Heckington Fen Solar Park

EN010123

Environmental Statement | Volume 3: Technical Appendices

Appendix 9.1: Flood Risk Assessment and Drainage Strategy

Applicant: Ecotricity (Heck Fen Solar) Limited

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APPENDIX 9.1: FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY

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Flood Risk Assessment

Heckington Fen Energy Park

Final Report

February 2023

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Contract

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Purpose

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Abbreviations

AEP	Annual Exceedance Probability
AIMS	Asset Information Management System
BBC	Boston Borough Council
BESS	Battery Energy Storage Systems
BGS	British Geological Survey
BSIDB	Black Sluice Internal Drainage Board
CC	Climate Change
CMP	Construction Management Plan
CO2	Carbon Dioxide
DCO	Development Consent Order
DEFRA	Department for Environment, Food and Rural Affairs
EA	Environment Agency
ESL	Extreme Sea Level
FMfP	Flood Map for Planning
FRA	Flood Risk Assessment
FZ1, FZ2, FZ3	Flood Zone 1, 2 and 3
ha	Hectares
HELAA	Housing and Economic Land Availability Assessment
IDB	Internal Drainage Board
JBA	Jeremy Benn Associates
LandIS	Land Information System
LCC	Lincolnshire County Council
LDP	Local Development Plan
LFRMS	Local Flood Risk Management Strategy
LiDAR	Light Detection and Ranging
LLFA	Lead Local Flood Authority
mAOD	metres Above Ordnance Datum
mbgl	metres Below Ground Level
MW	Megawatts
NGR	National Grid Reference
NKDC	North Kesteven District Council
NPPF	National Planning Policy Framework
NPPG	National Planning Policy Guidance
NPS	National Policy Statements
NSIP	Nationally Significant Infrastructure Project
OS	Ordnance Survey
PFRA	Preliminary Flood Risk Assessment
PPG	Planning Practice Guidance
PV	Photovoltaic
SFRA	Strategic Flood Risk Assessment
SLWP	South Lincolnshire Water Partnership
SuDS	Sustainable Drainage Systems
SUE	Strategic Urban Extensions

1 Introduction

1.1 Overview

1.1.1 Jeremy Benn Associates (JBA) was commissioned by Ecotricity (Heck Fen Solar) Limited to prepare a Flood Risk Assessment (FRA) in support of proposals for a ground mounted solar photovoltaic (PV) electricity generation and energy storage facility (referred to within this report as "the Energy Park") on Land at Six Hundreds Farm, Six Hundreds Drove, East Heckington, Sleaford, Lincolnshire. The DCO application is for the construction, operation (including maintenance) and decommissioning of "the Energy Park", cable route to, and above and below ground works at, the National Grid Bicker Fen Substation (hereafter referred to as "the Proposed Development" (inclusive of Energy Park).

1.1.2 Heckington Fen Energy Park represents a significant planning project and is defined as a Nationally Significant Infrastructure Project (NSIP) in accordance with the Planning Act 2008. The Proposed Development falls within the definition of an onshore generating station in England exceeding 50 megawatts (MW) and therefore represents an NSIP under Sections 14 and 15 of the Planning Act 2008.

1.1.3 The Planning Act 2008 dictates that the Secretary of State is responsible for determining the application for a Development Consent Order (DCO), with the power to appoint the Planning Inspectorate to manage and examine the application. In this role, the Planning Inspectorate will examine the application through an appointed Examining Authority for the Scheme and make a recommendation to the Secretary of State who will then decide whether to grant a DCO which authorises and permits the development.

1.1.4 This FRA provides an overview of flood risk at the site of the proposed Energy Park, focusing on residual flood risk arising from failure/breaching of the flood defence embankments associated with the watercourse forming the northern boundary of the Energy Park. The management of surface water run-off arising from the proposed development is also addressed, together with details of the Sequential Test and Exception Test.

1.1.5 This document has been prepared in accordance with the National Policy Statements for Energy (NPS EN-1, EN-3 and EN-5) and the National Planning Policy Framework (NPPF) and associated Planning Practice Guidance (PPG). This FRA provides the evidence required to satisfy Part 2 of the NPPF Exception Test.

1.2 Proposed development

1.2.1 The proposed Energy Park comprises the construction, operation (including maintenance) and decommissioning of ground mounted solar PV panel arrays, an energy storage facility and supporting infrastructure. Subject to obtaining the necessary consents, construction is anticipated to commence at the earliest in 2025, and to be completed ready for operation no earlier than 2027, with decommissioning no later than 40 years after the commencement of operation (2067).

1.2.2 It is anticipated that the Energy Park could create renewable energy to power over 100,000 homes and could prevent 75,000 tonnes of carbon dioxide (CO_2) per year from entering the atmosphere.

1.2.3 The Proposed Development includes the following key components:

- Solar PV panels;
- PV module mounting structures;
- Inverters;
- Transformers;
- Switchgear;

- Cabling (including high and low voltage) – mixture of above (on the energy park site only) and below ground (on the energy park site and the Grid Cable Route);
- One or more Energy Storage Systems (ESS) (technology not determined at this time);
- Onsite substation and control buildings;
- Fencing and Security Measures;
- Internal access tracks;
- Community orchard;
- Permissive path;
- Construction of new access point onto highway (consented as part of the previous wind park approval);
- Landscaping including creation of new habitat areas;
- Construction of temporary construction areas and worker facilities;
- Digging of cable trench and laying cables for connection to the National Grid Bicker Fen Substation
- Installing above ground grid cable access points along the Grid Route; and
- Extension of Bicker Fen National Grid Substation and installation of above ground equipment.

A layout plan of the proposed Energy Park prepared by Ecotricity is provided in Appendix A.1.

1.3 Site description and location

1.3.1 The Energy Park is located within the county of Lincolnshire on an area of agricultural land approximately 3.7km east of the village of Heckington and 8.9km west of the town of Boston. The off-site cable route extends across Great Hale Fen, West Low Grounds and Bicker Fen, connecting to the National Grid Bicker Fen Substation approximately 6km to the south of the proposed Energy Park.

1.3.2 The Energy Park lies wholly within the administrative area of North Kesteven District Council and immediately adjacent to the boundary of Boston Borough Council along the eastern edge. The entirety of the finalised cable route and the above ground works at the National Grid Bicker Fen Substation lie within the Boston Borough Council boundary.

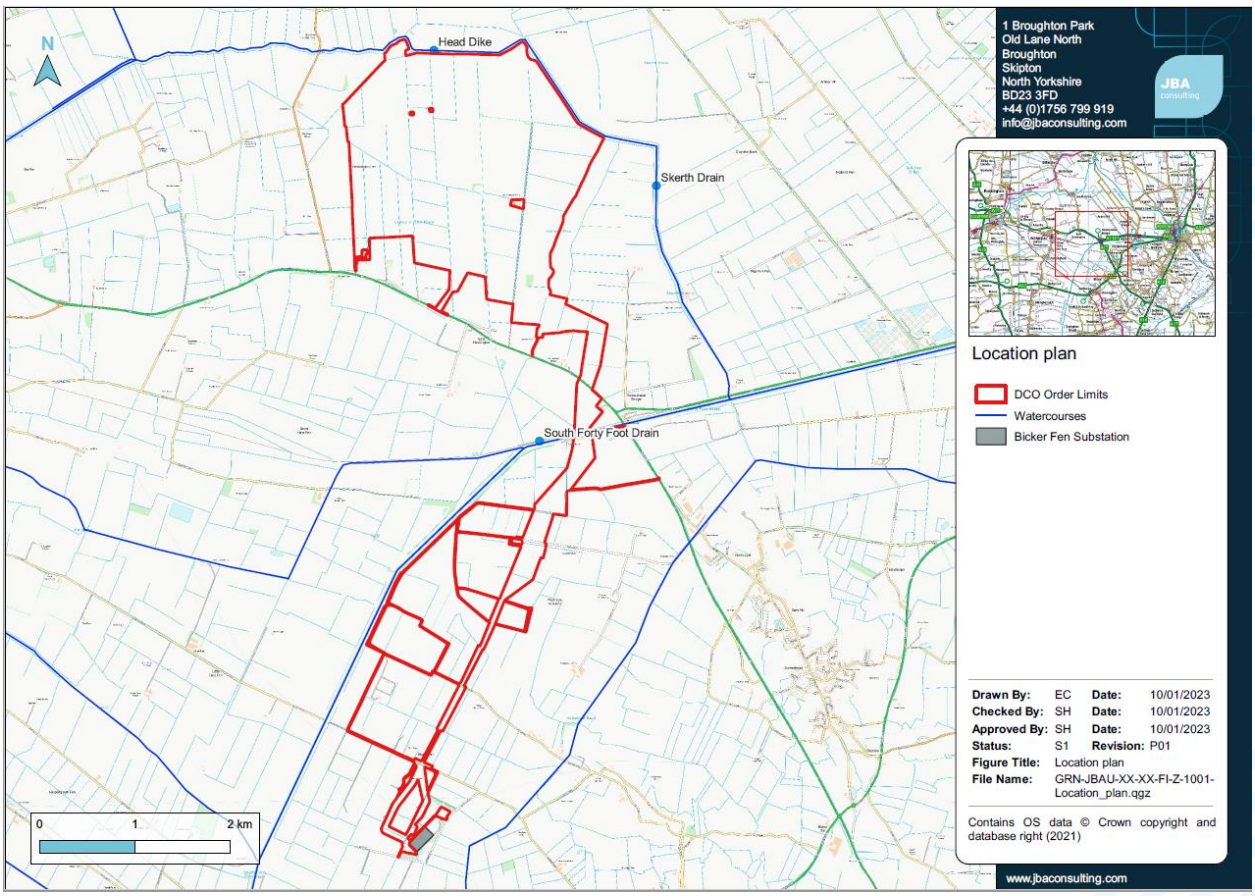


Figure 1-1: Location plan – Heckington Fen Energy Park DCO Order Limits

1.4 Available data

1.4.1 This FRA has been prepared using the following available data:

- British Geological Survey GeoIndex - http://www.bgs.ac.uk/geoindex/
- Central Lincolnshire Strategic Flood Risk Assessment (SFRA) Level 1 (2022) - https://www.n-kesteven.gov.uk/_resources/assets/attachment/full/0/133948.pdf
- Central Lincolnshire Strategic Flood Risk Assessment (SFRA) Level 2 (2022) - https://www.n-kesteven.gov.uk/_resources/assets/attachment/full/0/133949.pdf
- Central Lincolnshire Strategic Flood Risk Assessment (SFRA) Level 1 (2015) - https://www.n-kesteven.gov.uk/_resources/assets/attachment/full/0/17782.pdf
- Central Lincolnshire Strategic Flood Risk Assessment (SFRA) Level 2 (2015) - https://www.n-kesteven.gov.uk/_resources/assets/attachment/full/0/136995.pdf
- Central Lincolnshire Local Plan Adopted April 2017 - https://www.n-kesteven.gov.uk/EasySiteWeb/GatewayLink.aspx?alId=54815
- CIRIA SuDS Manual [C753] (December 2015) (ciria.org)
- Cranfield University's National Soils Resources Institute SoilScapes website - http://www.landis.org.uk/soilscapes/
- Department for Business, Energy and Industrial Strategy. Planning for New Energy Infrastructure: Draft National Policy Statements for energy infrastructure (November 2021)https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1015302/nps-consultation-document.pdf

- Department of Energy and Climate Change: Overarching National Policy Statement for Energy (EN-1) (July 2011) - 1938-overarching-nps-for-energy-en1.pdf (publishing.service.gov.uk)
- Department of Energy and Climate Change: National Policy Statement for Renewable Energy Infrastructure (EN-3) (July 2011) - 1940-nps-renewable-energy-en3.pdf (publishing.service.gov.uk)
- Department of Energy and Climate Change: National Policy Statement for Electricity Networks Infrastructure (EN-5) (July 2011) - 1942-national-policy-statement-electricity-networks.pdf (publishing.service.gov.uk)
- Environment Agency - Flood Map for Planning; https://flood-map-for-planning.service.gov.uk/
- Environment Agency – Long Term Flood Risk Mapping; https://flood-warning-information.service.gov.uk/long-term-flood-risk
- Environment Agency Product 4 and Product 8 flood risk data.
- Joint Lincolnshire Local Flood Risk and Water Management Strategy (2019) - Joint flood risk water management strategy 2019-2050 - strategic vision (lincolnshire.gov.uk)
- Lincolnshire County Council: Guidance for Developers - Guidance for developers – CMP and SuDS method statement - Lincolnshire County Council
- Lincolnshire County Council Lead Local Flood Authority: Preliminary Flood Risk Assessment (June 2011) - Preliminary flood risk assessment report (lincolnshire.gov.uk)
- National Planning Policy Framework (July 2021) - National Planning Policy Framework (publishing.service.gov.uk)
- Planning Practice Guidance: Climate Change (March 2019) – Climate change - GOV.UK (www.gov.uk)
- Planning Practice Guidance: Flood Risk and Coastal Change (August 2022) - Flood risk and coastal change - GOV.UK (www.gov.uk)
- Southeast Lincolnshire Local Plan (March 2019) - Local-Plan-text-March-2019.pdf (southeastlincslocalplan.org)
- Southeast Lincolnshire Strategic Flood Risk Assessment (March 2017)- SE-Lincolnshire-SFRA-2017-v6-24th-Jan-2018.pdf (southeastlincslocalplan.org)

1.5 Report structure

1.5.1 This FRA document is structured as follows:

1. Introduction
2. Planning Policy
3. Strategic context
4. Baseline environmental conditions
5. Stakeholder consultation
6. Flood risk from all sources
7. Sequential Test and Exception Test
8. Surface water management
9. Flood risk mitigation
10. Residual risk
11. Summary

2 Planning Policy

2.1 National Policy Statements

2.1.1 The relevant National Policy Statements (NPS) provide the primary basis for decisions by the Secretary of State on development consent applications for Nationally Significant Infrastructure Projects. The Overarching National Policy Statement for Energy (NPS EN-1) identifies both water quality and resources and flood risk as topics requiring consideration/assessment as part of energy related projects and requires that where the Project is likely to have effects on the water environment, the applicant:

- should undertake an assessment of the existing status of, and impacts of the Project on, water quality, water resources and physical characteristics of the water environment (Paragraph 5.15.2);
- an application should be accompanied by a Flood Risk Assessment for energy projects of 1ha or greater in Flood Zone 1 and all energy projects in Flood Zones 2 and 3 (Paragraph 5.7.4);
- where a project may be affected by or may increase flood risk, pre-application discussions should be undertaken with the Environment Agency (EA) and other bodies;
- any requirements for sequential testing are satisfied (Paragraph 5.7.9); and
- priority is given to the use of Sustainable Drainage Systems (SuDS) (Paragraph 5.7.9).

2.1.2 NPS EN-3 for Renewable Energy Infrastructure addresses climate change adaptation and requires that applicants set out how proposals would be resilient to rising sea levels and increased risk of flooding. In respect of water quality and resources, NPS EN-3 refers to the assessment requirements set out in NPS EN-1.

2.1.3 NPS EN-5 provides the primary basis for decisions taken by the Secretary of State on applications received for electricity networks infrastructure and sets out the factors influencing route selection and the impacts that may arise from such development. However, NPS EN-5 refers back to NPS EN-1 regarding the assessment of flood risk and consideration of resilience to climate change and does not therefore set out additional policy in respect of flood risk.

2.1.4 The National Policy Statements were first published in 2011. The Energy White Paper (Powering our Net Zero Future, December 2020) announced that the government would review the NPS to reflect the policies and broader strategic approach set out in the White Paper.

2.1.5 The requirements and criteria regarding flood risk set out in Draft NPS EN-1, published in September 2021, are consistent with those set out in the NPS originally published in 2011. Draft NPS EN-1, Paragraph 5.8.8 refers applicants to the National Planning Policy Framework and the associated Flood Risk and Coastal Change Planning Practice Guidance for further details regarding the minimum requirements for Flood Risk Assessments.

2.1.6 Paragraph 5.8.15 of Draft NPS EN-1 states that preference should be given to locating projects in areas of lowest flood risk and that the Secretary of State should not consent development in flood risk areas (Flood Zones 2 and 3 in England), accounting for all sources of flooding and the predicted impacts of climate change, unless they are satisfied that the sequential test requirements have been met.

2.1.7 Draft NPS EN-3 refers to Draft NPS EN-1 regarding the considerations that applicants and the Secretary of State should take into account to help ensure that renewable energy infrastructure is safe and resilient to climate change. Paragraph 2.3.4 notes that solar PV sites may be proposed in low lying, exposed sites and that applicants should consider how plant will be resilient to the increased risk of flooding. Paragraph 2.50.7 notes that the applicant's FRA will need to consider the impact upon drainage and that localised SuDS, such as swales and infiltration trenches, should be used to control run-off.

2.1.8 Draft NPS EN-5 refers back to Draft NPS EN-1 regarding considerations relating to flood risk and resilience to the effects of climate change and does not therefore set out additional policy in respect of flood risk.

2.2 National Planning Policy Framework

2.2.1 The NPPF, as revised 20th July 2021, sets out national planning policy with regards to development and flood risk. The accompanying PPG 'Flood Risk and Coastal Change' (discussed below) provides local planning authorities with guidance on implementation of the planning policy as set out in the NPPF.

2.2.2 The NPPF (Paragraphs 161-163) advocates use of the risk-based, sequential approach (which recognises that risk is a function of probability and consequence), in which new development is preferentially steered towards areas at the lowest probability of flooding. It also requires that new development should be planned to avoid increased vulnerability to the range of impacts arising from climate change. In respect of flood risk, paragraph 159 states that:

2.2.3 "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".

2.2.4 The overall approach of the NPPF[1] to flood risk is summarised in paragraph 167 of the document:

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:

- *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;*
- *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;*
- *it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;*
- *any residual risk can be safely managed; and*
- *safe access and escape routes are included where appropriate, as part of an agreed emergency plan*

2.2.5 Paragraph 162 requires that the sequential approach is applied to steer new development to areas with the lowest risk of flooding. However, Paragraph 166 confirms that the Sequential Test does not need to be undertaken for planning applications that come forward on sites allocated in the development plan through the Sequential Test.

2.2.6 According to Annex 3 of the NPPF, solar farms are categorised as Essential Infrastructure. In addition to application of the Sequential Test, Table 3 of the NPPG PPG 'Flood risk and coastal change' requires that the Exception Test is applied for proposals comprising Essential Infrastructure in Flood Zone 3. Application of the Sequential Test is discussed in Section 7 of this report and the Exception Test is also discussed in Section 7. This FRA document provides the evidence required to satisfy Part 2 of the NPPF Exception Test.

[1] Ministry of Housing Communities and Local Government. National Planning Policy Framework. July 2021.

2.3 Planning Practice Guidance

2.3.1 The PPG (Ministry of Housing, Communities and Local Government, 25th August 2022) defines the Flood Zones that provide the basis for application of the Sequential Test. The Flood Zones are defined as follows (PPG Table 1 Paragraph: 078 Reference ID: 7-078-20220825):

- Flood Zone 1: Low probability of flooding - less than 0.1% (1 in 1,000) annual probability of river or sea flooding in any year;
- Flood Zone 2: Medium probability of flooding - between 1% and 0.1% (1 in 100 and 1 in 1,000) annual probability of river flooding and between 0.5% and 0.1% (1 in 200 and 1 in 1,000) annual probability of sea flooding in any year;
- Flood Zone 3a: High probability of flooding - 1% (1 in 100) or greater annual probability of river flooding or 0.5% (1 in 200) or greater annual probability of sea flooding in any year; and
- Flood Zone 3b: The functional floodplain - where water from rivers or the sea has to flow or be stored in times of flood. The 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).

2.3.2 It should be noted that Flood Zones 1, 2 and 3a definitions ignore the presence of flood defences.

2.3.3 The 'Flood Risk and Coastal Change' PPG advocates the use of SuDS to reduce the overall level of flood risk. SuDS can reduce the causes and impacts of flooding, remove pollutants from urban run-off at source and combine water management with green space providing benefits for amenity, recreation and wildlife.

2.3.4 The NPPF (Paragraphs 153 and 154) and the 'Flood Risk and Coastal Change' PPG require that the spatial planning process should consider the possible impacts of climate change and contingency allowances are provided to enable impacts to be considered over the lifetime of the development.

2.4 Climate change guidance

2.4.1 According to the Planning Practice Guidance, developers should consider the impact of climate change in the preparation of an FRA. Development classified as 'Essential Infrastructure' in Flood Zone 2, 3a or 3b should use the higher central peak river flow allowances.

2.4.2 The Energy Park Order Limits fall entirely within the Witham Management Catchment for peak River flow allowances, where the climate uplifts for the 2050's epoch are as follows:

- Central allowance – 8%
- Higher allowance – 15%

2.5 Requirements of a Flood Risk Assessment

2.5.1 The requirements for an FRA are provided in the NPPF and associated PPG. The NPPF outlines that a site-specific FRA should be submitted for all developments larger than 1ha in Flood Zone 1 (FZ1) or any development of any size within FZ2 and FZ3.

2.5.2 FRAs should describe and assess all sources of flood risk, including:

- rivers,
- the sea,
- reservoirs,

- sewers and
- groundwater.

2.5.3 These issues, including an assessment of the potential implications of overtopping/breaching of flood defences and of climate change, are dealt with in Chapter 6 of this FRA.

2.5.4 Furthermore, an FRA should demonstrate how surface water runoff will be managed for a proposed development so that runoff is controlled and will not worsen flood risk downstream. This is the subject of Chapter 8 of this FRA.

2.5.5 An FRA should also set out the mitigation measures that will be put in place to manage residual flood risks at a site. In this instance, this should include consideration of access and evacuation during floods, the provision of safe refuge and the setting of appropriate design levels. These are described in Chapter 9 of this FRA.

3 Strategic Context

3.1 Overview

3.1.1 The strategic context for this FRA is guided by North Kesteven District Council (NKDC) and Boston Borough Council's (BBC) Strategic Flood Risk Assessment (SFRA) and Local Development Plan (LDP) documents. These are supplemented by documents for Lincolnshire as a whole.

3.2 North Kesteven District Council Studies

3.2.1 NKDC is a member of the Central Lincolnshire Joint Strategic Planning Committee. The Central Lincolnshire Local Plan Team is responsible for producing the Central Lincolnshire Local Plan. This Plan contains planning policies that relate to the delivery and management of development in Central Lincolnshire and replaces the previously adopted Local Plans for the City of Lincoln, West Lindsey, and North Kesteven District Councils. Development of the Central Lincolnshire Local Plan was supported by various evidence base studies, including Strategic Flood Risk Assessments.

Central Lincolnshire Strategic Flood Risk Assessment (SFRA) – Level 1 (2022)

3.2.2 The latest Level 1 SFRA was produced and published in March 2022 on behalf of the Central Lincolnshire Local Plan team by Roy Lobley Consulting. The outputs from the SFRA are used as an initial evidence base to support the local plan site allocation process. The SFRA builds upon the previous (2015) Level 1 SFRA produced for Central Lincolnshire.

3.2.3 The 2022 level 1 SFRA focused on any site identified in the current Housing and Economic Land Availability Assessment, (HELAA), existing allocated residential sites and Strategic Urban Extensions, (SUE), that had any portion of the site in either Flood Zone 3 or 2. The SFRA includes one large site on land south of the A17 highway and north of Heckington Village but does not include any areas relating to the proposed Energy Park.

3.2.4 The 2022 Level 1 SFRA does not consider surface water flood risk, which is considered in subsequent assessments. Furthermore, the report states that following discussions with the EA, it has been has concluded that the impact of climate change on the extent of the Flood Zones in the SFRA area including North Kesteven District is likely to be negligible and should not significantly impact on the strategic allocation of land.

Central Lincolnshire Strategic Flood Risk Assessment – Level 2 (2022)

3.2.5 The level 2 SFRA was also produced to provide the evidence base to support the local plan site allocation process. However, the document only reported on the proposed site allocations (without planning permission) arising from the Level 1 SFRA, that have any portion of the site in either Flood Zone 3 or 2. Again, this does not include the Energy Park.

Central Lincolnshire Strategic Flood Risk Assessment – Level 1 (2015)

3.2.6 The 2015 Level 1 SFRA was produced to update and consolidate information from three previous SFRA's:

- Lincoln Policy Area SFRA, February 2010
- North Kesteven District Council SFRA, November 2009
- West Lindsey District Council SFRA, July 2009

3.2.7 The SFRA deliverables includes high level maps for fluvial Flood Zones and surface water flood risk using Environment Agency Data. Heckington Fen is shown to have areas within Flood Zone 2 and 3. Surface water flood risk at Heckington Fen is shown to be predominantly low with small areas of surface water flood risk (from low to high).

Central Lincolnshire Strategic Flood Risk Assessment – Level 2 (2015)

3.2.8 As with the 2022 Level 2 SFRA, this report did not consider parcels of allocated land at Heckington Village or Heckington Fen.

3.2.9 However, for the areas covered, the following advice is provided:

- Site specific flood risk assessments should consider the latest climate change guidance and include hydraulic modelling for breaching or overtopping of defences to support a planning application where necessary.
- Regarding surface water drainage, the SFRA states that subsequent planning applications for the sites will need to be supported by specific FRAs and/or surface water drainage strategies in-line with Lincolnshire County Council guidance as the Lead Local Flood Authority.

Central Lincolnshire Local Plan (2017)

3.2.10 The adopted Central Lincolnshire Local Plan (2017) was prepared by the Central Lincolnshire Joint Strategic Planning Committee and supersedes the previous local plans prepared for the City of Lincoln, North Kesteven and West Lindsey.

3.2.11 The local plan outlines policies to drive the growth and regeneration of central Lincolnshire over the next 20 years to 2036. The policies relevant to the proposed Energy Park are summarised as follows:

LP1: A Presumption in Favour of Sustainable Development

To achieve this policy the district will work proactively with applicants to find solutions which mean that proposals can be approved wherever possible, and to secure development that improves the economic, social and environmental conditions in Central Lincolnshire.

LP2: The Spatial Strategy and Settlement Hierarchy

This policy focuses on delivering sustainable growth for Central Lincolnshire that meets the needs for homes and jobs, regenerates places and communities, and supports necessary improvements to facilities, services and infrastructure. This policy permits development for renewable energy generation in the countryside.

LP12: Infrastructure to support growth

All development should be supported by, and have good access to, all necessary infrastructure.

LP14: Managing water resources and flood risk

Local plan policy 14 requires all development proposals to be considered against the NPPF, including application of the Sequential Test and if necessary, the Exception Test.

LP18: Climate Change and Low Carbon Living

Under this policy Development proposals will be considered more favourably if the scheme would make a positive and significant contribution towards one or more of the following (which are listed in order of preference):

- Reducing demand
- Resource efficiency
- Energy production
- Carbon off-setting

LP19: Renewable energy proposals

Proposals for non-wind renewable technology will be assessed on their merits, with the impacts, both individual and cumulative, considered against the benefits of the scheme, taking account of factors including the surrounding landscape and townscape, residential and visual amenity and ecology and diversity.

LP55: Development in the countryside

Proposals should protect the best and most versatile agricultural land so as to protect opportunities for food production and the continuance of the agricultural economy.

3.3 Boston Borough Council Studies

Southeast Lincolnshire Strategic Flood Risk Assessment (2017)

3.3.1 The SFRA for Southeast Lincolnshire was produced by the Southeast Lincolnshire Joint Planning Unit to form a consistent evidence base for the local plan and to drive development management decisions. The SFRA contains information to cover both levels of assessment recommended by the National Planning Practice Guidance (NPPG), i.e., Level 1 and Level 2 assessments.

3.3.2 The Level 1 assessment is present in the form of the Environment Agency's Flood Map, Flood Map for Surface Water and Reservoir Flood Map. These maps identify the potential extent of flooding from tidal, fluvial, surface water and reservoir sources.

3.3.3 The Level 2 assessment is present in the form of hazard mapping, which classifies flood risk as Low Hazard and Danger to Some/Most/All based upon the modelling of factors including the potential depths of flooding, the velocity of flood flows and the presence of water borne debris. For the level 2 assessment two scenarios were modelled: the 1 in 200 (0.5%) and 1 in 1,000 (0.1%). This was undertaken for the 'present' day (2006 baseline) and 2115 scenario.

3.3.4 Hazard mapping produced for Swineshead, Boston (located approximately 2km east of the order limits (cable route) indicates that Skerth Drain forms a barrier to progression of flow to the west (see Appendix A.2). This hazard mapping indicates a combined fluvial and tidal event for a 2115 future climate scenario, a specific Annual Exceedance Probability is not provided for the mapping. Swineshead was not included in the Level 2 SFRA breach and overtopping assessment.

3.3.5 Similarly, the hazard mapping for an area to the south, shows that the South Forty Foot Drain forms a barrier to flow from the east. Appendix A.3 shows that there are areas of the cable route on Bicker Fen that are subject to flooding with Danger to Most shown along South Forty Foot Drain and reducing to Low Hazard moving east towards Bicker.

3.3.6 The SFRA states that development in areas beyond the Level 2 SFRA study area (and the fluvially dominant areas of Boston) and within a Flood Zone will need to undertake their own assessment, relative to the scale and nature of the proposed development, to inform appropriate mitigation consistent with the councils Standing Advice.

3.3.7 Guidance on essential infrastructure is provided stating that Essential Infrastructure that has to be there and has passed the Exception Test may also be permitted providing it is 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.

3.3.8 According to the SFRA, for all development, surface water flood risk on site should be managed using sustainable drainage systems such as swales, filter drains, bio-retention basins, permeable paving, rain gardens, green roofs, etc. Sustainable drainage systems (SuDS) should be designed to control surface water runoff as close to its source as possible and mimic the natural catchment process. The design should aim to reduce runoff by integrating stormwater controls throughout the site in small discrete units rather than using large flow attenuation and flow control structures.

Southeast Lincolnshire Local Plan (March 2019)

3.3.9 The adopted Southeast Lincolnshire Local Plan 2011-36 was produced by the South-east Lincolnshire Joint Strategic Planning Committee which is a partnership of Boston Borough, South Holland District and Lincolnshire County Councils. The local plan was prepared to guide development and land use for the period of April 2011 to March 2036 and forms the statutory development plan for the local area.

3.3.10 Key policies set out in the local plan that are relevant to the proposed Cable Route are listed as follows:

Policy 1: Spatial Strategy

This policy seeks to define areas to direct or restrain development based on the sustainability of developing in that area. The cable route falls within an area classed as countryside. The policy states that in the countryside, development will be permitted that is necessary in such a location and/or where it can be demonstrated that it meets the sustainable development needs of the area in terms of economic, community or environmental benefits.

Policy 2: Development Management

This policy is used to assess the sustainable development attributes of all planning proposals. Proposals requiring planning permission for development will be permitted provided that sustainable development considerations are met, specifically in relation to 9 key criteria including number 3; maximising the use of sustainable materials and resources, and number 7; sustainable drainage and flood risk.

Policy 4: Approach to Flood Risk

Under this policy 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, provided a series of criteria can be met. The criteria align with National Planning Practice Guidance and include the Sequential and Exception Tests and prioritising the use of SuDS on site.

Policy 5: Meeting Physical Infrastructure and Service Needs

Policy 5 sets out a strategic policy framework by which developers, service providers and the community are advised how physical infrastructure and service needs will be considered and met.

Policy 31: Climate Change and Renewable and Low Carbon Energy

This policy addresses the need to adapt to a changing climate. It firstly considers Climate Change and requires that development proposals demonstrate that the consequences of climate change have been addressed minimised or mitigated against. Secondly, Renewable Energy is considered. Under Policy 31 Renewable Energy Facilities should demonstrate no significant adverse impact to the natural environment, landscape character, agricultural land take and other factors.

3.4 Lincolnshire County Council

Joint Lincolnshire Local Flood Risk and Water Management Strategy (2019)

3.4.1 The 2019 Joint Lincolnshire Local Flood Risk and Water Management Strategy (LFRMS) applies to the seven districts of Lincolnshire, including North Kesteven and Boston, relevant to the site of interest at Heckington Fen and the wider Order Limits covering the cable route to the south. Lincolnshire County Council is the Lead Local Flood Authority (LLFA) and has been responsible for implementing and monitoring an LFRMS.

3.4.2 The LFRMS discusses the Lincolnshire Flood Risk and Drainage Management Partnership's (established 2010) review of key water issues that Lincolnshire faces, summarising these as flood and drought and the associated economics and developing resilience to climate

change and sea level rise in communities. The partnership groups these issues into four strategic themes; Coastal Lincolnshire, Agri-food, Catchment Based Approach and Urban Areas. Under the third theme, Catchment Based Approach, it outlines how a holistic and sustainable approach to land management will be tested in the South Forty Foot Catchment under the South Lincolnshire Water Partnership (SLWP) supported by the Lincolnshire Flood Risk and Water Management Partnership.

3.4.3 The LFRMS goes on to set out 8 Strategic Outcomes that will be established by the end of the LFRMS period (2019-2050) including themes around adapting to climate change, safe development and delivering multiple benefits through catchment-based management. The objectives outlined to meet these outcomes refer to management activities at a high-level across Lincolnshire and do not detail activities that specifically impact the Energy Park.

Preliminary Flood Risk Assessment

3.4.4 The PFRA was undertaken in 2011 to (i) identify areas where flood risk is nationally significant and (ii) assist in the development of Lincolnshire's flood risk management strategy. The study comprised a high-level overview of historical and future flood risk and was based on national datasets provided by the EA. It did not identify any nationally significant flood risk areas and does not include site-specific information (i.e., ordinarily required to support the preparation of an FRA in support of a planning application).

Guidance for Developers: CMP and SuDS

3.4.5 Lincolnshire County Council (LCC) provides guidance for developers in the preparation of a Construction Management Plan (CMP) and SuDS Method Statement.

3.4.6 The advice is based upon the CIRIA SuDS Manual (C753) and provides developers and designers with guidance regarding the design and implementation of SuDS as part of land development projects. The LCC guidance requires that a CMP and SuDS Method Statement is submitted and approved before work begins on a development site. This guidance provides a recommended structure for a SuDS Method Statement, guidelines regarding temporary drainage options during the construction phase and factors to consider when preparing potential protection and remedial measures for the construction phase.

4 Baseline Environmental Conditions

4.1 Topography

4.1.1 Topography across the area defined by the Order Limits is only a few metres above sea level and the land generally slopes very gently towards the north/north-east. The lowest point within the proposed Energy Park is 0.77m Above Ordnance Datum (AOD) along the northern boundary, while the highest point is 3.3mAOD along the southern boundary. Levels at National Grid Bicker Fen Substation are approximately 2mAOD.

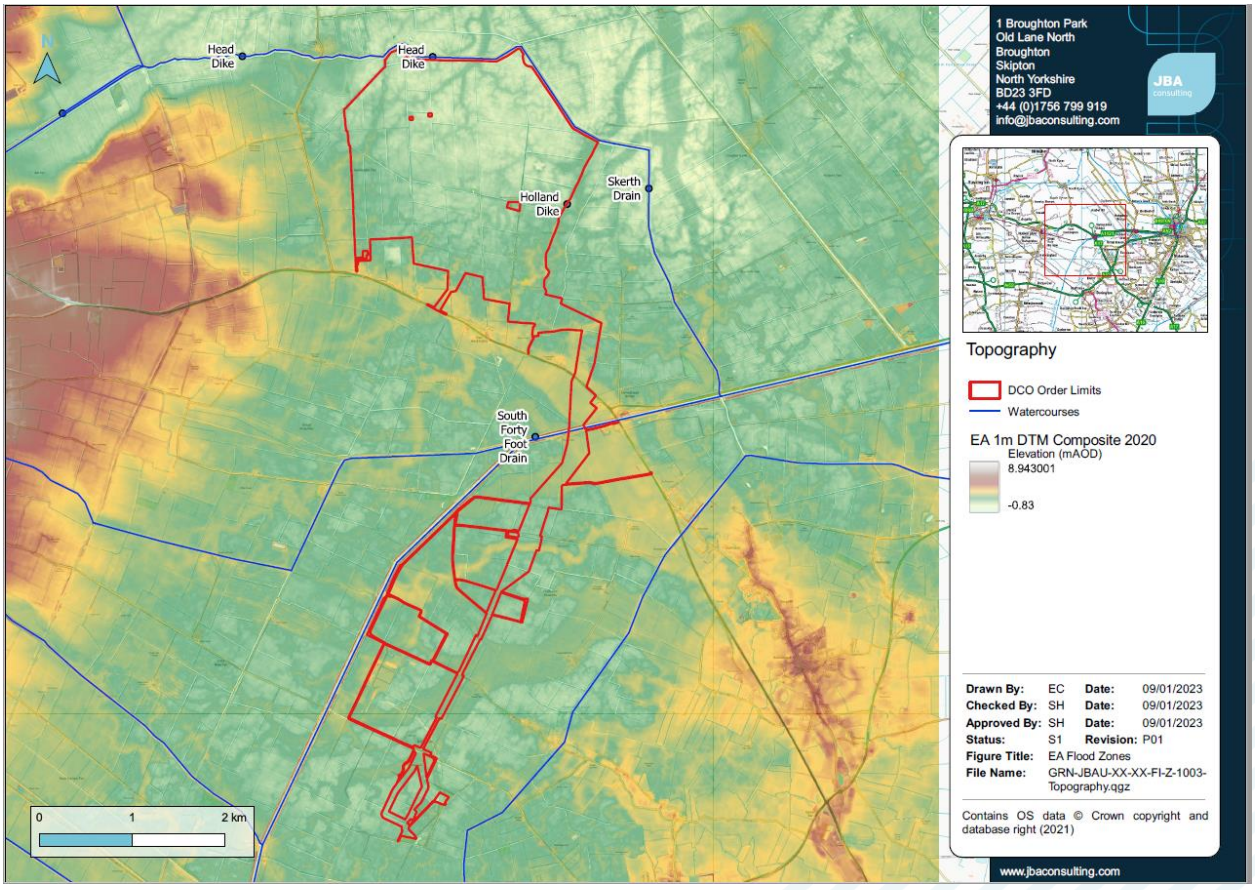


Figure 4-1: Environment Agency 2020 LiDAR (1m resolution)

4.2 Main Rivers and Ordinary Watercourses

4.2.1 The principal watercourses in the area are the River Witham and South Forty Foot Drain, located approximately 4km and 1.5km to the east and south of the proposed Energy Park respectively (Figure 4-2). Both are classified as Main River and therefore under the jurisdiction of the EA. The Energy Park itself is bound along the northern boundary by the Head Dike/Skerth Drain (which is also classified as Main River) and the Energy Park area is bisected by a number of ditches/drains, some of which are operated and maintained by the Black Sluice Internal Drainage Board. Water levels within the network of ditches/drains are managed through pumping to the Head Dike/Skerth Drain.

4.2.2 The Energy Park is currently in agricultural use and therefore comprises permeable surfaces, such that surface water run-off generally infiltrates into the ground or is routed to the various ditches/drains that bisect the site. Similarly, the off-site cable route traverses an area characterised by agriculture.

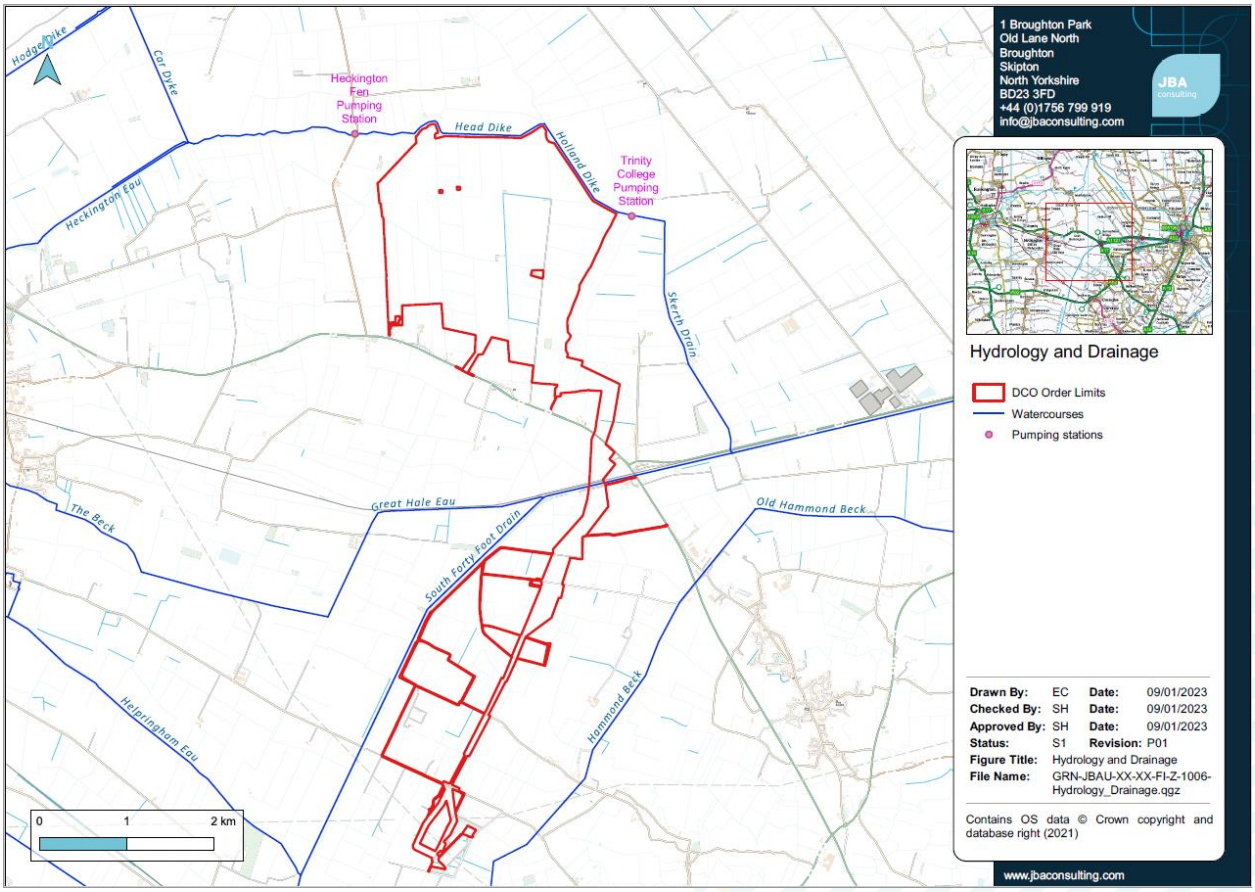


Figure 4-2: Energy Park Order Limits – Hydrology and drainage

4.3 Coastal

4.3.1 The Energy Park site is located on the Lincolnshire Fens, a coastal plain in the east of England which comprises a large broad flat marshland supporting a rich biodiversity. Head Dike and Skerth Drain ultimately drain to the South Forty Foot Drain, a Main River to the south of the Energy Park, which bisects the Off-site Cable Corridor.

4.4 Flood defences

4.4.1 Data regarding the nature and condition of the fluvial flood defences was included in the Product 4 flood data, provided by the EA in October 2021 (Appendix B.1). The defences protecting the proposed Energy Park consist of earth embankments. According to the EA, they are in fair condition and reduce the risk of flooding (at the defence) to a 10% (1 in

10) chance of occurring in any year (Appendix B.1). The EA has confirmed that they inspect these defences routinely to ensure potential defects are identified.

4.4.2 The existing fluvial defences reducing the risk of flooding from the South Forty Foot Drain consist of earth embankments. According to the EA, 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. The EA has confirmed that they inspect these defences routinely to ensure potential defects are identified.

4.4.3 The Product 4 flood data also states that there are tidal defences protecting the site which consist of earth embankments, supplemented by saltmarsh to maintain foreshore levels. According to the EA data, the defences 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. The tidal defences are also inspected annually.

4.4.4 The EA Asset Information Management System (AIMS) Spatial Flood Defence dataset provides attribute information for each flood defence, including the effective crest level and condition. The dataset confirms that most defences in this area are in fair condition (last inspection June 2019). The effective crest heights of embankments around Heckington Fen are between 2.75mAOD and 3.4mAOD.

4.4.5 Black Sluice Internal Drainage Board (BSIDB) was consulted regarding drainage of the Heckington Fen area. The IDB confirmed that the area is served by two pumping stations (Heckington Fen and Trinity College) that discharge surface water to the Head Dike and Skerth Drain respectively. Heckington Fen pumping station, serving a catchment of 1,576ha, has a maximum capacity of 2,661l/s and Trinity College pumping station, serving a catchment of 609ha, has a maximum capacity of 1,133l/s. The IDB also confirmed that Board maintained watercourses are generally designed to provide capacity for a 1 in 30 year storm event.

4.5 Geology, soils and hydrogeology

4.5.1 The geological environment controls the behaviour and quality of groundwater. The stratigraphy of the lithologies underlying the site is shown in Table 4-1 and geological mapping is presented in Appendix A.4 and Appendix A.5.

Table 4-1: Stratigraphy of lithologies underlying the Proposed Development

Age	Formation/ Group	Description	Thickness
Quarternary period	Tidal flats	Grey clay underlain by black silt and gravels.* Layers of peat and silty clay may also be present**	~4m, increasing towards the north-east*
Jurassic	Ampthill Clay Formation (Ancholme Group)	Mudstone, mainly smooth or slightly silty, pale to medium grey with argillaceous limestone (cementstone) nodules; some rhythmic alternations of dark grey mudstone in the lower part; topmost beds are typically pale grey marls with cementstone.**	Up to 50m**
	West Walton Formation (Ancholme Group)	Brown-grey clay, with sporadic argillaceous limestone nodules. Clay becoming slightly sandy at greater depths, with stone beds present.**	0-40m**
	Oxford Clay Formation (Ancholme Group)	Calcareous mudstone, silty mudstone and siltstone, with subordinate fine-grained sandstones and argillaceous limestone (cementstone) or siltstone nodules;	0-70m**
*BGS borehole log records, **BGS Online Lexicon of Named Rock Units			

4.5.2 Soils are described as loamy and clayey floodplain soils of coastal flats with the potential for perched groundwater tables, which sit above the low permeability superficial deposits (Soilscapes (DEFRA), 2022). Any perched groundwater is contained within the thin soil layer, is not laterally continuous and does not form an aquifer. Fertility is lime-rich to moderate, and the soils are mostly drained into marginal ditches in most fields.

4.5.3 Made Ground refers to lithology that is made up of artificial material, or the reworking of natural material used to create a new landform. Due to the greenfield nature of the site, it is unlikely that Made Ground exists beneath the Application Site.

4.5.4 The British geological Survey (BGS) 1:50,000 mapping indicates that the Energy Park, Off-site Cable Route and National Grid Bicker Fen Substation extension are entirely underlain by tidal flat deposits comprising a consolidated soft silty clay, with layers of peat, sand and basal gravel. Approximately 500m to the west of the Proposed Development, deposits of glacial till overly the tidal flats and extend 7km to the south-west. A BGS borehole record (BGS Ref: TF24SW2) located approximately 1.5km east of the Proposed Development documented the tidal flat deposits as comprising 2.6m of grey clay underlain by black silt and gravels. Located on the Energy Park Site's southern boundary, another BGS borehole (BGS Ref: TF14SE2) recorded 2.44m of silt underlain by 1.27m of sands and gravels. The thickness of the deposits increases from ~4m on the southern boundary of the Energy Park Site, to 13m at a location 3.4km to the east, and up to 16m thick some 4km to the north. Therefore, from the borehole records it is anticipated that the tidal flat deposits within the south-west part of the Energy Park Site are around 4m thick and increase in thickness towards the north-east of the Energy Park Site.

4.5.5 The BGS geology mapping shows that the bedrock underlying the Energy Park Site comprises the Jurassic age West Walton Formation in the south-west half of the Energy Park and the Ampthill Clay Formation in the north-east half. The north-eastern part of the Off-site Cable Route comprises the West Walton Formation, while in the south-west, the Oxford Clay Formation, which underlies the West Walton Formation, is exposed.

4.5.6 The Oxford Clay Formation comprises a silicate mudstone with limestone nodules, with a typical thickness of 50–70m. The West Walton Formation, which overlies the Oxford Clays, is described by the BGS as comprising calcareous mudstones, silty mudstone and

siltstones, with subordinate fine-grained sandstones and argillaceous limestones. It is estimated to be 20-40m in thickness and dips approximately 5 degrees to the east. Overlying the West Walton Formation, the Ampthill Clay Formation consists of smooth or slightly silty mudstone with grey argillaceous limestone nodules and is estimated to be up to 50m in thickness. BGS borehole records (BGS Ref: TF14SE2; TF14SE4/A) located on the West Walton Formation, documented the bedrock as comprising brown-grey clay, with sporadic argillaceous limestone nodules down to 135 metres below ground level (mbgl). At depths greater than 100mbgl, the records noted the clay becoming slightly sandy with stone beds present. However, the borehole records did not distinguish the West Walton Formation from the underlying Oxford Clay Formation. Hence, the thickness of West Walton at the site is unknown. Groundwater was encountered in the West Walton Formation at 71mbgl (Ref: TF14SE4/B).

4.5.7 Ground investigation was completed at the proposed Energy Park in September 2022 (Factual Ground Investigation Report, Grange GeoConsulting Limited, November 2022) comprising 46 window sample locations and 5 cable percussion locations.

4.5.8 In general, the investigation locations encountered topsoil overlying clays (soft-stiff, often silty, gravelly or sandy) overlying sands and/or gravels.

4.5.9 Strata interpreted as representing the tidal flat deposits were described as being complex and variable, but generally defined as forming part of a sequence of predominantly cohesive and predominantly granular horizons.

4.5.10 Layers of peat were encountered across the majority of the site as part of the tidal flats sequence, although peat was not recorded in all investigation locations. The thickness of peat (where present) varied from 0.05-0.55m. The depth at which peat was encountered varied from approximately 1.2 – 3.9mbgl.

4.5.11 Groundwater strikes were noted in the majority of excavations undertaken as part of the investigation, at depths of between 1.05m and 3.50mbgl.

5 Stakeholder Consultation

5.1 Overview

5.1.1 Local stakeholders have been consulted to acquire local/site-specific information on flood risk, to confirm design criteria/principles and agree the methodology for preparation of the FRA. Stakeholders consulted include:

- The Environment Agency;
- The Black Sluice Internal Drainage Board;
- Lincolnshire County Council (as LLFA);
- North Kesteven District Council;
- Boston Borough Council.

5.2 Environment Agency

5.2.1 The EA was consulted in October 2021. The Agency's advice was set out in their letter dated 19 October 2021 (Appendix B.2) and the principal points are summarised below:

(i) The risk of flooding is from Main River (the Head Dike and Skerth Drain outfalling to the South Forty Foot Drain);

(ii) We have no history of flooding at this location;

(iii) The EA own the embankments between Heckington Eau, Head Dike, Skerth Drain and SFFD;

(iv) The application must be referred to the Environment Agency together with a supporting Flood Risk Assessment, which 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;

(v) Environmental Permitting Regulations (2016) will apply for proposed cable crossings above and below watercourses;

(vi) Horizontal Directional Drilling is the favoured method for installing cables beneath watercourses;

(vii) *Floodplain compensation will not be required as there is no large covering of the surface which would likely impact the floodplain. Flood waters will still be able to flow freely onto the floodplain under the solar panels. Buildings will not be so large they will take up much of the floodplain*

(viii) We would always advise a flood warning and evacuation plan for the site to ensure any personnel on site have a means of escape even if not on site all the time

5.2.2 The EA also provided Product 4 and Product 8 flood data (Appendix B.1), comprising flood mapping, details regarding flood defences and hazard mapping relating to the breaching of flood defences.

5.2.3 The Agency provided further advice in their letter dated 18 November 2021 (Appendix B.3) and confirmed that breach analysis/modelling should be undertaken to establish the nature of residual flood risk and to define the water levels to be adopted for the purposes of setting the level (mAOD) of energy generation infrastructure.

5.2.4 The Agency subsequently provided a copy of the South Forty Foot Drain (2016) hydraulic model to be used as the basis for breach modelling. JBA Consulting reviewed the EA model and submitted a method statement detailing the scope of analysis to be undertaken to (i)

inform scheme design and (ii) support preparation of an FRA. The Agency's letter dated 22 April 2022 (Appendix B.4) confirmed that the proposed methodology was considered acceptable.

5.2.5 Full details of the breach analysis/modelling were submitted to the Agency on 5 July 2022 and the Agency's letter dated 1 August 2022 (Appendix B.5) confirmed that the modelling was considered acceptable and should be used to inform both scheme design and the FRA.

5.3 Black Sluice Internal Drainage Board and Lincolnshire County Council (as Lead Local Flood Authority)

5.3.1 The BSIDB and LCC as LLFA were consulted in December 2021 (joint MS Teams meeting) and the matters discussed and agreed set out in an e-mail dated 15th December 2012. The BSIDB and LLFA provided comment/confirmation in their e-mail dated 25th January 2022 (Appendix B.6) and the principal points are summarised below:

(i) solar farm proposals are considered to have a negligible effect upon the surface water drainage regime. With the exception of access roads, such proposals are not considered to increase impermeable area as the solar panels shed rainwater to ground. Swales would likely provide an adequate solution to intercept run-off from solar panels;

(ii) In terms of surface water management, it was agreed that a 'low key' approach would be appropriate, most likely comprising swales aligned along the lower edge of solar panels, allowing run-off to infiltrate to ground (where ground conditions permit);

(iii) IDB drains are generally designed to provide capacity for a 1 in 30 year event although, looking into the future, a 1 in 100 year design standard is likely to be provided. Pumping station capacity will also be increased in the long term;

(iv) In terms of maintenance activities, flailing is carried out annually and de-silting/dredging undertaken on a 5-10 year programme;

(v) On the matter of culverting drains as part of fencing works for site security, the IDB confirmed that there is a presumption against the installation of new culverts unless essential for access purposes. The IDB would not accept proposals for culverting to facilitate security fence crossings of watercourses;

(vi) IDB referred to Byelaw no.10 relating to access for maintenance and advised that no infrastructure should be located within 9m of any watercourse maintained by BSIDB (similar requirements applying to other non-IDB watercourses);

(vii) Any works within 9m of a watercourse (whether Board maintained or riparian) require IDB consent (as per Section 23 of the Land Drainage Act);

(viii) Consent is also required for any works beneath a watercourse (i.e. HDD for the installation of electricity cables or similar). IDB highlighted that cables must be located 2m below the watercourse to allow for future improvements/deepening of drains and a further depth allowance to be specified by the owner/operator of the cable network to provide a minimum clearance between the potential future bed level of the drain and the cable;

(ix) there are no records/reports of the various drains within the site boundary having overtopped during the past 15 years.

6 Flood Risk from all Sources

6.1 Environment Agency Flood Maps

Flood Map for Planning

6.1.1 The EA publishes floodplain maps on the internet (https://flood-map-for-planning.service.gov.uk). These maps show the possible extent of fluvial flooding for a 1 in 100 year flood (1% annual probability of occurrence) and the possible extent of tidal flooding associated with a 1 in 200 year event (0.5% annual probability of occurrence), ignoring the presence of flood defences. Also shown is the possible extent of flooding arising from a 1 in 1,000 year event (0.1% probability).

6.1.2 The flood map indicates that the majority of the Energy Park is located within Flood Zone 3a (High Probability – land having a 1 in 100 or greater annual probability of fluvial flooding). Limited areas along the southern fringe of the Energy Park are located within Flood Zone 2 (Medium Probability – land having between a 1 in 100 and 1 in 1,000 annual probability of flooding) and Flood Zone 1 (Low Probability – land having a less than 1 in 1,000 annual probability of flooding). The Environment Agency (EA) has confirmed that the source of flooding is Main River (the Head Dike and Skerth Drain). These watercourses are characterised by fluvial defences (comprising earth embankments) and the EA has advised that the defences are in fair condition and reduce the risk of flooding (at the defence) to a 10% (1 in 10) chance of occurring in any year.

6.1.3 The off-site cable route and National Grid Bicker Fen Substation are also shown to lie within Flood Zone 3a associated with fluvial flooding arising from the South Forty Foot Drain (SFFD). The SFFD is also classified as Main River and benefits from flood defences comprising earth embankments. According to the EA, 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.

6.1.4 The EA Product 4 data (October 2021) (Appendix B.1) states that 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.

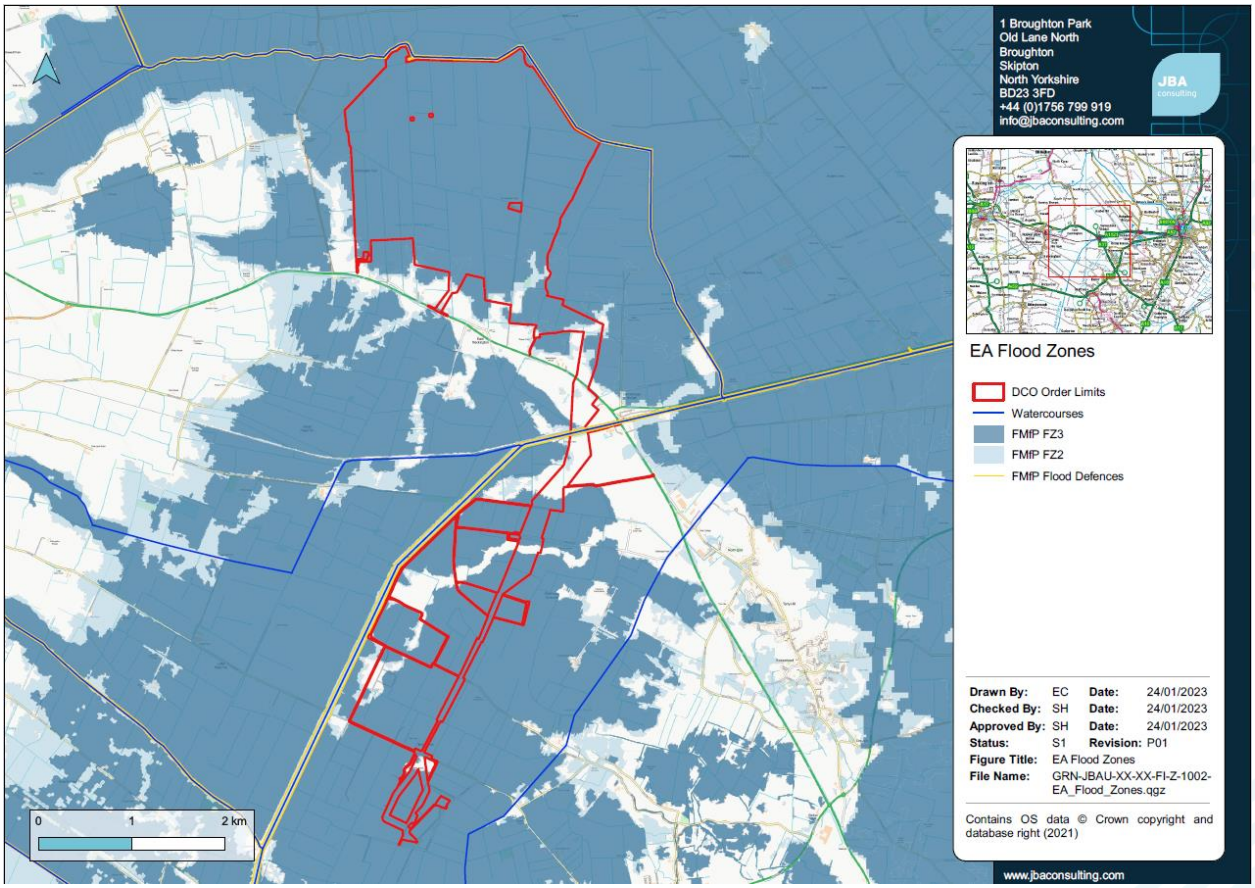


Figure 6-1: EA FMfP Flood Zones and DCO Order Limits

Long Term Flood Risk

6.1.5 The Long-Term flood risk dataset at Gov.uk (https://flood-warning-information.service.gov.uk/long-term-flood-risk) shows a flood extent outline comparable to that presented on the FMfP for the Low risk scenario (between 0.1% and 1% annual probability of flooding).

6.1.6 Figure 6-2 shows the risk of flooding from rivers or the sea published on the EA Long Term Flood Risk map. The long-term flood risk map takes into account the effect of any flood defences in the area.

6.1.7 The fluvial flood risk outlines appear to be relatively coarse which is indicative of broad-scale modelling techniques appropriate for a high-level/preliminary assessment of flood risk. It is the Flood Map for Planning discussed in the previous section that informs spatial planning as opposed to the Long-Term Flood Risk mapping.

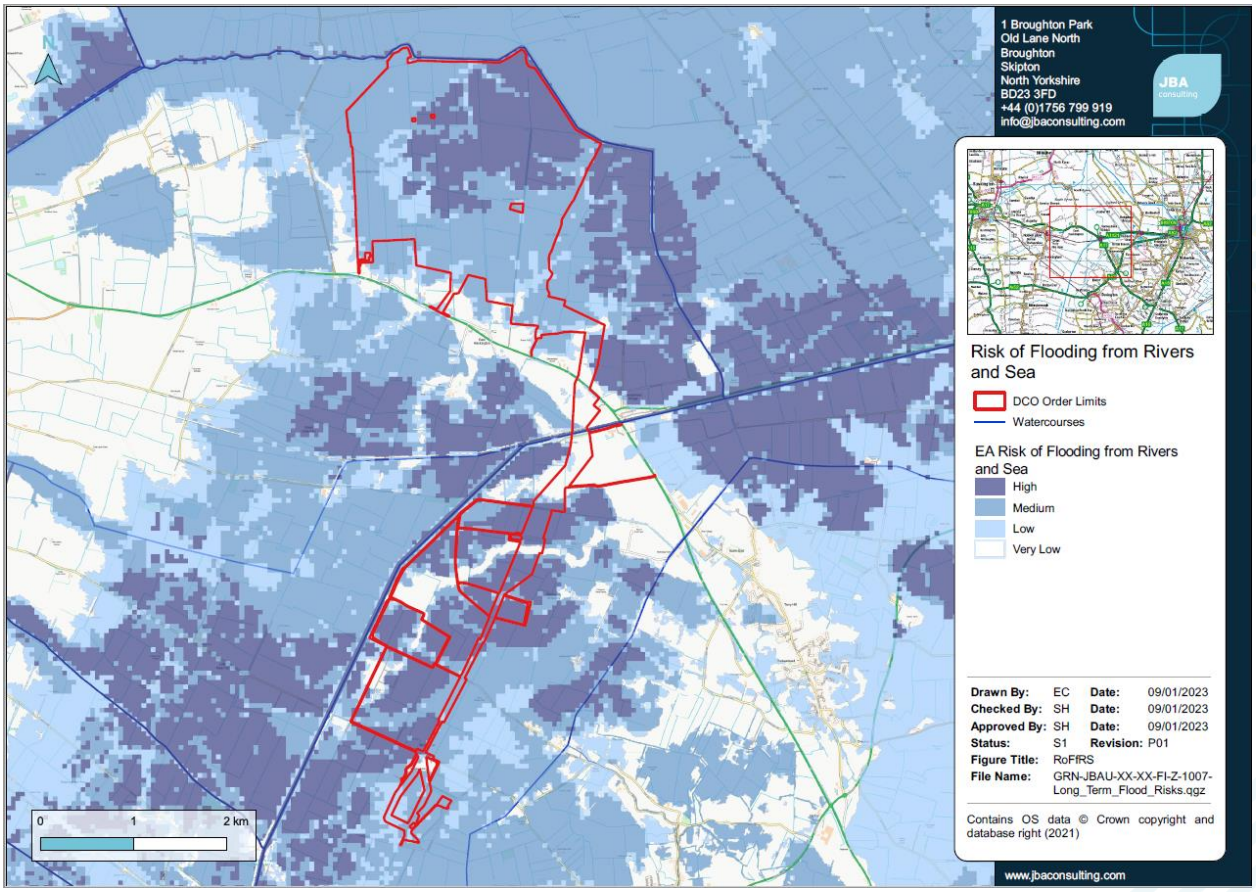


Figure 6-2: EA Long Term Flood Risk: Risk of flooding from Rivers or the Sea (December 2022)

Surface water flooding

6.1.8 The EA 'Flood Risk from Surface Water Map' (https://check-long-term-flood-risk.service.gov.uk/) shows areas that may be susceptible to surface water flooding following an extreme rainfall event. The risk categories are defined as follows:

- Very low risk means an annual chance of flooding of less than 0.1%.
- Low risk means an annual chance of flooding of between 0.1% and 1%.
- Medium risk means an annual chance of flooding of between 1% and 3.3%.
- High risk means an annual chance of flooding of greater than 3.3%.

6.1.9 The mapping shows that the majority of the Energy Park, and generally the entire DCO Order Limits are at a 'Very Low' risk of surface water flooding. The map highlights a number of isolated and very localised areas within and adjacent to the Energy Park at high, medium and low risk of surface water flooding. These areas generally coincide with watercourses/ditches/drains and topographical 'low' points across the terrain (i.e. areas where surface water would naturally accumulate following rainfall).

6.1.10 The EA mapping also shows that the majority of the Off-site Cable Route and National Grid Bicker Fen Substation are at 'Very Low' risk of surface water flooding, with only very localised areas at high, medium and low risk of flooding.

6.1.11 It should be noted that this map is generated using a broad methodology applied at the national scale. The model utilises generalised information on infiltration, sewerage infrastructure, rainfall events and catchment topography to route rainfall over a ground surface model. As such, the analysis does not take account of site-scale factors/characteristics that may exert an influence upon surface water flood depths and

extents. The map therefore only provides a guide regarding the areas that may be vulnerable to this source of flooding.

6.1.12 Figure 6-3 shows an extract from the EA's 'Flood Risk from Surface Water Map' for the Proposed Development.

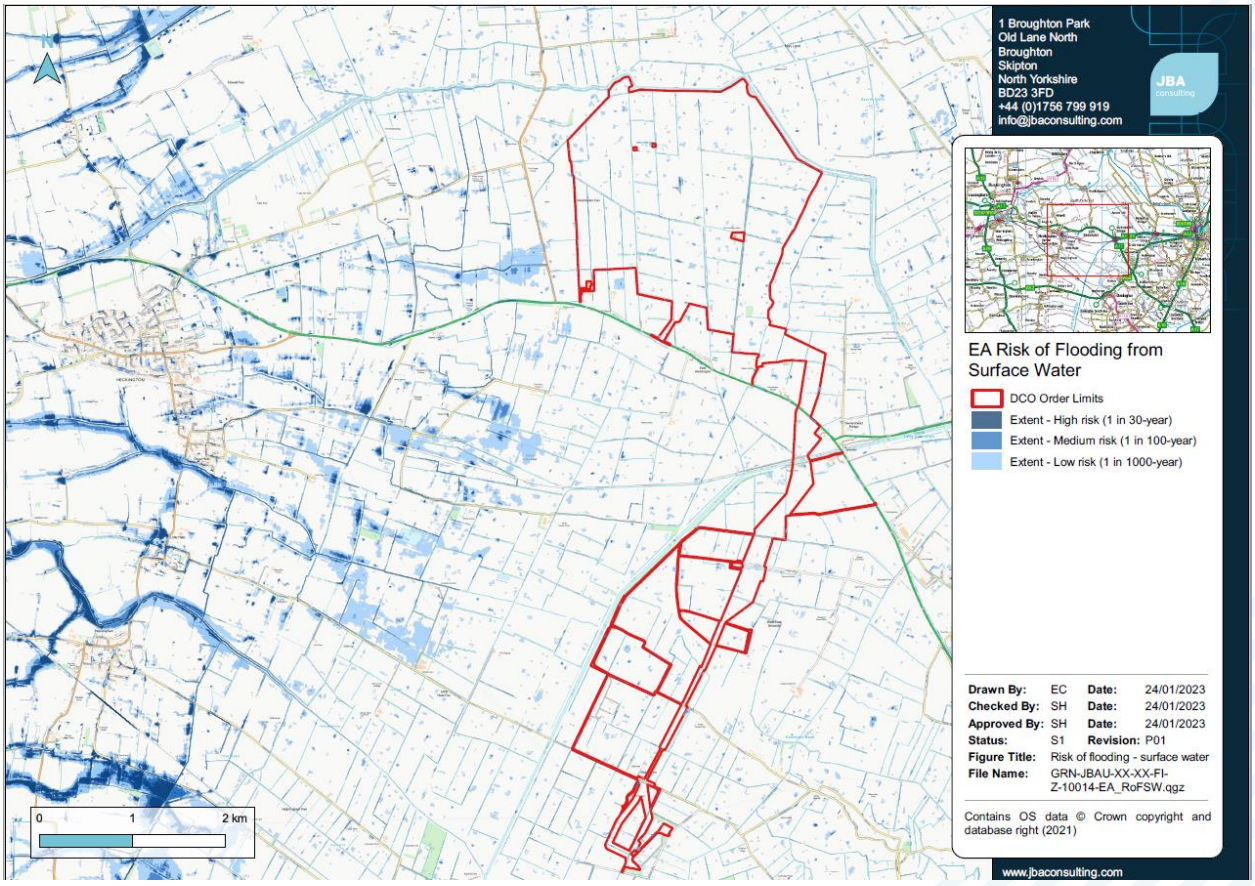


Figure 6-3: Risk of flooding from surface water map (indication of DCO Order Limits overlaid)

Reservoir flood risk

6.1.13 The EA 'Flood Risk from Reservoirs Map' shows the area that may be affected by flooding as a result of a breach of a large, raised reservoir i.e. capable of storing over 25,000 cubic metres of water above the natural level of any part of the surrounding land.

6.1.14 According to EA records the nearest reservoir is located approximately 8km to the west of the Energy Park, between Heckington and Sleaford. The EA's map shows that, when river levels are normal, only limited and localised areas along the northern boundary of the Energy Park adjacent to Head Dike are affected by reservoir flooding. The mapping shows that under conditions when there is also flooding from rivers, the majority of the Energy Park may be affected by reservoir flooding.

6.1.15 The EA mapping shows that the Off-site Cable Route and National Grid Bicker Fen Substation are only affected by reservoir flooding under conditions when there is also flooding from rivers.

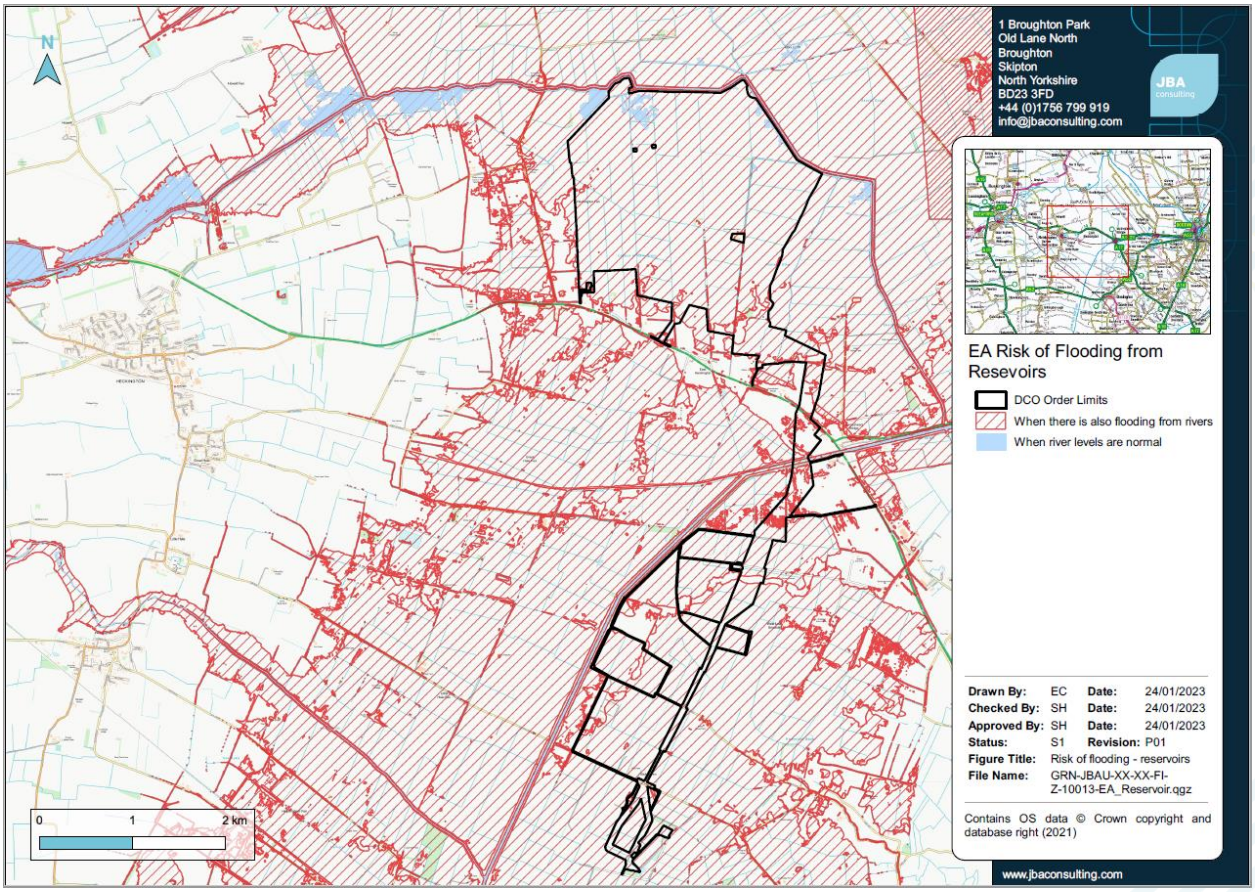


Figure 6-4: EA Risk of flooding from reservoirs map (December 2022) (indication of DCO Order Limits overlaid)

6.2 Relevant Council Studies

6.2.1 The SFRA documents (Level 1 and 2) prepared on behalf of both NKDC and Boston Borough Council were reviewed prior to preparation of this FRA and the relevant information is detailed in Section 3 of this document. The Southeast Lincolnshire SFRA provided Hazard Mapping that included areas of the DCO Order Limits. However, the data and mapping available is broad-scale, giving an indicative assessment of flood hazard only, and as such is not adequate for a site-scale appraisal. The area of the Proposed Development is not considered in the Housing and Economic Land Availability Assessments for either authority and the associated SFRA documents do not provide any further flood risk information.

6.3 Groundwater flooding

6.3.1 Groundwater flooding usually occurs in low lying areas underlain by permeable rock and aquifers that allow groundwater to rise to the surface through the permeable subsoil following long periods of wet weather. Low lying areas may be more susceptible to groundwater flooding because the water table is usually at a much shallower depth and groundwater flow-paths tend to travel from high to low ground.

6.3.2 As set out in Section 4.5, BGS mapping indicates that the Energy Park, Off-site Cable Route and National Grid Bicker Fen Substation are entirely underlain by Tidal Flat (superficial) deposits comprising predominantly low permeability clay, with a thickness of approximately 4m.

6.3.3 The BGS mapping also shows that the bedrock comprises a thick layer (up to 160m) of low permeability, unproductive mudstones and siltstones of the Ancholme Group. The Energy Park comprises the West Walton Formation and the Ampthill Formation of the Jurassic

Period. The northern area of the Off-site Cable Route is underlain by bedrock comprising the West Walton Formation and the southern area of the Off-site Cable Route and the National Grid Bicker Fen Substation are underlain by bedrock comprising the Oxford Clay Formation.

6.3.4 EA aquifer designation maps at https://magic.defra.gov.uk categorise both the superficial deposits and bedrock deposits as 'unproductive' (i.e. areas comprised of rocks that have negligible significance for water supply or baseflow to rivers, lakes and wetlands).

6.3.5 Ground investigation completed in September 2022 recorded groundwater at depths of 1.0m-3.5m below ground level across the Energy Park.

6.3.6 Geological data therefore suggests that groundwater emergence is unlikely due to the thick layers of low permeability superficial and bedrock deposits that underlie the Energy Park, Off-site Cable Route and National Grid Bicker Fen Substation. Neither the Central Lincolnshire SFRA Level 1 or SFRA Level 2 identify groundwater flooding as an issue across the North Kesteven District. The Southeast Lincolnshire SFRA, covering Boston Borough, does not present information regarding groundwater flood risk.

6.4 EA Flood Risk Data

Fluvial flood risk

6.4.1 The Environment Agency's hydraulic model of the South Forty Foot Drain (developed in 2016) includes data for the 5% (20 year) and 2% (50 year) flood events. Using these scenarios as a 'proxy' for the 3.3% (30 year) flood event suggests that limited areas within the Order Limits for the application lie within Flood Zone 3b.

6.4.2 The Product 4 and Product 8 data provided by the EA in October 2021 includes fluvial flood levels derived through hydraulic modelling of the Head Dike and Skerth Drain. Flood levels for the 0.1% (1,000 year) flood event, including a 20% allowance for climate change, are between 2.88AOD and 2.93mAOD. However, these are 'in-channel' flood levels and the Product 4 data notes that these levels '*may not represent the flood level on the floodplain, particularly where the channel is embanked or has raised defences' (Appendix B.1*). As set out in Section 5.2 above, the EA advised that breach analysis/modelling should be undertaken to establish the nature of residual flood risk and to define the water levels to be adopted for the purposes of setting the level (mAOD) of energy generation infrastructure. This modelling work and the results/findings are discussed below (Section 6.6).

Historic flooding

6.4.3 The EA confirmed that they do not have any records of flooding affecting the area of the Proposed Development.

Tidal flood levels

6.4.4 EA Product 4 data received for East Heckington and covering the DCO Order Limits states that *'Whilst the site is within a tidal flood zone, i.e., 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'* - Appendix B.7.

6.4.5 The EA has provided estimated Extreme Sea Levels (ESL) at 17 locations along the East Coast and The Wash for present day flood risk (base date 2017). The closest node points to the Proposed Development are at Boston Barrier (532,754mE, 342,852mN) and Hobhole (535,990mE, 340,116mN), approximately 12km east of the proposed Energy Park. The Extreme Sea Levels for these node points are detailed in Table 6-1 for the 97.5% confidence bound for each return period.

6.4.6 The technical summary report document produced by the EA, (Coastal flood boundary conditions for the UK: update 2018) notes that ESL values include the effects of storm

surge *and* astronomical tides but do not specifically account for any localised increase in sea level that may be induced by onshore wave action, orientation or topography.

6.4.7 The EA AIMS Spatial Flood Defence dataset provides effective crest heights for defences in the vicinity of the ESL node locations. Between Boston and the Hobhole node, actual crest levels of AIMS defences range between 6.3mAOD and 7.2mAOD, with a design Standard or protection of 1 in 150-years. Similarly, around the Port of Boston at Boston Barrier, the design crest levels range between 5.8mAOD and 7.5mAOD. Based on the available ESL data (Table 6-1) it is possible that the defences at Boston Barrier may overtop due to the effects of storm surge and astronomical tides for events of 1 in 50-year annual chance and greater. However, the EA Product 4 data states that the area of the Proposed Development (located several miles inland) is not affected by flooding due to overtopping of the coastal defences.

Table 6-1: Environment Agency Product 4 - 2018 Coastal Flood Boundary Extreme Sea Levels

Location	Annual Chance (1 in X) of tide level in meters ODN (97.5% Confidence Bound)						
	1	10	50	100	200	300	1000
Hobhole	5.01	5.56	5.98	6.20	6.44	6.57	6.99
Boston Barrier	4.98	5.57	6.05	6.27	6.49	6.59	6.94

Tidal hazard mapping

6.4.8 The EA Product 4 data includes the results of modelling to map the depth and velocity of floodwater following overtopping and/or breaching of coastal defences. By combining the depth and velocity of floodwater, the flood hazard, or danger posed to people, can be assessed and mapped.

6.4.9 The EA data notes that the area of the Proposed Development is not affected by defence breaching for the present day (2006) scenario. The mapping also shows that, with the exception of a very small and localised area on the eastern boundary (Appendix B.1), the Energy Park is unaffected by breaching during the 2115 0.1% (1 in 1,000) breach scenario (i.e. which takes account of the impacts of climate change). The flood depth within the area affected by flooding is up to 0.5m and the flood hazard is reported as 'low', with localised areas reported as 'danger for some'. The EA data shows that the area in the vicinity of the Bicker Fen Substation is unaffected by breaching during the 2115 0.1% (1 in 1,000) breach scenario (Appendix B.7).

6.5 Hydraulic Modelling - Residual flood risk

6.5.1 As noted above, the fluvial flood level data provided as part of the EA's Product 4 data comprise 'in-channel' flood levels, which are unlikely to be representative of the flood level across the floodplain. In accordance with EA requirements, site-scale hydraulic modelling has therefore been undertaken to establish the nature of residual flood risk and to define the water levels to be adopted for the purposes of setting the level (mAOD) of energy generation infrastructure. The modelling analysis has assessed flood levels associated with (i) a breach of the flood defence embankment adjacent to the Head Dike/Skerth Drain and (ii) failure of the IDB pumping stations.

6.5.2 The breach analysis was based upon data derived from the Environment Agency's hydraulic model of the South Forty Foot Drain (developed in 2016). The model indicated that the maximum water level at the Energy Park was 1.95mAOD for the 1,000-year plus 20% climate change breach scenario (see Figure 6-5).

6.5.3 Analysis of the implications of pumping station failure (i.e. BSIDB surface water pumps 'off-line' for the entirety of the storm event) resulted in a maximum water level across Heckington Fen of 1.29mAOD for the 1,000-year plus 20% climate change event. It was therefore concluded that the defence breach comprises the 'worst-case' residual flood risk

scenario and should therefore be used to inform scheme design.

6.5.4 Full details of the modelling methodology and the results/findings are presented in the Technical Note dated July 2022, enclosed in Appendix C.

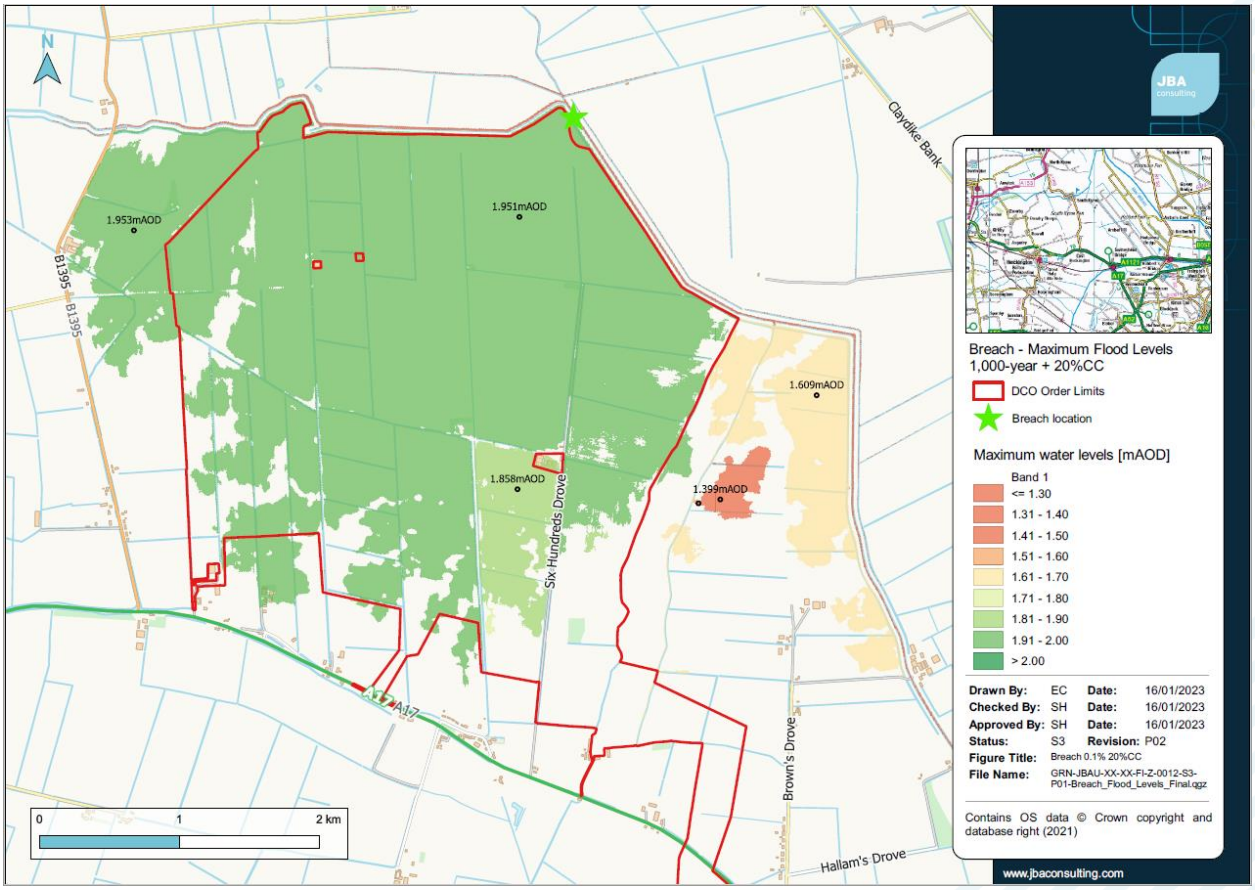


Figure 6-5: Breach analysis: 1000-year plus 20% climate change – maximum flood level (mAOD)

7 Sequential Test and Exception Test

7.1.1 Planning policy requires that the sequential risk-based approach is applied when determining the suitability of land for development in flood risk areas. The aim of this approach is to steer development to areas with the lowest probability of flooding.

7.1.2 NPS EN-1 (paragraph 5.7.12) states that the Infrastructure Planning Commission (now the Secretary of State) should not consent development in Flood Zone 2 in England unless it is satisfied that the Sequential Test requirements have been met and that it should not consent development in Flood Zone 3 unless it is satisfied that the Sequential and Exception Test requirements have been met.

7.1.3 The Exception Test should only be applied when, following application of the Sequential Test, it has been demonstrated that it is not possible for development to be located in areas with a lower risk of flooding (taking into account wider sustainable development objectives). The Test comprises two elements: (i) demonstrating that the development will provide wider sustainability benefits to the community that outweigh flood risk and (ii) demonstrating that the development will be safe for its lifetime, without increasing flood risk elsewhere.

7.1.4 The Sequential Test and Part (1) of the Exception Test have been applied and full details set out in a report prepared by Pegasus Group Limited, enclosed in Appendix D. The Sequential Test was applied following consultation with the planning authorities regarding the methodology and parameters that should be adopted.

7.1.5 The Sequential Test builds upon the assessment of 13 alternative sites set out within Chapter 3 of the Environmental Statement. The Test shows that several alternative sites are considered preferable on flood risk grounds. However, when wider physical and environmental characteristics and constraints are considered, it demonstrates that, notwithstanding their flood risk ranking, there are grounds on which these sites should be discounted. It is therefore concluded that there are no reasonably available alternative sites appropriate for the Proposed Development located in areas with a lower risk of flooding.

7.1.6 In respect of Part (1) of the Exception Test, the report enclosed in Appendix D identifies wider sustainability benefits arising from solar energy, including decarbonisation of energy supply and contributing to the UK's net zero ambition. Heckington Fen Energy Park will also enhance existing and create new wildlife habitats by delivering Biodiversity Net Gain.

7.1.7 This FRA addresses the second part of the Exception Test and demonstrates that the Proposed Development will be safe for its lifetime.

8 Surface Water Management and Drainage

8.1.1 The Proposed Development will give rise to a relatively small increase in the impermeable area within the catchment of the South Forty Foot Drain which, in the absence of mitigation, has the potential to increase surface water run-off to the watercourses/drains in the vicinity of the Proposed Development. A scheme for controlling surface water outflows is therefore required, to maximise surface water infiltration (where ground conditions permit), regulate outflows to the watercourse network and demonstrate that flood risk downstream is not increased as a result of the development proposals.

8.1.2 The Energy Park comprises an area of c.524ha. However, it is generally accepted that ground-mounted solar panels have a negligible effect upon the surface water drainage regime (i.e. as the solar panels shed rainwater to ground and porous/'green' surfaces are retained around and beneath the panels). As set out in Section 5.3 above, both the BSIDB and LLFA agree that the impact of the Proposed Development upon the drainage regime will likely be incidental, such that a 'low key' approach would be appropriate. The drainage strategy therefore comprises the following:

(i) grassed swales within the field parcels containing the solar panels (i.e. to intercept and store surface water run-off and facilitate infiltration (subject to ground conditions))
(ii) surface water balancing ponds/holding tanks within the On-site substation and energy storage compound.

8.1.3 The surface water management strategy has therefore been designed such that the rate of surface water run-off leaving the Energy Park and entering the adjacent watercourse network is limited to the existing (pre-development) greenfield rate, for up to and including the 1 in 100 year plus climate change storm event.

8.1.4 Infrastructure failure/leakage or fire has the potential to contaminate surface water run-off arising from the On-site substation and energy storage compound. The surface water drainage infrastructure serving the compound therefore includes additional (surplus) storage capacity (i.e. to accommodate water used for fire suppression). In addition, penstock flow controls will be incorporated into the system, enabling outflows from the compound to be stopped, thereby isolating the compound from the adjacent watercourse network and allowing any contaminated surface water to be tankered off site (as opposed to outfalling to the adjacent network of drains/ditches).

8.1.5 Access tracks within and around the Energy Park will generally be of porous construction (i.e. aggregate), such that provisions for the management/interception of surface water run-off would not ordinarily be required. However, the drainage strategy includes an allowance for additional run-off that may arise due to compaction of these corridors.

8.1.6 In accordance with planning policy requirements, surface water run-off from the Energy Park will therefore be managed in a sustainable manner and will cater for the residual risk of a pollution incident.

8.1.7 Full details regarding the proposed surface water drainage strategy for the Proposed Development are set out in the Technical Note presented in Appendix E. The strategy has been prepared following consultation with both the BSIDB and LCC (as LLFA).

8.1.8 The strategy is based on an Illustrative Site Layout. The final surface water drainage strategy will be secured via a Requirement to submit details for approval to the relevant LLFA.

9 Flood Risk Mitigation

9.1 Design Levels

9.1.1 The EA has advised as follows:

9.1.2 'The application must be referred to the Environment Agency together with a supporting Flood Risk Assessment, which 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.'

9.1.3 The solar panels and other flood-sensitive infrastructure (transformers, energy storage modules, control rooms, etc) will therefore be elevated above the 1,000 year +20% breach flood level of 1.95mAOD. In the case of the solar PV panels/modules, this will be achieved by mounting the panels on a rack supported by galvanised steel poles driven into the ground (i.e. to provide the required ground clearance). Other flood-sensitive infrastructure, such as transformers and energy storage modules, will be elevated above the breach flood level by localised ground raising and/or appropriate foundation design, with any sensitive equipment located at or above 2.25mAOD (1,000 year +20% breach flood level of 1.95mAOD + 300mm freeboard).

9.1.4 The design of the Energy Park site which has been assessed in the Environmental Statement (Document Reference: 6.1) and more specifically within Chapter 6: Landscape and Visual (Document Reference 6.1.6) is a design which complies with the necessary flood levels in a 1 in 1,000 year + 20% breach flood event. The detail of elevations of all of the equipment for the Proposed Development can be seen in the elevation figures within the ES (Document Reference: 6.2.4). It can therefore be concluded that the Landscape and Visual Assessment (Document Reference 6.1.6) has assessed a design which is compliant with a 1 in 1,000 year + 20% breach flood event.

9.1.5 To facilitate a connection to their transmission system, National Grid has confirmed that it will be necessary to install new equipment at the existing Bicker Fen substation. Although subject to further appraisal and detailed design, the works will make provision for a new generator bay of approximately 55m x 30m x 15m that will enable the Solar Park to connect into the Grid. The substation extension to provide a new generator bay will be delivered by National Grid and all substation works will be designed and constructed fully in accordance with the relevant National Grid design manual/technical specification regarding substation flood resilience/protection.

9.2 Safe Access

9.2.1 Consideration should be given to the incorporation of safe access and egress arrangements to ensure that operational staff/visitors are safe during periods of flooding.

9.2.2 As noted in Section 4.4 above, the Energy Park lies within an area that benefits from flood defences. Providing the defences operate as intended, access and exit arrangements will not be adversely affected during a 10% (1 in 10 year) AEP flood event on the Head Dike/Skerth Drain. Should the area in the vicinity of the Energy Park be inundated following a breach of the flood defence embankments, such that safe exit is not possible, safe refuge may be provided for operational staff/visitors within control room facilities which will be elevated above the 0.1% AEP (1 in 1,000 year) breach flood level.

9.3 Building Resilience

9.3.1 Where practical, buildings will incorporate flood resilient design/construction principles. Precise details will be set out at the detailed design stage, following consideration of the operational parameters and requirements of the Energy Park.

9.4 Flood Warning and Evacuation Plan

9.4.1 A flood incident preparedness, response and recovery plan should be prepared for the

Energy Park. Amongst other matters, this should set out the actions to be taken following notification of a potential flood event and during and following flood conditions. The plan should identify operational 'trigger' levels and the roles and responsibilities of operational staff/managers.

9.4.2 The plan should be prepared in consultation with stakeholders prior to the Energy Park becoming operational.

10 Residual Risk

10.1.1 It is difficult to completely guard against flooding since extreme events greater than the design standard event are always possible. However, risk may be minimised through the application of 'best practice' design, construction and management techniques, such as incorporation of a suitable freeboard.

10.1.2 In addition to more extreme conditions, the nature of flood risk within and in the vicinity of the Proposed Development may vary as a result of changes in landform and changes to the surface water drainage infrastructure. However, changes to landform are considered unlikely once the Energy Park has been constructed. Similarly, changes to the surface water drainage system are unlikely to adversely affect flood risk on account of such infrastructure being appropriately managed and maintained (the surface water drains being under the jurisdiction of the BSIDB and LLFA).

10.1.3 The blockage of watercourse crossings/culverts within the Energy Park has the potential to increase flood levels. However, it is highly unlikely that the Energy Park would be affected as flood-sensitive infrastructure will be elevated above the network of surface water drains. In any event, the likelihood of blockage can be minimised through periodic inspection and maintenance/clearance of watercourse corridors (as undertaken routinely by the BSIDB).

10.1.4 The principal residual flood risk issues in this instance relate to (i) failure/breaching of the fluvial flood defences (which has been assessed through hydraulic modelling to inform this FRA), and (ii) the operation/performance of the surface water drainage system serving the Energy Park.

10.1.5 As set out in Section 9, flood-sensitive infrastructure will be elevated above the 0.1% (1 in 1,000) annual probability plus 20% breach flood level.

10.1.6 Where practical, buildings will incorporate flood resilient design/construction principles. Precise details will be set out at the detailed design stage, following consideration of the operational parameters and requirements of the Energy Park.

10.1.7 Rainfall events in excess of the design capacity of the surface water drainage network may result in temporary above ground flooding, potentially giving rise to overland flows. However, residual flood risk may be mitigated/minimised through the application of 'best practice' design principles, including careful consideration of the design of external ground levels to facilitate the routing of overland flows away from flood-sensitive infrastructure and towards the surface water drains. 'Best practice' design principles include requirements to ensure all proposals account for the potential effects of climate change and therefore much of the potential residual risk can be considered to be accounted for within the design.

10.1.8 As noted in Section 9 above, a flood warning and evacuation plan will be prepared so that visitors/operational staff are aware of the action to be taken in the event of a flood event affecting the Energy Park and associated highway access.

11 Summary

11.1 Overview

11.1.1 JBA was commissioned by Ecotricity (Heck Fen Solar) Limited to prepare an FRA in support of proposals for a ground mounted solar PV electricity generation and energy storage facility at Land at Six Hundreds Farm, Six Hundreds Drove, East Heckington, Sleaford, Lincolnshire.

11.1.2 This FRA has been prepared in accordance with the National Policy Statements for Energy (NPS EN-1, EN-3 and EN-5) and the NPPF and associated PPG. In following the guidance set out in the NPPF and associated PPG this FRA provides an overview of flood risk arising from a number of sources, focusing on residual flood risk associated with failure/breaching of the flood defence embankments along the boundary of the proposed Energy Park.

11.1.3 This FRA has been prepared following consultation with stakeholders, including the EA and BSIDB.

11.2 Sources of flood risk

11.2.1 In terms of the various sources of flood risk, the principal observations/findings are as follows:

- The EA Flood Map for Planning (FMfP) shows that the DCO Order Limits are located almost entirely in Flood Zone 3a – High Probability, ignoring the presence of defences;
- Data derived from the Environment Agency's hydraulic model of the South Forty Foot Drain (developed in 2016) suggests that limited areas within the Order Limits for the application lie within Flood Zone 3b;
- The Long Term flood risk dataset at Gov.uk shows a flood extent outline comparable to that presented on the FMfP for the area of low risk. The data used for the Long Term Flood Risk mapping in the vicinity of the site appears to be relatively coarse which is indicative of broad-scale modelling techniques appropriate for a high-level/preliminary assessment of flood risk only;
- The EA Risk of flooding from surface water flood map shows that the majority of the Energy Park is at 'Very Low' risk of surface water flooding. The map highlights a number of isolated and very localised areas within and adjacent to the Energy Park at high, medium and low risk of surface water flooding. These areas generally coincide with topographical 'low' points across the terrain where surface water would naturally accumulate following rainfall. Most of the off-site cable route and National Grid Bicker Fen Substation are at 'Very Low' risk of surface water flooding, with only very localised areas at high, medium and low risk of flooding.
- The EA Risk of Flooding from Reservoirs map shows that under conditions when there is also flooding from rivers, the majority of the Energy Park may be affected by reservoir flooding. When there is flooding from rivers that coincides with a reservoir failure the off-site cable route and National Grid Bicker Fen Substation are likely to be affected. However, the probability of a reservoir breach occurring is of course very small. The EA is the enforcement authority and therefore responsible for ensuring that the reservoir 'undertaker' (responsible for the safety of the reservoir) observes and complies with the requirements of the Reservoirs Act. In addition, all large, raised reservoirs are inspected and supervised by qualified civil engineers (referred to as Panel Engineers);
- Geological data suggests that groundwater emergence is unlikely due to the thick layers of low permeability superficial and bedrock deposits that underlie the Energy Park, off-site cable route and National Grid Bicker Fen Substation. Neither the Central Lincolnshire SFRA Level 1 or SFRA Level 2 identify groundwater flooding as an issue across the North Kesteven District;

- Data provided by the EA shows that the Proposed Development is unaffected by the breaching of coastal defences for the present day (2006) scenario. The mapping also shows that, with the exception of a very small and localised area on the eastern boundary, the Energy Park is unaffected by breaching during the 2115, 1 in 1,000 year (0.1% annual probability) breach scenario (i.e. which takes account of the impacts of climate change). The EA data shows that the area in the vicinity of the Bicker Fen Substation is unaffected by breaching during the 2115 0.1% (1 in 1,000) breach scenario.
- The EA data also shows that the area of the Proposed Development is not affected by flooding due to overtopping of the coastal defences.

11.3 Sequential test and exception test

11.3.1 The Sequential Test and Exception Test have been applied following consultation with the planning authorities regarding the methodology and parameters that should be adopted.

11.3.2 The Sequential Test shows that whilst several alternative sites are considered preferable on flood risk grounds, wider physical and environmental characteristics and constraints are such that these sites should be discounted. It is therefore concluded that there are no reasonably available alternative sites appropriate for the Proposed Development located in areas with a lower risk of flooding.

11.3.3 In respect of Part (1) of the Exception Test, wider sustainability benefits arising from solar energy are identified, including decarbonisation of energy supply and contributing to the UK's net zero ambition. Heckington Fen Energy Park will also enhance existing and create new wildlife habitats by delivering Biodiversity Net Gain.

11.3.4 This FRA addresses the second part of the Exception Test and demonstrates that the Proposed Development will be safe for its lifetime.

11.4 Surface water management

11.4.1 The proposals include a scheme for controlling surface water outflows, to maximise surface water infiltration (where ground conditions permit), regulate outflows to the watercourse network and demonstrate that flood risk downstream is not increased as a result of the development proposals.

11.4.2 It is generally accepted that ground-mounted solar panels have a negligible effect upon the surface water drainage regime (i.e. as the solar panels shed rainwater to ground and porous/'green' surfaces are retained around and beneath the panels). Following consultation with both the BSIDB and LLFA, a 'low key' approach has been adopted, comprising the following:

(i) grassed swales within the field parcels containing the solar panels (i.e. to intercept and store surface water run-off and facilitate infiltration (subject to ground conditions))
(ii) surface water balancing ponds/holding tanks within the onsite substation and energy storage compound.

11.4.3 The surface water management strategy has been designed such that the rate of surface water run-off leaving the Energy Park and entering the adjacent watercourse network is limited to the existing (pre-development) greenfield rate, for up to and including the 1 in 100 year plus climate change storm event.

11.4.4 The surface water drainage infrastructure serving the compound also includes additional (surplus) storage capacity (i.e. to accommodate water used for fire suppression) and flow controls to isolate the compound from the adjacent watercourse network following a pollution incident.

11.5 Flood risk mitigation

11.5.1 The Energy Park proposals will include flood risk mitigation proposals comprising:

- All flood-sensitive infrastructure will be elevated above the 1,000 year (0.1% annual probability) +20% breach flood level of 1.95mAOD;
- Should the area in the vicinity of the Energy Park be inundated following a breach of the flood defence embankments, such that safe exit is not possible, safe refuge may be provided for operational staff/visitors within control room facilities which will be elevated above the 1,000 year (0.1% annual probability) +20% breach flood level of 1.95mAOD;
- Where practical, buildings will incorporate flood resilient design/construction principles. Precise details will be set out at the detailed design stage, following consideration of the operational parameters and requirements of the Energy Park.
- Prior to the Energy Park becoming operational, a flood incident preparedness, response and recovery plan will be prepared. The plan will identify operational 'trigger' levels and the roles and responsibilities of operational staff/managers.

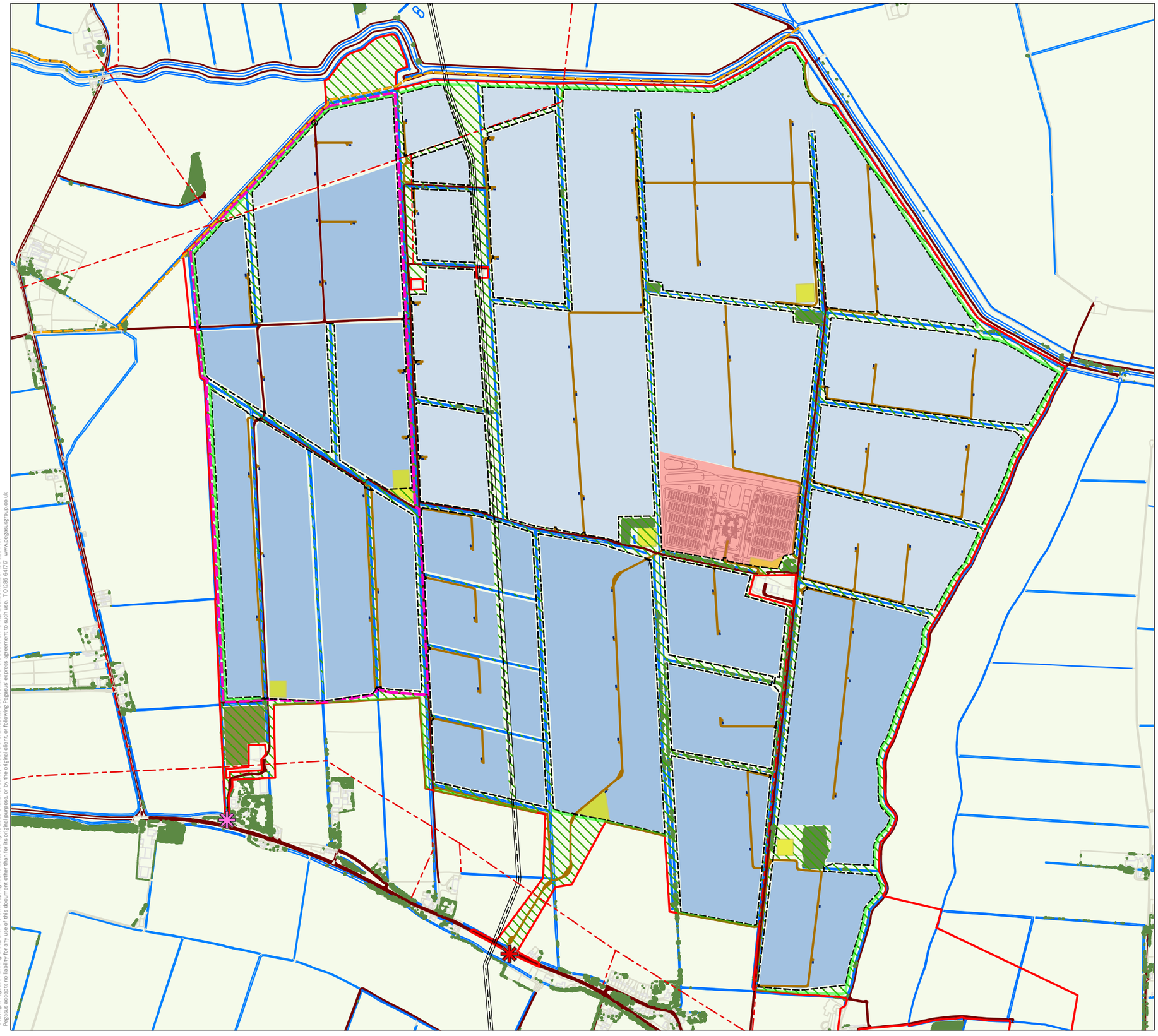
11.6 Residual risk

11.6.1 The assessment notes that there are two principal residual flood risk issues (failure/breaching of the fluvial flood defences and the operation/performance of the surface water drainage system serving the Energy Park). However, it is concluded that residual flood risk may be minimised through the application of 'best practice' design, construction, management and maintenance techniques.

Appendices

A Drawings

A.1 Energy Park Layout - Ecotricity



KEY

- Order Limits
- Security Fence
- Proposed Site Entrance
- Temporary Access
- Existing Road / Track
- Access Tracks
- Solar Park Zone Max Height 3.5m
- Solar Park Zone Max Height 3m
- Public Right of Way
- Proposed Permissive Footpath
- Habitat Enhancement Area
- Existing Vegetation
- Community Orchard
- Water Feature / Ditch
- Culvert
- Gas Pipeline
- 11kV Overhead Lines
- Inverters and Transformation Station
- Site Main Substation / Energy Storage Compound
- Construction and Operational Compounds
- Proposed Hedge

NOTES:
Buffers to development:
- 9m to BSIDB maintained open watercourses
- 8m to all other watercourses
- 12.2m to gas pipeline (total 24.4m easement strip)
- 5m to 11kV overhead line

Hedgerows would be up to 3m in width when mature and would be maintained up to 4m in height.

The Solar Development Area will include some localised electrical infrastructure such as inverters, transformers, energy storage and smaller substations.

DCO Document Reference: 6.2.2
APFP Regulation: 5(2)(a)

FIGURE 2.1 INDICATIVE SITE LAYOUT

DATE	SCALE	SHEET	REVISION
03/02/2023	1:12,000@A3	-	J

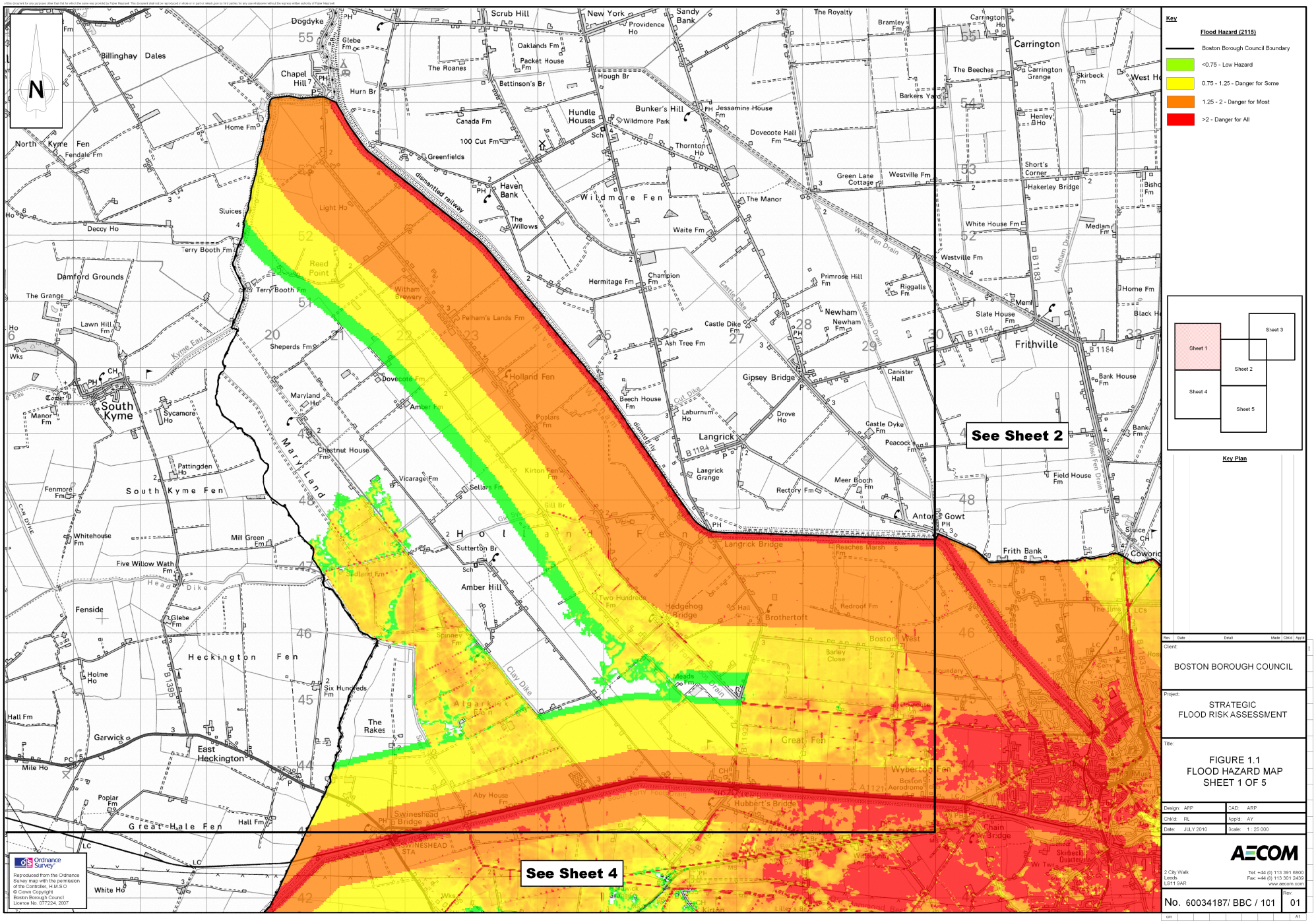
DRAWING NUMBER
P20-2370_03

0 0.5 km

ecotricity

PEGASUS GROUP

A.2 Southeast Lincolnshire Strategic Flood Risk Assessment (2017): Hazard Mapping SFRA Appendix A – Figure 1.1



Client: BOSTON BOROUGH COUNCIL

Project: STRATEGIC FLOOD RISK ASSESSMENT

Title: FIGURE 1.1 FLOOD HAZARD MAP SHEET 1 OF 5

Design: ARP	CAD: ARP
Chk'd: RL	App'd: AY
Date: JULY 2010	Scale: 1 : 25 000

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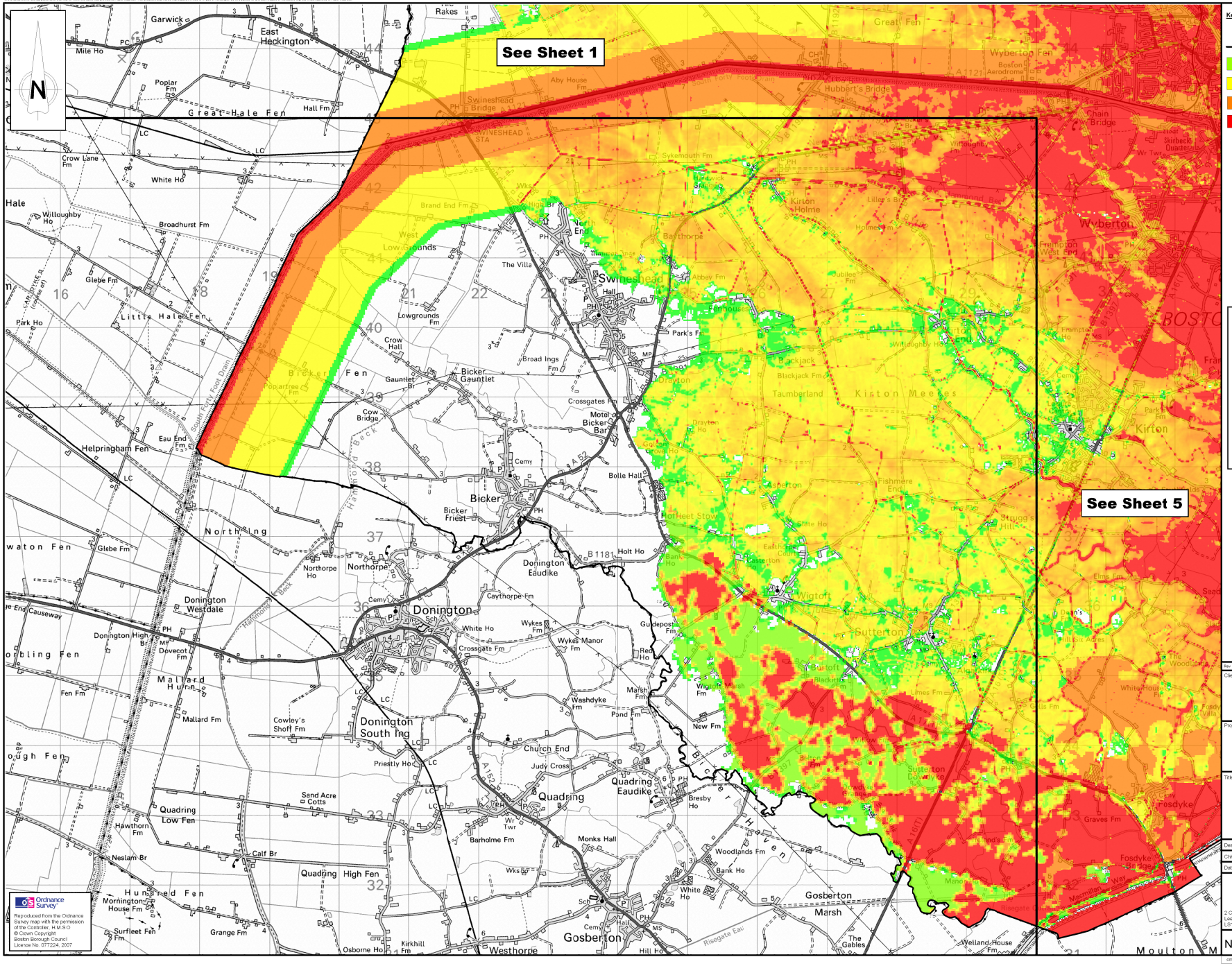
No. 60034187/ BBC / 101 | Rev: 01

A.3 Southeast Lincolnshire Strategic Flood Risk Assessment (2017): Hazard Mapping SFRA Appendix A – Figure 1.4



Client: BOSTON BOROUGH COUNCIL

Project: STRATEGIC FLOOD RISK ASSESSMENT

Title: FIGURE 1.4 FLOOD HAZARD MAP SHEET 4 OF 5

Design:	ARP	CAD:	ARP
Chk'd:	RL	App'd:	AY
Date:	JULY 2010	Scale:	1 : 25 000

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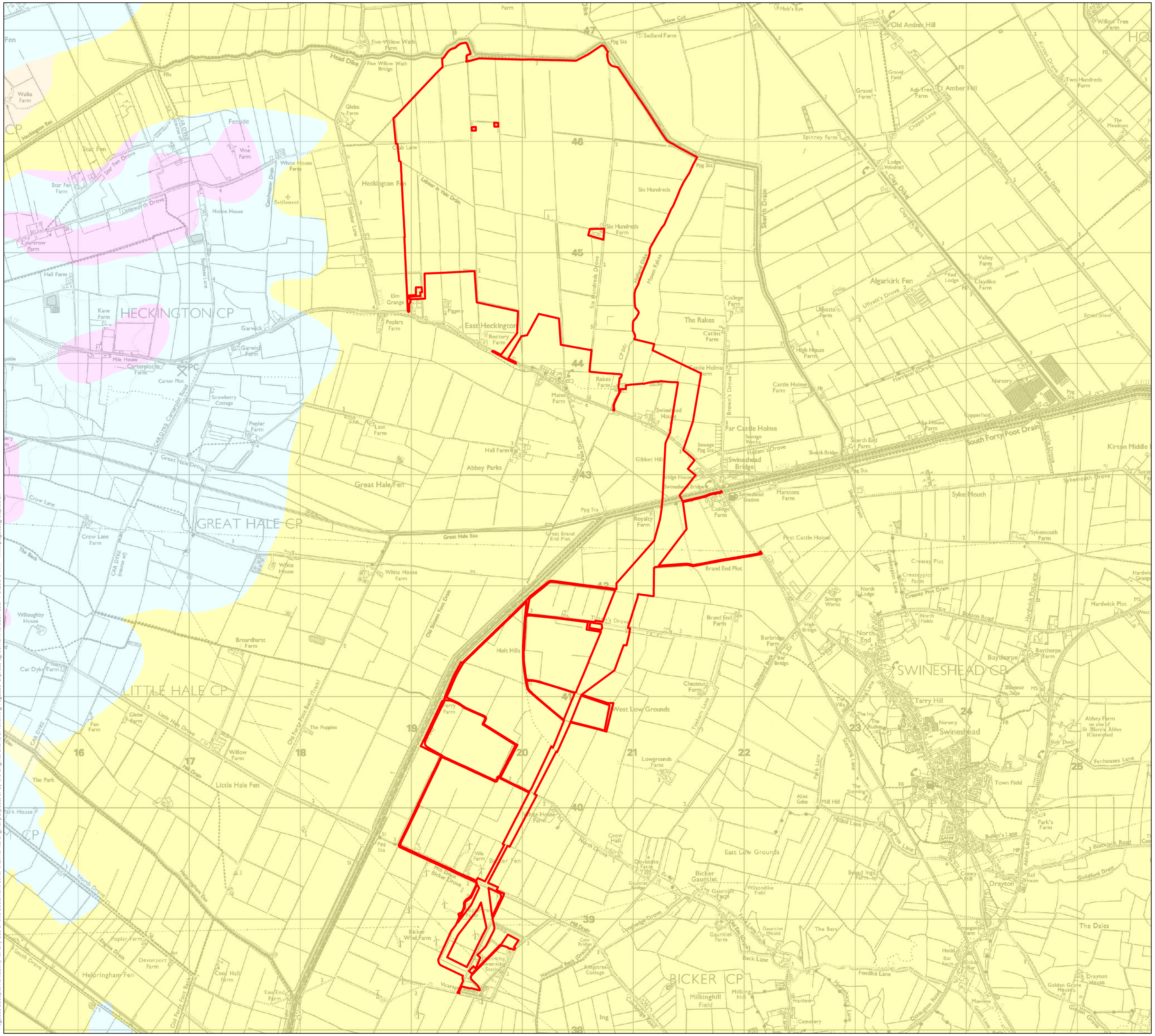
A.4 Superficial Geology - Energy Park Final Order Limits



KEY

Order Limits

BGS Superficial Geology

Tidal Flat Deposits - Clay and Silt

Till - Diamicton

Sand and Gravel

NOTES:

REVISIONS:

DCO Document Reference: 6.2.9
APFP Regulation: 5(2)(a)

FIGURE 9.2 SUPERFICIAL GEOLOGY

DATE	SCALE	SHEET	REVISION
12/12/2022	1:35,000@A3	-	-

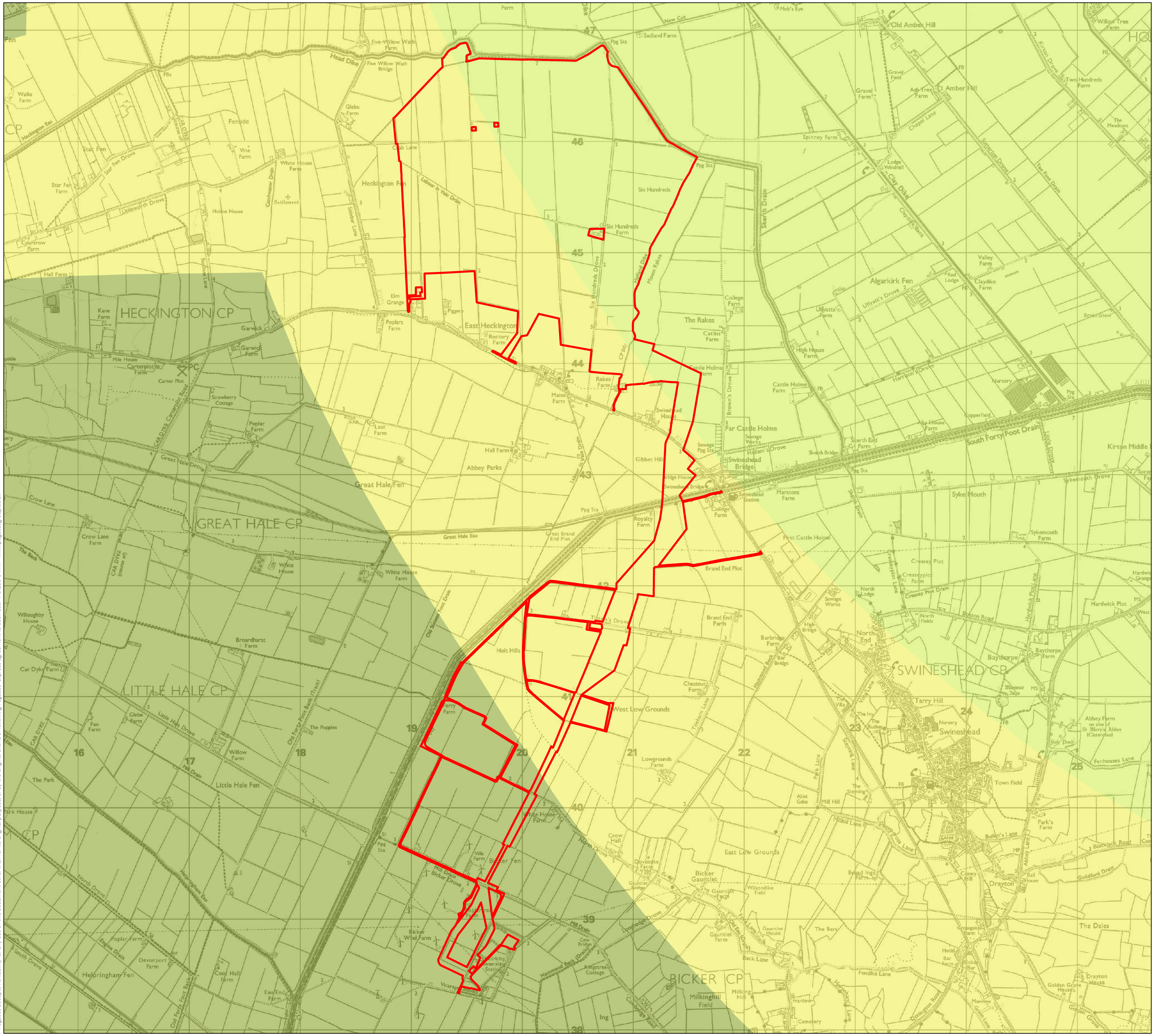
DRAWING NUMBER
P20-2370_54

0 1.5 km

ecotricity

PEGASUS GROUP

A.5 Bedrock Geology - Energy Park Final Order Limits



KEY

- Order Limits

BGS Bedrock Geology

- Ampthill Clay Formation
- West Walton Formation
- Oxford Clay Formation

NOTES:

REVISIONS:

DCO Document Reference: 6.2.9
APFP Regulation: 5(2)(a)

FIGURE 9.3 BEDROCK GEOLOGY

DATE	SCALE	SHEET	REVISION
12/12/2022	1:35,000@A3	-	-

DRAWING NUMBER
P20-2370_55

0 1.5 km

B Correspondence

B.1 EA Product 4 and Product 8 Data Request: 26th October 2021

Stuart Harwood
Stuart.Harwood@jbaconsulting.com

Our ref: CCN-2021-237352

Date: 26/10/2021

Dear Stuart,

Provision of Flood Risk Information for Heckington Fen Solar Farm

Thank you for your request to use 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.

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

4.1 Fluvial Defence Information

The existing fluvial defences reducing the risk of flooding to this site consist of earth embankments. They are in fair condition and reduce the risk of flooding (at the defence) to a 10% (1 in 10) chance of occurring in any year. We inspect these defences routinely to ensure potential defects are identified.

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

Please find attached a map showing available modelled flood extents, taking into account flood defences, for your area. This data is taken from the model named on the map, which is the most up-to-date model currently available.

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 fluvial hazard mapping.

5. Tidal Flood Risk Information

5.1 Tidal Defence Information

The existing tidal defences protecting this site consist of earth embankments which are supplemented by saltmarsh to maintain foreshore levels.

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 2115 0.1% (1 in 1000) chance

Your site is not affected by breaching of the tidal defences for the present day (2006) scenarios.

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

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 February 2016. 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. 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 Evangeline Kebble using the email address below.

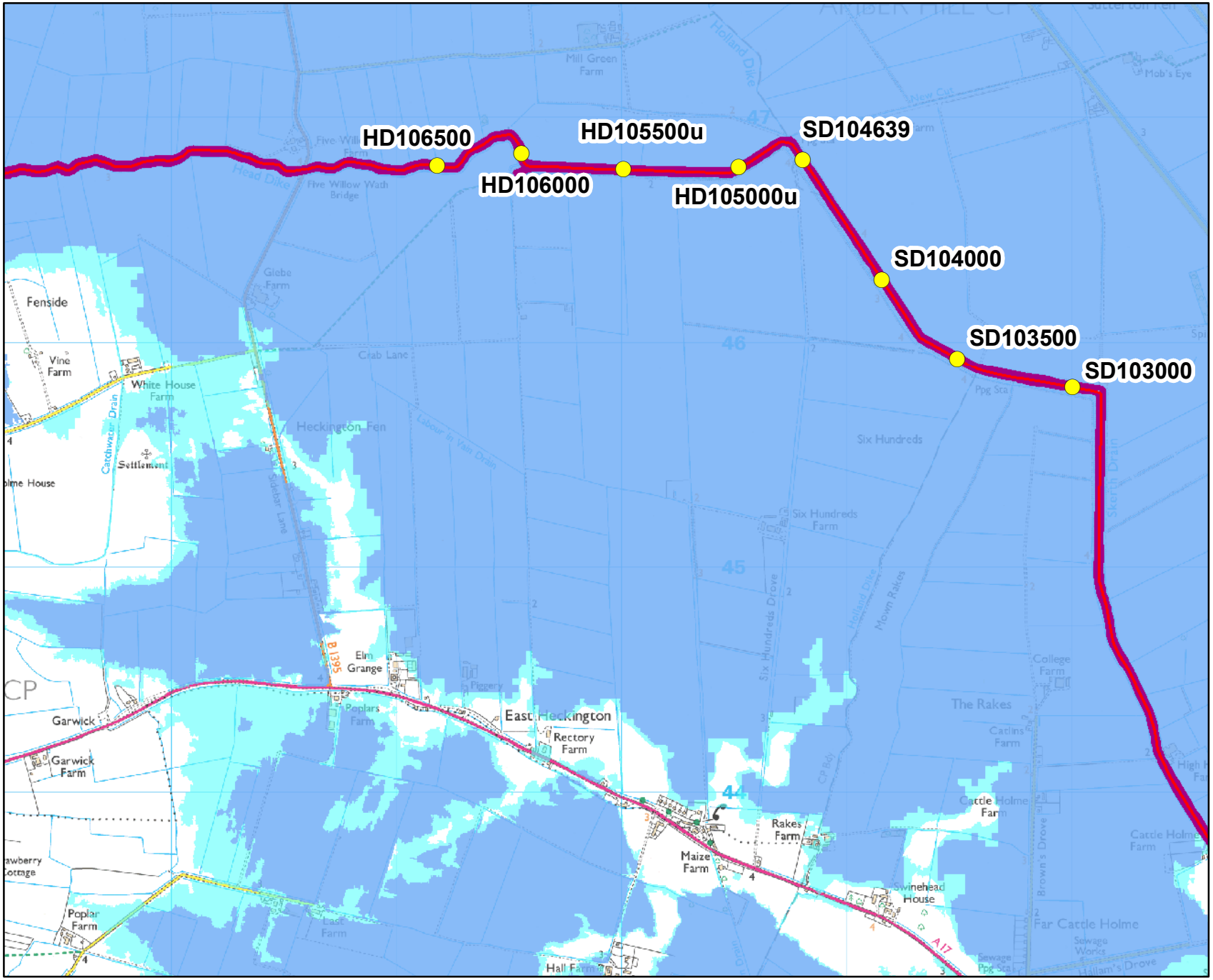
Yours sincerely,

Evangeline Kebble

for Ian Cappitt
Witham Partnerships and Strategic Overview Team Leader
e-mail PSOLINCS@environment-agency.gov.uk

Enc.
Flood Map
Modelled Node Points Map
Modelled Fluvial Levels and Flows Data Sheet
Modelled Flood Extent Maps
Tidal Level Data Sheets - Map and Tables
Tidal Breach Points – Locations Map
Hazard Mapping – Breaching

Flood Map centred on TF1993245341 - created September 2021 [Ref: CCN-2021-237352]



Environment Agency

Scale 1:24,000

N W E S

Legend

- Modelled Nodes
- Main River
- Raised Defences
- Flood Storage Area
- 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.

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

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).

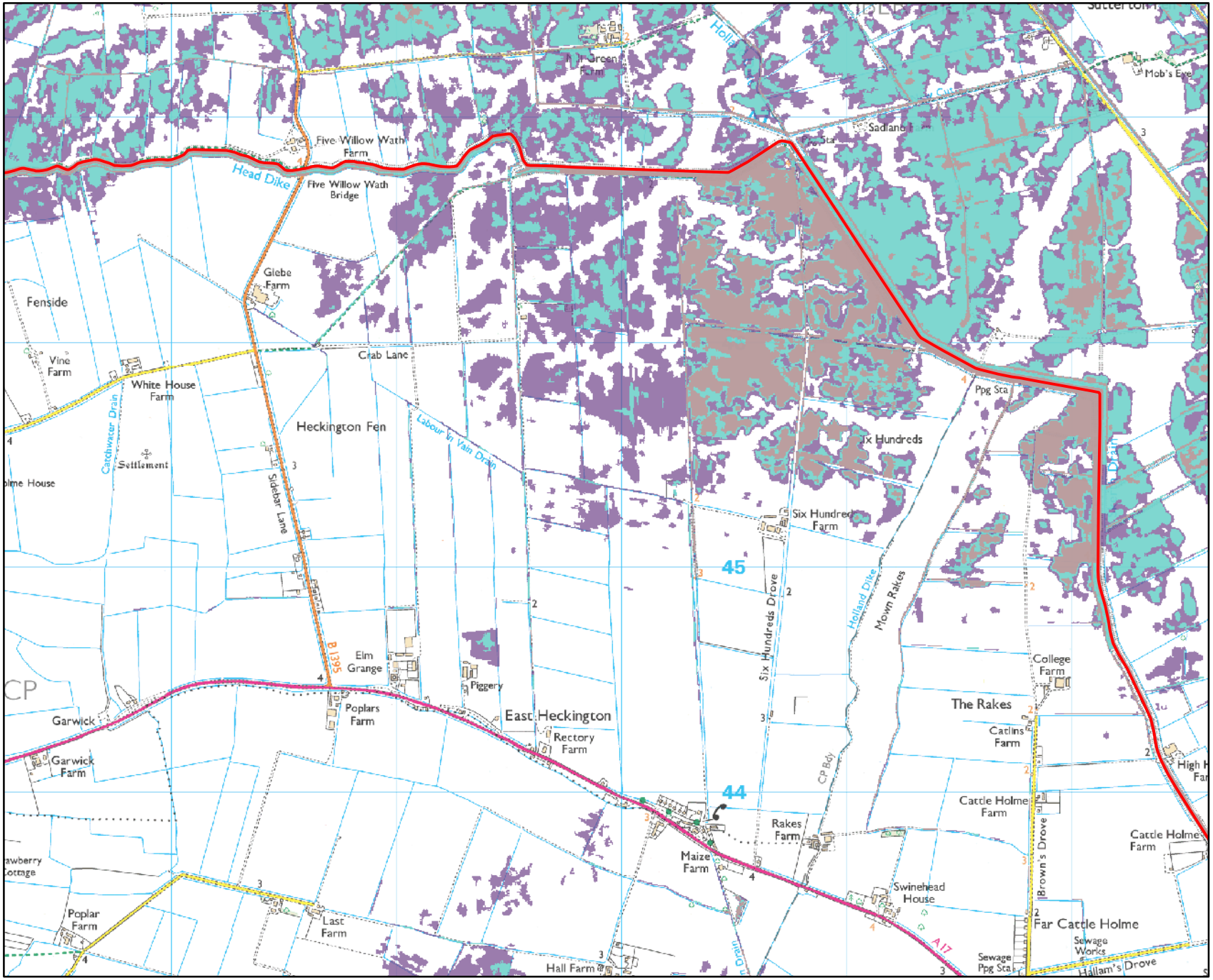
			Annual Exceedance Probability - Maximum Water Levels (mODN)										
Node Label	Easting	Northing	50% (1 in 2)	20% (1 in 5)	10% (1 in 10)	5% (1 in 20)	2% (1 in 50)	1.33% (1 in 75)	1% (1 in 100)	1% (1 in 100) inc 20% Climate Change	0.5% (1 in 200)	0.1% (1 in 1000)	0.1% (1 in 1000) inc 20% Climate Change
HD105000u	520520	346775	2.17	2.52	2.62	2.64	2.70	2.74	2.76	2.79	2.79	2.87	2.91
HD105500u	520009	346764	2.17	2.52	2.62	2.64	2.70	2.74	2.76	2.79	2.79	2.87	2.91
HD106000	519555	346835	2.18	2.52	2.62	2.64	2.70	2.74	2.76	2.80	2.80	2.88	2.92
HD106500	519181	346781	2.18	2.52	2.62	2.64	2.71	2.75	2.76	2.80	2.80	2.89	2.93
SD103000	522004	345797	2.17	2.51	2.61	2.64	2.69	2.73	2.75	2.78	2.78	2.84	2.86
SD103500	521492	345923	2.17	2.51	2.62	2.63	2.70	2.73	2.75	2.78	2.78	2.85	2.88
SD104000	521157	346275	2.17	2.51	2.62	2.64	2.70	2.74	2.75	2.78	2.78	2.85	2.89
SD104639	520805	346807	2.17	2.52	2.62	2.64	2.70	2.74	2.75	2.79	2.79	2.86	2.90

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)**	**2% (1 in 50)**	**1.33% (1 in 75)**	**1% (1 in 100)**	**1% (1 in 100) inc 20% Climate Change**	**0.5% (1 in 200)**	**0.1% (1 in 1000)**	**0.1% (1 in 1000) inc 20% Climate Change**
HD105000u	520520	346775	3.90	6.42	6.64	6.71	7.87	8.49	8.77	9.60	9.53	12.80	15.97
HD105500u	520009	346764	3.79	6.11	6.32	6.50	7.65	8.27	8.54	9.37	9.30	12.93	16.06
HD106000	519555	346835	3.66	5.77	5.97	6.29	7.42	8.03	8.30	9.12	9.06	13.06	16.15
HD106500	519181	346781	3.54	5.46	6.07	6.09	7.20	7.80	8.07	8.89	8.83	13.18	16.23
SD103000	522004	345797	5.77	8.26	8.71	8.47	8.67	9.30	9.59	10.43	10.37	12.49	15.27
SD103500	521492	345923	5.54	7.97	8.42	8.27	8.46	9.10	9.39	10.23	10.16	12.45	15.36
SD104000	521157	346275	5.42	7.70	8.15	8.09	8.27	8.90	9.18	10.02	9.95	12.57	15.45
SD104639	520805	346807	5.28	7.37	7.80	7.86	8.04	8.64	8.92	9.75	9.69	12.72	15.57

Modelled Flood Extents (with defences) Model: South Forty Foot 2016 [CCN-2021-237352]



Environment Agency

Scale 1:24,000

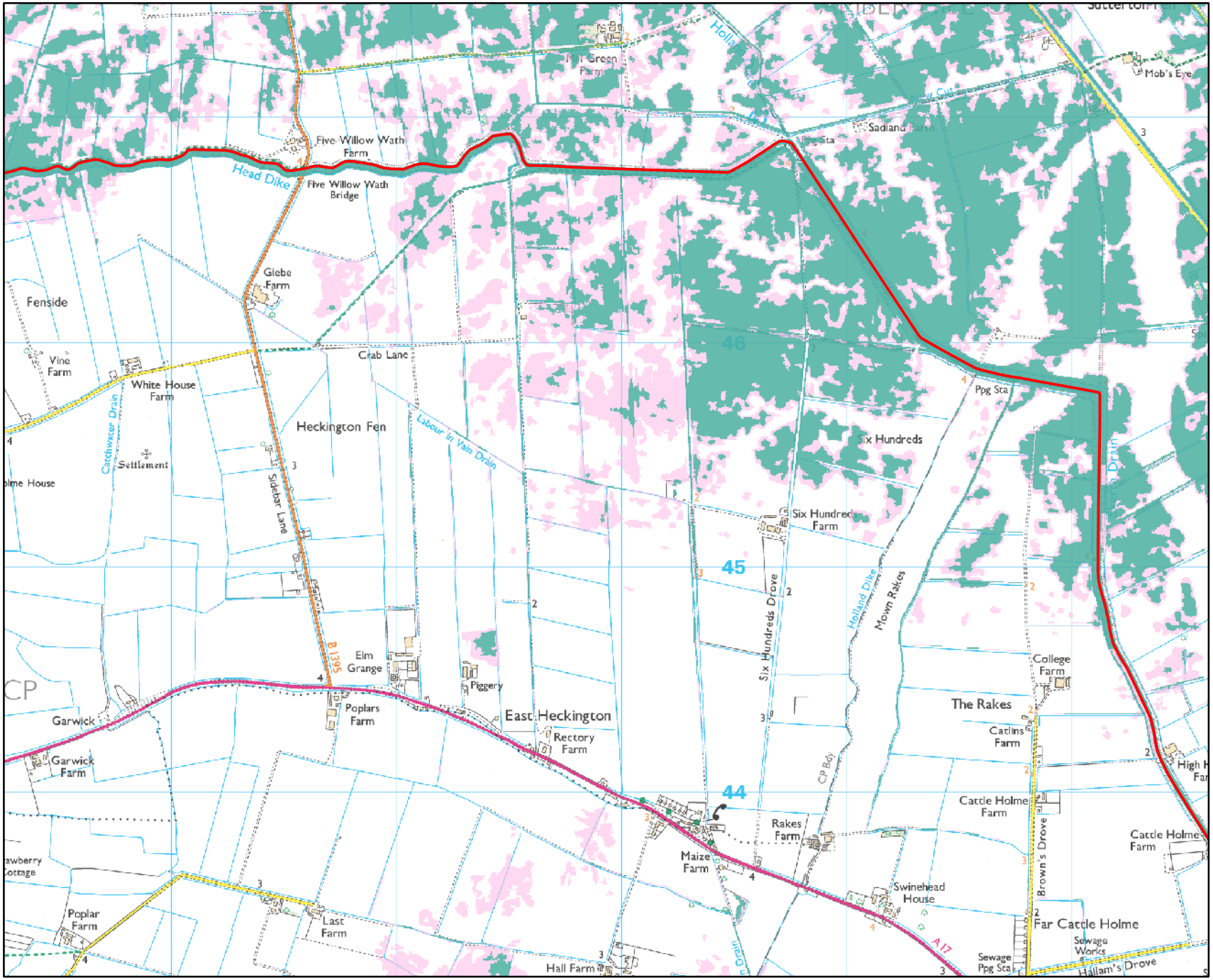
N W E S

Legend

- Main River
- 2016_SFFC_Defended_Baseline_1in10
- 2016_SFFC_Defended_Baseline_1in100
- 2016_SFFC_Defended_Baseline_1in1000

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 Flood Extents (with defences) Model: South Forty Foot 2016 [CCN-2021-237352]



Environment Agency

Scale 1:24,000

N W E S

Legend

- Main River
- 2016_SFFC_Defended_Baseline_1in100_CC20pc
- 2016_SFFC_Defended_Baseline_1in1000_CC20pc

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 seperate data sheet for predicted flood levels

Created by the Partnerships and Strategic Overview Team, Lincoln

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: 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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(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

- 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

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

^ **Modelled Breach Locations**

0 3.5 7 14 Kilometres

This map indicates the location of where we have modelled the consequence of breaches in the defences along the coastline and tidal rivers. We have mapped the 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.

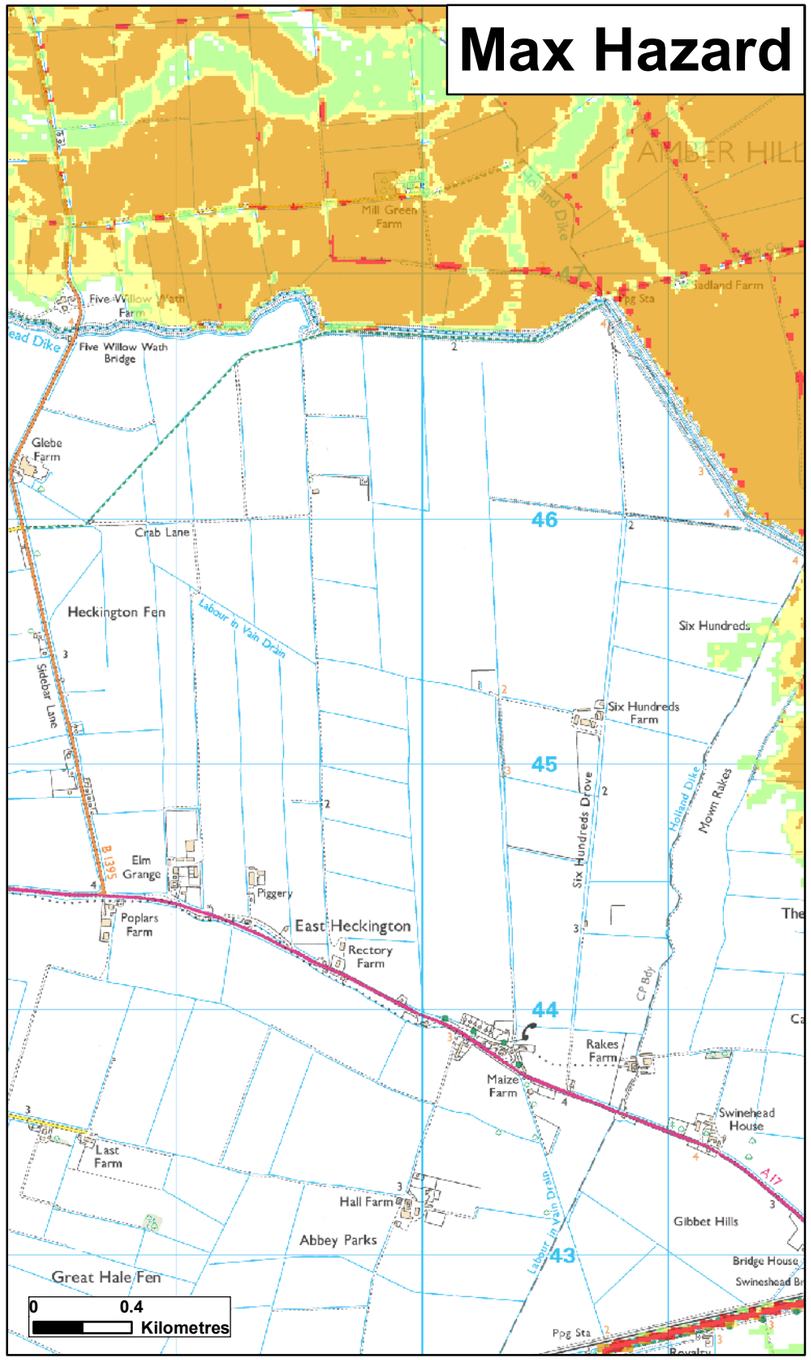
General Enquiries No: 03708 506 506.
Weekday daytime calls cost 5p plus up to 6ppm from BT Weekend Unlimited. Mobile and other providers charges may vary

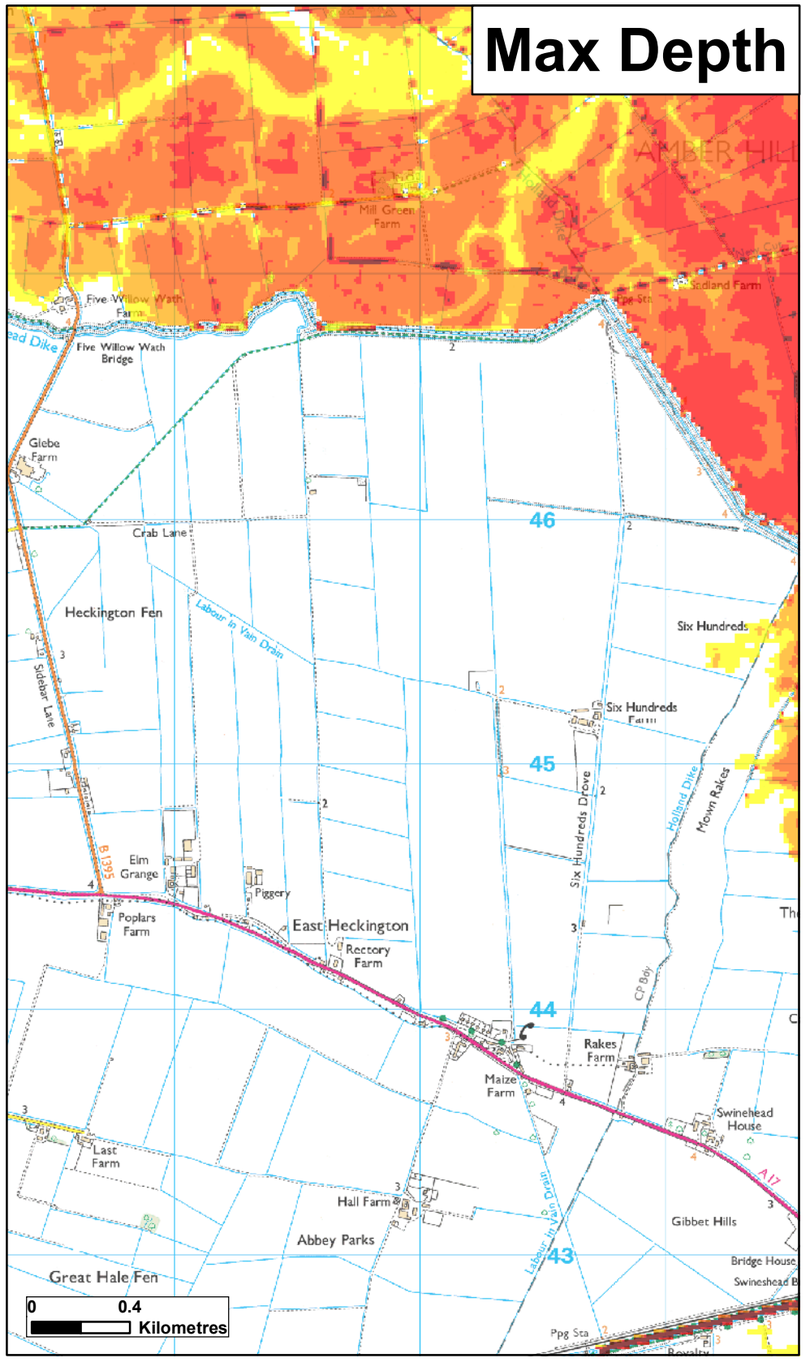
Environment Agency

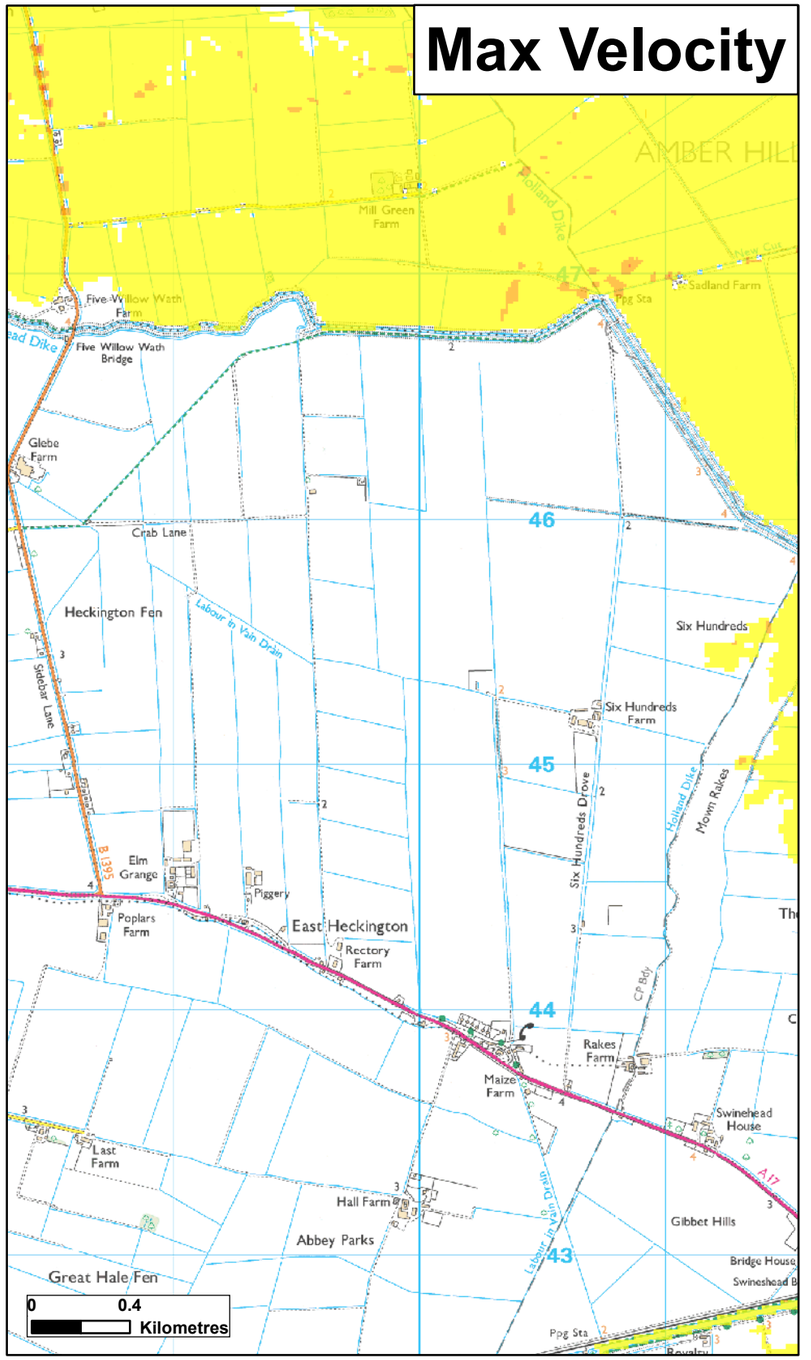
Produced by the Partnership and Strategic Overview Team, Lincoln
General Enquiries No: 03708 506 506

Northern Area Tidal Hazard Mapping

Location of Modelled Breaches







★ 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	October 2021	Scenario year	2115	Scenario Annual Chance	0.1% (1 in 1000)	CCN Number	CCN-2021-237352

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.

The map only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring. The likelihood of a breach occurring will depend on a number of different factors, including the construction and condition of the defences in the area. A breach is less likely where defences are of a good standard, but a risk of breaching remains.

Environment Agency

Lincolnshire and Northamptonshire Hazard mapping

Map Centred on TF1993245341

B.2 EA Advice Letter: 19th October 2021

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Environment Agency

Laura White
Ecotricity Group Limited:
Lion House
Rowcroft
Stroud
GL5 3BY

Our ref: AN/2021/132242/02-L01

Agreement number: ENVPAC/1/LNA/00127

Date: 19 October 2021

Dear Laura

Planning advice for SIX HUNDRED FARM

Thank you for accepting our offer to provide planning advice for flood risk management at the proposed solar farm development at Six Hundred Farm. We are providing our planning advice under project number ENVPAC/1/LNA/00127 and an invoice for £250 (2.5 hours) plus VAT will be issued shortly to Ecotricity Group Limited under PO-008261.

Based on the list of questions sent by Stuart of JBA Consulting please see our response listed below them. I understand the flood risk data has been requested and Chris Walker will ensure you receive this. Should you wish to discuss the data under the current agreed project time you have half an hour remaining. Should you request that we review a flood risk assessment once the remaining half hour has been used we will estimate how much longer is required and seek your acceptance prior to continuing. I trust this is all ok with you.

Chris Walkers response to each question are as follows:

Question 1. Given the location of the site in an area affected by tidal flooding, our working assumption is that flooding from the sea is the principal factor to consider/address from a development planning and design perspective.

Response

- The risk of flooding is from Main River coming from Head Dyke and Skerth Drain outfalling into the SFFD.
- In-channel water levels are 2.85m for the 1:1000 CC
- Land level ranges from 0.8m in the north to 1.8m in the south

Question 2. We would be grateful if you would provide Product 4 and Product 8 data. This information will be used to support/inform the FRA, scheme design (i.e. design/finished levels) and mitigation and it is not therefore proposed that fluvial or tidal/breach modelling is undertaken as part of the FRA.

Response. This this been requested and will be forwarded on.

Question 3. Details of historic flooding in the area of interest (to include written reports, photos, flood extent outlines, duration, return period/AEP and commentary on the source/mechanisms of flooding).

Response. We have no history of flooding at this location.

Question 4. Details of any local hydraulic features/controls and hydrological influences within the vicinity of the site that should be considered when undertaking a FRA (to include condition, capacity, ownership, operational procedures and maintenance arrangements).

Response.

- The EA own the embankments between Heckington Eau, Head Dyke, Skerth Drain and SFFD.
- We can share with you as part of the Product 4 request the operational procedures at this location – just make it known in the request. I assume this was requested.

Question 5. Flood defences (tidal) – please confirm the nature/type of tidal defences, the Standard of Protection afforded by the defences, the current condition grading and provide a copy of the most recent inspection report. Please also identify any features considered to be 'de facto' defences.

Response. This will be given to you as part of the Product 4 request. Note the defences are not tidally influenced.

Question 6. Flood defences (Main River) – for the watercourses bounding and in close proximity to the site (Head Dike/Skerth Drain and South Forty Foot Drain), please confirm the nature/type of defences, the Standard of Protection afforded by the defences , the current condition grading and provide a copy of the most recent inspection report. Please also identify any features considered to be 'de facto' defences.

Response. This will be given to you as part of the Product 4 request.

Question 7. Set out EA requirements/design principles related to the design/layout/configuration of solar panel arrays, the sub-station, energy storage infrastructure and ancillary buildings/plant.

Response. The application must be referred to the Environment Agency together with a supporting Flood Risk Assessment, which 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.

Question 8. Provide details of EA guidance regarding watercourse cable crossings (both above and below ground).

Response.

- Environmental Permitting Regulations 2016 will apply.
- Horizontal Directional Drilling will be our favoured method to which we have an exemption known as:

FRA3 – Service Crossing below the bed of a main river not involving an open cut technique:

With this exemption you can install a service crossing below the bed of a main river using techniques like directional drilling but not using an open cut technique. For example you can install an electricity service duct.
You cannot install a pipe crossing by excavating an open trench through the river.

3.1 What you must check
Before you register this exemption, you must check your activity meets all of the following conditions:

- the service crossing is within 10 degrees of perpendicular to the direction of flow in the main river
- the service crossing is at least 1.5m below the riverbed along its whole length, and the same height is maintained for at least 5m beyond each bank (measured from the top)
- the distance from the launch and reception pits to the landward side of each bank of the main river is:
    - 8m or more in the case of a non-tidal main river
    - 16m or more in the case of a tidal main river
- the service crossing does not pass through any bank, culvert, remote defence or river control works on the main river or through any sea defence
- the service crossing is 50m or more upstream of any impoundment or artificially raised channel
- you erect permanent hazard markers on both banks of the main river
- you remove from the flood plain all excavated material not re-used on the site of the works
- your works do not disturb the bed and banks of the main river

Question 9. Given the location of the site behind flood defences, it is not anticipated that it will be necessary to provide compensatory flood storage (i.e. for buildings, etc, within the floodplain).

Response. In line with OI 178_05 – Floodplain compensation will not be required as there is no large covering of the surface which would likely impact the floodplain. Flood waters will still be able to flow freely onto the floodplain under the solar panels. Buildings will not be so large they will take up much of the floodplain – confirm on plans.

Question 10. Given the nature and location of the proposals, and notwithstanding the residual risk of flooding associated with a breach of the tidal flood defences, it is not

anticipated that it will be necessary to develop a Flood Warning and Evacuation Plan or similar. North Lincolnshire Council (as the authority with responsibility for emergency planning) should be consulted on this matter.

Response. We would always advise a flood warning and evacuation plan for the site to ensure any personnel on site have a means of escape even if not on site all the time.

Should you require any additional information, or wish to discuss these matters further, please do not hesitate to contact me on the number below.

Yours sincerely

Mrs Sharon Nolan
Sustainable Places Planning Advisor

Direct dial 020302 53525
E-mail lnplanning@environment-agency.gov.uk

B.3 EA Advice Letter: 18th November 2021

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Environment Agency

Stuart Harwood
Stuart.Harwood@jbaconsulting.com

Our ref: AN/2021/132242/03-L01

Agreement number: ENVPAC/1/LNA/00127

Date: 18 November 2021

Dear Stuart

Solar park proposal East Heckington, Lincolnshire

Thank you for your email dated 15 November 2021 addressed to Chris Walker.

Chris has provide the comments below under the cost recovery project number ENVPAC/1/LNA/00127 and an invoice for £50 (.5 hours) plus VAT will be issued shortly to Ecotricity Group Limited under PO-008261.

Comments
"The water levels provided are in-channel only. We aren't able to provide a flood level for the site due to the way it has been modelled as a one-dimensional (1D) hydraulic model with spill and floodplain units. As we are not able to provide a flood level, breach analysis of the Head Dyke / Skirth Drain should be undertaken to understand the residual risk to site. This would be the key aspect of the site Flood Risk Assessment [FRA] which would also set out mitigation measures for the estimated flood depth.

Essential infrastructure requires use of the higher central allowance which for the 2050's epoch, ie that for a development with a 40 year lifespan, is a 15% increase in peak flows. Therefore using the 0.1% level + 20% in a FRA would be acceptable. Given the relatively small variation in flood level in the channel we do not consider this to be an overly precautious approach.

The nature of the system(s) is Head Dyke flows into Skerth Drain which then joins the South Forty Foot Drain".

Should you request that we review a document or provide further flood risk advice we will estimate how much time is required and seek your acceptance prior to continuing as outlined in our previous letter.

Should you require any additional information, or wish to discuss these matters further, please do not hesitate to contact me on the number below.

Yours sincerely

Mrs Sharon Nolan
Sustainable Places Planning Advisor

Direct dial 020302 53525
E-mail lnplanning@environment-agency.gov.uk

B.4 EA Advice Letter: 22nd April 2022

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Environment Agency

Stuart Harwood
Stuart.Harwood@jbaconsulting.com

Our ref: AN/2021/132242/05-L01

Agreement number: ENVPAC/1/LNA/00127

Date: 22 April 2022

Dear Stuart

Planning advice for Heckington Fen Solar

Thank you for accepting our offer to provide planning advice for flood risk management at the proposed solar farm development at Six Hundred Farm. We are providing our planning advice under project number ENVPAC/1/LNA/00127 and an invoice for £300 (3 hours) plus VAT will be issued shortly to Ecotricity Group Limited under PO-008261.

We have reviewed the technical report produced by JBA Consulting, Project Code 2021s1226 in the email sent to us on the 22 March 2022.

We are satisfied the model method statement is adequate and includes enough information for the model in relation to the works being proposed and will allow the outputs to inform the flood risk assessment accordingly. We have no further comments to make and will be happy to review the model if JBA feel this appropriate once complete. We would need to provide a further cost estimate for this.

Should you require any additional information, or wish to discuss these matters further, please do not hesitate to contact me on the number below.

Yours sincerely

Mrs Sharon Nolan
Sustainable Places Planning Advisor

Direct dial 020302 53525
E-mail lnplanning@environment-agency.gov.uk

B.5 EA Advice Letter: 1st August 2022

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Environment Agency

Ellen Corry
Ellen.Corry@jbaconsulting.com

Our ref: AN/2021/132242/07-L01
Your ref: 6945
Agreement number: ENVPAC/1/LNA/00127

Date: 01 August 2022

Dear Ellen

Planning advice for Heckington Fen Solar

Thank you for the opportunity to comment on the Hydrology and Hydraulic Modelling produced by JBA Consulting for Heckington Fen Solar Farm dated July 2022. We are providing our planning advice under project number ENVPAC/1/LNA/00127 and an invoice for £600 (6 hours) plus VAT will be issued shortly to Ecotricity Group Limited under PO-008261.

We have reviewed the Technical Note and associated files. The technical note offers enough information to carry out a review of the produced breach modelling. The breach modelling has been carried out to inform the Flood Risk Assessment of the possible depths to site to ensure the Solar Panels and Associated Infrastructure is above the 1:1000 plus climate change flood level.

The modelling suggests the maximum flood depth for the 1:1000 plus climate change on site is 1.94mAOD. The recommendation within the technical note suggests “solar panels and other flood-sensitive infrastructure should be positioned above the 1000-year plus 20% climate change maximum breach flood water level (1.95m AOD)”. This would be acceptable mitigation and demonstrates the site should be operable in high flood events.

We are happy with the breach analysis assessment and would welcome its inclusion with the recommended appropriate mitigation and conclusions within the FRA.
Furthermore, we would accept this analysis and mitigation when submitted with a FRA to the planning inspectorate and will condition the FRA appropriately in our future response.

At this moment we have no further comments to make.

Should you require any additional information, or wish to discuss these matters further, please do not hesitate to contact me on the number below.

Yours sincerely

Mrs Sharon Nolan
Sustainable Places Planning Advisor

Direct dial 020302 53525
E-mail lnplanning@environment-agency.gov.uk

B.6 BSIDB and LLFA e-mail response: 25th January 2022

Ellen Corry

From: Andrew Scott <Andrew.Scott@blacksluiceidb.gov.uk>
Sent: 25 January 2022 17:03
To: Stuart Harwood; Jon Sharpe
Cc: Laura White; Marcus Beddoe; Isobel Hollands
Subject: RE: 2021s1226 - Heckington Fen solar farm - meeting notes
Attachments: HeckingtonTrinityA1.pdf; FX717L.pdf

Our Ref: IW/AS/Scheme2115/S12

Your Ref: 2021s1226 - Heckington Fen solar farm

Hi, Stuart, apologies for not responding sooner.

Regarding your three points below, please find attached an A1 map showing the sub-catchments and pump station capacity data (points i & ii).

Ref point iii, can you be more specific? This could be a one line answer or an essay…..

Regarding the meeting notes summary, I have added comments in red below.

Kind regards.

Andy Scott
Planning & Byelaw Officer
Black Sluice Internal Drainage Board
Station Road, Swineshead, Boston, Lincolnshire, PE20 3PW
01205 821440
www.blacksluiceidb.gov.uk

From: Stuart Harwood
Sent: 15 December 2021 10:54
To: andrew.scott@blacksluiceidb.gov.uk; Jon Sharpe <Jon.Sharpe@lincolnshire.gov.uk>
Cc: Laura White <Laura.White@ecotricity.co.uk>; Marcus Beddoe <Marcus.Beddoe@ecotricity.co.uk>; Isobel Hollands <isobel.hollands@pegasusgroup.co.uk>
Subject: 2021s1226 - Heckington Fen solar farm - meeting notes

Morning Both,

Please see the summary below following the Teams meeting held on 10th December. We would be grateful if you would confirm that the summary constitutes an accurate record of the matters discussed/agreed or, alternatively, please outline any amendments/additions you consider necessary.

@andrew.scott@blacksluiceidb.gov.uk – we would be grateful if you could provide a copy of the plan referred to at Item 17 below. Could you also confirm:

i. The catchment areas served by the Heckington and Trinity College pumping stations
ii. Pumping station capacities

iii. The nature of any operational rules/criteria that apply to the Heckington and Trinity College catchments and whether these vary by season

Many thanks,

Stuart.

Attendees:

Andrew Scott	Black Sluice IDB
Jon Sharpe	Lincolnshire County Council (as Lead Local Flood Authority)
Laura White	Ecotricity
Isobel Hollands	Pegasus Group
Stuart Harwood	JBA Consulting

1. AS advised that any matters relating to hydraulic modelling to derive flood levels and inform scheme design should be addressed in consultation with the Environment Agency. SH confirmed that JBA had obtained EA Product 4 flood data and that, following consultation with the EA, detailed modelling was to be undertaken to assess flood water levels and inform scheme design. Agreed.

2. AS and JS confirmed that solar farm proposals are considered to have a negligible effect upon the surface water drainage regime. With the exception of access roads, such proposals are not considered to increase impermeable area as the solar panels shed rainwater to ground. It was noted that the installation of solar panels may result in the loss of vegetation and rainwater run-off would likely be concentrated in narrow areas beneath the lower edge of the panels. Swales would likely provide an adequate solution to intercept run-off from solar panels. Agreed.

3. In terms of surface water management, solar proposals would not therefore need to be addressed in the same way as a 'typical' land development project (i.e. residential) which gives rise to a significant increase in impermeable area and therefore requires surface water storage infrastructure, such as balancing ponds. Agreed.

4. It was agreed that a 'low key' approach would be appropriate, most likely comprising swales aligned along the lower edge of solar panels, allowing run-off to infiltrate to ground (where ground conditions permit), otherwise including perforated pipes set within granular material beneath the swale bed to facilitate the routing of surface water to the network of surface water drains. Agreed, but note that any land drain outfalls discharging into IDB-maintained watercourses will require Section 23 Land Drain consent.

5. AS happy to provide details re: IDB infrastructure, pumping station capacity, etc. SH to send AS a list of info needed to support preparation of the FRA and ES chapter. See attached.

6. AS confirmed that IDB drains are generally designed to provide capacity for a 1 in 30yr event although, looking into the future, a 1 in 100 year design standard is likely to be provided. Pumping station capacity will also be increased in the long term. Agreed.

7. In terms of maintenance activities, AS confirmed that flailing is carried out annually and de-silting/dredging undertaken on a 5-10 year programme. Agreed – BSIDB-maintained watercourses only.

8. On the matter of culverting drains as part of fencing works for site security, AS confirmed that there is a presumption against the installation of new culverts unless essential for access purposes. The IDB would not accept proposals for culverting to facilitate security fence crossings of watercourses. Agreed.

9. AS referred to Byelaw no.10 relating to access for maintenance and advised that no infrastructure should be located within 9m of any watercourse maintained by BSIDB. We would recommend similar access strips are

provided for all other watercourses to allow the farmer/landowner/tenant/solar farm owner to maintain those watercourses as per common law.

10. Any works within 9m of a watercourse (whether Board maintained or riparian) require IDB consent (as per Section 23 of the Land Drainage Act). Agreed – note that this applies at all times (i.e. during and post construction).

11. AS highlighted that existing culverts are owned by the adjacent landowner(s), not the Board. Agreed, unless proved otherwise.

12. Historically, the water levels in drains were generally managed on a seasonal basis (i.e. lower winter levels to provide additional capacity). AS confirmed that this is no longer the case, although the Board does seek to keep summer levels up to support irrigation for agricultural purposes. The operational regime of pumping stations is generally informed by weather forecasts. Stuart, is this what you were referring to in Point iii above?

13. AS noted that there are no records/reports of the various drains within the site boundary having overtopped during the past 15 years or so. Agreed.

14. It was noted that the application for the solar farm proposals would be via a Development Consent Order in accordance with the provisions of the Planning Act (2008). AS confirmed that this would result in the provisions of the Land Drainage Act being 'disapplied'. However, protective provisions could be incorporated within the DCO and these mirror provisions set out in the Land Drainage Act relating to access for maintenance, consent for works, etc. Agreed.

15. AS advised that consent is also required for any works beneath a watercourse (i.e. HDD for the installation of electricity cables or similar). AS referred to other power generation schemes (Triton Knoll and the Boston Energy Facility) and advised that cables were located c.2.9m below the hard bed of any watercourse – the IDB requiring 2m depth to allow for future improvements/deepening of drains and a further depth allowance to be specified by the owner/operator of the cable network to provide a minimum clearance between the potential future bed level of the drain and the cable. Agreed.

16. LW referred to the proposed site access from the A17 and requested clarity regarding ownership of the ditch/drain that the access road would cross. LW to provide details and JS will make enquiries internally via legal team to confirm ownership and consenting requirements. For JS – note that if ownership unproven, BSIDB would deem ownership being with the adjacent landowners as per common law (so if you were taking ownership of the land, you would be responsible for ownership and maintenance including any future culverting – any culverting would require Section 23 Land Drainage consent from BSIDB).

17. AS to provide a copy of Dwg/plan FX717 (detailing drains and associated infrastructure) relating to the previous wind farm scheme. See attached. I'm currently drafting a more detailed map showing culvert locations and diameters – bear with.

Stuart Harwood
Senior Analyst & Project Manager | Flood Risk Management
t: 01675 437750

Contact me on **Teams**

JBA Consulting, 1 Broughton Park, Old Lane North, Broughton, Skipton, North Yorkshire, BD23 3FD. Telephone: +441756799919

Visit our new website at www.jbaconsulting.com.

B.7 EA Product 4 data and product 8 data– East Heckington: 3rd January 2022

Stuart Harwood
Stuart.Harwood@jbaconsulting.com

Our ref: CCN-2022-292902

Date: 03/01/2022

Dear Stuart,

Provision of Flood Risk Information for East Heckington, (NGR: TF2068943873).

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.

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

4.1 Fluvial Defence Information

The existing fluvial defences reducing the risk of flooding from main river to this site from Long Skerth Drain consist of earth embankments. They are in fair condition and reduce the risk of flooding (at the defence) to a 10% (1 in 10) chance of occurring in any year. We inspect these defences routinely to ensure potential defects are identified.

The existing fluvial defences reducing the risk of flooding from main river to this site from the South Forty Foot Drain 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

Please find attached a map showing available modelled flood extents, taking into account flood defences, for your area. This data is taken from the model named on the map, which is the most up-to-date model currently available.

In some cases the flood extents shown may not be from main river, but may be from other sources such as IDB lowland drainage networks.

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 fluvial hazard mapping.

5. Tidal Flood Risk Information

This site is not considered to be at risk from tidal flooding.

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.

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. 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).

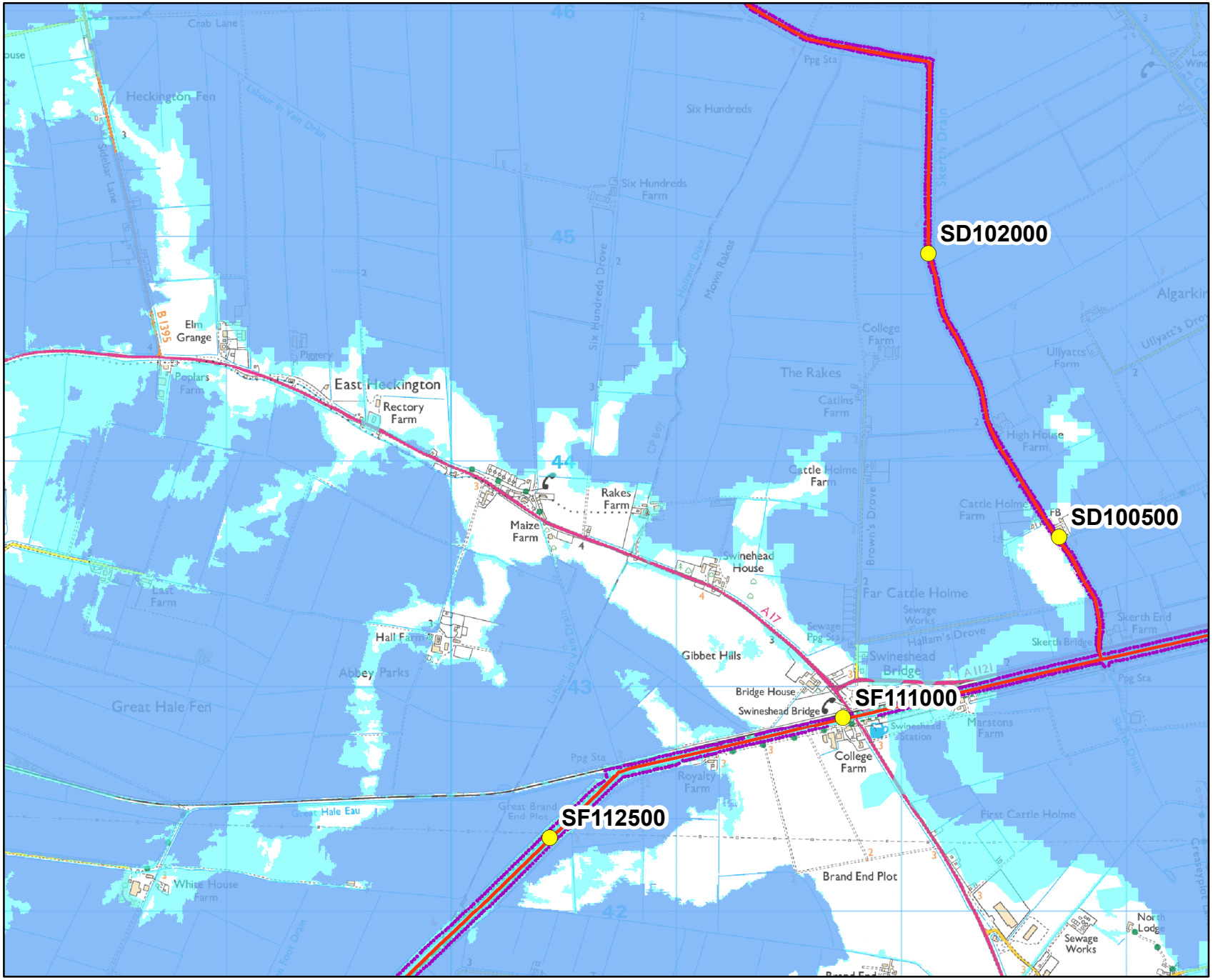
I hope we have correctly interpreted your request. If you have any queries or would like to discuss the content of this letter further please contact William Spratt using the email address below and quoting our CCN reference number above.

Yours sincerely,

for Ian Cappitt
Witham Partnerships and Strategic Overview Team Leader
e-mail PSOLINCS@environment-agency.gov.uk

Enc.
Flood Map with Modelled Node Points
Modelled Fluvial Levels and Flows Data Sheet
Modelled Flood Extent Maps

Flood Map centred on TF 20689 43873 - created January 2023 [Ref: CCN-2022-292902]



Environment Agency

Scale 1:24,000

N W E S

Legend

- Modelled Nodes
- Main Rivers
- Raised Defences
- Flood Storage Areas
- Flood_zone_3
- Flood_zone_2

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.

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

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).

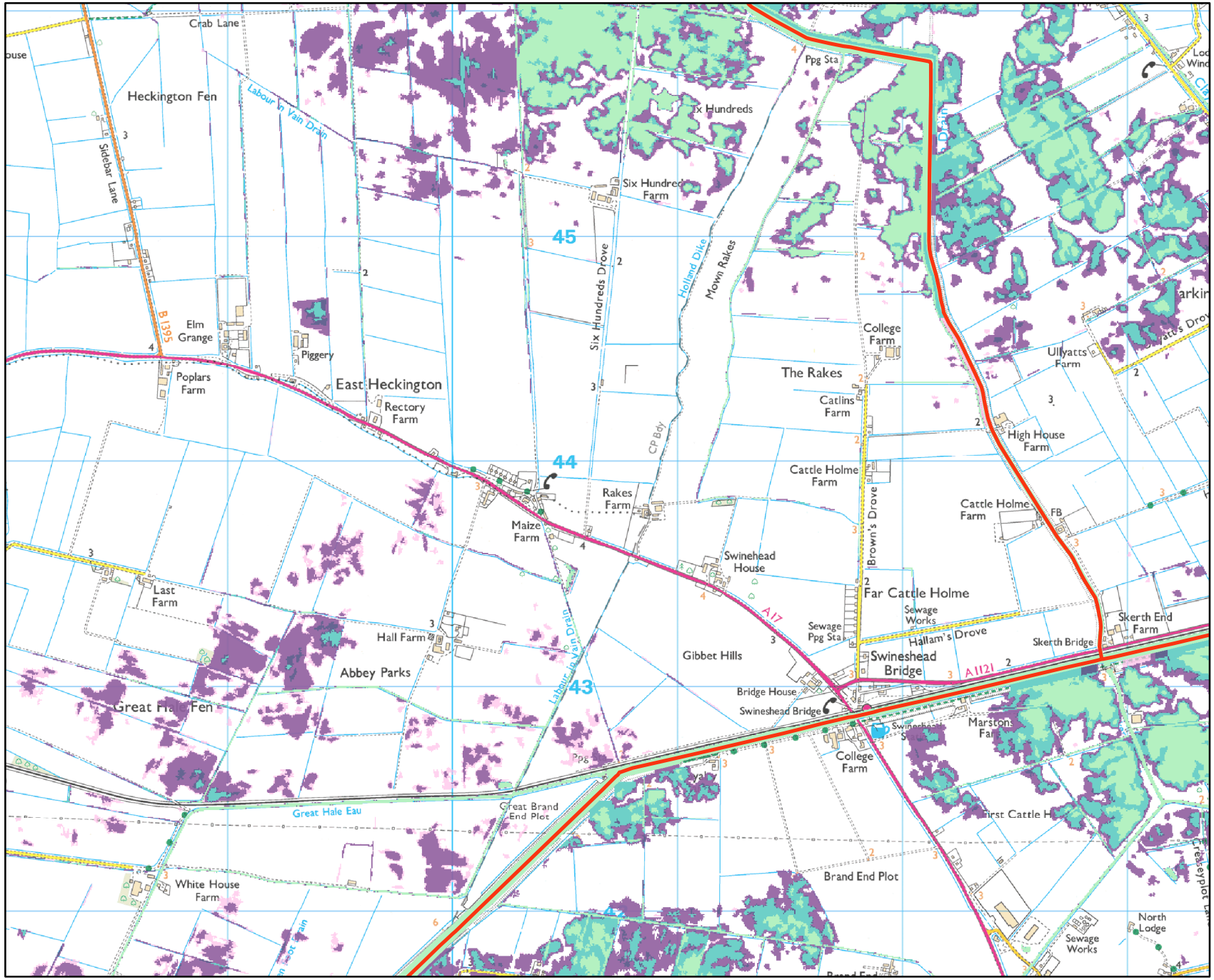
			Annual Exceedance Probability - Maximum Water Levels (mODN)										
Node Label	**Easting**	**Northing**	**50% (1 in 2)**	**20% (1 in 5)**	**10% (1 in 10)**	**5% (1 in 20)**	**2% (1 in 50)**	**1.33% (1 in 75)**	**1% (1 in 100)**	**1% (1 in 100) inc 20% Climate Change**	**0.5% (1 in 200)**	**0.1% (1 in 1000)**	**0.1% (1 in 1000) inc 20% Climate Change**
SD100500	522703	343661	2.16	2.51	2.61	2.63	2.68	2.72	2.74	2.76	2.76	2.80	2.82
SD102000	522121	344922	2.17	2.51	2.61	2.63	2.69	2.73	2.74	2.77	2.77	2.82	2.85
SF111000	521742	342858	2.16	2.55	2.63	2.65	2.79	2.83	2.85	2.87	2.87	2.90	2.90
SF112500	520439	342326	2.17	2.56	2.64	2.70	2.85	2.89	2.90	2.92	2.92	2.95	2.96

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)**	**2% (1 in 50)**	**1.33% (1 in 75)**	**1% (1 in 100)**	**1% (1 in 100) inc 20% Climate Change**	**0.5% (1 in 200)**	**0.1% (1 in 1000)**	**0.1% (1 in 1000) inc 20% Climate Change**
SD100500	522703	343661	6.42	9.59	10.09	9.42	9.61	10.30	10.61	11.48	11.42	13.49	14.80
SD102000	522121	344922	6.01	8.76	9.25	8.80	9.02	9.69	9.98	10.83	10.77	12.87	15.09
SF111000	521742	342858	19.95	32.61	36.03	37.86	40.86	41.25	41.22	41.57	41.52	42.74	43.24
SF112500	520439	342326	19.11	31.73	35.25	37.02	40.02	40.42	40.38	41.40	40.78	43.35	43.40

Modelled Flood Extents (with defences) Model: South Forty Foot 2016 [CCN-2022-292902]



Environment Agency

Scale 1:24,000

N W E S

Legend

- Main Rivers
- 2016_SFFC_Defended_Baseline_1in20
- 2016_SFFC_Defended_Baseline_1in100
- 2016_SFFC_Defended_Baseline_1in1000
- 2016_SFFC_Defended_Baseline_1in100_CC20pc
- 2016_SFFC_Defended_Baseline_1in1000_CC20pc

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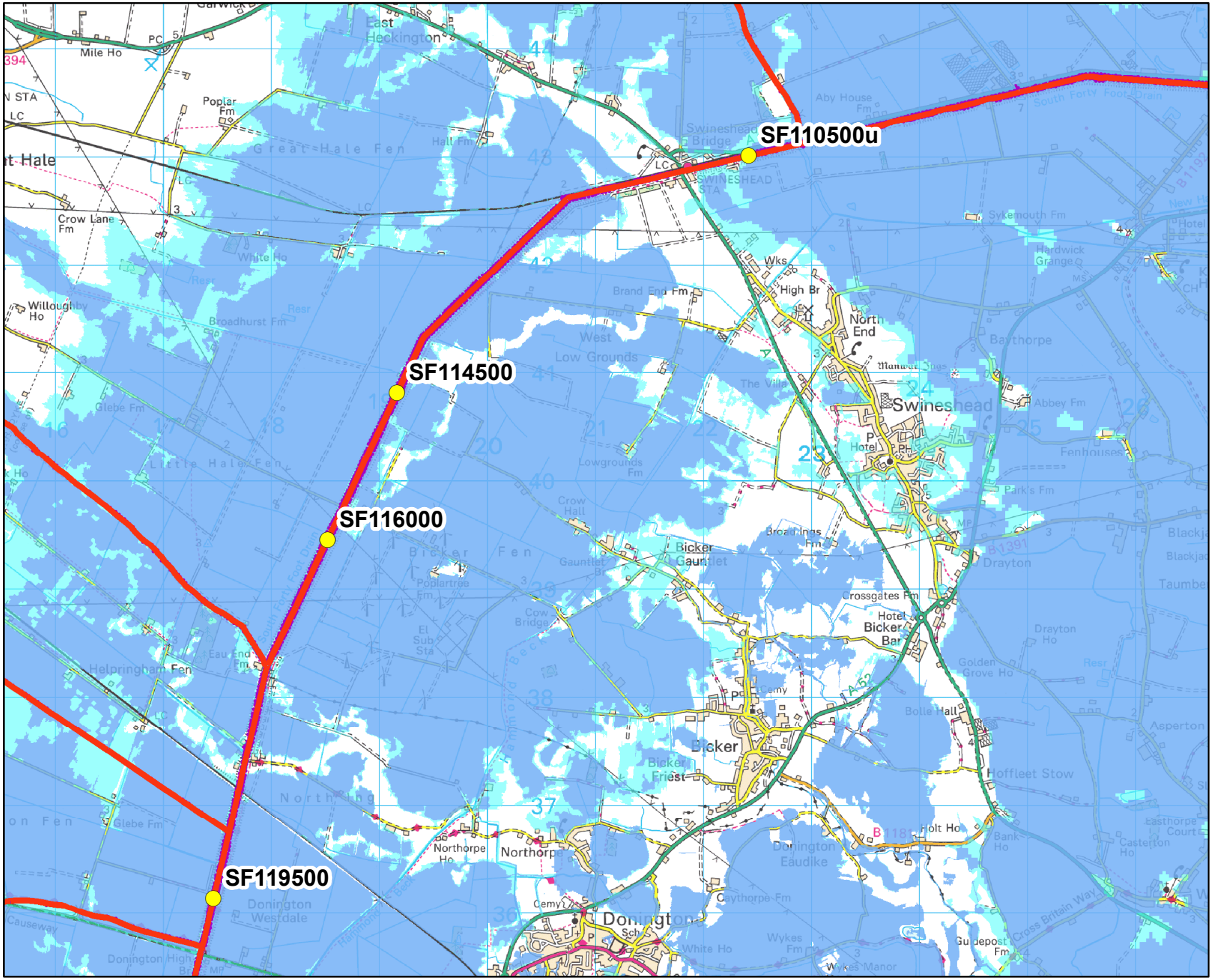
Flood Map centred on TF 21099 39917 - created January 2023 [Ref: CCN-2022-292902]



Environment Agency

Scale 1:50,000

N W E S

Legend

- Modelled Nodes
- Statutory_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.

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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).

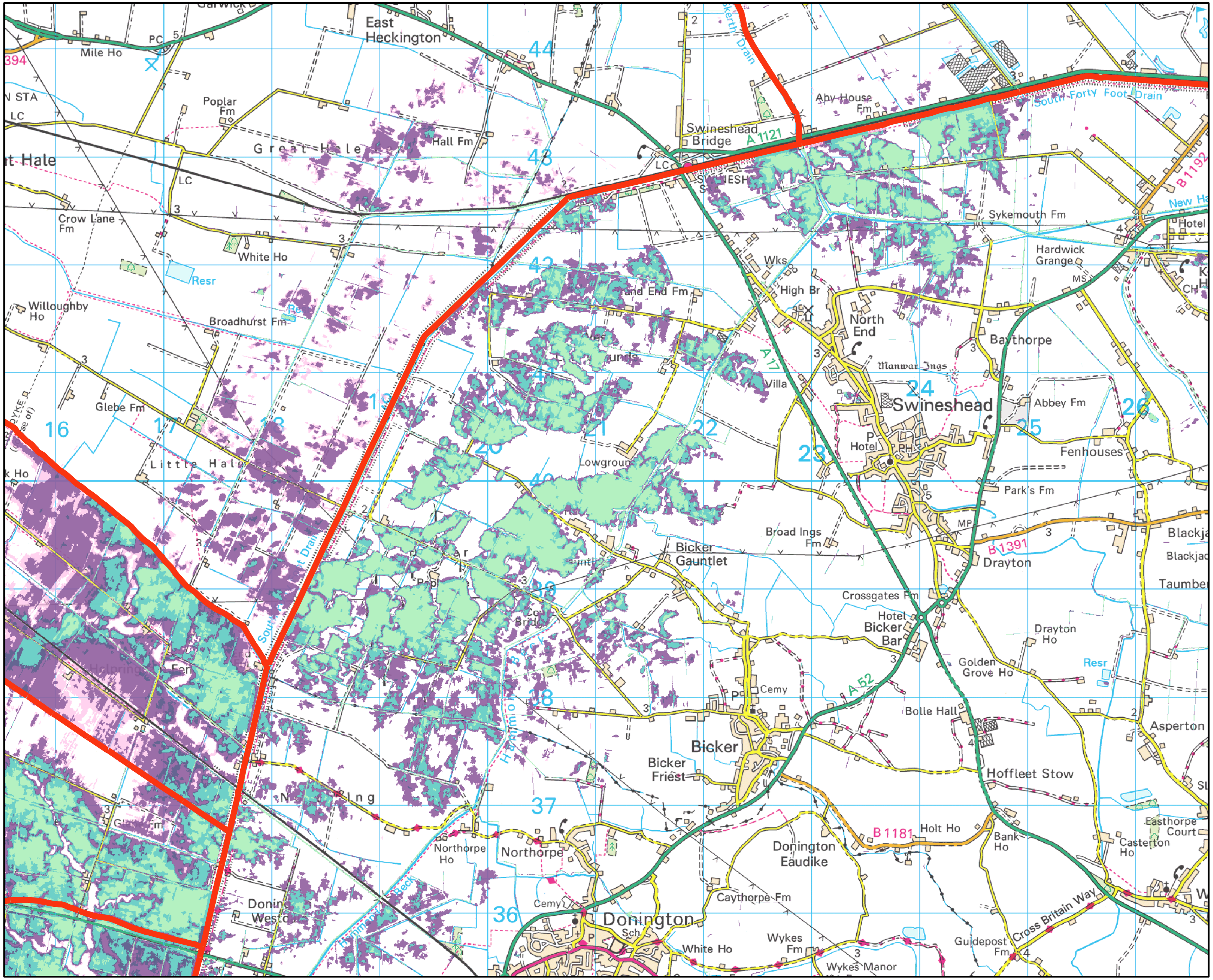
			Annual Exceedance Probability - Maximum Water Levels (mODN)										
Node Label	**Easting**	**Northing**	**50% (1 in 2)**	**20% (1 in 5)**	**10% (1 in 10)**	**5% (1 in 20)**	**2% (1 in 50)**	**1.33% (1 in 75)**	**1% (1 in 100)**	**1% (1 in 100) inc 20% Climate Change**	**0.5% (1 in 200)**	**0.1% (1 in 1000)**	**0.1% (1 in 1000) inc 20% Climate Change**
SF110500u	522417	343012	2.16	2.54	2.63	2.65	2.75	2.79	2.80	2.82	2.82	2.85	2.86
SF114500	519162	340814	2.17	2.58	2.64	2.78	2.92	2.96	2.97	2.99	2.99	3.02	3.03
SF116000	518519	339455	2.17	2.59	2.68	2.83	2.98	3.01	3.02	3.04	3.04	3.07	3.08
SF119500	517458	336134	2.18	2.63	2.77	2.90	3.04	3.07	3.08	3.10	3.10	3.13	3.13

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)**	**2% (1 in 50)**	**1.33% (1 in 75)**	**1% (1 in 100)**	**1% (1 in 100) inc 20% Climate Change**	**0.5% (1 in 200)**	**0.1% (1 in 1000)**	**0.1% (1 in 1000) inc 20% Climate Change**
SF110500u	522417	343012	19.94	32.89	36.28	38.14	41.15	41.54	41.50	41.85	41.80	42.56	43.20
SF114500	519162	340814	19.16	31.41	36.21	38.15	40.42	41.08	41.12	43.17	42.51	44.16	43.66
SF116000	518519	339455	18.27	31.68	37.14	39.23	41.47	42.12	42.47	44.45	43.84	44.69	43.84
SF119500	517458	336134	11.36	21.03	24.68	25.86	26.63	26.67	26.34	26.27	25.87	27.03	27.63

Flood Map centred on TF 21099 39917 - created January 2023 [Ref: CCN-2022-292902]



Scale 1:50,000

N W E S

Legend

- Statutory_Main_Rivers
- 2016_SFFC_Defended_Baseline_1in20
- 2016_SFFC_Defended_Baseline_1in100
- 2016_SFFC_Defended_Baseline_1in1000
- 2016_SFFC_Defended_Baseline_1in100_CC20pc
- 2016_SFFC_Defended_Baseline_1in1000_CC20pc

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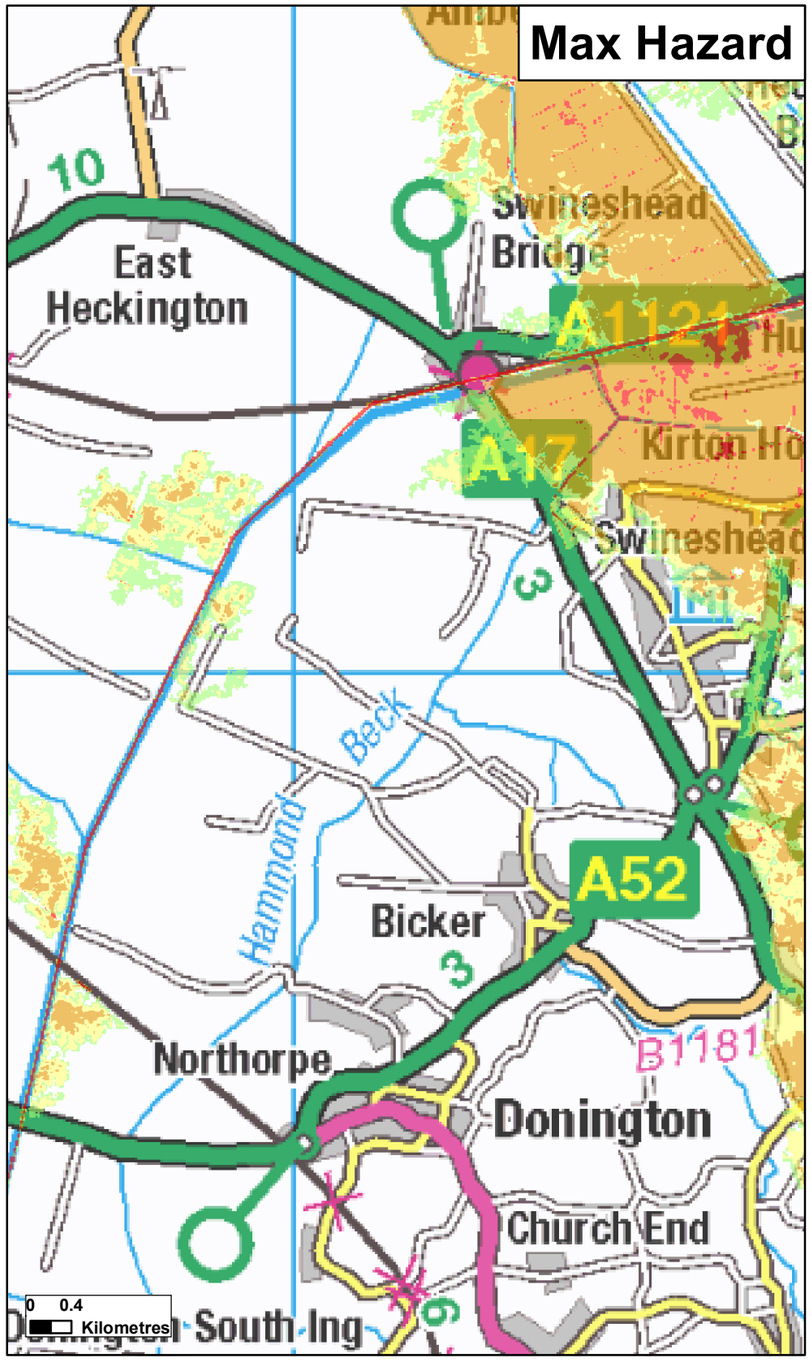

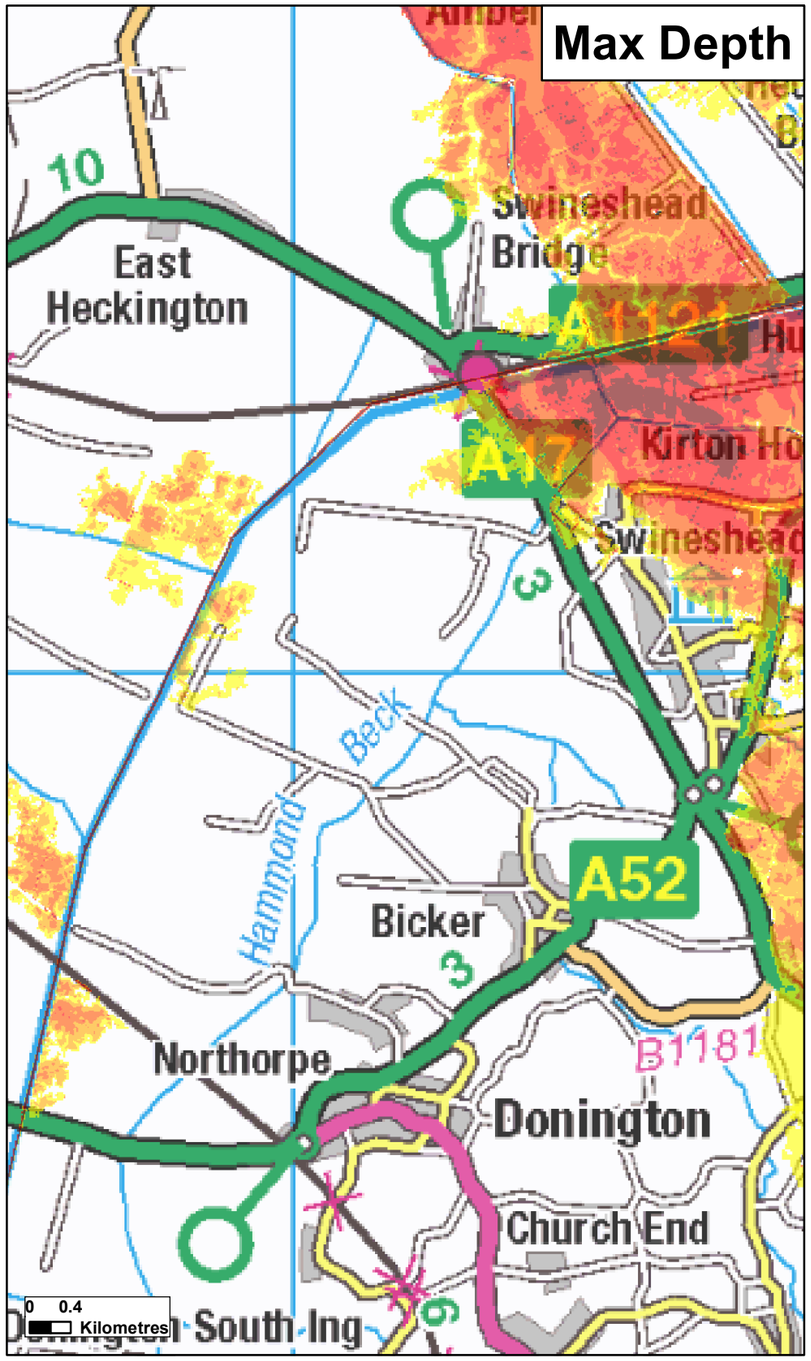

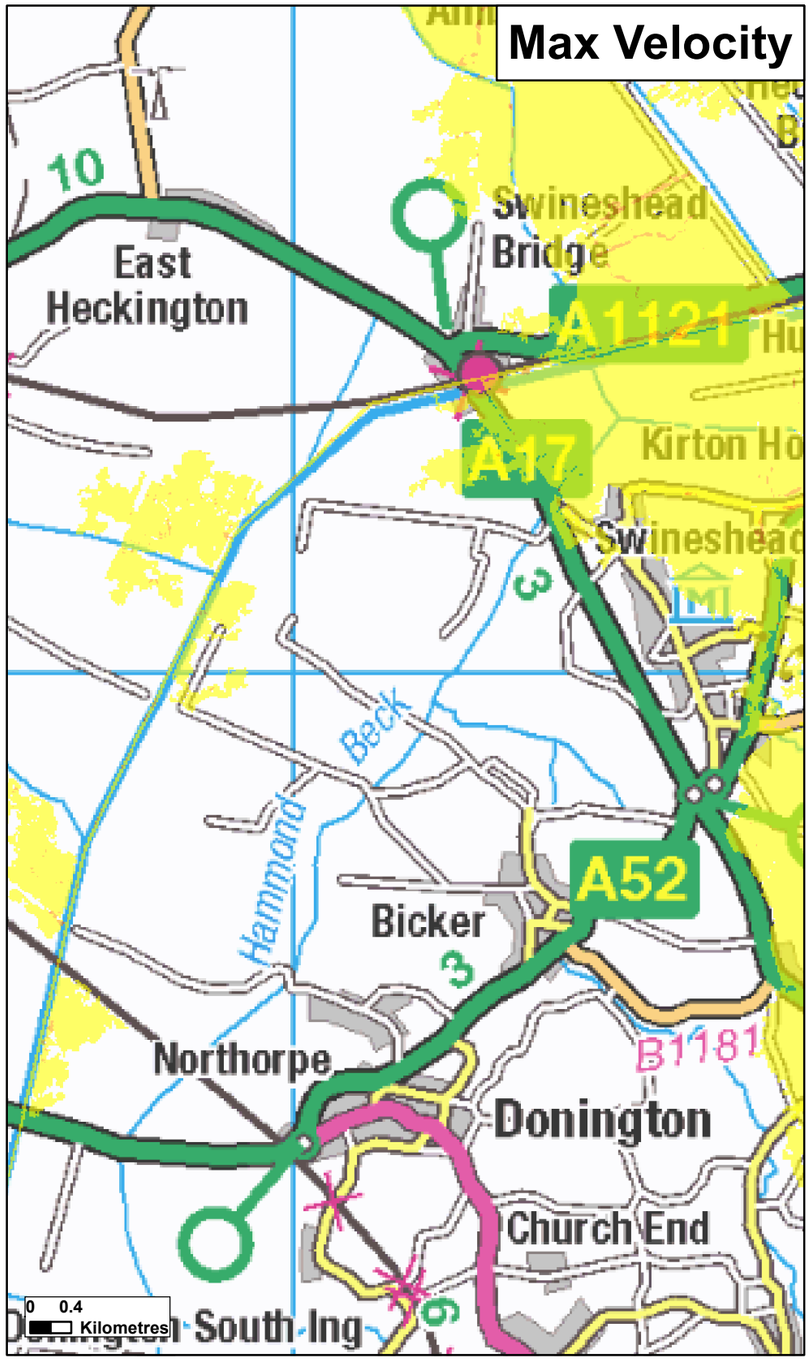

★ **Modelled Breach Locations** - see also the accompanying plan "Location of Modelled Breaches"

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	January 2023	Scenario year	2115	Scenario Annual Chance	0.1% (1 in 1000)	CCN Number	CCN-2022-292902

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.

The map only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring. The likelihood of a breach occurring will depend on a number of different factors, including the construction and condition of the defences in the area. A breach is less likely where defences are of a good standard, but a risk of breaching remains.

General Enquiries No: 03708 506 506. Weekday Daytime calls cost 5p plus up to 6p per minute from BT Weekend Unlimited. Mobile and other providers' charges may vary

Environment Agency

Lincolnshire and Northamptonshire Hazard Mapping

Map Centred on TF 21099 39917

C Hydraulic Modelling report

D Pegasus Group report – Sequential Test and Exception Test

E Surface Water Drainage Strategy Report

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