FENWICK SOLAR FARM

Preliminary Environmental Information Report

Volume III Appendix 9-3: Preliminary Flood Risk Assessment

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BOOM-POWER.CO.UK

Prepared for:
Fenwick Solar Project Limited

Prepared by:
AECOM Limited

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1. Introduction

1.1 Context

1.1.1 This Preliminary Flood Risk Assessment (PFRA) forms an appendix to the **Preliminary Environmental Information Report (PEIR) Volume I Chapter 9: Water Environment** for the Fenwick Solar Farm (the Scheme). Further information on the Scheme is included within **PEIR Volume I Chapter 2: The Scheme**. A full Flood Risk Assessment (FRA) will be developed to support the Environmental Statement (ES).

1.1.2 This report considers the flood risk posed to, and from the Scheme from all sources of flooding in accordance with the National Policy Statements (NPS) for Energy (NPS EN-1) (Ref. 1), NPS EN-3 (Ref. 2), NPS EN-5 (Ref. 3), the National Planning Policy Framework (NPPF) (Ref. 4), supporting Planning Practice Guidance (PPG) (Ref. 5), and other relevant legislation and policy related to Development Consent Orders (DCOs). Further information on planning policy and guidance is detailed in **PEIR Volume III Appendix 9-1: Legislation, Policy and Guidance (Water Environment)**.

1.2 FRA Objectives

1.2.1 The minimum requirements for FRAs, as outlined in the NPS EN-1 (paragraph 5.8.15) (Ref. 1) are to:

a. "be proportionate to the risk and appropriate to the scale, nature and location of the project;

b. consider the risk of flooding arising from the project in addition to the risk of flooding to the project;

c. take the impacts of climate change into account, across a range of climate scenarios, clearly stating the development lifetime over which the assessment has been made;

d. be undertaken by competent people, as early as possible in the process of preparing the proposal;

e. consider both the potential adverse and beneficial effects of flood risk management infrastructure, including raised defences, flow channels, flood storage areas and other artificial features, together with the consequences of their failure and exceedance;

f. consider the vulnerability of those using the site, including arrangements for safe access and escape;

g. consider and quantify the different types of flooding (whether from natural and human sources and including joint and cumulative effects) and include information on flood likelihood, speed-of-onset, depth, velocity, hazard and duration;

h. identify and secure opportunities to reduce the causes and impacts of flooding overall, making as much use as possible of natural flood management techniques as part of an integrated approach to flood risk management;

i. consider the effects of a range of flooding events including extreme events on people, property, the natural and historic environment and river and coastal processes;

j. include the assessment of the remaining (known as ‘residual’) risk after risk reduction measures have been taken into account and demonstrate that these risks can be safely managed, ensuring people will not be exposed to hazardous flooding;

k. consider how the ability of water to soak into the ground may change with development, along with how the proposed layout of the project may affect drainage systems[…]

l. detail those measures that will be included to ensure the development will be safe and remain operational during a flooding event throughout the development’s lifetime without increasing flood risk elsewhere;

m. identify and secure opportunities to reduce the causes and impacts of flooding overall during the period of construction; and

n. be supported by appropriate data and information, including historical information on previous events.

1.2.2 The principal objectives of the PFRA and FRA, taking into account the above, are to:

a. Identify potential sources of flooding, including rivers, watercourses, surface water flooding, groundwater flooding, flooding from sewer systems and other sources of flooding, relevant to the Scheme;

b. Establish the risk of flooding in relation to the Scheme;

c. Determine the effects of the Scheme on flooding elsewhere either through displacement of floodwaters or increased runoff; and

d. Suggest appropriate flood mitigation measures for the Scheme, including a strategy for management of surface water run-off following the principles of SuDS.

1.3 Consultation

1.3.1 During the pre-application stage, including Environmental Impact Assessment Scoping, meetings are being and have been held with the following stakeholders to agree flood risk and drainage proposals:

a. Doncaster Council (Lead Local Flood Authority (LLFA));

b. Yorkshire Water;

c. Danvm Drainage Commissioners Internal Drainage Board (IDB); and

d. Environment Agency.

1.3.2 Further details on the meetings held to date with the above stakeholders are presented in **PEIR Volume I Chapter 9: Water Environment**.

1.3.3 Consultation with the Environment Agency and LLFA including climate change and the requirements for additional hydraulic modelling are currently ongoing and further work will be undertaken to inform the full FRA for the ES.

1.4 The Scheme

1.4.1 The Scheme is a proposed solar farm which would generate renewable energy for exporting to the National Grid.

1.4.2 The Scheme would comprise the construction, operation and maintenance, and decommissioning of a solar photovoltaic (PV) electricity generating facility with a total capacity exceeding 50 megawatts (MW) together with energy storage (referred to as the Battery Energy Storage System (BESS)) and an export connection to the National Grid via the Existing National Grid Thorpe Marsh Substation. The Scheme will be located within the 'Site' (as described in Section 2) and will be the subject of the DCO Application. Further information on the Scheme is included within **PEIR Volume I Chapter 2: The Scheme**.

2. Site Description

2.1 Location

2.1.1 The Site comprises an area of approximately 536 hectares (ha) located within the administrative area of the City of Doncaster Council.

2.1.2 The Site comprises the Solar PV Site, Grid Connection Corridor and the Existing National Grid Thorpe Marsh Substation. The rationale for selecting the Site is described in **PEIR Volume I Chapter 3: Alternatives and Design Evolution**. The maximum extent of land that is expected to be included within the DCO Application for the Site, including the maximum area of the Grid Connection Corridor, is shown in **PEIR Volume II Figure 1-2: Site Boundary Plan**. This represents the current maximum (and where relevant, minimum) extent of land being considered and may be further refined at the ES stage.

2.1.3 The Site comprises of land which is predominantly agricultural in nature. Landscape features immediately surrounding the Solar PV Site comprise largely agricultural fields and small rural villages, including Fenwick, Moss and Sykehouse, as well as the hamlet of Topham.

2.1.4 A full description of the Site is contained within **PEIR Volume I Chapter 2: The Scheme**.

3. Legislation and Planning Policy

3.1 Introduction

3.1.1 Legislation, planning policy and guidance relating to flood risk and pertinent to the Scheme is set out in the following sections.

3.2 National Planning Policy

Overarching National Policy Statement for Energy (EN-1)

3.2.1 NPS EN-1 (Ref. 1) sets out the Government's policy for the development of nationally significant infrastructure projects (NSIPs) which must be authorised by a DCO.

3.2.2 The objectives of this PFRA are in line with paragraph 5.8.15 of NPS EN-1 which are outlined in paragraph 1.2.1 above.

3.2.3 Paragraph 5.8.18 of NPS EN-1 recommends that applicants should arrange pre-application discussions with the Environment Agency, and, where relevant, other bodies such as LLFAs, IDBs, sewerage undertakers, navigation authorities, highways authorities and reservoir owners and operators. Discussions should identify the likelihood and possible extent and nature of the flood risk, help scope the FRA, and identify the information that will be required by the Secretary of State to reach decision on the application when it is submitted. This PFRA is compliant with paragraph 5.8.18 of NPS EN-1, as consultation is ongoing with the Environment Agency and further consultation will other relevant bodies will be undertaken at ES stage.

3.2.4 NPS EN-1 states at paragraph 5.8.6 to 5.8.8 that the "aims of planning policy on development and flood risk are to ensure that flood risk from all sources of flooding is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to steer new development to areas with the lowest risk of flooding. [5.8.7] Where new energy infrastructure is, exceptionally, necessary in flood risk areas (for example where there are no reasonably available sites in areas at lower risk), policy aims to make it safe for its lifetime without increasing flood risk elsewhere and, where possible, by reducing flood risk overall. It should also be designed and constructed to remain operational in times of flood. [5.8.8] Proposals that aim to facilitate the relocation of existing energy infrastructure from unsustainable locations which are or will be at unacceptable risk of flooding, should be supported where it would result in climate-resilient infrastructure." This PFRA is compliant with paragraphs 5.8.6 to 5.8.8 of NPS EN-1, as it documents how flood risk has been considered in all planning stages and describes how the Scheme will remain safe for its lifetime without increasing flood risk elsewhere.

3.2.5 NPS EN-1 states at paragraph 5.8.9 that "If, following application of the Sequential Test, it is not possible, (taking into account wider sustainable development objectives), for the project to be located in areas of lower flood risk the Exception Test can be applied as defined in *https://www.gov.uk/guidance/flood-risk-and-coastal-change#table2*. The test provides a method of allowing necessary development to go ahead situations where suitable sites at lower risk of flooding are not available."

This PFRA is compliant with paragraph 5.8.9 of NPS EN-1, as the Sequential and Exception Tests have been applied as described in Section 8.

3.2.6 NPS EN-1 states at paragraph 5.8.10 that “The Exception Test is only appropriate for use where the Sequential Test alone cannot deliver an acceptable site. It would only be appropriate to move onto the Exception Test when the Sequential Test has identified reasonably available, lower risk sites appropriate for the proposed development where, accounting for wider sustainable development objectives, application of relevant policies would provide a clear reason for refusing development in any alternative locations identified. Examples could include alternative site(s) that are subject to national designations such as landscape, heritage and nature conservation designations, for example Areas of Outstanding Natural Beauty (AONBs), SSSIs and World Heritage Sites (WHS) which would not usually be considered appropriate.” This PFRA is compliant with paragraph 5.8.9 of NPS EN-1, as the Sequential and Exception Tests have been applied as described in Section 8.

3.2.7 Paragraph 5.8.11 of NPS EN-1 states that *“Both elements of the Exception Test will have to be satisfied for development to be consented. To pass the Exception Test it should be demonstrated that:*

a. The project would provide wider sustainability benefits to the community that outweigh flood risk; and

b. The project will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible will reduce flood risk overall.”

3.2.8 This PFRA is compliant with paragraph 5.8.11 of NPS EN-1, as the Exception Test has been applied as described in Section 8.

3.2.9 Paragraph 5.8.12 of NPS EN-1 states that "Development should be designed to ensure there is no increase in flood risk elsewhere, accounting for the predicted impacts of climate change throughout the lifetime of the development. There should be no net loss of floodplain storage and any deflection or constriction of flood flow routes should be safely managed within the site. Mitigation measures should make as much use as possible of natural flood management techniques.” This PFRA is compliant with paragraph 5.8.12 of NPS EN-1, as the Scheme will be designed to ensure no increase in flood risk elsewhere, accounting for climate change.

3.2.10 Paragraph 5.8.29 of NPS EN-1 requires a sequential approach to be applied to the layout and design of the Scheme with more vulnerable uses being located on parts of the site at lower probability and residual risk of flooding by using SuDS. This PFRA is compliant with paragraph 5.8.29 of NPS EN-1, as a sequential approach has been applied to the layout and design of the Scheme and SuDS have been proposed, as described in Section 7.

3.2.11 Paragraphs 5.8.41 of NPS EN-1 states that energy projects should not normally be consented within Flood Zone 3b or on land expected to fall within this zone within its predicted lifetime. However, it clarifies that where essential energy infrastructure has to be located in such areas, for operational reasons, they should only be consented if the Scheme will not result in a net loss of floodplain storage, and will not impede water flows. This PFRA is compliant with paragraph 5.8.41 of NPS EN-1 as a sequential approach has been applied to the Scheme to avoid areas at high flood risk and hydraulic modelling will be undertaken to confirm Flood Zone 3b at the ES stage.

3.2.12 Paragraph 5.8.27 of NPS EN-1 states that “the surface water drainage arrangements for any project should, accounting for the predicted impacts of climate change throughout the development’s lifetime, be such that the volumes and peak flow rates of surface water leaving the site are no greater than the rates prior to the proposed project, unless specific off-site arrangements are made and result in the same net effect”. This PFRA is compliant with paragraph 5.8.27 of NPS EN-1, as it considers drainage for the Scheme.

3.2.13 Paragraph 5.8.28 of NPS EN-1 also states that it “may be necessary to provide surface water storage and infiltration to limit and reduce both the peak rate of discharge from the site and the total volume discharged from the site. There may be circumstances where it is appropriate for infiltration facilities or attenuation storage to be provided outside the project site, if necessary through the use of a planning obligation”. This PFRA is compliant with paragraph 5.8.28 of NPS EN-1, as it considers drainage for the Scheme.

National Policy Statement for Renewable Energy Infrastructure NPS EN-3

3.2.14 Paragraph 2.4.11 of NPS EN-3 (Ref. 2) notes that *“Solar photovoltaic (PV) sites may also be proposed in low lying exposed sites. For these proposals, applicants should consider, in particular, how plant will be resilient to:*

a. Increased risk of flooding; and

b. Impact of higher temperature.”

3.2.15 Paragraph 2.10.60 states “[…] applicants will consider several factors when considering the design and layout of sites, including, proximity to available grid capacity to accommodate the scale of generation, orientation, topography, previous land – use and ability to mitigate environmental impacts and flood risk”. This PFRA is compliant with paragraph 2.10.60 of NPS EN-3, as design of the Scheme has considered all factors as described in Section 8.

3.2.16 Paragraph 2.10.84 notes that “Where a Flood Risk Assessment has been carried out this must be submitted alongside the applicant's ES. This will need to consider the impact of drainage. As solar PV panels will drain to the existing ground, the impact will not, in general, be significant.” This PFRA is compliant with paragraph 2.10.84 of NPS EN-3, as it considers drainage for the Scheme.

3.2.17 Paragraph 2.10.154 states “Water management is a critical component of site design for ground mount solar plants. Where previous management of the site has involved intensive agricultural practice, solar sites can deliver significant ecosystem services value in the form of drainage, flood attenuation, natural wetland habitat, and water quality management.” This PFRA is compliant with paragraph 2.10.154 of NPS EN-3, as it considers water management as described in Section 8.

National Policy Statement for Electricity Networks Infrastructure (EN-5) (2023)

3.2.18 National Policy Statement for Electricity Networks Infrastructure EN-5 (NPS EN-5) (Ref. 3) principally concerns high voltage transmission systems and distribution systems in addition to associated infrastructure.

3.2.19 Paragraph 2.3.2 of NPS EN-5 explain that as climate change is likely to increase risks to the resilience of electrical infrastructure it requires applicants to "*set out to what extent the proposed development is expected to be vulnerable, and, as appropriate, how it has been designed to be resilient to:*

a. flooding, particularly for substations that are vital to the network; and especially in light of changes to groundwater levels resulting from climate change;

b. the effects of wind and storms on overhead lines;

c. higher average temperatures leading to increased transmission losses;

d. earth movement or subsidence caused by flooding or drought (for underground cables)."

National Planning Policy Framework (NPPF)

3.2.20 The NPPF (Ref. 4) was first published in March 2012, superseding previous national planning policy statements and guidance. The NPPF was subsequently revised in July 2021, September 2023 and December 2023, and this PFRA complies with the revised version of the NPPF.

3.2.21 Section 14 of the NPPF (Ref. 4), entitled Meeting the Challenge of Climate Change, Flooding and Coastal Change (paragraphs. 157-179), sets out the requirements to assess flood risk and climate change for developments. Paragraph 175 expects "*major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate […].*"

3.2.22 NPPF (Ref. 4) Annex 3: Flood risk vulnerability classification classifies the Flood Risk Vulnerability of various land uses. The Scheme falls within the definition of 'Essential Infrastructure'.

3.2.23 The Flood Risk and Coastal Change Planning Practice Guidance (PPG) (Ref. 5) is referenced in footnote 214 of NPS EN-1 and provides guidance on application of the Sequential Test. The PPG was last updated in August 2022; this PFRA complies with this and all other current national and local policy.

3.2.24 The assessment of flood risk is based on the definitions in Table 3-1 as extracted from Table 1 of the PPG (Ref. 5).

Table 3-1: Flood Zones

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Environment Agency Flood Risk Map (for

Flood Zone	Definition
	Rivers and Sea) (Ref. 6) – all land outside Zones 2 and 3). Flood Zones are displayed on **PEIR Volume II Figure 9-4: Environment Agency Flood Map for Planning (Rivers and Seas)**.
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Environment Agency Flood Risk Map (for Rivers and Sea)).
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding. (Land shown in dark blue on the Environment Agency Flood Risk Map (for Rivers and Sea)).
Zone 3b The Functional Floodplain	This zone comprises land where water from rivers or the sea has to flow or be stored in times of flood. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. Functional floodplain will normally comprise: a. Land having a 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively; or b. Land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding). Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Environment Agency Flood Risk Map (for Rivers and Sea).

The Sequential Test and Exception Test

3.2.25 NPS EN-1 and the NPPF (Ref. 4) set out the details of the Sequential Test, which is a risk-based test that should be applied at all stages of development.

3.2.26 All plans should apply a sequential, risk-based approach to the location of development – taking into account all sources of flood risk and the current and future impacts of climate change – so as to avoid, where possible, flood risk to people and property. They should do this, and manage any residual risk, by:

a. Applying the sequential test and then, if necessary, the exception test as set out below;

b. Safeguarding land from development that is required, or likely to be required, for current or future flood management;

c. Using opportunities provided by new development and improvements in green and other infrastructure to reduce the causes and impacts of flooding, (making as much use as possible of natural flood management techniques); and

d. Where climate change is expected to increase flood risk so that some existing development may not be sustainable in the long-term, seeking opportunities to relocate development, including housing, to more sustainable locations.

3.2.27 The aim of the Sequential Test is to steer new development to areas with the lowest risk of flooding from any source. Development should not be allocated or permitted if there are reasonably available sites appropriate for the development in areas with a lower risk of flooding. The Strategic Flood Risk Assessment (SFRA) will provide the basis for applying this test. The sequential test approach should be used in areas known to be at risk now or in the future from any forms of flooding.

3.2.28 If 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 Exception Test may have to be applied. The need for the Exception Test will depend on the potential vulnerability of the site and of the development proposed, (in line with the Flood Risk Vulnerability Classification set out in Annex 3). Table 3-2 below reproduces the flood risk vulnerability and flood zone compatibility, as set out in Table 2 of the PPG (Ref. 5). It does not show the application of the Sequential Test which should be applied first to guide development to the lowest flood risk areas.

Table 3-2: Flood Risk Vulnerability and Flood Zone Compatibility

Flood Zone	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test Required	✓	✓	✓
Zone 3a	Exception Test Required	×	Exception Test Required	✓	✓
Zone 3b (functional floodplain)	Exception Test Required	×	×	×	✓

Flood Zone	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water compatible
✓ Exception test is not required					
× Development should not be permitted					
Flood Zones that the Scheme sits within					

3.2.29 The NPPF states in paragraph 170 that *"To pass the exception test it should be demonstrated that:*

a. the development would provide wider sustainability benefits to the community that outweigh the flood risk; and

b. the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall".

3.2.30 The NPPF provides at Paragraph 171 that both elements of the Exception Test should be satisfied for development to be allocated or permitted.

3.3 Local Planning Policy

Local Plan

3.3.1 The Doncaster Local Plan (Ref. 7) was adopted in 2021 and sets out how Doncaster Borough will grow and develop from 2015 to 2035. Within the document, the following policies are relevant to flood risk and drainage:

Policy 56: Drainage

"Development sites must incorporate satisfactory measures for dealing with their drainage impacts to ensure waste water and surface water run-off are managed appropriately and to reduce flood risk to existing communities. Proposals will be supported therefore in line with the following requirements:

a. There is adequate means of foul sewage disposal and treatment or that capacity can be made available in time to serve the development.

b. They will not increase flood risk on site and ensure no flooding to land or buildings elsewhere.

c. They achieve a reduction in surface water run off on brownfield sites, and no increase on existing rates for greenfield sites.

d. They secure the removal of culverting and avoid building over a culvert or new culverting of watercourses and a 10 metre buffer zone is left free from development from the water's edge.

e. They make use of Sustainable Drainage Systems unless it can be shown to be technically unfeasible.

f. They dispose of surface water appropriately according to the following networks in order of preference:

i. to an infiltration-based system wherever possible (such as soakaways).

ii. *discharge into a watercourse with the prior approval of the landowner and navigation authority (following treatment where necessary).*

iii. *discharge to a public water sewer or highway drain.*

Policy 57: Flood Risk Management

a. *"All development proposals will be considered against the NPPF, including application of the sequential test and, if necessary, the exception test.*

b. *The extent and detailed boundaries of the functional flood plain (flood zone 3b) are identified through the Council's Strategic Flood Risk Assessment, in agreement with the Environment Agency, where national policy will be applied.*

c. *All windfall development proposals outside of Development Allocations in Flood Zones 2 and 3a will be supported as follows: […]*

   i. *All other proposals: will normally require a borough-wide area of search unless a case can be made to narrow the search area due to certain locational needs of the development or specific catchment requirements.*

   ii. *The Council's Strategic Flood Risk Assessment identifies a number of residual flood risk areas and details development planning advice for these which should be considered when looking to develop in these areas. The Council will ensure it keeps its evidence base on flood risk up to date, including commissioning a Level 2 Strategic Flood Risk Assessment at the earliest opportunity, so that proposals outside of Development Allocations have the best available evidence on which to prepare their own site specific flood risk assessments and appropriate mitigation and to assist with successful pass of the sequential and exception Tests".*

3.3.2 In respect of Policy 57, the Scheme is captured as an 'other proposal' as it does not fall within the other categories listed withing the Policy, being Housing, Offices, Retail and Mixed Use activities.

Strategic Flood Risk Assessment

3.3.3 The Doncaster Level 1 Strategic Flood Risk Assessment (SFRA) (Ref. 8) was published in 2015 and is part of the evidence base for the Local Plan. The SFRA assesses flood risk from all sources within the local authority area. Information, where applicable, has been extracted from the SFRA to inform the risk of flooding within this PFRA, as documented in Section 5.

Local Flood Risk Management Strategy

3.3.4 As LLFA, City of Doncaster Council has the responsibility to produce and maintain a Local Flood Risk Management Strategy (LFRMS). The Doncaster LFRMS (Ref. 9) is currently being consulted on and covers the period 2023 – 2029. The LFRMS considers all local sources of flooding including from surface water, groundwater and ordinary watercourses. Information, where applicable has been extracted from the LFRMS to inform the risk of flooding within this PFRA, as documented in Section 5.

South Yorkshire Interim Local Guidance for Sustainable Drainage Systems

3.3.5 The South Yorkshire Interim Local Guidance for Sustainable Drainage Systems (Ref. 10) has been prepared by a number of local authorities (Barnsley, Doncaster, Rotherham and Sheffield) to provide developers guidance for local standards for the South Yorkshire LLFAs and promotes the use of SuDS.

3.4 Climate Change

3.4.1 The design life of the Scheme is expected to be 40 years. For the purposes of this PFRA it is anticipated that the Scheme would be decommissioned after approximately 40 years, and the assessment of flood risks which may arise from the impacts of climate change has therefore been considered for this period.

Peak River Flow Allowances

3.4.2 The Environment Agency provide peak river flow allowances that show the anticipated changes to peak flow for each management catchment (Ref. 11). The range of allowances is based on percentiles, which describe the proportion of possible scenarios that fall below an allowance level. For example, an allowance based on the 50th percentile is exceeded by 50% of the scenarios in the range. An allowance value is provided for the 50th, 70th and 95th percentile and management catchment across three epochs: 2020s, 2050s and 2080s.

3.4.3 The Scheme is located within the Don and Rother Management Catchment, where the peak river flow allowances are presented in Table 3-3.

Table 3-3: Don and Rother Management Catchment Peak River Flow Allowances

Epoch	Central (50%)	Higher Central (70%)	Upper (95%)
2020s	11%	15%	25%
2050s	15%	21%	36%
2080s	28%	38%	60%

3.4.4 Guidance from the Environment Agency states that for ‘Essential Infrastructure’ developments in Flood Zone 2 or 3a the Higher Central allowance should be used. As the lifetime of the development is 40 years, the 2050 epoch would need to be considered. This results in a necessary allowance of 21%.

Peak Rainfall Intensity Allowances

3.4.5 The Environment Agency provide allowances for peak rainfall intensity (Ref. 11). The range of allowances is based on percentiles, which describe the proportion of possible scenarios that fall below an allowance level. An allowance value is provided for the 50th (Central) 95th (Upper End) percentiles for 1% Annual Exceedance Probability (AEP) and 3.3% AEP events.

3.4.6 The Scheme is located within the Don and Rother Management Catchment, where the peak rainfall intensity allowances are applicable, as presented in Table 3-4 and Table 3-5.

Table 3-4: Don and Rother Management Catchment Peak Rainfall Intensity Allowances (1% AEP Event)

Epoch	Central (50%)	Upper (95%)
2050s	20%	40%
2070s	25%	40%

Table 3-5: Don and Rother Management Catchment Peak Rainfall Intensity Allowances (3.3% AEP Event)

Epoch	Central (50%)	Upper (95%)
2050s	20%	35%
2070s	25%	35%

3.4.7 Guidance from the Environment Agency states that for developments with a lifetime between 2061 and 2100, the Central allowance should be used for the 2070s epoch for both the 1% AEP and 3.3% AEP events. This results in a necessary allowance of 25% for both events. The Drainage Strategy for the Scheme has been designed to account for the 1% AEP event plus 40% climate change for resilience.

Credible Maximum Scenario

3.4.8 In line with Environment Agency guidance (Ref. 11), NSIPs such as power stations and power lines, flood risk should also be assessed for a credible maximum climate change scenario. The credible maximum scenario includes:

a. The H++ climate change allowance for sea level rise (not applicable for the Scheme).

b. The Upper end allowance for peak river flow (36% for Don and Rother Management Catchment).

c. The sensitivity test allowances for offshore wind speed and extreme wave height (not applicable for the Scheme).

d. An additional 2 mm for each year on top of sea level rise allowance from 2017 for storm surge (not applicable for the Scheme).

3.4.9 Climate change and the requirements for additional hydraulic modelling will be taken into account for development of the full FRA which will be submitted at the ES stage.

4. Assessment of Flood Risk Methodology

4.1 Flood Risk from All Sources

4.1.1 Flood risk from all sources are being assessed against the maximum extent of land that is expected to be included within the DCO Application for the Scheme (see **PEIR Volume II Figure 1-2: Site Boundary Plan**). These sources are:

a. Fluvial – flooding occurs when the capacity of a river is exceeded either due to high flows from the catchment draining into the river or a combination of high flows and high tides which causes the river to overflow or overtop the banks;

b. Tidal – flooding occurs during extreme high tide and/or storm surge events which may cause wave overtopping or the unlikely event of a breaching scenario of existing tidal defences. High water levels within tidally influenced estuaries and rivers may also contribute to tidal flooding;

c. Surface water – Surface water runoff is defined as water flowing over the ground that has not yet entered a drainage channel or similar. An intense period of rainfall which exceeds the infiltration capacity of the ground usually results in surface water runoff and can also occur when the capacity of the sewer or drainage network is exceeded. Typically, runoff occurs on sloping land or where the ground surface is relatively impermeable. The ground can be impermeable, either naturally through the soil type or geology, or unnaturally due to development, which places large areas of impervious material over the ground surface (e.g. paving and roads);

d. Sewer – Sewer flooding can occur because of infrastructure failure, for example blocked sewers or failed pumping stations. It can also occur when combined sewer systems surcharge due to the volume or intensity of rainfall exceeding the capacity of the sewer, or if the system becomes blocked by debris or sediment;

e. Groundwater – flooding occurs when the natural level of water stored within the ground rises above local ground level. This can result in deep and long-lasting flooding of low lying or below ground areas such as underpasses and basements. It tends to occur after long periods of sustained high rainfall, and the areas at most risk are often low-lying where the water table is more likely to be at shallow depth. Groundwater flooding is most likely to occur in areas underlain by major aquifers, although it is also associated with more localised floodplain sands and gravels; and

f. Artificial sources – flood sources include raised channels such as canals or storage features such as ponds and reservoirs:

   i. Reservoir failure can be particularly dangerous as it causes the release of a large volume of water at a high velocity, which can result in deep and widespread flooding. However, reservoir inspection and design procedures are very rigorous such that the probability of failure is generally regarded as extremely low;

4.1.2 Canals do not pose a direct flood risk given they are regulated water bodies with controlled water levels; however, flooding can still occur through a breach or overtopping. Control structures such as weirs or locks could experience a blockage or failure resulting in rising water levels and overtopping. Structural failure could lead to a breach which can potentially be hazardous as they may involve the rapid release of a large volume of water at high velocity.

4.1.3 The methodology used to assess the flood risk is detailed below:

a. **Very Low**: where very little risk is identified or any theoretical risk identified is classified as very low within Local Authority SFRAs and/or Environment Agency flood risk mapping extents, with very low probability of flooding occurring;

b. **Low**: where little risk is identified or any theoretical risk identified is classified as low within Local Authority SFRAs and/or Environment Agency flood risk mapping extents, with low probability of flooding occurring;

c. **Medium**: where risk is identified within Local Authority SFRAs and/or Environment Agency flood risk mapping extents indicating a medium probability, but manageable flood risk with little to no mitigation required; and

d. **High**: where modelled levels within Local Authority SFRA and/or Environment Agency flood risk mapping extents show risk to the Scheme as a high probability of flood risk and where mitigation needs to be considered and residual risks controlled.

5. Assessment of Flood Risk to the Solar PV Site

5.1 Overview

5.1.1 As outlined above at section 3.2.20 and section 3.2.1 the NPPF and NPS EN-1 require that all potential sources of flooding that could affect the Scheme are considered. This section of the PFRA assesses the flood risk posed to the Site from: rivers and the sea, directly from rainfall on the ground surface, rising groundwater, overwhelmed sewers and drainage systems, from reservoirs, canals, lakes and other artificial flood sources.

5.1.2 Whilst developments are typically assessed as a whole site, this assessment is split into two separate assessment sections due to the differing nature of these elements:

a. Solar PV Site (including BESS Area and On-Site Substation); and

b. Grid Connection Corridor (including the Existing National Grid Thorpe Marsh Substation).

5.1.3 This section provides the methodology for the assessment of flood risk posed to the Solar PV Site.

5.2 Fluvial

5.2.1 The majority of the south and west areas of the Solar PV Site are located within Flood Zone 1. The north and east areas of the Solar PV Site are located within Flood Zones 2 and 3 associated with the River Went (Main River) and Fleet Drain (Ordinary Watercourse). Flood Zones are illustrated on **PEIR Volume II Figure 9-4: Environment Agency Flood Map for Planning (Rivers and Seas).** Areas of Flood Zone 3 within the Solar PV Site are shown to be in areas where there is a reduction in risk of flooding from rivers and the sea due to defences (Ref. 12).

5.2.2 The BESS Area and On-Site Substation would be located within Flood Zone 1. Some Field Stations would be located within Flood Zone 2 and some Solar PV Panels would be located within areas of Flood Zone 2 and 3. On-Site Cables would be required to connect the Solar PV Panels and inverters which would typically be above ground level (along a row of racks fixed to the Solar PV Mounting Structure or fixed to other parts of nearby components). All other On-Site Cables would be underground.

5.2.3 Historic flood mapping and recorded flood outlines (Ref. 13) for the Site and surrounding area show that there have been a number of flood events where fluvial flooding occurred in the Solar PV Site. These events were recorded in 1947, 1995, 2000, 2007, 2019 and 2020. Further information and associated mapping will be included in the FRA at the ES stage.

5.2.4 Climate change and the requirements for additional hydraulic modelling will be taken into account for development of the FRA which will be submitted at the ES stage. Discussions are ongoing with the Environment Agency in relation to additional hydraulic modelling required for the River Went to inform the FRA at the ES stage.

5.2.5 Based on this information, the flood risk from fluvial sources to the south and west areas of the Solar PV Site are considered to be low, and the flood risk from fluvial sources to the north and east areas of the Solar PV Site are considered to be high.

5.3 Tidal

5.3.1 The closest tidal source to the Solar PV Site is the River Don, located to the south and east of the Solar PV Site and is tidally influenced near to the Site. The River Don, at its closest point, is located approximately 3.6 km to the south of the Solar PV Site. The Humber Estuary is another tidal source in the surrounding area, the tidal limit of the Humber Estuary is located approximately 14 km to the north east of the Site. Due to the distance from tidal sources, the flood risk to the Solar PV Site from tidal sources is considered to be low. The tidal influence of Humber Estuary on the River Don will be considered as part of the full FRA at the ES stage.

5.4 Surface Water

5.4.1 As defined by the Environment Agency (Ref. 14), the following levels of surface water flood risk can be classified as follows:

a. Very Low Risk – the area has a chance of flooding of less than 0.1% each year;

b. Low Risk – the area has a chance of flooding of between 0.1% and 1% each year;

c. Medium Risk – the area has a chance of flooding of between 1% and 3.3% each year; or

d. High Risk – the area has a chance of flooding of greater 3.3% each year.

5.4.2 A review of the Environment Agency Long Term Flood Risk Map (Ref. 14) indicates that the risk to the majority of the Solar PV Site is generally very low. There are isolated areas at low to high risk of flooding which are likely associated with areas of low topography. The map also shows areas at low to high risk associated with smaller ordinary watercourses and/or local land drains. The risk of surface water flooding is illustrated in **PEIR Volume II Figure 9-5: Risk of Flooding from Surface Water**. Based on this information, the flood risk from surface water to the majority of the Solar PV Site is considered to be very low, with isolated areas at low to high risk.

5.5 Groundwater

5.5.1 A review of the Doncaster Level 1 SFRA (Ref. 8) indicates that the Solar PV Site is located in an area where there is a <25% chance of groundwater emergence. It is considered that groundwater flood risk is unlikely to increase from the Solar PV Site as the majority of the infrastructure (e.g. Solar PV Panels, Field Stations, BESS Battery Containers, On-Site Substation, etc.) would be above the ground surface. Infiltration into the soil and underlying geology would remain as existing conditions. Therefore, it is considered that there is a low risk of groundwater flooding to the Solar PV Site. Further mapping information will be sought from the British Geological

Survey (BGS) to confirm the susceptibility of groundwater flooding at the ES Stage.

5.6 Sewer

5.6.1 As the Solar PV Site is located within a rural area, it is unlikely flooding from sewers will impact the Solar PV Site. A search undertaken to identify Yorkshire Water sewerage assets within the Solar PV Site did not identify any public sewers. The Doncaster Level 1 SFRA mapping (Ref. 8) shows no historic sewer flooding incidents at the Solar PV Site. Therefore, it is considered that there is a very low risk of sewer flooding to the Solar PV Site.

5.7 Artificial Sources

5.7.1 According to the Environment Agency Long Term Flood Risk Map (Ref. 14), the north, east and southern areas of the Solar PV Site are located within an area at risk of flooding from reservoirs when there is also flooding from rivers. The risk of flooding from reservoirs is illustrated in Plate 5-1. The consequences from a reservoir failure could be severe, however, the Environment Agency note that this is a worst-case prediction; reservoirs are maintained to a very high standard and are extremely unlikely to fail.

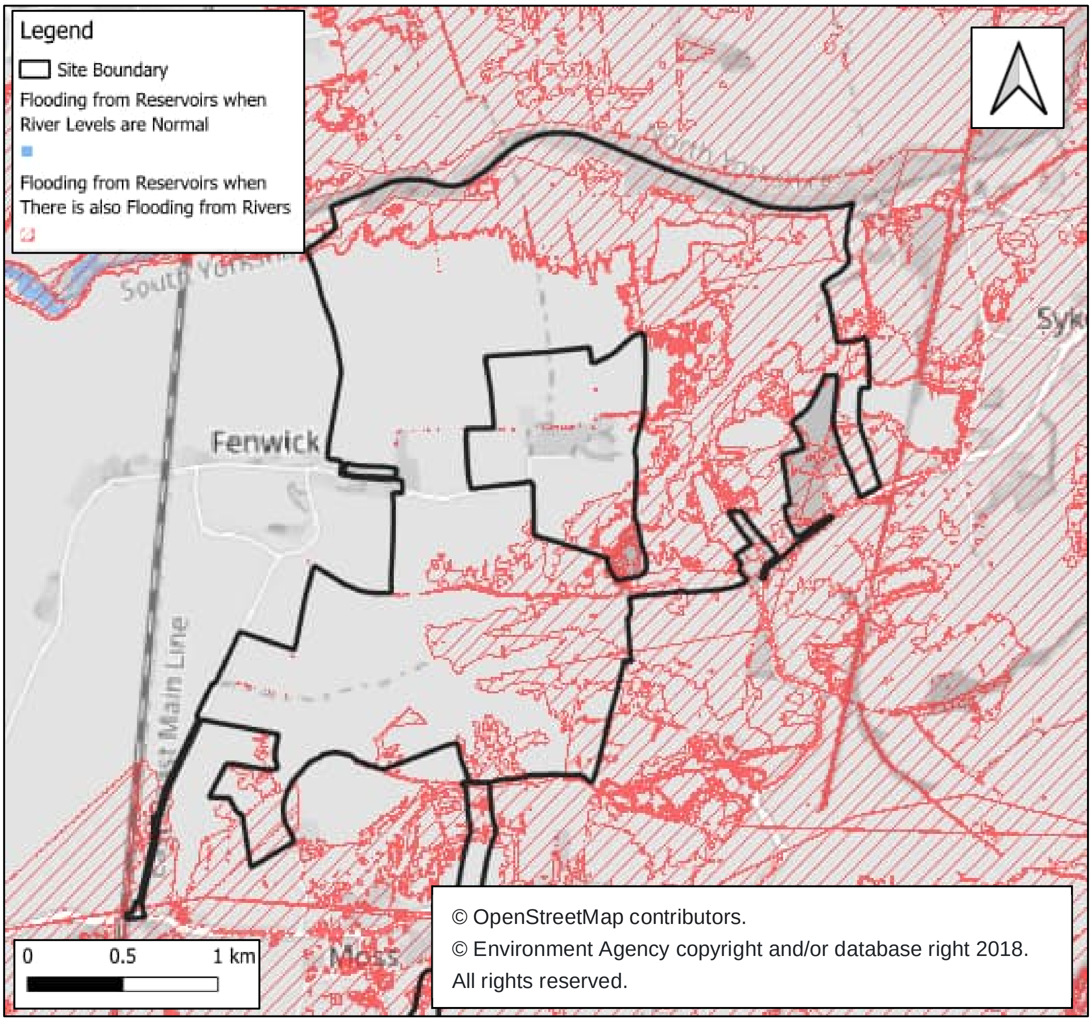

Plate 5-1: Environment Agency Extent of Reservoir Flooding Mapping Across the Solar PV Site

5.7.2 The closest other artificial source of flooding is the New Junction Canal, however this is located approximately 1.8 km to the east of the Solar PV Site and is therefore unlikely to pose a flood risk.

5.7.3 Based on this information, the flood risk from artificial sources to the Solar PV Site is considered to be low.

5.8 Summary

5.8.1 A summary of flood risk from all sources to the Solar PV Site is provided in Table 5-1.

Table 5-1: Summary of Flood Risk to the Solar PV Site

Flood Mechanism	Source	Flood Risk to the Scheme	Mitigation Required
Fluvial	Main Rivers/Ordinary Watercourses	Low (south and west areas), high (north and east areas)	Yes: sequential location of infrastructure, within Flood Zone 1 and Flood Zone 2. The minimum height of the lowest part of the solar PV panels should be 300 mm above the design flood level. Field Stations should be raised 300 mm above the design flood level. Where On-Site Cables are required above ground, these should be raised 300 mm above the design flood level. Additional mitigation to be determined at the ES stage.
Tidal	Tidally influenced River Don	Low	No
Surface Water	Runoff from surrounding land and hard surfaces	Very low (majority), low – high (localised areas)	Yes: Any Field Stations within high surface water flood risk areas should be raised 300 mm above surface water flood level.
Groundwater	Rising groundwater levels in the underlying geology	Low	None during operation. Yes during construction: Construction Environmental Management Plan (CEMP) will be prepared at the ES stage including flood risk measures.
Sewer	Surrounding public/private drainage systems	Very low	No
Artificial Sources	Reservoirs/canals	Low	No

6. Flood Risk to the Grid Connection Corridor

6.1 Overview

6.1.1 As detailed in **PEIR Volume I Chapter 2: The Scheme**, the On-Site Substation would connect to the Existing National Grid Thorpe Marsh Substation via a Grid Connection Line Drop within the Solar PV Site or Grid Connection Cables in the Grid Connection Corridor. If the Grid Connection Line Drop is taken forward by the Scheme, the Grid Connection Corridor will not be required. This section assesses the flood risk posed to the Grid Connection Corridor (including the Existing National Grid Thorpe Marsh Substation), should this option be taken forward.

6.2 Fluvial

6.2.1 The Grid Connection Corridor is largely located within areas of Flood Zone 3 with smaller areas of Flood Zone 2 along its central section. Flood Zone 2 and 3 in this area is associated with the River Don. Approximately 0.7 km of the Grid Connection Corridor is located within Flood Zone 1 towards its northern extent. Flood Zones are illustrated on **PEIR Volume II Figure 9-4: Environment Agency Flood Map for Planning (Rivers and Seas)**. The majority of the Flood Zone 3 area along the Grid Connection Corridor is not located within an area with a reduction in risk of flooding from rivers and the sea due to defences. The Existing National Grid Thorpe Marsh Substation is located within Flood Zones 2 and 3.

6.2.2 The Grid Connection Corridor intersects a flood defence embankment along the eastern bank of the River Don. The Grid Connection Corridor crosses the Thorpe Marsh Drain Main River and five ordinary watercourses (Mill Dyke, Wrancarr Drain, Engine Dyke under Marsh Road, Engine Dyke parallel to Thorpe Marsh Drain and Hawkehouse Green Dyke) which pose a fluvial flood risk.

6.2.3 Climate change and the requirements for additional hydraulic modelling will be taken into account for development of the FRA of the Grid Connection Corridor which will be submitted at the ES stage.

6.2.4 Based on this information, the flood risk to the Grid Connection Corridor from fluvial sources is considered to be high. However, the Grid Connection Cables will be buried and therefore unlikely to be impacted from fluvial sources.

6.3 Tidal

6.3.1 The closest tidal source to the Grid Connection Corridor is the River Don which is tidally influenced near to the Site. The Grid Connection Corridor runs parallel to the River Don at is southern extent.

6.3.2 Based on this information, the flood risk to the Grid Connection Corridor from tidal sources is considered to be high. However, the Grid Connection Cables will be buried and therefore unlikely to be impacted from tidal sources.

6.4 Surface Water

6.4.1 A review of the Environment Agency Long Term Flood Risk Map (Ref. 14) indicates that the risk of flooding from surface water is generally very low. There are isolated areas at low to high risk of flooding which are likely associated with areas of low topography. The map also shows areas at low to high risk associated with smaller ordinary watercourses and/or local land drains which the Grid Connection Corridor crosses. Flood risk from surface water is illustrated in **PEIR Volume II Figure 9-5: Risk of Flooding from Surface Water**. Based on this information, the flood risk from surface water to the majority of the Grid Connection Corridor is considered to be very low, with isolated areas at low to high risk.

6.5 Groundwater

6.5.1 A review of the Doncaster Level 1 SFRA (Ref. 8) indicates that the northern stretch of the Grid Connection Corridor is located in an area where there is a <25% chance of groundwater emergence. The middle stretch of the Grid Connection Corridor is in an area where there is between >25% and >=50% chance of groundwater emergence. The southern stretch of the Grid Connection Corridor where it connects to the Existing National Grid Thorpe Marsh Substation is located in an area where there is a >=75% chance of groundwater emergence. Therefore, it is considered that there is a low risk of groundwater flooding to the northern and middle stretches of the Grid Connection Corridor and a high risk of groundwater flooding to the southern stretch of the Grid Connection Corridor. Further information will be sought from the BGS Groundwater Flood Map at the ES Stage.

6.6 Sewer

6.6.1 As the Grid Connection Corridor is located within a rural area, it is unlikely that flooding from sewers will impact the Grid Connection Corridor. A search undertaken to identify Yorkshire Water sewerage assets within the Grid Connection Corridor did not identify any public sewers. The Doncaster Level 1 SFRA mapping (Ref. 8) shows no historic sewer flooding incidents within the Grid Connection Corridor. Therefore, it is considered that there is a very low risk of sewer flooding within the Grid Connection Corridor.

6.7 Artificial Sources

6.7.1 According to the Environment Agency Long Term Flood Risk Map (Ref. 14), the majority of the Grid Connection Corridor is located within an area at risk of flooding from reservoirs when there is also flooding from rivers. Small areas of the Grid Connection Corridor are also located within areas where there is a risk of flooding from reservoirs when river levels are normal. The risk of flooding from reservoirs is illustrated in Plate 6-1. The consequences from a reservoir failure could be severe, however, the Environment Agency note that this is a worst-case prediction; reservoirs are maintained to a very high standard and are extremely unlikely to fail.

6.7.2 The closest other artificial source of flooding is the Dun Navigation Canal, located approximately 0.1 km to the east of the Grid Connection Corridor at its closest point. However, the canal levels are monitored and maintained by the Canal and Rivers Trust. As a result, overtopping is unlikely. From a review of mapping, the River Don is situation between the Dun Navigation Canal and the Grid Connection Corridor and it appears that the River Don is raised above surrounding ground levels. In the unlikely event that the Dun Navigation Canal fails, floodwaters would propagate into the River Don. Based on the above, and the therefore the Grid Connection Corridor is at low risk of flooding from the canal.

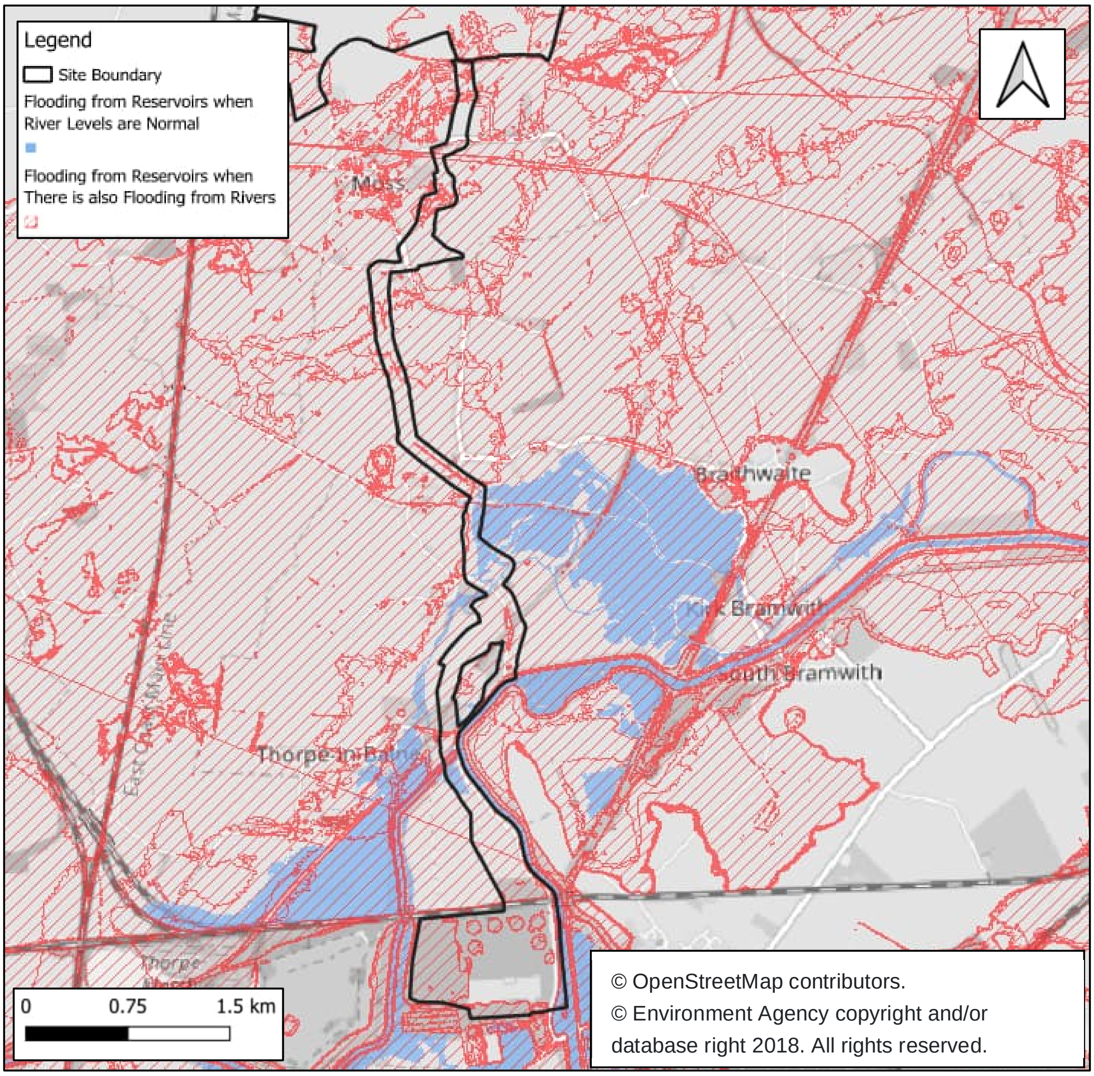

Plate 6-1: Environment Agency Extent of Reservoir Flooding Mapping Along the Grid Connection Corridor

6.7.3 The risk of flooding from this source is considered very low as the Grid Connection Cable would be buried.

6.8 Summary

6.8.1 A summary of flood risk from all sources to the Grid Connection Corridor is provided in Table 6-1.

Table 6-1: Summary of Flood Risk to the Grid Connection Corridor

Flood Mechanism	Source	Flood Risk to the Scheme	Mitigation required
Fluvial	Main Rivers/Ordinary Watercourses	High	None during operation: Grid Connection Corridor is via buried cables, therefore unlikely to be impacted by above ground fluvial sources. Yes during construction: CEMP will be prepared at ES stage including flood risk measures.
Tidal	Tidally influenced River Don	High	None during operation: Grid Connection Corridor is via buried cables, therefore unlikely to be impacted by above ground tidal sources. Yes during construction: CEMP will be prepared at ES stage including flood risk measures.
Surface Water	Runoff from surrounding land and hard surfaces	Very low (majority), low – high (localised areas)	No
Groundwater	Rising groundwater levels in the underlying geology	Low (northern and middle section), High (southern section)	Yes: The cable and cable ducting will be designed to prevent water ingress. Additional mitigation to be determined at ES stage.
Sewer	Surrounding public/private drainage systems	Very low	No
Artificial Sources	Reservoirs/canals	Very low	No

7. Flood Risk from the Scheme

7.1 Overview

7.1.1 Built development can lead to an increased risk of flooding by increasing surface water runoff. Development often increases the area of impermeable surfaces thereby promoting rapid run-off to surface water sewers or watercourses rather than percolation into the ground. The effect can be to increase both total and peak water flows, contributing to flooding.

7.1.2 However, the NPS EN-3 (Renewable Energy Infrastructure) highlights in paragraph 2.10.84 that:

"As solar PV panels will drain to the existing ground, the impact will not, in general, be significant."

7.1.3 **PEIR Volume I Chapter 9: Water Environment** provides information on the embedded mitigation measures to manage surface water flood risk from the Scheme.

7.2 Solar PV Site and On-Site Cables

7.2.1 The construction of mounts to support the Solar PV Panels may cause a reduction in floodplain storage. The volume of floodplain storage lost, and provision of compensatory storage will be assessed as part of the full FRA to ensure that panel mounts do not increase flood risk elsewhere.

7.2.2 The Scheme proposes, as a design principle, to utilise existing water crossing locations (where practicable) to avoid the need for new crossings. However, should a new crossing be required, an open span bridge crossing would be used, with the specific type of crossing selected being determined based on site specific factors and in consultation with the relevant authority (generally the IDB/LLFA for the Solar PV Site).

7.2.3 As noted in paragraph 7.1.2, Solar PV Panels would drain to the existing ground and the impact would not, in general, be significant. A Preliminary Surface Water Drainage Strategy has been prepared to support the PEIR (see **PEIR Volume III Appendix 9-3: Preliminary Drainage Strategy**). A summary of the main embedded mitigation measures to manage surface water flood risk are provided below:

a. Individual Solar PV Panels would be held above the ground surface on Solar PV Mounting Structures (see PEIR Volume I Chapter 2: The Scheme). This would avoid sealing the ground with impermeable surfaces. As a result, it is assumed that the impermeable area would remain largely consistent with its pre-development state. The areas surrounding the panels will be planted with native grassland to intercept and absorb rainfall running off the panels, preventing it from concentrating and potentially forming channels in the ground. However, runoff from the Solar PV Panels and the small impermeable areas associated with the proposed Field Stations, compounds for the On-Site Substation and BESS Area may alter the existing routing of runoff in localised areas. To prevent ponding occurring in these areas a series of boundary and routing swales would be constructed to convey surface water runoff away from the Solar PV Panels and towards receiving watercourses.

b. The swales would be sized to accommodate the attenuation required for the 1% AEP + 40% climate change event. Due to current understanding of ground conditions within the Solar PV Site, it is unlikely that runoff would be able to discharge via infiltration. Therefore, surface water from the swales is proposed to be discharged to local watercourses. The discharge to these watercourses would be maintained at existing greenfield runoff rates by restricting rates using a flow control. The flow control would use a restriction on the outlet of the swale which would hold water back within the swale and release it at a controlled rate.

c. Where proposed access tracks cross watercourses, the intention is to use open span crossings and not introduce any new culverts for temporary or permanent access routes. Existing culverts may be upgraded or slightly extended as required. Access tracks would use permeable materials such as crushed rock/gravel and localised SuDS, such as swales and infiltration trenches, to control runoff where required. Small areas of impermeable surfacing would be included on the open span crossings.

d. The On-Site Cables would be underground, apart from cables between the Solar PV Panels and inverters which would typically be above ground.

7.3 Grid Connection Corridor

7.3.1 If the Grid Connection Line Drop is not feasible, Grid Connection Cables in the Grid Connection Corridor would be required to connect to the Existing National Grid Thorpe Marsh Substation. The Grid Connection Cables would be buried cables, therefore the likelihood of increased flood risk from this is considered to be low. In particular, for flood risk sources above ground (fluvial, tidal, surface water and artificial), there would not be a quantifiable increase in risk from these sources.

7.3.2 The depth and construction around the flood defence embankment along the River Don will be identified through liaison with the Environment Agency and horizontal directional drilling would be used at a sufficient depth to avoid compromising the structural integrity of the flood defence embankment. Small watercourse crossings are currently assumed to be crossed using open cut installation techniques as a worst-case assumption. For intrusive crossings of small watercourses, it is assumed that water flow would be maintained by temporarily damming the watercourse and over pumping or fluming the flow through the works, maintaining existing conditions. Therefore, the likelihood of increased flood risk from the corridor crossings during construction and operation is considered to be low.

7.3.3 The Grid Connection Cables would not increase flood risk from sewers as no sewerage assets were identified by the utilities search undertaken.

7.3.4 The Grid Connection Cables may impede groundwater flow locally. The Grid Connection Corridor is within green open space (arable fields and roadside verges) and where the Grid Connection Corridor is located within road corridors the impermeable surfacing will prevent ground water emergence. Therefore, any increases are unlikely to affect vulnerable receptors.

8. Demonstrating the Sequential and Exception Tests

8.1 Introduction

8.1.1 As set out in Section 3, the NPS EN-1 and the NPPF require the application of both the Sequential Test and the Exception Test where relevant. The aim of the Sequential Test is to steer new development to areas with the lowest risk of flooding from any source. The Scheme is classified as 'Essential Infrastructure' as defined in Annex 3 of the NPPF (see Table 3-2 in Section 3 above) and the majority of the Scheme is situated within areas with the lowest risk of flooding from any source. However, there are certain areas that lie in Flood Zone 2, 3a and 3b, which need to undergo the Sequential Test. Table 3-2 in Section 3.2 indicates that this type of development can be located in Flood Zones 3 if the Exception Test is passed. In accordance with national planning policy the Secretary of State will need to be satisfied that the Scheme passes the Sequential Test and, as the Grid Connection Corridor is within Flood Zone 3, the Exception Test.

8.2 Solar PV Site

8.2.1 A sequential approach has been applied in selecting the land for the Scheme and to the layout and design of the solar infrastructure within the Solar PV Site to date with the Scheme being located, as far as practicable, in areas with the lowest risk of flooding from any source with embedded mitigation where required.

8.2.2 The location of the Solar PV Site has been selected on the basis of a number of different factors which are discussed in more detail in **PEIR Volume I Chapter 3: Alternatives and Design Evolution** and has been informed by the considerations outlined in section 2.10 of NPS EN-3. The main factors include the irradiation levels, site topography, availability of a grid connection with appropriate capacity, proximity of the land to residential dwellings and other planning and environmental designations, current and proposed land use, accessibility, public rights of way and land availability. **PEIR Volume I Chapter 3: Alternatives and Design Evolution** provides a summary explanation of the site selection process. This has not identified reasonably available sites in Flood Zone 1 which are not already within the Solar PV Site. Further details of how alternative locations to the Solar PV Site have been considered in response to the flood risk policy requirements will be submitted with the DCO Application.

8.2.3 A sequential approach has been applied to the layout and design of the solar infrastructure within the Solar PV Site to date whereby the On-Site Substation, BESS Area and the majority of the Solar PV Panels are in areas with the lowest risk of flooding from any source.

8.3 Grid Connection Corridor

8.3.1 The Grid Connection Corridor is predominantly located within areas of high risk (Flood Zone 3) and medium risk (Flood Zone 2) of fluvial and tidal flooding. As explained in **PEIR Volume I Chapter 3: Alternatives and**

Design Evolution the identification of the Grid Connection Corridor considered the operational and engineering requirements, including the need to connect to the Existing National Grid Thorpe Marsh Substation; planning and environmental constraints, which included the flood risk context; and other land use and land ownership constraints. This confirmed that a Grid Connection Corridor outside Flood Zones 2 and 3 would not be possible and no reasonable alternatives are available in Flood Zone 1. Areas of the Grid Connection Corridor within Flood Zone 3 were also unable to be avoided by using Flood Zone 2 land.

8.3.2 Following application of the Sequential Test it is not considered to be possible for the Grid Connection Corridor to be located in areas of lower flood risk.

8.3.3 As a result of the Grid Connection Corridor being located within Flood Zone 3, it is therefore necessary to apply the Exception Test to this part of the Scheme in accordance with national planning policy set out in Section 3 of this PFRA. The Exception Test in the NPPF and NPS EN-1 requires it to be demonstrated that:

a. "The development would provide wider sustainability benefits to the community that outweigh the flood risk; and

b. The development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall".

8.3.4 In response to meeting part a of the Exception Test a summary of the need for the Scheme is set out in **PEIR Volume I Chapter 3: Alternatives and Design Evolution**. Through the generation of low carbon electricity, the Scheme would contribute to the urgent need to decarbonise electricity generation in the UK as required by national energy policy and would contribute to the UK's obligations for net zero under the Climate Change Act 2008 (2050 Target Amendment) Order 2019 (Ref. 15). It would also meet the need identified in current and emerging planning policy on renewable energy. Therefore, the Scheme would have both a national, and global significance, through its decarbonisation of the nation's electricity generation.

8.3.5 In addition, the Scheme would include habitat creation and enhancement as set out in **PEIR Volume I Chapter 2: The Scheme** and **PEIR Volume I Chapter 8: Ecology**. This would contribute to the Scheme providing biodiversity net gain in line with the Environment Act 2021 (Ref. 16). Therefore, taking the above into account, it is considered that the Scheme would provide wider sustainability benefits to the community that outweigh its impacts on flood risk in accordance with NPS EN-1 (Ref. 1) and the NPPF (Ref. 4).

8.3.6 In response to meeting part b of the Exception Test, the information presented in Sections 6 and 7 of this PFRA and **PEIR Volume I Chapter 9: Water Environment**, demonstrate that the nature of the Grid Connection Corridor (being underground cabling) means it would have no material impact on flood risk, and in addition mitigation measures have been, and will be, developed into the design and construction methods for the cabling to ensure this outcome. This would ensure that the Scheme would be at a low risk of flooding from all sources and would be safe for its lifetime and that there would be no increase in flooding elsewhere.

8.3.7 Therefore, the Scheme satisfies part b of the Exception Test of the NPPF (Ref. 4) and NPS EN-1 (Ref. 1).

9. Conclusion

9.1 Overview

9.1.1 This PFRA has assessed flood risks to and from the Scheme. The majority of the Solar PV Site lies in Flood Zone 1. The north and east areas of the Solar PV Site are located within Flood Zones 2 and 3 associated with the River Went and Fleet Drain. The majority of the Grid Connection Corridor is in Flood Zone 3, associated with the River Don and its floodplain. Other sources of flood risk (fluvial, surface water, sewer, groundwater and artificial) also impact both elements of the Scheme to differing degrees.

9.1.2 The Scheme is classed as ‘Essential Infrastructure’ under the NPPF and therefore should avoid Flood Zone 3a and 3b where feasible and consider the availability of suitable sites at lower risk of flooding. Where this is unavoidable, the Scheme is required to pass the Exception Test and should be designed and constructed to remain operational and safe in times of flooding.

9.2 Flood Risk – to the Scheme

9.2.1 The following potential sources of flooding which could affect the Solar PV Site have been considered and assessed as follows:

a. With a large area of the Scheme, including the BESS Area and On-Site Substation, located in Flood Zone 1, the current risk from fluvial sources is considered to be ‘low’. However, the Scheme does have areas of higher flood risk (Flood Zones 2 and 3) which increases the risk in these locations to ‘high’. The Scheme will be designed accordingly in order to remain operational during times of flood and a sequential approach has been applied to avoid the location of solar PV infrastructure including Solar PV Panels in Flood Zone 3 as far as practicable. Where solar PV panels are located in areas of Flood Zone 2 and 3, the minimum height of the lowest part of the Solar PV Panels should be 300 mm above the design flood level. Field Stations in Flood Zones 2 or 3 should also be raised 300 mm above the design flood level. On-Site Cables above ground should be 300 mm above the design flood level. Based on the design, the risk within these areas is considered to be low;

b. The risk of surface water flooding to the majority of the Solar PV Site is considered to be ‘very low’. There are a few areas where the risk is higher but these generally cover a small spatial extent. Where any Field Stations are located within high surface water flood risk areas, they should be raised 300 mm above the design flood level. A Surface Water Drainage Strategy incorporating SuDS would be implemented to manage these flow paths to ensure that the Scheme remains safe throughout its lifetime. A Preliminary Surface Water Drainage Strategy has been prepared to support the PEIR (**PEIR Volume III: Appendix 9-4: Preliminary Drainage Strategy**);

c. The risk of groundwater is likely to be ‘low’ based on available information. Further information will be sought at the ES stage and updated for the DCO submission;

d. The risk of flooding from sewers is considered to be ‘very low’; and

e. The risk of flooding from artificial sources is considered to be ‘low’.

9.2.2 The following potential sources of flooding which could affect the Grid Connection Corridor have been considered and assessed as follows:

a. The majority of the Grid Connection Corridor (including the Existing National Grid Thorpe Marsh Substation) is in Flood Zone 3, associated with the River Don and its floodplain. The Grid Connection Cables would be buried, meaning they are inherently flood protected, and protected by existing flood defences; it would therefore remain operational during times of flood. Based on these factors, the risk within these areas should be considered low;

b. The risk of surface water flooding to the majority of the Grid Connection Corridor (including the Existing National Grid Thorpe Marsh Substation) is considered to be ‘very low’. There are a few isolated areas where the risk is high but these generally cover a small spatial extent. A Surface Water Drainage Strategy would be implemented to manage these flow paths to ensure that the Scheme remains safe throughout its lifetime;

c. The risk of groundwater flooding is considered to be ‘low’ risk to the northern and middle stretches of the Grid Connection Corridor (including the Existing National Grid Thorpe Marsh Substation) and ‘high’ to the southern stretch of the Grid Connection Corridor (including the Existing National Grid Thorpe Marsh Substation) based on available information. The cable and cable ducting will be designed to prevent water ingress. Further information will be sought at the ES stage and updated for the DCO submission;

d. The risk of flooding from sewers is considered to be ‘very low’; and

e. The risk of flooding from artificial sources is considered to be ‘very low’, due to the combined factors of existing flood defences, low likelihood of reservoir failure, and that the cable would be buried during operation the risk from this source is mitigated.

9.2.3 Additional hydraulic modelling will be undertaken to determine the impacts of climate change on the fluvial and tidal flood extents the outputs of which will be used to inform the FRA at the ES stage.

9.3 Flood Risk – from the Scheme

9.3.1 With the exception of fluvial and surface water sources, an increase in flood risk from other sources from the Scheme is considered unlikely or very localised (groundwater for the buried Grid Connection Cables). Where required, further detail will be added at the ES stage.

Fluvial

9.3.2 The following potential sources of flooding which could come from the Solar PV Site have been considered and assessed as follows:

a. Within the Solar PV Site, Solar PV Mounting Structures and Solar PV Panels will be sequentially located to avoid areas of high fluvial flood risk and raised to a sufficient height to avoid flood water, being preferentially located in Flood Zone 1 and then Flood Zone 2. The On-Site Cables between Solar PV Panels and inverters would typically be above ground with all other cabling buried. The majority of the Solar PV Site and On-Site Cables are in Flood Zone 1. The volume of floodplain storage lost as a result of panel mounts within Flood Zone 3 and provision of compensatory storage will be assessed as part of the full FRA to ensure flood risk is not increased elsewhere.

b. The Scheme proposes, as a design principle, to utilise existing water crossing locations (where practicable) to avoid the need for new crossings. However, should a new crossing be required, an open span bridge crossing would be used, with the specific type of crossing selected being determined based on site specific factors and in consultation with the relevant authority (generally the IDB/LLFA for the Solar PV Site).

c. The On-Site cables above ground between the Solar PV Panels and inverters should be located 300 mm above the design flood level and remaining cabling would be underground so there would be no loss of floodplain storage, impedance of water flows or increase to flood risk elsewhere.

9.3.3 The following potential sources of flooding which could come from the Grid Connection Corridor have been considered and assessed as follows:

a. The Grid Connection Cables would be underground so there will be no loss of floodplain storage, impedance of water flows or increase to flood risk elsewhere.

Surface Water

9.3.4 A Preliminary Surface Water Drainage Strategy has been developed outlining how surface water would be managed to prevent any increase in flood risk. This would be developed into a detailed Surface Water Drainage Strategy prior to construction, as secured through the DCO. The Strategy provides measures to manage surface water run off from new infrastructure required by the Scheme (e.g. Solar PV Panels, BESS Battery Containers, access tracks and areas of hardstanding across the Solar PV Site) and manage any required changes to existing land drainage arrangements (**PEIR Volume I Chapter 9: Water Environment**).

10. References

Ref. 1 Department for Energy Security and Net Zero (DESNZ) (2023). Overarching National Policy Statement for Energy (EN-1). Available at: https://assets.publishing.service.gov.uk/media/655dc190d03a8d001207fe33/overarching-nps-for-energy-en1.pdf. [Accessed 15 January 2024].

Ref. 2 DESNZ (2023). National Policy Statement for Renewable Energy Infrastructure (EN-3). Available at: https://assets.publishing.service.gov.uk/media/655dc352d03a8d001207fe37/nps-renewable-energy-infrastructure-en3.pdf. [Accessed 15 January 2024].

Ref. 3 DESNZ (2023). National Policy Statement for Electricity Networks Infrastructure (EN-5). Available at: https://assets.publishing.service.gov.uk/media/655dc25e046ed400148b9dca/nps-electricity-networks-infrastructure-en5.pdf [Accessed 12 December 2023].

Ref. 4 Department of Communities and Local Government (DCLG) (December 2023). National Planning Policy Framework (NPPF). Available at: https://www.gov.uk/government/publications/national-planning-policy-framework--2. [Accessed 21 December 2023].

Ref. 5 DCLG (2023). Planning Practice Guidance (PPG). Available at: https://www.gov.uk/government/collections/planning-practice-guidance. [Accessed 21 December 2023].

Ref. 6 Environment Agency (2023). Flood Map for Planning. Available at: https://flood-map-for-planning.service.gov.uk/ [Accessed 7 August 2023].

Ref. 7 Doncaster Council (2021). Doncaster Local Plan 2015 – 2035. Available at: https://www.doncaster.gov.uk/services/planning/local-plan. [Accessed 07 August 2023].

Ref. 8 Doncaster Metropolitan Borough Council (2015). Doncaster MBC Level 1 Strategic Flood Risk Assessment. Available at: https://www.doncaster.gov.uk/services/planning/development-and-floodrisk. [Accessed 7 August 2023].

Ref. 9 City of Doncaster Council (2023). Local Flood Risk Management Strategy 2023-2029. Available at: https://www.doncaster.gov.uk/services/transport-streets-parking/flood-risk-management. [Accessed 7 August 2023].

Ref. 10 South Yorkshire Authorities (2015). Interim Local Guidance for Sustainable Drainage Systems. Available at: https://www.doncaster.gov.uk/services/planning/development-and-floodrisk. [Accessed 7 August 2023].

Ref. 11 Environment Agency (2022). Flood risk assessments: Climate Change Allowances. Available at: https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances. [Accessed 7 August 2023].

Ref. 12 Environment Agency (2023). Reduction in Risk of Flooding from Rivers and Sea due to Defences. Available at: https://www.data.gov.uk/dataset/dcdcf96b-3293-4987-8ca8-9b8827f5ccf8/reduction-in-risk-of-flooding-from-rivers-and-sea-due-to-defences#:~:text=Summary,the%20presence%20of%20flood%20defences. [Accessed 15 January 2024].

Ref. 13 Environment Agency (2023). Recorded Flood Outlines. Available at: https://www.data.gov.uk/dataset/16e32c53-35a6-4d54-a111-ca09031eaaaf/recorded-flood-outlines. [Accessed 15 January 2024].

Ref. 14 Environment Agency (2023). Long Term Flood Risk Map. Available at: https://check-long-term-flood-risk.service.gov.uk/map. [Accessed 7 August 2023].

Ref. 15 His Majesty's Stationery Office (HMSO) (2019). Climate Change Act 2008 (2050 Target Amendment) Order 2019. Available at: https://www.legislation.gov.uk/uksi/2019/1056/contents/made. [Accessed 12 December 2023].

Ref. 16 HMSO (2021). Environment Act 2021. Available at: https://www.legislation.gov.uk/ukpga/2021/30/contents/enacted [Accessed 12 December 2023].

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