risk to the site in a breach event can be considered high.

4.23. It is noted that the probability of a breach event occurring can be considered low.

Canals

4.24. The Canal and River Trust (CRT) generally maintains canal levels using reservoirs, feeders, and boreholes and manages water levels by transferring it within the canal system.

4.25. No recorded CRT canals within the 1km of the site.

4.26. The risk of flooding to this site from canals is considered to be low.

Pluvial

4.27. Pluvial flooding can occur during prolonged or intense storm events when the infiltration potential of soils, or the capacity of drainage infrastructure is overwhelmed leading to the accumulation of surface water and the generation of overland flow routes.

4.28. Annual surface water flood risk is labelled by the EA as:

- 'High Risk'; >3.3% AEP (annual probability greater than 1 in 30).
- 'Medium Risk'; 1.1% to 3.3% AEP (annual probability between 1 in 100 and 1 in 30).
- 'Low Risk'; 0.1% to 1% AEP (annual probability between 1 in 1000 and 1 in 100).
- 'Very Low Risk'; <0.1% AEP (annual probability less than 1 in 1000).

4.29. Examination of the EA's Flood Risk from Surface Water mapping for High Risk, Medium Risk, and Low Risk AEP flood events shows the site and its immediate vicinity is at risk of flooding in 'Low' surface water flood events (Figure 14).

4.30. It is noted that only the west boundary is affected in the 'Low' risk event, and the proposed development footprint is not affected.

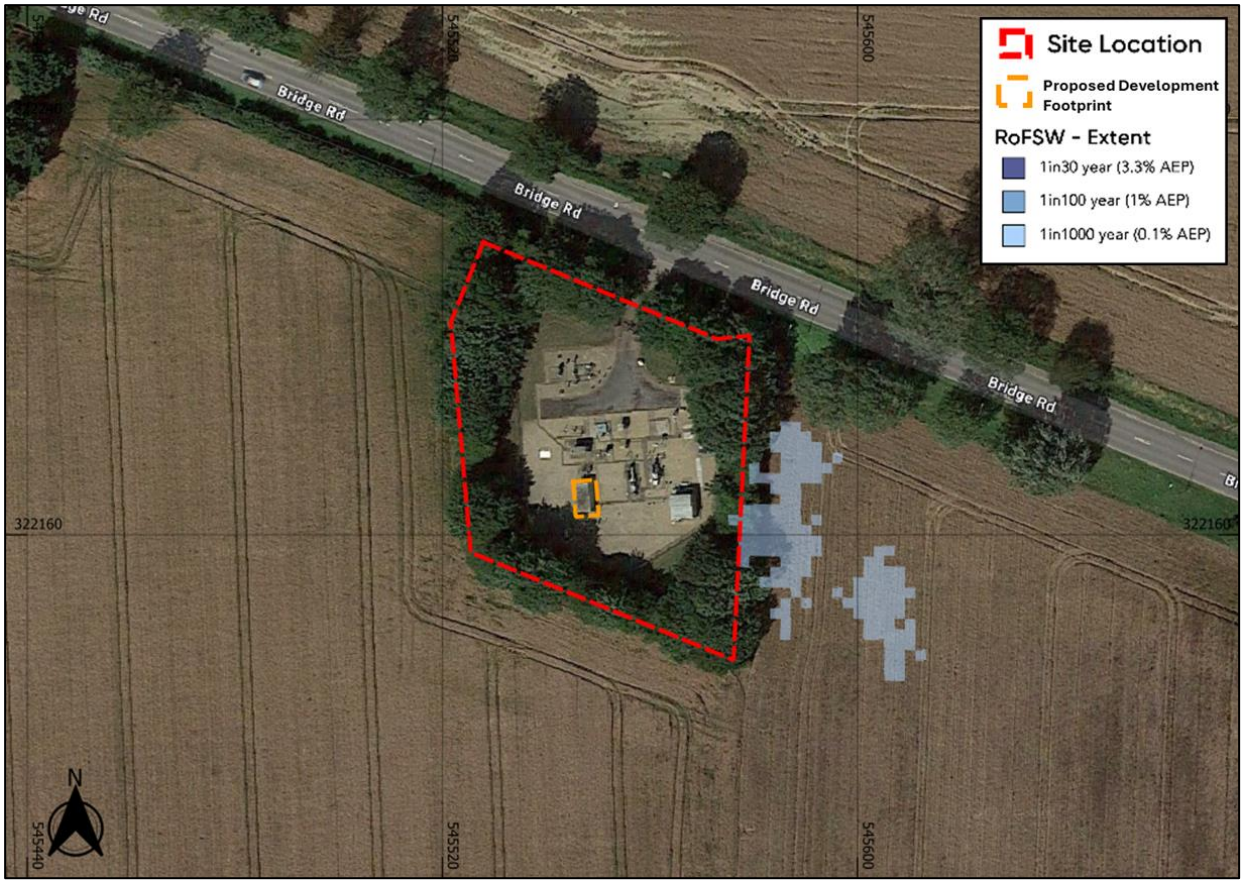


Figure 14: EA Surface Water Flood Risk Mapping (Base map and data from Google Hybrid © Contains public sector information licensed under the Open Government Licence v3.0)

4.31. As can be seen in Figure 15, during the modelled 1 in 1000 year event, surface water flood depths at the east of the site reach between 150mm to 300mm. Only the eastern boundary is affected in this event.



Figure 15: EA Surface Water Flood Risk Mapping 1 in 1000 year depth (Base map and data from Google Hybrid © Contains public sector information licensed under the Open Government Licence v3.0)

4.32. As such, the risk of surface water flooding to the site is considered to be low.

Reservoirs

4.33. Flooding can occur from large waterbodies or reservoirs if they are impounded above the surrounding ground levels or are used to retain floodwater. Although unlikely, reservoirs and large waterbodies could overtop or breach leading to rapid inundation of the downstream floodplain.

4.34. According to the EA's Flood Risk from Reservoirs mapping the site is outside modelled flood extents in the event of reservoir flooding.

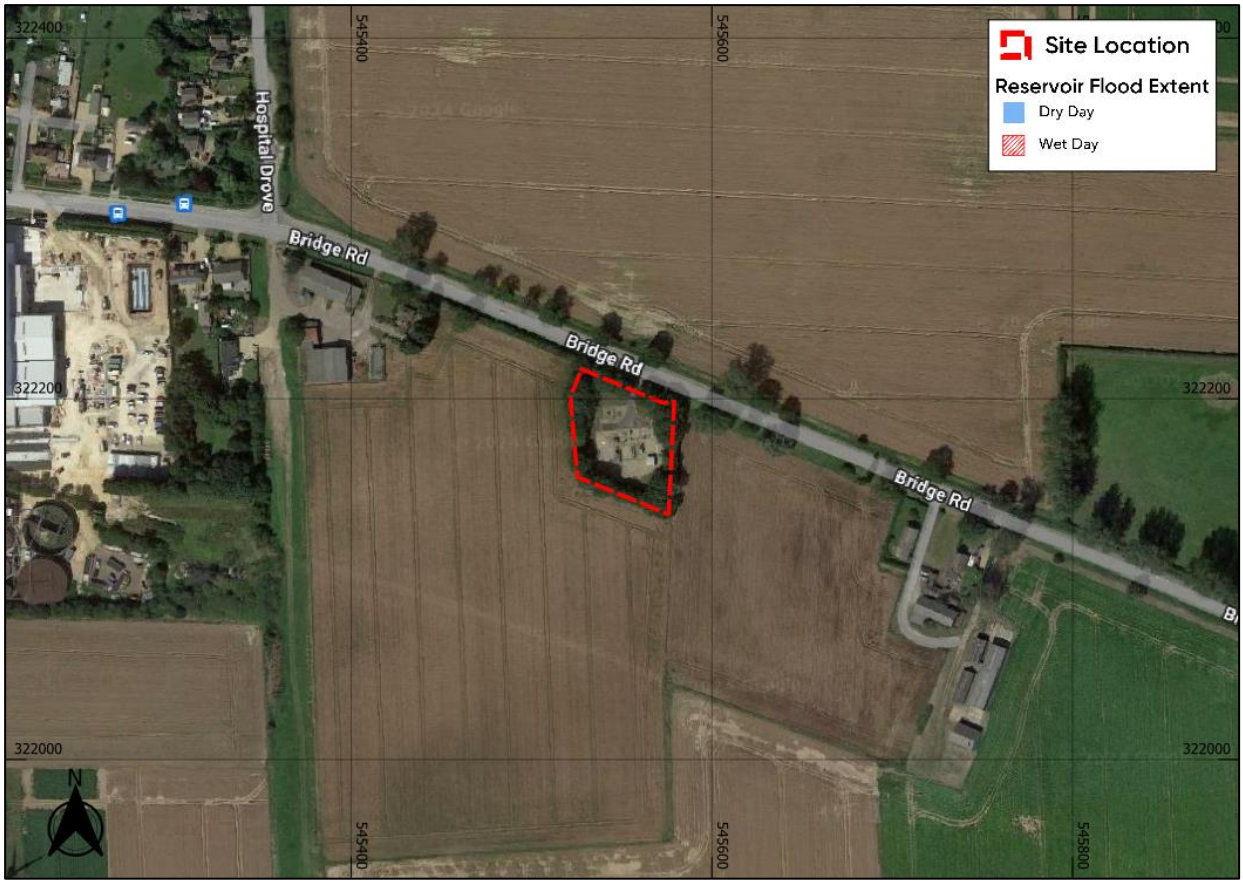


Figure 16: EA Reservoir Flood Risk Mapping (Base map and data from Google Hybrid © Contains public sector information licensed under the Open Government Licence v3.0)

4.35. The site has not been flagged as being at risk of flooding following a reservoir failure.

Groundwater

4.36. Groundwater flooding occurs in areas where underlying geology is permeable and water can rise within the strata sufficiently to breach the surface.

4.37. The British Geological Survey's (BGS) mapping shows superficial deposits of Tidal Flat Deposits comprised of clay and silt underlying the site. The bedrock underlying the site is Ampthill Clay Formation comprised of mudstone.

4.38. The closest Historical BGS borehole TF42SE11 was approximately 328m east of the site and was bored to a depth of 22m and groundwater was encountered at 1.86m.

4.39. Due to the superficial deposits and bedrock underlying the site being impermeable (as per the BGS mapping), the risk to the site from groundwater flooding can be considered low.

Sewers

4.40. Foul or surface water sewers can be a cause of flooding if the drainage network becomes overwhelmed, either by blockage or due to local development beyond the designed capabilities of the drainage system.

4.41. Due to the nature of the development (gas supply metering infrastructure) and the site being rural, it is assumed that there are no public sewers within the curtilage of the site.

4.42. As such the risk to the site from sewer flooding is considered low.

5. Flood Risk Mitigation

Fluvial/Tidal

5.1. The site is located in an area benefiting from flood defences. The EA Product 4 data has shown that the site is not at risk of flooding in the modelled present day (2006) and climate change (2115) overtopping flood scenarios. As such, the risk to the site in an overtopping scenario is considered low.

5.2. The site is also not flooded in the in the modelled present day (2006) breach scenarios. However, the site is affected by flood depths of 0.50m to 1.0m in the climate change (2115) 0.5% AEP and flood depths of 0.5m to 1.6m in the climate change (2115) 0.1% AEP breach scenarios. The site is affected by a hazard rating of 1.25 and 2.0 (Danger to Most) both scenarios. As such, the risk to the site in a breach event can be considered high.

5.3. It is noted that the probability of a breach event occurring can be considered low.

5.4. The SFRA's standing advice for developments, shows that a site classified as essential infrastructure and has a hazard rating of 1.25 and 2.0 should:

> *demonstrates that the proposal will remain operational during a 0.1% event (2115 scenario) and that appropriate mitigation measures/flood resilient construction techniques have been incorporated into the development.*

5.5. However, due to the nature of the development (gas supply metering infrastructure), the gas supply would not be affected, and the site would still be operational in a flood event, apart from the metering and visibility of the site.

5.6. As such, it can be considered that the site would still be functional in a flood event, irrespective of whether the proposed metering infrastructure is in operation or not, and therefore the proposed development does not need to consider a flood resistant/resilient design.

5.7. The site management staff should sign up to the EA's Flood Warning Service - 'Tidal River Nene in Sutton Bridge. Upon receipt of a Flood Warning, management and staff should be prepared to carry out their flood protocol, which presumably involves shutdown of flood sensitive equipment. The prosed gas supply metering infrastructure should be incorporated into their current flood protocol. If a flood protocol/ Flood Emergency Plan (FEP) is not currently in place then one should be formalised.

Pluvial Reservoirs, Groundwater and Sewers

5.8. Flood risk from these sources is considered to be low, therefore mitigation is not required.

Increase to Flood Risk Elsewhere

5.9. As per Paragraph 049 of the NPPG, the loss of floodplain storage is less likely to be a concern in areas benefitting from appropriate flood risk management infrastructure or where the source of flood risk is solely tidal.

5.10. As such, the proposed development in isolation should have a negligible impact on flood risk elsewhere.

Flood Warnings

5.11. The site is in the Environment Agency (EA) 'Tidal River Nene in Sutton Bridge' flood warning service area. This service allows site owners to register an address along with contact details so that, in the event of a flood being forecast, they are sent an alert. As a further precaution and risk reduction, the owner of the site should sign up.

5.12. Flood warnings/alerts can be enforced at any time of the day or night. Signing up for this service provides site owners some notice before a flood event. The amount of time afforded before a flood occurs depends on the site-specific location (e.g. proximity to the source of flooding, topography of the surrounding area) and the flood mechanism (e.g. bank over topping versus a breach event). Flood alerts and warnings provide site managers with time to take necessary action, e.g. communication of the risk of flooding to employees etc, evacuation of occupants offsite or to a safe level, removal of valuable items out of reach of flooding and the mounting of site-specific flood defences.

6. Conclusions

6.1. This FRA has been undertaken with reference to the requirements of NPPF and Planning Practice Guidance with respect to the development at Cadent Gas, Bridge Road, Sutton Bridge, South Holland, PE12 9EG. It has been written to support a planning application and prepared with due consideration to the nature of the proposed development to provide the appropriate level of detail.

6.2. An assessment of the risk of flooding from all sources has been undertaken and is summarised in the table below:

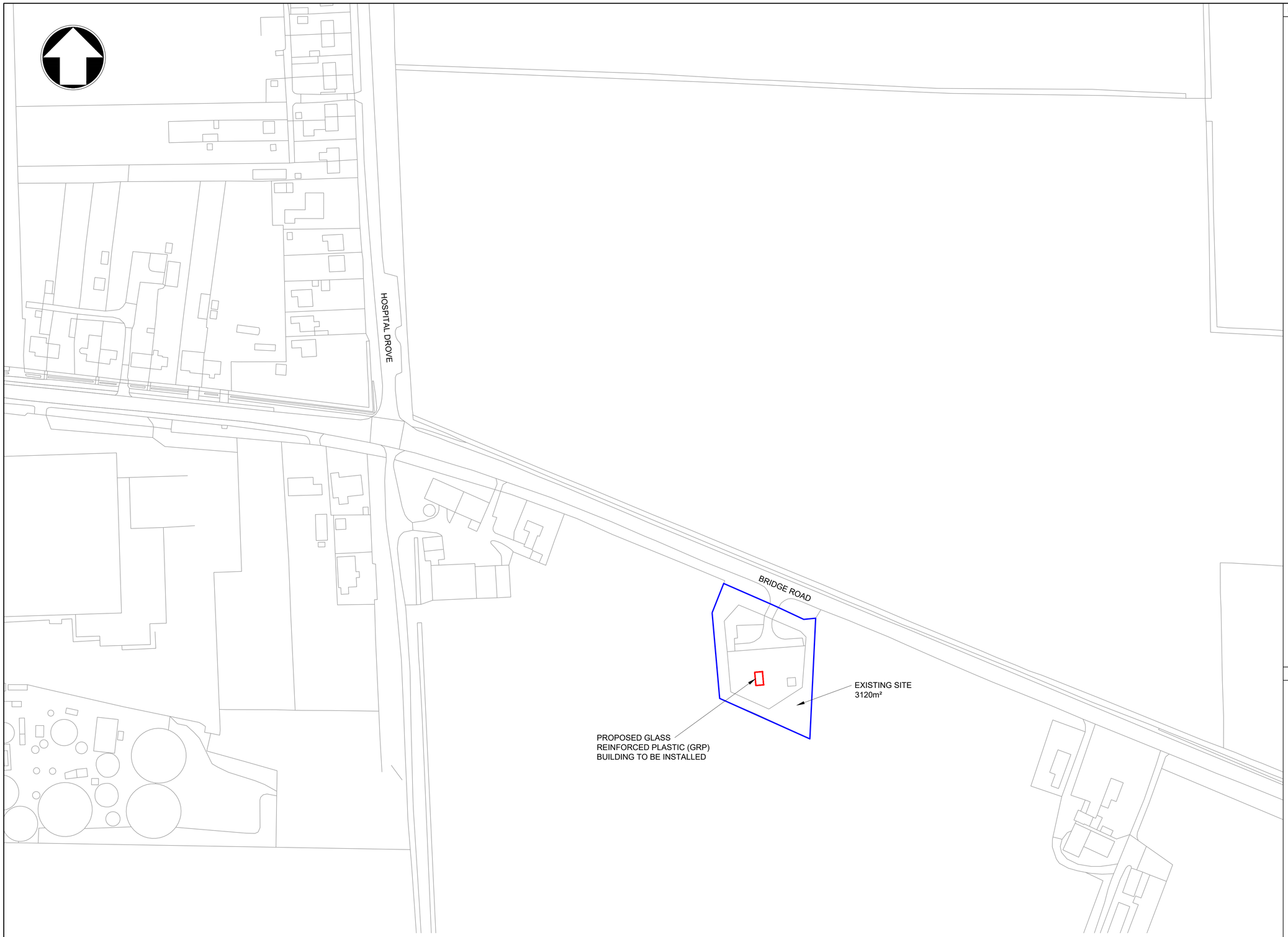
Source of Flooding	Flood Risk Summary
Fluvial/Tidal	The site is not at risk of flooding in the present day and climate change overtopping events. The site is also not affected in the present day breach events. However, the site is affected by flood depths of 0.50m to 1.0m in the climate change (2115) 0.5% AEP and flood depths of 0.5m to 1.6m in the climate change (2115) 0.1% AEP breach scenarios. The site is affected by a hazard rating of 1.25 and 2.0 (Danger to Most) both scenarios. As such, the risk to the site in a breach event can be considered high. It is noted that the probability of a breach event occurring can be considered low. The SFRA's standing advice for developments, shows that a site classified as essential infrastructure and has a hazard rating of 1.25 and 2.0 should: *demonstrates that the proposal will remain operational during a 0.1% event (2115 scenario) and that appropriate mitigation measures/flood resilient construction techniques have been incorporated into the development.* However, due to the nature of the development (gas supply metering infrastructure), the gas supply would not be affected, and the site would still be operational in a flood event, apart from the metering and visibility of the site. As such, it can be considered that the site would still be functional in a flood event, irrespective of whether the proposed metering infrastructure is in operation or not, and therefore the proposed development does not need to consider a flood resistant/resilient design.
Canals Pluvial	The site is considered to be at low risk from these sources.

Reservoirs Groundwater Sewers	

6.3. The FRA supports the planning application and demonstrates that there is an acceptable level of flood risk to the site if the mitigation strategies recommended are implemented in the scheme. The development does not increase flood risk off site or to the wider area.

6.4. This Flood Risk Assessment should be submitted as part of the planning application to satisfy the requirements under NPPF.

Appendix A - Development Proposals



NOTES

REFERENCE DRAWINGS

0 50m 100m
1:1000

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CLIENT

Cadent
Your Gas Network

KEY TO SYMBOLS

- EXISTING
- KIOSK APPLICATION BOUNDARY
- AREA OF OWNERSHIP

REV	DATE	DRN	DESCRIPTION	CH'K'D	APP'D
P2	27.11.23	M.J.	COMMENTS INCORPORATED	-	-
P1	24.10.23	M.J.	PRELIMINARY ISSUE	-	-

TITLE
CADENT METERING UPGRADE DD
SUTTON BRIDGE
PLANNING DRAWING
PROPOSED LOCATION PLAN

STATUS: PRE
SECURITY: STD
SHEET 2 OF 2 | SCALE 1:1000 | A1 | REV
DRG NO 104524-MMD-STBR-XX-PLN-M-0002 | P2
CLIENT DOC NO

FILE NAME : C:\Plant 3D Projects\Collaboration\104524_Metering_Upgrade\Orthos\DWGs\Phase 2\Sutton Bridge\Mech\Phase 2\104524-MMD-STBR-XX-PLN-M-0002s2.dwg

Appendix B - EA Data

Lisa Slater
lisa@aegaea.com

Your ref: 4130
Our ref: CCN-2024-343133

Date: 31/01/2024

Dear Lisa,

Provision of Flood Risk Information for Sutton Bridge, South Holland.

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 **June 2023.**

1. Flood Map for Planning

The attached map includes the current Flood Map for Planning for your area. The 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 for Planning 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 for Planning 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. Recorded Flood 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.

Please note, our Recorded Flood Outlines do not reflect the latest (October 2023-present) flood incidents. Due to the scale of the events, it will take time to gather the information and verify the extent of the flooding before we are able to provide this information.

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

This site is not considered to be at risk of flooding from main rivers.

The site may 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.

5. Tidal Flood Risk Information

This site is considered to be at risk from tidal flooding.

5.1 Tidal Defence Information

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

They are in fair condition and reduce the risk of flooding (at the defence) to a 0.67% (1 in 150) 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.

The attached maps show the maximum values of flood depth, velocity and hazard rating (danger to people) resulting from breaching of the defences at specific locations for the scenarios below. For some locations the breach mapping also includes flooding from overtopping if this is expected in that scenario. The location of modelled tidal breaches is shown on a separate attached map.

5.3.1 Tidal Hazard Mapping – Breaches

- Year 2006 0.5% (1 in 200) chance
- Year 2006 0.1% (1 in 1000) chance
- Year 2115 0.5% (1 in 200) chance
- Year 2115 0.1% (1 in 1000) chance

5.3.2 Tidal Hazard Mapping - Overtopping

The attached maps show the maximum values of flood depth, velocity and hazard rating (danger to people) resulting from simulated overtopping of defences for the following scenarios:

Your site is not affected by overtopping of the defences for the present day (2006) and climate change (2115) scenarios, though may be at risk from breaching.

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 Christopher using the email address below and quoting our CCN reference number above.

Yours sincerely,

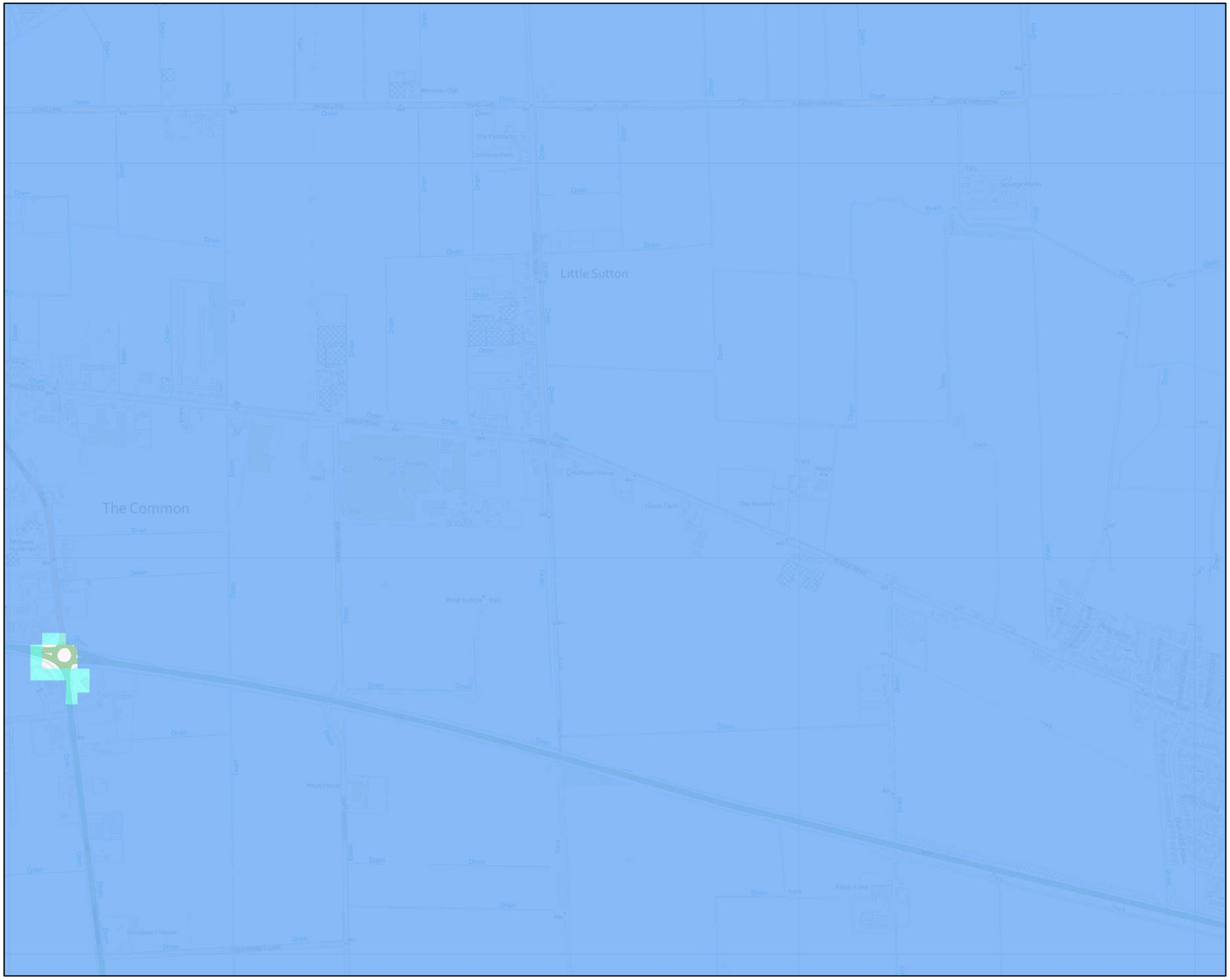


+44 7385226602

for Ben Thornely
Area Flood and Coastal Risk Manager
e-mail PSOWN@environment-agency.gov.uk

Enc.
Flood Map for Planning
Tidal Level Data Sheets - Map and Tables
Tidal Breach Points – Locations Map
Hazard Mapping – Breaching

Flood Map centred on TF 45532 22173 - created January 2024 [Ref: CCN-2024-343133]



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

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 separate 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

Customer services line: 03708 506 506
Calls to 03 numbers cost the same as calls to standard geographic numbers
(i.e. numbers beginning with 01 or 02)

Email: enquiries@environment-agency.gov.uk
www.gov.uk/environment-agency

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

- Grand Sluice remains the tidal limit for the River Witham.
- The data is based on CFB 2018 data for Boston Barrier site, capped at 5.3mAOD to reflect use of the barrier which raises for tides above this level.
- 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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KINGSTON UPON HULL to

Rotterdam (Europort)	11 hrs
Zeebrugge	12 hrs

★ **Modelled Breach Locations**

0 3.5 7 14 Kilometers

This map idicates the location of where we have modelled the consequence of breaches in the defences along the coastline and tidal rivers. We have mapped the maximum values of Hazard Rating (Danger to People), Depth and Velocity.

We have not assumed that all breaches occur at the same time, but have modelled each breach individually and overlaid the results to find the maximum values.

Our modelling only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring. Our defences generally provide a good standard of flood defence but a risk of breaching remains.

Please contact the Environment Agency for information on how these maps are used in the management of flood risk.

General Enquiries No: 03708 506 506.
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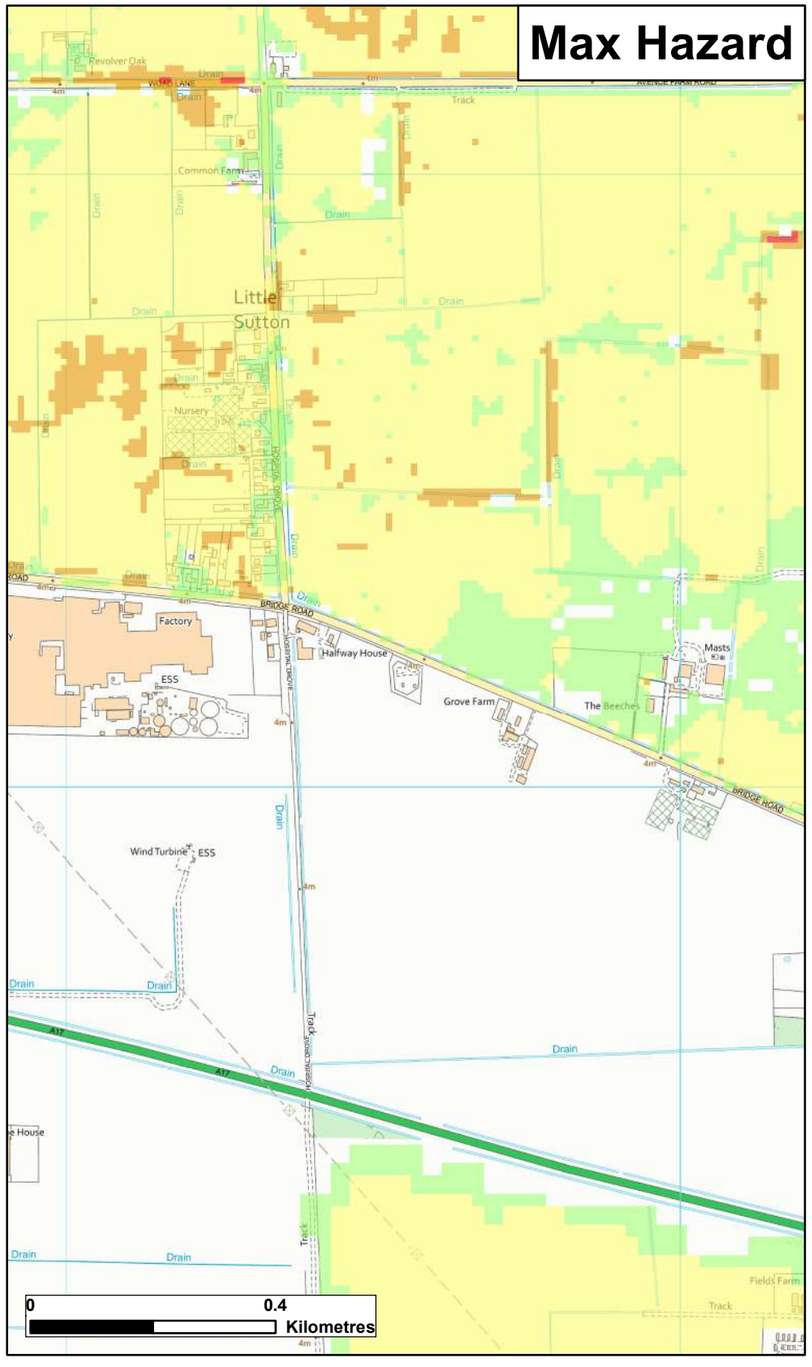
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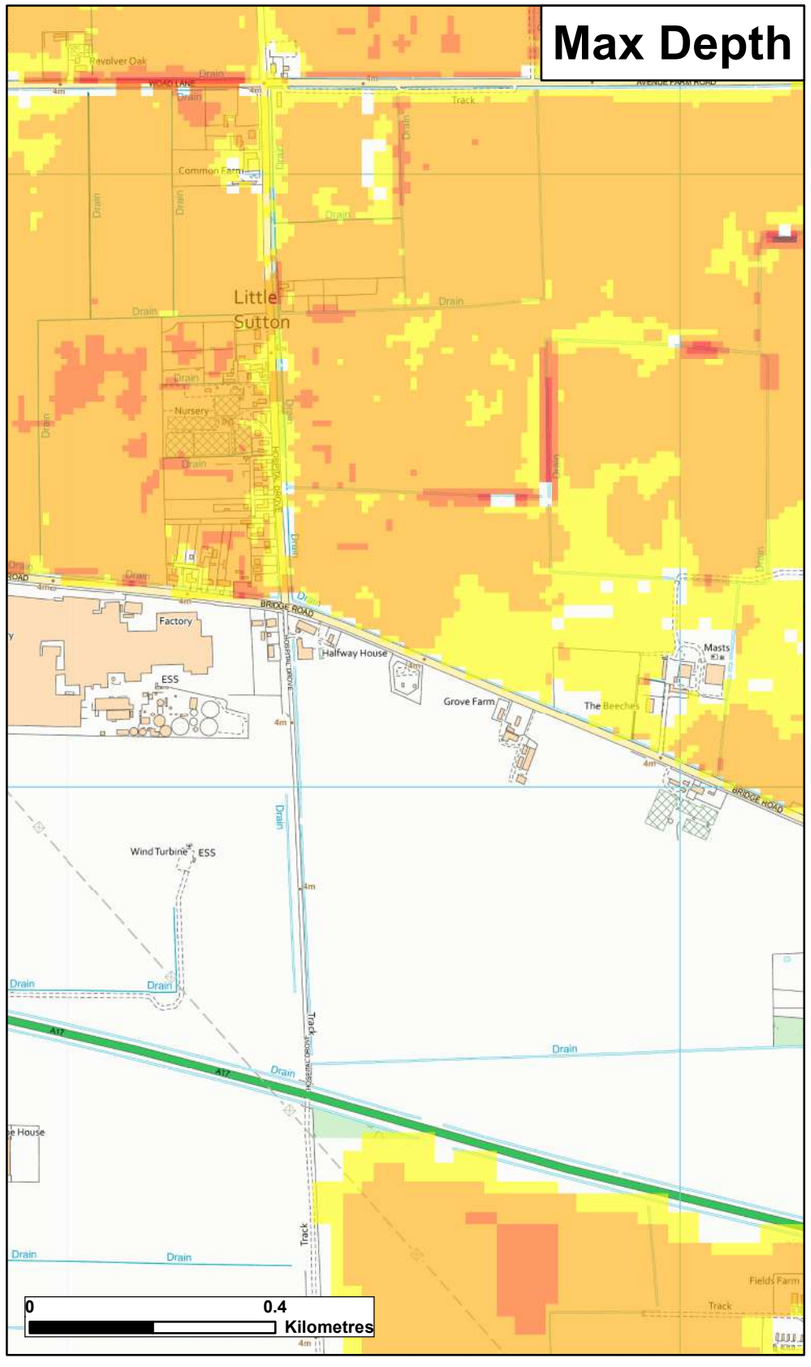
Produced by the Partnership and Strategic Overview Team, Lincoln
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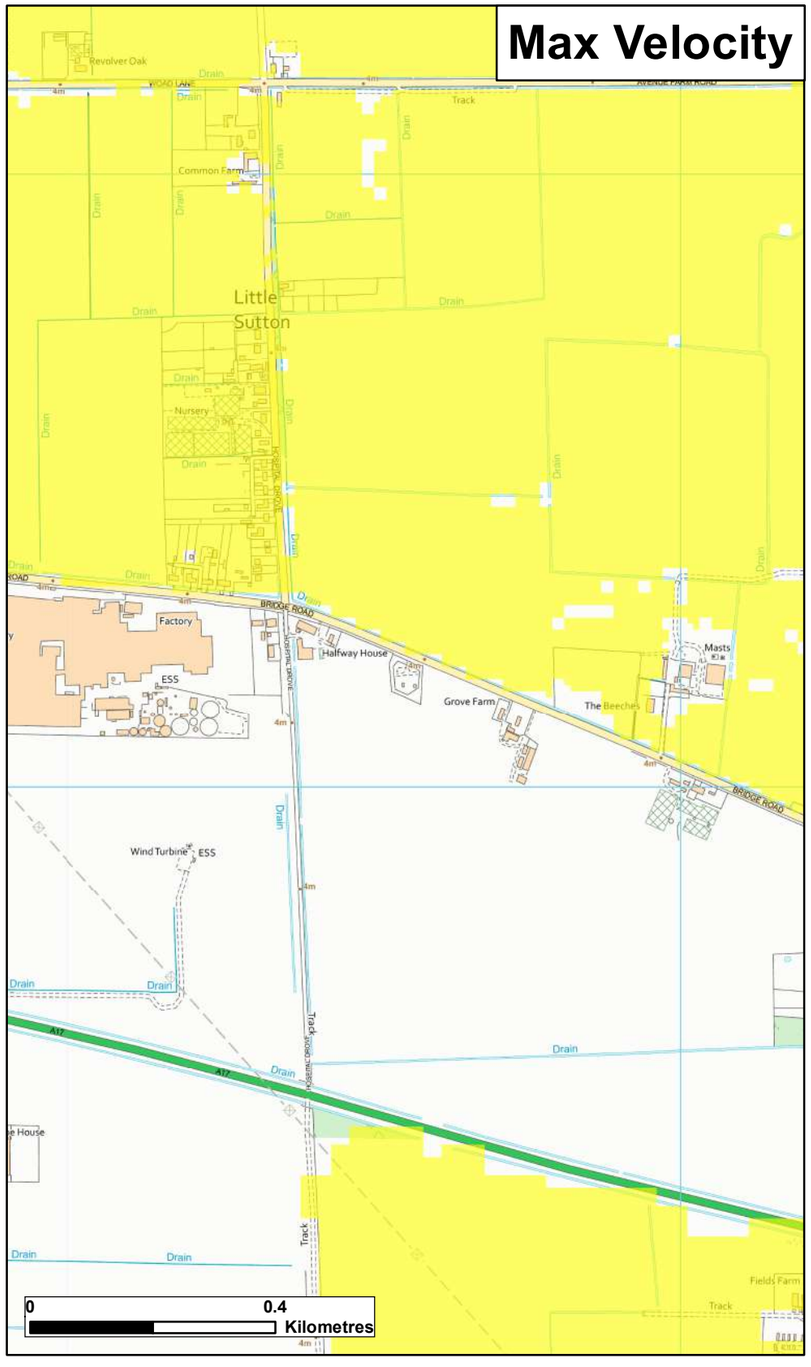
Northern Area Tidal Hazard Mapping

Location of Modelled Breaches

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★ Modelled Breach Locations

- see also the accompanying plan "Location of Modelled Breaches"

Max Hazard
(Flood Risk to People : FD2320)

- Less than 0.75 (Low Hazard)
- Between 0.75 and 1.25 (Danger for Some)
- Between 1.25 and 2.0 (Danger for Most)
- Greater than 2.0 (Danger for All)

Max Depth (m)

- 0 - 0.25
- 0.25 - 0.50
- 0.50 - 1.0
- 1.0 - 1.6
- 1.6 +

Max Velocity (m/s)

- 0 - 0.3
- 0.3 - 1.0
- 1.0 - 1.5
- 1.5 - 2.5
- 2.5 +

Date Printed	February 2024	Scenario year	2006	Scenario Annual Chance	0.5% (1 in 200)	CCN Number	CCN-2024-343133

This map shows the level of flood hazard to people (called a hazard rating) if our flood defences are breached at certain locations, for a range of scenarios. The hazard rating depends on the depth and velocity of floodwater, and maximum values of these are also mapped.

The map is based on computer modelling of simulated breaches at specific locations. Each breach has been modelled individually and the results combined to create this map. Multiple breaches, other combinations of breaches, different sized tidal surges or flood flows may all give different results.

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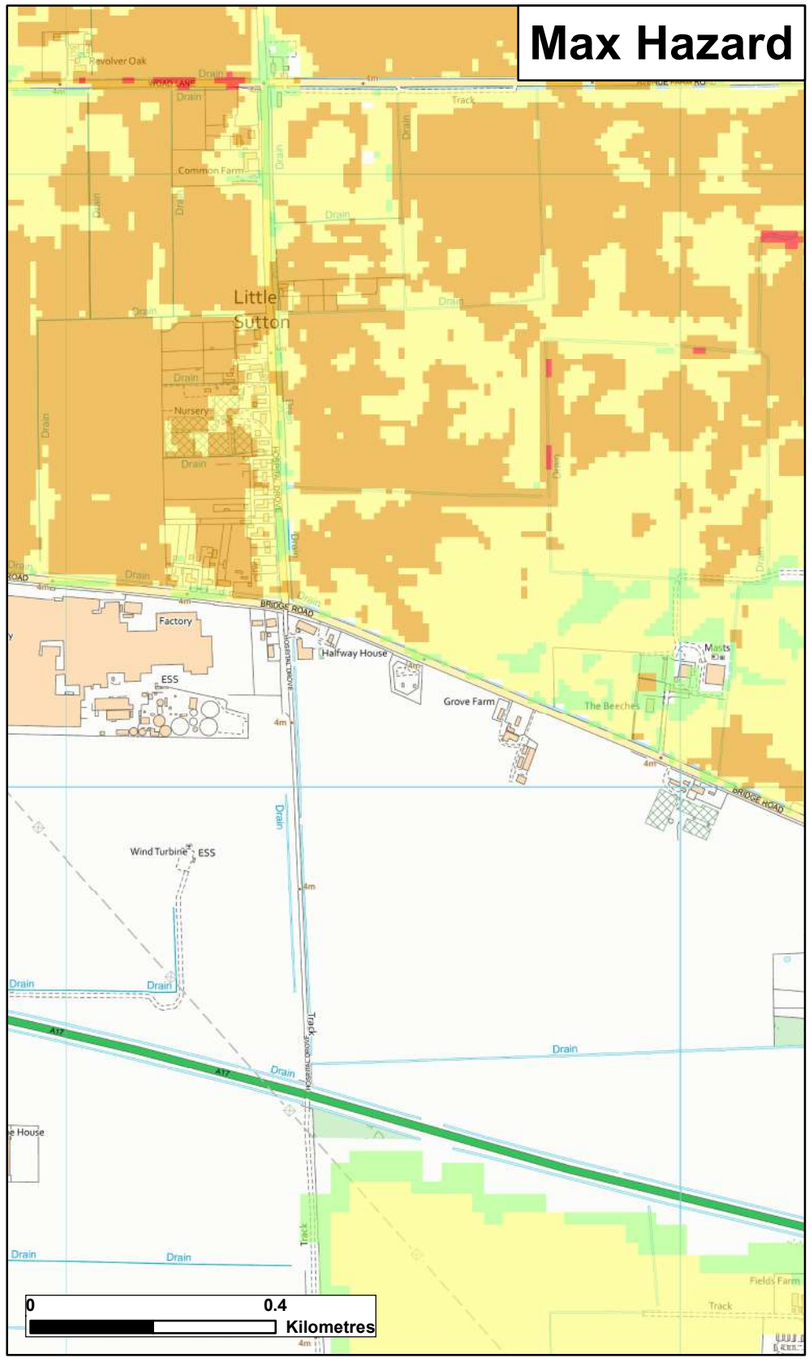
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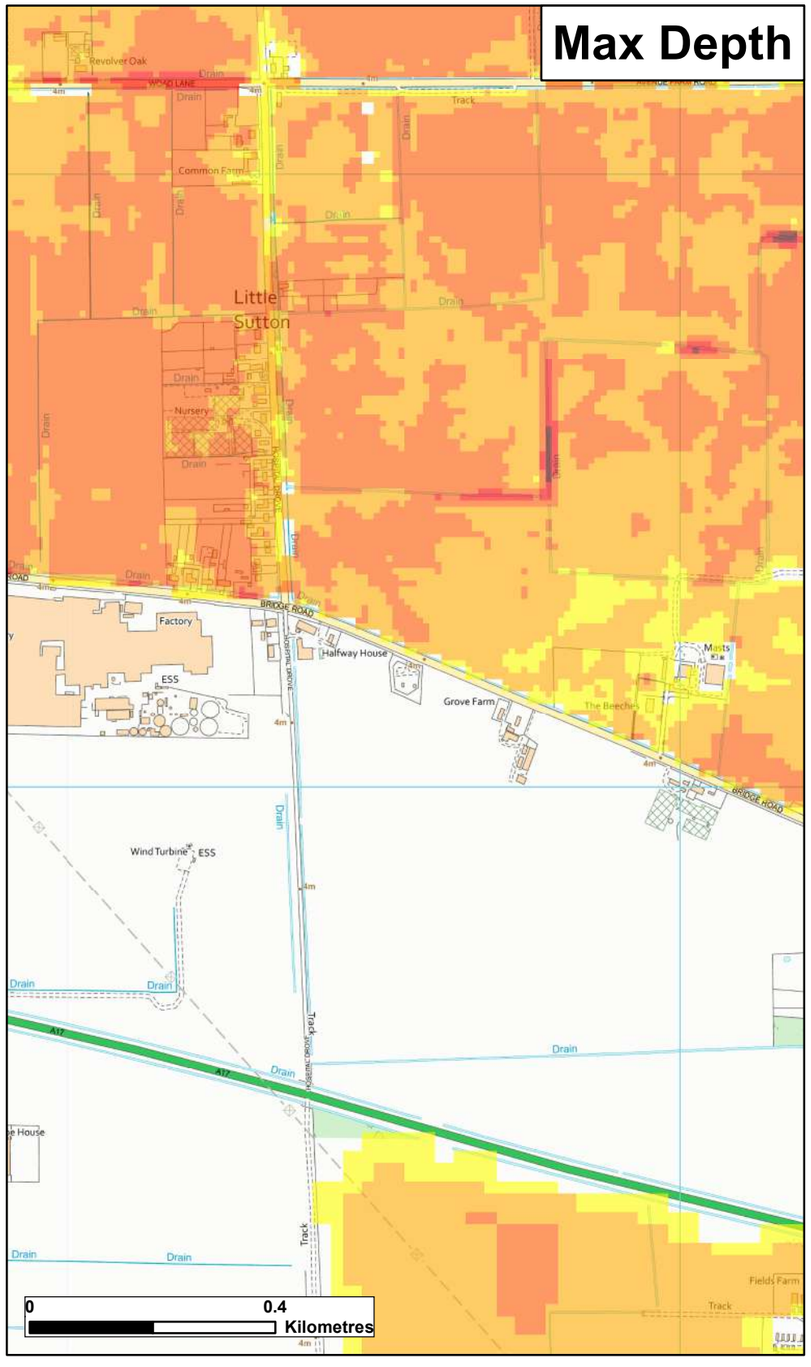
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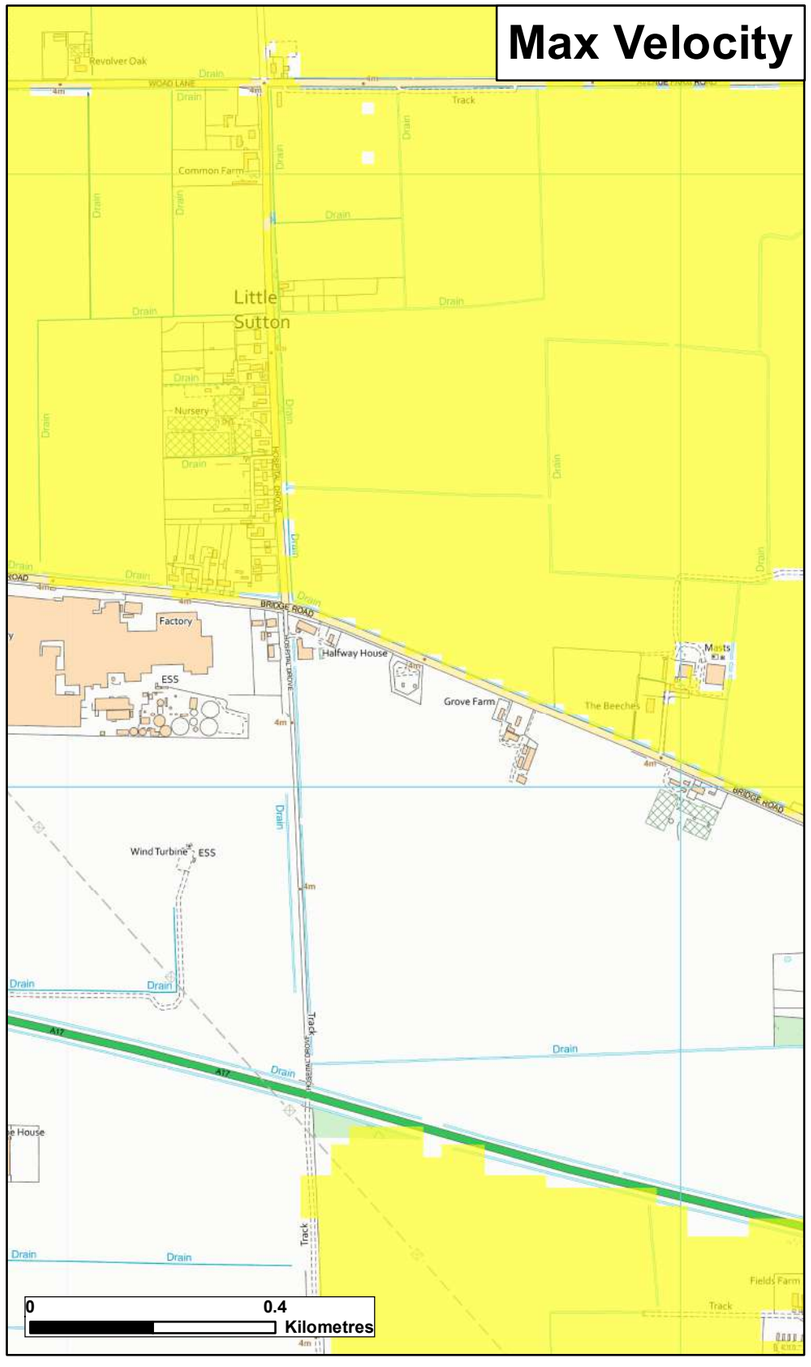
Lincolnshire and Northamptonshire Breach Hazard Mapping

Map Centred on TF 45532 22173

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★ Modelled Breach Locations - see also the accompanying plan "Location of Modelled Breaches"

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(Flood Risk to People : FD2320)

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- Between 0.75 and 1.25 (Danger for Some)
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- Greater than 2.0 (Danger for All)

Max Depth (m)

- 0 - 0.25
- 0.25 - 0.50
- 0.50 - 1.0
- 1.0 - 1.6
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Max Velocity (m/s)

- 0 - 0.3
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- 1.0 - 1.5
- 1.5 - 2.5
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Date Printed	February 2024	Scenario year	2006	Scenario Annual Chance	0.1% (1 in 1000)	CCN Number	CCN-2024-343133

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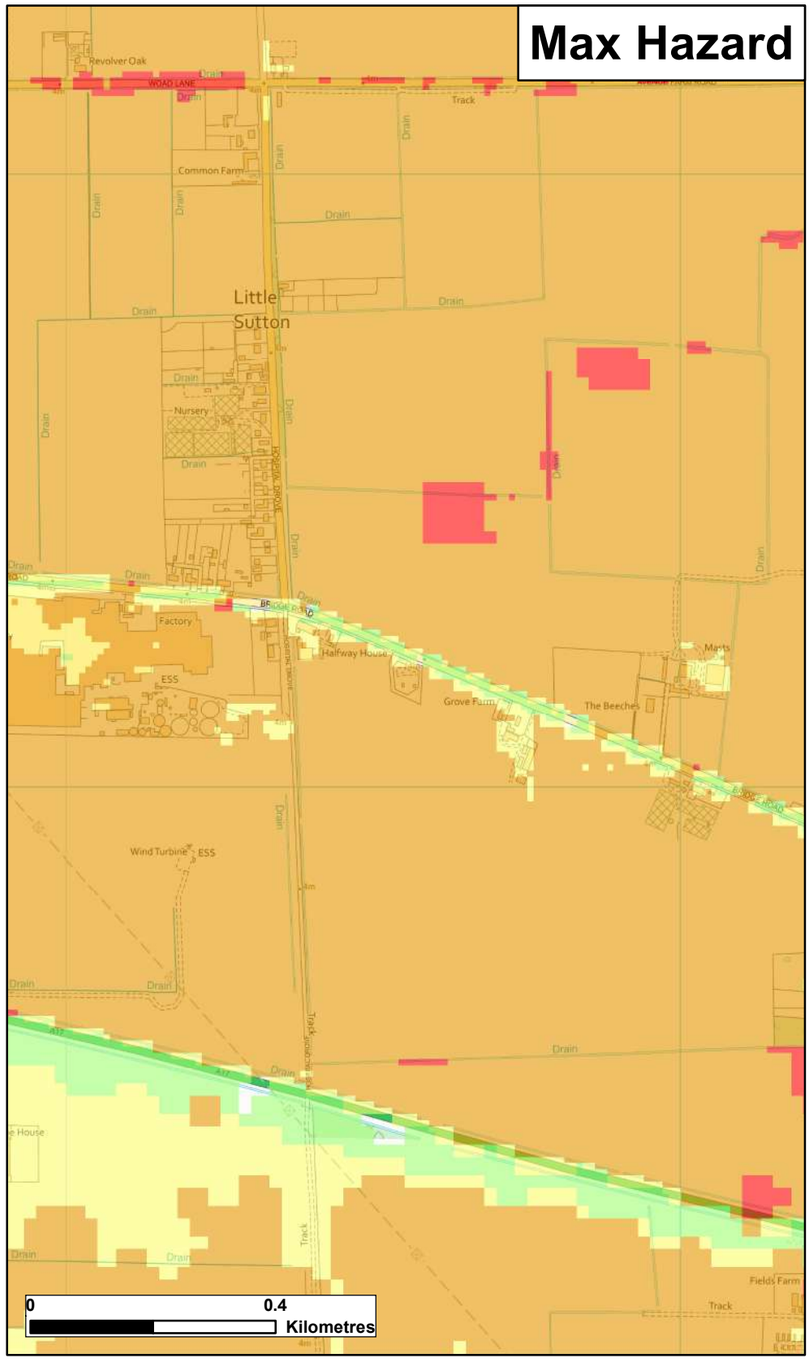
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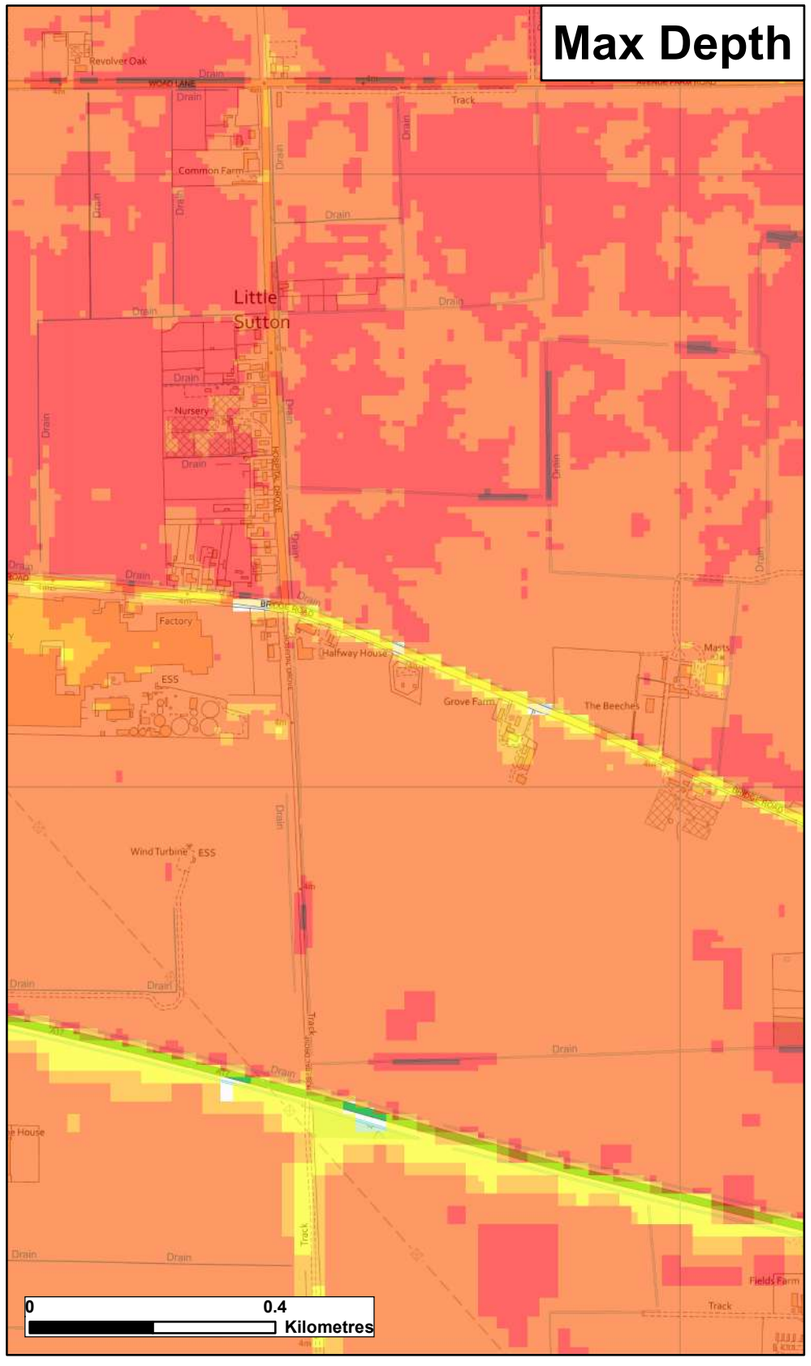
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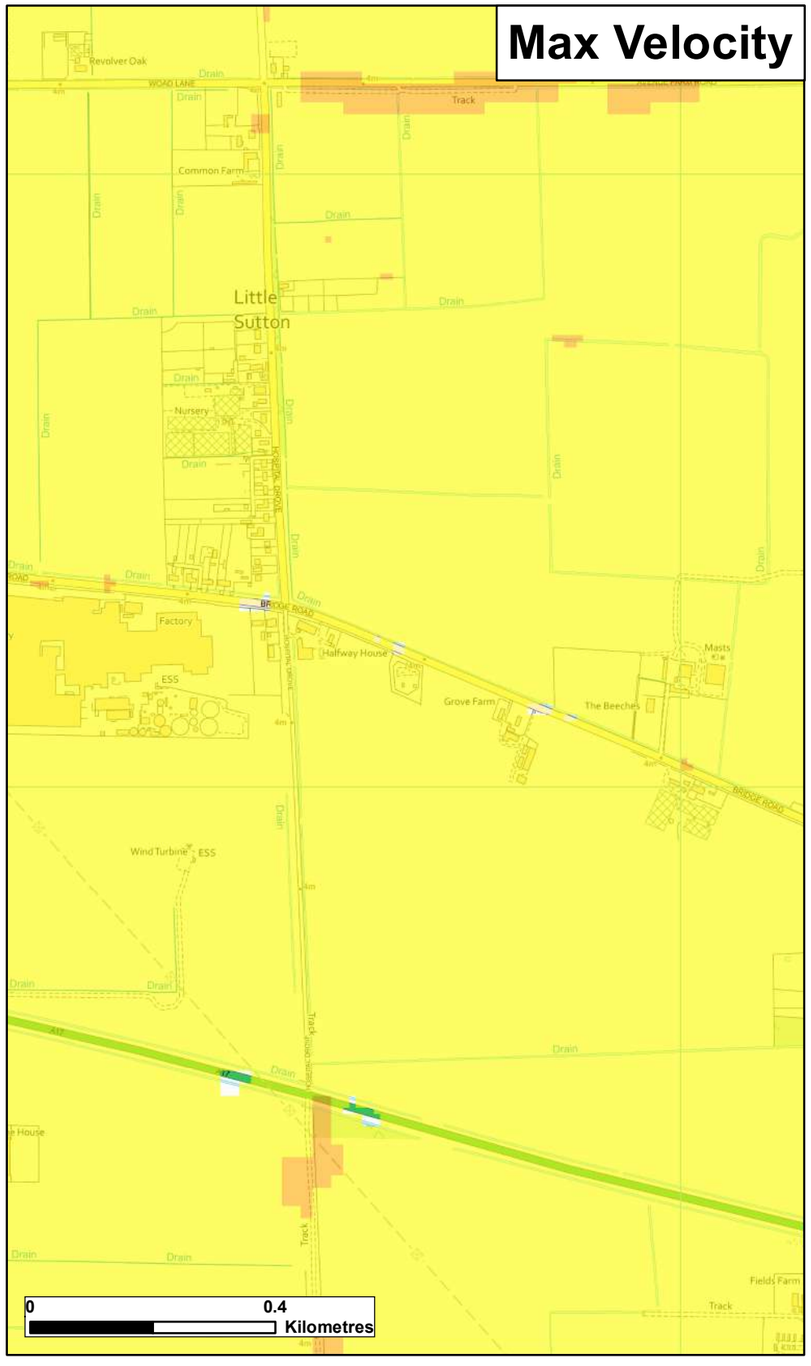
Lincolnshire and Northamptonshire Breach Hazard Mapping

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- 1.0 - 1.5
- 1.5 - 2.5
- 2.5 +

Date Printed	February 2024	Scenario year	2115	Scenario Annual Chance	0.5% (1 in 200)	CCN Number	CCN-2024-343133

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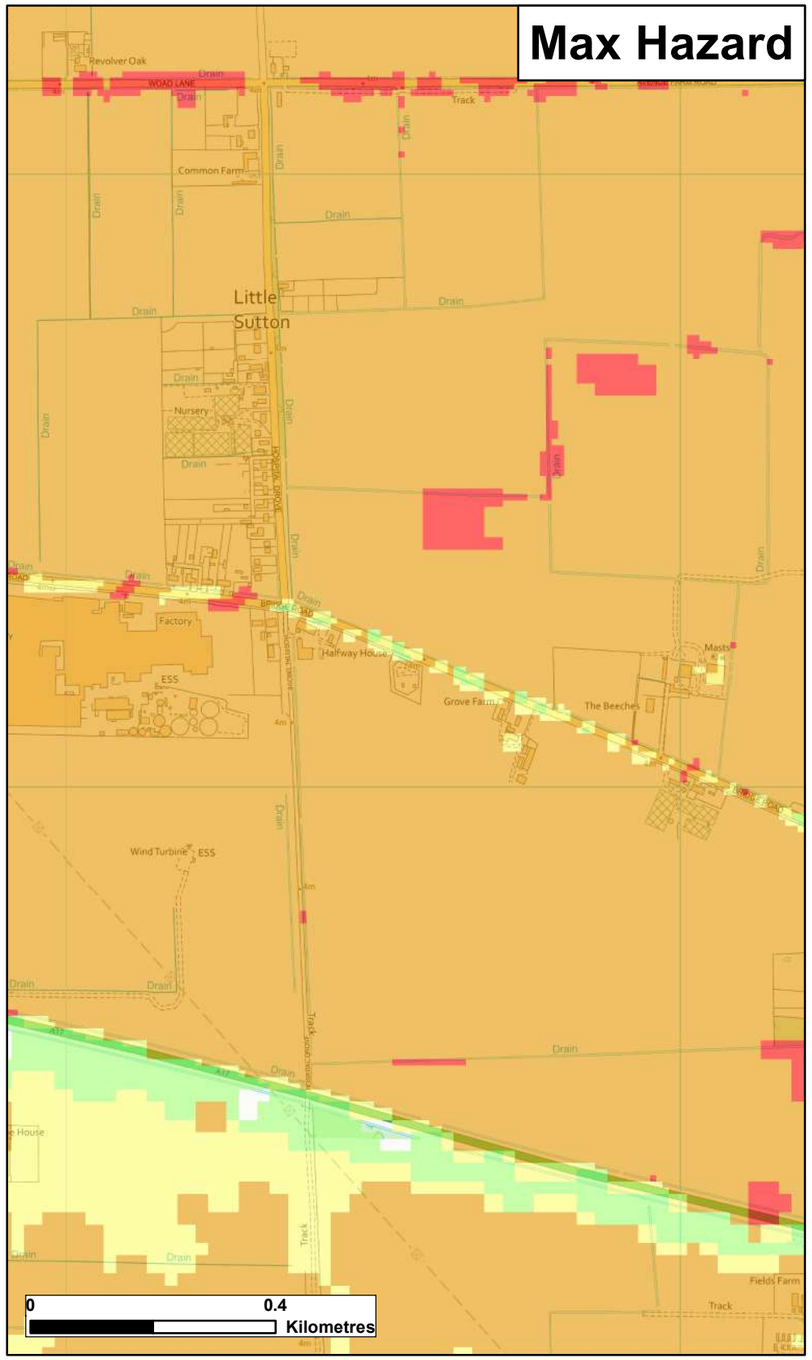
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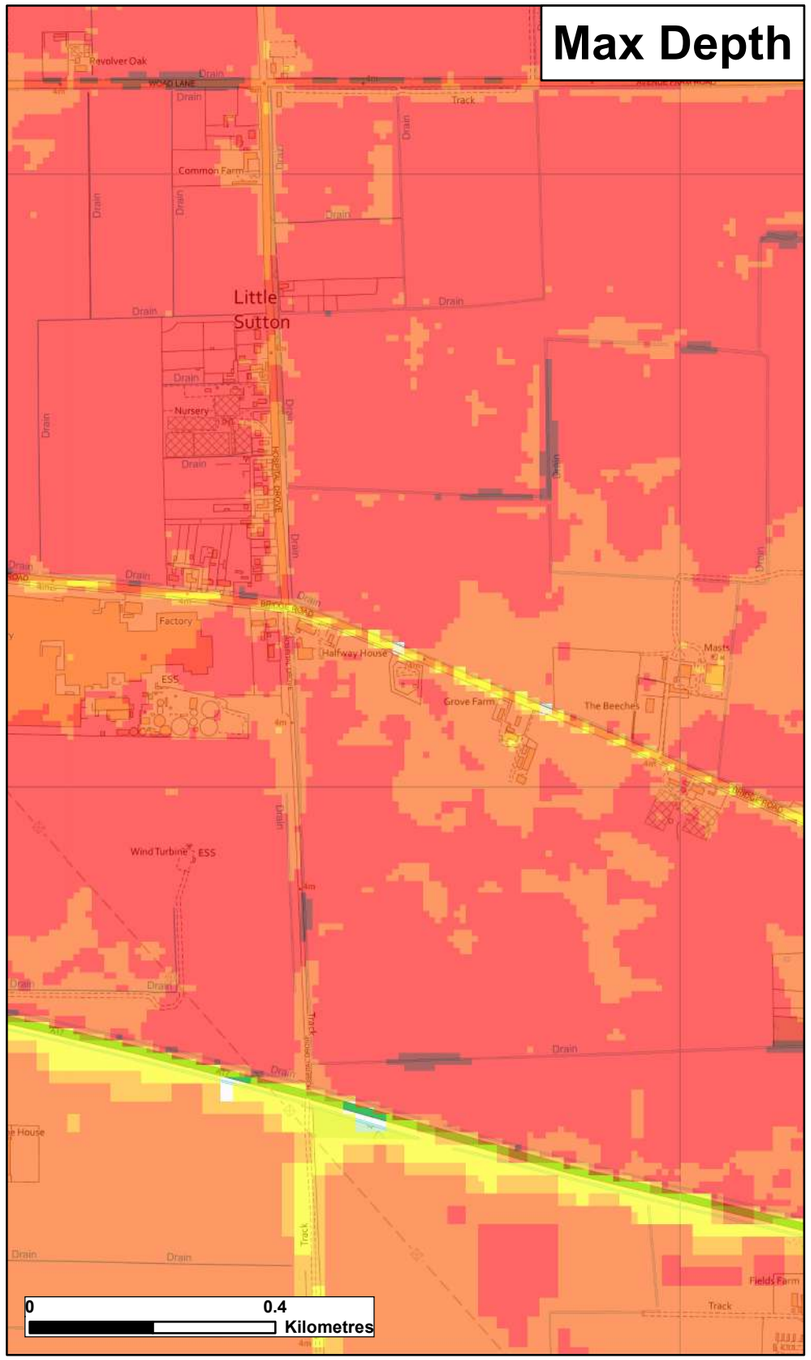
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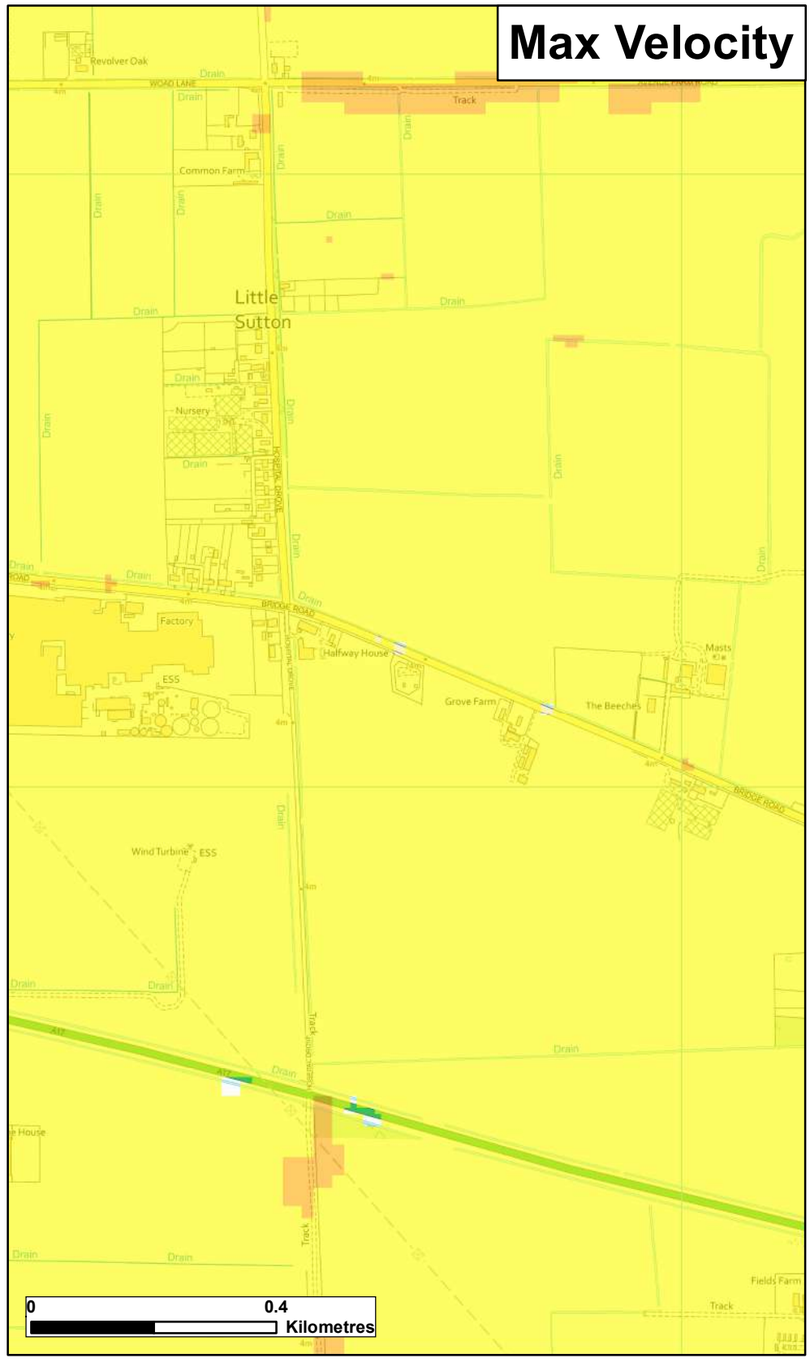
Lincolnshire and Northamptonshire Breach Hazard Mapping

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Date Printed	February 2024	Scenario year	2115	Scenario Annual Chance	0.1% (1 in 1000)	CCN Number	CCN-2024-343133

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