Light Valley Solar

Environmental Statement Volume 3

Appendix 15.1: Flood Risk Assessment

Document Reference: EN0110012/APP/LVS/06.03.15.01

September 2026
Version 2

Planning Inspectorate Reference: EN0110012
APFP Regulation 5(2)(e)

Light Valley
Solar

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning
(Applications: Prescribed Forms and Procedure) Regulations 2009

Light Valley Solar

DCO Submission

Appendix 15.1: Flood Risk Assessment

Regulation Reference	APFP Regulation 5(2)(e)
Planning Inspectorate Case Reference	EN0110012
Application Document Reference	EN0110012/APP/LVS/06.03.15.01
Author	Light Valley Solar Limited

Version	Date	Status of Version
1.0	February 2026	DCO Submission
2.0	September 2026	DCO Deadline 2 Submission

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1 Introduction

1.1 Overview

1.1.1 Ove Arup & Partners Limited (Arup) have been commissioned by Light Valley Solar Limited (the 'Applicant'), a subsidiary of Island Green Power UK limited, to prepare this Flood Risk Assessment (FRA) to assess the development of a solar farm and associated infrastructure within the administrative area of North Yorkshire Council (NYC), within the Selby District.

1.1.2 The Proposed Development comprises a solar photovoltaic (PV) electricity generating station of over 100 megawatts (MW) and 'associated development' comprising a Battery Energy Storage System (BESS), grid connection infrastructure and other infrastructure integral to the construction, operation and maintenance, and decommissioning phases.

1.1.3 The main element of the Proposed Development comprises seven Solar Development Sites (Solar Development Sites 1-4 and 6-8) that will accommodate the Solar PV Panels. A BESS Compound will be located within Solar Development Site 2.

1.1.4 The Cable Route Corridor is the area within which the export connection cables (hereafter referred to as the 'Grid Connection Cables') would be located to connect the Solar PV Sites to the National Grid at the existing Monk Fryston Substation (hereafter referred to as the 'Existing National Grid Monk Fryston Substation') and the area within which cables connecting the Solar Development Sites would be located (hereafter referred to as 'Interconnecting Cables') (refer to Figure 2.1: Illustrative Site Layout Plan (ES Volume 2) [**EN0110012/APP/LVS/06.02.02.01**].

1.1.5 Further details of the Proposed Development are presented in Chapter 2: The Proposed Development (ES Volume 1) [**EN0110012/APP/LVS/06.01.02**] and the design envelope for the Proposed Development is set out in the Design Parameters and Commitments Document [**EN0110012/APP/LVS/05.06**] and the limits of deviation shown on the Works Plans [**EN0110012/APP/LVS/02.03**].

1.1.6 The Proposed Development requires a site-specific FRA as the Order Limits cover more than 1 hectare (ha) of land in Flood Zones 2 and 3, in accordance with NPS EN-1, paragraph 5.8.13 (Ref 13).

1.1.7 The Proposed Development has been assessed with regards to the requirements of the National Policy Statement for Energy (NPS), the National Planning Policy Framework (NPPF) and in accordance with the Planning Policy Guidance (PPG) for 'Flood Risk and Coastal Change' and 'Climate Change' to determine the suitability of the Proposed Development in this area.

1.1.8 This appendix presents the findings of the assessment, evaluating the compliance of the Proposed Development with relevant regulatory requirements.

It forms an appendix to Chapter 15: Water Resources and Flood Risk (ES Volume 1) [**EN0110012/APP/LVS/06.01.15**] of the ES.

1.1.9 This appendix presents a Level 3 FRA, as defined in CIRIA C624 (Ref 1) and will introduce the Proposed Development, provide information to support the demonstration of the Sequential Test (and, where required, the Exception Test), assess the risk of flooding from all sources, using site-specific flood information, and identify recommendations for mitigation and management of residual risks.

1.1.10 The assessment builds on the desk-based study, produced as part of the Preliminary Environmental Impact Report (PEIR), using readily available information including Product Data from the Environment Agency (EA). The FRA for the ES incorporates the results of site-specific hydraulic modelling carried out and which has been used to inform the Proposed Development site layouts. The assessment is based on the Design Parameters set out in Chapter 2: The Proposed Development (ES Volume 1) [**EN0110012/APP/LVS/06.01.02**] and secured through the Design Parameters and Commitments Document **[EN0110012/APP/LVS/05.06]**.

1.1.11 As the Proposed Development is partially located in Flood Zones 2 and 3, site-specific hydraulic modelling has been carried out to further identify the level of flood risk at the Solar Development Sites and Cable Route Corridor, and to inform a greater understanding of potential impacts associated with the development. The outputs have informed the FRA and provide an updated understanding of flood risk across the Solar Development Sites.

1.2 Project background and scope

1.2.1 The Proposed Development comprises a total of seven Solar Development Sites (herein referred to as ‘Solar Development Sites’/’Solar Development Sites 1-4 and 6-8’ or individually) and the Cable Route Corridor.

1.2.2 Solar Development Site 5 was previously included at the EIA Scoping stage but was removed prior to PEIR due to flood risk concerns. Additionally, between the PEIR and ES stages, the southernmost land parcel of Solar Development Site 4 was also removed from the Order Limits. Although no development was proposed in this area, the area lies within Flood Zone 3b washland and was removed for similar flood-related reasons.

1.2.3 Each Solar Development Site and the Cable Route Corridor has been assessed within this FRA, with each being discussed individually within a site-specific FRA contained within Annex A – Annex H.

1.2.4 The Proposed Development will contribute to the UK Government’s legally binding target to reach net-zero emissions by 2050 and respond to the projected increase in demand for electricity, as well as improving UK energy security and resilience in line with national strategy. The Overarching National Policy Statement for Energy (NPS EN-1) (Ref 13) establishes that the delivery for low carbon energy infrastructure, such as the Proposed Development, is of Critical National Priority (CNP).

1.3 Purpose of this report

1.3.1 An FRA is required in England for any development (or change of use) for sites identified to be within Flood Zones 2 or 3, any development measuring over 1 ha in Flood Zone 1, or any development which may be susceptible to flooding from sources other than rivers and the sea.

1.3.2 The purpose of this FRA is for the Secretary of State (SoS) to make an informed decision on the flood risks associated with the development of the Site. The FRA considers the risks to the Proposed Development from various sources of flooding, including the development itself, along with the potential for the development to increase flood risk elsewhere.

1.3.3 Several of the Solar Development Sites are situated within fluvial Flood Zones 2 and 3. Product information, including hydraulic model files and their outputs, was requested from the EA and this information, alongside the results of site-specific hydraulic modelling commissioned by the Applicant, was used to inform the location of the limits of deviation for the Proposed Development and the commitments made in the Design Parameters and Commitments Document [**EN0110012/APP/LVS/05.06**].

1.3.4 The site-specific modelling has been used to further assess flood risks to the Proposed Development and evaluate the potential impacts of the development on others. The results of this modelling are discussed in greater detail in Sections 5 and 6 of this Flood Risk Assessment.

1.4 Flood risk assessment methodology

1.4.1 This report has been prepared in accordance with NPS EN-1 (Ref 13), the National Planning Policy Framework (NPPF) (Ref 19) and the associated Planning Practice Guidance (PPG) documents.

1.4.2 The structure of the overarching FRA in this appendix is as follows:

1) Section 1 outlines the planning policy context and relevant guidance.
2) Section 3 provides a summary of the key consultations undertaken to date, including the EIA Scoping Opinion.
3) Section 1 introduces the Proposed Development.
4) Section 5 provides a summary of the site-specific hydraulic modelling commissioned by the Applicant for the Proposed Development.
5) Section 6 presents the risk assessment.
6) Section 7 presents the Sequential and Exception Tests for the Proposed Development.
7) Section 8 summarises the recommended flood risk management measures.
8) Section 9 presents the conclusion.

1.4.3 Given the Proposed Development covers a broad spatial extent, a site-specific FRA is provided in Annex A through to Annex H of this appendix for each of the

Solar Development Sites and the Cable Route Corridor. The relevant Annex for each Solar Development Site and the Cable Route Corridor is as follows:

1) Annex A – Solar Development Site 1;
2) Annex B – Solar Development Site 2;
3) Annex C – Solar Development Site 3;
4) Annex D – Solar Development Site 4;
5) Annex E – Solar Development Site 6;
6) Annex F – Solar Development Site 7;
7) Annex G – Solar Development Site 8; and
8) Annex H – Cable Route Corridor.

This overarching FRA report draws on the findings presented in the accompanying site-specific FRAs.

1.4.4 The technical note supporting the site-specific hydraulic modelling has been included in Annex I for reference. This note outlines the methodology, assumptions, and data used in the modelling process, providing additional context and verification for the results presented in this report.

1.5 Sources of information

1.5.1 The following guidelines and references have been used in preparation of this FRA:

1) National Planning Policy Framework (NPPF) Planning Practice Guidance (PPG) documents for 'Flood Risk and Coastal Change' (Ref 2) and 'Flood Risk Assessments: Climate Change Allowances' (Ref 3);
2) DEFRA/EA Flood Risk Assessment guidance for planning applications (Ref 4);
3) DEFRA/EA Flood Risk Standing Advice for England (Ref 5);
4) CIRIA Report C735 'The SuDS Manual' (Ref 6);
5) NYC Strategic Flood Risk Assessment 2016 (SFRA) (Ref 7);
6) Selby Local Plan (Ref 8);
7) NYC Flood Risk Management Strategy 2022 (Ref 9);
8) EA Product Data, including the following hydraulic models and their outputs:
    a) 2016 Upper Humber Flood Risk Mapping Study;
    b) 2017 Lower Aire; and
    c) 2018 Lower Ouse and Wharfe Washlands.
9) NYC SuDS guidance (Ref 10); and
10) National Standards for SuDS guidance (Ref 11).

1.6 Use and limitations

1.6.1 All reasonable skill, care and diligence have been exercised in preparing this assessment within the timescale available and in accordance with the technical requirements of the brief. Notwithstanding the efforts made by the professional team in preparing the report, it is possible that other flood risks, as yet undetected, may exist and consequently reliance on this report must be limited accordingly. Arup does not accept any liability for the accuracy or otherwise of any information derived from secondary sources, however, endeavours have been made to verify the suitability and appropriateness of information obtained in this way.

2 Planning policy context

2.1 National planning policy

2.1.1 This section considers national planning policy relevant to the Proposed Development.

2.1.2 The approval of nationally significant energy infrastructure projects such as the Proposed Development is through a Development Consent Order (DCO) application. National Policy Statements (NPS) are published by the Department for Energy Security and Net Zero (DESNZ), which set out the requirements for assessing and approving such projects. For this solar project, the following are relevant:

1) Overarching National Policy Statement for Energy (EN-1) (December 2025 (Ref 13));
2) National Policy Statement for Renewable Energy Infrastructure (EN-3) (December 2025 (Ref 14); and
3) National Policy Statement for Electricity Networks Infrastructure (EN-5) (December 2025 (Ref 15).

NPS for Energy (EN-1)

2.1.3 The Overarching National Policy Statement for Energy (EN-1), revised by the Department for Energy Security and Net Zero (DESNZ) in 2025, reinforces the objectives for the development of Nationally Significant Infrastructure Projects (NSIPS) and updates the legal framework for planning decisions. The revision embeds the Clean Power 2030 strategy as a core policy driver. Specific policy relating to flood risk is detailed in section 5.6 and section 5.8 of NPS EN-1 (Ref 13).

2.1.4 According to NPS EN-1, paragraph 5.8.13, site-specific FRAs are required for all energy projects located in Flood Zones 2 and 3 in England. For projects located in Flood Zone 1, an assessment is required for all proposals that involve:

1) Sites of 1 hectare or more;
2) Land which has been identified by the EA or NRW as having critical drainage problems;
3) Land identified (for example in a local authority strategic flood risk assessment) as being at increased flood risk in the future;
4) Land that may be subject to other sources of flooding (for example surface water); and
5) where the EA or NRW, Lead Local Flood Authority (LLFA), IDB or other body have indicated that there may be drainage problems.

2.1.5 Relevant factors for the Secretary of State to consider when determining an application for development consent are listed within paragraph 5.8.36. Which states '*in determining an application for development consent, the Secretary of State should be satisfied that where relevant:*

1) *The application is supported by an appropriate FRA;*
2) *The Sequential Test has been applied and satisfied as part of the sites' selection;*
3) *A sequential approach has been applied at the site level to minimise risk by directing the most vulnerable uses to areas of lowest flood risk;*
4) *The proposal is in line with any relevant national and local flood risk management strategy;*
5) *Sustainable drainage systems (SuDS) have been used unless there is clear evidence that their use would be inappropriate;*
6) *In flood risk areas the project is designed and constructed to remain safe and operational during its lifetime, without increasing flood risk elsewhere;*
7) *The project includes safe access and escape routes where required, as part of an agreed emergency plan, and that any residual risk can be safely managed over the lifetime of the development; and*
8) *Land that is likely to be needed for present and future flood risk management infrastructure has been appropriately safeguarded from development to the extent that development would not prevent or hinder its construction, operation or maintenance.'*

NPS for Renewable Energy Infrastructure (EN-3)

2.1.6 The NPS for Renewable Energy Infrastructure (EN-3) sets out the policy framework for the development of nationally significant renewable energy projects, including solar PV, in England and Wales.

2.1.7 According to NPS EN-3, paragraph 2.4.11, solar PV sites may be proposed in low lying exposed sites. For these proposals, applicants should consider how the plant will be resilient to the increased risk of flooding and impact of higher temperatures. The 2025 revision implements strengthened climate adaptation requirements which emphasise the need to assess climate resilience in line with projected temperature extremes and flood risk scenarios.

2.1.8 According to NPS EN-3, paragraph 2.10.84, an FRA will need to consider the impact of drainage and that, as solar PV panels will drain to the existing ground, the impact will not, in general, be significant. It further clarifies that drainage strategies should align with local flood risk management plans and consider cumulative impacts where multiple solar PV projects are proposed, supporting the integrated approach to infrastructure planning.

NPS for Electricity Networks Infrastructure (EN-5)

2.1.9 The NPS for Electricity Networks Infrastructure (EN-5), designated by the DESNZ in January 2024, is part of the suite of NPSs, reflecting its refresh under the Clean

Power 2030 Framework, and should be read in conjunction with EN-1 and EN-3 to reflect strengthened alignment across energy infrastructure policy

2.1.10 Paragraph 2.3.2 of NPS EN-5 specifies, with regards to climate change adaptation and resilience, applicants must detail the extent to which the Proposed Development is expected to be vulnerable and, where appropriate, how it has been designed to be resilient to flooding, particularly for substations critical to the network, and especially in light of changes to groundwater levels resulting from climate change and earth movement or subsidence caused by flooding for underground cables.

The National Planning Policy Framework (NPPF)

2.1.11 The National Planning Policy Framework (NPPF) sets out the government's planning policies for England and outlines how these are expected to be applied. In relation to flood risk, ~~T~~the NPPF ~~for flood risk and coastal change states that the main considerations for any development should be to~~seeks to minimise vulnerability to flooding and apply a sequential, risk-based approach to the location of development, accounting for current and future climate change impacts. The Sequential Test and Exception Test within the NPPF are designed to achieve these policy objectives.

NPPF Planning Practice Guidance (PPG)

2.1.12 Decision makers have the authority to control development in accordance with the guidelines set out in the national PPG. The PPG for Flood Risk and Coastal Change (Ref 2) advises on how to take account of, and address the risks associated with flooding and coastal change, stating that the aim is to steer new developments towards areas of lower flood risk.

2.1.13 The assessment of flood risk is based on the definitions of flood zones in Table 2-1 of the PPG, reproduced below in Table 2-1, and these zones shown on the EA Flood Map for Planning (Ref 16).

Table 2-1 Flood Zones

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 0.1% annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map for Planning – all land outside Zones 2, 3a and 3b)
Zone 2 Medium Probability	Land having between a 1% and 0.1% annual probability of river flooding; or land having between a 0.5% and 0.1% annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1% or greater annual probability of river flooding; or Land having a 0.5% or greater annual probability of sea. (Land shown in dark blue on the Flood Map)
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

Flood Zone	Definition
	take account of local circumstances and not be defined solely on rigid probability parameters. Functional floodplain will normally comprise: ▪ land having a 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively; or ▪ land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding). Local planning authorities should identify in their Strategic Flood Risk Assessments (SFRA) areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

Note: The Flood Zones shown on the Environment Agency's Flood Map for Planning (Rivers and Sea) do not take account of the possible impacts of climate change and consequent changes in the future probability of flooding. Reference should therefore also be made to the Strategic Flood Risk Assessment when considering location and potential future flood risks to developments and land uses.

2.1.14 The associated PPG on climate change allowances (Ref 3) and on FRAs: applying for planning permission (Ref 4) have also been considered.

2.1.15 Decision makers are expected to consider the impacts of climate change when determining the suitability of development proposals. The PPG for Climate Change advises that a proactive approach is taken to both mitigating and adapting to climate change through the planning system. This includes minimising vulnerability and improving resilience to the effects of climate change, such as increased flood risk.

2.1.16 In accordance with PPG, developers are required to consider how climate change is likely to affect flood risk over the lifetime of the development. This includes applying the relevant climate change allowances for peak river flows and rainfall intensity as provided by the EA. These allowances should be factored into hydraulic modelling and drainage calculations, informing site layout, finished floor levels, drainage design, and emergency planning, ensuring that the development remains safe, resilient, and does not increase flood risk elsewhere.

2.2 Local planning policy

2.2.1 Under the Flood and Water Management Act 2010, the relevant statutory body for all matters related to local flood risk is the LLFA. NYC are the LLFA in the Proposed Development area.

2.2.2 NYC, acting as the Local Planning Authority and Lead Local Flood Authority, have several documents that identify how the issue of flooding is managed within this area as a key planning consideration. The Proposed Development design has sought to align with the policies detailed in these documents.

North Yorkshire Council Strategic Flood Risk Assessment (SFRA)

2.2.3 The adopted SFRA sets out the risks posed by flooding from a range of sources to the defined administrative area and help inform the Sequential Test and a sequential approach to the allocation of development.

2.2.4 Supported by the SFRA, the North Yorkshire County Council Local Plan at the time of this report is currently being prepared. This, once published, will document the vision and framework for the future growth of the district, identifying where development could take place.

2.2.5 The Emerging Selby Local Plan, published prior to local government re-organisation in the area, set out strategic policies for housing, infrastructure, and environmental protection, including climate change mitigation and renewable energy development. Within this, Policy SG10 – low Carbon and Renewable Energy supported proposals for renewable energy generation across the region, such as solar PV, where they are appropriately located and designed to minimise impacts on landscape, heritage, biodiversity, and amenity.

North Yorkshire Council Flood Risk Management Strategy (FRMS)

2.2.6 The Flood Risk Management Strategy (FRMS), implemented in 2022, sets out the council's strategy to better understand the flood risk across the area, and to enable the development of schemes to reduce flood risk within North Yorkshire, and to ensure the area is better prepared for flood events.

2.2.7 The FRMS prioritises sustainable flood risk reduction through community engagement, improved understanding of drainage networks, and integration of SuDS in development. The strategy emphasises climate resilience, coordination between Risk Management Authorities, and alignment with local flood risk management plans. It also includes an action plan for incident response, asset maintenance, and securing funding for mitigation measures.

North Yorkshire Council Local Flood Risk Strategy

2.2.8 The Local Flood Risk Strategy (LFRS) (Ref 9) outlines the LLFA's approach to managing local sources of flood risk, including surface water, ordinary watercourses, and groundwater, and emphasises the importance of sustainable, risk-based development. In line with the LFRS, this FRA considers site-specific flood risks and identifies appropriate drainage measures that align with the LFRS objectives, including the use of sustainable drainage systems (SuDS) where feasible, to reduce runoff and minimise the risk of flooding both on and off-site.

North Yorkshire Council Sustainable Drainage Systems Guidance

2.2.9 The NYC SuDS Guidance (Ref 10) provides comprehensive criteria for the design and implementation of effective drainage solutions within the county. Key considerations include:

1) The prioritisation of surface water discharge follows a specific hierarchy:
   a) Discharge into the ground (infiltration);
   b) Discharge to a surface water body;
   c) Discharge to a surface water sewer, highway drain, or other drain; and
   d) Discharge to a combined sewer.
2) The requirement for detailed infiltration testing in accordance with BRE 365 standards to assess the viability of on-site infiltration. The NYC Supplementary Infiltration Guidance emphasises the importance of inviting the LLFA to witness these tests and mandates comprehensive reporting.
3) SuDS design should incorporate a sequence of components to control runoff rates and volumes, promoting water quality and biodiversity benefits. This includes source control measures, site control, and regional control techniques.
4) A development should not increase the flood risk on or off-site. SuDS should be designed to protect people, property, and infrastructure from flooding and be economically maintainable for a development's lifetime.

3 Consultation

3.1 EIA Scoping Opinion

3.1.1 An EIA Scoping Report (Appendix 1.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.01.01**]) was submitted to the Planning Inspectorate (PINS) on 11 November 2024. The EIA Scoping Opinion was issued by PINS on 19 December 2024 (Appendix 1.2 (ES Volume 3) [**EN0110012/APP/LVS/06.03.01.02**]).

3.1.2 Consultation undertaken throughout the pre-application and scoping phases for the Proposed Development has informed the approach to the FRA.

3.1.3 A summary of key comments from the EIA Scoping Opinion and how these have been addressed is presented in Chapter 15: Water Resources and Flood Risk (ES Volume 1) [**EN0110012/APP/LVS/06.01.15**].

3.2 Statutory consultation

3.2.1 A period of statutory consultation took place between 26 June 2025 to 7 August 2025 wherein consultees were able to respond to preliminary environmental information set out in the Preliminary Environmental Information Report (PEIR). Table 15-6 of Chapter 15: Water Resources and Flood Risk (ES Volume 1) [**EN0110012/APP/LVS/06.01.15**] outlines the statutory consultation responses relating to water resources and flood risk and how these have been addressed through the ES.

3.2.2 Responses to the Statutory Consultation are outlined in the Consultation Report [**EN0110012/APP/LVS/05.01**].

3.2.3 Meetings were held with the Environment Agency (EA) and the Ouse and Derwent Internal Drainage Board (IDB) to review key aspects related to flood risk and surface water management. A summary of key consultation points from these meetings is provided below in Sections 3.3 and 3.4, respectively.

3.2.4 Both the Selby Area IDB and North Yorkshire Council as the LLFA were invited to participate in consultation. Selby Area IDB did not respond to requests to meet, and North Yorkshire Council, acting as Lead Local Flood Authority (LLFA), declined a meeting, opting instead to provide comments through the Statutory Consultation process, as outlined in the Consultation Report and summarised here.

3.2.5 The LLFA advised the Applicant to review the North Yorkshire SuDS Guidance, which sets out design expectations and requirements for sustainable drainage systems, and to follow the Drainage Hierarchy alongside supplementary infiltration testing guidance to ensure infiltration feasibility is properly assessed – this has informed Appendix 15.4: Outline Drainage Strategy (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.04**]. They also advised that applications should address key elements including flood risk, runoff destinations, peak flow and volume control, designing for exceedance, climate change, urban creep and a maintenance plan, with detailed requirements provided within the SuDS Guidance – this has been done as relevant in this FRA. They noted that all drainage schemes must comply with the standard design parameters specified by the LLFA.

3.2.6 The LLFA also confirmed that whilst they hold no records of flooding in the vicinity of the proposed development, this does not confirm flooding has never occurred, as incidents may not have been reported.

3.2.7 Subsequently, a meeting was held with the LLFA in November 2025 to discuss the approach to both temporary and permanent watercourse crossings associated with the Proposed Development. During this meeting, the LLFA confirmed that they are accepting of the use of culverts in principle; however, they clarified that approval for any culvert located within an IDB district lies with the relevant IDB.

3.2.8 A summary of stakeholder engagement held to date is provided in Table 15-7 of the Chapter 15: Water Resources and Flood Risk (ES Volume 1) [**EN0110012/APP/LVS/06.01.15**].

3.3 Environment Agency

3.3.1 Following receipt of the EIA Scoping Opinion, consultation was carried out with the EA to agree the methodology and approach for the site-specific flood modelling to be carried out for the Solar Development Sites 1-4 of the Proposed Development, which are located in Flood Zones 2 and 3.

3.3.2 Arthian Ltd were appointed to carry out the site-specific hydraulic modelling by the Applicant, who recognise that flood risk is an important issue for the Proposed Development. Several models have been developed, including updates to the existing 2017 Lower Aire and 2018 Lower Ouse and Wharfe Washlands models provided by the EA, in addition to development of new rainfall-runoff models for Solar Development Sites 1 and 2.

3.3.3 An initial meeting was held on 29 January 2025 and was attended by the Applicant, EA, Arthian Ltd and Arup. A subsequent meeting was also held on 28 March 2025. Key outcomes from this consultation include:

1) The EA confirmed that the flood risk to the Solar Development Sites is fluvially influenced, not tidal, for both the FRA and modelling purposes. It was agreed appropriate for the tidal influence to be considered during sensitivity testing only; and

2) The EA accepted the use of a 30% ‘higher central’ allowance for climate change for the design flood event (1 in 100-year), per the existing 2017 Lower Aire and 2018 Lower Ouse and Wharfe Washlands model conditions, rather than the current value stipulated by PPG of 31% for both management catchments.

3.3.4 Further meetings were held with the EA following submission of the PEIR throughout June – August 2025. Key outcomes from this period of consultation include:

1) Finished floor levels were agreed to be set to the 1% annual probability flood plus climate change plus 300 mm freeboard *or* the credible maximum scenario flood level – whichever is higher. If stilted foundations are used, the freeboard requirement increases to 600 mm.

2) The EA confirmed that the development should be designed to withstand flooding in the credible maximum scenario, while separately considering resilience to more extreme scenarios such as breach events.

3) It was agreed that the FRA at ES stage would include sensitivity testing to understand the impact of solar panel support frames, either via roughness testing in areas of high flood velocities or through a simple volumetric assessment where flood velocities are low.

4) It was agreed that an assessment of interactions between flood defences and the Cable Route Corridor would be carried out at locations of proposed cable crossings, with this assessment provided in Annex H, and the Applicant committed to post-consent condition surveys (pre- and post-construction) for cable crossings of EA assets, which will be secured via the consent process within the EA's Protective Provisions within the Draft DCO [**EN0110012/APP/LVS/03.01**].

5) Several matters relating to surface water drainage were also discussed during consultation and are covered in detail in the outline Drainage Strategy (Appendix 15.4 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.04**]).

3.4 Internal Drainage Boards

3.4.1 The Order Limits include areas within two Internal Drainage Board (IDB) Districts. The first is the Ouse and Derwent IDB District, which contains Solar Development Site 1. The second is the Selby Area IDB District which contains Solar Development Sites 2 – 4 and 6 – 8. The Cable Route Corridor runs through both IDB districts.

3.4.2 During the period of statutory consultation, a meeting was held with the Ouse and Derwent IDB to provide responses to and discuss the IDB's consultation comments.

3.4.3 The IDB agreed to the proposed 10 m buffer for all watercourses and confirmed that surface water runoff rates are to be restricted to 1.4 l/s/ha or a minimum of 1 l/s, and the treatment of site surfaces in relation to surface water drainage as follows:

1) PV areas to be treated as permeable.

2) BESS/substations to be treated as impermeable with SuDS to be proposed.

3) Access track permeability was clarified, with Type 1 to be treated as impermeable and Type 3 to be treated as permeable.

3.4.4 The IDB also confirmed that crossing methods of any IDB watercourses must be trenchless, while open cut crossings of non-IDB ordinary watercourses are not preferred, they may be permitted at the landowner's discretion.

3.4.5 Further meetings with the Ouse and Derwent IDB and Selby Area IDB were held in December 2025 to discuss proposed temporary and permanent watercourse crossings and the approach to Land Drainage consenting.

3.4.6 The Proposed Development requires two new permanent culverts on Solar Development Sites 2 and 4, and a single temporary culvert (less than 2 years in-situ) on Solar Development Site 1. This is in addition to a further seventeen temporary culverts within the Cable Route Corridor, a number of which are within the Selby Area IDB district.

3.4.7 The proposed temporary culverts are to facilitate construction; allowing construction traffic to travel along the haul road and reduce the number of vehicles using the public road network, whilst the permanent culverts are to provide a permanent means of access within the respective Solar Development Sites.

3.4.8 In the meeting on 05 December 2025, the Selby Area IDB raised no objections to the provision of the permanent and temporary culverts, subject to further detail being provided as part of the consenting process secured via the drainage authority protective provisions included in Article 6 of the draft DCO Application.

3.4.9 The Applicant outlined that all culverts would be designed in accordance with CIRIA Report C786 (Ref 17), with initial sizing based on upstream catchment assessments and anticipated flows. Both IDBs confirmed that this design approach was acceptable in principle, subject to the submission of detailed drawings and calculations.

3.4.10 The Selby Area IDB requested that each crossing be supported by full design information, including temporary headwall details and upstream and downstream erosion protection, and emphasised the need to demonstrate that proposed pipe sizes are appropriate for expected flows.

3.4.11 The Ouse and Derwent IDB similarly raised no objection in principle, subject to the provision of standard drawings for each culvert. These drawings are to include details of the proposed culvert length, diameter and headwall arrangements. The IDB also advised that culvert sizing should take account of existing upstream and downstream control structures. Following receipt and review of the standard drawings, the IDB will inspect each location in order to agree final culvert details including sizing.

4 Proposed Development

4.1 Site description

4.1.1 The Proposed Development is shown in Figure 1.1: Site Location Plan and Order Limits (ES Volume 2) [**EN0110012/APP/LVS/06.02.01.01**]).

4.1.2 The total area within the Solar Development Sites is approximately 900 ha. The current land use is predominantly arable farmland and pastoral land with associated smallholdings, with some highways passing through the Order Limits.

4.1.3 The Cable Route Corridor is typically 50 m wide but widens in a number of locations for utility, road and river crossings. The exact location of the Grid Connection Cables and Interconnecting Cables within the Cable Route Corridor will be determined at the detailed design stage. The Cable Route Corridor Construction method statement provides further details on this (Appendix 2.1: Cable Route Method Statement (ES Volume 3) **[EN0110012/APP/LVS/06.03.02.01])**. The Solar Development Sites are split across a total of seven land parcels as presented in Figure 2.1: Illustrative Site Layout Plans (ES Volume 2) [**EN0110012/APP/LVS/06.02.02.01**]).

4.1.4 The Cable Route Corridor consists of nine separate corridors, predominantly crossing agricultural land with local farm holdings. In some areas, the Cable Route Corridor is crossed by highways (including the A19 and A63), rail lines, and the Selby Dam and River Ouse and associated flood defences. Each Cable Route Corridor is named corresponding to the Solar Development Sites in which they connect, outlined as follows: Cable Route Corridor 1-4 and 1-4a, Cable Route Corridor 2-4, Cable Route Corridor 2-6, Cable Route Corridor 3-4 and 3-4a, Cable Route Corridor 6-7, Cable Route Corridor 2-8, and Cable Route Corridor 4-POC. The Cable Route Corridors are further described in Annex H and an assessment of interactions between the Cable Route Corridors with EA flood defence assets is also provided.

4.1.5 The watercourses and topography (LIDAR Digital Terrain Model (DTM)) are shown on Figure 15.1: Surface Water Features (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.01]**, on which those that are designated as a 'main river' are also indicated. Given the broad spatial extent of the Order Limits, the topography varies substantially. Numerous watercourses are present within the Study Area, including main rivers designated by the EA, IDB watercourses, and ordinary watercourses.

4.1.6 The main rivers in the Study Area are the River Aire, River Ouse, and Selby Dam. The Order Limits spans across two IDB areas: the Selby Area IDB and the Ouse and Derwent IDB.

4.1.7 NYC is the LLFA for the Proposed Development and is responsible for managing and maintaining ordinary watercourses within its jurisdiction that are not under the authority of the IDB.

4.2 Proposed Development

4.2.1 The Proposed Development is a NSIP as it would generate over 100 MW of electricity. It will support national and local decarbonisation and Net Zero targets and improve energy security.

4.2.2 The Proposed Development includes the construction of solar PV with BESS and other associated infrastructure. There are seven Solar Development Sites (1-4, 6-8).

4.2.3 A description of the specific proposals for each Solar Development Site is provided in Section 6.3.28 of this FRA, and further detail about each is provided in the corresponding annex for each Solar Development Site.

4.2.4 The Design Parameters utilised in this FRA are described in Table 2-1 within Chapter 2: The Proposed Development (ES Volume 1) [**EN0110012/APP/LVS/06.01.02**].

4.2.5 Solar PV panels will either be of a tracking (Option A) or fixed (Option B) design with a minimum clearance between the ground and the bottom of a solar PV panel of 0.4 m. If a tracking type is used, the maximum height when horizontal or in a 'stow' position is 2.5 m above ground level. Solar PV Panels of either type would be positioned in rows with a minimum separation distance of 2.5 m.

4.2.6 Solar PV panels will be mounted on metal frames and secured via metal posts driven into the ground. The exception to this is in areas where archaeological protection may be required, where other non-ground penetrating techniques, including concrete footings, may be used to secure the mounting structure to the ground. 5.6% of the total Solar PV panel areas will require concrete footings or equivalent.

4.2.7 Panels and their frames are considered able to tolerate flood levels that remain below 1.0 m, subject to tolerable debris and impact loading of any panels within areas subject to overland flood flows. An assessment of the potential impacts of the solar panels has been carried out, including a review of flood velocities to inform appropriate assessment methods. This is provided in Section 6.3.

4.2.8 The Proposed Development includes three 275 kV substations within the ES Assessment Area. The locations of these substations have now been confirmed (shown on the Works Plans in [**EN0110012/APP/LVS/02.03**]) and are situated on Solar Development Sites 1, 2, and 4, within the areas illustrated on Figure 2.1: Illustrative Site Layout Plans (ES Volume 2) [**EN0110012/APP/LVS/06.02.02.01**]. Each substation will occupy a defined area within these sites, with a maximum compound footprint of approximately 3.5 ha.

4.2.9 The Proposed Development also includes for Integrated Conversion Units (ICUs) across the Solar Development Site PV areas. For the purposes of assessment, the ICUs are interchangeable with 33 kV switch rooms of equivalent dimensions and referred to as ICUs in this assessment. The indicative (but not finalised) locations of these are shown in Figure 2.1: Illustrative Site Layout Plans (ES

Volume 2) [**EN0110012/APP/LVS/06.02.02.01**] and will be subject to ongoing design development.

4.2.10 It is assumed that the foundations for ICUs or switch rooms will take the form of a concrete raft. The ICUs are anticipated to have maximum foundation dimensions of 16 m x 6 m and a maximum height of 3.5 m.

4.2.11 For Solar Development Site 1, the maximum compound area for the on-site 275 kV substation is 1.0 ha, whereas for Solar Development Sites 2 and 4, the maximum compound area is 3.5ha. Each substation will have a maximum height of 13 m to the top of the busbars. Foundations are expected to take the form of a concrete raft up to 2.5 m deep or piled foundations up to 15 m deep.

4.2.12 Supporting infrastructure in the form of BESS also forms part of the Proposed Development. The BESS is intended to store surplus electricity generated by the solar PV system and/or energy from the grid. The BESS Compound is to be located on Solar Development Site 2 and will have a maximum compound area of 10.5 ha. Each enclosure will measure 16 m x 3 m, with a maximum height of 3.5 m AGL. For the purposes of this assessment, a worst-case assumption has been made that the BESS Enclosures will be founded on concrete pads, although other types of foundation may be possible.

4.2.13 Minimum finished floor levels (FFLs) for flood sensitive assets and solar panels within the design flood extents on Solar Development Site 1 will be set to the 1 in 100-year plus 31 / 30% adopted climate change allowance plus 300 mm freeboard *or* set to the height of the credible maximum scenario – whichever is higher. In the event voided structures are used, freeboard will be a minimum of 600 mm. The specific FFLs for individual assets will be set at detailed design stage in accordance with these parameters. Indicative FFLs based on the Proposed Development Layout shown in Figure 2.1: Illustrative Site Layout Plans (ES Volume 2) [**EN0110012/APP/LVS/06.02.02.01**] are presented in Section 8.1.

4.2.14 Substations, BESS and ICUs are regarded as 'flood-sensitive' assets and cannot tolerate flooding. Substations and BESS are therefore sequentially located in areas of lowest flood risk, as demonstrated through the embedded mitigation measures for the Proposed Development and already committed to and secured within the Design Parameters and Commitments Document [**EN0110012/APP/LVS/05.06**] and as shown on the Works Plans [**EN0110012/APP/LVS/02.03**]. The Works Plans [**EN0110012/APP/LVS/02.03]** commit to locating the substations and the BESS Compound within Flood Zone 1 and Flood Zone 2 only. These locations are also outside the flood envelope associated with the 1 in 100-year plus climate change design flood event.

4.2.15 ICUs are also flood-sensitive assets, however, they are small-scale components that are typically co-located with the solar panels they serve and so have limited locational flexibility. As a result, ICUs are located within the same Flood Zone as the associated solar PV, including Flood Zone 2 and 3. Nevertheless as shown on Figure 2.1: Illustrative Site Layout Plan (ES Volume 2) [**EN0110012/APP/LVS/06.02.02.01**] it is possible for the ICUs to be largely located outside of the flood envelope associated with the 1 in 100-year plus climate change design flood event, with exceptions on Solar Development Site 1. The potential impacts and mitigation associated with ICUs is discussed further in Section 6 and Section 7 of this report.

4.2.16 The Solar Development Sites will be connected to each other and the substations via underground cables, located within the Cable Route Corridor (shown on Figure 15.14: Spatial Flood Defences (ES Volume 2) [**EN0110012/APP/LVS/06.02.15.14**].

4.3 Development type and vulnerability classification

4.3.1 The NPPF classifies all types of development in accordance with their vulnerability to flood risk, to steer vulnerable developments into areas of lowest flood risk. The Proposed Development involves the construction of solar PV and associated infrastructure for the purpose of energy generation and distribution, which is listed under NPPF as 'Essential infrastructure'.

4.3.2 This FRA assumes a design life of up to 60 years, including construction and decommissioning, resulting in a lifetime beyond 2080. Given the status of the Proposed Development as an NSIP, the consideration of later climate epochs up to the 2080's epoch (2070-2125) is required.

4.4 Climate change

4.4.1 NPS EN-1 confirms the need to factor the effects of climate change into any FRA. Paragraph 4.10.13 advises that the latest UK Climate Projections and associated research and expert guidance (such as the EA's 'Flood Risk Assessments: Climate Change Allowances' Guidance (February 2016; last updated May 2022) (Ref 18) should be used to ensure appropriate mitigation or adaptation measures are identified to cover the estimated lifetime of the Proposed Development.

4.4.2 The EA Guidance provides climate change allowances (predictions of anticipated change), and those relevant to the Proposed Development are the allowances for:

1) Peak river flow; and
2) Peak rainfall intensity.

4.4.3 Peak river flow allowances show the anticipated changes to peak flow by management catchment. Management catchments are sub-catchments of river basin districts. Given the location, type and vulnerability classification, and anticipated lifespan of the development of up to 60 years, it is appropriate to consider the climate change values for the 2080's epoch.

4.4.4 The Proposed Development is located across two management catchments: the Wharfe and Lower Ouse management catchment and the Aire and Calder management catchment. Solar Development Site 1 is located within the Wharfe and Lower Ouse management catchment, whilst the remaining Solar Development Sites are located in the Aire and Calder management catchment. The Cable Route Corridor spans both catchment areas.

4.4.5 The same EA Guidance states that Essential Infrastructure Developments should use the 'higher central' allowance for design purposes. However, NPS EN-1 Paragraph 4.10.11 states that 'Applicants should demonstrate that proposals have a high level of climate resilience built-in from the outset and should also demonstrate how proposals can be adapted over their predicted lifetimes to remain resilient to a credible maximum climate change scenario'. NPS EN-1 therefore requires that the Proposed Development should also consider a credible maximum scenario, which for fluvial flooding, is the 'upper end' climate change allowance.

4.4.6 A credible maximum scenario ensures that the development remains resilient to the potential impacts of more extreme flood events due to climate change. The 'upper end' allowances will be applied in sensitivity testing to evaluate the Proposed Development's performance, providing a robust assessment of flood risk and ensuring that the Proposed Development can operate safely throughout its anticipated design life.

4.4.7 Table 4-1 provides the Higher Central and Upper End Allowances for both Management Catchments.

Table 4-1 Management catchments within the Order Limits – peak river flow allowances

Management catchment	Higher Central 2080's epoch	Upper End 2080's epoch
Wharfe and Lower Ouse	31% (30% adopted)	48% (50% adopted)
Aire and Calder	31%	51%

4.4.8 With reference to Section 3, in consultation with the EA on 29 January 2025, the Proposed Development adoption of the 30% allowance for climate change for the design event (1 in 100-year) was agreed, per the existing 2017 Lower Aire and 2018 Lower Ouse and Wharfe Washlands model conditions, rather than the current PPG stipulated value of 31%. Subsequently, the site-specific modelling using the River Aire model has been updated to apply a 31% climate change allowance.

4.4.9 The aforementioned guidance further confirms that the appropriate allowance to assess off-site impacts is the 'central allowance', except where the affected area contains essential infrastructure, in which case the higher central allowance should be used. The higher central allowance should also be used to determine safe access and egress for Essential Infrastructure Developments.

4.4.10 For peak rainfall intensity, the peak rainfall allowances map (Ref 18) shows the anticipated changes in peak rainfall intensity to be used for site-scale applications, such as drainage design. The peak rainfall allowances for both catchments are provided for the 2070s epoch in Table 4-2 below.

Table 4-2 Management catchments within the Order Limits – peak rainfall allowances

Management catchment	3.3% annual exceedance rainfall event 2070s	1% annual exceedance rainfall event 2070s
Wharfe and Lower Ouse	Central allowance = 25% Upper end allowance = 40%	Central allowance = 30% Upper end allowance = 40%
Aire and Calder	Central allowance = 25% Upper end allowance = 40%	Central allowance = 25% Upper end allowance = 45%

Note: The 2070s epoch is used for development with a lifetime between 2061 and 2125.

5 Hydraulic modelling

5.1 Introduction

5.1.1 With reference to Figure 15.10: Risk of Flooding from Rivers and Seas (ES Volume 2) [**EN0110012/APP/LVS/06.02.15.10**], the Solar Development Sites have varying Flood Zone characteristics due to the broad spatial extent of the Order Limits. The need for hydraulic modelling was highlighted in previous EIA stages due to many of the Solar Development Sites being partially or wholly located in Flood Zones 2 and 3.

5.1.2 Site-specific hydraulic modelling has been commissioned by the Applicant and has been used to inform the Flood Risk Assessment presented here, providing an updated understanding of flood risk across the Solar Development Sites. This modelling was undertaken on the basis of the Illustrative Site Layout Plans (ES Volume 2) **[EN0110012/APP/LVS/06.02.02.01]** as a reasonable worst-case scenario of the Proposed Development design (and also being a scenario which accords with the limits of deviation for infrastructure set by the Works Plans [**EN0110012/APP/LVS/02.03**]).

5.1.3 These outputs, alongside the EA National Flood Risk Assessment 2 (NaFRA2) data (published 28 March 2025), contribute to a comprehensive evaluation of current and future flood risk, incorporating fluvial, coastal, and surface water sources under climate change scenarios.

5.1.4 Site-specific hydraulic models were not developed specifically for Solar Development Sites 6, 7 or 8, all of which are largely in Flood Zone 1.

5.1.5 Four models were used or developed by Arthian: a direct rainfall model for Solar Development Site 1 (Pallion Dike and tributaries), a direct rainfall model for Site 2 (unnamed ditch), the 2017 Lower Aire Study model (covering Solar Development Sites 2–5), and the 2018 Lower Ouse and Wharfe Washlands Study model (covering Solar Development Site 1).

5.1.6 The outputs have been used to inform the site-specific Flood Risk Assessments in Annex A through Annex G. Site-specific flood maps showing the modelled extents and depths of flooding can be seen in Figures 15.15 to 15.26 (ES Volume 2) [**EN0110012/APP/LVS/06.02.15.15-26**] and the accompanying hydraulic modelling technical note completed by Arthian can be found in Annex I.

5.2 Summary of modelling methodology

5.2.1 The following provides a summary of the hydraulic modelling methodology used by Arthian, as detailed in the technical note in Annex I, and key findings from the outputs.

5.2.2 The 2017 Lower Aire Study model was updated to incorporate new EA LiDAR data (2019–2022), ensuring that the model reflects current topographic conditions.

5.2.3 The 2018 Lower Ouse and Wharfe Washlands Study model was considered representative of the existing floodplain and was not updated with new LiDAR for the assessment.

5.2.4 The development of site-specific rainfall-runoff models was considered to be unnecessary for Solar Development Sites 3 and 4, as these sites are robustly covered by the existing and updated River Aire EA model. Additionally, the Proposed Development will not significantly alter existing topography, land use, or drainage and local minor watercourses are either largely absent on these Sites or not considered to add significant risk beyond what is captured in these models.

5.2.5 Climate change uplifts were applied in accordance with current EA guidance shown in Table 4-1. For the strategic models, a +31% uplift was used in the 2017 Lower Aire Study and 2018 Lower Ouse and Wharfe Washlands Study to represent the design event. For the credible maximum scenario, uplift values of +51% (Aire) and +50% (Ouse) were applied, representing upper-end projections for the 2080s. The +50% uplift for the Ouse catchment was deemed equivalent to the EA +48% uplift projected for the 2080s. For the site-specific models at Sites 1 and 2, a +30% uplift was applied to all events.

5.2.6 Solar Development Sites 6 – 8 are wholly or predominantly located in Flood Zone 1 except for an area of Solar Development Site 6 immediately adjacent to Milford Common Drain and Lumby Common Drain, which bisects the site and the western and northernmost boundaries of Solar Development Site 8, likely associated with the Habholme Dyke.

5.2.7 The extents of the outputs from the fluvial models encompass Solar Development Sites 6 – 8. Separate rainfall–runoff models have therefore not been developed to assess the risk from smaller watercourses around or within these sites, as the risk of flooding from surface water (RoFSW) mapping has been shown to provide a suitable proxy for identifying areas potentially at risk from these features.

5.2.8 The technical note by Arthian in Annex I summarises that the models are indicated to be generally robust and show good correlation with the latest Environment Agency NaFRA2 RoFSW flood mapping (Ref 16). For Solar Development Sites 1 and 2, while direct rainfall models were developed to represent local watercourses, the interaction between these tributaries and the main rivers is not fully captured. Additionally, calibration of the models for smaller, ungauged catchments is limited.

6 Site-specific Flood Risk Assessment

6.1 Overview of site-specific assessments

6.1.1 Site-specific Flood Risk Assessments (FRAs) have been carried out for each of the Solar Development Sites and are provided in Annex A through to Annex G of this Appendix. The site-specific FRA for the Cable Route Corridor is also provided in Annex H.

6.1.2 These assessments build upon the baseline information provided in this Appendix and consider the unique characteristics and flood risk constraints of each Solar Development Site.

~~6.1.2~~6.1.3 The assessments incorporate the latest available data, including Environment Agency Product Data, NaFRA2 data, and site-specific modelling, to evaluate flood risk from all relevant sources, including fluvial, surface water, groundwater, and artificial sources.

~~6.1.3~~6.1.4 A summary table is provided below that highlights the different sources of flooding that have been assessed for each Solar Development Site.

Table 6-1 Flood risk sources

Flood risk source	Solar Development Site						
	1	2	3	4	6	7	8
Fluvial	✓	✓	✓	✓	✓	✓	✓
Surface water	✓	✓	✓	✓	✓	✓	✓
Groundwater	✓	✓	✓	✓	✓	✓	✓
Reservoirs	✓	✓	✓	✓	✓	✓	✓
Highway drainage	✓	✓	✓	✓	✓	✓	✓
Private drainage	✓	✓	✓	✓	✓	✓	✓
Additional sources*	✓	✓	✓	✓	✓	✓	✓

* Flood risk may come from additional sources, such as Yorkshire Water infrastructure (for example sewer flooding or watermain burst).

~~6.1.4~~6.1.5 This FRA considers several events, including the design event, credible maximum scenario, and further sensitivity tests including breach scenarios. Climate change has been applied as outlined in Section 4.4. The models have been developed by Arthian Ltd in line with the approach agreed with the EA during consultation, as detailed in Section 3.3.

~~6.1.5~~6.1.6 The assessment also considers the latest changes to the Flood Map for Planning, which now reflects the Environment Agency's updated NaFRA2 data, published on 25 March 2025. This ensures that the assessment is robust, up to date, and aligned with the latest available flood risk information.

~~6.1.6~~6.1.7 The assessment has also been updated to include an evaluation of the potential impacts of the solar panels, considering flood depths and velocities in the credible maximum scenario and accounting for the Design Parameters and Commitments set out within Chapter 2: The Proposed Development (ES Volume 1) **[EN0110012/APP/LVS/06.01.02]** and the Design Parameters and Commitments document **[EN0110012/APP/LVS/05.06]**. This assessment is provided in Section 6.3.

~~6.1.7~~6.1.8 In addition, the assessment considers the interactions between the Cable Route Corridor and EA flood defence assets using the AIMS Spatial Flood Defence dataset, ensuring that any potential impacts on the integrity and performance of these defences are identified and addressed. This assessment is provided in FRA Annex H.

6.2 Summary of ~~S~~site-specific assessments

6.2.1 This section provides a summary of the FRAs carried out for each of the Solar Development Sites forming part of the Proposed Development. Table 6-2 presents a high-level summary of the anticipated levels of flood risk at each Solar Development Site, based on the range of potential sources identified in Table 6-1.

Table 6-2 Solar Development Sites Flood Risk Assessment summary

Flood risk source	Solar Development Site / Risk						
	1	2	3	4	6	7	8
Fluvial	High	Low	Medium	High	Low	Low	Low – Medium
Surface water	Low	Low – Medium	Low	Low – Medium	Low – Medium	Low – Medium	Low – Medium
Groundwater	Low – Medium	Low – Medium	Low – Medium	Low – Medium	Low	Low	Low
Reservoirs	Very low	Very low	Very low	Very low	Very low	Very low	Very low
Highway drainage	Very low	Very low	Very low	Very low	Very low	Very low	Very low
Private drainage	Very low	Very low	Very low	Very low	Very low	Very low	Very low
Additional sources	Very low	Very low	Very low	Low	Very low	Very low	Very low

6.2.2 The assessments indicate that the primary source of flood risk to the Proposed Development is from fluvial flooding. Other sources of potential flood risk to the development include surface water and groundwater flooding.

6.2.3 Solar Development Sites 1, 3 and 4 are located predominantly within Flood Zones 2 and 3 and are therefore considered to be at a medium to high risk of flooding from fluvial sources in accordance with the Flood Map for Planning.

6.2.4 However, site-specific hydraulic modelling shown in Figure 15.15: Design Event (1 in 100-year plus Climate Change) (ES Volume 2)

[**EN0110012/APP/LVS/06.02.15.15**] indicates that these sites remain dry during the design flood event, with the exception of the southern portion of Solar Development Site 1, which is shown to be affected by flooding under this scenario associated with Pallion Dyke, which forms the Site's southern boundary. Solar Development Site 1 experiences flooding up to 1.0 m deep in Solar PV areas in this event.

~~6.2.5~~ Solar Development Sites 2, 6, 7 and 8 are considered to be at a lower risk from fluvial flooding, as they are wholly or predominantly located in Flood Zone 1. While smaller portions of these sites – such as the easternmost boundary of Solar Development Site 2, areas immediately adjacent to Milford Common Drain and Lumby Common Drain within Solar Development Site 6, and the western and northern boundaries of Solar Development Site 8 associated with the Habholme Dyke – encroach into Flood Zones 2 and 3, site specific modelling confirms that these areas remain dry during the design flood event.

~~6.2.6~~6.2.5 Any flooding observed along these watercourses can be effectively avoided by maintaining the committed Design Principle of 10 m from the bank top of all watercourses (an embedded mitigation measure).

~~6.2.7 Separate rainfall runoff models have not been developed for Solar Development Sites 6 – 8. Instead, the RoFSW mapping is regarded a suitable proxy for identifying areas potentially at risk from smaller watercourses within or surrounding the sites. This approach is considered proportionate and appropriate for assessing residual surface water flood risk, given the good correlation observed between the site specific results for Solar Development Site 2 and the NaFRA2 data.~~

~~6.2.8 Furthermore, the updated strategic river models (River Aire 2017 and River Ouse 2018) generally provide a worst-case scenario for flood depths from river flooding. The direct rainfall site specific models developed for Solar Development Sites 1 and 2 show more widespread but shallow flooding from minor watercourses. The localised risks from minor watercourses are unlikely to exceed the impacts already accounted for in the strategic models. The interaction between flooding from main rivers and minor watercourses has not been explicitly modelled. This limitation is acknowledged, but the use of only strategic models means the assessment is robust, risk averse, and consistent with regulatory best practice.~~

~~6.2.9~~6.2.6 Fluvial flooding in the credible maximum scenario has also been reviewed from the Lower Ouse and River Aire model results, equating to the 1 in 100-year plus 50 and 51% (respectively) climate change allowances, and can be seen in Figure 15.16: Credible Maximum Scenario Depth (ES Volume 2) [**EN0110012/APP/LVS/06.02.15.16**].

~~6.2.10~~6.2.7 Solar Development Site 1 experiences more extensive flooding in this event, with Solar PV areas subject to depths up to 1.25 m. Solar Development Site 4 experiences flooding in the same event, where much of the eastern reaches of the site are shown to be inundated with average flood depths of around 0.25 m.

~~6.2.11~~6.2.8 Flood-sensitive elements – the BESS Enclosures, 275 kV substations, and ICUs – all remain outside of the flood envelope for the design event with the exception of a handful of ICUs on Solar Development Site 1, which are indicated to experience flood depths up to 0.5 m.

~~6.2.12~~6.2.9 Flood-sensitive elements also largely remain dry in the credible maximum scenario, with the exception of the 275 kV substation on Solar Development Site 4 and several ICUs located across Solar Development Sites 1 and 4, prior to mitigation.

~~6.2.13~~6.2.10 A handful of ICUs are shown to encroach into the flood envelope associated with the credible maximum scenario on Solar Development Site 1, with modelled flood depths reaching up to approximately 1.0 m. On Solar Development Site 4, flooding under the same scenario is generally more widespread but remains shallow, with depths typically up to 0.3 m, and isolated areas reaching approximately 0.5 m.

~~6.2.14~~6.2.11 The 275 kV substation on Solar Development Site 4 experiences limited flooding across its footprint in the credible maximum scenario as it has been strategically located in the south-western corner of Field 4.4, where modelling indicates shallower flood depths. Average flood depths within the substation footprint are reported to be generally less than 0.05 m, with a maximum flood depth of 0.386 m in southeasternmost corner. This pocket of deeper flooding is highly localised and likely corresponds to an existing topographic depression.

~~6.2.15~~6.2.12 This placement reflects a risk-informed sequential approach to infrastructure siting within the development. This location ensures that the majority of the substation footprint lies outside the flood envelope for this event, with only a minor portion encroaching into the area of potential inundation. This placement avoids the more pronounced flooding observed further north and along the eastern boundary of this land parcel.

~~6.2.16~~6.2.13 The modelled flood levels associated with the design event plus 300 mm freeboard or the credible maximum scenario, whichever is greater, will be used to inform the minimum FFL of the affected 275 kV substation and integrated conversion units on these sites, to ensure resilience against flooding and continued operation. Indicative FFLs for these scheme elements based on the Proposed Development Layout shown in Figure 2.1: Illustrative Site Layout Plans (ES Volume 2) [**EN0110012/APP/LVS/06.02.02.01**] are presented in ~~Section~~Table 8.1.

6.2.14 ~~Groundwater and surface water are additional notable sources of flood risk that may affect the Solar Development Sites. The level of risk from these sources' ranges from low to medium across the Proposed Development, with site specific conditions assessed in the relevant annexes.~~ Surface water is also a notable source of flood risk that may affect the Solar Development Sites. As summarised in Table 6-2 and detailed in the site-specific assessments in Annexes A – G, the level of surface water flood risk ranges from low to medium across the Proposed Development and is generally associated with localised topographic depressions and existing watercourses.

6.2.15 The risk of flooding from surface water has been assessed using the latest Environment Agency NaFRA2 RoFSW data and site-specific rainfall-runoff models where relevant. The NaFRA2 RoFSW data has been reviewed for all Solar Development Sites, with the site-specific models developed for Solar Development Sites 1 and 2 providing further information on flood risk associated with direct rainfall runoff and smaller watercourses. The approach to the assessment and the basis for the use of these datasets is described in Section 5.2, with the site-specific assessments presented in Annexes A – G.

6.2.16 The site-specific assessments identify that the majority of the Solar Development Sites are generally at very low risk of surface water flooding, with the areas of higher risk generally being limited in extent and associated with existing watercourses, field boundaries, and localised topographic depressions. No significant overland surface water flow paths are identified across the Solar Development Sites. The direct rainfall models developed for Solar Development Sites 1 and 2 show more widespread but shallow flooding, with deeper flooding generally limited to minor watercourses, reflective of the NaFRA2 data.

6.2.17 The localised risks from minor watercourses are unlikely to exceed the impacts already accounted for in the strategic fluvial models. Whilst the interaction between flooding from main rivers and minor watercourses has not been explicitly modelled, the use of strategic models means the assessment is robust, risk-averse, and consistent with regulatory best practice.

6.2.18 As a result, there is limited potential for the Proposed Development to obstruct or materially alter significant overland flow pathways. While localised areas of risk are present, these are limited in nature and can be effectively managed through the detailed siting and design of infrastructure, including by applying the committed Design Principle of 10 m from the bank top of all watercourses, minimum panel ground clearances, and the minimum FFL and freeboard requirements for flood-sensitive assets.

6.2.19 Furthermore, surface water runoff arising from the Proposed Development itself will be managed in accordance with the outline Drainage Strategy (Appendix 15.4 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.04**]), including measures to retain the existing greenfield runoff response within the Solar PV areas and the provision of appropriate drainage and runoff controls for the BESS and substations. On this basis, the identified surface water flood risk is not considered to present an unacceptable risk to the Proposed Development, and the Proposed Development would not increase surface water flood risk elsewhere.

6.2.20 In regard to groundwater flooding, the site-specific assessments identify the risk of flooding from groundwater as low to medium. Whilst the North Yorkshire SFRA identifies no substantial evidence of groundwater flooding across the majority of North Yorkshire, groundwater is recognised as a contributing factor which may exacerbate surface water flooding under certain circumstances. In some locations, areas of greater susceptibility are likely to be associated with low-lying areas near to watercourses. Accordingly, the measures identified to manage fluvial and surface water flood risk are considered to address any associated groundwater flood risk.

~~6.2.17~~6.2.21 On this basis, the primary flood risk to the Proposed Development is considered to be fluvial in nature.

6.3 Additional flood risk considerations

6.3.1 This assessment responds to the EA's request to evaluate the impact of solar panel installations on flood risk and structural resilience, considering the influence of solar panel mounting structures on flood flow velocities and floodplain storage.

6.3.2 In order to determine an acceptable method for assessing these impacts, flow velocities have been reviewed during the credible maximum scenario and velocity mapping is provided in Figure 15.17: Credible Maximum Scenario Velocity (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.17]**. The flood velocities across the proposed Solar Development Sites are generally low, with the exception of localised areas within or near to watercourses. Under the credible maximum scenario:

1) Solar Development Site 1 experiences predominantly low velocities in the region of 0.1 – 0.2 m/s across the site. Velocities in and around the various watercourses passing through the site are generally indicated up to 0.5 m/s, with isolated areas reaching up to a maximum of 1.26 m/s in the south-west corner associated with Pallion Dyke. The solar panel areas are located outside of areas where higher velocities are recorded close to watercourses, minimising the exposure of high velocity flows to the structures and avoiding areas providing flood-flow conveyance.
2) Solar Development Site 3: Velocities remain low across the site, with a maximum of 0.35 m/s close to the western boundary.
3) Solar Development Site 4: Velocities range from 0 to 0.91 m/s, with slightly higher flows to the east associated with existing watercourses.
4) Solar Development Site 8: A maximum velocity of 0.94 m/s is observed along the western boundary, associated with the Habholme Dyke. The remainder of the site is unaffected by flooding and thus Solar Development Site 8 is not discussed further in this assessment.

6.3.3 Given the low velocities observed, a roughness sensitivity test (-60%) is not considered necessary, and a volumetric approach has been adopted to assess potential flood storage losses. This volumetric assessment is provided below.

6.3.4 The installation of solar photovoltaic (PV) panels on ground-mounted racking systems introduces a minor obstruction to overland flow and temporary flood storage within the inundated extent. While it could be assumed that all volume beneath and within the panel footprint is completely displaced (i.e., 100% solid obstruction), this assumption is overly conservative and inconsistent with the actual physical characteristics of the array structures.

6.3.5 An assessment has been carried out to determine the potential loss of storage as a result of installation of the PV mounting structures within the floodplain, and the results of this assessment are included below.

6.3.6 Solar panels are considered to be flood compatible and are expected to tolerate flood depths up to 1.0 m, provided debris loading is minimal. The space beneath and around PV panels is predominantly void space, with only a small proportion of the area occupied by slender posts, concrete footings (for ~5.6% of panels across the Proposed Development), frame rails, and ancillary electrical equipment. Hydraulic interaction therefore occurs primarily through changes to flow patterns rather than wholesale loss of storage.

6.3.7 The flood depths and volumes have been calculated in areas where solar panels intersect with the credible maximum scenario flood extents. These values are presented in Table 6-3 below.

Table 6-3 Flooded panel area

Solar Development Site	Site area (ha)	Flooded Panel Area (ha)	Estimated average flood depth (m)
Site 1	361.4	17.5	0.68
Site 3	19.9	2.2	0.22
Site 4	280	43.0	0.19

6.3.8 As can be seen from the table, flood depths on Solar Development Sites 3 and 4 are generally indicated to be below 0.4 m, meaning flood waters largely remain below the panel edge in events up to and including the credible maximum scenario.

6.3.9 Solar Development Site 1 experiences deeper flooding (up to 1.25 m) in the same scenario, but only 5% of the site area is affected. Furthermore, the site behaves like a bowl that fills with slow-moving water, reducing dynamic loading risks.

6.3.10 Assuming a worst-case panel design (Option B – fixed panels with a minimum of 0.4 m clearance above ground level), three distinct zones can be identified for assessment:

1) **The foundation zone (0m – 0.3 m AGL)**: The solar panels are typically proposed to be mounted on small diameter driven or helical type piles. These have been assessed allowing for up to 110 mm pile diameter, protruding up to 300mm above ground level. Within Solar Development Site 1, concrete footings have been proposed in limited areas for archaeological protection. These concrete foundations will have a greater impact on floodwater displacement and have been included in the assessment for Solar Development Site 1 in the specified locations. The foundations in both cases are provided at approximately 3.5 m spacings, with the area between foundations remaining clear and allowing the passage and storage of flood water.

2) **The sub-panel frame (0.3 m AGL +):** This area includes the proposed metal mounting structure for the Solar PV panels, including columns which are mounted to the foundations and struts for lateral stability. A nominal loss of storage is anticipated due to the relatively small cross-sectional area

(28.65 cm^2) but has been included in the assessment for completeness. The remainder of the area underneath the panels remains clear, allowing for the passage and storage of flood water. As per the foundations, two columns are allowed for at each support location, with supports provided at 3.5 m spacings.

3) **The panel zone (> 0.4 m above ground level):** This area includes the solar panel itself. Where flood waters reach this depth, the panel will reduce the storage volume available to floodwater as well as acting as a baffle that locally alters flow paths and reduces connectivity. The panels will therefore have the effect of volumetric displacement and flow impedance. All panels have been assumed to be at a 25^{o} angle to the horizontal. This is considered to be conservative as steeper angles would reduce the extent of the panel within the floodplain depth.

6.3.11 In addition to the solar panels, any ICUs within the flooded areas associated with the credible maximum scenario will also have the potential to displace floodwater. These structures are proposed to be raised above the flood level to protect the structure itself, and in a worst-case scenario this raising would have the same impact on volumetric reduction through the introduction of a solid concrete foundation. Alternative approaches, such as using stilted foundations that introduce a void beneath the structure plus a minimum of 600 mm freeboard, could reduce floodplain displacement, however these have not been assumed for the purposes of this assessment. The ICUs are therefore also included within the assessment.

6.3.12 The depth of flooding varies significantly across a single bank of solar panels. Since the flood depth is a key criterion in assessing the volume loss, the maximum modelled flood depth within a bank of panels has been taken and applied uniformly across the whole bank for analysis. This provides a conservative assessment of volume loss and displacement, as in reality, some areas in each bank will experience no or lower flood depths.

6.3.13 For Solar Development Site 1, the River Ouse credible maximum scenario has been assessed. Allowing for the varying flood depths across the solar arrays and height-dependant volumetric displacement as described in paragraph 6.3.10, the total displaced volume is calculated to be 6,626 m^3.

6.3.14 The total area of fluvial flooding associated with the River Ouse for the same event within the Order Limits is circa. 1.71 million m^2. If a conservative assumption is taken that the volume of displacement only increases the depth of flooding within Solar Development Site 1 itself, a 4 mm increase in flood depth is estimated across the site.

6.3.15 This assessment uses a conservative assumption that displaced floodwater is contained within the Solar Development Site 1 boundary, whereas in practice, floodwater would be distributed across the wider hydraulically connected floodplain. To determine whether the resulting increase in flood level of 4 mm is representative of behaviour across the wider floodplain, a supplementary GISbased review of the hydraulically connected floodplain has been carried out by Arthian Ltd.

6.3.16 An analysis of peak flood levels across the inundated area of Solar Development Site 1 identifies an average peak water level of approximately 7.093 mAOD in the design event, with a standard deviation of approximately 1 mm. This indicates an extremely flat hydraulic response across the wider floodplain system.

6.3.17 Applying a tolerance of ±5 mm (i.e. peak flood levels between 7.088 mAOD and 7.098 mAOD), the hydraulically connected floodplain is estimated to extend to approximately 18,252,600 m². This is more than ten times greater than the flooded area within Solar Development Site 1 itself in the credible maximum scenario (approximately 1,719,000 m²), demonstrating that the site forms part of a much larger, continuous floodplain system.

6.3.18 This further analysis indicates that, in practice, any displacement of floodwater would be redistributed across a significantly larger hydraulically connected area than that defined by the Solar Development Site 1 boundary used in the initial assessment. As such, a more realistic equivalent increase in flood level distributed across the wider floodplain is expected to be proportionally well below 1 mm.

6.3.19 Furthermore, the solar panels on Solar Development Site 1 will be raised in accordance with the parameters set out in Paragraph 8.1.3 so that the bottom panel edge is above the flood level associated with the design event plus 300mm freeboard or the credible maximum scenario, whichever is greater. Alternatively, their locations will be reviewed and reasonably adjusted where practical to position them outside of the flood envelope as the design progresses. This will further reduce the volume and risk of any displacement and will ensure resilience against flooding.

~~6.3.15~~6.3.20 For Solar Development Sites 3 and 4 together, the River Aire credible maximum scenario has been assessed. Allowing for the varying flood depths across the solar arrays and height-dependant volumetric displacement as described in paragraph 6.3.10, the total displaced volume has been calculated to be 991 m^3.

~~6.3.16~~6.3.21 The total area of fluvial flooding associated with the River Aire for the same event within the Order Limits is circa. 1.24 million m^2. If the conservative assumption is taken that the volume of displacement only serves to increase the depth of flooding within the boundaries of Solar Development Sites 3 and 4, an increase of less than 1 mm is estimated.

~~6.3.17~~6.3.22 ~~In reality, these displaced volumes would be spread over much larger areas,~~Across Solar Development Sites 1, 3 and ~~given the~~4, this assessment adopts a range of conservative assumptions ~~made~~ within the ~~assessment~~ volumetric methodology, outlined in the preceding paragraphs. Under these assumptions, the ~~total~~estimated increases in flood depths are demonstrated to be below 1 mm. These results therefore demonstrate that the effects of potential floodwater displacement on flood depths are expected to be negligible.

~~6.3.18~~6.3.23 In addition, to assess the potential for debris loading on the panels, likely sources of debris, prevailing flood hydraulics and the form of the PV mounting system have been considered. The floodplain predominantly comprises arable and pastoral land with no significant buildings, walls, stored materials or other features that could generate large floating debris.

~~6.3.19~~6.3.24 Predicted flood depths and velocities are generally low across the Solar PV areas, limiting the capacity for floodwaters to mobilise and transport heavy objects. The solar arrays are offset from watercourses and will be elevated above ground on open-framed supports, allowing water and smaller items of vegetation to pass beneath and between the rows. On this basis, the risk of significant debris loading on the PV structures is considered to be minimal.

~~6.3.20~~6.3.25 Good practice measures, including maintaining panel ground clearances, avoiding solid barriers across the floodplain, and clearing any post-event debris as part of routine maintenance, will further ensure that debris does not materially increase flood risk or affect structural performance. The design of the panels will also ensure that support frames in the floodplain are engineered to withstand anticipated hydrostatic and hydrodynamic forces.

~~6.3.21~~6.3.26 The above assessment indicates that off-site impacts on flood risk are anticipated to be minimal. The estimated displacement volumes result in negligible increases in flood depths of less than 4 mm on Solar Development Site 1 and less than 1 mm across Solar Development Sites 3 and 4.

~~6.3.22~~6.3.27 The figures presented are based on conservative assumptions, including the application of the maximum flood depth uniformly across each bank of solar panels and the attribution of all displaced volume solely to the area within the Solar Development Site(s). In reality, flood depths vary considerably across the solar arrays, and any displaced volume would be dispersed over a larger hydraulically connected area, resulting in a negligible change in water levels.

~~6.3.23~~6.3.28 Accordingly, the overall increase in flood risk beyond the Order Limits is expected to be negligible. In addition, proposed scrapes within the southern Bird Mitigation Area on Solar Development Site 1 may provide additional attenuation by increasing local storage capacity, thereby helping to offset any potential minimal increase in flood risk. The total area of these scrapes is anticipated to be around 8 ha, with final details to be confirmed during detailed design.

7 Sequential and Exception Tests

7.1 Overview

7.1.1 The Sequential Test is designed to prioritise the allocation of Solar Development Sites with the lowest flood risk, with the aim of keeping developments out of high and medium flood risk areas.

7.1.2 When suitable sites in Flood Zone 1 are unavailable, the test permits developers to site developments in Flood Zone 2, provided the flood risk can be mitigated. Only after all reasonable sites in Flood Zones 1 and 2 have been assessed can sites in Flood Zone 3 be considered. The Sequential Test ensures a sequential, risk-based approach is followed to direct new development to areas with the lowest flood risk, considering all sources of flood risk and the impacts of climate change.

7.1.3 The “flood risk vulnerability and flood zone ‘compatibility’ table 2 from the PPG document for Flood Risk and Coastal Change (Ref 2) has been partly reproduced in Table 7-1.

Table 7-1 Flood risk vulnerability and flood zone 'incompatibility'

Flood Zones	Flood risk vulnerability classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a†	Exception Test required	X	Exception Test required	✓	✓
Zone 3b*	Exception Test required	X	X	X	✓

† In Flood Zone 3a essential infrastructure should be designed and constructed to remain operational and safe in times of flood.

* In Flood Zone 3b (functional floodplain) essential infrastructure that has passed the Exception Test, and water-compatible uses, should be designed and constructed to remain operational and safe in times of flood, result in no net loss of floodplain storage, and note impede water flows and not increase flood risk elsewhere.

7.1.4 With reference to the table above and in accordance with Annex 3: Flood risk vulnerability classifications (Ref 19) all classifications of development are permitted in Flood Zone 2; however, ‘highly vulnerable’ development is subject to the Exception Test. Annex 3 specifically lists solar farms as ‘Essential infrastructure’, which is classified as being required to be operational during times of flood and including essential utility infrastructure.

7.2 Flood Zone overview

7.2.1 Given the Order Limits cover a broad spatial extent, the Flood Zone classification varies across the seven Solar Development Sites. The Flood Zone extents for the Order Limits can be seen on Figure 15.10: Risk of Flooding from Rivers and Seas (ES Volume 2) [**EN0110012/APP/LVS/06.02.15.10**].

7.2.2 Figure 15.10 presents the available Environment Agency flood risk mapping across the Order Limits, including Flood Zone 2, Flood Zone 3 and the Flood Zones plus Climate Change layer (as shown on the Flood Map for Planning). The Figure shows that the Order Limits lie almost entirely within an area where 'climate change data is unavailable'.

7.2.3 For the purposes of this assessment, and with reference to the Flood Zone definitions in Table 2-1, the extent of Flood Zone 3b (the functional floodplain) has been identified using the best available information available at the time of assessment.

7.2.4 The Environment Agency Flood Map for Planning does not distinguish between Flood Zone 3a and Flood Zone 3b, and no locally defined Flood Zone 3b mapping was available from North Yorkshire Council. Consequently, the extent of Flood Zone 3b was informed by Environment Agency Product Data and consideration of the Planning Practice Guidance definition of functional floodplain. This includes land intentionally designed to flood during flood events, such as washlands or flood storage areas.

7.2.5 With reference to Table 2-1, the probabilistic definition of the functional floodplain is now the 3.3% AEP (1 in 30 year) inundation zone. Environment Agency Product Data outputs reviewed during the scoping stage included the 5% AEP (1 in 20-year) flood event, which represented the best available evidence at the time. This data indicated that the washland area south of Birkin Road (to the south of Solar Development Site 4) was inundated during this flood event and, as it is also land intentionally designed to flood, met the definition of functional floodplain. On this basis, Flood Zone 3b was identified as being limited to the washland area south of Birkin Road, which was subsequently omitted from the Order Limits as part of the iterative design process.

7.2.6 The only element of the Proposed Development considered to be located within the functional floodplain (as depicted by the 1 in 30 model in the absence of NYC having yet established it in a SFRA) is the Cable Corridor where it crosses beneath the River Ouse and the associated floodplain, including the flood storage area at Wistow. No above-ground permanent development is proposed within this area; the permanent cable will be below-ground and therefore not result in any loss of floodplain storage or impede flows. The flood defence and associated flood risk at this location are assessed in Annex H; any residual risks will be limited to the construction phase and will be managed through the safe working practices set out in this FRA and the oCEMP, including preparation of a Flood Warning and Evacuation Plan (FWEP).

7.2.7 All other land within the Solar Development Sites that is in Flood Zone 3 is therefore considered to be within Flood Zone 3a.

7.2.8 Furthermore, as set out in Table 7-1 and Paragraph 7.4.1, solar farms are classified as Essential Infrastructure. PPG recognises that Essential Infrastructure is a compatible use within Flood Zone 3a and Flood Zone 3b, subject to the Exception Test being passed and the development being designed and constructed to remain operational and safe during flood events, result in no net-loss of floodplain storage, not impede flood flows, and not increase flood risk elsewhere.

~~7.2.1~~7.2.9 ~~and a~~A summary of the Flood Zone classification for each Solar Development Site is provided below to inform the Sequential and Exception Tests.

Solar Development Site 1

~~7.2.2~~7.2.10 Solar Development Site 1 is considered as two distinct parcels each with different Flood Zone classifications. The northern parcel of land is predominantly in Flood Zone 1 and the southern parcel in Flood Zones 2 and 3.

Solar Development Site 2

~~7.2.3~~7.2.11 Solar Development Site 2 is predominantly located in Flood Zone 1, with a small area of land along the eastern boundary of the site located within Flood Zones 2 and 3 in the vicinity of Fleet Dike.

Solar Development Site 3

~~7.2.4~~7.2.12 Solar Development Site 3 is located within Flood Zone 2.

Solar Development Site 4

~~7.2.5~~7.2.13 Solar Development Site 4 is situated within Flood Zones 2 and 3. A large area to the northeast of the site is within Flood Zone 3, with the remainder of Solar Development Site 4 being within or surround by Flood Zone 2.

Solar Development Site 6

~~7.2.6~~7.2.14 Solar Development Site 6 is predominantly located within Flood Zone 1. Areas of Flood Zone 2 and 3 are indicated within the immediate vicinity around Milford Common Drain and Lumby Common Drain, which cross the site.

Solar Development Site 7

~~7.2.7~~7.2.15 Solar Development Site 7 is located within Flood Zone 1.

Solar Development Site 8

~~7.2.8~~7.2.16 Solar Development Site 8 is predominantly in Flood Zone 1, with parcels of land adjacent to the northern and western boundary being located within Flood Zone 2 in close proximity to Habholme Dike.

7.3 Sequential Test

Introduction

7.3.1 A full Sequential Test has been prepared in line with the principles set out in the NPPF and associated PPG (Ref 2) and is provided in the Site Selection Assessment Report (SSAR) (Appendix 3.1 (ES Volume 3) **[EN0110012/APP/LVS/06.03.03.01])**. The SSAR evaluates the reasonable available alternative sites and applies a risk-based approach to directing development away from areas of highest flood risk. Consequently, this FRA does not repeat the Sequential Test but instead references the SSAR conclusions and considers the Applicant's sequential approach to site layout.

7.3.2 The Solar Development Sites have been identified based on factors such as proximity to an available grid connection, topography, agricultural land classification, access for construction, and landscape designations. Based on current information and the Study Area assessed at this stage, no other sites in or near the Order Limits have been identified that are both entirely within Flood Zone 1 and suitable for the Proposed Development.

7.3.3 The identification of the seven Solar Development Sites has also been influenced by site availability and the presence of suitable existing infrastructure. The initial site selection methodology, main design iterations, and consideration of a 'no development' alternative are described in Chapter 3: Alternatives and Design Iteration (ES Volume 1) [**EN0110012/APP/LVS/06.01.03**].

7.3.4 The SSAR demonstrates that the Applicant's search for sites was initially focussed on areas at lower risk of flooding and that areas at higher risk were only considered once lower risk areas had been identified as not appropriate or available for development. With reference to the SSAR, whilst Potential Development Area (PDA) 8, as the chosen site, carries a higher flood risk than PDAs 5 and 7, and a similar flood risk to PDA 6, PDA 8 is considered to be the most suitable for development, when other environmental and planning factors are considered, and best placed to meet the Project Objectives.

7.3.5 The SSAR demonstrates that the Sequential Test has been applied in line with PPG, which states that the Sequential Test should be applied proportionately, focussing on realistic alternatives in areas of lower flood risk that could meet the same development need.

Sequential approach to site layout

7.3.6 A 'sequential approach' has been applied to the developing layout and design of the Solar Development Sites throughout the EIA and FRA process, with flood-sensitive assets including the BESS and substations being steered to Solar Development Sites or parts of sites that have a lower probability and residual risk of flooding.

7.3.7 In accordance with the current PPG for Flood Risk and Coastal Change (Ref 2), all sources of flooding have been assessed through the site-specific FRAs in

Annex A – Annex G. With reference to Section 6.2, these assessments demonstrate that the flood risk from surface water and groundwater is generally low to medium, with all other sources (including reservoirs, sewers and other sources) presenting a very low risk.

7.3.8 Furthermore, the Sequential Test does not need to be applied in relation to surface water flood risk, as this site-specific FRA and associated outline Drainage Strategy (Appendix 15.4 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.04**]) demonstrate that the Proposed Development can be made safe from current and future surface water flooding for its lifetime and will not increase flood risk elsewhere.

7.3.9 These findings have been considered alongside the assessment of fluvial flood risk, which forms the primary consideration in applying the Sequential Test to the Proposed Development. The resulting arrangements, as committed to within the Works Plans [**EN0110012/APP/LVS/02.03**], reflect this risk-based approach.

7.3.10 The Proposed Development requires substations in key locations and integrated conversion units (interchangeable with 33kV switch rooms) on all Solar Development Sites to export the generated electricity onwards to the National Grid at the Monk Fryston Substation. Within the current Proposed Development design, BESS enclosures are located within a single compound area. The requirements for the Proposed Development are set out in Table 7-2 below.

Table 7-2 Flood-sensitive asset locations

Proposed Development element	Solar Development Site	Flood Zone
275 kV substation	SDS 1 – within field 1.19, boundaries shown on **[EN0110012/APP/LVS/06.02.02.02.01-08]**	1
275 kV substation and BESS	SDS 2 - within field 2.4, boundaries shown on **[EN0110012/APP/LVS/06.02.02.02.01-08]**	1
275 kV substation proposed	SDS 4 – within field 4.4, boundaries shown on **[EN0110012/APP/LVS/06.02.02.02.01-08]**	2
Integrated Conversion Units (ICU's) – interchangeable with 33kV switch rooms	Located across the Solar Development Sites	Various

7.3.11 Solar Development Site 4 is wholly within, or surrounded by, Flood Zone 2, with a large area shown to be in Flood Zone 3 to the east – north-east. While the Flood Zone categorisation provides an initial indication of flood risk, EA Product Data and subsequent site-specific hydraulic model outputs have been used to further refine this assessment.

7.3.12 Site-specific detailed hydraulic model outputs have been used to inform the current Proposed Development Design and flood-sensitive assets have been carefully sited outside of the floodplain for the design event (1% AEP event plus 31 / 30% adopted climate change allowance). Figure 15.15: Design Event (1 in 100-year plus Climate Change) (ES Volume 2)

[**EN0110012/APP/LVS/06.02.15.15**] shows that the majority of flood-sensitive assets – including the substation within Flood Zone 2 on Solar Development Site 4 – remains dry during the design flood event.

7.3.13 The exception is a small number of ICUs on Solar Development Site 1, which are shown to experience flood depths of up to 0.5 m in the design event. The ICUs are small-scale components that are typically co-located with the solar panels they serve and so have limited locational flexibility.

7.3.14 Across several Solar Development Sites, non-flood-sensitive assets including Solar PV areas are proposed within areas of higher flood risk, including Flood Zones 2 and 3. In line with EN-3, solar PV development may be located within areas of higher flood risk where avoidance is not reasonably practical, provided that a site-specific FRA demonstrates the flood risks can be safely managed and appropriate mitigation is incorporated, and that the development does not increase flood risk elsewhere.

7.3.15 As a result, a limited number of ICUs are also likely to be situated within areas of higher flood risk. Their placement is consistent with the broader siting strategy for locating the non-flood-sensitive infrastructure such as Solar PV areas within the areas of higher flood risk which cannot be avoided given the baseline Flood Zone position of the Solar Development Sites. It is considered that these ICUs can be designed with appropriate resilience measures to ensure safe operation under the design flood conditions.

7.3.16 The modelled flood levels associated with the design event plus 300mm freeboard or the credible maximum scenario, whichever is greater, will therefore be used to inform the minimum FFL of the integrated conversion units on Solar Development Site 1 to seek to ensure resilience against flooding. Stilted foundations may also be used, with a freeboard allowance of 600 mm. Alternatively, their locations will be reviewed and reasonably adjusted where practicable to position them outside of the flood envelope as the design progresses.

7.3.17 It is recognised that solar panels themselves would be mounted on metal frames, and the mounting structures themselves are compatible with being placed in floodplain, provided velocities and debris impact loading are minimal. Neither the panel nor its mounting structure is considered to impede the flow of water. This is especially true for tracking-type panels, which can be placed in the horizontal or ‘stow’ position during a flood event, increasing the clearance between the ground and the bottom of the panel up to 2.5 m.

7.3.18 Substations will also be designed so that any earthworks, foundations and SuDS features will not result in land take from the floodplain, and therefore there should be no change in the flood storage provided by the baseline environment.

Conclusion

7.3.19 The approach taken demonstrates a clear and transparent application of the Sequential Test, consistent with national guidance. Flood risk has been a key factor for the Applicant throughout the process of site selection.

7.3.20 While a precautionary approach has been adopted, the sequential approach recognises that different elements of a solar development have varying sensitivities to flooding. Substations and BESS have been sequentially located in areas of lowest flood risk, as demonstrated through the embedded mitigation measures for the Proposed Development and already committed to and secured within the Design Parameters and Commitments Document [**EN0110012/APP/LVS/05.06**] and as shown on the Works Plans [**EN0110012/APP/LVS/02.03**]. The Works Plans commit to locating the BESS Compound and substations within Flood Zone 1 and Flood Zone 2 only. These locations are also outside the flood envelope associated with the 1 in 100-year plus climate change design flood event.

7.3.21 The Applicant's site-scale application of the sequential approach reflects an appropriate balance between flood risk avoidance and the operational and spatial requirements of the Proposed Development (as further defined in Chapter 3: Alternatives and Design iteration (Volume 1) [**EN0110012/APP/LVS/06.01.03**]).

7.3.22 Other forms of flooding, including pluvial, groundwater, drainage, reservoirs and further sources have been considered for the individual Solar Development Sites and for the Cable Route Corridor contained within Annex A - Annex H. The risk from these sources is typically considered to be low.

7.3.23 On the basis of the information presented, it is considered that the Proposed Development satisfies the requirements of the Sequential Test and that the test has been applied at a site-scale to the developing site layouts.

7.4 Exception Test

7.4.1 As the Proposed Development is classified as 'Essential Infrastructure', the Exception Test is required for Solar Development Sites within Flood Zone 3. The Exception Test requires two additional criteria to be met (as outlined in paragraph 5.7.23 of the NPS EN-1 (Ref 13) before development can be allocated or permitted in situations where suitable sites at a lower risk of flooding are unavailable following the application of the Sequential Test.

7.4.2 The Exception Test as set out in EN-1 (Ref 13) paragraph 5.7.23 requires it to be demonstrated that:

a) '*development that has to be in a flood risk area will provide wider sustainability benefits to the community that outweigh 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'*.

7.4.3 Paragraph 5.7.23 of NPS EN1 (Ref 13) states, 'The sequential approach should be applied to the layout and design of the project. More vulnerable uses should be located on parts of the site at lower probability and residual risk of flooding.' This is demonstrated through the embedded mitigation measures for the Proposed Development, already committed to and secured within the Design Parameters and Commitments Document [**EN0110012/APP/LVS/05.06**] and as shown on the Works Plans [**EN0110012/APP/LVS/02.03**], which commit to locating the BESS Compound and substations within Flood Zone 1 and Flood Zone 2 only. These locations are also outside the flood envelope associated with the 1 in 100-year plus climate change design flood event. With reference to Table 7-2 above, no flood-sensitive assets are proposed within Flood Zone 3 within the current Proposed Development Design. As such, these elements of the Proposed Development are not considered to require an Exception Test. However, as several of the Solar Development Sites include land within Flood Zone 3, consideration has been given to the Exception Test at a strategic level. This is in recognition of the broader flood risk context and in continuation of the Sequential Test, discussed earlier in this report, to demonstrate that the Proposed Development satisfies national policy requirements where development in areas of higher flood risk is necessary.

7.4.4 Site-specific detailed flood modelling for Solar Development Sites 1 – 4 has been carried out and used to inform the spatial planning of the Solar Development Sites and Proposed Development Layout shown in Figure 2.1: Illustrative Site Layout Plans (ES Volume 2) [**EN0110012/APP/LVS/06.02.02.01**].

7.4.5 Where flood-sensitive infrastructure is proposed in Flood Zone 2, the hydraulic model outputs have been used to inform the limits of deviation to locate these assets outside of the floodplain for the 1 in 100-year plus climate change design event, with the exception of a handful of co-located ICUs on Solar Development Site 1. It is considered that these ICUs can be designed with appropriate resilience measures – including raising FFLs – to ensure safe operation under the design flood conditions.

7.4.6 Substations will be designed so that any earthworks, foundations and SuDS features will not result in land take from the floodplain, and therefore there should be no change in the flood storage provided by the baseline environment. Localised changes to ground levels will only be undertaken where necessary for the safe and effective installation and operation of infrastructure. Any proposed changes will be assessed through detailed design to confirm that existing overland flow routes will remain functional and that flood risk will not be increased elsewhere. The location, extent and associated mitigation for any such changes will be set out in the detailed CEMP prior to the relevant works commencing.

7.4.7 Evidence provided within the FRAs for each Solar Development Site in Annex A - Annex G demonstrate that the Proposed Development can be designed to be safe from flooding over its lifetime, considering the vulnerability of its users, and without increasing flood risk elsewhere. This is also further addressed in part through the proposed outline Drainage Strategy (Appendix 15.4 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.04**]).

7.4.8 Furthermore, an assessment is presented in Section 6.3 that considers the potential loss of floodplain storage as a result of installation of PV mounting structures within the floodplain. The assessment concludes that off-site impacts are anticipated to be negligible across the Order Limits, with conservative increases in flood depths estimated to be less than ~~4 mm on Solar Development Site 1 and less than~~ 1 mm across Solar Development Sites 1, 3 and 4. In addition, proposed scrapes within the southern Bird Mitigation Area on Solar Development Site 1 may provide additional attenuation by increasing local storage capacity, thereby helping to offset any potential minimal increase in flood risk.

Wider sustainability benefits

7.4.9 As set out in the York and North Yorkshire's Routemap to Carbon Negative (Ref 20) in the strategic priorities in relation to power, a focus is placed on the increase in low carbon energy generation, inclusive of Solar PV, and the improvement on energy infrastructure.

7.4.10 The British Energy Security Strategy (Ref 22), published by the UK Government in April 2022, announced the intention to increase solar capacity in the UK from 14 GW to 70 GW by 2035. The Energy White Paper: Powering our Net Zero Future (Ref 23) also outlined the need to 'build back greener' following the Coronavirus Pandemic, addressing the intergenerational challenges of climate change. The White Paper identifies the UK Government's aim for a fully decarbonised, reliable, and low-cost power system by 2050.

7.4.11 The 'Powering Up Britain' (Ref 24) policy paper further reiterates the UK Government's commitment to solar energy, setting a goal for a fivefold increase in solar power by 2035. Additionally, the UK Government's manifesto states that Labour will work with the private sector to triple solar power by 2030 (Ref 25).

7.4.12 The Proposed Development would contribute to the UK Government's legally binding target to achieve net-zero emissions by 2050. It addresses the projected increase in electricity demand while enhancing the UK energy security and resilience in line with the national strategy. The Overarching National Policy Statement for Energy (NPS EN-1), designated in January 2024, establishes that the delivery of low carbon energy infrastructure, such as the Proposed Development, is of CNP.

7.4.13 The Proposed Development will have both local and national significance through its contribution to the decarbonisation of the UK's electricity generation. The incorporation of the BESS offers additional carbon-saving opportunities, addressing the urgent need to decarbonise electricity generation in the UK.

7.4.14 The Applicant has entered into a connection agreement with National Grid for the export and import of 500 MW of electricity at Monk Fryston Substation. Light Valley Solar aims to fully utilise the capacity allocated in the connection agreement to reduce further the need for additional projects to reach 500 MW of renewable energy generation and storage capacity. A smaller scheme would not represent a reasonable alternative.

7.4.15 As part of the Proposed Development infrastructure implementation, benefits will also include employment generation and Gross Value Added (GVA) contributions during the construction phase, refer to Chapter 13: Socioeconomics (ES Volume 1) **[EN0110012/APP/LVS/06.01.13]** for details. Similar economic benefits are also anticipated for the decommissioning phase.

7.4.16 The Proposed Development will provide local recruitment and procurement and supporting local education and skills uplifting, including promotion of apprenticeship schemes, workforce training, and STEM education initiatives.

7.4.17 The Solar Development Sites currently consist of arable and pastoral fields, incorporating features such as hedgerows, field margins, ditches, and watercourses, all of which are considered to have ecological value. As part of the Proposed Development, significant biodiversity enhancements will be delivered, with the potential to result in a net gain of 2,277.68 area habitat units, 256.18 hedgerow units, and 15.68 watercourse units, equating to percentage increases of 78.30%, 78.12% and 10.42% respectively.

7.4.18 These gains will be achieved through measures such as planting new hedgerows and trees, infilling gaps with native species to strengthen ecological connectivity, and sowing grassland beneath and between solar arrays to create managed meadow habitats. This approach will incorporate limited cutting and a mix of grazed and ungrazed areas to promote habitat diversity, while certain sections may be retained or adapted for agricultural purposes. Refer to the Biodiversity Net Gain Report [**EN0110012/APP/LVS/05.09**] for further details..

7.4.19 There is also potential for further enhancements to habitats, by incorporating features such as bat and bird boxes.

Safe operation

7.4.20 The risk of flooding to the Proposed Development has been considered with regard to embedded mitigation measures, site access and occupation, flood warning and emergency planning, and the management of residual flood risks across lifecycle phases.

~~7.4.20~~7.4.21 In determining whether the Proposed Development will be safe for its lifetime, flood risk from all sources has been considered, including fluvial, surface water and groundwater flooding. With reference to Section 6.2, fluvial flooding presents the primary risk to the Proposed Development.

~~7.4.21~~7.4.22 Substations and BESS are sequentially located in areas of lowest flood risk, as demonstrated through the embedded mitigation measures for the Proposed Development and already committed to and secured within the Design Parameters and Commitments Document [**EN0110012/APP/LVS/05.06**] and as shown on the Works Plans [**EN0110012/APP/LVS/02.03**]

~~7.4.22~~7.4.23 In addition, the location and design of Construction Compounds within Flood Zone 2 or 3 have been carefully considered to minimise both flood risk to the site and any off-site impacts. Where it is not feasible to avoid the floodplain entirely, all materials, equipment, welfare facilities and fuel stores would be located on the highest available ground, as far from the flood-prone area as practical, securely stored and, where necessary, raised above predicted flood levels to prevent damage or displacement during a flood event. This is set out in the Outline CEMP **[EN0110012/APP/LVS/07.02]**.

7.4.24 The solar panels themselves are located in areas where flood depths are anticipated to be below 1.0 m during the design flood event. They will be elevated above the ground with a minimum clearance of between 0.4 – 1.0 m, making them resilient to flooding as floodwater is able to flow under and around the panels. Depending on the type of panels used, panels can be placed in the 'stow' position if flooding is anticipated to increase the clearance height.

7.4.25 The embedded mitigation measures incorporated to address fluvial flood risk are also considered sufficient to address the more localised surface water and groundwater flood risks, as set out in paragraphs 6.2.14 to 6.2.21.

~~7.4.23~~7.4.26 Once operational, the Proposed Development will be largely unmanned and managed remotely, with no requirement for routine access during periods of flooding and only occasional maintenance visits required. Notwithstanding the largely unmanned nature of the Proposed Development, safe access and egress has been considered on a proportionate basis and in the context of the site-specific hydraulic modelling outputs.

~~7.4.24~~7.4.27 Access for maintenance and inspection will be managed through operational procedures that avoid periods of elevated flood risk, including during flood warnings or severe weather conditions. As such, there is no reliance on safe vehicular or pedestrian access being available during flood events.~~.~~

~~7.4.25~~7.4.28 For largely flood-compatible, unmanned development, safe operation can be achieved through appropriate operational controls rather than physical mitigation measures. In the unlikely event that personnel are present on site during a flood event, appropriate evacuation procedures will be implemented through the Flood Warning and Emergency Plan (FWEP). On this basis, safe access and egress are considered to be appropriately addressed through operational management measures, including the FWEP.

~~7.4.26~~7.4.29 To support the safe operation of the Proposed Development and the management of residual flood risk, a robust FWEP will be in place throughout the lifetime of the development. The Proposed Development will be registered to receive flood alerts and warnings from the EA's Flood Warning Service for both catchment areas, and further details of the FWEP are provided in Section 8.3.

~~7.4.27~~7.4.30 During the construction phase, and during operation where any large-scale replacement activities are carried out, there will be a temporary increase in the number of personnel on site. The FWEP will provide the framework for managing flood risk during ~~this~~these periods, including monitoring of flood warnings and avoidance of work during high-risk periods and forecasted flood events to ensure safety. This includes any cable crossings.

~~7.4.28~~7.4.31 Other appropriate measures for managing flood risk can include training for workers related to flood response and evacuation protocols and the scheduling of work to prioritise work in lower-risk zones (i.e. those outside of the floodplain) during wetter periods. Materials storage, machinery, welfare facilities and sensitive equipment would be located outside of the floodplain, as far as is practical.

~~7.4.29~~7.4.32 The decommissioning phase is very similar to the construction phase, and similar measures would be in place and the FWEP still active to ensure safe working practices.

~~7.4.30~~7.4.33 In addition to the design and operational measures outlined above, consideration has been given to residual flood risks associated with extreme, low-probability events, including flood defence breach scenarios primarily affecting Solar Development Sites 3 and 4. .

~~7.4.31~~7.4.34 Solar Development Sites 3 and 4 are in an area protected by existing flood defences along the River Aire. Breach of these defences therefore represents a potential residual flood risk to the Proposed Development.

~~7.4.32~~7.4.35 A breach scenario represents a high-risk and low-probability condition in which a physical structural failure or localised collapse of a flood defence results in the rapid release of water. Flood defence breach events are inherently uncertain in terms of timing and location, and flooding caused by a such a failure can happen suddenly. Breach modelling is used to inform understanding of the residual risk associated with such an event to ensure operational safety.

~~7.4.33~~7.4.36 Site-specific breach modelling has been completed for two representative breach locations and two return period events (1 in 100-year and 1 in 1000-year) both with and without climate change. These outputs, shown in Figures 15.19 – 15.22 ((ES Volume 2) [**EN0110012/APP/LVS/06.02.15.19 – 15.22**]), have been reviewed to enable a more complete understanding of how an extreme failure scenario could interact with the Proposed Development, although it is acknowledged that the likelihood of such an event occurring is very low. The breach modelling and associated outputs are discussed in more detail in Annex I.

~~7.4.34~~7.4.37 The modelling indicates that, for Breach Location 1, no flooding of Solar Development Sites 3 and 4 is predicted during the 1 in 100-year plus climate change event. The same event at Breach Location 2 results in limited flooding affecting the north-eastern area of Solar Development Site 4, generally less than 0.5 m in depth. In contrast, the 1 in 1,000-year breach scenarios at both locations result in extensive flooding across Solar Development Sites 3 and 4, with predicted flood depths generally ranging from approximately 0.3 m to greater than 1.5 m. Flooding associated with these extreme residual-risk scenarios is shown to generally be contained to areas south of the A63 road.

~~7.4.35~~7.4.38 The FWEP will recognise the potential for rapid onset flooding due to breach and reinforce the importance of flood risk awareness and avoidance of site access during periods of elevated flood risk, such as when river levels are high. In the unlikely event that personnel are present on site during a breach event, the FWEP will include procedures for site withdrawal and identification of areas of relative safety.

~~7.4.36~~7.4.39 In addition, while breach events do not establish the design criteria for the Proposed Development, the findings inform consideration of operational resilience. FFLs for flood-sensitive assets and equipment platforms will be set to a minimum threshold based on the design flood or credible maximum scenario, consistent with policy and EA guidance. However, where necessary, a decision could be made to elevate certain critical infrastructure above the breach-related flood thresholds to enhance the resilience of essential components and reduce the potential for damage under extreme residual-risk conditions and the findings will continue to inform the ongoing design.

7.5 Exception Test Summary

7.5.1 The Exception Test has been addressed at a proportionate, strategic level, in recognition of the broader flood risk context of the Proposed Development which includes land within Flood Zone 3. It provides context for how national planning policy requirements have been considered alongside the Sequential Test discussed earlier in this report.

7.5.2 In summary, the Proposed Development is expected to provide broader sustainability and biodiversity benefits for the community, including job creation in the local area during construction and decommissioning phases. The Proposed Development will deliver a significant amount of low-carbon energy, contributing positively to the UK's energy system. In accordance with NPS EN-11, these benefits outweigh its impacts on flood risk, which, through the application of a sequential approach to the layout of the Solar Development Sites, this FRA and its annexes consider to be negligible. Therefore, the Proposed Development satisfies part (a) of the Exception Test.

7.5.3 In response to meeting part (b) of the Exception Test, Section 6 of the site-specific individual FRAs in Annex A – Annex H demonstrate that, with mitigation, the Proposed Development can be made safe from flooding from all sources throughout its lifetime without increasing the flood risk elsewhere. In combination with the measures outlined in Section 7.4 above and the nature of the non-flood sensitive assets of the Proposed Development located in Flood Zone 3a, it is demonstrated that the site can be developed to remain operational and safe during times of flooding. Therefore, the Proposed Development is considered satisfactory in relation to part (b) of the Exception Test.

7.5.4 Based on the evidence presented it is considered that the Proposed Development satisfies the requirements of the Exception Test.

8 Flood risk management measures

8.1 Design Principles

8.1.1 The Proposed Development incorporates a range of avoidance and mitigation measures to ensure, as far as reasonably practicable, that it remains safe from flooding over its lifetime and does not increase flood risk to surrounding receptors.

8.1.2 A sequential approach has been applied to site layout planning, avoiding placement of critical components in areas of flood risk.

8.1.3 Minimum FFLs have been agreed with the EA to be set to either:

1) The 1 in 100-year flood level plus a scheme adopted 31 / 30% climate change allowance and a minimum 300 mm freeboard allowance, or

2) The height of the credible maximum scenario flood level, whichever is greater.

8.1.4 Where stilted foundations are proposed, a minimum of 600 mm freeboard will be applied.

~~8.1.4~~ Site-specific hydraulic modelling has informed this Level 3 FRA, agreed with the EA, and has been used to refine the Design Parameters and limits of deviation on the Works Plans [**EN0110012/APP/LVS/02.03**].

8.1.5

8.1.6 Based on the Proposed Development Layout shown in Figure 2.1: Illustrative Site Layout Plans (ES Volume 2) [**EN0110012/APP/LVS/06.02.02.01**] and the results of the site-specific flood risk assessments contained within Annex A – G of this FRA, indicative minimum FFLs have been derived for flood-affected assets in accordance with the approach outlined above. These are presented in Table 8-1 below.

Table 8-1 Indicative Finished Floor Levels

Solar Development Site	Element of the Proposed Development	Anticipated maximum flood depth above ground level		Anticipated minimum FFL (reported as a height above ground level)
		Design flood	Credible maximum scenario	
1	2 no. ICUs	+0.5	+1.000	+1.000
3	1 no. ICU	+0	+0.070	+0.300
4	Several ICUs	+0	+0.660	+0.660
4	275 kV substation	+0	+0.386	+0.386

8.1.7 The resulting infrastructure heights have been assessed to remain within the maximum development heights reported in Section 4.2 and secured by the Design Parameters.

8.1.8 For Solar PV panels, the minimum design parameters include a clearance distance of 0.4 m between existing ground level and the lowest edge of the panel. Solar Development Sites 2 – 4 and 6 – 8 remain free from flooding during the design flood event and therefore no flood-derived panel level requirements apply at these sites.

8.1.9 Solar Development Site 1 is the only site where flooding is predicted within proposed panel areas during the design flood event; consequently, panels located within the design flood extent will be raised above the modelled design flood level in the corresponding location in accordance with the applicable freeboard parameters or, where this is not practical, panel layouts will be refined to avoid flood-affected areas such that the maximum development heights are not exceeded.

~~8.1.5~~8.1.10 The FFLs presented in Table 8-1 are indicative and based on the current illustrative locations of the flood-sensitive assets. There is no single FFL applicable to all elements of the Proposed Development. Final FFLs will be confirmed during detailed design, taking account of the final siting within the limits of deviation on the Works Plans [**EN0110012/APP/LVS/02.03**], the relevant modelled flood level and the applicable freeboard requirement, in accordance with the Design Parameters and Commitments Document [**as updated alongside this submission**].

8.2 Mitigation measures

8.2.1 During construction, operation, and decommissioning of the Proposed Development, appropriate measures must be taken to ensure flood risk hazards are mitigated against. The following measures will be implemented:

1) Design elements that need to be located in flood risk areas, following application of a sequential approach, will be designed to be compatible with floodwater in a way that avoids the need for flood defences or ground raising as far as is reasonably practical. Adapting designs to raise vulnerable components such as electricity systems above this level is preferable to wholescale ground raising in Flood Zone 2 or 3, which could cause displacement of flood water and exacerbate impacts to nearby receptors.

2) Solar panels will be mounted on metal frames, which are compatible with being placed in a floodplain, provided velocities and debris impact loading are within accepted tolerances. The findings of the assessment in Section 6.3 indicate that such impacts are expected to be minimal – flood velocities in the credible maximum scenario are low, and the affected areas are not identified as contributing to flood flow conveyance.

3) Solar PV panels will either be of a tracking (Option A) or fixed (Option B) design with a minimum clearance between the ground and the bottom of a solar PV panel of 0.4 m, allowing floodwater to pass beneath the panel. If tracking type panels are used, the maximum height when horizontal or in a ‘stow’ position is 2.5 m above ground level. The use of tracking panels will

be assessed in future design stages. Where used, tracking panels offer improved flood resilience, both to the panel itself and off-site flood risk. This panel type can be set to the 'stow' position in advance of anticipated flooding, increasing the clearance height, and allowing floodwater to pass beneath the panel.

4) Stilted foundations are not anticipated to be used generally; however, their use may be considered to introduce void space beneath proposed structures such as ICUs. This approach allows floodwater to pass beneath raised assets, thereby reducing potential floodplain displacement and maintaining flood flow conveyance. The use of stilted foundations plus a minimum of 600 mm freeboard would be considered at detailed design and, where adopted, would complement minimum FFL requirements by providing additional flood resilience. Additional design considerations, including on site landscaping, drainage infrastructure, flood resilience measures, and required river crossings will also account for increased flood risk due to climate change. Adaptive design measures have been considered in the Proposed Development design to ensure resilience.

5) The incorporation of sustainable drainage systems will be considered in order to control surface water flow rates and reduce volumes of runoff. Further details of proposed drainage provisions are provided in the outline Drainage Strategy (Appendix 15.4 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.04**]).

6) Access tracks will be designed to avoid increasing flood risk, with suitable drainage measures in place as set out in the outline Drainage Strategy (Appendix 15.4 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.04**]). It is anticipated that access tracks would be constructed at or close to existing ground levels and on this basis, access tracks are not expected to result in a material loss of floodplain storage or affect flood flow conveyance. Where any access tracks are required to be locally raised above existing ground levels, the potential effects would be assessed at detailed design stage, and appropriate mitigation measures implemented to avoid or minimise impacts on floodplain storage or conveyance.

7) New crossings of watercourses will be avoided as far as reasonably practicable, with a preference to reuse existing crossing points and structures wherever practicable. In respect of crossings:

   a) For IDB maintained watercourses, trenchless techniques will be used. Horizontal Directional Drilling (HDD) is assumed as a worst-case trenchless technique, which requires a 25 m x 25 m working area for launch and receptor pits.
   b) For other non-IDB adopted ordinary watercourses or ditches (but still within the IDB district boundaries), culverts will be used for access road watercourse crossings and any new structures will be suitably sized to convey the design flood with an allowance for climate change. Best practice includes setting the soffit height of culverts at least 600 mm

above the 1 in 100-year plus climate change flood level and in accordance with the parameters agreed with the IDBs (refer to Section 3.4). The majority of these culverts will be temporary to facilitate construction access only. Consideration would also be given to ensuring that reducing any existing constrictions would not inadvertently increase the flows downstream and cause flooding.

8) Underground cabling will consider the risk of groundwater flooding and be appropriately waterproofed. Furthermore, the role of underground cabling in creating a barrier to groundwater flow pathways or preferential pathway, and therefore implications to local groundwater flood risk, should be further considered in the ongoing design.

9) It must be demonstrated that a safe and suitable means of access and egress to the Proposed Development will remain available during a flood event. This requirement applies to critical infrastructure; access and egress considerations to non-critical infrastructure would instead be addressed through the site-wide FWEP.

8.3 Flood Warning and Evacuation Plan

8.3.1 Given the aforementioned considerations, it is essential that a FWEP is in place for the duration of the Proposed Development, including construction, operation and decommissioning. The FWEP will be prepared and implemented as part of the detailed Environmental Management Plan appropriate to each project phase, namely the Construction Environmental Management Plan (CEMP), Operational Environmental Management Plan (OEMP), and Decommissioning Environmental Management Plan (DEMP) [**EN0110012/APP/LVS/07.02 – 04**].

8.3.2 These management plans incorporate embedded and good practice measures, as well as any further mitigation that arises out of the EIA process. Outline versions of these management plans are submitted alongside the ES as part of this DCO Application to secure the commitments within each assessment. A Requirement is included in the draft DCO [**EN0110012/APP/LVS/03.01**] to ensure detailed management plans will be prepared to full versions by the appointed Contractor(s), substantially in accordance with the outline management plans, and will be submitted for approval by North Yorkshire Council in advance of starting the relevant phase of works.

8.3.3 While most operational flood risks are managed passively through the design and layout of the development, and do not typically require active intervention, the FWEP provides a framework for managing the safety of people in the event of a flood and serves as a critical document to address those rare instances where evacuation becomes necessary.

8.3.4 The FWEP is a requirement under the NPPF which sets out the overarching procedures and responsibilities applicable to the Proposed Development. It would include potential evacuation routes, information on flood warnings and warning systems, and emergency contact details. Although highly unlikely, the FWEP would also encompass emergency procedures in the event of flooding due to a reservoir breach. The Exception test contained in Section 7.4 outlines other measures related to safe operation that may be appropriate for inclusion within the FWEP, depending on site-specific risk considerations.

8.3.5 The FWEP would be prepared prior to commencement of construction and be treated as a live document. The FWEP would be reviewed and updated as necessary at key project stages, including prior to the commencement of construction, operation and decommissioning. Additional reviews would be undertaken annually or following any material change to site conditions or flood risk management arrangements over the lifetime of the Proposed Development.

9 Conclusions

9.1.1 This Level 3 FRA has reviewed the current sources of flood risk to the Proposed Development using data available at the time of the assessment. It draws on the findings presented in the accompanying site-specific FRAs, which are contained within Annex A – Annex H of this report. The FRA also incorporates the results of site-specific modelling, commissioned by the Applicant and carried out by Arthian Ltd in support of the development. The supporting technical note is provided in Annex I of this report.

9.1.2 The assessment finds that the primary source of flood risk to the Proposed Development is from fluvial flooding. Other sources of potential flood risk to the development include surface water and groundwater flooding, which are considered further in Annex A – Annex H.

9.1.3 Flood risk design requirements based on the latest NPPF PPG and relevant National Policy Statements for energy infrastructure have been used to set out an approach to site selection, site layout and site design. A sequential approach has been applied to inform the layout of the Proposed Development throughout the EIA and FRA process.

9.1.4 The Proposed Development has evolved through an iterative design process. The Proposed Design, as reflected on the Works Plans [**EN0110012/APP/LVS/02.03**], has responded to the results of site-specific hydraulic modelling. The layout of the Proposed Development will continue to be refined further post-DCO Application consent within the limits of deviation and the commitments made in the Design Parameters and Commitments Document [**EN0110012/APP/LVS/05.06**]. The Applicant has and continues to engage with key stakeholders on issues related to flood risk and drainage.

9.1.5 Certain elements of the Proposed Development are considered sensitive to flooding, including the BESS enclosures and substations. A sequential approach has been followed, and no such elements have been located within fluvial Flood Zone 3, or Flood Zone 2 as far as reasonably practical, and where this is not practicable, they have been located outside of the floodplain extent associated with the design flood event (defended 1% AEP event plus 31 / 30% adopted allowance for climate change, as agreed with the EA).

9.1.6 The Proposed Development also considers a credible maximum scenario to ensure that the development remains resilient to the potential impacts of more extreme flood events due to climate change. The ‘upper end’ allowances have been applied in sensitivity testing to evaluate the Proposed Development's performance, providing a robust assessment of flood risk and ensuring that the Proposed Development can operate safely throughout its anticipated design life. These ‘upper end’ allowances are 48% (50% adopted) and 51% for the Wharfe and Lower Ouse and Aire and Calder catchments, respectively.

9.1.7 Flood-sensitive elements largely remain dry in the credible maximum scenario, with the exception of the 275 kV substation on Solar Development Site 4 and several integrated conversion units located across Solar Development Sites 1 and 4. It is considered that, by incorporating flood resilient features, these assets can be designed to operate safely and without increasing flood risk elsewhere.

9.1.8 The assessment of potential floodwater displacement concludes that the proposed solar PV areas will have a negligible impact on off-site flood risk in the credible maximum scenario. Predicted increases in flood depths, calculated on the basis of conservative assumptions, are minimal (< 1 mm~~ – 4 mm) and are expected to be even lower in reality.~~). Additional mitigation measures such as the proposed scrapes in the Bird Mitigation Area on Solar Development Site 1 are also likely to further reduce any residual effects. The total area of these scrapes is anticipated to be around 8 ha, with final details to be confirmed during detailed design.

9.1.9 Additional sensitivity testing, including breach modelling, has also been carried out in agreement with the EA, the results of which have been reviewed and are considered as part of the Exception Test presented within Section 6.3.28 of this FRA.

9.1.10 Should sensitive elements be identified to occupy areas of high or medium flood risk (from any source), then the siting of sensitive elements, as part of the overall sequential approach to site layout, will be revised considering the latest available information where practicable. This also applies to flood design levels and temporary bridge or culvert sizes at watercourse crossings, to demonstrate that the Proposed Development is safe from flooding for its lifetime, and that it does not cause any increase in flood risk to nearby receptors.

9.1.11 The provision of safe access and egress from the Proposed Development has also been assessed using the site-specific hydraulic modelling outputs to ensure compliance with relevant flood risk and safety requirements.

9.1.12 A number of Avoidance Areas have been identified (refer to ES Volume 2, Figure 2.5 **[EN0110012/APP/LVS/06.02.02.05]** and Appendix 2.1: Cable Route Construction Method Statement (ES Volume 3) **[EN0110012/APP/LVS/06.03.02.01]** where non-intrusive (trenchless) installation methods will be used to avoid impact to sensitive features such as watercourses, hedgerows and mature vegetation. The locations of trenchless crossing and open cut crossing locations are shown on Figure 15.1 (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.01]**.

9.1.13 In addition, interactions between proposed Cable Route Corridor 1-4 and existing EA flood defences along the River Ouse and Selby Dam have been considered, and this assessment is presented in Annex H. As the Cable Route Corridor is further refined, the total number of watercourse crossings will be determined.

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Annex A Solar Development Site 1

Annex A Solar Development Site 1

A.1. Development information

Existing site

Site location

A.1.1. Solar Development Site 1 (Figure 1.1: Site Location Plan and Order Limits (ES Volume 2) **[EN0110012/APP/LVS/06.02.01.01])** is the most northerly site and is located approximately 575 m east of Escrick village, a civil parish, and approximately 9 km south of York. Solar Development Site 1 is located approximately 20 km north-east of Monk Fryston Substation.

Site description

A.1.2. There are numerous farm holdings within the boundary of Solar Development Site 1, including Tileshed Farm, Manor Farm and Mount Pleasant Farm. The main existing land use on the site is agricultural, with small holdings and plantations and three Public Rights of Way (PRoW) within the site. The fields are bordered by hedgerows and scattered trees, with individual trees dispersed throughout the site. The site covers an area of 344.8 ha.

A.1.3. The land within Solar Development Site 1 is split into two parcels, with the northern parcel predominantly being in Flood Zone 1, and the Southern parcel in Flood Zone 2 and 3. Solar Development Site 1 is covered by the extents of the 2018 Lower Ouse and Wharfe Washlands model.

Site topography

A.1.4. The topography of Solar Development Site 1 is undulating with a general slope down from north to south from 12 m Above Ordnance Datum (AOD) in the north, to 5 m AOD in the south.

Watercourses

A.1.5. With reference to Figure 15.1: Surface Water Features (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.01]**, there are no main rivers within Solar Development Site 1. However, several watercourses managed by the Ouse and Derwent Internal Drainage Board (IDB), along with ordinary unnamed watercourses, are present, including Whinchat Dyke, Chatterton Dyke, and Pallion Dike.

A.1.6. The Whinchat Dyke enters the boundary of the Solar Development Site 1 from the west and flows through the southern portion of the site in a southeast direction. The Chatterton Dyke is also present within Solar Development Site 1. Both Dykes flow towards the southeast, where they converge with the Pallion Dike. The Pallion Dike follows the southern and eastern boundaries of the site.

A.1.7. Several ordinary watercourses appear to be present along the eastern and southern site boundaries. One watercourse in the south-eastern land parcel crosses Solar Development Site 1, seemingly dividing this parcel into two. In the southern land parcel, a few smaller drains are present in the northeast and southwest corners. Within the northern land parcel, a smaller unnamed watercourse is shown in the northeastern corner, and a small body of water is indicated in Field 1.4.

Artificial drainage

A.1.8. Within Solar Development Site 1, no existing sewers or private drainage systems have been identified to be present.

Flood defences

A.1.9. With reference to Figure 15.14: Spatial Flood Defences (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.14]**, the Environment Agency's (EA) Asset Information and Maintenance Systems (AIMS) Spatial Flood Defence database has been reviewed to identify any known flood defences within the Order Limits.

A.1.10. Within Solar Development Site 1, no existing flood defences have been identified to be present.

A.2. Proposed Development

Details of Solar Development Site 1

A.2.1. Solar Development Site 1 is anticipated to contain Solar PV and integrated conversion units (ICUs), and a 275 kV substation which is anticipated to have a compound area of up to 1.0 ha.

A.2.2. The ICUs (interchangeable with 33 kV switch rooms of equivalent dimensions) are anticipated to have maximum dimensions of 15 m by 5 m and a maximum height of 3.5 m. They will be enclosed by 3 m high palisade fencing. Foundations may comprise a concrete slab, strips or footings extending up to 16 m by 6 m, with a levelling layer of aggregate to a maximum depth of 0.8 m, or alternatively a concrete plinth placed directly onto the topsoil where non-ground penetrative works are required. Piling may be necessary depending on ground conditions.

A.2.3. The proposed 225 kV substation will have a maximum height of 13 m to the top of the busbars. Raft foundations are anticipated to extend to a depth of up to 2.5 m, with pile foundations reaching depths of up to 15 m, as required.

A.2.4. Both the Solar PV and substation are located in the northern parcel of Solar Development Site 1, avoiding Flood Zone 2 and Flood Zone 3 to the south. Further detail related to the design parameters of these elements can be found in section 4.2 of the Flood Risk Assessment (FRA) (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]).

A.2.5. Access to Solar Development Site 1 will be via existing access points from Wheldrake Lane and Skipwith Lane.

A.2.6. New substation access tracks will have a maximum width of 6 m (8 m at passing points) and may be constructed of asphalt over a levelling layer of substrate. Parking bays are to be provided at substations and BESS area. The access tracks and parking bays are anticipated to be impermeable, with the final surfacing selection to be confirmed post-DCO at the detailed design stage. The proposed access tracks are as shown on the Works Plans [**EN0110012/APP/LVS/02.03**], with parking bays located within the maximum compound areas.

A.2.7. New internal Solar PV access tracks will have a maximum width of 3.5 m (6 m at passing points) constructed of hardcore or gravel over a levelling layer of substrate. The access points from the public highway may comprise reinforced concrete. These access tracks will be permeable to allow water to filtrate through and maintain greenfield runoff rates as per the existing condition.

A.2.8. In areas of Solar Development Site 1 where archaeological sensitivity has been identified, non-intrusive Solar PV foundation methods such as concrete footings or alternative surface-mounted techniques will be employed across approximately 3.0 ha to preserve underlying heritage assets. Figure 2.5 (ES Volume 2) [**EN0110012/APP/LVS/06.02.02.05**] shows the locations where concrete footings or equivalent techniques will be used.

A.2.9. Solar Development Site 1 currently consist of arable and pastoral fields, incorporating features such as hedgerows, field margins, ditches, and watercourses, all of which are considered to have ecological value. As part of the Proposed Development, new hedgerows and trees will be planted on Solar Development Site 1, and land between and beneath the solar arrays will be sown with grassland and managed as meadow, using limited cutting and a combination of grazed and ungrazed areas to promote habitat diversity. Certain areas may be retained or repurposed for agricultural use, and gaps within existing hedgerows will be infilled with native species to enhance ecological connectivity and biodiversity.

Development type and vulnerability

A.2.10. In accordance with national and local planning policies, it is essential that a development not only assesses the potential flood risks but also ensures that it does not create or exacerbate flood risks downstream over its lifetime and that a development retains the natural hydrological behaviour of the existing site.

A.2.11. The Proposed Development involves the construction of solar PV and associated infrastructure on Solar Development Site 1 for the purpose of energy generation and distribution, which is listed under the National Planning Policy Framework (NPPF) Annex 3 as ‘Essential infrastructure’.

Climate change

A.2.12. In accordance with the NPPF, the Environment Agency (EA) mandates that the rate of surface water runoff from a new development must not exceed that of any previous development. Additionally, the EA and local planning authorities jointly aim to actively promote the reduction of surface water discharge as a condition for the approval of new developments.

A.2.13. Solar Development Site 1 is located within the Wharfe and Lower Ouse management catchment. With reference to Table 4-1 within the FRA, peak river flow allowances are given for the 2080's epoch as follows:

1) 'Higher Central' 31% (30% scheme adopted allowance); and
2) 'Upper End' 48% (50% scheme adopted allowance).

A.2.14. Furthermore, all new drainage systems must be designed to accommodate runoff from a 1 in 100-year rainfall event, with an additional allowance to account for the future impacts of climate change. With reference to Table 4-2, peak rainfall allowances are given for the 2070's epoch as follows:

1) 3.3% annual exceedance rainfall event:
   a) Central allowance = 25%.
   b) Upper end allowance = 40%.
2) 1% annual exceedance rainfall event:
   a) Central allowance = 30%.
   b) Upper end allowance = 40%.

A.3. Flood Risk Assessment

A.3.1. This section identifies and describes both natural and artificial drainage systems that may pose a flood risk to Solar Development Site 1. It also includes an assessment of runoff within Solar Development Site 1 itself. The Construction Compounds on Solar Development Site 1 are assessed separately in Section A.4.

Natural sources

Rivers

A.3.2. With regards to fluvial flooding, an extract from the Flood Map for Planning service is provided in Figure 15.10: Risks of Flooding from Rivers and Seas (ES Volume 2) [**EN0110012/APP/LVS/06.02.15.10**]. This illustrates the present-day risk of flooding only. It does not consider the future probability of flooding due to the impacts of climate change, or proposed land use changes to the site.

A.3.3. The site is split into two individual land parcels. The northern parcel of Solar Development Site 1 is predominantly in Flood Zone 1, described as land with a very low probability of fluvial flooding (less than 1 in 1000-year or 0.1% annual probability).

A.3.4. The southern land parcel of Solar Development Site 1 is in Flood Zones 2 and 3. With reference to the Planning Policy Guidance, land in Flood Zone 2 has a medium probability of flooding defined as land having between a 1% and 0.1% annual probability of river flooding; or land having between a 0.5% and 0.1% annual probability of sea flooding. Flood Zone 3 is considered land that has a 1% or greater annual probability of river flooding; or land having a 0.5% or greater annual probability of sea flooding.

A.3.5. The site-specific hydraulic modelling commissioned during the PEIR stage has now been received from Arthian Ltd and subject to detailed review. The outputs have informed the following assessment and provide an updated understanding of flood risk across the Solar Development Sites.

A.3.6. With reference to Figure 15.15: Design Event (1 in 100-year plus Climate Change) (ES Volume 2) [**EN0110012/APP/LVS/06.02.15.15**], the southern land parcel is shown to be inundated during the design flood event (1 in 100-year plus 30% climate change allowance). This widespread flooding is likely caused by flooding of Dam Dike and Pallion Dike, which form the sites southern boundary. Fields 1.27 to 1.30 and 1.33 to 1.37 are subject to flooding up to 1 m in deep in this event.

A.3.7. The site-specific hydraulic modelling outputs have been used to inform the spatial distribution of infrastructure provided for by the Works Plans [**EN0110012/APP/LVS/02.03**]) and already committed to and secured within the Design Parameters and Commitments Document [**EN0110012/APP/LVS/05.06**]. Solar PV areas have been excluded from the southern portion of the site where modelled flood depths exceed 1.0 m. Solar panels are considered to tolerate flooding up to 1.0 m deep.

A.3.8. Flood extents are largely similar in the credible maximum scenario (1 in 100-year plus 50% climate change allowance), with higher flood depths and velocities observed across the site. For example, Field 1.30 floods to depths of 0.95 m and 1.25 m in the design storm and credible maximum scenario events, respectively. Flooding in this event also extends further northwards, and Fields 1.17 and 1.27 are shown to be flooded to a greater extent with flood depths up to around 0.25 m reported.

A.3.9. Approximately seven ICUs are shown to be within the flood extents associated with the credible maximum scenario, generally in areas where flood depths are reported to be between 0.1 – 0.5 m. However, the results indicate that in one or two locations, flood depths reach up to 1.0 m. The potential impacts and mitigation associated with ICUs is discussed further in sections 6 – 8 of the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]).

A.3.10. The final design of flood-sensitive elements will therefore be raised above the design flood level, with finished floor levels (FFL) set accordingly to seek to ensure as a minimum they are elevated above the flood levels associated the design event plus 300mm freeboard, or the credible maximum scenario flood level, whichever is greater. For an assessment of interactions of solar panels and ICUs within the floodplain, refer to section 6.3 in the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]).

A.3.11. In contrast, the majority of the northern land parcel within Flood Zone 1 is indicated to be outside of the flood envelope for all considered return periods. The proposed 225 kV substation therefore remains outside of the flood envelope.

1.1.1 In addition, a site-specific rainfall-runoff model has also been developed to assess the potential flood risk arising from the smaller watercourses within the site. The 1 in 100-year and 1 in 1000-year flood events, both including climate change, were modelled and the results reviewed. The outputs show good correlation with the risk of flooding from surface water mapping and indicate that flood depths are generally below 1.0 metre. The results show widespread shallow flooding in both scenarios that generally correlates to natural topographic variation across the site, with no evident flooding originating directly from watercourses.

A.3.12. It is therefore concluded that the flooding observed on Solar Development Site 1 is predominantly fluvial in nature, with greater flood extents and depths observed in the site-specific Lower Ouse and Wharfe Washlands model outputs.

Surface water and overland flow

A.3.13. With regards to surface water flooding, the EA's Risk of Flooding from Surface Water data is provided in Figure 15.9: Risks of Flooding from Surface Water

(ES Volume 2) **[EN0110012/APP/LVS/06.02.15.09]**. This data illustrates the potential present-day risk of surface water inundation or flooding across Solar Development Site 1. It does not account for the future probability of flooding due to the impacts of climate change or proposed land use changes.

A.3.14. Predicting flooding from surface water is challenging, as the location and volume of rainfall are difficult to forecast. Factors such as the presence and condition of local drainage features can significantly influence the likelihood and severity of this type of flooding.

A.3.15. In addition, the surface water flood mapping is produced using a 70% runoff coefficient for rainfall, which accounts for potential infiltration and runoff entering existing drainage systems in the catchment. Losses through infiltration and drainage are highly variable and in reality, will often not be reflected in the high-level assumptions included in large scale modelling.

A.3.16. The majority of the site is shown to be at very low risk of surface water flooding (chance of flooding less than 0.1% each year). No significant surface water flow paths appear to be shown to be located within Solar Development Site 1.

A.3.17. Areas at a higher risk of surface water flooding (more than 3.3% chance each year) generally appear to align with the existing IDB drains, ordinary watercourses, and field margins crossing the site. Smaller areas shown to be at a high risk of surface water flooding could correspond to localised low spots in the topography.

A.3.18. The above, combined with the general fall of the topography from north to south for Solar Development Site 1, indicates that the risk of flooding from surface water is **low**.

Groundwater

A.3.19. The EA's national Areas Susceptible to Groundwater Flooding (AStGWF) dataset, provided within the North Yorkshire Council Strategic Flood Risk Assessment (SFRA) (Ref 1), serves as the primary dataset for assessing the future risk of groundwater flooding. The AStGWF map categorises susceptibility into four levels, indicating the proportion of each 1 km grid square where geological and hydrogeological conditions suggest potential groundwater emergence.

A.3.20. The risk of groundwater flooding emergence varies across Solar Development Site 1 according to the AStGWF map. In the centre of the site, underlain by the Thorganby Clay Member, there is no potential groundwater flooding. Conversely, the southern area of the site, underlain by Skipworth Sand Member, is categorised as having the potential for groundwater flooding to occur at the surface. This is further supported by the susceptibility to groundwater flooding mapping shown in Figure 15.12: Susceptibility to Groundwater Flooding (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.12]**.

A.3.21. As stated in the North Yorkshire Council SFRA, there is no substantial evidence of direct groundwater flooding in the majority of North Yorkshire. However, it is known to be a contributing factor in specific circumstances and that it may exacerbate surface water flooding. The areas of greater susceptibility are located in the southern half of Solar Development Site 1, where levels are lowest and in proximity to watercourses, which may influence shallow groundwater conditions.

A.3.22. Given the above, the risk of flooding to Solar Development Site 1 from groundwater is considered to be **low to medium**.

Artificial sources

Reservoirs

A.3.23. The risk of flooding from reservoirs is illustrated in Figure 15.11: Risk of Flooding from Reservoirs (ES Volume 3) **[EN0110012/APP/LVS/06.02.15.11]**, which presents an extract from the Flood Map for Planning service. This indicates that the southern half of Solar Development Site 1 is at risk of flooding in an event that a reservoir failure occurred and released the water held on a ‘wet day’ when local rivers are also in flood.

A.3.24. Flooding from reservoir failures is, however, extremely unlikely, as it is a highly managed risk associated only with a very rare event. An area is considered at risk if people’s lives could be threatened in the event of a dam or reservoir failure.

A.3.25. The risk of flooding from this source is therefore considered to be **very low**.

Highway drainage

A.3.26. In the surrounding area to the Solar Development Site 1, highway drainage primarily appears to be provided via runoff flowing over-edge and into surrounding ditches. This is true of Wheldrake Lane to the north, and Skipwith Road and Narrow Lane to the west and south.

A.3.27. The over-edge drainage mechanism for runoff into watercourses/ditches, combined with the comparatively large site area, ensures that surface water should be efficiently managed without overwhelming the existing system or the site under normal circumstances.

A.3.28. The risk of flooding from this source is considered to be **very low**, especially when the size and scale of Solar Development Site 1 is considered in relation to the extent of highways present in and around the Solar Development Site. Any flood risk from this source would be highly localised.

Private drainage

A.3.29. Solar Development Site 1 incorporates small holdings including Tileshed Farm, Manor Farm and Mount Pleasant Farm. Small holdings that are already situated on the site have existing drainage arrangements outside of the Solar Development Site and therefore any drainage associated with these holdings will remain in place.

A.3.30. The risk posed to Solar Development Site 1 by failure of these existing drainage systems is considered to be **very low**.

Additional sources

A.3.31. Flood risk may come from additional sources such as Yorkshire Water infrastructure (for example sewer flooding).

A.3.32. Within Solar Development Site 1, there appear to be no adopted sewerage assets. It is therefore considered that the risk posed to the Proposed Development from this source is **very low**.

A.4. Construction Compounds Flood Risk Assessment

A.4.1. Two Construction Compounds are located on Solar Development Site 1: Solar Development Site 1 Construction Compound B within Field 1.20 and Solar Development Site 1 Construction Compound A within Field 1.47 as shown on the Works Plans [**EN0110012/APP/LVS/02.03**].

A.4.2. A small area in the south-east corner of the Solar Development Site 1 Construction Compound B lies within Flood Zone 2, and Solar Development Site 1 Construction Compound Ais entirely within Flood Zone 1.

A.4.3. Both Construction Compounds are generally positioned adjacent to existing roads/tracks, providing access for construction vehicles.

Natural sources

Rivers

A.4.4. With reference to Figures 15.15 and 15.16 (ES Volume 2) [**EN0110012/APP/LVS/06.02.15.[15-16]**], the proposed construction compounds on Solar Development Site 1 are located outside of the flood extents for both the design flood event and the credible maximum scenario. The exception is the compound in Field 1.20, which partially encroaches into the northernmost flood extents for both events.

A.4.5. The final siting of the affected Construction Compound in Field 1.20 will be reviewed at detailed design and, where feasible, adjusted in size or repositioned to avoid the areas identified as at risk of flooding along the field boundary.

A.4.6. A detailed assessment of considerations for temporary construction-phase resilience is provided in sections 7 – 9 of the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]) and the Outline Drainage Strategy (Appendix 15.3 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.04**]). Where it is not feasible to avoid the floodplain entirely, all materials, equipment, welfare facilities and fuel stores would be located on the highest available ground, as far from the flood-prone area as practical, securely stored and, where necessary, raised above predicted flood levels to prevent damage or displacement during a flood event. This is set out in the Outline CEMP **[EN0110012/APP/LVS/07.02]**. A FWEP will also be in place during construction.

Surface water and overland flow

A.4.7. The EA's Risk of Flooding from Surface Water data is provided in Figure 15.9: Risk of Flooding from Surface Water (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.09]**.

A.4.8. The Solar Development Site Construction Compound within Field 1.47 is shown to encompass areas of low, medium, and high surface water flood risk, indicating the potential for localised ponding during intense rainfall events.

A.4.9. Additionally, the Solar Development Site Construction Compound located in Field 1.20 is situated adjacent to a narrow parcel of land shown to be at a high-risk of surface water flooding, which appears to follow the natural topography.

A.4.10. During the construction phase, temporary drainage and water management measures will be required, as outlined in the Outline Drainage Strategy (Appendix 15.3 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.04**]). Temporary drainage measures, including cut-off drains, swales, and attenuation, will be provided to manage runoff and ponding during construction. Construction drainage will be designed to an appropriate flood event with an allowance for climate change and freeboard and agreed with North Yorkshire Council as part of approval of the CEMP.

A.4.11. Taking these considerations into account, the overall risk of flooding from this source is considered to be **low to medium**.

Groundwater

A.4.12. The susceptibility to groundwater flooding mapping shown in Figure 15.12: Susceptibility to Groundwater Flooding (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.12]**. The areas of greater susceptibility are shown to be located in the southern half of Solar Development Site 1, where levels are lowest and in proximity to watercourses, which may influence shallow groundwater conditions.

A.4.13. As stated in the North Yorkshire Council SFRA, there is no substantial evidence of direct groundwater flooding in the majority of North Yorkshire. However, it is known to be a contributing factor in specific circumstances and that it may exacerbate surface water flooding.

A.4.14. Given the above, the risk of flooding to the Solar Development Site 1 Construction Compounds from groundwater is considered to be **low to medium**.

A.4.15. Groundwater considerations are also addressed separately in Chapter 15: Water Resources and Flood Risk (ES Volume 1) [**EN0110012/APP/LVS/06.01.15**].

Artificial sources

Reservoirs

A.4.16. With reference to Figure 15.11: Risk of Flooding from Reservoirs (ES Volume 2) [**EN0110012/APP/LVS/06.02.15.11**], which provides an extract from the Flood Map for Planning service, both Site Construction Compounds lie outside areas identified as being at risk of flooding from reservoirs under wet or dry day scenarios.

Highway drainage

A.4.17. The risk of flooding to the Solar Development Site 1 Construction Compounds from highway drainage infrastructure during temporary works and construction is very low, due to their locations and limited interaction with highway systems.

A.4.18. The over-edge drainage mechanism for runoff into watercourses/ditches ensures that surface water should be efficiently managed without overwhelming the existing system or the Construction Compounds under normal circumstances.

A.4.19. Any localised flooding would primarily result from construction activities and will be managed through the mitigation measures outlined in sections 7–9 of the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]) and the Outline Drainage Strategy (Appendix 15.3 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.04**]).

A.4.20. The overall risk of flooding from this source is therefore considered to be **low**.

A.5. Summary and conclusions

A.5.1. Solar Development Site 1 is divided into parcels, with the northern parcel primarily shown to be in Flood Zone 1, indicating a very low probability of fluvial flooding. The southern parcel, however, falls within Flood Zones 2 and 3.

A.5.2. This review encompasses the results of site-specific hydraulic modelling, alongside the most recent EA National Flood Risk Assessment 2 (NaFRA2) data (published 28 March 2025) and contributes to a comprehensive evaluation of current and future flood risk, incorporating fluvial, tidal, and surface water sources under climate change scenarios.

A.5.3. The assessment is based on the Design Parameters set out in Chapter 2: The Proposed Development (ES Volume 1) [**EN0110012/APP/LVS/06.01.02**] and secured through the Design Parameters and Principles Commitments Document [**EN0110012/APP/LVS/05.05.06**]. The site-specific flood risk findings presented in this Annex should be considered alongside the mitigation measures outlined in the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]).

A.5.4. The southern land parcel is shown to be inundated during the design flood event (1 in 100-year return period plus 30% allowance for climate change) in the site-specific flood model outputs, with flood depths exceeding 1m across most of this area. In contrast, the majority of the northern land parcel within Flood Zone 1 is indicated to be outside of the flood envelope for all considered return periods.

A.5.5. The site-specific hydraulic modelling outputs have been used to inform the spatial distribution of infrastructure provided for by the Works Plans [**EN0110012/APP/LVS/02.03**] and already committed to and secured within the Design Parameters and Commitments Document [**EN0110012/APP/LVS/05.06**]. Solar PV areas have been excluded from the southern portion of the site where modelled flood depths exceed 1.0 m. Solar panels are considered to tolerate flooding up to 1.0 m deep.

A.5.6. Certain elements of Solar Development Site 1 are considered to be sensitive to flooding. This includes the proposed 275 kV substation on Field 1.19, which is located within Flood Zone 1 in the northern parcel of Solar Development Site 1, and is shown to be outside of the flood envelope associated with both the design flood event and credible maximum scenario in the site-specific Lower Ouse and Wharfe Washlands flood model outputs.

A.5.7. Approximately seven ICUs are shown to be within the flood extents associated with the credible maximum scenario, generally in areas where flood depths are reported to be between 0.1 – 0.5 m. However, the results indicate that in one or two locations, flood depths reach up to 1.0 m. These structures are proposed to be raised above the flood level to protect the structure itself, and it is considered that these ICUs can be designed with appropriate resilience measures – including raising FFLs – to ensure safe operation under the design flood conditions. For an assessment of interactions of solar panels and ICUs within the floodplain, refer to section 6.3 in the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]). Avoidance and mitigation measures will be taken to ensure, insofar as reasonably practical, that Solar Development Site 1 is safe from flooding for its lifetime, and that flood risk to surrounding receptors is not increased.

A.5.8. A rainfall-runoff hydraulic model has also been developed to further inform the risk of flooding from the smaller watercourses on Solar Development Site 1. These outputs show good correlation with the risk of flooding from surface water mapping and indicate that localised flood depths are generally below 1.0 m. The results show widespread shallow flooding across the site, largely reflecting natural topographic variation, with no clear evidence of flooding directly from the minor watercourses. It is therefore concluded that the primary flood risk to the site is fluvial in nature, associated with Dam Dike and Pallion Dike.

A.5.9. Minimum FFLs will be set to the 1 in 100-year plus 31 / 30% adopted climate change allowance plus 300 mm freeboard or set to the height of the credible maximum scenario, whichever is higher. In the event voided structures are used, freeboard will be a minimum of 600 mm.

A.5.10. The majority of the site is shown to be at very low risk of surface water flooding (chance of flooding less than 0.1% each year). No significant surface water flow paths are shown to be located within Solar Development Site 1, with areas at a higher risk of surface water flooding generally aligning with the existing IDB drains, ordinary watercourses, and field margins. Considering the general fall of the topography from north to south, the risk of flooding from surface water to Solar Development Site 1 is considered to be **low**.

A.5.11. Avoidance and mitigation measures will be taken to ensure, insofar as reasonably practical, Solar Development Site 1 is safe from surface water flooding for its lifetime, and that surface water flood risk to surrounding receptors is not increased. Any drainage systems will be designed to accommodate the 1% (1 in 100) annual flood, plus an appropriate allowance for climate change.

A.5.12. During the construction phase, temporary drainage and water management measures will be required, as outlined in the Outline Drainage Strategy (Appendix 15.3 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.04**]). Temporary drainage measures, including cut-off drains, swales, and attenuation, will be provided to manage runoff and ponding during construction. Construction drainage will be designed to an appropriate flood event with an allowance for climate change and freeboard and agreed with North Yorkshire Council as part of approval of the CEMP.

A.5.13. The potential for groundwater flooding across Solar Development Site 1 is variable, ranging from no potential for groundwater flooding to a potential for groundwater flooding to occur at the surface. Areas of greater susceptibility are located in the southern half of Solar Development Site 1, where levels are lowest and in proximity to watercourses, which may influence shallow groundwater conditions. The North Yorkshire Council SFRA states that while there is no substantial evidence of direct groundwater flooding in most of North Yorkshire, it may contribute to surface water flooding in certain circumstances. The risk from this source is therefore considered to be **low to medium**.

A.5.14. Regarding artificial sources of flood risk, the EA’s long-term flood risk service indicates that Solar Development Site 1 is at risk of flooding in the event of a reservoir failure, which could release water on a ‘wet day’ when local rivers are in flood. However, flooding from reservoir failures is extremely unlikely due to the highly managed nature of this risk. The risk from this source is considered to be **very low**, however, reservoir flooding should be included in any future Flood Warning and Evacuation Plan (FWEP).

A.5.15. The risk of flooding from other artificial sources is also considered to be **very low**.

References

Ref 1 North Yorkshire County Council, "Strategic Flood Risk Assessment," (2016) [Online]. Available at: https://www.northyorks.gov.uk/sites/default/files/fileroot/planning_migrated/minerals_and_waste_plan/Strategic_flood_risk_assessment%20-%20accessible.pdf [Accessed January 2026]

Annex B Solar Development Site 2

Annex B Solar Development Site 2

B.1. Development information

Existing site

Site location

B.1.1. Solar Development Site 2 (Figure 1.1: Site Location Plan and Order Limits (ES Volume 2) [**EN0110012/APP/LVS/06.02.01.01**]) borders the east-bound carriageway of the A63 approximately 1.4 km east of the junction of Water Lane and the A63 in Monk Fryston. Siddle Farm House, Fryston Common Farm and Oak Tree Farm buildings are adjacent to the Solar development. Solar Development Site 2 is located approximately 3.5 km northeast of Monk Fryston Substation.

Site description

B.1.2. Solar Development Site 2 predominantly comprises agricultural cropland bisected in two by the Fleet Dike watercourse, managed by the Selby District Area Internal Drainage Board (IDB). Further watercourses and hedgerows bound the periphery of the site. A number of scattered trees are present at the northern end of the site, as well as a small parcel of modified grassland cut for silage. There are no Public Rights of Way within the site. The site covers an area of 83.3 ha.

B.1.3. Solar Development Site 2 is predominantly located in Flood Zone 1, with a small area of land along the eastern boundary of the site located within Flood Zones 2 and 3 in the vicinity of Fleet Dike. Solar Development Site 2 is outside of the influence of any existing hydraulic models.

Site topography

B.1.4. The topography of Solar Development Site 2 is relatively flat at an elevation of approximately 10 mAOD.

Watercourses

B.1.5. With reference to the surface water features shown in Figure 15.1: Surface Water Features (ES Volume 2) [**EN0110012/APP/LVS/06.02.15.01**], there are no main rivers within the site boundary. The Fleet Dyke flows west to east through the centre of Solar Development Site 2, at which point it turns and flows north to south along the eastern boundary. An ordinary watercourse, the Causeway Dyke, is present along the southern boundary of the site.

B.1.6. There are several unnamed land drains in the surrounding area, adjacent to highways.

Artificial drainage

B.1.7. Within Solar Development Site 2, no existing sewers or private drainage systems have been identified to be within the site boundary.

Flood defences

B.1.8. With reference to Figure 15.14: Spatial Flood Defences (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.14]**, the Environment Agency's (EA) Asset Information and Maintenance Systems (AIMS) Spatial Flood Defence database has been reviewed to identify any known flood defences within the Order Limits.

B.1.9. Within Solar Development Site 2, no existing flood defence assets have been identified to be present.

B.2. Proposed Development

Details of Solar Development Site 2

B.2.1. Solar Development Site 2 is anticipated to contain Solar PV and integrated conversion units, the Battery Energy Storage System (BESS) development area and a 275 kV substation.

B.2.2. The Battery Energy Storage System (BESS) development area will comprise units, each measuring 16 m in length by 3 m in width, with a maximum height of 3.4 m above ground level (AGL). Foundations for the BESS will be constructed of concrete.

B.2.3. The proposed 225 kV substation will have a maximum height of 13 m to the top of the busbars. Raft foundations are anticipated to extend to a depth of up to 2.5 m, with pile foundations reaching depths of up to 15 m, as required.

B.2.4. The integrated conversion units (interchangeable with 33 kV switch rooms of equivalent dimensions) are anticipated to have maximum dimensions of 15 m by 5 m and a maximum height of 3.5 m. They will be enclosed by 3 m high palisade fencing. Foundations may comprise a concrete slab, strips or footings extending up to 16 m by 6 m, with a levelling layer of aggregate to a maximum depth of 0.8 m, or alternatively a concrete plinth placed directly onto the topsoil where non-ground penetrative works are required. Piling may be necessary depending on ground conditions.

B.2.5. Solar Development Site 2 is predominantly located in Flood Zone 1, with a small area of land along the eastern boundary of the site located within Flood Zones 2 and 3 in the vicinity of Fleet Dike. The BESS enclosures and a 275 kV substation compound is proposed in Field 2.4, land which is shown to be in Flood Zone 1.

B.2.6. Access into the southern section of Solar Development Site 2 is feasible directly from the A63 via an existing agricultural access. There is also a proposed emergency access on the A63 in the south-west corner of the site. This would only be used in the event of a fire and unfavourable wind conditions at the other access.

B.2.7. Access into the northern section of Solar Development Site 2 will be provided via an access point from the southern section of Site 2, which will allow vehicles to cross Fryston Common Lane. Fryston Common Lane provides a secondary access point, but this shall only be used for emergency purposes and not for standard construction or operation traffic.

B.2.8. New BESS and substation access tracks will have a maximum width of 6 m (8 m at passing points) and may be constructed of asphalt over a levelling layer of substrate. Parking bays are to be provided at substations and BESS area. The access tracks and parking bays are anticipated to be impermeable, with the final surfacing selection to be confirmed post-DCO at the detailed design stage. The proposed access tracks are as shown on the Works Plans [**EN0110012/APP/LVS/02.03**], with parking bays located within the maximum compound areas.

B.2.9. New internal Solar PV access tracks will have a maximum width of 3.5 m (6 m at passing points) constructed of hardcore or gravel over a levelling layer of substrate. The access points from the public highway may comprise reinforced concrete. These access tracks will be permeable to allow water to filtrate through and maintain greenfield runoff rates as per the existing condition.

B.2.10. In areas of Solar Development Site 2 where archaeological sensitivity has been identified, non-intrusive Solar PV foundation methods such as concrete footings or alternative surface-mounted techniques will be employed across approximately 3 ha to preserve underlying heritage assets. Figure 2.5: Avoidance Areas (ES Volume 2) **[EN0110012/APP/LVS/06.02.02.05]** shows the locations where concrete footings or equivalent techniques will be used.

Development type and vulnerability

B.2.11. In accordance with national and local planning policies, it is essential that a development not only assesses the potential flood risks but also ensures that it does not create or exacerbate flood risks downstream over its lifetime and that a development retains the natural hydrological behaviour of the existing site.

B.2.12. The Proposed Development involves the construction of solar PV and associated infrastructure on Solar Development Site 2 for the purpose of energy generation and distribution, which is listed under the National Planning Policy Framework (NPPF) as ‘Essential infrastructure.’

Climate change

B.2.13. In accordance with the NPPF, the Environment Agency (EA) mandates that the rate of surface water runoff from a newly developed site must not exceed that of any previous development. Additionally, the EA and local planning authorities jointly aim to actively promote the reduction of surface water discharge as a condition for the approval of new developments.

B.2.14. Solar Development Site 2 is located within the Aire and Calder management catchment. With reference to table 4-1 within the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]), peak river flow allowances are given for the 2080's epoch as follows:

1) 'Higher Central' 31%; and
2) 'Upper End' 51%.

B.2.15. Furthermore, all new drainage systems must be designed to accommodate runoff from a 1 in 100-year rainfall event, with an additional allowance to account for the future impacts of climate change. With reference to table 4-2 within the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]), peak rainfall allowances are given for the 2070's epoch as follows:

1) 3.3% annual exceedance rainfall event
    a) Central allowance = 25%
    b) Upper end allowance = 40%
2) 1% annual exceedance rainfall event
    a) Central allowance = 25%
    b) Upper end allowance = 45%

B.3. Flood Risk Assessment

B.3.1. This section identifies and describes both natural and artificial drainage systems that may pose a flood risk to Solar Development Site 2. It also includes an assessment of runoff within Solar Development Site 2 itself. The Construction Compounds on Solar Development Site 2 are assessed separately in B.4.

Natural sources

Rivers

B.3.2. With regards to fluvial flooding, an extract from the Flood Map for Planning service is provided in Figure 15.10: Risk of Flooding from Rivers and Seas (ES Volume 2) [**EN0110012/APP/LVS/06.02.15.10**]. This illustrates the present-day risk of flooding only. It does not consider the future probability of flooding due to the impacts of climate change, or proposed changes to Solar Development Site 2.

B.3.3. Solar Development Site 2 is shown to be predominantly in Flood Zone 1, described as land with a very low probability of fluvial flooding (less than 1 in 1000-year or 0.1% annual probability).

B.3.4. The site-specific hydraulic modelling commissioned during the PEIR stage has now been received from Arthian Ltd and subject to detailed review. The outputs have informed the following assessment and provide an updated understanding of flood risk across the Solar Development Sites.

B.3.5. The site-specific hydraulic modelling outputs have been used to inform the spatial distribution of infrastructure provided for by the Works Plans [**EN0110012/APP/LVS/02.03**]) and already committed to and secured within the Design Parameters and Commitments Document [**EN0110012/APP/LVS/05.06**].

B.3.6. With reference to Figure 15.15: Design Event (1 in 100-year plus Climate Change (ES Volume 2) [**EN0110012/APP/LVS/06.02.15.15**], Solar Development Site 2 is shown to be outside of the flood envelope for all considered return periods, including the design event (1 in 100-year plus 31% climate change allowance) and credible maximum scenario (1 in 100-year plus 51% climate change allowance).

B.3.7. In addition, a site-specific rainfall-runoff model has also been developed to assess the potential flood risk arising from the smaller watercourses within Solar Development Site 2.

B.3.8. The 1 in 100-year plus climate change results for Solar Development Site 2 show that there are two localised areas of deeper flooding within the site that appear to correspond to localised depressions. One of these areas is in the southeast corner of the site and reaches a maximum flood depth of around 1.0 m. The other is central to the site and reaches a maximum depth of around 0.5 m.

B.3.9. The 1 in 1000-year plus climate change outputs illustrate similar flood extents compared to the 1 in 100-year, with generally increased flood depths. The flooding in the southeast of the site reaches a depth of approximately 1.5 m in this scenario. The 1 in 1000-year plus climate change return period, while not a design event, is presented for understanding potential residual impacts.

B.3.10. The areas of deeper flooding, particularly to the south-east, are highly localised and reflect small-scale variations in site topography. Given their limited extent, it is anticipated that any risks can be managed by detailed layout design through appropriate positioning of solar arrays and associated infrastructure, or by elevating equipment, if required.

B.3.11. The outputs show good correlation with the risk of flooding from surface water mapping and indicate that flood depths are generally at or below 0.3 m. The results show widespread, shallow flooding in both the 1 in 100- and 1000-year flood events that generally correlates to natural topographic variation across Solar Development Site 2. Surface water and overland flow

B.3.12. With regards to surface water flooding, the EA's Risk of Flooding from Surface Water data is provided in Figure 15.9: Risks of Flooding from Surface Water (ES Volume 2) [**EN0110012/APP/LVS/06.02.15.09**]. This data illustrates the potential present-day risk of surface water inundation or flooding across Solar Development Site 2. It does not account for the future probability of flooding due to the impacts of climate change or proposed land use changes.

B.3.13. Predicting flooding from surface water is challenging, as the location and volume of rainfall are difficult to forecast. Factors such as the presence and condition of local drainage features can significantly influence the likelihood and severity of this type of flooding.

B.3.14. In addition, the surface water flood mapping is produced using a 70% runoff coefficient for rainfall, which accounts for potential infiltration and runoff entering existing drainage systems in the catchment. Losses through infiltration and drainage are highly variable and in reality, will often not be reflected in the high-level assumptions included in large scale modelling.

B.3.15. The site is generally shown to be at very low risk of surface water flooding (chance of flooding of less than 0.1% each year). No significant flow paths are shown to be located within the vicinity of the site. Areas shown to have a low to high chance of surface water flooding (between 0.1 and > 3.3% chance each year) generally appear to align with the existing IDB drains and ordinary watercourses on and around the site. The topography of Solar Development Site 2 is generally flat, and as such, smaller areas shown to be at risk of surface water flooding may correspond to localised low spots in the topography.

B.3.16. This suggests that the risk of flooding from surface water to Solar Development Site 2 is **low to medium.**

Groundwater

B.3.17. The EA's national Areas Susceptible to Groundwater Flooding (AStGWF) dataset provided within the North Yorkshire County Council Strategic Flood Risk Assessment (SFRA) (Ref 1), provides the main dataset used to assess the future risk of groundwater flooding.

B.3.18. The AStGWF map uses four susceptibility categories to show the proportion of each 1km grid square where geological and hydrogeological conditions show that groundwater might emerge. Susceptibility to groundwater flooding across Solar Development Site 2 varies from no potential for groundwater flooding, where the sites are underlain by the Hemingbrough Glaciolacustrine Formation, to 'Potential for groundwater flooding to occur at surface' where the sites are underlain by more permeable deposits such as Alluvium or the Breighton Sand Formation.

B.3.19. This is generally supported by the Susceptibility to Groundwater Flooding mapping shown in Figure 15.12: Susceptibility to Groundwater Flooding (ES Volume 2) [**EN0110012/APP/LVS/06.02.15.12**], which shows the majority of Solar Development Site 2 to be outside of the area susceptible to groundwater flooding, with the exception of the north-eastern corner.

B.3.20. As stated in the North Yorkshire Council SFRA, there is no substantial evidence of direct groundwater flooding in the majority of North Yorkshire. However, it is known to be a contributing factor in specific circumstances and that it may exacerbate surface water flooding.[1]

B.3.21. Given the above, the risk of flooding to Solar Development Site 2 from groundwater is considered to be **low to medium**.

Artificial sources

Reservoirs

B.3.22. The Risk of Flooding from Reservoirs is illustrated in Figure 15.11: Risk of Flooding from Reservoirs (ES Volume 2) [**EN0110012/APP/LVS/06.02.15.11**], which presents an extract from the Flood Map for Planning service. This indicates that the eastern land parcel of Solar Development Site 2 is at risk of flooding in an event that a reservoir failure occurred and released the water held on a 'wet day' when local rivers are also in flood.

B.3.23. Flooding from reservoir failures is, however, extremely unlikely, as it is a highly managed risk associated only with a very rare event. An area is considered at risk if people's lives could be threatened in the event of a dam or reservoir failure.

B.3.24. The risk of flooding from this source is considered to be **very low**.

[1] *Sustainability appraisal strategic flood risk assessment

Highway drainage

B.3.25. In the surrounding area to the Solar Development Site 2, highway drainage appears to be provided via runoff flowing over-edge and into surrounding ditches.

B.3.26. The over-edge drainage mechanism for runoff into watercourses/ditches, combined with the comparatively large site area, ensures that surface water should be efficiently managed without overwhelming the existing system or the site under normal conditions.

B.3.27. With reference to the rainfall-runoff model developed for Solar Development Site 2, the area of localised flooding observed in the southeastern corner of the site could be related to the drainage ditch adjacent to the highway in this location, which appears to outfall to the IDB ditch forming the eastern site boundary.

B.3.28. The risk of flooding from this source is considered to be **very low**.

Private drainage

B.3.29. No existing properties with associated private drainage systems are situated within the boundary of Solar Development Site 2. The risk of flooding from this source is therefore considered to be **very low**.

Additional sources

B.3.30. Flood risk may come from additional sources such as Yorkshire Water infrastructure (for example sewer flooding).

B.3.31. Within Solar Development Site 2, there appear to be no adopted sewerage assets. It is therefore considered that the risk posed to the Proposed Development from this source is **very low**.

B.4. Construction Compounds Flood Risk Assessment

B.4.1. Two Construction Compounds are located on Solar Development Site 2: Solar Development Site 2 Construction Compound within Field 2.4 and Cable Construction Compound 6 within Field 2.5 as shown on the Works Plans [**EN0110012/APP/LVS/02.03**].

B.4.2. The Construction Compounds on Field 2.4 and Field 2.5 are both situated entirely within Flood Zone 1.

B.4.3. Both of the Solar Development Site Construction Compounds are positioned close to access points, providing access for construction vehicles.

Natural sources

Rivers

B.4.4. The Construction Compounds on both Field 2.4 and 2.5 are in Flood Zone 1.

B.4.5. The results from the site-specific rainfall-runoff model, developed to assess the potential flood risk arising from the smaller watercourses within Solar Development Site 2, show localised areas of flooding up to approximately 0.3m deep affecting both Construction Compounds in the 1 in 100-year plus climate change design event.

B.4.6. This is likely due to natural topographical variation and indicating the potential for localised ponding during intense rainfall events. During the construction phase, temporary drainage and water management measures will be required as outlined in B.4.11.

B.4.7. The final siting of the affected Construction Compounds will be reviewed at detailed design and, where feasible, adjusted in size or repositioned to avoid the areas identified as at risk of flooding,

B.4.8. A detailed assessment of considerations for temporary construction-phase resilience is provided in sections 7 – 9 of the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]). Where it is not feasible to avoid the floodplain entirely, all materials, equipment, welfare facilities and fuel stores would be located on the highest available ground, as far from the flood-prone area as practical, securely stored and, where necessary, raised above predicted flood levels to prevent damage or displacement during a flood event. This is set out in the Outline CEMP [**EN0110012/APP/LVS/07.02**].

Surface water and overland flow

B.4.9. The EA's Risk of Flooding from Surface Water data is provided in Figure 15.9: Risks of Flooding from Surface Water (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.09]**.

B.4.10. The Construction Compound within Field 2.4 is shown to be at very low risk of surface water flooding. Additionally, small areas to the south-east and north-west corners of the Construction Compound on Field 2.5 are shown to be at a high risk of surface water flooding, likely due to natural topographical variation and indicating the potential for localised ponding during intense rainfall events.

B.4.11. During the construction phase, temporary drainage and water management measures will be required, as outlined in the outline Drainage Strategy (Appendix 15.4 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.04**]). Temporary drainage measures, including cut-off drains, swales, and attenuation, will be provided to manage runoff and ponding during construction. Construction drainage will be designed to an appropriate flood event with an allowance for climate change and freeboard and agreed with North Yorkshire Council as part of approval of the CEMP.

B.4.12. Taking these considerations into account, the overall risk of flooding from this source is considered to be **low to medium**.

Groundwater

B.4.13. The susceptibility to groundwater flooding mapping shown in Figure 15.12: Susceptibility to Groundwater Flooding (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.12]**. This shows the majority of Solar Development Site 2 to be outside of the area susceptible to groundwater flooding, with the exception of the north-eastern corner.

B.4.14. As stated in the North Yorkshire Council SFRA, there is no substantial evidence of direct groundwater flooding in the majority of North Yorkshire. However, it is known to be a contributing factor in specific circumstances and that it may exacerbate surface water flooding.

B.4.15. Given the above, the risk of flooding to the Solar Development Site 2 Construction Compounds from groundwater is considered to be **low to medium**.

B.4.16. Groundwater considerations are also addressed separately in Chapter 15: Water Resources and Flood Risk (ES Volume 1) [**EN0110012/APP/LVS/06.01.15**].

Artificial sources

Reservoirs

B.4.17. With reference to Figure 15.11: Risk of Flooding from Reservoirs (ES Volume 2) [**EN0110012/APP/LVS/06.02**], which provides an extract from the Flood Map for Planning service, the Construction Compound in Field 2.4 is not shown to be at risk of reservoir flooding under either a dry-day or wet-day scenario. In contrast, the Construction Compound Field 2.5, while not shown to be at risk during a dry-day scenario, is shown to be at risk of flooding during a wet-day scenario.

B.4.18. Flooding from reservoir failure is, however, extremely unlikely, as it is a highly managed risk associated only with a very rare event. An area is considered at risk if people’s lives could be threatened in the event of a dam or reservoir failure.

B.4.19. The risk of flooding from this source is therefore considered to be **very low**.

Highway drainage

B.4.20. The risk of flooding to the Solar Development Site 2 Construction Compounds from highway drainage infrastructure during temporary works and construction is very low, due to their locations and limited interaction with highway systems.

B.4.21. The over-edge drainage mechanism for runoff into watercourses/ditches ensures that surface water should be efficiently managed without overwhelming the existing system or the Construction Compounds under normal circumstances.

B.4.22. Any localised flooding would primarily result from construction activities and will be managed through the mitigation measures outlined in sections 7–9 of the

FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]) and the outline Drainage Strategy (Appendix 15.4 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.04**]).

B.4.23. The overall risk of flooding from this source is therefore considered to be **very low**.

B.5. Summary and conclusions

B.5.1. Solar Development Site 2 is predominantly classified as Flood Zone 1, indicating a very low probability of fluvial flooding (less than 1 in 1000-year or 0.1% annual probability). Areas of Flood Zone 2 and 3 are present along the eastern site boundary, associated with the IDB watercourses.

B.5.2. This review encompasses the results of site-specific hydraulic modelling, alongside the most recent EA National Flood Risk Assessment 2 (NaFRA2) data (published 28 March 2025) and contributes to a comprehensive evaluation of current and future flood risk, incorporating fluvial and surface water sources under climate change scenarios.

B.5.3. The assessment is based on the Design Parameters set out in Chapter 2: The Proposed Development (ES Volume 1) [**EN0110012/APP/LVS/06.01.02**] and secured through the Design Parameters and Commitments [**EN0110012/APP/LVS/05.05.06**]. The site-specific flood risk findings presented in this Annex should be considered alongside the mitigation measures outlined in the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]).

B.5.4. The site-specific hydraulic modelling outputs have been used to inform the spatial distribution of infrastructure provided for by the Works Plans [**EN0110012/APP/LVS/02.03**]) and already committed to and secured within the Design Parameters and Commitments [**EN0110012/APP/LVS/05.06**]. Solar Development Site 2 is shown to be outside of the flood envelope for all considered return periods in the 2017 Lower Aire model and the proposed BESS and 275 kV substation are shown to be located in an area that appears to not be at risk of fluvial flooding.

B.5.5. Avoidance and mitigation measures will be taken to ensure, insofar as reasonably practical, that Solar Development Site 2 is safe from flooding for its lifetime, and that flood risk to surrounding receptors is not increased.

B.5.6. Minimum FFLs will be set to the 1 in 100-year plus 31 / 30% adopted climate change allowance plus 300 mm freeboard or set to the height of the credible maximum scenario, whichever is higher. In the event voided structures are used, freeboard will be a minimum of 600 mm.

B.5.7. The majority of the site shown to be at very low risk of surface water flooding (chance of flooding less than 0.1% each year). No significant surface water flow paths are shown to be located within Solar Development Site 2, with areas at a higher risk generally aligning with the existing IDB drains and ordinary watercourses and possible low spots in the topography given the flat gradient of the site. The risk of flooding from surface water to Solar Development Site 2 is therefore considered to be low to medium.

B.5.8. A rainfall-runoff hydraulic model has been developed to further inform the risk of flooding from the smaller watercourses on Solar Development Site 2. These outputs show good correlation with the risk of flooding from surface water mapping and indicate that localised flood depths are generally below 0.3 m. The results show widespread shallow flooding across the site, largely reflecting natural topographic variation, with no clear evidence of flooding directly from the minor watercourses. A localised area of flooding up to 1.0 m deep is observed in the south-east corner, which may be associated with the highway drainage ditch in this location.

B.5.9. Avoidance and mitigation measures will be taken to ensure, insofar as reasonably practical, Solar Development Site 2 is safe from surface water flooding for its lifetime, and that surface water flood risk to surrounding receptors is not increased. Any drainage systems will be designed to accommodate the 1% (1 in 100) annual flood, plus an appropriate allowance for climate change.

B.5.10. During the construction phase, temporary drainage and water management measures will be required, as outlined in the outline Drainage Strategy (Appendix 15.4 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.04**]). Temporary drainage measures, including cut-off drains, swales, and attenuation, will be provided to manage runoff and ponding during construction. Construction drainage will be designed to an appropriate flood event with an allowance for climate change and freeboard and agreed with North Yorkshire Council as part of approval of the detailed CEMP.

B.5.11. For groundwater flooding, the AStGWF map shows the susceptibility varies from no potential for groundwater flooding to a potential for groundwater flooding to occur at the surface. The North Yorkshire Council SFRA considers that there is no substantial evidence of direct groundwater flooding in the majority of North Yorkshire, however, it is known to exacerbate surface water flooding in some instances. The risk from this source is therefore considered to be **low to medium**.

B.5.12. Regarding artificial sources of flood risk, the EA's long-term flood risk service indicates that Solar Development Site 2 is at risk of flooding in the event of a reservoir failure, which could release water on a 'wet day' when local rivers are also in flood. However, flooding from reservoir failures is extremely unlikely due to the highly managed nature of this risk. The risk from this source is considered to be **very low**, however, reservoir flooding should be included in any future Flood Warning and Evacuation Plan (FWEP).

B.5.13. The risk of flooding from other artificial sources is also considered to be **very low**.

References

Ref 1 North Yorkshire County Council, “Strategic Flood Risk Assessment,” (2016) [Online]. Available at: https://www.northyorks.gov.uk/sites/default/files/fileroot/planning_migrated/minerals_and_waste_plan/Strategic_flood_risk_assessment%20-%20accessible.pdf [Accessed January 2026]

Annex C Solar Development Site 3

Annex C Solar Development Site 3

C.1. Development information

Existing site

Site location

C.1.1. Solar Development Site 3 (Figure 1.1: Site Location and Order Limits ES Volume 2) [**EN0110012/APP/LVS/06.02.01.01**] is located approximately 850 m to the south-east of the junction of Hillam Lane, Lumby Hill and Chapel Street in Hillam. Hillam Common Lane runs along the northern perimeter of the site with Woodlands Lane running along the south. The area within Solar Development Site 3 is made up of agricultural land.

Site description

C.1.2. The existing site land is made up of agricultural land with Hillam Common Lane running along the northern perimeter of the site with Woodlands Lane running along the south. There are no existing Public Right of Ways (PRoW) within the site. Solar Development Site 3 covers an area of 19.9 ha.

C.1.3. The land within Solar Development Site 3 is split into two Field parcels, both in Flood Zone 2. Solar Development Site 3 is covered by the extents of the 2017 Lower Aire hydraulic model.

Site topography

C.1.4. The topography of Solar Development Site 3 is relatively flat at an elevation of approximately 10 mAOD.

Watercourses

C.1.5. Within the site boundary, there are no main watercourses. Several Selby IDB watercourses and unnamed watercourses are present in and around the site. These include the Maspin Moor Drain, an unnamed ordinary watercourse, and a series of unnamed land drains.

C.1.6. The Maspin Moor Drain crosses the Site parallel to Woodlands Lane, between Field 3.1 and Field 3.2. The unnamed ordinary watercourse is present along the southern boundary of Solar Development Site 3.

C.1.7. A series of unnamed land drains are present in the surrounding area.

Artificial drainage

C.1.8. Within Solar Development Site 3, no existing sewers or private drainage systems have been identified within the site.

Flood defences

C.1.9. With reference to Figure 15.14: Spatial Flood Defences (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.14]**, the Environment Agency's (EA) Asset Information and Maintenance Systems (AIMS) Spatial Flood Defence database has been reviewed to identify any known flood defences within the Order Limits.

C.1.10. Within Solar Development Site 3, no existing flood defence assets have been identified to be present.

C.2. Proposed Development

Details of the Solar Development Site 3

C.2.1. Solar Development Site 3 is located within Flood Zone 2 and is anticipated to contain Solar PV and ICUs.

C.2.2. The ICUs (interchangeable with 33 kV switch rooms of equivalent dimensions) are anticipated to have maximum dimensions of 15 m by 5 m and a maximum height of 3.5 m. They will be enclosed by 3 m high palisade fencing. Foundations may comprise a concrete slab, strips or footings extending up to 16 m by 6 m, with a levelling layer of aggregate to a maximum depth of 0.8 m, or alternatively a concrete plinth placed directly onto the topsoil where non-ground penetrative works are required. Piling may be necessary depending on ground conditions.

C.2.3. Access into Solar Development Site 3 will be from Hillam Common Lane, with access into the southern Field 3.2 provided via a proposed internal access track that utilises an existing crossing point.

C.2.4. Access tracks serving the solar PV arrays will be constructed to a maximum width of 3.5 m, with passing places extending up to 6 m. The tracks will be constructed using hardcore or gravel laid over a levelling substrate. Where access is required from the public highway, reinforced concrete may be utilised at entry points.

Development type and vulnerability

C.2.5. In accordance with national and local planning policies, it is essential that a development not only assesses the potential flood risks but also ensures that it does not create or exacerbate flood risks downstream over its lifetime and that a development retains the natural hydrological behaviour of the existing site.

C.2.6. The Proposed Development involves the construction of solar PV and associated infrastructure on Solar Development Site 3 for the purpose of energy generation and distribution, which is listed under the National Planning Policy Framework (NPPF) as 'Essential infrastructure'.

Climate change

C.2.7. In accordance with the NPPF, the Environment Agency (EA) mandates that the rate of surface water runoff from a newly developed site must not exceed that of any previous development. Additionally, the EA and local planning authorities jointly aim to actively promote the reduction of surface water discharge as a condition for the approval of new developments.

C.2.8. Solar Development Site 3 is located within the Aire and Calder management catchment. With reference to table 4-1 within the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]), peak river flow allowances are given for the 2080's epoch as follows:

1) ‘Higher Central’ 31%; and
2) ‘Upper End’ 51%.

C.2.9. Furthermore, all new drainage systems must be designed to accommodate runoff from a 1 in 100-year rainfall event, with an additional allowance to account for the future impacts of climate change. With reference to Table 4-2 within the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]), peak rainfall allowances are given for the 2070’s epoch as follows:

1) 3.3% annual exceedance rainfall event:
    a) Central allowance = 25%
    b) Upper end allowance = 40%
2) 1% annual exceedance rainfall event:
    a) Central allowance = 25%
    b) Upper end allowance = 45%

C.3. Flood Risk Assessment

C.3.1. This section identifies and describes both natural and artificial drainage systems that may pose a flood risk to Solar Development Site 3. It also includes an assessment of runoff within Solar Development Site 3 itself.

Natural sources

Rivers

C.3.2. With regards to fluvial flooding, an extract from the Flood Map for Planning service is provided in Figure 15.10: Risk of Flooding from Rivers and Seas (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.10]**. This data illustrates the present-day risk of flooding only. It does not consider the future probability of flooding due to the impacts of climate change, or proposed land use changes to the site.

C.3.3. The site is shown to be within Flood Zone 2. With reference to the Planning Policy Guidance, land in Flood Zone 2 has a medium probability of flooding defined as land having between a 1% and 0.1% annual probability of river flooding; or land having between a 0.5% and 0.1% annual probability of sea flooding.

C.3.4. The site-specific hydraulic modelling commissioned during the PEIR stage has now been received from Arthian Ltd and subject to detailed review. The outputs have informed the following assessment and provide an updated understanding of flood risk across the Solar Development Sites.

C.3.5. The site-specific hydraulic modelling outputs have been used to inform the spatial distribution of infrastructure provided for by the Works Plans [**EN0110012/APP/LVS/02.03**]) and already committed to and secured within the Design Parameters and Commitments [**EN0110012/APP/LVS/05.06**].

C.3.6. With reference to Figure 15.15: Design Event (1 in 100-year plus Climate Change) (ES Volume 2) [**EN0110012/APP/LVS/06.02.15.15**], Solar Development Site 3 is shown to be outside of the flood envelope associated with the design flood event (1 in 100-year plus 31% climate change). The nearest modelled flood extent, associated with the Fleet Drain, is approximately 750 m to the south.

C.3.7. However, in the credible maximum scenario (Figure 15.16: Credible Maximum Scenario Depth (ES Volume 2) [**EN0110012/APP/LVS/06.02.15.16**] (1 in 100-year plus 51% climate change allowance) an area to the north of Field 3.1 is shown to be inundated, up to a maximum flood depth of approximately 0.5 m. A single ICU to the west lies within the flood extents associated with this event, but is located in an area of relatively low risk, with modelled flood depths of approximately 0.07 m. The potential impacts and mitigation associated with ICUs is discussed further in sections 6– 8 of the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]).

C.3.8. Should an ICU be required to be located in this area in the final design, flood-sensitive elements will be raised above the design flood level, with finished floor levels (FFL) set accordingly to seek to ensure as a minimum they are elevated above the flood levels associated the design event plus 300mm freeboard, or the credible maximum scenario flood level, whichever is greater. For an assessment of interactions of solar panels and ICUs within the floodplain, refer to section 6.3 in the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]).

C.3.9. It is assumed that this localised area of flooding emanates from the IDB drain which forms the northern site boundary, and it also correlates to the flood extents shown on the risk of flooding from surface water mapping (Figure 15.9: Risk of Flooding from Surface Water (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.09])**, suggesting a topographical depression in this area.

C.3.10. The remaining site area to the south is shown to be outside of the flood extents associated with the credible maximum scenario.

C.3.11. No Construction Compounds are proposed on Solar Development Site 3.

Surface water and overland flow

C.3.12. With regards to surface water flooding, the EA's Risk of Flooding from Surface Water data is provided in Figure 15.9: Risk of Flooding from Surface Water (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.09]**. This data illustrates the potential present-day risk of surface water inundation or flooding across Solar Development Site 3. It does not account for the future probability of flooding due to the impacts of climate change or proposed land use changes.

C.3.13. Predicting flooding from surface water is challenging, as the location and volume of rainfall are difficult to forecast. Factors such as the presence and condition of local drainage features can significantly influence the likelihood and severity of this type of flooding.

C.3.14. In addition, the surface water flood mapping is produced using a 70% runoff coefficient for rainfall, which accounts for potential infiltration and runoff entering existing drainage systems in the catchment. Losses through infiltration and drainage are highly variable and in reality, will often not be reflected in the high-level assumptions included in large scale modelling.

C.3.15. The site is generally shown to be at very low risk of surface water flooding (chance of flooding of less than 0.1% each year). Localised topographic depressions across the site are shown to have a low to high chance of surface water flooding (between 0.1 and > 3.3% chance each year). No significant surface water flow paths are shown to be located within Solar Development Site 3.

C.3.16. This suggests that the risk of flooding from surface water to Solar Development Site 3 is **low**.

Groundwater

C.3.17. The EA's national Areas Susceptible to Groundwater Flooding (AStGWF) dataset, provided within the North Yorkshire Council Strategic Flood Risk Assessment (SFRA) (Ref 1), serves as the primary dataset for assessing the future risk of groundwater flooding. The AStGWF map categorises susceptibility into four levels, indicating the proportion of each 1 km grid square where geological and hydrogeological conditions suggest potential groundwater emergence.

C.3.18. The risk of groundwater flooding emergence varies across Solar Development Site 3 according to the AStGWF map. In the centre of the site, underlain by the Thorganby Clay Member, there is no potential groundwater flooding. Conversely, the southern area of the site boundary, underlain by Skipworth Sand Member, is categorised as having the potential for groundwater flooding to occur at the surface.

C.3.19. This is generally supported by the susceptibility to groundwater flooding mapping shown in Figure 15.12: Susceptibility to Groundwater Flooding (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.12]**, which shows Solar Development Site 3 to be predominantly in an area with potential for groundwater flooding to occur at surface.

C.3.20. As stated in the North Yorkshire Council SFRA, there is no substantial evidence of direct groundwater flooding in the majority of North Yorkshire. However, it is known to be a contributing factor in specific circumstances and that it may exacerbate surface water flooding [Ref 1].

C.3.21. Given the above, the risk of flooding to Solar Development Site 3 from groundwater is considered to be **low to medium**.

Artificial sources

Reservoirs

C.3.22. The risk of flooding from reservoirs is illustrated in Figure 15.11: Risk of Flooding from Reservoirs (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.11]**, which presents an extract from the Flood Map for Planning service. This indicates that Solar Development Site 3 is at risk of flooding in the event that a reservoir failure occurred, even when river levels are normal.

C.3.23. Flooding from reservoir failures is, however, extremely unlikely, as it is a highly managed risk associated only with a very rare event. An area is considered at risk if people's lives could be threatened in the event of a dam or reservoir failure.

C.3.24. The risk of flooding from this source is therefore considered to be **very low.**

Highway drainage

C.3.25. There are limited number of highways surrounding Solar Development Site 3, with the most notable being Hillam Common Lane to the north and Woodlands Lane to the south. Highway drainage appears to be provided via runoff flowing over-edge and into surrounding ditches.

C.3.26. The over-edge drainage mechanism for runoff into watercourses/ditches, combined with the comparatively large site area, ensures that surface water should be efficiently managed without overwhelming the existing system or the site under normal conditions.

C.3.27. The risk of flooding from this source is considered to be **very low**.

Private drainage

C.3.28. No existing properties with associated private drainage systems are situated within the boundary of Solar Development Site 3. The risk of flooding from this source is therefore considered to be **very low**.

Additional sources

C.3.29. Flood risk may come from additional sources such as Yorkshire Water infrastructure (for example sewer flooding).

C.3.30. Within Solar Development Site 3, there appear to be no adopted sewerage assets. It is therefore considered that the risk to the Proposed Development from this source is **very low**.

C.4. Summary and conclusions

C.4.1. Solar Development Site 3 is classified as being in Flood Zone 2, indicating a medium probability of flooding between a 1% and 0.1% annual probability of river flooding; or between a 0.5% and 0.1% annual probability of sea flooding.

C.4.2. This review encompasses the results of site-specific hydraulic modelling, alongside the most recent EA National Flood Risk Assessment 2 (NaFRA2) data (published 28 March 2025) and contributes to a comprehensive evaluation of current and future flood risk, incorporating fluvial, tidal, and surface water sources under climate change scenarios.

C.4.3. The assessment is based on the Design Parameters set out in Chapter 2: The Proposed Development (ES Volume 1) [**EN0110012/APP/LVS/06.01.02**] and secured through the Design Parameters and Principles Commitments Document [**EN0110012/APP/LVS/05.05.06**]. The site-specific flood risk findings presented in this Annex should be considered alongside the mitigation measures outlined in the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]).

C.4.4. The site-specific hydraulic modelling outputs have been used to inform the spatial distribution of infrastructure provided for by the Works Plans [**EN0110012/APP/LVS/02.03**]) and already committed to and secured within the Design Parameters and Commitments Document [**EN0110012/APP/LVS/05.06**].

C.4.5. Solar Development Site 3 is shown to be outside of the flood envelope associated with the design flood event (1 in 100-year return period plus 31% climate change allowance). The northern land parcel is shown to flood in the credible maximum scenario (1 in 100-year return period plus 51% climate change allowance), with localised flooding anticipated up to depths of around 0.5 m.

C.4.6. Certain elements of Solar Development Site 3 are considered to be sensitive to flooding, such as ICUs. Two ICUs are proposed and are shown to be outside of the flood extents associated with both the design event and credible maximum scenario. A single ICU to the west lies within the flood extents for the credible maximum scenario but is located in an area of relatively low risk, with modelled flood depths of approximately 0.07 m. These structures are proposed to be raised above the flood level to protect the structure itself, and it is considered that these ICUs can be designed with appropriate resilience measures – including raising FFLs – to ensure safe operation under the design flood conditions.

C.4.7. For an assessment of interactions of solar panels and ICUs within the floodplain, refer to section 6.3 in the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]). Avoidance and mitigation measures will be taken to ensure, insofar as reasonably practical, that Solar Development Site 3 is safe from flooding for its lifetime, and that flood risk to surrounding receptors is not increased.

C.4.8. Minimum FFLs will be set to the 1 in 100-year plus 31/30% adopted climate change allowance plus 300 mm freeboard or set to the height of the credible maximum scenario, whichever is higher. In the event voided structures are used, freeboard will be a minimum of 600 mm.

C.4.9. The majority of the site shown to be at very low risk of surface water flooding (chance of flooding less than 0.1% each year), with localised topographic depressions across the site shown to be at high and medium risk of surface water flooding. No significant surface water flow paths are shown to be located within Solar Development Site 3. The risk of flooding from surface water to Solar Development Site 3 is therefore considered to be **low**.

C.4.10. Avoidance and mitigation measures will be taken to ensure, insofar as reasonably practical, Solar Development Site 3 is safe from surface water flooding for its lifetime, and that surface water flood risk to surrounding receptors is not increased. Any drainage systems will be designed to accommodate the 1% (1 in 100) annual flood, plus an appropriate allowance for climate change.

C.4.11. During the construction phase, temporary drainage and water management measures will be required, as outlined in the outline Drainage Strategy (Appendix 15.3 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.04**]). Temporary drainage measures, including cut-off drains, swales, and attenuation, will be provided to manage runoff and ponding during construction. Construction drainage will be designed to an appropriate flood event with an allowance for climate change and freeboard and agreed with North Yorkshire Council as part of approval of the detailed CEMP.

C.4.12. The potential of groundwater flooding across Solar Development Site 3 is indicated to be variable, ranging from no potential for groundwater flooding to a potential for groundwater flooding to occur at the surface. The North Yorkshire Council SFRA considers that there is no substantial evidence of direct groundwater flooding in the majority of North Yorkshire, however, it is known to exacerbate surface water flooding in some instances. The risk from this source is therefore considered to be **low to medium**.

C.4.13. Regarding artificial sources of flood risk, the EA's long-term flood risk service indicates that Solar Development Site 3 is at risk of flooding in the event of a reservoir failure, which could release water on a 'dry day' when river levels are normal. However, flooding from reservoir failures is extremely unlikely due to the highly managed nature of this risk. The risk from this source is considered to be **very low**, however, reservoir flooding should be included in any future Flood Warning and Evacuation Plan (FWEP).

C.4.14. The risk of flooding from other artificial sources is also considered to be **very low**.

References

Ref 1 North Yorkshire County Council, "Strategic Flood Risk Assessment," (2016) [Online]. Available at: https://www.northyorks.gov.uk/sites/default/files/fileroot/planning_migrated/minerals_and_waste_plan/Strategic_flood_risk_assessment%20-%20accessible.pdf [Accessed January 2026]

Annex D Solar Development Site 4

Annex D Solar Development Site 4

D.1. Development information

Existing site

Site location

D.1.1. Solar Development Site 4 (Figure 1.1: Site Location Plan and Order Limits (ES Volume 2) [**EN0110012/APP/LVS/06.02.01.01**]) is located approximately 280 m northeast of the junction of Main Street, Roe Lane and Haddlesey Road in Birkin. Solar Development Site 4 is situated approximately 4 km east of the existing Monk Fryston Substation.

Site description

D.1.2. The existing site comprises of numerous agricultural fields which are dissected by Haddlesey Road and Roe Lane. Within Solar Development Site 4, Bowers House and Woodhouse Farm are situated within the site. The River Aire runs along the southern boundary and Gateforth Common and Gateforth Wood is located adjacent to the northern boundary. Solar Development Site 4 covers an area of 283.9 ha.

D.1.3. The A63 is the nearest, large transport connection and is located approximately 1.3 km north.

D.1.4. The land within Solar Development Site 4 is primarily in Flood Zone 2 and 3. Solar Development Site 4 previously encompassed a parcel of land to the south, adjacent to the River Aire, which has been removed from the Order Limits due to its designation as a washland in Flood Zone 3b. Solar Development Site 4 is covered by the extents of the updated 2017 Lower Aire Study model.

Site topography

D.1.5. The topography of Solar Development Site 4 is relatively flat at an elevation of approximately 10 mAOD.

Watercourses

D.1.6. With reference to Figure 15.1: Surface Water Features (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.01]**, there are no main rivers within Solar Development Site 4. The River Aire flows from west to east approximately 460 m south from the southern boundary of the site.

D.1.7. Several watercourses managed by the Selby Area Internal Drainage Board (IDB), along with ordinary and unnamed watercourses, are present in and around Solar Development Site 4. These include, from west to east, Roe Lane Drain, Maspin Moor Drain, Hagg Lane Drain, Mearley Drain and The Fleet.

D.1.8. The Maspin Moor Drain is aligned with Maspin Moor Road and follows the northern boundary of Solar Development Site 4, crossing into the boundary at two locations where the boundary extends northwards beyond Maspin Moor Road.

D.1.9. The western extents of Maspin Moor Drain appear to discharge into a piped watercourse, the Roe Lane Drain, just to the west of Roe Lane. The piped watercourse is then shown along the eastern boundary of the westernmost land parcel of Solar Development Site 4, where it meets an unnamed IDB watercourse at the southeastern corner of this land parcel. This unnamed IDB watercourse is shown along the southern boundary of the same land parcel.

D.1.10. East of Roe Lane, the Maspin Moor Drain continues along the northern boundary to the northeast corner of Solar Development Site 4. At this point, Maspin Moor Drain continues along the eastern boundary, continuing southwards until it becomes the Mearley Drain. The Mearley Drain continues south along the eastern boundary until it reaches Haddlesey Road.

D.1.11. Outside of the Solar Development Site 4 boundary, to the southeast, an IDB pumping station is indicated to be present. It is assumed the Mearly Drain is pumped from this location. A piped watercourse exiting this pumping station is shown to cross Haddlesey Road, passing through the southernmost land parcel and discharging to the River Aire.

Artificial drainage

D.1.12. Within the vicinity of Solar Development Site 4, existing properties and small holdings are present. However, no existing sewers or private drainage systems have been identified to be within the site boundary.

Flood defences

D.1.13. With reference to Figure 15.14: Spatial Flood Defences (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.14]**, the Environment Agency’s (EA) Asset Information and Maintenance Systems (AIMS) Spatial Flood Defence database has been reviewed to identify any known flood defences within the Order Limits.

D.1.14. Following a review of the Environment Agency’s AIMS dataset, no flood defences appear to be present within the Order Limits.

D.1.15. The flood defences in this area take the form of embankments and are situated along Haddlesey Road to the south of the Order Limits, approximately 250 m to the southeast of the Solar PV development area.

D.1.16. The flood defences along Haddlesey Road are associated with the flood management infrastructure of the River Aire and flood storage washlands located to the south of Solar Development Site 4. These defences form part of system designed to manage fluvial flood risk across the Lower Aire catchment, particularly during high-flow events.

D.1.17. The presence of this flood management infrastructure offers protection to adjacent land parcels, including Solar Development Site 4. The effectiveness of these defences under future climate scenarios and extreme events, including breach scenarios, is considered in more detail within section 7.4 of the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]).

D.2. Proposed Development

Details of Solar Development Site 4

D.2.1. Solar Development Site 4 is anticipated to contain Solar PV and ICUs, and a 275 kV substation with three transformers which is anticipated to have a compound area up to 3.0 ha.

D.2.2. The ICUs (interchangeable with 33 kV switch rooms of equivalent dimensions) are anticipated to have maximum dimensions of 15 m by 5 m and a maximum height of 3.5 m. They will be enclosed by 3 m high palisade fencing. Foundations may comprise a concrete slab, strips or footings extending up to 16 m by 6 m, with a levelling layer of aggregate to a maximum depth of 0.8 m, or alternatively a concrete plinth placed directly onto the topsoil where non-ground penetrative works are required. Piling may be necessary depending on ground conditions.

D.2.3. The proposed 225 kV substation will have a maximum height of 13 m to the top of the busbars. Raft foundations are anticipated to extend to a depth of up to 2.5m, with pile foundations reaching depths of up to 15 m, as required.

D.2.4. The 275 kV substation is shown to be located in the southwestern corner of Field 4.4 in the most north-westerly land parcel of Solar Development Site 4 in an area in Flood Zone 2. Solar PV areas are shown to be in Flood Zones 2 and 3. Further detail related to the design parameters of these elements can be found in section 4.2 of the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]).

D.2.5. Four field accesses have been identified for potential construction vehicle access: two from Roe Lane and two from Haddlesey Road. Given the proximity of the site to the A19, it is expected that the majority of construction traffic will arrive and depart from the east.

D.2.6. New internal Solar PV access tracks will have a maximum width of 3.5 m (6 m at passing points) constructed of hardcore or gravel over a levelling layer of substrate. The access points from the public highway may comprise reinforced concrete. These access tracks will be permeable to allow water to filtrate through and maintain greenfield runoff rates as per the existing condition.

D.2.7. One new minor watercourse crossing over the Hagg Lane Drain will be necessary for access between Solar PV areas in Fields 4.8 and 4.12. This watercourse is managed by Selby Area Internal Drainage Board (IDB).

D.2.8. New substation access tracks will have a maximum width of 6 m (8 m at passing points) and may be constructed of asphalt over a levelling layer of substrate. Parking bays are to be provided at substations and BESS area. The access tracks and parking bays are anticipated to be impermeable, with the final surfacing selection to be confirmed post-DCO at the detailed design stage. The proposed access tracks are as shown on the Works Plans [**EN0110012/APP/LVS/02.03**], with parking bays located within the maximum compound areas.

D.2.9. In areas of Solar Development Site 4 where archaeological sensitivity has been identified, non-intrusive Solar PV foundation methods such as concrete footings or alternative surface-mounted techniques will be employed across approximately 1.5 ha to preserve underlying heritage assets. Figure 2.5: Avoidance Areas (ES Volume 2) **[EN0110012/APP/LVS/06.02.02.05]** shows the locations where concrete footings or equivalent techniques will be used.

Development type and vulnerability

D.2.10. In accordance with national and local planning policies, it is essential that a development not only assesses the potential flood risks but also ensures that it does not create or exacerbate flood risks downstream over its lifetime and that a development retains the natural hydrological behaviour of the existing site.

D.2.11. The Proposed Development involves the construction of solar PV and associated infrastructure on Solar Development Site 4 for the purpose of energy generation and distribution, which is listed under the National Planning Policy Framework (NPPF) as 'Essential infrastructure'.

Climate change

D.2.12. In accordance with the NPPF, the EA mandates that the rate of surface water runoff from a newly developed site must not exceed that of any previous development. Additionally, the EA and local planning authorities jointly aim to actively promote the reduction of surface water discharge as a condition for the approval of new developments.

D.2.13. Solar Development Site 4 is located within the Aire and Calder management catchment. With reference to table 4-1 of the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]), peak river flow allowances are given for the 2080's epoch as follows:

1) 'Higher Central' 31%; and
2) 'Upper End' 51%.

D.2.14. Furthermore, all new drainage systems must be designed to accommodate runoff from a 1 in 100-year rainfall event, with an additional allowance to account for the future impacts of climate change. With reference to table 4-2 within the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]), peak rainfall allowances are given for the 2070's epoch as follows:

1) 3.3% annual exceedance rainfall event
   a) Central allowance = 25%
   b) Upper end allowance = 40%
2) 1% annual exceedance rainfall event
   a) Central allowance = 25%
   b) Upper end allowance = 45%

D.3. Flood Risk Assessment

D.3.1. This section identifies and describes the natural and artificial drainage systems that may pose a flood risk to Solar Development Site 4. It also includes an assessment of runoff within Solar Development Site 4 itself. The Construction Compounds on Solar Development Site 4 are assessed separately in D.4

Natural sources

Rivers

D.3.2. With regards to fluvial flooding, an extract from the Flood Map for Planning service is provided in Figure 15.10: Risks of Flooding from Rivers and Seas (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.10]**. This illustrates the present-day risk of flooding only. It does not consider the future probability of flooding due to the impacts of climate change, or proposed land use changes to the site.

D.3.3. Solar Development Site 4 is comprised of several land parcels, the majority of which are shown to be within Flood Zone 2 and Flood Zone 3, with areas of higher risk located towards the north-eastern half of the site. With reference to the Planning Policy Guidance, land in Flood Zone 2 has a medium probability of flooding defined as land having between a 1% and 0.1% annual probability of river flooding; or land having between a 0.5% and 0.1% annual probability of sea flooding. Flood Zone 3 is considered of land that has a 1% or greater annual probability of river flooding; or land having a 0.5% or greater annual probability of sea flooding.

D.3.4. The site-specific hydraulic modelling commissioned during the PEIR stage has now been received from Arthian Ltd and subject to detailed review. The outputs have informed the following assessment and provide an updated understanding of flood risk across the Solar Development Sites.

D.3.5. The site-specific hydraulic modelling outputs have been used to inform the spatial distribution of infrastructure provided for by the Works Plans [**EN0110012/APP/LVS/02.03**]) and already committed to and secured within the Design Parameters and Commitments Document [**EN0110012/APP/LVS/05.06**].

D.3.6. With reference to Figure 15.15: Design Event (1 in 100-year plus Climate Change) (ES Volume 2) **[EN0110012/APP/LVS/06.02.02.15.15]**, Solar Development Site 4 is shown to be outside of the flood envelope associated with the design flood event (1 in 100-year plus 31% climate change). In this event, flooding is shown to be contained by the flood defence embankments located to the south of Haddlesey Road. The proposed 275 kV substation therefore remains outside of the flood envelope associated with the design event.

D.3.7. With reference to Figure 15.16: Credible Maximum Scenario Depth (ES Volume 2) **[EN0110012/APP/LVS/06.02.02.15.16]**, a large portion of the site is indicated to be affected by flooding in the credible maximum scenario (1 in 100-

year plus 51% climate change allowance). Fields 4.4, 4.6, 4.8, 4.9, 4.13 and 4.14 are all shown to be partially inundated with widespread, generally shallow flooding, with average flood depths reported of around 0.25 m.

D.3.8. Localised areas of deeper flooding, reaching up to 1.0 m, are reported in the north-east of the site and in proximity to existing watercourses across the site.

D.3.9. Notably, the 275 kV substation in Field 4.4 is within the flood extents associated with the credible maximum scenario. In response to this, the 275 kV substation has been strategically located in the south-western corner of Field 4.4, where modelling indicates shallower flood depths. This location ensures that the majority of the substation footprint lies outside the flood envelope for this event, with only a minor portion encroaching into the area of potential inundation. This placement avoids the more pronounced flooding observed further north and along the eastern boundary of this land parcel.

D.3.10. Average flood depths within the substation footprint are reported to be generally less than 0.05 m, with a maximum flood depth of 0.386 m in southeasternmost corner. This pocket of deeper flooding is highly localised and likely corresponds to an existing topographic depression. This placement reflects a risk-informed sequential approach to infrastructure siting within the development.

D.3.11. The maximum modelled flood water level within the substation footprint is recorded at 7.858 m AOD, occurring in the southeasternmost corner. This maximum water level will inform the setting of the minimum FFL, in line with the conditions agreed with the EA, within the current scheme design. Minimum FFLs will be reviewed during detailed design to reflect the final siting of the substation to mitigate residual flood risks and support operational resilience.

D.3.12. Several ICUs also lie within the flood extents associated with the credible maximum scenario. In the areas of intersection between Solar PV areas and the modelled flood envelope, average flood depths of approximately 0.19 m are reported, with localised, maximum depths reaching up to approximately 0.66 m. The potential impacts and mitigation associated with ICUs is discussed further in sections 6 – 8 of the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]).

D.3.13. The final design of flood-sensitive elements will therefore be raised above the design flood level, with finished floor levels (FFL) set accordingly to seek to ensure as a minimum they are elevated above the flood levels associated the design event plus 300mm freeboard, or the credible maximum scenario flood level, whichever is greater. For an assessment of interactions of solar panels and ICUs within the floodplain, refer to section 6.3 in the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]).

Surface water and overland flow

D.3.14. With regards to surface water flooding, the EA's Risk of Flooding from Surface Water data is provided in Figure 15.9: Risk of Flooding from Surface Water (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.09]**. This data illustrates the potential present-day risk of surface water inundation or flooding across Solar Development Site 4. It does not account for the future probability of flooding due to the impacts of climate change or proposed land use changes.

D.3.15. Predicting flooding from surface water is challenging, as the location and volume of rainfall are difficult to forecast. Factors such as the presence and condition of local drainage features can significantly influence the likelihood and severity of this type of flooding.

D.3.16. In addition, the surface water flood mapping is produced using a 70% runoff coefficient for rainfall, which accounts for potential infiltration and runoff entering existing drainage systems in the catchment. Losses through infiltration and drainage are highly variable and in reality, will often not be reflected in the high-level assumptions included in large scale modelling.

D.3.17. The site is generally shown to be at very low risk of surface water flooding (chance of flooding of less than 0.1% each year). Given the large extent of Solar Development Site 4, localised topographic depressions across the site are shown to have a low to high chance of surface water flooding (between 0.1 and > 3.3% chance each year). No significant surface water flow paths are shown to be located within Solar Development Site 4, with some areas shown to be at risk of surface water flooding generally aligning with the watercourses crossing the site.

D.3.18. This suggests that the risk of flooding from surface water to Solar Development Site 4 is **low to medium**.

Groundwater

D.3.19. The EA's national Areas Susceptible to Groundwater Flooding (AStGWF) dataset, provided within the North Yorkshire Council Strategic Flood Risk Assessment (SFRA) (Ref 1), serves as the primary dataset for assessing the future risk of groundwater flooding. The AStGWF map categorises susceptibility into four levels, indicating the proportion of each 1 km grid square where geological and hydrogeological conditions suggest potential groundwater emergence. It does not show the likelihood of groundwater flooding occurring.

D.3.20. The risk of groundwater flooding emergence varies across Solar Development Site 4 according to the AStGWF map. The susceptibility to groundwater flooding across Solar Development Site 4 varies from no potential for groundwater flooding where the sites are underlain by the Hemingbrough Glaciolacustrine Formation, to 'potential for groundwater flooding to occur at surface' where the site is underlain by more permeable deposits.

D.3.21. This is generally supported by the susceptibility to groundwater flooding mapping shown in Figure 15.12: Susceptibility to Groundwater Flooding (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.12]**, which shows the southern and western areas of Solar Development Site 4 to be in areas with 'limited potential for groundwater flooding' to 'potential for groundwater flooding of property situated below ground'. These areas of greater susceptibility are located in proximity to watercourses, which may influence shallow groundwater conditions. The remaining area of Solar Development Site 4 is shown to be outside of the areas identified to be susceptible to groundwater flooding.

D.3.22. As stated in the North Yorkshire Council SFRA, there is no substantial evidence of direct groundwater flooding in the majority of North Yorkshire. However, it is known to be a contributing factor in specific circumstances and that it may exacerbate surface water flooding.

D.3.23. Given the above, the risk of flooding to Solar Development Solar Development Site 4 is considered to be **low to medium**.

Artificial sources

Reservoirs

D.3.24. The Risk of Flooding from Reservoirs is illustrated in Figure 15.11: Risk of Flooding from Reservoirs (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.11]**, which presents an extract from the Flood Map for Planning service. This indicates that Solar Development Site 4 is at risk of flooding in the event that a reservoir failure occurred, even when river levels are normal.

D.3.25. Flooding from reservoir failures is, however, extremely unlikely, as it is a highly managed risk associated only with a very rare event. An area is considered at risk if people's lives could be threatened in the event of a dam or reservoir failure.

D.3.26. The risk of flooding from this source is considered to be **very low**.

Highway drainage

D.3.27. Roe Lane and Haddlesey Road, which are located in the western and southern areas of the site respectively. Both appear to drain over-edge into highway drains with no drainage gullies or other positive drainage features evident.

D.3.28. The over-edge drainage mechanism for runoff into watercourses/ditches, combined with the comparatively large site area, ensures that surface water should be efficiently managed without overwhelming the existing system or the site under normal conditions.

D.3.29. The risk of flooding from this source is considered to be **very low**, especially in the context of the size of Solar Development Site 4 in relation to the extent of highways present in and around the site boundary.

Private drainage

D.3.30. Small holdings including Bowers House and Woodhouse Farm are adjacent to Solar Development Site 4. These have existing drainage arrangements outside of the Proposed Development and therefore any drainage associated with these holdings will remain in place.

D.3.31. The risk posed to Solar Development Site 4 by failure of these existing drainage systems is considered to be **very low**, especially in the context of the scale of Solar Development Site 4.

Additional sources

D.3.32. Flood risk may come from additional sources such as Yorkshire Water infrastructure (for example sewer flooding).

D.3.33. Within Solar Development Solar Development Site 4, there appear to be no adopted sewerage assets. It is therefore considered that the risk to Solar Development Site 4 from this source is **very low**.

D.4. Construction Compounds Flood Risk Assessment

D.4.1. Three Solar Development Site Construction Compounds are proposed within Solar Development Site 4, located in Field 4.4 (Solar Development Site 4 Construction Compound A), Field 4.5 (Solar Development Site 4 Construction Compound B) and Field 4.14 (Solar Development Site 4 Construction Compound C) as shown on the Works Plans [**EN0110012/APP/LVS/02.03**].

D.4.2. The entirety of Solar Development Site 4 lies within Flood Zones 2 and 3, meaning there are no suitable alternative locations on-site within lower risk areas (e.g. Flood Zone 1) for the Construction Compounds.

D.4.3. All Solar Development Site Construction Compounds are generally positioned adjacent to existing roads/tracks, providing access for construction vehicles.

Natural sources

Rivers

D.4.4. All three Construction Compounds are situated within Flood Zone 2, reflecting the wider flood plain characteristics of Solar Development Site 4.

D.4.5. With reference to Figure 15.15: Design Event (1 in 100-year plus Climate Change) ((ES Volume 2) **[EN0110012/APP/LVS/06.02.02.15.15]**, Solar Development Site 4 is shown to be outside of the flood envelope associated with the design flood event (1 in 100-year plus 31% climate change). In this event, flooding is shown to be contained by the flood defence embankments located to the south of Haddlesey Road. The Construction Compounds therefore remains outside of the flood envelope associated with the design event.

D.4.6. With reference to Figure 15.16: Credible Maximum Scenario Depth (ES Volume 2) **[EN0110012/APP/LVS/06.02.02.15.16]**, a large portion of the site is indicated to be affected by flooding in the credible maximum scenario (1 in 100-year plus 51% climate change allowance). This includes two of the three proposed Construction Compounds in Fields 4.4 and 4.14 on Solar Development Site 4, which are shown to be partially inundated with widespread, generally shallow flooding, with average flood depths reported of around 0.25 m.

D.4.7. The final siting of the affected Construction Compounds will be reviewed at detailed design and, where feasible, adjusted in size or repositioned to avoid the areas identified as at risk of flooding, though it is noted that they remain dry in their current positions in the design event.

D.4.8. A detailed assessment of considerations for temporary construction-phase resilience is provided in sections 7 – 9 of the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]) and the Outline Drainage Strategy (Appendix 15.3 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.04**]). Where it is not feasible to avoid the floodplain entirely, all materials, equipment, welfare facilities and fuel stores would be located on the highest available ground, as far from the flood-prone area as practical, securely stored and, where necessary, raised above predicted flood levels to prevent damage or displacement during a flood event. This is set out in the Outline CEMP [**EN0110012/APP/LVS/07.02**]. A FWEP will also be in place during construction.

Surface water and overland flow

D.4.9. The EA's Risk of Flooding from Surface Water data is provided in Figure 15.9: Risk of Flooding from Surface Water (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.09]**.

D.4.10. Surface water flood risk varies across the three Construction Compounds as described below:

1) The Construction Compound on Field 4.4 is shown to be at very low risk of surface water flooding, with the exception of a small central area shown to be at high to medium risk.
2) The Construction Compound on Field 4.5 is shown to be at very low risk of surface water flooding, with an area of low risk in the south-east corner.
3) The Construction Compound on Field 4.11 is shown to be at very low risk from surface water flooding, with the exception of the southern area of the compound which is shown to be at medium to low risk.

D.4.11. The areas shown to be at a higher risk of surface water flooding likely correspond to localised low spots in the topography, and these conditions indicate the potential for localised ponding to occur during intense rainfall events.

D.4.12. During the construction phase, temporary drainage and water management measures will be required, as outlined in the outline Drainage Strategy (Appendix 15.3 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.04**]). Temporary drainage measures, including cut-off drains, swales, and attenuation, will be provided to manage runoff and ponding during construction. Construction drainage will be designed to an appropriate flood event with an allowance for climate change and freeboard and agreed with North Yorkshire Council as part of approval of the detailed CEMP.

D.4.13. Taking these considerations into account, the overall risk of flooding from this source is considered to be **low to medium**.

Groundwater

D.4.14. The susceptibility to groundwater flooding mapping shown in Figure 15.12: Susceptibility to Groundwater Flooding (ES Volume 2) [**EN0110012/APP/LVS/06.02.15.12**] which shows the southern and western areas of Solar Development Site 4 to be in areas with 'limited potential for groundwater flooding' to 'potential for groundwater flooding of property situated below ground'. These areas of greater susceptibility are located in proximity to watercourses, which may influence shallow groundwater conditions.

D.4.15. As stated in the North Yorkshire Council SFRA, there is no substantial evidence of direct groundwater flooding in the majority of North Yorkshire. However, it is known to be a contributing factor in specific circumstances and that it may exacerbate surface water flooding.

D.4.16. Given the above, the risk of flooding to Solar Development Site 4 Construction Compounds is considered to be low to medium.

D.4.17. Groundwater considerations are also addressed separately in Chapter 15: Water Resources and Flood Risk (ES Volume 1) [**EN0110012/APP/LVS/06.01.15**].

Artificial sources

Reservoirs

D.4.18. With reference to Figure 15.11: Risk of Flooding from Reservoirs (ES Volume 2) [**EN0110012/APP/LVS/06.02**], which provides an extract from the Flood Map for Planning service, the Construction Compounds on Solar Development Site 4 are shown to be at risk of flooding in the event that a reservoir failure occurred, even when river levels are normal on a 'dry' day.

D.4.19. Flooding from reservoir failures is, however, extremely unlikely, as it is a highly managed risk associated only with a very rare event. An area is considered at risk if people's lives could be threatened in the event of a dam or reservoir failure.

D.4.20. The risk of flooding from this source is therefore considered to be **very low**.

Highway drainage

D.4.21. The risk of flooding to the Solar Development Site 4 Construction Compounds from highway drainage infrastructure during temporary works and construction is very low, due to their locations and limited interaction with highway systems.

D.4.22. The over-edge drainage mechanism for runoff into watercourses/ditches ensures that surface water should be efficiently managed without overwhelming the existing system or the Construction Compounds under normal circumstances.

D.4.23. Any localised flooding would primarily result from construction activities and will be managed through the mitigation measures outlined in sections 7–9 of the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]) and the outline Drainage Strategy (Appendix 15.3 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.04**]).

D.4.24. The overall risk of flooding from this source is therefore considered to be **low**.

D.5. Summary and conclusions

D.5.1. Solar Development Site 4 is formed of several land parcels, the majority of which are shown to be within Flood Zone 2 and Flood Zone 3. Flood Zone 2 is defined as having between a 1% and 0.1% annual probability of river flooding and Flood Zone 3 is defined as having a 1% or greater annual probability of river flooding.

D.5.2. This review encompasses the results of site-specific hydraulic modelling, alongside the most recent EA National Flood Risk Assessment 2 (NaFRA2) data (published 28 March 2025) and contributes to a comprehensive evaluation of current and future flood risk, incorporating fluvial, tidal, and surface water sources under climate change scenarios.

D.5.3. The assessment is based on the Design Parameters set out in Chapter 2: The Proposed Development (ES Volume 1) [**EN0110012/APP/LVS/06.01.02**] and secured through the Design Parameters and Principles Commitments Document [**EN0110012/APP/LVS/05.05.06**]. The site-specific flood risk findings presented in this Annex should be considered alongside the mitigation measures outlined in the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]).

D.5.4. The site-specific hydraulic modelling outputs have been used to inform the spatial distribution of infrastructure provided for by the Works Plans [**EN0110012/APP/LVS/02.03**]) and already committed to and secured within the Design Parameters and Commitments Document [**EN0110012/APP/LVS/05.06**]. Solar Development Site 4 is shown to be outside of the flood envelope associated with the design flood event (1 in 100-year return period plus 31% climate change allowance). Widespread, mostly shallow flooding is reported in the credible maximum scenario (1 in 100-year return period plus 51% climate change allowance).

D.5.5. Under the credible maximum scenario, the 275 kV substation in Field 4.4 is shown to lie within the modelled flood extents. However, it has been strategically located in the south-western corner of the field, where flood depths are significantly lower and typically less than 0.05 m. The siting of this substation demonstrates a risk-informed sequential approach to infrastructure siting across Solar Development Site 4.

D.5.6. A maximum, highly localised flood depth of 0.386 m is reported in the southeasternmost corner, corresponding to a maximum flood level of 7.858 mAOD. This maximum water level will inform the setting of the minimum FFL for the substation, in line with the conditions agreed with the EA, within the current scheme design.

D.5.7. Several ICUs and Solar PV panel areas intersect with the flood envelope under the credible maximum scenario. In these areas, average flood depths of approximately 0.19 m are reported, with localised maximum depths reaching up to 0.66 m. These structures are proposed to be raised above the flood level to protect the structure itself, and it is considered that these ICUs can be designed with appropriate resilience measures – including raising FFLs – to ensure safe operation under the design flood conditions.

D.5.8. For an assessment of interactions of solar panels and ICUs within the floodplain, refer to section 6.3 in the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]). Avoidance and mitigation measures will be taken to ensure, insofar as reasonably practical, that Solar Development Site 4 is safe from flooding for its lifetime, and that flood risk to surrounding receptors is not increased.

D.5.9. Minimum FFLs will be set to the 1 in 100-year plus 31 / 30% adopted climate change allowance plus 300 mm freeboard or set to the height of the credible maximum scenario, whichever is higher. In the event voided structures are used, freeboard will be a minimum of 600 mm.

D.5.10. Given the large extent of Solar Development Site 4, the majority of the site is shown to be at very low risk of surface water flooding (chance of flooding less than 0.1% each year), with localised topographic depressions across the site are shown to have a low to high chance of surface water flooding (between 0.1 and > 3.3% chance each year). No significant surface water flow paths are shown to be located within Solar Development Site 4, with areas at higher risk generally aligning with the existing watercourses. The risk of flooding from surface water to Solar Development Site 4 is considered to be **low to medium**.

D.5.11. Avoidance and mitigation measures will be taken to ensure, insofar as reasonably practical, Solar Development Site 4 is safe from surface water flooding for its lifetime, and that surface water flood risk to surrounding receptors is not increased. Any drainage systems will be designed to accommodate the 1% (1 in 100) annual flood, plus an appropriate allowance for climate change.

D.5.12. During the construction phase, temporary drainage and water management measures will be required, as outlined in the outline Drainage Strategy (Appendix 15.3 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.04**]). Temporary drainage measures, including cut-off drains, swales, and attenuation, will be provided to manage runoff and ponding during construction. Construction drainage will be designed to an appropriate flood event with an allowance for climate change and freeboard and agreed with North Yorkshire Council as part of approval of the detailed CEMP.

D.5.13. The potential of groundwater flooding across Solar Development Site 4 is variable, ranging from no potential for groundwater flooding to a potential for groundwater flooding to occur at the surface. Areas of greater susceptibility are located near watercourses and may influence shallower groundwater conditions. The North Yorkshire Council SFRA considers that there is no substantial evidence of direct groundwater flooding in the majority of North Yorkshire, however, it is known to exacerbate surface water flooding in some instances. The risk from this source is therefore considered to be **low to medium**.

D.5.14. Solar Development Site 4 is shown to be at risk of flooding in the event that a reservoir failure occurred, even when river levels are normal. However, flooding from reservoir failures is extremely unlikely due to the highly managed nature of this risk. The risk from this source is considered to be **very low**, however, reservoir flooding should be included in any future Flood Warning and Evacuation Plan (FWEP).

D.5.15. The risk of flooding from other artificial sources is considered to be **very low**.

References

Ref 1 North Yorkshire County Council, "Strategic Flood Risk Assessment," (2016) [Online]. Available at: https://www.northyorks.gov.uk/sites/default/files/fileroot/planning_migrated/minerals_and_waste_plan/Strategic_flood_risk_assessment%20-%20accessible.pdf [Accessed January 2026]

Annex E Solar Development Site 6

Annex E Solar Development Site 6

E.1. Development information

Existing site

Site location

E.1.1. Solar Development Site 6 (Figure 1.1: Site Location Plan and Order Limits (ES Volume 2)) **[EN0110012/APP/LVS/06.02.01.01]** is split into two sections by Lumby Common Drain and is located approximately 500 m north of Monk Fryston and 540 m east of South Milford.

Site description

E.1.2. Common Lane is located directly to the north of the Solar Development Site 6 boundary, with Turpin Lane dissecting the western parcel of the site providing access to the existing properties.

E.1.3. The Lumby Common Drain runs through the centre of the site. The Milford Curve rail line runs adjacent to the western edge of the southern section of Solar Development Site 6 and to the northwest and north of the northern section of Solar Development Site 6. The site covers an area of 99.6 ha.

Site topography

E.1.4. The watercourses and topography are shown on Figure 15.1: Surface Water Features (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.01]**. The topography appears to be generally flat.

Watercourses

E.1.5. With reference to Figure 15.1: Surface Water Features (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.01]**, there are no main rivers within the boundary of Solar Development Site 6.

E.1.6. Two Selby Area Internal Drainage Board (IDB) drains, Milford Common Drain and Lumby Common Drain, cut through the southern land parcel of Solar Development Site 6 in two places, with Lumby Common Drain continuing northwards through the northern land parcel of Solar Development Site 6, bisecting the site.

Artificial drainage

E.1.7. Within Solar Development Site 6, no existing sewers or private drainage systems have been identified to be within the site boundary.

Flood defences

E.1.8. With reference to Figure 15.14: Spatial Flood Defences (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.14]**, the Environment Agency's (EA) Asset Information and Maintenance Systems (AIMS) Spatial Flood Defence database has been reviewed to identify any known flood defences within the Order Limits.

E.1.9. Within Solar Development Site 6, no existing flood defences have been identified to be present.

E.2. Proposed Development

Details of Solar Development Site 6

E.2.1. Solar Development Site 6 is anticipated to contain Solar PV and ICUs.

E.2.2. The Solar PV are shown in the central southern parcel of the site, avoiding Flood Zones 2 and 3. Further detail related to the design parameters of these elements can be found in section 4.2 of the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]).

E.2.3. The ICUs (interchangeable with 33 kV switch rooms of equivalent dimensions) are anticipated to have maximum dimensions of 15 m by 5 m and a maximum height of 3.5 m. They will be enclosed by 3 m high palisade fencing. Foundations may comprise a concrete slab, strips or footings extending up to 16 m by 6 m, with a levelling layer of aggregate to a maximum depth of 0.8 m, or alternatively a concrete plinth placed directly onto the topsoil where non-ground penetrative works are required. Piling may be necessary depending on ground conditions.

E.2.4. HGVs and other construction traffic will access Solar Development Site 6 from two access points from Common Lane.

E.2.5. Access tracks serving the solar PV arrays will be constructed to a maximum width of 3.5 m with passing places extending up to 6 m. The tracks will be constructed of hardcore or gravel over a levelling layer of substrate. The access points from the public highway may comprise reinforced concrete.

E.2.6. Solar Development Site 6 currently consists of arable and pastoral fields, incorporating features such as hedgerows, field margins, ditches, and watercourses, all of which are considered to have ecological value. As part of the Proposed Development on Solar Development Site 6, new hedgerows and trees will be planted, and land between and beneath the solar arrays will be sown with grassland and managed as meadow, using limited cutting and a combination of grazed and ungrazed areas to promote habitat diversity. Certain areas may be retained or repurposed for agricultural use, and gaps within existing hedgerows will be infilled with native species to enhance ecological connectivity and biodiversity.

Development type and vulnerability

E.2.7. In accordance with national and local planning policies, it is essential that a development site not only assesses the potential flood risks but also ensures that it does not create or exacerbate flood risks downstream over its lifetime and that the proposed development retains the natural hydrological behaviour of the existing site.

E.2.8. Solar Development Site 6 involves the construction of solar PV and associated infrastructure for the purpose of energy generation and distribution, which is listed under the National Planning Policy Framework (NPPF) as ‘Essential infrastructure’.

Climate change

E.2.9. In accordance with the NPPF, the Environment Agency (EA) mandates that the rate of surface water runoff from a newly developed site must not exceed that of any previous development. Additionally, the EA and local planning authorities jointly aim to actively promote the reduction of stormwater discharge as a condition for the approval of new developments.

E.2.10. Solar Development Site 6 is located within the Aire and Calder management catchment. With reference to table 4-1 within the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]), peak river flow allowances are given for the 2080's epoch as follows:

1) 'Higher Central' 31%; and
2) 'Upper End' 51%.

E.2.11. Furthermore, all new drainage systems must be designed to accommodate runoff from a 1 in 100-year rainfall event, with an additional allowance to account for the future impacts of climate change. With reference to table 4-2 within the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]), peak rainfall allowances are given for the 2070's epoch as follows:

1) 3.3% annual exceedance rainfall event
   a) Central allowance = 25%
   b) Upper end allowance = 40%
2) 1% annual exceedance rainfall event
   a) Central allowance = 25%
   b) Upper end allowance = 45%

E.3. Flood Risk Assessment

E.3.1. This section identifies and describes both natural and artificial drainage systems that may pose a flood risk to Solar Development Site 6. It also includes an assessment of runoff within Solar Development Site 6 itself. The Construction Compound on Solar Development Site 6 is assessed separately in E.4.

Natural sources

Rivers

E.3.2. With regards to fluvial flooding, an extract from the Flood Map for Planning service is provided in Figure 15.10: Risks of Flooding from Rivers and Seas (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.10]**. This illustrates the present-day risk of flooding only. It does not consider the future probability of flooding due to the impacts of climate change, or proposed land use changes to the site.

E.3.3. Solar Development Site 6 is shown to be within Flood Zone 1, described as land with a very low probability of fluvial flooding (less than 1 in 1000-year or 0.1% annual probability). Land immediately adjacent to Milford Common Drain and Lumby Common Drain, which bisects the site, is shown to be in Flood Zone 2 and 3.

E.3.4. With reference to the Planning Policy Guidance, land in Flood Zone 2 has a medium probability of flooding defined as land having between a 1% and 0.1% annual probability of river flooding; or land having between a 0.5% and 0.1% annual probability of sea flooding. Flood Zone 3 is considered of land that has a 1% or greater annual probability of river flooding; or land having a 0.5% or greater annual probability of sea flooding.

E.3.5. The site-specific hydraulic modelling commissioned during the PEIR stage has now been received from Arthian Ltd and subject to detailed review. The outputs have informed the following assessment and provide an updated understanding of flood risk across the Solar Development Sites.

E.3.6. Although Solar Development Site 6 is not explicitly covered within the extent of the site-specific hydraulic model, the model boundaries associated with the River Aire were extended to ensure that flood extents were not artificially truncated at Hillam Common Lane.

E.3.7. A.3.7. The site-specific hydraulic modelling outputs have been used to inform the spatial distribution of infrastructure provided for by the Works Plans [**EN0110012/APP/LVS/02.03**] and already committed to and secured within the Design Parameters and Commitments Document [**EN0110012/APP/LVS/05.06**]. The model outputs (shown in Figure 15.15: Design Event (1 in 100-year plus Climate Change) and 15.16: Credible Maximum Scenario Depth (ES Volume 2)) [**EN0110012/APP/LVS/06.02.15.[15–16]**] confirm that the modelled floodplain does not extend into Solar Development Site 6 under either the design flood event or the credible maximum scenario. The nearest modelled flood extent is over 700 m to the north, where flooding is reported and likely associated with the Carr Dike.

Surface water and overland flow

E.3.8. With regards to surface water flooding, the EA's Risk of Flooding from Surface Water data is provided in Figure 15.9: Risk of Flooding from Surface Water (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.09]**. This data illustrates the potential present-day risk of surface water inundation or flooding across Solar Development Site 6. It does not account for the future probability of flooding due to the impacts of climate change or proposed land use changes.

E.3.9. Predicting flooding from surface water is challenging, as the location and volume of rainfall are difficult to forecast. Factors such as the presence and condition of local drainage features can significantly influence the likelihood and severity of this type of flooding.

E.3.10. In addition, the surface water flood mapping is produced using a 70% runoff coefficient for rainfall, which accounts for potential infiltration and runoff entering existing drainage systems in the catchment. Losses through infiltration and drainage are highly variable and in reality, will often not be reflected in the high-level assumptions included in large scale modelling.

E.3.11. The majority of the site is shown to be at a very low risk of surface water flooding (chance of flooding less than 0.1% each year). No significant surface water flow paths appear to be located within Solar Development Site 6.

E.3.12. Areas with a low to high chance of surface water flooding (between 0.1 and > 3.3% chance each year) generally appear to align with the existing ordinary watercourses crossing the site. Smaller areas of surface water flooding likely correspond to localised depressions in the topography.

E.3.13. This suggests that the risk of flooding from surface water to Solar Development Site 6 is **low to medium**.

Groundwater

E.3.14. The EA's national Areas Susceptible to Groundwater Flooding (AStGWF) dataset, provided within the North Yorkshire County Council Strategic Flood Risk Assessment (SFRA) (Ref 1), serves as the primary dataset for assessing the future risk of groundwater flooding. The AStGWF map categorises susceptibility into four levels, indicating the proportion of each 1 km grid square where geological and hydrogeological conditions suggest potential groundwater emergence.

E.3.15. The risk of groundwater flooding emergence is considered to be low for Solar Development Site 6. The North Yorkshire Council SFRA states that there is no substantial evidence of direct groundwater flooding in the majority of North Yorkshire. However, it is a known contributing factor in specific circumstances and that it may exacerbate surface water flooding. This is supported by the susceptibility to groundwater flooding mapping shown in Figure 15.12:

Susceptibility to Groundwater Flooding (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.12]**, which shows Solar Development Site 6 to be outside of the area susceptible to groundwater flooding.

E.3.16. Given the above, the risk of flooding to Solar Development Site 6 from groundwater is considered to be **low**.

Artificial sources

Reservoirs

E.3.17. The risk of flooding from reservoirs is illustrated in Figure 15.11: Risk of Flooding from Reservoirs (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.11]**, which presents an extract from the Flood Map for Planning service. This indicates that the majority of Solar Development Site 6 is not at risk of flooding in an event that a reservoir failure. A small area in the northern land parcel aligning with the Lumby Common Drain is shown to be at risk of flooding in an event that a reservoir failure occurred and released the water held on a ‘wet day’ when local rivers are also in flood.

E.3.18. Flooding from reservoir failures is however extremely unlikely, as a highly managed risk, associated only with a very rare event. An area is considered at risk if people’s lives could be threatened in the event of a dam or reservoir failure.

E.3.19. The risk of flooding from this source is considered to be **very low**.

Highway drainage

E.3.20. In the area surrounding Solar Development Site 6, the highway drainage appears to be overedge draining into the surrounding ditches.

E.3.21. The over-edge drainage mechanism for runoff into watercourses/ditches, combined with the comparatively large site area, ensures that surface water should be efficiently managed without overwhelming the existing system or the site under normal conditions.

E.3.22. The risk of flooding from this source is considered to be **very low**.

Private drainage

E.3.23. No existing properties are situated within the boundary of Solar Development Site 6, however, should there be any preexisting private drainage it is classified as being outside of Solar Development Site 6 and therefore any drainage associated will remain in place.

E.3.24. The risk posed to Solar Development Site 6 by failure of existing private drainage systems is considered to be **very low**.

Additional sources

E.3.25. Flood risk may come from additional sources such as Yorkshire Water infrastructure (for example sewer flooding).

E.3.26. Within Solar Development Site 6, there appear to be no adopted sewerage assets. It is therefore considered that the risk posed to Solar Development Site 6 from this source is **very low**.

E.4. Construction Compound Flood Risk Assessment

E.4.1. A single Construction Compound is located on Solar Development Site 6, within Field 6.3 (Solar Development Site 6 Construction Compound) as shown on the Works Plans [**EN0110012/APP/LVS/02.03**].

E.4.2. The entirety of the Construction Compound is located within Flood Zone 1. The Construction Compound is located adjacent to existing roads/tracks, providing access for construction vehicles.

Natural sources

Rivers

E.4.3. The Construction Compound located on Solar Development Site 6 within Field 6.3 is in Flood Zone 1.

E.4.4. The risk from this source of flooding is therefore considered to be **very low**.

Surface water and overland flow

E.4.5. The EA's Risk of Flooding from Surface Water data is provided in Figure 15.9: Risk of Flooding from Surface Water (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.09]**.

E.4.6. The Construction Compound within Field 6.3 is shown to be at very low risk of surface water flooding, with the exception of the northernmost area which is shown to be at a medium risk of surface water flooding. This is likely due to natural topographical variation and the presence of drainage ditches to the north and east and indicates the potential for localised ponding to occur during intense rainfall events.

E.4.7. During the construction phase, temporary drainage and water management measures will be required, as outlined in the outline Drainage Strategy (Appendix 15.3 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.04**]). Temporary drainage measures, including cut-off drains, swales, and attenuation, will be provided to manage runoff and ponding during construction. Construction drainage will be designed to an appropriate flood event with an allowance for climate change and freeboard and agreed with North Yorkshire Council as part of approval of the detailed CEMP.

E.4.8. Taking these considerations into account, the overall risk of flooding from this source is considered to be **low to medium**.

Groundwater

E.4.9. The susceptibility to groundwater flooding mapping shown in Figure 15.12: Susceptibility to Groundwater Flooding (ES Volume 2) [**EN0110012/APP/LVS/06.02.15.12**] which shows Solar Development Site 6 to be outside of the area susceptible to groundwater flooding.

E.4.10. As stated in the North Yorkshire Council SFRA, there is no substantial evidence of direct groundwater flooding in the majority of North Yorkshire. However, it is known to be a contributing factor in specific circumstances and that it may exacerbate surface water flooding.

E.4.11. Given the above, the risk of flooding to the Solar Development Site 6 Construction Compound is considered to be **low**.

E.4.12. Groundwater considerations are also addressed separately in Chapter 15: Water Resources and Flood Risk (ES Volume 1) [**EN0110012/APP/LVS/06.01.15**].

Artificial sources

Reservoirs

E.4.13. With reference to Figure 15.11: Risk of Flooding from Reservoirs (ES Volume 2) [**EN0110012/APP/LVS/06.02**], which provides an extract from the Flood Map for Planning service, the Construction Compound on Solar Development Site 6 is shown to lie outside of areas identified as being at risk of flooding from reservoirs under wet or dry day scenarios.

Highway drainage

E.4.14. The risk of flooding to the Solar Development Site 6 Construction Compound from highway drainage infrastructure during temporary works and construction is very low, due to its location and limited interaction with highway systems.

E.4.15. The over-edge drainage mechanism for runoff into watercourses/ditches ensures that surface water should be efficiently managed without overwhelming the existing system or the Construction Compound under normal circumstances.

E.4.16. Any localised flooding would primarily result from construction activities and will be managed through the mitigation measures outlined in sections 7–9 of the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]) and the outline Drainage Strategy (Appendix 15.3 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.04**]).

E.4.17. The overall risk of flooding from this source is therefore considered to be **very low**.

E.5. Summary and conclusions

E.5.1. This review encompasses the results of site-specific hydraulic modelling, alongside the most recent EA National Flood Risk Assessment 2 (NaFRA2) data (published 28 March 2025) and contributes to a comprehensive evaluation of current and future flood risk, incorporating fluvial and surface water sources under climate change scenarios.

E.5.2. The assessment is based on the Design Parameters set out in Chapter 2: The Proposed Development (ES Volume 1) [**EN0110012/APP/LVS/06.01.02**] and secured through the Design Parameters and Principles Commitments Document [**EN0110012/APP/LVS/05.05.06**]. The site-specific flood risk findings presented in this Annex should be considered alongside the mitigation measures outlined in the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]).

E.5.3. Solar Development Site 6 is predominantly situated within Flood Zone 1, indicating a very low probability of fluvial flooding (less than 1 in 1000-year or 0.1% annual probability). Areas of Flood Zone 2 and 3 are present immediately adjacent to the Milford Common Drain and Lumby Common Drain, that bisect the site. Considering the embedded mitigation to provide a minimum 10 m offset from IDB watercourses, it is anticipated that Solar Development Site 6 can be suitably designed to avoid development in these areas. The overall risk from this source is therefore considered to be **low**.

E.5.4. The site-specific hydraulic modelling outputs have been used to inform the spatial distribution of infrastructure provided for by the Works Plans [**EN0110012/APP/LVS/02.03**] and already committed to and secured within the Design Parameters and Commitments Document [**EN0110012/APP/LVS/05.06**]. Solar Development Site 6 is shown to be outside of the flood envelope for all considered return periods.

E.5.5. Avoidance and mitigation measures will be taken to ensure, insofar as reasonably practical, that Solar Development Site 6 is safe from flooding for its lifetime, and that flood risk to surrounding receptors is not increased.

E.5.6. Minimum FFLs will be set to the 1 in 100-year plus 31% climate change allowance plus 300 mm freeboard or set to the height of the credible maximum scenario, whichever is higher. In the event voided structures are used, freeboard will be a minimum of 600 mm.

E.5.7. The majority of the site is shown to be at a very low risk of surface water flooding (chance of flooding less than 0.1% each year). No significant surface water flow paths appear to be located within Solar Development Site 6, and areas with a low to high chance of surface water flooding (between 0.1 and > 3.3% chance each year) generally appear to align with the existing IDB drains crossing the site. This suggests that the risk of flooding from surface water to Solar Development Site 6 is **low to medium**.

E.5.8. Avoidance and mitigation measures will be taken to ensure, insofar as reasonably practical, that Solar Development Site 6 is safe from surface water flooding for its lifetime, and that surface water flood risk to surrounding receptors is not increased. Any drainage systems will be designed to accommodate the 1% (1 in 100) annual flood, plus an appropriate allowance for climate change.

E.5.9. During the construction phase, temporary drainage and water management measures will be required, as outlined in the outline Drainage Strategy (Appendix 15.3 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.04**]). Temporary drainage measures, including cut-off drains, swales, and attenuation, will be provided to manage runoff and ponding during construction. Construction drainage will be designed to an appropriate flood event with an allowance for climate change and freeboard and agreed with North Yorkshire Council as part of approval of the detailed CEMP.

E.5.10. For groundwater flooding, the AStGWF map shows Solar Development Site 6 to be outside of the area susceptible to groundwater flooding. The North Yorkshire Council SFRA considers that there is no substantial evidence of direct groundwater flooding in the majority of North Yorkshire, however, it is known to exacerbate surface water flooding in some instances. The risk from this source is therefore considered to be **low**.

E.5.11. Regarding artificial sources of flood risk, the EA's long-term flood risk service indicates that the majority of Solar Development Site 6 is not at risk of flooding in the event of a reservoir failure, with the exception of a small area in the northern land parcel aligning with the Limby Common Drain, which is shown to be at risk of flooding from this source when local rivers are also in flood. However, flooding from reservoir failures is extremely unlikely due to the highly managed nature of this risk. The risk from this source is considered to be **very low**, however, reservoir flooding should be included in any future Flood Warning and Evacuation Plan (FWEP).

E.5.12. The risk of flooding from other artificial sources is also considered to be **very low**.

References

Ref 1 North Yorkshire County Council, “Strategic Flood Risk Assessment,” (2016) [Online]. Available at: https://www.northyorks.gov.uk/sites/default/files/fileroot/planning_migrated/minerals_and_waste_plan/Strategic_flood_risk_assessment%20-%20accessible.pdf [Accessed January 2026]

Annex F Solar Development Site 7

Annex F Solar Development Site 7

F.1. Development information

Existing site

Site location

F.1.1. Solar Development Site 7 (Figure 1.1: Site Location Plan and Order Limits (ES Volume 2)) **[EN0110012/APP/LVS/06.02.01.01]** is located approximately 510 metres (m) east of South Milford. The existing site comprises of agricultural land, bordered by trees and shrubs.

Site description

F.1.2. The southern edge of the site runs adjacent to Common Lane. Along the boundary of Solar Development Site 7, Normanton and Colton Junction railway line runs to the west of the site and the Hull railway line runs adjacent to the northern edge of the site.

F.1.3. There are no designated nature conservation sites located within the site. No roads run directly through the site with the local transport network consisting of Common Lane. The site covers an area of 8.7 ha.

Site topography

F.1.4. The topography of Solar Development Site 7 is shown on Figure 15.1: Surface Water Features (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.01]**.

Watercourses

F.1.5. With reference to Figure 15.1: Surface Water Features (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.01]**, there are no main rivers within the boundary of Solar Development Site 7.

F.1.6. A Selby Area Internal Drainage Board (IDB) drain flows along the southern boundary, adjacent to Common Lane, and an unnamed watercourse runs adjacent to the eastern boundary of Solar Development Site 7. No watercourses appear to cross the site.

Artificial drainage

F.1.7. Within Solar Development Site 7, Network Rail sewers have been identified that run along the site boundaries. Within the site boundary itself, no existing sewers or private drainage systems have been identified.

Flood defences

F.1.8. With reference to Figure 15.14: Spatial Flood Defences (ES Volume 2) [**EN0110012/APP/LVS/06.02.15.14**], the Environment Agency's (EA) Asset Information and Maintenance Systems (AIMS) Spatial Flood Defence database has been reviewed to identify any known flood defences within the Order Limits.

F.1.9. Within Solar Development Site 7, no existing flood defences have been identified to be present.

F.2. Proposed Development

Details of Solar Development Site 7

F.2.1. Solar Development Site 7 is anticipated to contain Solar PV and ICUs.

F.2.2. The Solar PV area is shown in Flood Zone 1. Further detail related to the design parameters of these elements can be found in section 4.2 of the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]).

F.2.3. The ICUs (interchangeable with 33 kV switch rooms of equivalent dimensions) are anticipated to have maximum dimensions of 15 m by 5 m and a maximum height of 3.5 m. They will be enclosed by 3 m high palisade fencing. Foundations may comprise a concrete slab, strips or footings extending up to 16 m by 6 m, with a levelling layer of aggregate to a maximum depth of 0.8 m, or alternatively a concrete plinth placed directly onto the topsoil where non-ground penetrative works are required. Piling may be necessary depending on ground conditions.

F.2.4. HGV's and construction vehicles are expected to arrive from the west using the A162 due to the sites proximity to the A1 (M). Access to Solar Development Site 7 will be from Common Lane using an existing access point.

F.2.5. Access tracks serving the solar PV arrays will be constructed to a maximum width of 3.5 m with passing places extending up to 6 m. The tracks will be constructed of hardcore or gravel over a levelling layer of substrate. The access points from the public highway may comprise reinforced concrete.

F.2.6. Solar Development Site 7 currently consist of arable and pastoral fields, incorporating features such as hedgerows, field margins, ditches, and watercourses, all of which are considered to have ecological value. As part of the Proposed Development on Solar Development Site 7, new hedgerows and trees will be planted, and land between and beneath the solar arrays will be sown with grassland and managed as meadow, using limited cutting and a combination of grazed and ungrazed areas to promote habitat diversity. Certain areas may be retained or repurposed for agricultural use, and gaps within existing hedgerows will be infilled with native species to enhance ecological connectivity and biodiversity.

Development type and vulnerability

F.2.7. In accordance with national and local planning policies, it is essential that a development not only assesses the potential flood risks but also ensures that it does not create or exacerbate flood risks downstream over its lifetime and that a development retains the natural hydrological behaviour of the existing site.

F.2.8. The Proposed Development involves the construction of solar PV and associated infrastructure on Solar Development Site 7 for the purpose of energy generation and distribution, which is listed under the National Planning Policy Framework (NPPF) as 'Essential infrastructure'.

Climate change

F.2.9. In accordance with the NPPF, the Environment Agency (EA) mandates that the rate of surface water runoff from a newly developed site must not exceed that of any previous development. Additionally, the EA and local planning authorities jointly aim to actively promote the reduction of stormwater discharge as a condition for the approval of new developments.

F.2.10. Solar Development Site 7 is located within the Aire and Calder management catchment. With reference to table 4-1 within the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]), peak river flow allowances are given for the 2080's epoch as follows:

1) 'Higher Central' 31%; and
2) 'Upper End' 51%.

F.2.11. Furthermore, all new drainage systems must be designed to accommodate runoff from a 1 in 100-year rainfall event, with an additional allowance to account for the future impacts of climate change. With reference to Table 4-2 within the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]), peak rainfall allowances are given for the 2070's epoch as follows:

1) 3.3% annual exceedance rainfall event:
    a) Central allowance = 25%
    b) Upper end allowance = 40%
2) 1% annual exceedance rainfall event:
    a) Central allowance = 25%
    b) Upper end allowance = 45%

F.3. Flood Risk Assessment

F.3.1. This section identifies and describes the natural and artificial drainage systems that may pose a flood risk to Solar Development Site 7. It also includes an assessment of runoff within Solar Development Site 7 itself.

Natural sources

Rivers

F.3.2. With regards to fluvial flooding, an extract from the Flood Map for Planning service is provided in Figure 15.10: Risks of Flooding from Rivers and Seas (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.10]**. This illustrates the present-day risk of flooding only. It does not consider the future probability of flooding due to the impacts of climate change, or proposed land use changes to the site.

F.3.3. Solar Development Site 7 is situated entirely within Flood Zone 1, described as land with a very low probability of fluvial flooding (less than 1 in 1000-year or 0.1% annual probability).

F.3.4. The site-specific hydraulic modelling commissioned during the PEIR stage has now been received from Arthian Ltd and subject to detailed review. The outputs have informed the following assessment and provide an updated understanding of flood risk across the Solar Development Sites. Although Solar Development Site 7 is not explicitly covered within the extent of the site-specific hydraulic model, the model boundaries associated with the River Aire were extended to ensure that flood extents were not artificially truncated at Hillam Common Lane.

F.3.5. The results (shown in Figure 15.15: Design Event (1 in 100-year plus Climate Change) and 15.16: Credible Maximum Scenario Depth (ES Volume 2)) [**EN0110012/APP/LVS/06.02.15.[15–16]**] confirm that the modelled floodplain does not extend into Solar Development Site 7 under either the design flood event or the credible maximum scenario. The nearest modelled flood extent is over 1,350 m to the northeast, where flooding is reported and likely associated with the Carr Dike.

F.3.6. The site-specific hydraulic modelling outputs have been used to inform the spatial distribution of infrastructure provided for by the Works Plans [**EN0110012/APP/LVS/02.03**]) and already committed to and secured within the Design Parameters and Commitments Document [**EN0110012/APP/LVS/05.06**].

Surface water and overland flow

F.3.7. With regards to surface water flooding, the EA's Risk of Flooding from Surface Water data is provided in Figure 15.9: Risk of Flooding from Surface Water (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.09]**. This data illustrates the potential present-day risk of surface water inundation or flooding across Solar Development Site 7. It does not account for the future probability of flooding due to the impacts of climate change or proposed land use changes.

F.3.8. Predicting flooding from surface water is challenging, as the location and volume of rainfall are difficult to forecast. Factors such as the presence and condition of local drainage features can significantly influence the likelihood and severity of this type of flooding.

F.3.9. In addition, the surface water flood mapping is produced using a 70% runoff coefficient for rainfall, which accounts for potential infiltration and runoff entering existing drainage systems in the catchment. Losses through infiltration and drainage are highly variable and in reality, will often not be reflected in the high-level assumptions included in large scale modelling.

F.3.10. The majority of the site shown to be at very low risk of surface water flooding (chance of flooding less than 0.1% each year). No significant surface water flow paths appear to be shown to be located within Solar Development Site 7.

F.3.11. Areas with a low to high chance of surface water flooding (between 0.1 and > 3.3% chance each year) generally appear to align with the existing watercourses along the site boundaries, and smaller areas of surface water flooding likely correspond to localised depressions in the topography.

F.3.12. This suggests that the risk of flooding from surface water to Solar Development Site 7 is **low to medium**.

Groundwater

F.3.13. The EA's national Areas Susceptible to Groundwater Flooding (AStGWF) dataset, provided within the North Yorkshire County Council Strategic Flood Risk Assessment (SFRA) (Ref 1), serves as the primary dataset for assessing the future risk of groundwater flooding. The AStGWF map categorises susceptibility into four levels, indicating the proportion of each 1 km grid square where geological and hydrogeological conditions suggest potential groundwater emergence.

F.3.14. The risk of groundwater flooding emergence is considered to be low for Solar Development Site 7. The North Yorkshire Council SFRA states that there is no substantial evidence of direct groundwater flooding in the majority of North Yorkshire. However, it is a known contributing factor in specific circumstances and that it may exacerbate surface water flooding. This is supported by the susceptibility to groundwater flooding mapping shown in Figure 15.12: Susceptibility to Groundwater Flooding (ES Volume 2) [**EN0110012/APP/LVS/06.02.15.12**] which shows Solar Development Site 7 to be outside of the area susceptible to groundwater flooding.

F.3.15. Given the above, the risk of flooding to Solar Development Site 7 from groundwater is considered to be **low**.

Artificial sources

Reservoirs

F.3.16. The risk of flooding from reservoirs is illustrated in Figure 15.11: Risk of Flooding from Reservoirs (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.11]**, which presents an extract from the Flood Map for Planning service. This indicates that Solar Development Site 7 is not at risk of flooding in the event of reservoir failure.

F.3.17. The risk of flooding from this source is therefore considered to be **very low**.

Highway drainage

F.3.18. In the area surrounding Solar Development Site 7, Common Lane to the south appears to drain overedge into the IDB drain.

F.3.19. The over-edge drainage mechanism for runoff into watercourses/ditches, combined with the comparatively large site area, ensures that surface water should be efficiently managed without overwhelming the existing system or the site under normal conditions.

F.3.20. The risk of flooding from this source is considered to be **very low**.

Private drainage

F.3.21. No existing properties are situated within the boundary of Solar Development Site 7, however, should there be any preexisting private drainage it is classified as being outside of Solar Development Site 7 and therefore any drainage associated will remain in place.

F.3.22. The risk posed to Solar Development Site 7 by failure of these existing drainage systems is therefore considered to be **very low**.

Additional sources

F.3.23. Flood risk may come from additional sources such as Yorkshire Water infrastructure (for example sewer flooding).

F.3.24. Within Solar Development Site 7, there appear to be no adopted sewerage assets. It is therefore considered that the risk posed to the Development from this source is **very low**.

F.4. Summary and conclusions

F.4.1. This assessment encompasses the results of site-specific hydraulic modelling, alongside the most recent EA National Flood Risk Assessment 2 (NaFRA2) data (published 28 March 2025) and contributes to a comprehensive evaluation of current and future flood risk, incorporating fluvial and surface water sources under climate change scenarios.

F.4.2. The assessment is based on the Design Parameters set out in Chapter 2: The Proposed Development (ES Volume 1) [**EN0110012/APP/LVS/06.01.02**] and secured through the Design Parameters and Principles Commitments Document [**EN0110012/APP/LVS/05.05.06**]. The site-specific flood risk findings presented in this Annex should be considered alongside the mitigation measures outlined in the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]).

F.4.3. Solar Development Site 7 is entirely situated within Flood Zone 1, indicating a very low probability of fluvial flooding (less than 1 in 1000-year or 0.1% annual probability).

F.4.4. The site-specific hydraulic modelling outputs have been used to inform the spatial distribution of infrastructure provided for by the Works Plans [**EN0110012/APP/LVS/02.03**]) and already committed to and secured within the Design Parameters and Commitments Document [**EN0110012/APP/LVS/05.06**]. Solar Development Site 7 is shown to be outside of the flood envelope for all considered return periods.

F.4.5. Avoidance and mitigation measures will be taken to ensure, insofar as reasonably practical, that Solar Development Site 7 is safe from flooding for its lifetime, and that flood risk to surrounding receptors is not increased.

F.4.6. Minimum FFLs will be set to the 1 in 100-year plus 31% climate change allowance plus 300 mm freeboard or set to the height of the credible maximum scenario, whichever is higher. In the event voided structures are used, freeboard will be a minimum of 600 mm.

F.4.7. The majority of the site is shown to be at very low risk of surface water flooding (chance of flooding less than 0.1% each year). No significant surface water flow paths appear to be shown to be located within Solar Development Site 7 and areas with a low to high chance of surface water flooding (between 0.1 and > 3.3% chance each year) generally appear to align with the existing watercourses along the site boundaries, and smaller areas of surface water flooding could correspond to localised low spots in the topography.

F.4.8. Avoidance and mitigation measures will be taken to ensure, insofar as reasonably practical, that Solar Development Site 7 is safe from surface water flooding for its lifetime, and that surface water flood risk to surrounding receptors is not increased. Any drainage systems will be designed to accommodate the 1% (1 in 100) annual flood, plus an appropriate allowance for climate change.

F.4.9. During the construction phase, temporary drainage and water management measures will be required, as outlined in the outline Drainage Strategy (Appendix 15.3 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.04**]). Temporary drainage measures, including cut-off drains, swales, and attenuation, will be provided to manage runoff and ponding during construction. Construction drainage will be designed to an appropriate flood event with an allowance for climate change and freeboard and agreed with North Yorkshire Council as part of approval of the detailed CEMP.

F.4.10. For groundwater flooding, the AStGWF map shows Solar Development Site 7 to be outside of the area susceptible to groundwater flooding. The North Yorkshire Council SFRA considers that there is no substantial evidence of direct groundwater flooding in the majority of North Yorkshire, however, it is known to exacerbate surface water flooding in some instances. The risk from this source is therefore considered to be **low**.

F.4.11. Regarding artificial sources of flood risk, the EA's long-term flood risk service indicates that the majority of Solar Development Site 7 is not at risk of flooding in the event of a reservoir failure. The risk from this source is therefore considered to be **very low**.

F.4.12. The risk of flooding from other artificial sources is also considered to be **very low**.

References

Ref 1 North Yorkshire County Council, “Strategic Flood Risk Assessment,” (2016) [Online]. Available at: https://www.northyorks.gov.uk/sites/default/files/fileroot/planning_migrated/minerals_and_waste_plan/Strategic_flood_risk_assessment%20-%20accessible.pdf [Accessed January 2026]

Annex G Solar Development Site 8

Annex G Solar Development Site 8

G.1. Development Information

Existing Site

Site location

G.1.1. Solar Development Site 8 (Figure 1.1: Site Location Plan and Order Limits (ES Volume 2)) **[EN0110012/APP/LVS/06.02.01.01]** is located approximately 700 metres (m) northwest of the village of Hambleton. The existing site comprises of agricultural land, bordered by trees and shrubs.

Site description

G.1.2. Solar Development Site 8 covers an area of 60.0 ha.

G.1.3. The southern edge of Solar Development Site 8 is adjacent to the Selby Line railway, with Phillip Lane forming the eastern boundary of the site.

Site topography

G.1.4. The watercourses and topography are shown on Figure 15.1: Surface Water Features (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.01].** The topography appears to be generally flat.

Watercourses

G.1.5. With reference to Figure 15.1: Surface Water Features (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.01]**, there are no main rivers within the boundary of Solar Development Site 8.

G.1.6. A Selby Area Internal Drainage Board (IDB) drain, the Habholme Dike, forms the western boundary of the site and an unnamed drain, adjacent to Philip Lane, forms the eastern boundary of the site.

G.1.7. The Habholme Dike is shown to outfall to the Selby Dam, an EA designated main river, to the north-east of Solar Development Site 8.

Artificial drainage

G.1.8. Within Solar Development Site 8, no existing sewers or private drainage systems have been identified to be within the site boundary.

Flood defences

G.1.9. With reference to Figure 15.14: Spatial Flood Defences (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.14]**, the Environment Agency's (EA) Asset Information and Maintenance Systems (AIMS) Spatial Flood Defence database has been reviewed to identify any known flood defences within the Order Limits.

G.1.10. Within Solar Development Site 8, no existing flood defences have been identified to be present.

G.1.11. Approximately 425 m to the north of Solar Development Site 8, spatial flood defences associated with the Selby Dam have been identified to be within the Order Limits. These flood defences are shown to be directly adjacent to the river itself and are present within the Cable Route Corridor. An additional flood embankment approximately 150 m in length is shown approximately 280 m east of the cable crossing point.

G.1.12. An assessment of existing flood defence assets has been completed for this Cable Route Corridor and is presented in Section H2 of Annex H.

G.2. Proposed Development

Details of Solar Development Site 8

G.2.1. Solar Development Site 8 is anticipated to contain Solar PV and ICUs.

G.2.2. The ICUs (interchangeable with 33 kV switch rooms of equivalent dimensions) are anticipated to have maximum dimensions of 15 m by 5 m and a maximum height of 3.5 m. They will be enclosed by 3 m high palisade fencing. Foundations may comprise a concrete slab, strips or footings extending up to 16 m by 6 m, with a levelling layer of aggregate to a maximum depth of 0.8 m, or alternatively a concrete plinth placed directly onto the topsoil where non-ground penetrative works are required. Piling may be necessary depending on ground conditions.

G.2.3. HGVs and other construction vehicles will likely access Solar Development Site 8 via Philip Lane to the east. This access route is via the existing level crossing on Phillip Lane. Access from this point is feasible but requires HGVs to use the level crossing to cross the railway corridor. Network Rail (NR) have advised that they would only need to be informed if abnormal loads are expected.

G.2.4. As part of a possible access route to the north of Solar Development Site 8, a new permanent access road culvert may be needed over Habholme Dike, a Selby Area IDB watercourse.

G.2.5. Additionally, the potential access road to the north of Solar Development Site 8 will cross over Selby Dam, a main river. There is currently an existing culvert crossing the Selby Dam, however the condition of the culvert is not known. As a worst-case scenario, the existing culvert may need to be removed and replaced with a new permanent crossing structure, subject to detailed design and agreement with the relevant stakeholders. During the replacement of the culvert (if required) a temporary crossing structure would be installed to maintain current access provision if access could not be maintained over the current structure during the replacement works.

G.2.6. If a temporary crossing structure is required, the structure would be in place for less than 6 months. Any new crossing structure is not anticipated to be wider than the existing structure, and therefore any impacts associated with any modifications are expected to be minimal.

G.2.7. Any crossings of IDB watercourses required as part of the Proposed Development will be designed and delivered in accordance with the agreed principles set out in section 3.4 of the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]) and secured via the drainage authority protective provisions included in Article 6 of the Draft DCO [**EN110012/APP/LVS/03.01**].

G.2.8. Access tracks serving the solar PV arrays will be constructed to a maximum width of 3.5 m, with passing places extending up to 6 m. The tracks will be constructed of hardcore or gravel over a levelling layer of substrate. The access points from the public highway may comprise reinforced concrete.

G.2.9. Solar Development Site 8 currently consists of arable and pastoral fields, incorporating features such as hedgerows, field margins, ditches, and watercourses, all of which are considered to have ecological value. As part of the Proposed Development on Solar Development Site 8, new hedgerows and trees will be planted, and land between and beneath the solar arrays will be sown with grassland and managed as meadow, using limited cutting and a combination of grazed and ungrazed areas to promote habitat diversity. Certain areas may be retained or repurposed for agricultural use, and gaps within existing hedgerows will be infilled with native species to enhance ecological connectivity and biodiversity.

Development type and vulnerability

G.2.10. In accordance with national and local planning policies, it is essential that a development not only assesses the potential flood risks but also ensures that it does not create or exacerbate flood risks downstream over its lifetime and that a development retains the natural hydrological behaviour of the existing site.

G.2.11. The Proposed Development involves the construction of solar PV and associated infrastructure on Solar Development Site 8 for the purpose of energy generation and distribution, which is listed under the National Planning Policy Framework (NPPF) as ‘Essential infrastructure’.

Climate change

G.2.12. In accordance with NPPF, the Environment Agency (EA) mandates that the rate of surface water runoff from a newly developed site must not exceed that of any previous development. Additionally, the EA and local planning authorities jointly aim to actively promote the reduction of stormwater discharge as a condition for the approval of new developments.

G.2.13. Solar Development Site 8 is located within the Aire and Calder management catchment. With reference to table 4-1 within the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]), peak river flow allowances are given for the 2080’s epoch as follows:

1) ‘Higher Central’ 31%; and
2) ‘Upper End’ 51%.

G.2.14. Furthermore, all new drainage systems must be designed to accommodate runoff from a 1 in 100-year rainfall event, with an additional allowance to account for the future impacts of climate change. With reference to Table 4-2 within the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]), peak rainfall allowances are given for the 2070’s epoch as follows:

1) 3.3% annual exceedance rainfall event
   a) Central allowance = 25%
   b) Upper end allowance = 40%

2) 1% annual exceedance rainfall event
   a) Central allowance = 25%
   b) Upper end allowance = 45%

G.3. Flood Risk Assessment

G.3.1. This section identifies and describes the natural and artificial drainage systems that may pose a flood risk to Solar Development Site 8. It also includes an assessment of runoff within Solar Development Site 8 itself. The Construction Compound on Solar Development Site 8 is assessed separately in G.4.

Natural sources

Rivers

G.3.2. With regards to fluvial flooding, an extract from the Flood Map for Planning service is provided in Figure 15.10: Risks of Flooding from Rivers and Seas (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.10]**. This illustrates the present-day risk of flooding only. It does not consider the future probability of flooding due to the impacts of climate change, or proposed land use changes to the site.

G.3.3. Solar Development Site 8 is predominantly situated in Flood Zone 1, described as land with a very low probability of fluvial flooding (less than 1 in 1000-year or 0.1% annual probability). The land adjacent to the north and west of the site boundary is located within Flood Zone 2, which has a medium probability of flooding and is defined as land having between a 1% and 0.1% annual probability of river flooding: or land having between a 0.5% and a 0.1% annual probability of sea flooding. These areas of Flood Zone 2 are likely associated with the Habholme Dike and Selby Dam.

G.3.4. The site-specific hydraulic modelling commissioned during the PEIR stage has now been received from Arthian Ltd and subject to detailed review. The outputs have informed the following assessment and provide an updated understanding of flood risk across the Solar Development Sites.

G.3.5. The site-specific hydraulic modelling outputs have been used to inform the spatial distribution of infrastructure provided for by the Works Plans [**EN0110012/APP/LVS/02.03**]) and already committed to and secured within the Design Parameters and Commitments Document [**EN0110012/APP/LVS/05.06**].

G.3.6. With reference to Figure 15.15: Design Event (1 in 100-year plus Climate Change) (ES Volume 2) [**EN0110012/APP/LVS/06.02.15.15**], Solar Development Site 8 is almost entirely shown to be outside of the flood envelope associated with the design flood event (1 in 100-year plus 31% climate change). Flooding associated with the Selby Dam and Habholme Dike encroaches onto the site's northern boundary, generally avoiding the Solar PV development area.

G.3.7. In the credible maximum scenario (1 in 100-year plus 51% climate change allowance) (Figure 15.16: Credible Maximum Scenario Depth (ES Volume 2) [**EN0110012/APP/LVS/06.02.15.16**]) Solar Development Site 8 is similarly shown to be largely outside of the modelled flood extents. Flooding is shown along the western boundary of Field 8.2, corresponding to the Habholme Dyke. Average depths are reported to be under 0.04 m.

G.3.8. Considering the embedded mitigation requirement to provide a minimum 10 m offset from watercourses, it is anticipated that Solar Development Site 8 can be suitably designed to avoid development in these areas. The overall risk from this source is therefore considered to be **low**.

G.3.9. With reference to Figure 15.10: Risks of Flooding from Rivers and Seas (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.10]**, the proposed construction compound in Field 8.1 on Solar Development Site 8 is shown to be outside of the flood envelopes for both events. A detailed assessment of considerations for temporary construction-phase resilience is provided in sections 7 – 9 of the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]).

Surface water and overland flow

G.3.10. With regards to surface water flooding, the EA's Risk of Flooding from Surface Water data is provided in Figure 15.9: Risk of Flooding from Surface Water (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.09]**. This data illustrates the potential present-day risk of surface water inundation or flooding across Solar Development Site 8. It does not account for the future probability of flooding due to the impacts of climate change or proposed land use changes.

G.3.11. Predicting flooding from surface water is challenging, as the location and volume of rainfall are difficult to forecast. Factors such as the presence and condition of local drainage features can significantly influence the likelihood and severity of this type of flooding.

G.3.12. In addition, the surface water flood mapping is produced using a 70% runoff coefficient for rainfall, which accounts for potential infiltration and runoff entering existing drainage systems in the catchment. Losses through infiltration and drainage are highly variable and in reality, will often not be reflected in the high-level assumptions included in large scale modelling.

G.3.13. The majority of the site is shown to be at very low risk of surface water flooding (chance of flooding less than 0.1% each year). No significant surface water flow paths appear to be shown to be located within Solar Development Site 8.

G.3.14. Areas with a low to high chance of surface water flooding (between 0.1 and > 3.3% chance each year) generally appear to align with the existing watercourses along the site boundaries, and smaller areas of surface water flooding likely correspond to localised depressions in the topography.

G.3.15. This suggests that the risk of flooding from surface water to Solar Development Site 8 is **low to medium**.

Groundwater

G.3.16. The EA's national Areas Susceptible to Groundwater Flooding (AStGWF) dataset, provided within the North Yorkshire County Council Strategic Flood Risk Assessment (SFRA) (Ref 1), serves as the primary dataset for assessing the future risk of groundwater flooding. The AStGWF map categorises susceptibility into four levels, indicating the proportion of each 1km grid square where geological and hydrogeological conditions suggest potential groundwater emergence.

G.3.17. The risk of groundwater flooding emergence is considered to be low for Solar Development Site 8. The North Yorkshire Council SFRA states that there is no substantial evidence of direct groundwater flooding in the majority of North Yorkshire. However, it is a known contributing factor in specific circumstances and that it may exacerbate surface water flooding.

G.3.18. This is generally supported by the susceptibility to groundwater flooding mapping shown in Figure 15.12: Susceptibility to Groundwater Flooding (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.12]**, which shows most of Solar Development Site 8 to be outside of the area susceptible to groundwater flooding, with the exception of an area to the south, which is indicated to have limited potential for groundwater flooding to occur.

G.3.19. Given the above, the risk of flooding to Solar Development Site 8 from groundwater is considered to be **low**.

Artificial sources

Reservoirs

G.3.20. The risk of flooding from reservoirs is illustrated in Figure 15.11: Risk of Flooding from Reservoirs (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.11]**, which presents an extract from the Flood Map for Planning service. This indicates that a large area in the southern half of Solar Development Site 8 is not at risk of flooding in the event of a reservoir failure.

G.3.21. The northern boundary of the site, aligning with the IDB drain, encroaches into an area shown to be at risk of flooding in the event of a reservoir failure on a ‘wet day’ when local rivers are also in flood.

G.3.22. Flooding from reservoir failures is however extremely unlikely, as a highly managed risk, associated only with a very rare event. An area is considered at risk if people’s lives could be threatened in the event of a dam or reservoir failure.

G.3.23. The risk of flooding from this source is therefore considered to be **very low**.

Highway drainage

G.3.24. In the area surrounding Solar Development Site 8, the highway drainage appears to be overedge draining into surrounding ditches. There are no highways in direct vicinity of the site except Philip Lane and Hagg Lane, which both appear to be small access tracks.

G.3.25. The over-edge drainage mechanism for runoff into watercourses/ditches, combined with the comparatively large site area, ensures that surface water should be efficiently managed without overwhelming the existing system or the site under normal conditions.

G.3.26. The risk of flooding from this source is considered to be **very low**.

Private drainage

G.3.27. No existing properties are situated within the boundary of Solar Development Site 8, however, should there be any preexisting private drainage it is classified as being outside of Solar Development Site 8 and therefore any drainage associated will remain in place.

G.3.28. The risk posed to the Development by failure of these existing drainage systems is considered to be **very low**.

Additional sources

G.3.29. Flood risk may come from additional sources such as Yorkshire Water infrastructure (for example sewer flooding).

G.3.30. Within Solar Development Site 8, there appear to be no adopted sewerage assets. It is therefore considered that the risk posed to Solar Development Site 8 from this source is **very low**.

G.4. Construction Compound Flood Risk Assessment

G.4.1. A single Construction Compound (Solar Development Site 8 Construction Compound) is located on Solar Development Site 8, within Field 8.1, as shown on the Works Plans [**EN0110012/APP/LVS/02.03**].

G.4.2. The entirety of the Solar Development Site 8 Construction Compound is located within Flood Zone 1. The Construction Compound is located adjacent to existing roads/tracks, providing access for construction vehicles.

Natural sources

Rivers

G.4.3. The Construction Compound located on Solar Development Site 8 within Field 8.1 is in Flood Zone 1.

G.4.4. The risk from this source of flooding is therefore considered to be **very low**.

Surface water and overland flow

G.4.5. The EA's Risk of Flooding from Surface Water data is provided in Figure 15.9: Risk of Flooding from Surface Water (ES Volume 2) [**EN0110012/APP/LVS/06.02.15.09**].

G.4.6. The Construction Compound within Field 8.1 is shown to be at very low risk of surface water flooding, with the exception of the northernmost corners which are shown to be at a high risk of surface water flooding. This is likely due to natural topographical variation and the presence of drainage ditches to the east and indicates the potential for localised ponding to occur during intense rainfall events.

G.4.7. During the construction phase, temporary drainage and water management measures will be required, as outlined in the outline Drainage Strategy (Appendix 15.3 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.04**]). Temporary drainage measures, including cut-off drains, swales, and attenuation, will be provided to manage runoff and ponding during construction. Construction drainage will be designed to an appropriate flood event with an allowance for climate change and freeboard and agreed with North Yorkshire Council as part of approval of the detailed CEMP.

G.4.8. Taking these considerations into account, the overall risk of flooding from this source is considered to be low to medium.

Groundwater

G.4.9. The susceptibility to groundwater flooding mapping is shown in Figure 15.12: Susceptibility to Groundwater Flooding (ES Volume 2) [**EN0110012/APP/LVS/06.02.15.12**], which shows Solar Development Site 8 to be in an area with limited potential for groundwater flooding.

G.4.10. As stated in the North Yorkshire Council SFRA, there is no substantial evidence of direct groundwater flooding in the majority of North Yorkshire. However, it is known to be a contributing factor in specific circumstances and that it may exacerbate surface water flooding.

G.4.11. Given the above, the risk of flooding to the Solar Development Site 8 Construction Compound is considered to be **low**.

G.4.12. Groundwater considerations are also addressed separately in Chapter 15: Water Resources and Flood Risk (ES Volume 1) [**EN0110012/APP/LVS/06.01.15**].

Artificial sources

Reservoirs

G.4.13. With reference to Figure 15.11: Risk of Flooding from Reservoirs (ES Volume 2) [**EN0110012/APP/LVS/06.02**], which provides an extract from the Flood Map for Planning service, the Construction Compound on Solar Development Site 8 is shown to be at risk of flooding in the event that a reservoir failure occurred, when river levels are also high, on a ‘wet’ day.

G.4.14. Flooding from reservoir failures is, however, extremely unlikely, as it is a highly managed risk associated only with a very rare event. An area is considered at risk if people’s lives could be threatened in the event of a dam or reservoir failure.

G.4.15. The risk of flooding from this source is therefore considered to be **very low.**

Highway drainage

G.4.16. The risk of flooding to the Solar Development Site 8 Construction Compound from highway drainage infrastructure during temporary works and construction is very low, due to its location and limited interaction with highway systems.

G.4.17. The over-edge drainage mechanism for runoff into watercourses/ditches ensures that surface water should be efficiently managed without overwhelming the existing system or the Construction Compound under normal circumstances.

G.4.18. Any localised flooding would primarily result from construction activities and will be managed through the mitigation measures outlined in sections 7–9 of the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]) and the outline Drainage Strategy (Appendix 15.3 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.04**]).

G.4.19. The overall risk of flooding from this source is therefore considered to be very low.

G.5. Summary and conclusions

G.5.1. This assessment encompasses the results of site-specific hydraulic modelling, alongside the most recent EA National Flood Risk Assessment 2 (NaFRA2) (data (published 28 March 2025) and contributes to a comprehensive evaluation of current and future flood risk, incorporating fluvial and surface water sources under climate change scenarios.

G.5.2. The assessment is based on the Design Parameters set out in Chapter 2: The Proposed Development (ES Volume 1) [**EN0110012/APP/LVS/06.01.02**] and secured through the Design Parameters and Principles Commitments Document [**EN0110012/APP/LVS/05.05.06**]. The site-specific flood risk findings presented in this Annex should be considered alongside the mitigation measures outlined in the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]).

G.5.3. Solar Development Site 8 is predominantly situated within Flood Zone 1, indicating a very low probability of fluvial flooding (less than 1 in 1000-year or 0.1% annual probability). Areas of Flood Zone 2 are present along the western and northern boundaries, associated with the Habholme Dike.

G.5.4. The site-specific hydraulic modelling outputs have been used to inform the spatial distribution of infrastructure provided for by the Works Plans [**EN0110012/APP/LVS/02.03**]) and already committed to and secured within the Design Parameters and Commitments Document [**EN0110012/APP/LVS/05.06**]. Solar Development Site 8 is shown to be largely outside of the flood envelope for all considered return periods, with the exception of the western site boundary which experiences flooding in events up to and including the credible maximum scenario.

G.5.5. Considering the embedded mitigation to provide a minimum 10 m offset from watercourses, it is anticipated that Solar Development Site 8 can be suitably designed to avoid development in these areas. The overall risk from this source is therefore considered to be **low**.

G.5.6. Avoidance and mitigation measures will be taken to ensure, insofar as reasonably practical, that Solar Development Site 8 is safe from flooding for its lifetime, and that flood risk to surrounding receptors is not increased.

G.5.7. Minimum FFLs will be set to the 1 in 100-year plus 31% climate change allowance plus 300 mm freeboard or set to the height of the credible maximum scenario, whichever is higher. In the event voided structures are used, freeboard will be a minimum of 600 mm.

G.5.8. The majority of the site is shown to be at a very low risk of surface water flooding (chance of flooding less than 0.1% each year). No significant surface water flow paths appear to be located within Solar Development Site 8, and areas with a low to high chance of surface water flooding (between 0.1 and > 3.3% chance each year) are likely associated with low points in the topography. This suggests that the risk of flooding from surface water to Solar Development Site 8 is **low to medium**.

G.5.9. Avoidance and mitigation measures will be taken to ensure, insofar as reasonably practical, that Solar Development Site 8 is safe from surface water flooding for its lifetime, and that surface water flood risk to surrounding receptors is not increased. Any drainage systems will be designed to accommodate the 1% (1 in 100) annual flood, plus an appropriate allowance for climate change.

G.5.10. During the construction phase, temporary drainage and water management measures will be required, as outlined in the outline Drainage Strategy (Appendix 15.3 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.04**]). Temporary drainage measures, including cut-off drains, swales, and attenuation, will be provided to manage runoff and ponding during construction. Construction drainage will be designed to an appropriate flood event with an allowance for climate change and freeboard and agreed with North Yorkshire Council as part of approval of the CEMP.

G.5.11. For groundwater flooding, the AStGWF map shows Solar Development Site 8 to be outside of the area susceptible to groundwater flooding. The North Yorkshire Council SFRA considers that there is no substantial evidence of direct groundwater flooding in the majority of North Yorkshire, however, it is known to exacerbate surface water flooding in some instances. The risk from this source is therefore considered to be **low**.

G.5.12. Regarding artificial sources of flood risk, the EA's long-term flood risk service indicates that the majority of Solar Development Site 8 is not at risk of flooding in the event of a reservoir failure, with the exception of the northern boundary which encroaches into the flood extents associated with a reservoir flood on a 'wet day' when local rivers are also in flood. However, flooding from reservoir failures is extremely unlikely due to the highly managed nature of this risk. The risk from this source is considered to be very low, however, reservoir flooding should be included in any future Flood Warning and Evacuation Plan (FWEP).

G.5.13. The risk of flooding from other artificial sources is also considered to be **very low**.

G.5.14. Access to Solar Development Site 8 is expected via the existing level crossing on Phillip Lane. Access from this point is feasible but requires HGVs to use the level crossing to cross the railway corridor. NR have advised that they would only need to be informed if abnormal loads are expected. As part of a possible access route to the north of Solar Development Site 8, a new permanent access road culvert may be needed over Habholme Dike, a Selby Area IDB watercourse. Additionally, the potential access road to the north of Solar Development Site 8 will cross over Selby Dam, a main river.

G.5.15. There is currently an existing culvert crossing the Selby Dam, however, the condition of the culvert is not known. As a worst-case scenario, the existing culvert may need to be removed and replaced with a new permanent crossing structure, subject to detailed design and agreement with the relevant stakeholders. During the replacement of the culvert (if required) a temporary crossing structure would be installed to maintain current access provision if access could not be maintained over the current structure during the replacement works.

G.5.16. If a temporary crossing structure is required, the structure would be in place for less than 6 months. Any new crossing structure is not anticipated to be wider than the existing structure, and therefore any impacts associated with any modifications are expected to be minimal.

G.5.17. Any crossings of IDB watercourses required as part of the Proposed Development will be designed and delivered in accordance with the agreed principles set out in section 3.4 of the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]) and secured via the drainage authority protective provisions included in Article 6 of the Draft DCO [**EN110012/APP/LVS/03.01**].

References

Ref 1 North Yorkshire County Council, “Strategic Flood Risk Assessment,” (2016) [Online]. Available at: https://www.northyorks.gov.uk/sites/default/files/fileroot/planning_migrated/minerals_and_waste_plan/Strategic_flood_risk_assessment%20-%20accessible.pdf

Annex H Cable Route Corridor

Annex H Introduction

H.1. Development information

Existing site

H.1.1. Underground cables (located within Cable Route Corridors) will be required between the Solar Development Sites and the existing Monk Fryston substation where the Proposed Development will connect to the National Grid.

H.1.2. The Cable Route Corridor is typically 50 m wide, but in a number of locations such as utility, road, and rail crossings, it widens up to 450 m wide, noting the typical construction working width is approximately 25 m wide. The Cable Route Corridor being considered will allow for flexibility for the detailed design process which would follow the DCO Application, should it be granted.

H.1.3. The land uses within the Cable Route Corridor are predominantly agricultural land with local farm holdings. In some areas, the Cable Route Corridor is crossed by highways (including the A19 and A63), rail lines, and the River Ouse and Selby Dam, and many other smaller watercourses.

H.1.4. The Cable Route Corridor is shown in Figure 15.14: Spatial Flood Defences (ES Volume 2) [**EN0110012/APP/LVS/06.02.15.14**].

Cable Route Corridors

Cable Route Corridor 1-4 – from Solar Development Site 1 - 4

H.1.5. Cable Route Corridor 1-4 is the proposed cable route from Solar Development Site 1 to 4.

H.1.6. This corridor is the longest of the Cable Route Corridors and is approximately 18.5 km in length. The route crosses the A19, EA Main Rivers, the River Ouse and Selby Dam, National Rail lines, the A63 and other smaller roads.

H.1.7. Table 15-6 of Chapter 15: Water Resources and Flood Risk (ES Volume 1) [**EN0110012/APP/LVS/06.01.15**] outlines the statutory consultation responses relating to water resources and flood risk and how these have been addressed through the ES. The EA stated that the FRA, or a separate assessment, should include full details of all flood defences and associated assets within the Study Aments

H.1.8. rea, including their current condition, crest levels, and standard of protection.

H.1.9. With reference to Figure 15.14: Spatial Flood Defences (ES Volume 2) [**EN0110012/APP/LVS/06.02.15.14**] which shows the Environment Agency's (EA) Asset Information and Maintenance Systems (AIMS) Spatial Flood Defence dataset, this Cable Route Corridor can be seen to cross flood defences indicated to be present on the River Ouse and the Selby Dam. As such, an assessment of existing flood defence assets has been completed for this Cable Route Corridor and is presented in Section H.4 of this Annex.

Cable Route Corridor 1-4a – Alternative from Solar Development Site 1 - 4

H.1.10. Cable Route Corridor 1-4a is an Alternative Cable Route Corridor from Solar Development Site 1 to Solar Development Site 4 which crosses over Fox Lane and Hillam Common Lane. The cable also connects into Cable Route Corridor 2-4 for the most southern section.

H.1.11. The corridor is approximately 148 m in length and crosses over National Rail lines and Common Lane.

Cable Route Corridor 2-4 – from Solar Development Site 2 to 4

H.1.12. Cable Route Corridor 2-4 is the proposed cable route from Solar Development Site 2 to 4.

H.1.13. The corridor is approximately 1.4 km in length and crosses over the A63 and Hillam Common Lane.

Cable Route Corridor 2-6 – from Solar Development Site 2 to 6

H.1.14. Cable Route Corridor 2-6 is the proposed cable route from Solar Development Site 2 to 6.

H.1.15. The corridor is approximately 1.5 km in length and crosses over Fryston Common Lane.

Cable Route Corridor 3-4 and Cable Route Corridor 3-4a – from Solar Development Site 3 to 4

H.1.16. Cable Route Corridor 3-4 and Cable Route Corridor 3-4a are proposed cable routes from Solar Development Site 3 to 4.

H.1.17. The corridor for Cable Route Corridor 3-4 is approximately 438 m in length and runs through a single agricultural field with no water or road/rail crossings. The corridor for Cable Route Corridor 3-4a is approximately 826 m in length and crosses Stocking Lane.

Cable Route Corridor 6-7 - from Solar Development Site 6 to 7

H.1.18. Cable Route Corridor 6-7 is the proposed cable route from Solar Development Site 6 to 7

H.1.19. The corridor is approximately 148 m in length and crosses over National Rail lines and Common Lane.

Cable Route Corridor 2-8 – from Solar Development Site 2 to 8

H.1.20. Cable Route Corridor 2-8 is the proposed cable route from Solar Development Site 2 to 8.

H.1.21. The corridor for Cable Route Corridor 2-8 is approximately 1.4 km in length and crosses the Leeds to Selby Line (HUL3) railway line and Common Lane.

Cable Route Corridor 4-POC – from Monk Fryston Substation to Solar Development Site 4

H.1.22. The corridor is approximately 4.9 km in length and crosses over the A162, National Rail lines, Hillam Lane, Fairfield Lane and Roe Lane.

Cable Construction Compounds

H.1.23. Temporary Cable Construction Compounds are to be established within the Solar Development Sites and along the Cable Route Corridor to facilitate construction. The Cable Construction Compounds will include temporary portacabins, the dimensions of which will vary but have an expected maximum individual unit size of 12 m x 3 m with a typical maximum height of 3 m.

H.1.24. The locations of the temporary Cable Construction Compounds 1 to 5 along the Cable Route Corridors are outlined below. Cable Construction Compound 6, which will be located on the eastern side of Solar Development Site 2 within Field 2.5, may also be used for construction activities associated with the development of Solar Development Site 2, and has therefore been assessed within Annex B.

Cable Construction Compound 1

H.1.25. Cable Construction Compound 1 will be situated along Cable Route Corridor 1-4 between Solar Development Sites 1 and 4, approximately 975 m north of Thorpe Willoughby within field CR234.

Cable Construction Compound 2

H.1.26. Cable Construction Compound 2 will be situated along Cable Route Corridor 1-4 between Solar Development Sites 1 and 4, approximately 700 m north of Selby, to the south of the River Ouse within field CR181.

Cable Construction Compound 3

H.1.27. Cable Construction Compound 3 will be situated along Cable Route Corridor 1-4 between Solar Development Sites 1 and 4, approximately 165 m east of Riccall within field CR93.

Cable Construction Compound 4

H.1.28. Cable Construction Compound 4 will be situated along Cable Route Corridor 1-4 between Solar Development Sites 1 and 4, approximately 445 m south of Hambleton within field CR304.

Cable Construction Compound 5

H.1.29. Cable Construction Compound 5 will be situated along Cable Route Corridor 4-POC, approximately 525 m south of Hillam within field CR413.

H.2. Flood Risk Assessment

H.2.1. This section identifies potential sources of flooding and provides a high-level assessment of the flood risk to Cable Route Corridor and the Cable Construction Compound areas.

H.2.2. The Proposed Development is located across two management catchments: the Wharfe and Lower Ouse management catchment and the Aire and Calder management catchment. The Cable Route Corridor spans both catchment areas, with Cable Route Corridor 1-4 predominantly located within the Wharfe and Lower Ouse management catchment, whilst the remaining Cable Route Corridors are located in the Aire and Calder management catchment.

Cable Route Corridor

Natural sources

Rivers

H.2.3. With regards to fluvial flooding, an extract from the Flood Map for Planning service provided in Figure 15.10: Risks of Flooding from Rivers and Seas (ES Volume 2) [**EN0110012/APP/LVS/06.02.15.10**]. This illustrates the present-day risk of fluvial flooding only. It does not consider the future probability of flooding due to the impacts of climate change, or proposed land use changes.

H.2.4. In addition, the site-specific hydraulic modelling for the Proposed Development includes parts of the Cable Route Corridor, and the results have therefore been used to inform the flood risk assessment in these locations where appropriate.

H.2.5. The Flood Zone classification across the Cable Route Corridor varies considerably due to its extensive spatial coverage. Much of the corridor lies within Flood Zones 2 and 3. With reference to the Planning Policy Guidance, land in Flood Zone 2 has a medium probability of flooding defined as land having between a 1% and 0.1% annual probability of river flooding; or land having between a 0.5% and 0.1% annual probability of sea flooding. Flood Zone 3 includes land that has a 1% or greater annual probability of river flooding; or land having a 0.5% or greater annual probability of sea flooding.

H.2.6. This variation in flood risk is influenced by the corridor’s alignment through diverse topographical and hydrological settings, with the Cable Route Corridor coming into proximity or passing through many watercourses, including EA Main Rivers – the River Ouse and the Selby Dam.

H.2.7. Although sections of the Cable Route Corridor are located within Flood Zones 2 and 3, the risk of flooding to the infrastructure itself is considered low due to its underground nature. Once installed, the cables will not impede flood flows or storage, and the system will be designed to prevent ingress of floodwater to any above-ground components. The risk from this source is therefore considered to be low.

H.2.8. A detailed assessment of considerations for temporary construction-phase resilience is provided in sections 7 – 9 of the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]) and in the outline Drainage Strategy (Appendix 15.3: (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.04**]), while the flood risk to construction compounds is assessed separately below.

Surface water and overland flow

1.1.1 With regards to surface water flooding, the EA's Risk of Flooding from Surface Water data is provided in Figure 15.9: Risk of Flooding from Surface Water (ES Volume 2) [**EN011001/APP/LVS/06.02.15.09**]. This extract illustrates the potential present-day risk of surface water inundation or flooding across the site area, with the location shown indicatively in red. It does not account for the future probability of flooding due to the impacts of climate change or proposed land use changes to the site.

1.1.2 Predicting flooding from surface water is challenging, as the location and volume of rainfall are difficult to forecast. Factors such as the presence and condition of local drainage features can significantly influence the likelihood and severity of this type of flooding.

1.1.3 In addition, the surface water flood mapping is produced using a 70% runoff coefficient for rainfall, which accounts for potential infiltration and runoff entering existing drainage systems in the catchment. Losses through infiltration and drainage are highly variable and in reality, will often not be reflected in the high-level assumptions included in large scale modelling.

1.1.4 The risk of flooding from surface water varies considerably along the length of the Cable Route Corridor, reflecting local topography and drainage characteristics. Localised areas of ponding are indicated in low-lying sections or at shallow depressions where overland flow may accumulate.

1.1.5 However, given the underground nature of the Cable Route Corridor, the overall risk of flooding from this source is low.

H.2.9. Temporary surface water management measures are required during construction to address surface water runoff and localised ponding. Construction-phase mitigation measures associated with flooding and surface water drainage are outlined in the outline Drainage Strategy (Appendix 15.3: (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.04**]) and the oCEMP [**EN0110012/APP/LVS/07.02**], while the flood risk to construction compounds is assessed separately below.

Groundwater

H.2.10. The EA's national Areas Susceptible to Groundwater Flooding (AStGWF) dataset, provided within the North Yorkshire County Council Strategic Flood Risk Assessment (SFRA) (Ref 1), serves as the primary dataset for assessing the future risk of groundwater flooding. The AStGWF map categorises susceptibility into four levels, indicating the proportion of each 1 km grid square where geological and hydrogeological conditions suggest potential groundwater emergence.

H.2.11. The North Yorkshire Council SFRA states that there is no substantial evidence of direct groundwater flooding in the majority of North Yorkshire. However, it is a known contributing factor in specific circumstances and that it may exacerbate surface water flooding.

H.2.12. The susceptibility to groundwater flooding mapping shown in Figure 15.12: Susceptibility to Groundwater Flooding (ES Volume 2) [**EN0110012/APP/LVS/06.02.15.12**] shows the risk varies across the Cable Route Corridor, from no susceptibility to groundwater flooding to risk of groundwater flooding at property level.

H.2.13. The North Yorkshire Council SFRA states that there is no substantial evidence of direct groundwater flooding in the majority of North Yorkshire. However, it is a known contributing factor in specific circumstances and that it may exacerbate surface water flooding.

H.2.14. The EA's national AStGWF dataset is derived from high-level mapping and should therefore be treated as indicative only. More detailed, site-specific assessment of groundwater behaviour will be undertaken at future design stages to confirm appropriate protection and drainage measures.

H.2.15. Underground cabling should consider the risk of groundwater flooding, buoyancy, and appropriate waterproofing. Furthermore, the role of underground cabling in creating a barrier to groundwater flow pathways or preferential pathways, and therefore implications to local groundwater flood risk, should be considered in future design stages.

H.2.16. Groundwater is also assessed separately within the Chapter 15: Water Resources and Flood Risk (ES Volume 1) [**EN0110012/APP/LVS/06.01.15**].

H.2.17. Overall, the risk of groundwater flooding to the Cable Route Corridor is considered to be **low**. While localised groundwater interactions cannot be ruled out, particularly in areas of higher susceptibility, such risks can be mitigated through standard design measures, including sealed joint bays, appropriate backfill materials, and implementation of local drainage measures during construction.

Artificial sources

Reservoirs

H.2.18. The risk of flooding from reservoirs is illustrated in Figure 15.11: Risk of Flooding from Reservoirs (ES Volume 2) [**EN0110012/APP/LVS/06.02.15.11**], which presents an extract from the Flood Map for Planning service. This indicates that the risk of flooding from reservoirs varies along the length of the Cable Route Corridor.

H.2.19. EA reservoir flood mapping indicates many sections of the Cable Route Corridor fall within areas that could be affected in the unlikely event of a reservoir breach, in both 'wet' and 'dry' conditions.

H.2.20. Flooding from reservoir failures is however extremely unlikely, as a highly managed risk, associated only with a very rare event. An area is considered at risk if people's lives could be threatened in the event of a dam or reservoir failure.

H.2.21. The risk of flooding from this source is therefore considered to be **very low**. However, the greatest risk lies during the construction stage, and reservoir flooding should be included in any future Flood Warning and Evacuation Plan (FWEP).

Highway drainage

H.2.22. The Cable Route Corridor crosses or runs adjacent to sections of the local and strategic highway network where highway drainage infrastructure is present, including gullies, carrier drains, and culverts. In the Order Limits, the highway drainage predominantly appears to be overedge draining into surrounding ditches.

H.2.23. The risk of flooding from highway drainage infrastructure to the proposed Cable Route Corridor is considered to be **very low**, given the underground nature of the cables and the limited interaction with highway systems once in-situ.

H.2.24. Any potential for localised flooding would primarily relate to construction activities or temporary works, which will be managed through construction-phase mitigation measures as outlined in sections 7 – 9 of the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]) and the outline Drainage Strategy (Appendix 15.3: (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.04**]).

Additional sources

H.2.25. Flood risk may come from additional sources such as Yorkshire Water infrastructure (for example sewer flooding).

H.2.26. Given the rural setting of the Order Limits, the extent and presence of sewerage infrastructure within the Cable Route Corridor is limited. The potential for flooding from these assets is therefore considered to be **very low**.

H.2.27. However, the greatest risk lies during the construction stage in the unlikely event of a blockage or surcharge within a sewer, or water main burst, coinciding with construction activities. Such risks will be minimised through good practice construction methods, including through the application of appropriate stand-off distances and easements from existing infrastructure. More information can be found in the oCEMP [**EN0110012/APP/LVS/07.02**].

H.2.28. In areas where existing sewerage infrastructure is present, potential interactions with the proposed Cable Route Corridor will be carefully managed through the detailed design stage. This will include confirmation of asset locations and depths using utility survey data and ground investigations to agree any easements or ensure adequate clearance and protection are achieved during construction.

H.2.29. Where crossings of existing sewerage assets are unavoidable, appropriate crossing agreements and protective measures will be agreed with the relevant statutory undertaker in accordance with their standard requirements and pursuant to DCO Protective Provisions.

Cable Construction Compounds

Natural sources

Rivers

H.2.30. With reference to Figure 15.14: Spatial Flood Defences (ES Volume 2) **[EN0110012/APP/LVS/06.02.15.14]**, the Flood Zone characteristics of the Cable Construction Compounds has been reviewed and is presented in Table H-1.

H.2.31. The Flood Zone classification across the Cable Construction Compounds varies considerably due to their spatial coverage. With reference to the Planning Policy Guidance, land in Flood Zone 1 has a low probability of flooding, defined as land having a less than a 0.1% annual probability of flooding. Land in Flood Zone 2 has a medium probability of flooding, defined as having between a 1% and 0.1% annual probability of river flooding; or land having between a 0.5% and 0.1% annual probability of sea flooding. Flood Zone 3 is considered land that has a 1% or greater annual probability of river flooding; or land having a 0.5% or greater annual probability of sea flooding.

Table H-1 Flood Zones

Cable Construction Compound	Flood Zone
Cable Construction Compound 1	Flood Zone 2
Cable Construction Compound 2	Primarily Flood Zone 2, with a small area to the northeast of the Compound in Flood Zone 3
Cable Construction Compound 3	Flood Zone 2
Cable Construction Compound 4	Flood Zone 1
Cable Construction Compound 5	Primarily Flood Zone 1, with a small area to the southeast of the Compound in Flood Zone 2

H.2.32. The site-specific hydraulic modelling outputs have been used to inform the spatial distribution of infrastructure provided for by the Works Plans [**EN0110012/APP/LVS/02.03**]) and already committed to and secured within the Design Parameters and Commitments [**EN0110012/APP/LVS/05.06**]. Chapter

3: Alternatives and Design Iteration (ES Volume 1) **[EN0110012/APP/LVS/06.01.03]** also sets out how the locations of the Cable Construction Compounds were selected and the criteria used to determine the least environmentally constrained locations.

H.2.33. With reference to Figure 15.15: Design Event (1 in 100-year plus Climate Change) (ES Volume 2) [**EN0110012/APP/LVS/15.15**], a small area of the northern corner of Compound 2 lies within the modelled flood extent the design event, with an average flood depth of around 0.3 m.

H.2.34. With reference to Figure 15.16: Credible Maximum Scenario Depth (ES Volume 2) [**EN0110012/APP/LVS/15.16**], the remainder of Compound 2 and most of Compound 1 are shown to be within the floodplain associated with the credible maximum scenario, with average modelled flood depths of approximately 0.7 m and 0.4 m on each Compound, respectively.

H.2.35. Some of the proposed construction compounds are located within Flood Zones 2 and 3, reflecting the wider distribution of floodplain within the Order Limits. While the presence of compounds in these zones is unavoidable given the linear nature of the Cable Route Corridor and the suitability of access points, the risk to the temporary infrastructure can be effectively managed through embedded mitigation measures.

H.2.36. A FWEP will be in place during construction, enabling safe evacuation when high river levels are anticipated. As the Cable Construction Compounds span across two river catchments, the Proposed Development will be registered to receive flood alerts and warnings from both catchment areas.

H.2.37. Appropriate flood risk mitigation measures will be implemented as part of the FWEP, including monitoring of flood warnings and avoidance of work during high-risk periods and forecasted flood events to ensure safety.

H.2.38. Other appropriate measures will include training for workers related to flood response and evacuation protocols and the scheduling of work to prioritise work in lower-risk zones (i.e. those outside of the floodplain) during wetter periods. Materials storage, machinery, welfare facilities and sensitive equipment will be located outside of the floodplain, as far as is practical.

H.2.39. The design of construction compounds within Flood Zone 2 or 3 will be carefully considered to minimise both flood risk to the site and any off-site impacts. The final siting of these compounds will be reviewed during detailed design and, where feasible, they will be adjusted in size or repositioned to avoid the areas identified as at risk of flooding.

H.2.40. Where it is not feasible to avoid the floodplain entirely, all materials, equipment, welfare facilities and fuel stores will be located on the highest available ground, as far from the flood-prone area as practical, securely stored and, where necessary, raised above predicted flood levels to prevent damage or displacement during a flood event. A detailed assessment of considerations for temporary construction-phase resilience is provided in sections 7 – 9 of the FRA and the outline Drainage Strategy (Appendix 15.3: (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.04**]).

Surface water and overland flow

1.1.6 With regards to surface water flooding, the EA's Risk of Flooding from Surface Water data is provided in Figure 15.9: Risk of Flooding from Surface Water (ES Volume 2) [**EN0110012/APP/LVS/06.02.15.09.01**].

1.1.7 This extract illustrates the potential present-day risk of surface water inundation or flooding across the site area. It does not account for the future probability of flooding due to the impacts of climate change or proposed land use changes to the site.

1.1.8 Predicting flooding from surface water is challenging, as the location and volume of rainfall are difficult to forecast. Factors such as the presence and condition of local drainage features can significantly influence the likelihood and severity of this type of flooding.

1.1.9 In addition, the surface water flood mapping is produced using a 70% runoff coefficient for rainfall, which accounts for potential infiltration and runoff entering existing drainage systems in the catchment. Losses through infiltration and drainage are highly variable, and in reality, will often not be reflected in the high-level assumptions included in large scale modelling.

1.1.10 The risk of flooding from surface water to the Cable Construction Compounds has been reviewed and is presented in Table H-2.

Table H-2 Risk of Flooding from Surface Water

Cable Construction Compound	Surface water flood risk
Cable Construction Compound 1	Generally shown to be at very low risk of surface water flooding (chance of flooding less than 0.1% each year). However, areas along the northern and western boundaries are shown to be at a higher risk of surface water flooding. This may correspond to localised depressions in the topography.
Cable Construction Compound 2	Generally shown to be at very low risk of surface water flooding. However, small areas along the northern and western boundaries of the Cable Construction Compound are shown to be at a higher risk of surface water flooding. This may correspond to localised depressions in the topography.
Cable Construction Compound 3	Generally shown to be at very low risk of surface water flooding. However, the northern boundary is shown to be at a higher risk of surface water flooding. This may correspond to a localised depressions in the topography, between field boundaries.
Cable Construction Compound 4	Generally shown to be at very low risk of surface water flooding.
Cable Construction Compound 5	Generally shown to be at very low risk of surface water flooding. However, small areas along the eastern and western boundaries

Cable Construction Compound	Surface water flood risk
	are shown to be at a higher risk of surface water flooding. This may correspond to a localised depressions in the topography.

H.2.41. The overall risk of flooding from surface water to the Cable Construction Compounds is generally **low**.

H.2.42. Temporary surface water management measures are required during construction to address surface water runoff and localised ponding. Construction-phase mitigation measures associated with flooding and surface water drainage are outlined in the outline Drainage Strategy (Appendix 15.3: (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.04**]) and the oCEMP [**EN0110012/APP/LVS/07.02**].

Groundwater

H.2.43. The EA's national AStGWF dataset, provided within the North Yorkshire Council SFRA (Ref 1), serves as the primary dataset for assessing the future risk of groundwater flooding. The AStGWF map categorises susceptibility into four levels, indicating the proportion of each 1 km grid square where geological and hydrogeological conditions suggest potential groundwater emergence. It does not show the likelihood of groundwater flooding occurring.

H.2.44. The risk of groundwater flooding emergence across each Cable Construction Compound is provided in Table H-3 below.

Table H-3 Risk of flooding from groundwater

Cable Construction Compound	Groundwater flood risk
Cable Construction Compound 1	Low – Cable Construction Compound 1 is shown to be in an area not susceptible to flooding from groundwater sources. However, a small area to the east is shown to be in an area indicated to have potential for groundwater flooding of property situated below ground level.
Cable Construction Compound 2	Low – Cable Construction Compound 2 is shown to be in an area with potential for groundwater flooding of property situated below ground level.
Cable Construction Compound 3	Medium – Cable Construction Compound 3 is partially shown in an area with potential for groundwater flooding to occur at the surface. The northern half of Compound 3 is shown to be in an area with potential for groundwater flooding of property situated below ground level.
Cable Construction Compound 4	Low – Cable Construction Compound 4 is shown in an area with limited potential for groundwater flooding to occur.
Cable Construction Compound 5	Medium – Cable Construction Compound 5 is shown in an area with potential for groundwater flooding to occur at the surface. However, the immediate vicinity of the Cable Construction

Cable Construction Compound	Groundwater flood risk
	Compound appears to be outside of the areas susceptible to groundwater flooding.

H.2.45. As stated in the North Yorkshire Council SFRA (Ref 1), there is no substantial evidence of direct groundwater flooding in the majority of North Yorkshire. However, it is known to be a contributing factor in specific circumstances and that it may exacerbate surface water flooding.

H.2.46. Overall, the risk of groundwater flooding to the Cable Construction Compounds is considered to be **low to medium**. While localised groundwater interactions cannot be ruled out, particularly in areas of higher susceptibility, such risks can be mitigated through standard design measures, including sealed joint bays, appropriate backfill materials, and implementation of local drainage measures during construction as outlined in the outline Drainage Strategy (Appendix 15.3: (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.04**]) and the oCEMP [**EN0110012/APP/LVS/07.02**].

Artificial sources

Reservoirs

H.2.47. The Risk of Flooding from Reservoirs is illustrated in Figure 15.11: Risk of Flooding from Reservoirs (ES Volume 2) [**EN0110012/APP/LVS/06.02**], which presents an extract from the Flood Map for Planning service.

H.2.48. The risk of flooding from reservoirs for each Cable Construction Compound is provided in Table H-4 below.

Table H-4 Risk of flooding from reservoirs

Cable Construction Compound	Reservoir flood risk
Cable Construction Compound 1	Cable Construction Compound 1 is shown to be at risk of flooding from reservoirs
Cable Construction Compound 2	Cable Construction Compound 2 is shown to be at risk of flooding from reservoirs
Cable Construction Compound 3	Cable Construction Compound 3 is shown to be at risk of flooding from reservoirs
Cable Construction Compound 4	Cable Construction Compound 4 is shown to be in an area not at risk of flooding from reservoirs
Cable Construction Compound 5	Cable Construction Compound 5 is shown to be at risk of flooding from reservoirs

H.2.49. The majority of the Cable Construction Compounds are shown to be at risk of flooding from reservoir failure, in both wet and dry conditions.

H.2.50. However, flooding from this source is extremely unlikely to occur, as it is a highly managed risk associated only with a very rare event. An area is considered at risk if lives could be threatened in the event of a dam or reservoir failure.

H.2.51. The risk of flooding from this source is therefore considered to be **very low**. However, reservoir flooding should be included in any future FWEP.

Highway drainage

H.2.52. Within the Order Limits, highway drainage predominantly appears to be overedge draining into surrounding ditches.

H.2.53. While the Cable Construction Compounds are relatively remote within the Order Limits, they are generally positioned adjacent to existing roads or tracks, allowing practical access for construction vehicles.

H.2.54. Wherever practicable, access will be from existing routes and existing field accesses will be utilised for construction access within the Order Limits. If a suitable field access point does not exist, for example due to poor highway visibility, new temporary construction accesses are anticipated to be constructed.

H.2.55. Where new access points are created, or existing access points amended, consideration will need to be given to any existing drainage infrastructure at those points. Any new or modified ditch crossings will be subject to agreement with the relevant drainage authority, such as the IDB or LLFA, as appropriate.

H.2.56. Any potential for localised flooding from highway sources would relate to construction activities or temporary works, which will be managed through construction-phase mitigation measures as outlined in the outline Drainage Strategy (Appendix 15.3: (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.04**]).

H.2.57. The risk of flooding from highway drainage infrastructure to the proposed Cable Construction Compounds is otherwise considered to be **low**.

Additional sources

H.2.58. Flood risk may come from additional sources such as Yorkshire Water infrastructure (for example sewer flooding).

H.2.59. Given the rural setting of the Order Limits, the extent and presence of sewerage infrastructure within the Cable Route Corridor is anticipated to be limited. The potential for flooding from these assets is therefore considered to be **very low**.

H.2.60. Residual risks are present during the construction stage, in the unlikely event of a blockage or surcharge within a sewer, or water main burst, coinciding with construction activities. Such risks will be minimised through good practice construction methods, including through the application of appropriate stand-off distances and easements from existing infrastructure.

H.2.61. In areas where existing sewerage infrastructure is present, potential interactions with the proposed Cable Construction Compounds will be carefully managed through the detailed design stage. This will include confirmation of asset locations and depths using utility survey data and ground investigations to agree any easements or ensure adequate clearance and protection are achieved during construction.

H.2.62. Where work adjacent to or over existing sewerage assets are unavoidable, appropriate agreements and protective measures will be agreed with the relevant statutory undertaker in accordance with their standard requirements.

H.3. Flood mitigation measures

H.3.1. No specific mitigations for the proposed Cable Route Corridor are considered to be necessary, as the asset will be buried below ground during operation of the Proposed Development.

H.3.2. Underground cabling should consider the risk of groundwater flooding, buoyancy and appropriate waterproofing. Furthermore, the role of underground cabling in creating a barrier to groundwater flow pathways or preferential pathways, and therefore implications to local groundwater flood risk, should be considered in future design stages.

H.3.3. While localised groundwater interactions cannot be ruled out, particularly in areas of higher susceptibility, such risks can be mitigated through standard design measures, including sealed joint bays, appropriate backfill materials, and implementation of local drainage measures during construction. Groundwater is also assessed separately within Chapter 15: Water Resources and Flood Risk (ES Volume 1) [**EN0110012/APP/LVS/06.01.15**].

H.3.4. Access to the cable will be required relatively infrequently, typically by technicians for maintenance and inspection works or site management. Such works can be scheduled as to avoid the area during times of flood.

H.3.5. With reference to section 7.4 regarding Safe Operation in the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]), appropriate flood risk mitigation measures relating to construction activities will be implemented during the construction period and a FWEP will be in place throughout the construction phase.

H.3.6. During the construction phase, there will be a temporary increase in the number of personnel on site and avoidance of work during high-risk periods and forecasted flood events to ensure safety will be prioritised.

H.3.7. All Cable Construction Compounds are located in Flood Zones 1 and 2, with the exception of the northern corner of Compound 2, which extends into Flood Zone 3. Compounds have otherwise been sited to avoid Flood Zone 3. The presence of Flood Zone 3 in this location is associated with the floodplain of the River Ouse, and the proximity of the construction compound to the river is necessary to facilitate the planned river crossing.

H.3.8. The compounds have otherwise been sequentially sited to avoid areas designated as Flood Zone 3 and in the best available location as outlined in Chapter 3: Alternatives and Design Iteration (ES Volume 1) **[EN0110012/APP/LVS/06.01.03]** that sets out how the locations of the Cable Construction Compounds were selected and the criteria used to determine the least environmentally constrained locations.

H.3.9. Where practicable, compounds will be sited on the highest available ground within the development area and outside of modelled floodplain extents. Where it is not feasible for a Cable Construction Compound to avoid the floodplain entirely, all materials, equipment, welfare facilities and fuel stores should be located as far from the flood-prone area as practical, securely stored and, where necessary, raised above predicted flood levels to prevent damage or displacement during a flood event. This is set out in the oCEMP **[EN0110012/APP/LVS/07.02]**.

H.4. Cable Route Corridor assessment of interactions

H.4.1. With reference to Figure 15.14: Spatial Flood Defences (ES Volume 2 [**EN0110012/APP/LVS/06.02.15.14**]), which shows the EA's AIMS Spatial Flood Defence dataset, an assessment of existing flood defence assets has been completed for the Cable Route Corridor and is presented below.

H.4.2. Cable Corridor 1 is shown to cross perpendicularly underneath EA flood defence assets in the following key locations:

1) The River Ouse and its associated flood defences.
2) A set-back flood defence embankment, associated with the River Ouse.
3) The Selby Dam and its associated flood defences.

H.4.3. The flood defences and the set-back flood defence associated with the River Ouse both comprise of embankments, classified as formal flood defences and owned and maintained by the EA.

H.4.4. Information obtained from the AIMS asset database indicates that the River Ouse flood defences were last inspected on 07 February 2025, with the next inspection scheduled for 19 February 2026. On the left bank, flood defence asset ID 78736 has a reported length of 3290.8 m, with actual upstream and downstream crest levels of 7.04 mAOD and 6.25 mAOD reported respectively. On the right bank, flood defence asset 50869 has a reported length of 3492.2 m, with actual upstream and downstream crest levels of 6.97 mAOD and 6.46 mAOD reported respectively. In addition, the set-back flood defence is present on the right bank (asset ID 50880), with a reported length of 3,268.9 m and actual upstream and downstream crest levels of 7.13 mAOD and 8.13 mAOD reported respectively.

H.4.5. The flood defence associated with the Selby Dam is categorised as privately owned engineered high ground, providing a raised landform that functions as a passive flood barrier.

H.4.6. Information from the AIMS asset database indicates that the Selby Dam flood defences were last inspected on 10/04/2025, with the next inspection scheduled for 25/04/2026. The left bank flood defence (asset ID 404412) has a reported length of 8180.3 m, while the right bank flood defence (asset ID 404392) has a reported length of 7418.1 m.

H.4.7. The proposed method for crossing the designated Main Rivers will involve the use of trenchless construction techniques. For the purposes of assessment, Horizontal Directional Drilling (HDD) has been adopted as a representative worst-case scenario.

H.4.8. HDD requires the largest area to undertake and the most equipment to support the works, as HDD operations are anticipated to require a working area of approximately 25 m x 25 m for both the launch and receptor pits.

H.4.9. An example HDD crossing profile is included within Appendix 2.1: Cable Route Method Statement (ES Volume 3) **[EN0110012/APP/LVS/ 06.03.02.01]**. With reference to Appendix 2.1: Cable Route Method Statement (ES Volume 3)

[**EN0110012/APP/LVS/06.03.02.01**], the following activities would be required to facilitate HDD:

1) Site preparation and appropriate surveys.
2) Launch and reception pits would be excavated using a suitable excavator, with any required shoring or battering installed. Plant and spoil would be placed a safe distance away from the edge of the excavation so as to minimise the risk of the trench sides collapsing.
3) Once the launch pit has been excavated, work would then commence on the initial drill (the 'pilot bore').
4) Upon completion of the pilot bore connecting the launch and reception pits the drill head would be removed from the drill string and reamer would be attached. Reamers would be used to widen the bore until it is of an acceptable size to accept the duct.
5) Once the bore is enlarged to the required size the product pipe would then be connected to the reamer via a swivel for installation.

H.4.10. As a trenchless and non-invasive technique, HDD avoids direct excavation through flood defence assets, thereby reducing the risk of physical damage and maintaining the integrity of these structures.

H.4.11. Works within or in proximity to Main Rivers and flood defences will require EA consent under their Protective Provisions in the DCO Application approval.

H.4.12. Through that consent, the EA will be able to require pre- and post-construction condition surveys of all affected assets, as well as any additional mitigation measures. These may include vibration assessments and ensuring that HDD launch and receptor pits are set back an appropriate distance from flood defences and watercourse banks and maintaining adequate clearance beneath each watercourse crossing.

H.4.13. The application of HDD allows below-ground cable installation beneath Main Rivers with minimal disturbance to surface flows or aquatic habitats. This represents a considerable reduction in potential impact compared to open-cut trenching methods, which can lead to sediment release, increased turbidity, and disturbance of habitats.

H.4.14. A key consideration when employing HDD is the management of drilling fluids to prevent contamination of the water environment and protect aquatic life. Appropriate management measures have been set out in the oCEMP [**EN0110012/APP/LVS/07.02**].

H.4.15. With the implementation of standard best-practice measures during construction, including monitoring and adherence to relevant environmental standards and obtaining the necessary approvals, it is concluded that the Proposed Development can be completed without compromising the integrity or functionality of existing flood defence assets.

H.5. Summary

H.5.1. This FRA has reviewed the current sources of flood risk to the Cable Route Corridor using data available at the time of the assessment. In relation to natural flood risks, the primary risk to the Cable Route Corridor has been identified to be from fluvial sources.

H.5.2. This review encompasses the results of site-specific hydraulic modelling, alongside the most recent EA National Flood Risk Assessment 2 (NaFRA2) data (published 28 March 2025) and contributes to a comprehensive evaluation of current and future flood risk, incorporating fluvial, tidal, and surface water sources under climate change scenarios.

H.5.3. The assessment is based on the Design Parameters set out in Chapter 2: The Proposed Development (ES Volume 1) [**EN0110012/APP/LVS/06.01.02**] and secured through the Design Parameters and Principles Commitments Document [**EN0110012/APP/LVS/05.05.06**]. The site-specific flood risk findings presented in this Annex should be considered alongside the mitigation measures outlined in the FRA.

H.5.4. Figure 15.14: Spatial Flood Defences (ES Volume 3) [**EN0110012/APP/LVS/06.02.15.14**], shows the Cable Route Corridor in relation to Main Rivers, Flood Zones 2 and 3, and the EA's AIMS spatial flood defence asset information.

H.5.5. The Cable Route Corridor spans across Flood Zones 1 – 3 due to its size and spatial extent, traversing the floodplains associated with the River Ouse, Selby Dam, and their tributaries. The cables themselves will be below the existing surface level and therefore, there will be no loss of floodplain volume as a result of the Proposed Development and no increase in flood risk elsewhere.

H.5.6. Chapter 3: Alternatives and Design Iteration (ES Volume 1) **[EN0110012/APP/LVS/06.01.03]** sets out how the locations of the Cable Construction Compounds were selected and the criteria used to determine the least environmentally constrained locations.

H.5.7. All Cable Construction Compounds are located in Flood Zones 1 and 2, with the exception of the northern corner of Compound 2, which extends into Flood Zone 3. Compounds have otherwise been sited to avoid Flood Zone 3. The presence of Flood Zone 3 in this location is associated with the floodplain of the River Ouse, and the proximity of the construction compound to the river is necessary to facilitate the planned river crossing.

H.5.8. The compounds have otherwise been sequentially sited to avoid areas designated as Flood Zone 3. Where practicable, compounds will be sited on the highest available ground within the development area and outside of modelled floodplain extents.

H.5.9. The design of Cable Construction Compounds within Flood Zone 2 or 3 will be carefully considered to minimise both flood risk to the compound and any off-site impacts. Where it is not feasible to avoid the floodplain entirely, all materials, equipment, welfare facilities and fuel stores would be located on the highest available ground, as far from the flood-prone area as practical, securely stored and, where necessary, raised above predicted flood levels to prevent damage or displacement during a flood event.

H.5.10. With reference to section 7.4 to 7.4 Safe Operation in the FRA (Appendix 15.1 (ES Volume 3) [**EN0110012/APP/LVS/06.03.15.01**]), appropriate flood risk mitigation measures will be implemented during the construction period and a FWEP will be in place throughout the construction phase.

H.5.11. Relevant offsets from watercourses shall be maintained in accordance with the embedded mitigation measures, with all materials, equipment, welfare facilities and fuel stores securely stored and, where necessary, raised above predicted flood levels to prevent damage or displacement during a flood event.

H.5.12. The Cable Route Corridor crosses main rivers the River Ouse and Selby Dam in a north-south direction, to the west of Solar Development Site 1 and to the east of Solar Development Site 8 respectively. The Cable Route Corridor passes through or comes in close proximity to many other watercourses, including IDB watercourses, due to its significant length and size.

H.5.13. With reference to Figure 15.14: Spatial Flood Defences (ES Volume 2) [**EN0110012/APP/LVS/06.02.15.14**], Cable Route Corridor 1-4 is shown to cross existing flood defences indicated to be present on the River Ouse and the Selby Dam.

H.5.14. As the Cable Route Corridor is refined, the total number of watercourse crossings will be determined. However, at this stage it can be noted that a large number of avoidance areas have been identified where no works are to be carried out in watercourses. In addition, between PEIR and ES stages, an assessment has been carried out to consider the potential interactions between the proposed Cable Route Corridor 1-4 and the existing EA flood defences along the River Ouse and Selby Dam.

H.5.15. No physical interaction with main rivers will occur and embedded measures agreed for the Proposed Development include a minimum offset of 10 m from bank top for all watercourses and their associated riparian zones from all infrastructure (including fencing) and construction works (e.g. oil/ fuel storage, stockpiles etc), except where watercourse crossings are required.

H.5.16. With the implementation of standard best-practice measures during construction, including monitoring and adherence to relevant environmental standards and obtaining the necessary environmental permits, it is concluded that the proposed works can be completed without compromising the integrity or functionality of existing flood defence assets.

H.5.17. Underground cabling should consider the risk of groundwater flooding, buoyancy, and appropriate waterproofing. Furthermore, the role of underground cabling in creating a barrier to groundwater flow pathways or preferential pathways, and therefore implications to local groundwater flood risk, should be considered in future design stages.

References

Ref 1 North Yorkshire County Council SFRA (2016) https://www.northyorks.gov.uk/sites/default/files/fileroot/planning_migrated/minerals_and_waste_plan/Strategic_flood_risk_assessment%20-%20accessible.pdf [Accessed January 2026]

Annex I Hydraulic Modelling Technical Note

Hydraulic Modelling Technical Note

Prepared by: [redacted]

For: Island Green Power UK Ltd

Site: Light Valley Solar

Date: 29/08/2025

Document Ref: 317690-REP-001

Issue-01

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Quality Assurance

Issue Record

Revision	Description	Date	Author	Reviewer	Approver
00	Initial issue (DRAFT)	1st August 2025	IR	DH	JR
01	Final issue	29th August 2025	IR	DH	JR

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Reference of Terms

Annual Exceedance Probability (AEP)

The AEP is the chance or probability of a natural hazard event (usually a rainfall or flooding event) occurring annually and is usually expressed as a percentage.

Aquifers

- Principal Aquifers are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.
- Secondary A Aquifers are 'permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers'.
- Secondary B Aquifers are 'predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers'.
- Secondary Undifferentiated Aquifers are assigned in 'cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type'.
- Unproductive Strata are 'rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow'.

Canal Failure

Canal failure can occur due to high-intensity rainfall or structural failure and can be dangerous due to the rapid release of large volumes of water. It is typically limited to raised canal reaches and can result in a rapid peak in flow followed by a gradual reduction.

Climate Change (CC)

A change in global or regional climate patterns. For flood risk, CC are assessed in terms of allowances which are predictions of anticipated change for peak river flow, peak rainfall intensity, sea level rise and offshore wind speed and extreme wave height. CC scenario data exists across different epochs (time periods) to determine the needs for climate resilience measures. CC data is requested as part of an EAPD request. If a separate ESG Flood Risk and CC Assessment is needed, additional CC data will be required.

Environment Agency (EA) and EA Product Data (EAPD)

The EA is the lead organisation for providing flood and coastal risk management and warnings of flooding from Main Rivers and on the coast. For sites within or in close elevational proximity to Flood Zone 2 or Flood Zone 3, EAPD is ordered to obtain more detailed flood risk data such as flood depths, breach and overtopping mapping and fluvial/tidal risks associated with CC.

Fluvial Flooding

Fluvial flooding typically occurs when a river's capacity is exceeded, and the excess water overtops the riverbanks. It can also occur when the watercourse has a high level downstream, perhaps due to structures or blockage, thus limiting conveyance. This creates a backup of water which can overtop the banks. Typical flooding issues occur when the natural floodplain has been urbanised and the river has been confined. EA mapping defines three zones of different flood risk, the third of which is subdivided into two categories:

- Zone 1 "Low probability of flooding" – This zone comprises land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%);
- Zone 2 "Medium probability of flooding" – This zone comprises land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year;
- Zone 3a "High probability of flooding" – This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year; and
- Zone 3b "Functional floodplain" – A sub-part of Zone 3, this zone comprises land where water has to flow or be stored in times of flood. This zone is not normally included within the national Flood Map for Planning and is calculated where necessary using detailed hydraulic modelling.

Groundwater Flooding

Groundwater flooding is caused by the emergence of water from beneath the ground at either point or diffuse locations when the natural level of the water table rises above ground level. This can result in deep and long-lasting flooding of low-lying or below-ground infrastructure such as underpasses and basements. Groundwater flooding can cause significant damage to property, especially in urban areas, and can pose further risks to the environment and ground stability.

Sewer Flooding

Flooding from sewers primarily occurs when flow entering a system exceeds available capacity or if the network capacity has been reduced through blockage or collapse. In the case of surface water sewers that discharge to watercourses, the same effect can be caused as a result of high-water levels in the receiving watercourse. As a result, water can begin to surcharge the sewer network, emerging at ground level through gullies and manholes and potentially causing flooding to highways and properties. If this occurs flooding can represent a significant hazard to human health due to the potential for contaminants in flood water.

Source Protection Zones

Source Protection Zones (SPZs) are areas of land through which water infiltrates into a groundwater borehole, well or spring that is used for public drinking water supply. These zones show the risk of contamination from potential pollution. SPZ's have been created as public facing boundaries where discrete groundwater bodies within SPZ's have been dissolved on zone number where common boundaries and overlaps have been removed. SPZs are defined around large and public potable groundwater abstraction sites. The purpose of SPZs is to provide additional protection to safeguard drinking water quality through constraining the proximity of an activity that may impact upon a drinking water abstraction.

- Zone 1 (Inner Protection Zone) is defined by a travel time of 50-days or less from any point within the zone at, or below, the water table. Additionally, the zone has as a minimum a 50-metre radius.
- Zone 2: (Outer Protection Zone) - This zone is defined by the 400-day travel time from a point below the water table. Additionally, this zone has a minimum radius of 250 or 500 metres, depending on the size of the abstraction.
- Zone 3: (Total catchment) - This zone is defined as the total area needed to support the abstraction or discharge from the protected groundwater source. A further Zone 4, or 'Zone of Special Interest' was previously defined for some groundwater sources.

Surface Water Runoff

Surface water runoff is defined as water flowing over the ground that has not yet entered a drainage channel or similar. It usually occurs because of an intense period of rainfall which exceeds the infiltration capacity of the ground. Typically, runoff occurs on sloping land or where the ground surface is relatively impermeable. The ground can be impermeable either naturally due to the soil type or geology, or due to development which places impervious material over the ground surface (e.g. paving and roads).

Tidal Flooding

Tidal flooding is caused by high tides coinciding with a low-pressure storm system which raises sea and tidal water levels, overwhelming coastal and river defences. This may be made worse by gale-force winds blowing the raised body of water up tidal river basins some distance from the coast, due to floodwater being forced up the tidal reaches of rivers and estuaries. Such flooding may become more frequent in future years due to rising sea levels.

Reservoirs Failure

Reservoir failure can be a particularly dangerous form of flooding as it results in the sudden release of large volumes of water that can travel at high velocity, causing deep and widespread flooding. The likelihood of this occurring is low as large reservoirs are managed in accordance with the Reservoirs Act 1975. The EA's online reservoir inundation map illustrates the maximum flood extents that could occur in the event of a reservoir.

1. Introduction

1.1 Acknowledgement

1.1.1 This report has been prepared for the sole and exclusive use of Island Green Power UK Ltd in accordance with the scope of work presented via email by Arthian, dated 15/11/2024. This report is based on information and data collected by Arthian. Should any of the information be incorrect, incomplete, or subject to change, Arthian may wish to revise the report accordingly.

1.1.2 Arthian has been instructed to provide hydraulic modelling support for a proposed solar development in West Yorkshire, known as Light Valley Solar Farm. The Flood Risk Assessment (FRA) for this development is being written by Arup.

1.2 Project Understanding

1.2.1 The proposed Light Valley Solar Farm development spans five sites, all of which are shown by existing Environment Agency (EA) flood mapping data to be at risk of fluvial flooding from nearby watercourses such as the River Aire, River Ouse, and several smaller tributaries of these watercourses. The River Aire and River Ouse join to form the Humber approximately 10km east of Site 5. These key watercourses are shown in Figure 1.

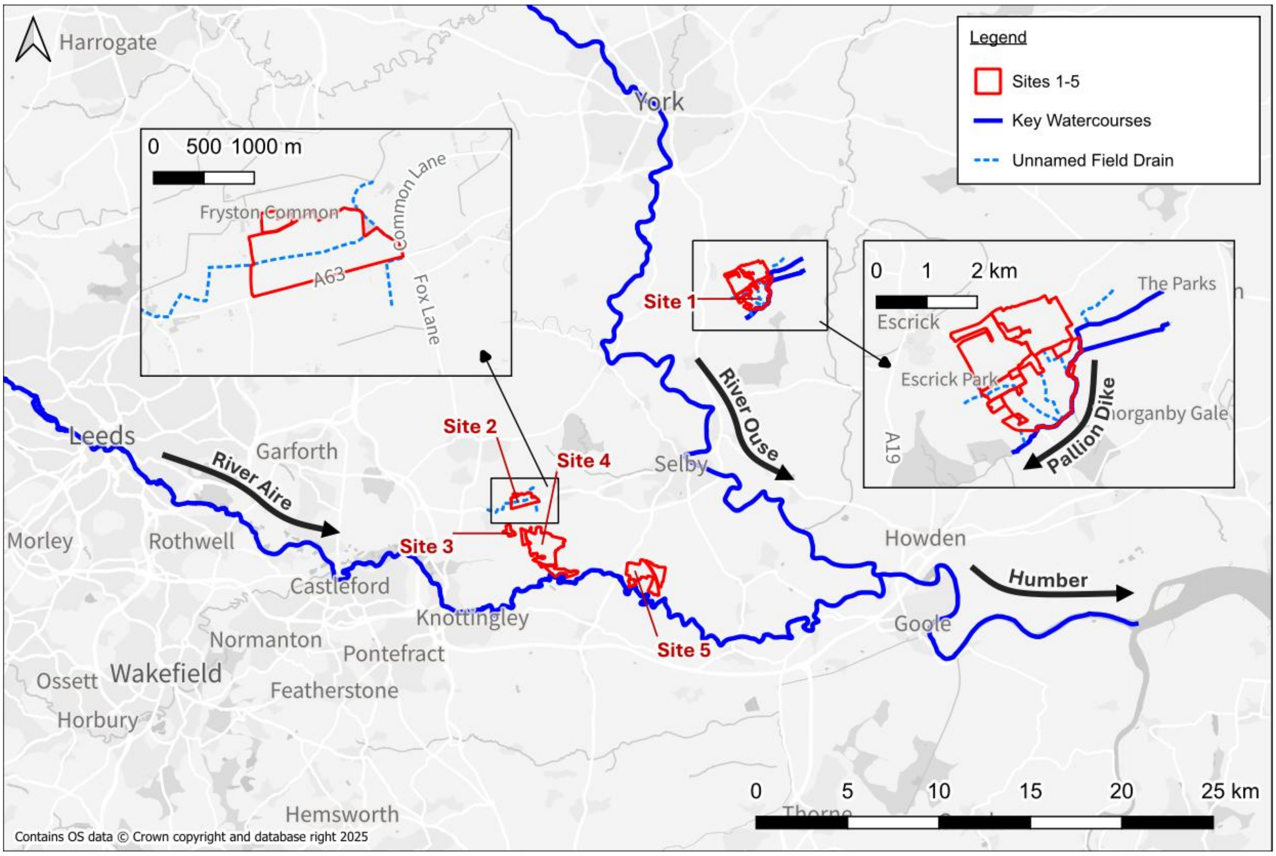

Figure 1: Key watercourses

1.2.2 The EA provided three existing models for this assessment. The extent of these models is shown in Figure 2.

- River Aire – Lower Aire Study (July 2017)
- River Ouse – Lower Ouse and Wharfe Washlands Study (July 2018)
- Humber Estuary – Upper Humber Study (August 2016)

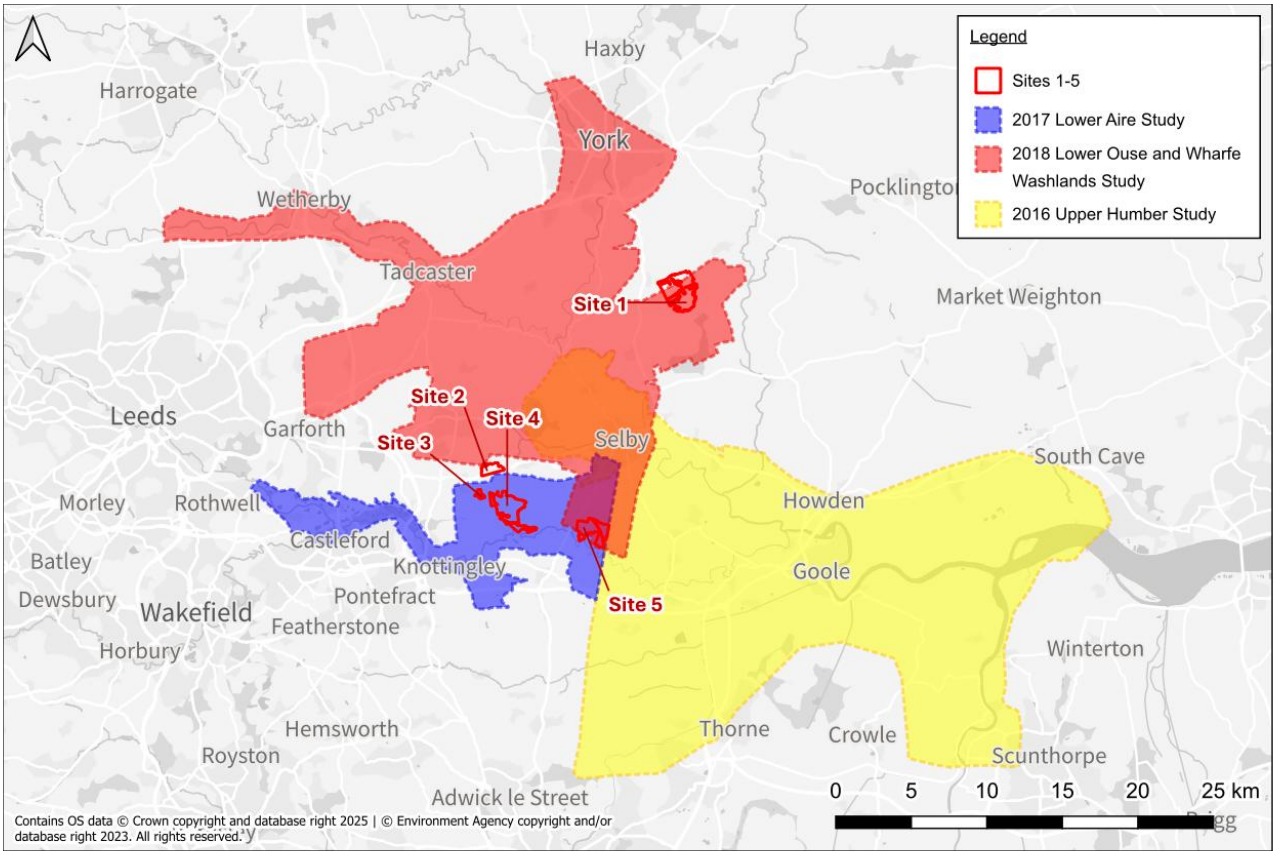

Figure 2: Existing EA model coverage

1.2.3 The 2018 Lower Ouse and Wharfe Washlands Study model covers Site 1 but omits Pallion Dike and its tributaries. Arthian has developed a new model to assess fluvial flood risk to Site 1 from these watercourses.

1.2.4 The 2017 Lower Aire Study model covers sites 3, 4, and 5. Site 2 lies just outside the modelled area. Arthian has developed a new model of an unnamed ditch flowing through Site 2 to assess fluvial flood risk to the site from this watercourse.

1.2.5 Although the 2016 Upper Humber Study model includes nodes near Site 5, EA documentation indicates that the model domain begins downstream of Temple Hirst bridge (node “02670500058D”), at the downstream extent of Site 5. As such, this model has not been used directly to assess flood risk to Site 5. However, it has been used to verify the downstream boundary conditions applied in the 2017 Lower Aire Study model, which terminates at Site 5.

1.2.6 Scoping Opinion (ref: XA/2024/100202/01-L01) was issued by the EA on 9 December 2024. It recommended reviewing existing models for suitability. This review has been undertaken, and minor updates were made to ensure successful simulations.

1.2.7 The report is structured by model, with each section detailing the review, refinement, and simulation process used to assess site-specific flood risk.

1.2.8 This report takes into account the following guidance documents:

- Using modelling for flood risk assessments (2023)[1];
- TUFLOW manual (2025)[2].

1.3 Project Limitations

1.3.1 The wider Arthian limitations are contained within Appendix A.

[1] https://www.gov.uk/guidance/using-modelling-for-flood-risk-assessments
[2] https://docs.tuflow.com/classic-hpc/manual/2025.1/

2. “Site 1” Model

2.1 Model Requirements

2.1.1 Whilst Site 1 is covered by the 2018 Lower Ouse and Wharfe Washlands Study model, the watercourses immediately adjacent to the site such as Pallion Dike and its tributaries were not explicitly modelled and therefore a new, site-specific model has been produced to establish fluvial flood risk to the site from these watercourses.

2.2 Data Sources

Table 1: Data sources used during model development

Data Source	Doc Ref	Provider	Date/Age	Comments
Topographic survey	Light Valley Topographic.dwg	Arthian	Q1 2025	Full coverage of the watercourses through the site Structure details such as culvert inverts and diameters included
EA Composite LiDAR DTM	[tile]_DTM_1m.tif	EA	November 2020	Full coverage of study/model area at 1m resolution Good agreement with the topographic survey coverage noted

2.3 Model Setup

Table 2: Model details, methodology, and parameters

Arthian Model Reference and Version:	317690_S1_v1
Simulation Type:	Direct rainfall model – considered proportionate to the catchment’s scale and the site’s upstream location. This approach, combined with topographic survey and a high-resolution LiDAR DTM, enables the representation of the many small tributaries and paleochannels that may be overlooked by traditional fluvial models. Methods such as ReFH2 and FEH Statistical are less reliable in small, ungauged catchments, and a direct rainfall approach avoids the uncertainties associated with deriving inflows in such settings.
Model Type:	2D with embedded 1D structures
Software Builds:	TUFLOW HPC 2025.1.1 *(latest build available at the time of simulation)*
Number of Domains and Extent:	Single domain with quadtree nests applied. The model extent is shown in Figure 3.

DTM Data Sources:	Topographic survey levels showed good correlation with EA Composite LiDAR DTM data (1m resolution). The LiDAR was preferred owing to its higher resolution. LiDAR used in this model was flown in 2020. The coverage is shown in Figure 4.
Cell Size:	Quadtree nest level 1 set to 4m A second quadtree nest level was applied, lowering the cell size to 1m along channels/banks Sub-grid sampling and high-resolution grid outputs enabled Suitable to represent key flow paths without significantly impacting model run times
Building Representation:	Very few buildings are present within the model domain, however, OS MasterMap data was used to define land use, including building footprints. High roughness applied to all buildings to represent internal walls and contents – 0.5s/m$^{1/3}$.
Existing Flood Defences:	No known formal flood defences were present within the study area.
Roughness Approach and Values:	Manning's n based on Chow (1959)[3], survey, photographs, and aerial imagery. Land use based on OS MasterMap data. Land Use Type — Roughness (s/m$^{1/3}$) General surface .... 0.030 Industrial land............................... 0.030 Land/gardens .... 0.060 Rough ground/scrub .... 0.080 Roads, tracks, and paths................ 0.020 Buildings .... 0.500 Inland waters 0.030
Boundary Conditions:	Rainfall hyetographs were generated using the ReFH2 method and applied uniformly across the full model domain. Net rainfall was used, with infiltration losses accounted for within ReFH2 rather than simulated explicitly within TUFLOW. Peak rainfall rates are presented in Table 3. An automatic level-flow (HQ) boundary has been established at the downstream end of the model domain, at a similar location to the ReFH2 calculation point. The slope has been set based on underlying DTM data.
Structures:	All structures encountered by the surveyor during the channel survey have been included within the domain as embedded ESTRY culverts.
Other DTM Adjustments:	None required.
Timestep:	Initial timestep set to 2s. TUFLOW HPC uses an adaptive timestepping process to maintain model stability. The control number factor has been left at the default value of 1.0.
Initial Conditions:	None required – simulations start "dry".

[3] Chow, V.T. (1959) Open Channel Hydraulics. McGraw-Hill, New York.

Non-Default Parameters:	Cell Wet/Dry Depth set to 0.2mm – standard action for rainfall modelling.
Further Comments:	-

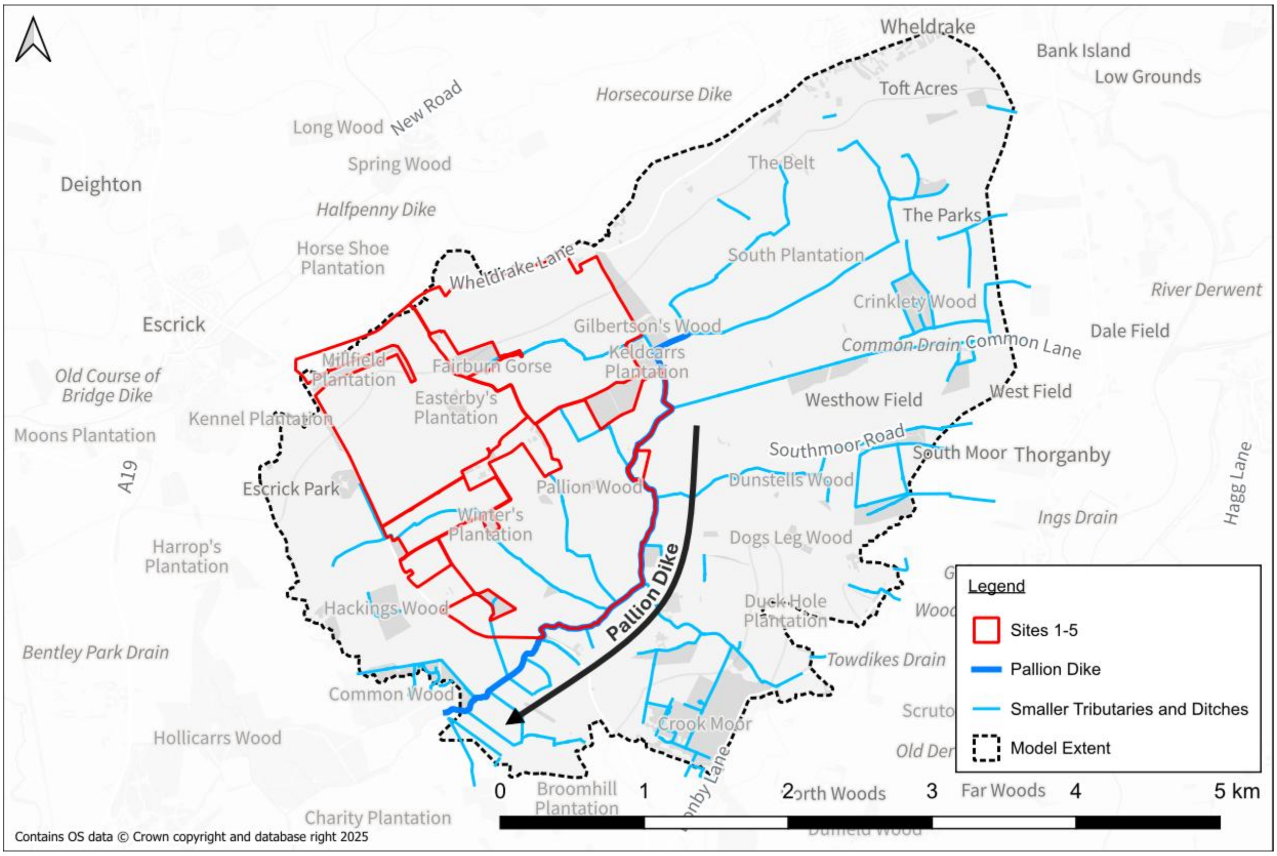

Figure 3: Site 1 model extent

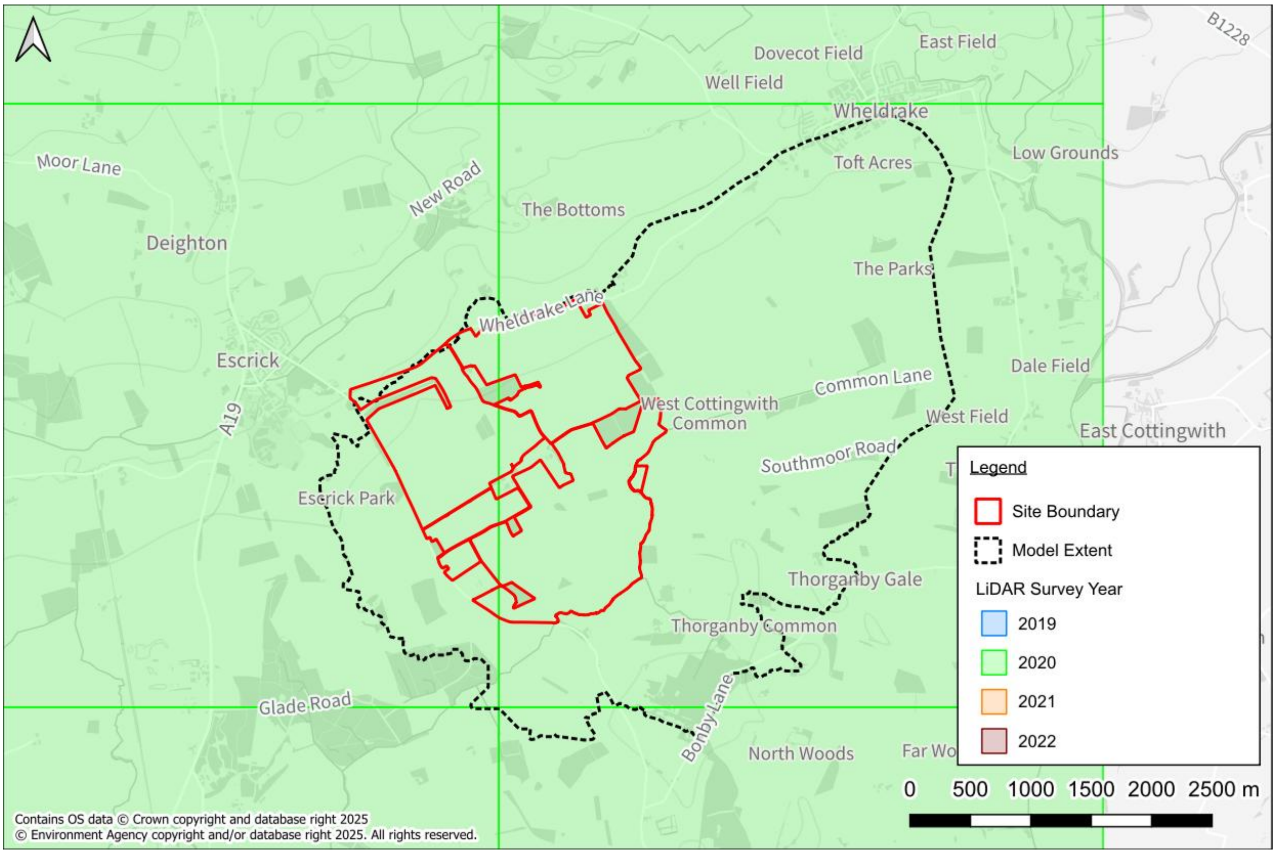

Figure 4: LiDAR survey years

Table 3: ReFH2 peak rainfall rates

Pluvial Event (AEP)	Peak Net Rainfall Rate (mm/hour)
50%	0.86
50% +25%CC	1.09
3.3%	1.76
3.3% +25%CC	2.28
1%	2.27
1% +30%CC	3.11
0.1%	3.82
0.1% +30%CC	5.36

2.4 Simulated Flood Events and Scenarios

2.4.1 The model was used to simulate four present-day rainfall events: 50%, 3.3%, 1%, and 0.1% Annual Exceedance Probability (AEP). Each of these events was also simulated with climate change uplifts applied in accordance with EA guidance at the time of modelling – +25% for the 50% and 3.3% AEP events, and +30% for the 1% and 0.1% AEP events.

2.4.2 Only the baseline (pre-development) scenario was modelled, as the proposed solar development does not involve significant changes to topography, land use, or drainage characteristics that would affect the modelled flood response. As such, the development is not expected to materially alter flood risk within the model domain.

2.5 Model Assumptions and Limitations

2.5.1 The hydraulic model has been developed using industry-standard methods in accordance with current EA guidance. Nevertheless, all models are simplifications of real-world systems, and several assumptions and limitations apply.

Topography and survey data: The model topography is based on topographic survey data where available, supplemented by Environment Agency LiDAR (1m resolution) elsewhere. This is assumed to be representative of current ground levels. Small-scale features such as embankments, field boundaries, or minor channels outside the topographic survey coverage and below the resolution of the LiDAR may not be fully captured. However, a desktop review of the catchment and comparison with existing flood mapping datasets indicate that the model is performing appropriately.

Hydrological inputs: Rainfall inputs were derived using the ReFH2 method, with losses (e.g. interception and infiltration) accounted for within ReFH2 and not represented explicitly in the hydraulic model. Uniform net rainfall was applied across the domain, assuming consistent catchment response and standard rural antecedent conditions. While this approach does not account for spatial variability in rainfall or runoff, the catchment is relatively small, and the assumption of uniform hydrological behaviour is considered reasonable for the purposes of this assessment.

Direct rainfall methodology: The model uses a direct rainfall methodology to simulate fluvial flood risk, rather than inflow boundaries derived from hydrological modelling. While this approach introduces some uncertainty, particularly around catchment response timing and volume, it is considered appropriate for this assessment due to the relatively small catchment size and the need to capture localised flooding mechanisms from paleochannels and minor tributaries. The rainfall-driven method allows surface runoff and small watercourses to be represented more dynamically across the domain.

2.6 Model Health and Stability

2.6.1 A review of the 2D log files shows that there are no comments, warnings or errors warranting attention.

2.6.2 Mass balance error statistics show the model achieves near 0.00% mass balance error for all simulations including sensitivity tests, as expected when using the TUFLOW HPC engine.

2.6.3 There are no negative depths reported in any simulations.

2.7 Results Summary

2.7.1 The model shows flood depths across the site remain shallow (<300mm) across much of the site during the 1% AEP +30% CC event. Maximum depths of 600mm are experienced west of Mount Pleasant Farm. There are no areas of depths above 1m except along the existing drainage ditches through the site. Maximum flood depths are presented in Figure 5.

2.7.2 During the 0.1% AEP +30% CC event, flood depths across much of the site remain below 300mm, with maximum flood depths of 700mm alongside Pallion Dike to the south of the site.

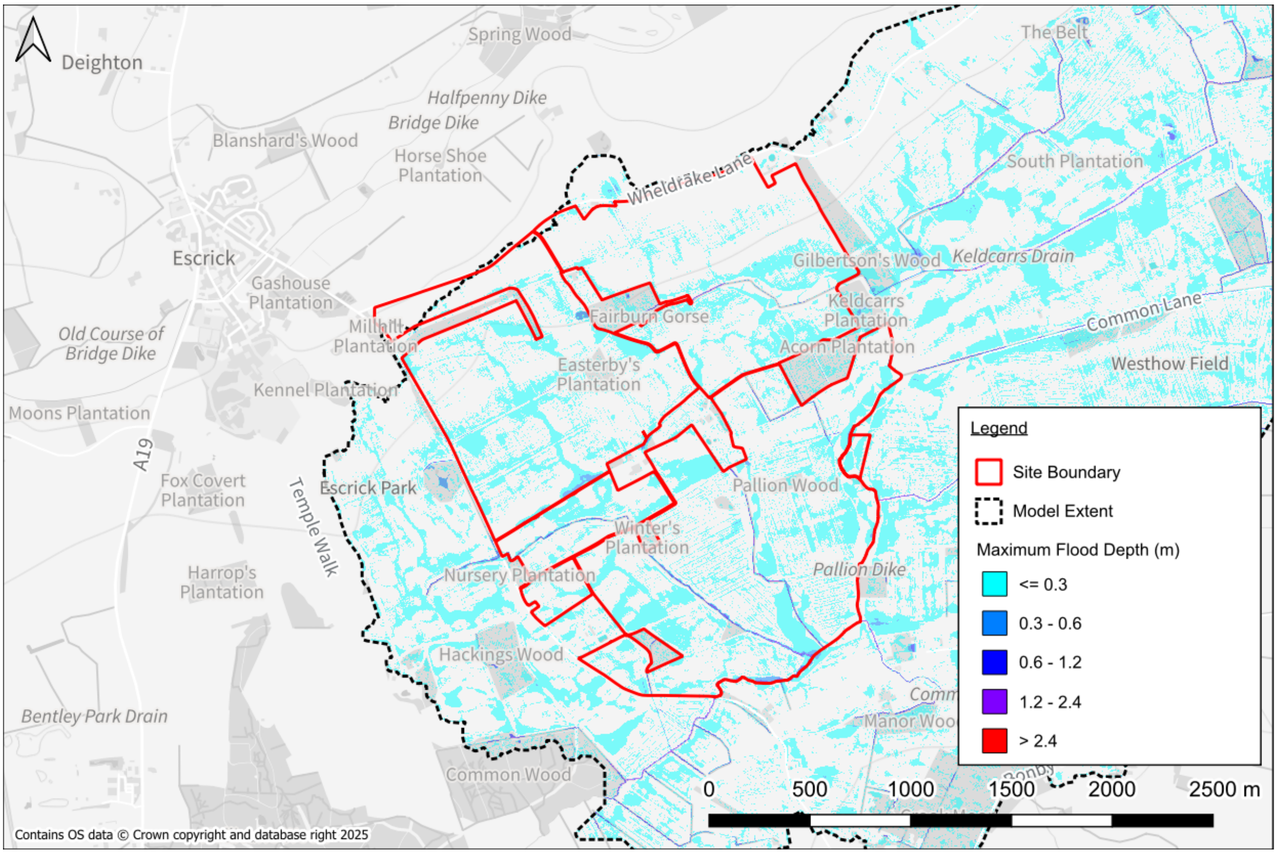

Figure 5: Maximum flood depths at Site 1, 1% AEP +30%CC pluvial event, baseline site layout

2.8 Model Verification and Sensitivity Testing

2.8.1 The ReFH2-estimated peak flow at the calculation point during the 1% AEP +30% climate change rainfall event, based on a contributing catchment area of 16.72km^2, was 6.62m^3/s. The hydraulic model reports a peak flow of 0.40m^3/s leaving the domain at the same location, or 94% lower than ReFH2 predicted.

2.8.2 The discrepancy reflects extensive field ponding and storage captured in the 1 m LiDAR model, which attenuate runoff and reduce the hydraulically connected contributing area compared with ReFH2's lumped assumptions. Differences in input data and simplifications in the rainfall model (e.g. storage and temporal rainfall distribution) also contribute. The uncertainty in the hydrological data, along with inherent simplifications in the rainfall model (such as catchment storage and temporal rainfall distribution), can contribute to the difference. A lower peak flow could still be a realistic and conservative estimate, particularly if it incorporates factors like soil moisture and land use. While the peak flow differs, the model remains a valuable tool for understanding catchment behaviour, with the results reflecting the model's assumptions and data limitations.

2.8.3 Despite the observed discrepancy between the rainfall model's peak flow and the ReFH2 flow, the primary flood risk to Site 1 is driven by the River Ouse, discussed in Section 5. As such, any inconsistencies in this model are of secondary importance, with the River Ouse flood risk remaining the dominant consideration in the overall risk assessment for the site.

2.8.4 Comparison of the model outputs against EA NaFRA2 surface water flood maps shows reasonable correlation, with flooding in similar hotspots, providing confidence in the model performance.

2.8.5 Sensitivity testing was undertaken on key model parameters to assess the robustness of results. The following variations were applied to the 1% AEP +30%CC simulation:

- Roughness: ±20%
- Downstream boundary slope: ±20%
- Rainfall rate: ±20%
- Cell size: halved/doubled (SGS remains on)
- Control number factor: ±20%

2.8.6 The model outputs were not found to be particularly sensitive to any of the tested parameters, with relatively minor variations observed in peak flow and flood extent for all tests. This suggests that the model is reasonably robust to typical uncertainties in input data and configuration.

3. "Site 2" Model

3.1 Model Requirements

3.1.1 Site 2 lies outside the extent of the 2017 Lower Aire Study model. This model has been extended to assess potential fluvial risk to the site directly from the River Aire during extreme events with updated climate change allowances and is discussed further in Section 3.8.1. A new site-specific model has also been developed to quantify the fluvial flood risk associated with an unnamed ditch flowing through the site and its contributing catchment and is known as the "Site 2 model".

3.2 Data Sources

Table 4: Data sources used during model development

Data Source	Doc Ref	Provider	Date/Age	Comments
Topographic survey	Light Valley Topographic.dwg	Arthian	Q1 2025	Full coverage of the watercourses through the site Structure details such as culvert inverts and diameters included
EA Composite LiDAR DTM	[tile]_DTM_1m.tif	EA	November 2020	Full coverage of study/model area at 1m resolution Good agreement with the topographic survey coverage noted

3.3 Model Setup

Table 5: Model details, methodology, and parameters

Arthian Model Reference and Version:	317690_S2_v2
Simulation Type:	Direct rainfall model – considered proportionate to the catchment's scale and the site's upstream location. This approach, combined with topographic survey and a high-resolution LiDAR DTM, enables the representation of small tributaries and paleochannels that may be overlooked by traditional fluvial models. Methods such as ReFH2 and FEH Statistical are less reliable in small, ungauged catchments, and a direct rainfall approach avoids the uncertainties associated with deriving inflows in such settings.
Model Type:	2D with embedded 1D structures
Software Builds:	TUFLOW HPC 2025.1.1 *(latest build available at the time of simulation)*

Number of Domains and Extent:	Single domain with quadtree nests applied. The model extent is shown in Figure 6.
DTM Data Sources:	Topographic survey levels have been applied where available, supplemented elsewhere by EA Composite LiDAR DTM (1m resolution). LiDAR used in this model was flown in 2020. The coverage is shown in Figure 7.
Cell Size:	Quadtree nest level 1 set to 4m Two further quadtree nest levels applied, lowering the cell size to 2m where topographic survey is available and 1m along channels/banks Sub-grid sampling and high-resolution grid outputs enabled Suitable to represent key flow paths without significantly impacting model run times
Building Representation:	OS MasterMap data used to define land use throughout the model, including buildings. High roughness applied to all buildings to represent internal walls and contents – 0.5s/$m^{1/3}$.
Existing Flood Defences:	No formal flood defences were present within the study area.
Roughness Approach and Values:	Manning's n based on Chow (1959), survey, photographs, and aerial imagery. Land use based on OS MasterMap data. <u>Land Use Type Roughness (s/$m^{1/3}$)</u> General surface .... 0.030 Industrial land............................... 0.030 Land/gardens .... 0.060 Rough ground/scrub .... 0.080 Roads, tracks, and paths............... 0.020 Buildings .... 0.500 Inland waters 0.030
Boundary Conditions:	Rainfall hyetographs were generated using the ReFH2 method and applied uniformly across the full model domain. Net rainfall was used, with infiltration losses accounted for within ReFH2 rather than simulated explicitly within TUFLOW. Peak rainfall rates are presented in Table 6. An automatic level-flow (HQ) boundary has been established at the downstream end of the model domain, at a similar location to the ReFH2 calculation point. The slope has been set based on underlying DTM data.
Structures:	All structures encountered by the surveyor during the channel survey have been included within the domain as ESTRY culverts.
Other DTM Adjustments:	None required.
Timestep:	Initial timestep set to 1s. TUFLOW HPC uses an adaptive timestepping process to maintain model stability. The control number factor has been left at the default value of 1.0.
Initial Conditions:	None required – simulations start "dry".
Non-Default Parameters:	Cell Wet/Dry Depth set to 0.2mm – standard action for rainfall modelling.

Further Comments:	-

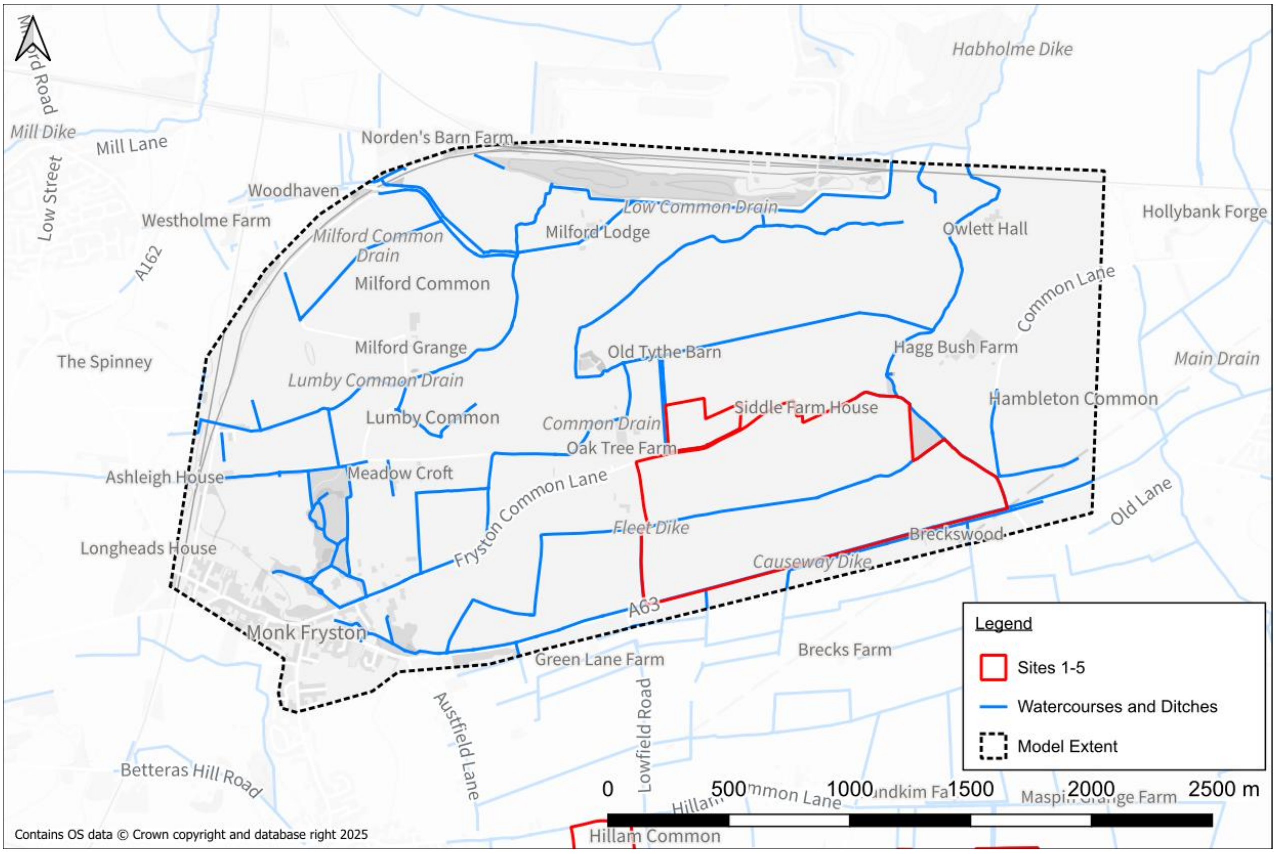

Figure 6: Site 2 model extent

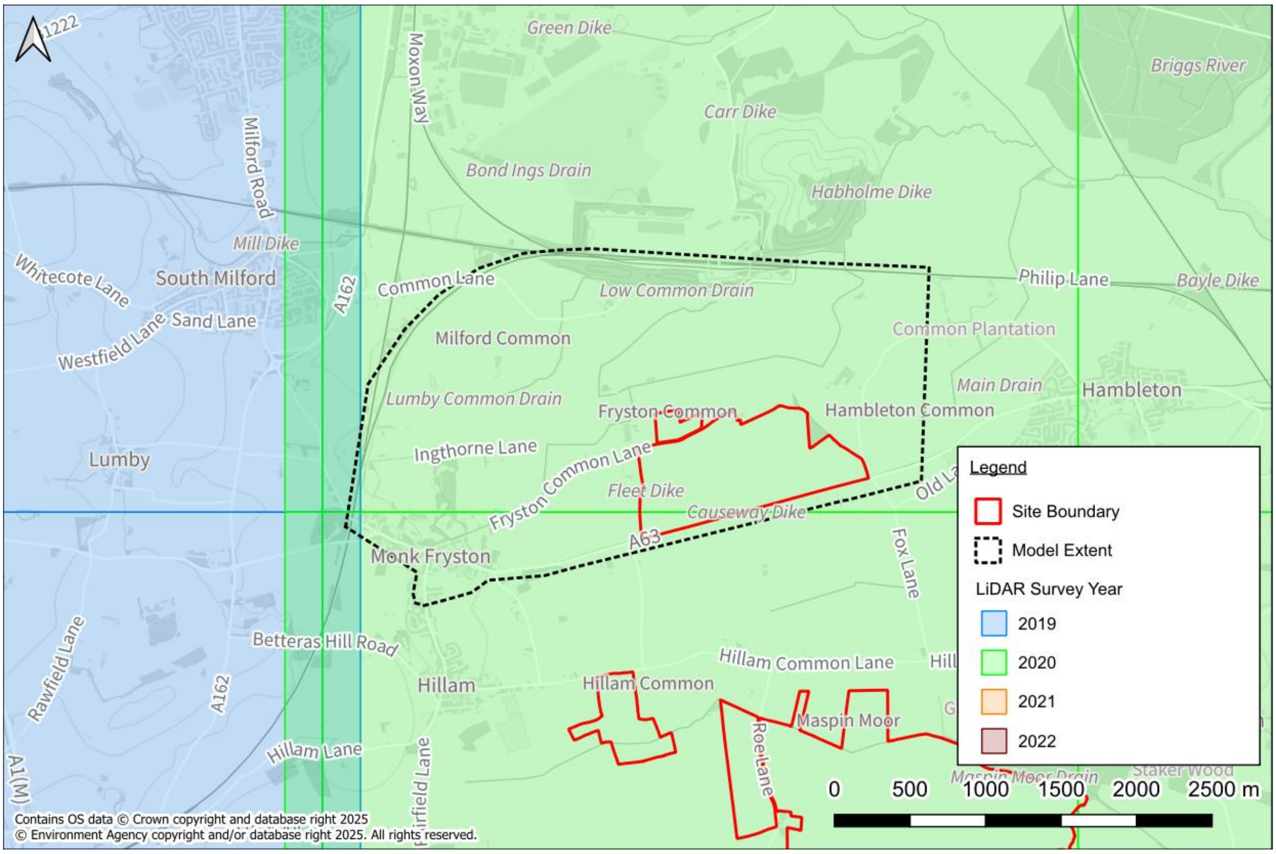

Figure 7: LiDAR survey years

Table 6: ReFH2 peak rainfall rates

Pluvial Event (AEP)	Peak Net Rainfall Rate (mm/hour)
50%	0.86
50% +25%CC	1.09
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3.3% +25%CC	2.28
1%	2.27
1% +30%CC	3.11
0.1%	3.82
0.1% +30%CC	5.36

3.4 Simulated Flood Events and Scenarios

3.4.1 The model was used to simulate four present-day rainfall events: 50%, 3.3%, 1%, and 0.1% Annual Exceedance Probability (AEP). Each of these events was also simulated with climate change uplifts applied in accordance with EA guidance at the time of modelling – +25% for the 50% and 3.3% AEP events, and +30% for the 1% and 0.1% AEP events.

3.4.2 Only the baseline (pre-development) scenario was modelled, as the proposed solar development does not involve significant changes to topography, land use, or drainage characteristics that would affect the modelled flood response. As such, the development is not expected to materially alter flood risk within the model domain.

3.5 Model Assumptions and Limitations

3.5.1 The hydraulic model has been developed using industry-standard methods in accordance with current EA guidance. Nevertheless, all models are simplifications of real-world systems, and several assumptions and limitations apply.

3.5.2 **Topography and survey data:** The model topography is based on topographic survey data where available, supplemented by Environment Agency LiDAR (1m resolution) elsewhere. This is assumed to be representative of current ground levels. Small-scale features such as embankments, field boundaries, or minor channels below the resolution of the LiDAR may not be fully captured. However, a desktop review of the catchment and comparison with existing flood mapping datasets indicate that the model is performing appropriately.

3.5.3 **Hydrological inputs:** Rainfall inputs were derived using the ReFH2 method, with losses (e.g. interception and infiltration) accounted for within ReFH2 and not represented explicitly in the hydraulic model. Uniform net rainfall was applied across the domain, assuming consistent catchment response and standard rural antecedent conditions. While this approach does not account for spatial variability in rainfall or runoff, the catchment is relatively small, and the assumption of uniform hydrological behaviour is considered reasonable for the purposes of this assessment.

3.5.4 **Direct rainfall methodology:** The model uses direct rainfall to simulate fluvial flood risk, rather than inflow boundaries derived from hydrological modelling. While this approach introduces some uncertainty, particularly around catchment response timing and volume, it is considered appropriate for this assessment due to the small catchment size and the need to capture localised flooding mechanisms from paleochannels and minor tributaries. The rainfall-driven method allows surface runoff and small watercourses to be represented more dynamically across the domain.

3.6 Model Health and Stability

3.6.1 A review of the 2D log files shows that there are no comments, warnings or errors warranting attention.

3.6.2 Mass balance error statistics show the model achieves near 0.00% mass balance error for all simulations including sensitivity tests, as expected when using the TUFLOW HPC engine.

3.6.3 There are no negative depths reported in any simulations.

3.7 Results Summary

3.7.1 The model shows flood depths across the site remain shallow (<300mm) across much of the site during the 1% AEP +30% CC event. Maximum depths of 600mm are experienced west of Mount Pleasant Farm. There are no areas of depths above 1m except along the existing drainage ditches through the site. Flood depths during this event are presented in Figure 8.

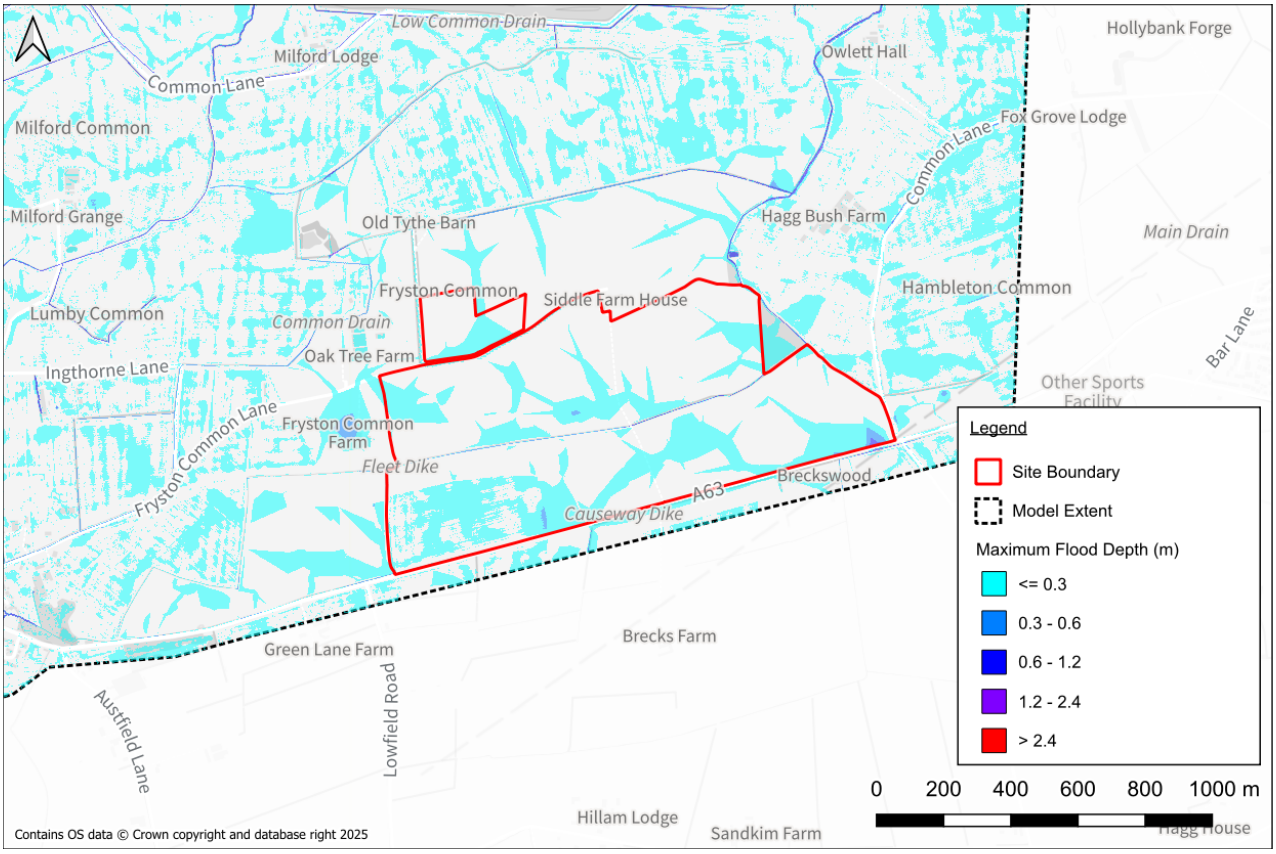

Figure 8: Maximum flood depths at Site 2, 1% AEP +30%CC pluvial event, baseline site layout

3.7.2 During the 0.1% AEP +30% CC event, flood depths across much of the site remain below 300mm, with maximum flood depths of 750mm in a local depression to the southeast of the site.

3.8 Model Verification and Sensitivity Testing

3.8.1 The ReFH2-estimated peak flow at the calculation point during the 1% AEP +30% climate change rainfall event, based on a contributing catchment area of 1.54km^2, was 0.62m^3/s. The hydraulic model reports a peak flow of 0.17m^3/s leaving the domain at the same location, or 72% lower than ReFH2 predicted.

3.8.2 The discrepancy between the ReFH2 flow and the rainfall model's peak outflow likely arises from differences in model assumptions, methodologies, and input data. The uncertainty in the hydrological data, along with inherent simplifications in the rainfall model (such as catchment storage and temporal rainfall distribution), can contribute to the difference. A lower peak flow could still be a realistic and conservative estimate, particularly if it incorporates factors like soil moisture and land use. While the peak flow differs, the model remains a valuable tool for understanding catchment behaviour, with the results reflecting the model's assumptions and data limitations.

3.8.3 Despite the observed discrepancy between the rainfall model's peak flow and the ReFH2 flow, the primary flood risk to Site 2 is driven by the River Aire during a defence breach, discussed in section 4. As such, any inconsistencies in this model are of secondary importance, with the River Aire flood risk remaining the dominant consideration in the overall risk assessment for the site.

3.8.4 Comparison of the model outputs against EA NaFRA2 surface water flood maps shows reasonable correlation, with flooding in similar hotspots.

3.8.5 Sensitivity testing was undertaken on key model parameters to assess the robustness of results. The following variations were applied to the 1% AEP +30%CC simulation:

- Roughness: ±20%
- Downstream boundary slope: ±20%
- Rainfall rate: ±20%
- Cell size: halved/doubled (SGS remains on)
- Control number factor: ±20%

3.8.6 The model outputs were not found to be particularly sensitive to any of the tested parameters, with relatively minor variations observed in peak flow and flood extent for all tests. This suggests that the model is reasonably robust to typical uncertainties in input data and configuration.

4. 2017 Lower Aire Study Model

4.1 Existing Model Setup

4.1.1 As supplied by the EA, the 2017 Lower Aire Study model covered sites 3, 4, and 5. It has also been extended to establish flood risk to site 2 in the event of a defence breach.

4.2 Model Setup and Updates

Table 7: Model details, methodology, and parameters

Arthian Model Reference and Version:	317690_Lower_Aire_v4
Simulation Type:	Fluvial
Model Type:	Linked 1D-2D
Software Builds:	Flood Modeller 7.3 TUFLOW Classic 2025.1.1 *(latest builds available at the time of simulation)*
Number of Domains and Extent:	Single domain. The model extent is shown in Figure 9. Early test simulations showed significant glasswalling in the vicinity of Site 2, indicating that the site *may* be at risk of flooding from the River Aire during an extreme event, including scenarios involving defence breach. To address this, the model domain was extended northwards to incorporate Site 2 and the surrounding potential floodplain. Survey data from the Site 2 model was used to represent channels and structures within the extended area.
DTM Data Sources:	As part of the National LiDAR Programme, new LiDAR data was available for the study area. A comparison between this dataset and the ground model used in the 2017 Lower Aire model showed that differences were generally within ±150mm. However, in some areas to the south of the River Aire – notably around Hensall (within the model build area) and High Eggborough (outside the model build area) – ground elevations in the updated dataset were found to be 1-2 m lower. Differences of 0.5-1m were also observed within agricultural fields in Site 5, specifically in the area bounded by two railway lines. These variations are likely attributable to land management activities that have occurred since the previous LiDAR capture. To ensure the model reflects current topographic conditions, the latest LiDAR DTM data was incorporated into the model. LiDAR used in this model was flown between 2019 and 2022. The coverage is shown in Figure 10.
Cell Size:	10m – whilst relatively coarse, this is considered suitable to represent key flow paths and establish flood risk to the proposed development without significantly impacting model run times
Building Representation:	OS MasterMap data used to define land use throughout the model, including buildings. High roughness applied to all buildings to represent internal walls and contents – $0.5 s/m^{1/3}$.

Existing Flood Defences:	Following the LiDAR updates, all modelled bank levels were reviewed. While no significant changes were required to existing defences, a new length of raised defence was included where identified in the updated data with crest levels extracted using zonal statistics tools to ensure high spots were appropriately represented. Two defence breach scenarios have been modelled – locations are presented in Figure 11. Both breach locations were chosen based on the baseline model outputs, defence crest to toe differences, and proximity to the site to provide a "worst case" assessment. In both cases, the existing defence is an earth embankment, so the breach width was set to 50m in line with current EA guidance. The breaches are modelled using variable z-shapes to lower the levels of the banks to toe levels (extracted from nearby LiDAR) over a period of ten minutes once water levels in channel reach 0.5m below the bank level. Levels remain low for 36 hours after which the defence is repaired to pre-breach levels for the duration of the simulation.
Roughness Approach and Values:	Manning's n based on Chow (1959), survey, photographs, and aerial imagery. Land use based on OS MasterMap data. Land Use Type — Roughness ($s/m^{1/3}$) General surface .... 0.030 Industrial land.............................. 0.030 Land/gardens .... 0.060 Rough ground/scrub .... 0.080 Roads, tracks, and paths............... 0.020 Buildings .... 0.500 Inland waters............................... 0.030
Boundary Conditions:	The hydrology for the 2017 Lower Aire Study model was not updated as part of this assessment due to the complexity and scale of the contributing catchment. Given the nature of the proposed development (solar), this was considered proportionate. Instead, confidence in the existing inflows has been supported through sensitivity testing to account for potential uncertainty in peak flows. The model was provided with ... The uplift percentages have been updated in line with current EA guidance for the Aire and Calder Management Catchment, resulting in central, higher, and upper uplifts of +23%, +31%, and +51% respectively. The higher uplift has been used as the design event, with the central and upper uplifts providing sensitivity testing, discussed in more detail in Section 4.7. The hydrology provided with the 2017 Lower Aire Study model included combinations of flood events from both the River Aire and River Calder catchments. Early test simulations showed that the events with higher flows along the River Calder were producing higher depths adjacent to sites 3-5, so this combination was considered for all subsequent simulations. The downstream boundary is situated in close proximity to site 5, where the River Aire passes under the East Coast Mainline railway and uses a normal depth unit. This boundary condition is discussed in more detail in Section 4.4.

Structures:	Initial simulations using the original river network file exhibited significant culvert backflow issues. Investigation identified that the problem was caused by the presence of loss units within the 1D network. These units were located upstream of the development sites, primarily around meanders downstream of Beal, and are understood to have been included in the original model to aid calibration. To enable successful simulation, 20 of these units were removed (sequentially to ensure potential impact was minimised whilst aiding model stability). A revised river network file was created and used for subsequent runs, which completed without error. Comparison of early model outputs (with the loss units in place) and final simulations showed negligible differences in flood levels in the vicinity of Sites 3, 4, and 5, suggesting the adjustment is appropriate is unlikely to have a noticeable impact on the assessment of flood risk to the development sites.
Other DTM Adjustments:	None required.
Timestep:	Initial timestep set to 2s. TUFLOW HPC uses an adaptive timestepping process to maintain model stability. The control number factor has been left at the default value of 1.0.
Initial Conditions:	Initial water levels provided with the existing EA Flood Modeller network were deemed suitable and remain unchanged.
Non-Default Parameters:	No changes to parameters provided with the existing model setup
Further Comments:	The report supplied with the 2017 Lower Aire model states that the tidal limit of the model is noted to be located at Temple Hirst which is adjacent to the eastern boundary of Site 5. Tidal risk in the Lower Aire model has been discounted, with the hydraulic modelling report stating that "an early agreement was made to avoid modelling the tidal reaches of the Aire as the scope noted that the downstream coordinates that were originally provided for the River Aire were indicative and would need to be established during the project to cover areas where flood risk was considered to be predominantly fluvial". This is evidenced in the model build, where the downstream boundary is shown to be a normal depth boundary as opposed to a tidal boundary. It is further considered that tidal risk is covered sufficiently by the Lower Ouse and Wharfe Washlands 2018 model and the Upper Humber 2016 model.

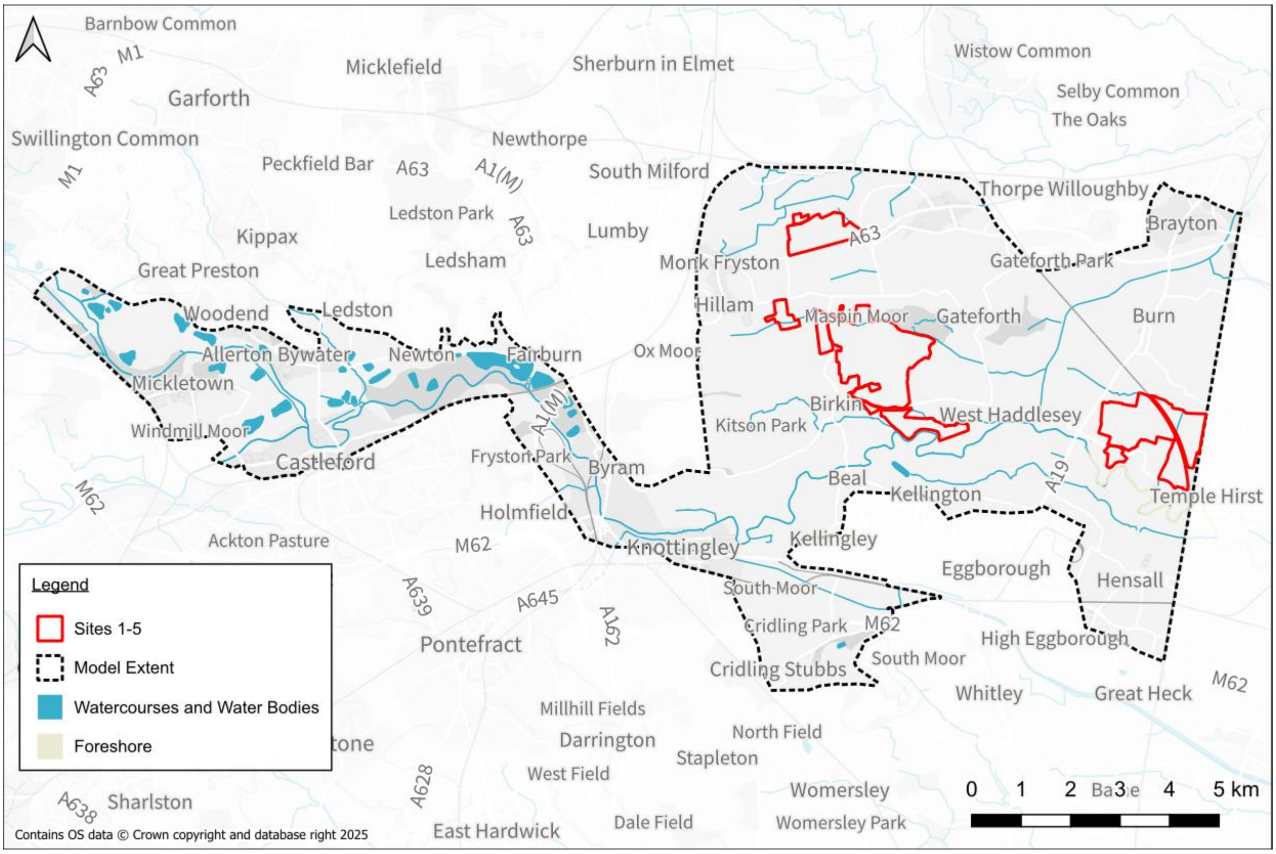

Figure 9: 2017 Lower Aire model extent

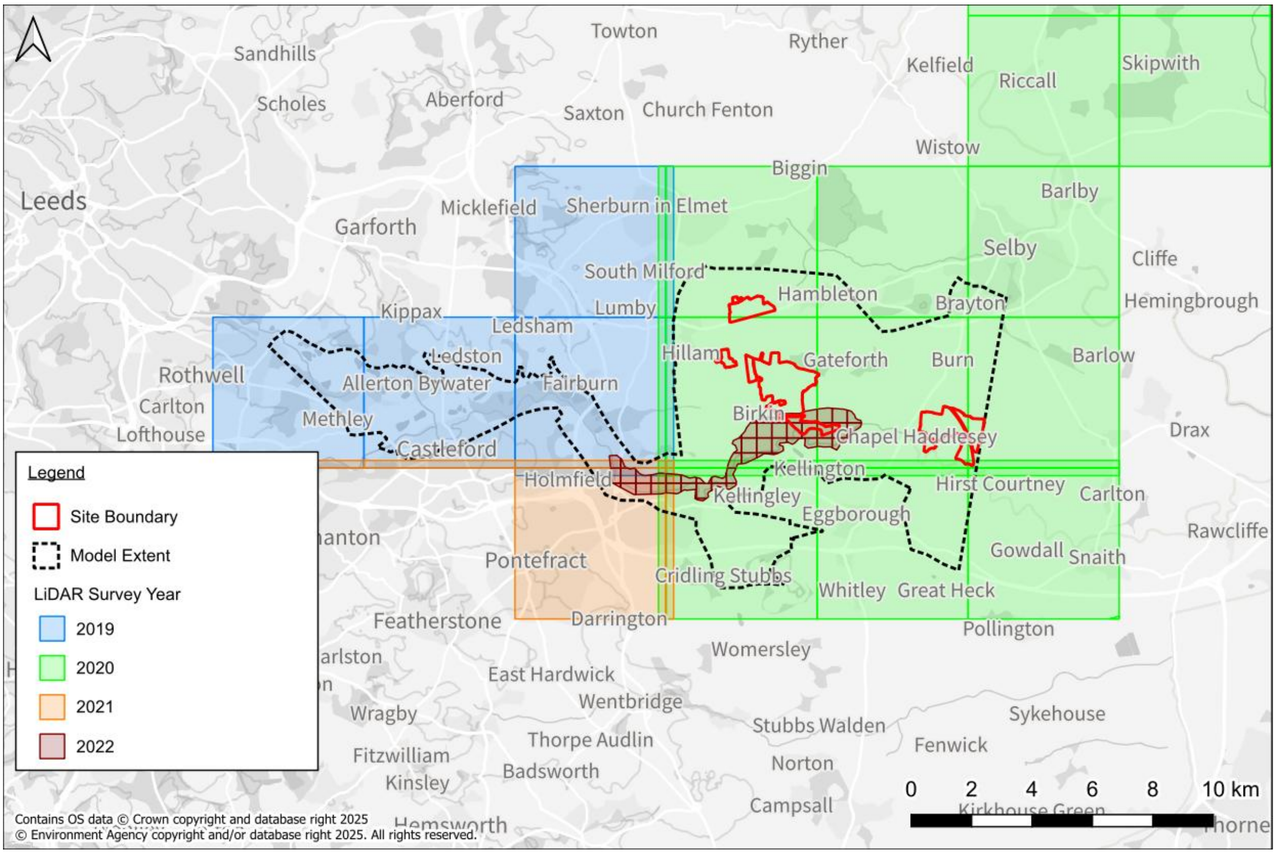

Figure 10: LiDAR survey years

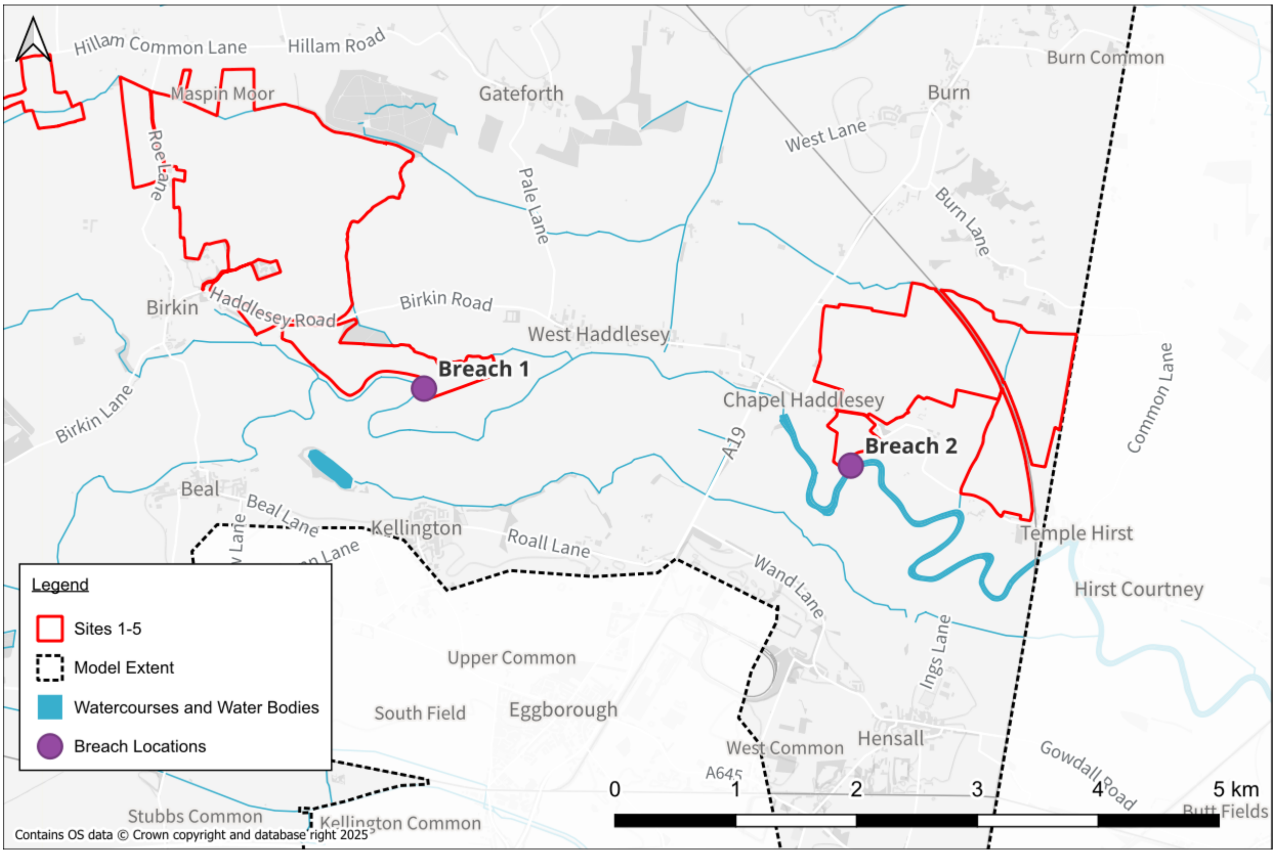

Figure 11: Modelled defence breach locations

4.3 Simulated Flood Events and Scenarios

4.3.1 The model was used to simulate three present-day flood events: 3.3%, 1%, and 0.1% AEP. The 1% and 0.1% AEP events were also simulated with a 31% climate change uplift applied in accordance with EA guidance at the time of modelling.

4.3.2 Only the baseline (pre-development) scenario was modelled, as the proposed solar development does not involve significant changes to topography, land use, or drainage characteristics that would affect the modelled flood response. As such, the development is not expected to materially alter flood risk within the model domain.

4.4 Model Assumptions and Limitations

4.4.1 The hydraulic model has been developed using industry-standard methods in accordance with current EA guidance. Nevertheless, all models are simplifications of real-world systems, and several assumptions and limitations apply.

Model Resolution and Grid/Cell Size: The 1D cross-section spacing (average 210m, typically 110m-310m) and 2D model grid resolution (10m) are appropriate for catchment-scale flood risk assessment but will not resolve small-scale site features such as minor bunds, drains, or platform levels associated with the solar array. Interpolation between cross-sections or 2D cells may miss localised depressions or raised ground. This does not materially affect flood risk from the River Aire given the dominant flood mechanisms, but site-specific drainage or pluvial risk would require higher-resolution modelling.

Survey Data Age: The hydraulic model incorporates river survey from 1989 and 2002 with a 2016 check survey of key sections and structures. Where older sections remain, any unrecorded modification to channels or structures since those dates will not be reflected in the model. This is a typical limitation for strategic-scale models of major rivers. It is not expected to impact the assessment of flood risk to the site.

Calibration Limits: The model was calibrated against four observed events, including December 2015, using a network of river and washland level gauges along the Lower Aire. Calibration quality is high at gauge locations and provides a good representation of floodplain behaviour. Flood levels at the solar site are derived from the hydraulics of the model and the nearest gauge data available but are still subject to the usual uncertainties inherent in any hydraulic model.

Washland Operation: The model assumes typical operation of washland sluices and pumps as represented in the 2017 study. Actual behaviour during a flood event will depend on operational rules and manual intervention. Any changes in washland management since 2017 could influence storage behaviour and therefore downstream flood levels.

Hydrological inputs: The existing hydrology data provided with the model remains unchanged. The hydrological analysis from the 2017 Lower Aire study remains appropriate for use in 2025 to inform flood risk to the proposed solar site. The River Aire and Calder are large, slow-responding catchments with extensive managed washlands, where flood behaviour is governed by broad-scale hydrology and long-term storage rather than short-term, flashy runoff. The 2017 study incorporated post-2012 operation of the St Aidan's flood basin and the Boxing Day 2015 event, providing an up-to-date statistical basis using FEH-compliant methods (Enhanced Single Site and FEH Statistical) and long-term gauge records at Lemonroyd and Methley. This approach produces stable flow–frequency relationships that are not materially altered without significant step changes in catchment behaviour. No new gauging evidence or substantive catchment alterations have occurred since 2017 that would warrant recalculating inflows, and the EA's general 3–4 year hydrology refresh guidance is not considered applicable to this type of large, stable river system. The existing model also incorporates current Humber climate change allowances, which can be updated in line with EA policy without recalibrating the base hydrology. Sensitivity testing has been carried out on model inflows to provide further confidence and is discussed in section 0. Given the scale and hydraulic controls of the catchment and the absence of evidence for any hydrological shift, the 2017 analysis remains robust for present-day and future flood risk assessment at this location.

Downstream Boundary: The 2017 Lower Aire study model applies a normal depth boundary at Temple Hirst to represent fluvial-dominant conditions at the downstream extent. This boundary has been cross-checked against the Upper Humber model, which continues seamlessly from the Lower Aire reach. Comparison with the level–flow relationship at the equivalent downstream bridge in the Upper Humber model confirms that the normal depth rating curve used in the Aire model is consistent with the verified hydraulic control at this location. Site 5 lies immediately upstream of this control point, meaning flood levels in this reach are influenced by the downstream boundary. However, the agreement between the two linked models demonstrates that the adopted boundary condition is hydraulically realistic and suitable for use in assessing flood risk to the site. Sensitivity testing of this boundary has been completed and is discussed in Section 4.7.

4.5 Model Health and Verification

4.5.1 A review of the 2D log files shows that there are no comments, warnings or errors warranting attention.

4.5.2 Mass balance error statistics show the 2D mass balance error peaks at -1.2% for all simulations including sensitivity tests, which is considered acceptable.

4.5.3 There are no negative depths reported in any simulations.

4.6 Results Summary

4.6.1 Model results show sites 2 and 3 to remain flood free during the fully defended 1% AEP +31%CC fluvial event along the Lower Aire. Flood depths of 3m and over are experienced across much of site 4. This is presented in Figure 12.

4.6.2 Flood depths across site 5 vary from below 600mm to the west, up to 1.5m in the east during this event and are presented in Figure 13.

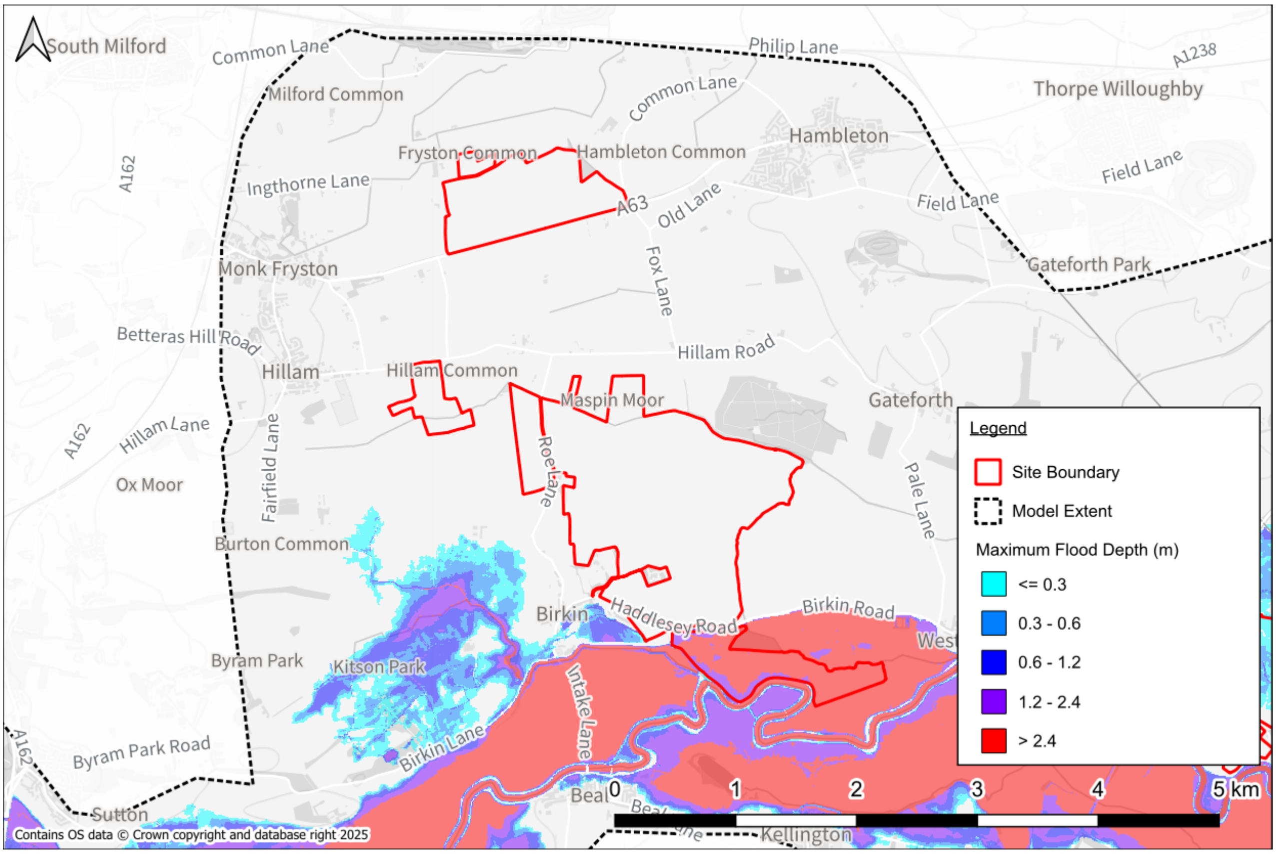

Figure 12: Maximum flood depths at Sites 2-4, 1% AEP +31%CC fluvial event, baseline site layout

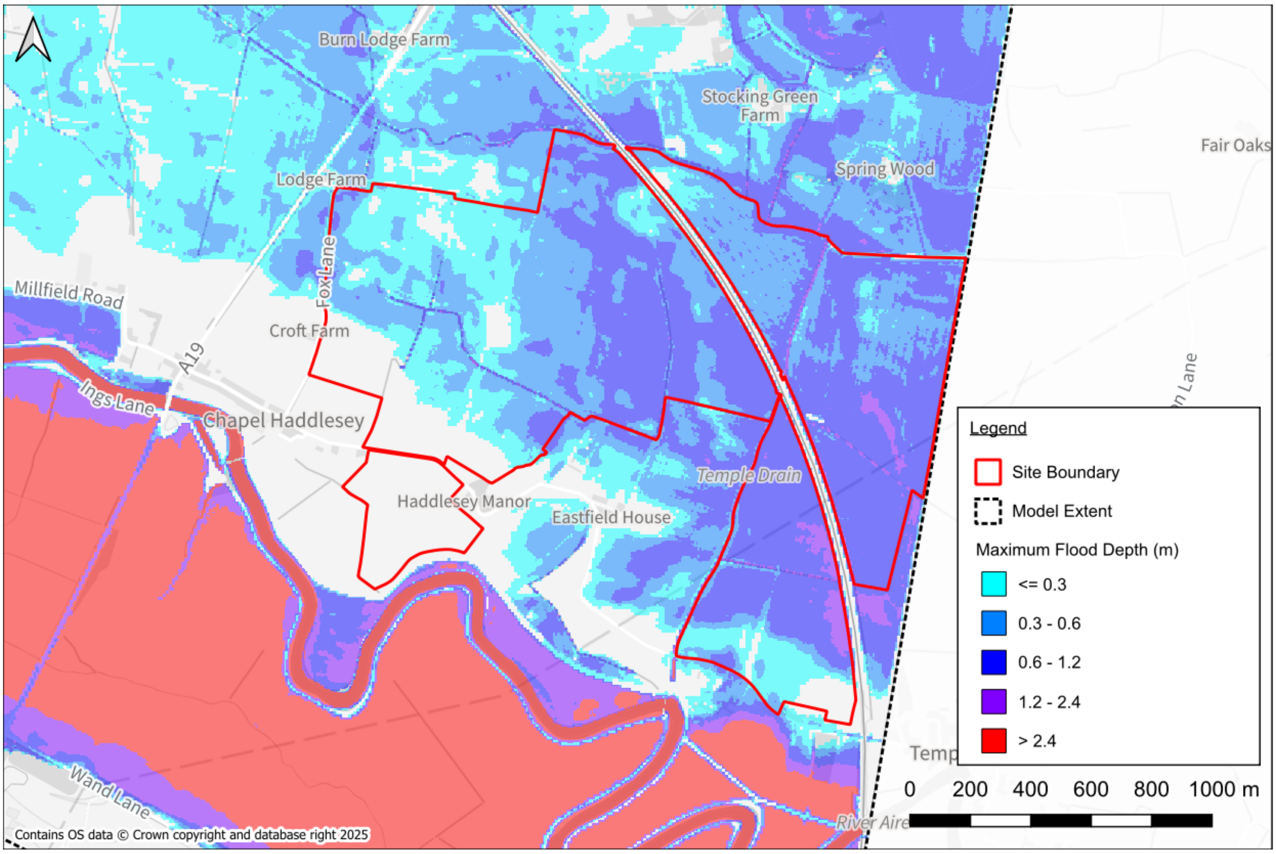

Figure 13: Maximum flood depths at Site 5, 1% AEP +31%CC fluvial event, baseline site layout

4.6.3 In the event of a breach to flood defences along the Lower Aire northern bank (Breach 1) during a 1% AEP +31%CC fluvial event, adjacent to site 4, there is minimal difference in flood extent and depths across the floodplain, primarily due to the significant overtopping that occurs in the area already. Model results show sites 2 and 3 to remain flood free during the fully defended 1% AEP +31%CC fluvial event along the Lower Aire. Flood depths of 3m and over are experienced across much of site 4. This is presented in Figure 14.

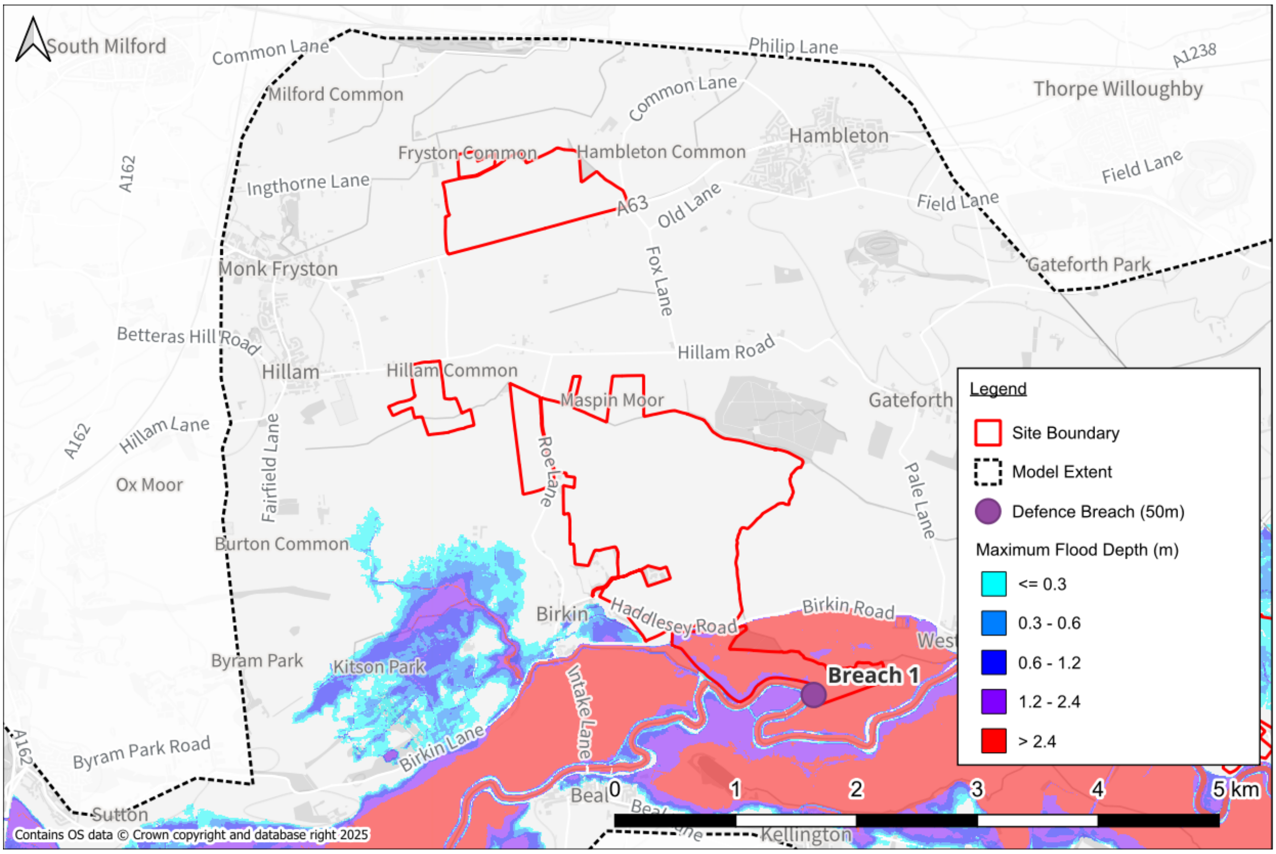

Figure 14: Maximum flood depths at Site 5, 1% AEP +31%CC fluvial event, including a 50m defence breach at location 1, baseline site layout

4.6.4 A 50m defence breach to flood defences along the Lower Aire northern bank (Breach 2) during a 1% AEP +31%CC fluvial event, adjacent to site 5, results in significant additional flooding throughout the floodplain to the north, including across site 3 where flood depths of up to 850mm are experienced. This is presented in Figure 15.

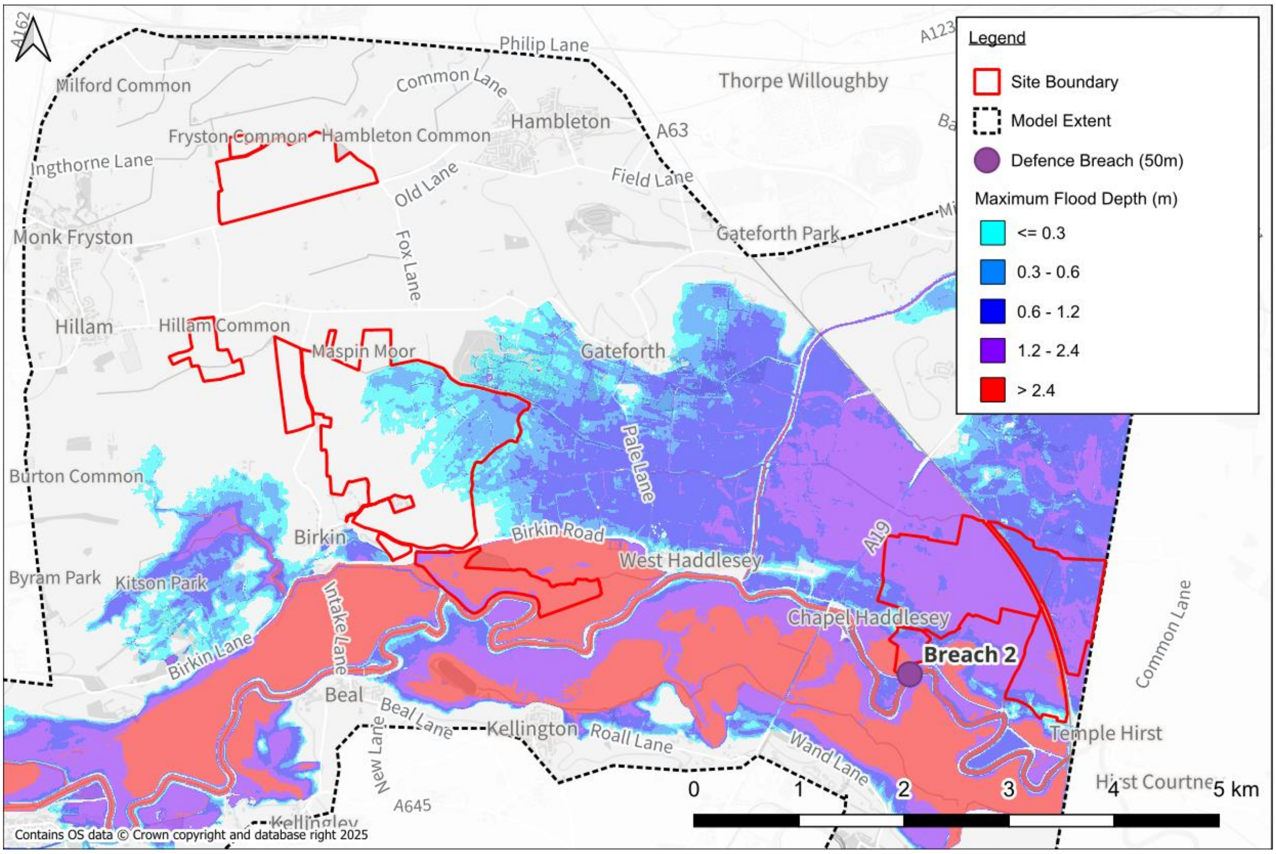

Figure 15: Maximum flood depths at Site 5, 1% AEP +31%CC fluvial event, including a 50m defence breach at location 1, baseline site layout

4.7 Sensitivity Testing

4.7.1 Sensitivity testing was undertaken on key model parameters to assess the robustness of results. The following variations were applied to the 1% AEP +30%CC simulation:

- Roughness (global): ±20%
- Downstream boundary rating curve, flows: ±20%
- Flows: uplift set to +51%/+23% in line with EA climate change allowances

4.7.2 The model outputs were not found to be particularly sensitive to roughness with only minor variations observed in peak depths (±150mm) and flood extent across much of the model. Some areas, including Site 5, experienced changes in level of up to ±300mm. Roughnesses remain unchanged from the 2017 Lower Aire Study model and are considered fit for purpose.

4.7.3 Levels throughout much of the model are shown to remain unchanged when the downstream boundary condition is adjusted. Given the proximity of the downstream boundary to Site 5, significant changes in flood depths of between -500mm and +300mm are noted. However, as discussed in Section 4.4, comparison with the level–flow relationship at the equivalent downstream bridge in the Upper Humber model confirms that the normal depth rating curve used in the Aire model is consistent with the verified hydraulic control at this location, therefore providing confidence in the baseline model outputs.

4.7.4 Increasing or decreasing the climate change uplift affects flood depths throughout the model as expected, with Sites 3 and 4 both experiencing flooding of up to 500-600mm in places when the higher climate change allowance is considered. These areas were previously flood free. Depths across Site 5 increase by between 300-580mm. Climate change parameters have been set in line with the current EA climate change allowance guidance at the time of writing.

4.7.5 Sensitivity testing indicates that model outputs respond to variations in roughness and downstream boundary assumptions, with localised changes in flood depths of several hundred millimetres. However, the adopted roughness values are consistent with those used in the EA's 2017 Lower Aire Study, and the downstream boundary condition has been shown to reflect the verified hydraulic control in the Humber system. The greatest changes arise from varying climate change uplifts, as expected. On this basis, the model configuration is considered appropriate and provides a robust foundation for assessing flood risk at Site 5.

5. 2018 Lower Ouse and Wharfe Washlands Study

5.1 Existing Model Setup

5.1.1 As supplied by the EA, the 2018 Ouse and Wharfe Washlands Study model partially covers sites 1 and 5. The Lower Ouse and Wharfe Washlands Model 2018 provides joint probability events between the River Ouse and River Wharfe, including 36 separate washlands. These are listed in full in the Ouse and Wharfe Washlands Optimisation Study report[4], published July 2018.

5.1.2 The Lower Ouse and Wharfe Washlands Model 2018 model consists of tidal-fluvial combination events with different climate change scenarios. Three scenarios were modelled and are described below and summarised in Table 8:

- Scenario A – target RP peak flows on study catchments; QMED and LMED other catchments and downstream boundary condition
- Scenario B – target RP volume flows on study catchments; QMED and LMED other catchments and downstream boundary condition
- Scenario C (tidal scenario) – QMED volume flows on study catchments; QMED other catchments and downstream boundary condition stretched to target RP

Table 8: 2018 Lower Ouse and Wharfe Washlands Model Scenario Overview

Hydrological Scenario Code	Description	Ouse, Wharfe	Study ReFH Catchments	Don, Derwent, Aire GS	Blacktoft
A	Peak flow	2015 scaled to peak flow for target RP	26-hour storm using target RP	2015 scaled to QMED	2015 stretched to LMED
B	Volume flow	2012 scaled to peak flow for target RP	51-hour storm using target RP	2012 scaled to QMED	2012 stretched to LMED
C	Tidal	2012 scaled to QMED	51-hour storm using QMED	2012 scaled to QMED	2012 stretched to LMED

[4] 343322_26_F_WashlandsModellingReport_(ForIssue)

5.1.3 Three climate change scenarios were simulated with reference to the 2016 EA publication "*Adapting to Climate Change: Advice for Flood and Coastal Erosion Risk Management Authorities*". For CC1, CC2 and CC3 scenarios respectively, the following was applied:

- River flows - the potential change for the 2080's of Central Estimate (CE, 50%ile) Higher Central (CE, 75%ile) and Upper Estimate (UE, 90%ile) for the Humber Basin have been respectively applied to scenarios CC1, CC3, and CC2.
- Tidal levels - the potential impacts using the UE scenario have been applied to CC1 and CC3 with the impacts from the H++ applied to CC2.

Further description of the climate change scenarios is provided in Table 8.

Table 9: 2018 Lower Ouse and Wharfe Washlands Model Scenarios

Short Code	Hydrological Scenario Code	Indicative AEP	Fluvial Event	Tidal Event	CC Scenario
CC1	A & B	1%	1% AEP +20%CC	LMED +1.11m	Upper end
	C	0.5%	50% AEP +20%CC	L200 +1.11m	Upper end
CC2	A & B	1%	1% AEP +50%CC	LMED +2.35m	H++
	C	0.5%	50% AEP +50%CC	L200 +2.35m	H++
CC3	A & B	1%	1% AEP +30%CC	LMED +1.11m	Upper end
	C	0.5%	50% AEP +30%CC	L200 +1.11m	Upper end

5.2 Model Setup and Updates

Table 10: Model details, methodology, and parameters

Arthian Model Reference and Version:	317690_Lower_Ouse_v1
Simulation Type:	Fluvial
Model Type:	Linked 1D-2D
Software Builds:	Flood Modeller 7.3 TUFLOW Classic 2025.1.1 *(latest builds available at the time of simulation)*

Number of Domains and Extent:	Single domain. The model extent is shown in Figure 16.
DTM Data Sources:	No changes have been made to the existing DTM data provided with the model. It is considered representative of the existing floodplain.
Cell Size:	25m – whilst relatively coarse, this is considered suitable to represent key flow paths and establish flood risk to the proposed development without significantly impacting model run times
Building Representation:	OS MasterMap data used to define land use throughout the model, including buildings. High roughness applied to all buildings to represent internal walls and contents – 0.5s/m$^{1/3}$.
Existing Flood Defences:	No changes to existing defence/bank level data within the existing model
Roughness Approach and Values:	Manning's n based on Chow (1959), survey, photographs, and aerial imagery. Land use based on OS MasterMap data. A selection of the roughnesses is provided below: Land Use Type — Roughness (s/m$^{1/3}$) General land/surface .... 0.050 Industrial land................................ 0.030 Land/gardens .... 0.050 Rough ground/scrub .... 0.075 Roads, tracks, and paths................ 0.022 Buildings .... 0.100 Inland waters................................ 0.030
Boundary Conditions:	The hydrology for the River Ouse and its tributaries was not updated as part of this assessment due to the complexity and scale of the contributing catchment. Given the nature of the proposed development (solar), this was considered proportionate. Instead, confidence in the existing inflows has been supported through sensitivity testing to account for potential uncertainty in peak flows. The 2018 Ouse and Wharfe Washlands Study model was provided with multiple hydrological scenarios (see section 5.1), considering peak flows, volume flows, and tidal influence. Initial simulations showed that scenario "B", volume flow, resulted in the highest depths at site 1 and was therefore solely considered for all subsequent simulations. The tidal boundary was applied using observed data from the Blacktoft level site approximately 1.6 km west from where it joins the River Trent and becomes the Humber. The model was updated to run the climate change scenario for the 1000-year event. Following the NPPG: Flood and Coastal Risk Projects, Schemes and Strategies: climate change allowances[5] guidance and Figure 7 below depicting Table 1 of the guidance, sea level rise uplifts for the Humber River Basin District were calculated, assuming a design life of 75 years. This totalled 944 mm (or 0.94 m) of additional sea level rise to the year 2100.

[5] https://www.gov.uk/guidance/flood-and-coastal-risk-projects-schemes-and-strategies-climate-change-allowances#sea-level-allowances

Structures:	No changes to existing structures within the model
Other DTM Adjustments:	None required.
Timestep:	1D – 3s 2D – 6s Both timesteps are unchanged from the existing EA model setup and are considered suitable given the scale and setup of the existing model.
Initial Conditions:	Initial water levels stored within the existing EA Flood Modeller network were deemed suitable and remain unchanged.
Non-Default Parameters:	No changes to parameters provided with the existing model setup
Further Comments:	See Section 2.4 Model Assumptions and Limitations for further details. Initial attempts to run the 2018 Lower Ouse and Wharfe Washlands Model were unsuccessful and convergence was poor. Two network files were provided with minimal differences to improve stability during the larger magnitude events. A persistent error when loading the “standard” river network led to the stability network being used for all simulations in this study. Frequent glitches were encountered related to TUFLOW water level lines, which were ultimately removed from the model to improve reliability.

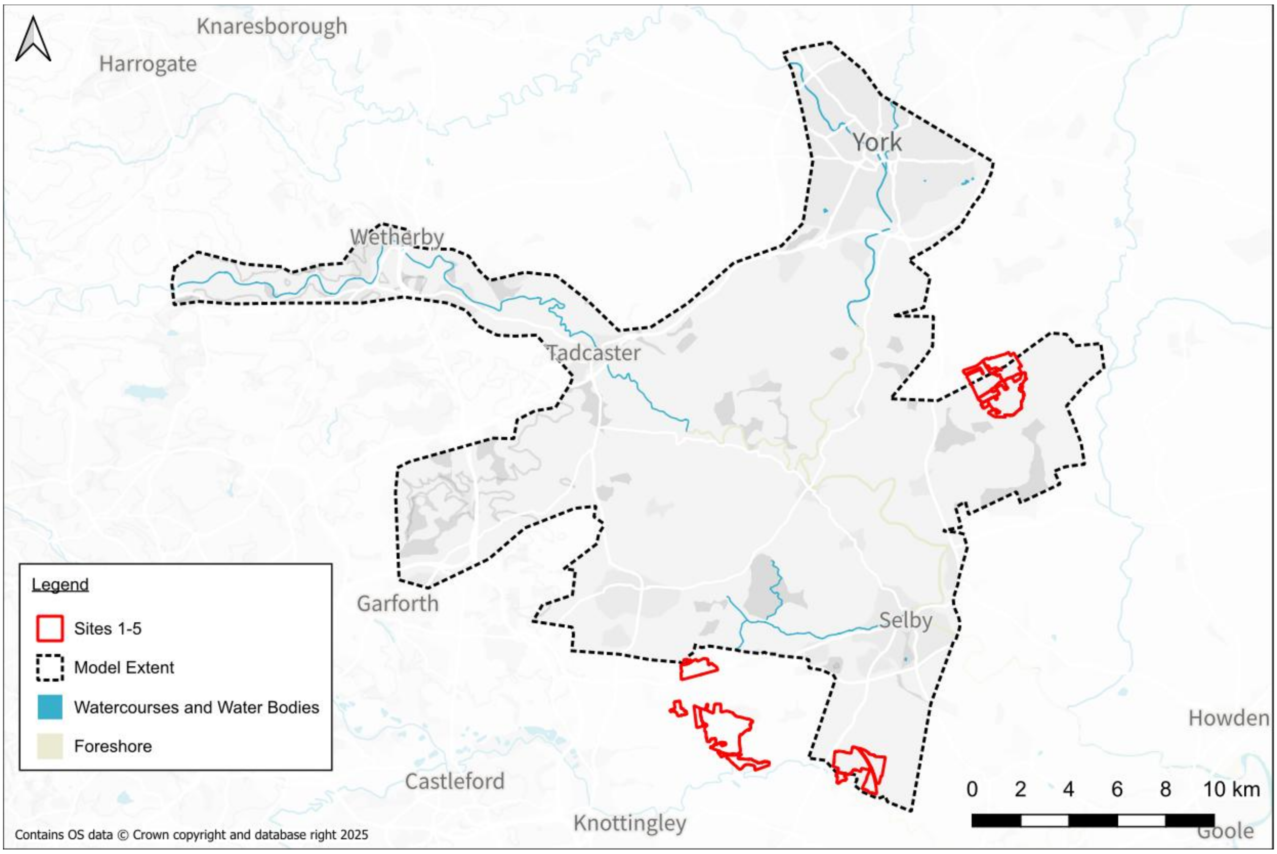

Figure 16: 2016 Lower Ouse model extent

Table 1: sea level allowances by river basin district for each epoch in mm for each year (based on a 1981 to 2000 baseline) – the total sea level rise for each epoch is in brackets

Area of England	Allowance	2000 to 2035 (mm)	2036 to 2065 (mm)	2066 to 2095 (mm)	2096 to 2125 (mm)	Cumulative rise 2000 to 2125 (metres)
Humber	Higher central	5.5 (193)	8.4 (252)	11.1 (333)	12.4 (372)	1.15
Humber	Upper end	6.7 (235)	11 (330)	15.3 (459)	17.6 (528)	1.55

Figure 17: Sea Level Rise Allowances

5.3 Simulated Flood Events and Scenarios

5.3.1 The model was used to simulate three present-day flood events: 3.3%, 1%, and 0.1% AEP. The 1% and 0.1% AEP events were also simulated with a 31% climate change uplift applied in accordance with EA guidance at the time of modelling.

5.3.2 Only the baseline (pre-development) scenario was modelled, as the proposed solar development does not involve significant changes to topography, land use, or drainage characteristics that would affect the modelled flood response. As such, the development is not expected to materially alter flood risk within the model domain.

5.4 Model Assumptions and Limitations

5.4.1 The hydraulic model has been developed using industry-standard methods in accordance with current EA guidance. Nevertheless, all models are simplifications of real-world systems, and several assumptions and limitations apply.

Model Resolution and Grid/Cell Size: The 1D cross-section spacing (average 240m, typically 80m-400m) and 2D model grid resolution (25m) are appropriate for catchment-scale flood risk assessment but will not resolve small-scale site features such as minor bunds, drains, or platform levels associated with the solar array. Interpolation between cross-sections or 2D cells may miss localised depressions or raised ground. This does not materially affect flood risk from the River Aire given the dominant flood mechanisms, but site-specific drainage or pluvial risk would require higher-resolution modelling.

Calibration Limits: The model was calibrated against four observed events, including December 2015, using a network of river level gauges along the Lower Ouse. Calibration quality is high at gauge locations and provides a good representation of floodplain behaviour. Flood levels at the solar site are derived from the hydraulics of the model and the nearest gauge data available but are still subject to the usual uncertainties inherent in any hydraulic model.

Washland Operation: The model assumes typical operation of washland sluices and pumps as represented in the 2018 study. Actual behaviour during a flood event will depend on operational rules and manual intervention. Any changes in washland management since 2018 could influence storage behaviour and therefore downstream flood levels.

Hydrological inputs: The hydrology within the model has not been re-derived for this assessment. The existing inflows are based on the 2018 Lower Ouse and Wharfe Washlands Study, which used joint-probability analysis and long-term EA gauge records to generate design hydrographs for the River Ouse and its tributaries. These flow–frequency relationships remain appropriate in 2025 for assessing fluvial risk at the site due to the large, slow-responding nature of the Ouse catchment and the extensive washland system that governs floodplain behaviour. No new gauging evidence or substantive catchment-scale changes have occurred since the 2018 study that would warrant recalculating inflows, and the EA's typical three-to-four-year hydrology refresh guidance is not generally applied to a river of this scale with stable statistical records. Sensitivity testing of inflows has been carried out to account for potential uncertainty in peak flows and demonstrates that reasonable hydrological variation does not materially alter predicted flood levels in the vicinity of the site.

5.5 Model Health and Verification

5.5.1 A review of the 2D log files shows that there are no comments, warnings or errors warranting attention.

5.5.2 Mass balance error statistics show the 2D mass balance error peaks at -3.0% upon initial wetting but drops close to 0.0% for the remainder of the simulation for all simulated events including sensitivity tests, which is considered acceptable.

5.5.3 There are no negative depths reported in any simulations.

5.6 Results Summary

5.6.1 Model results show that site 1 experiences flood depths of up to 2.0m across the lower lying areas to the south along Pallion Dike during a defended 1% AEP +31%CC event. This is presented in Figure 18.

5.6.2 Site 5 is shown to remain flood free during this event.

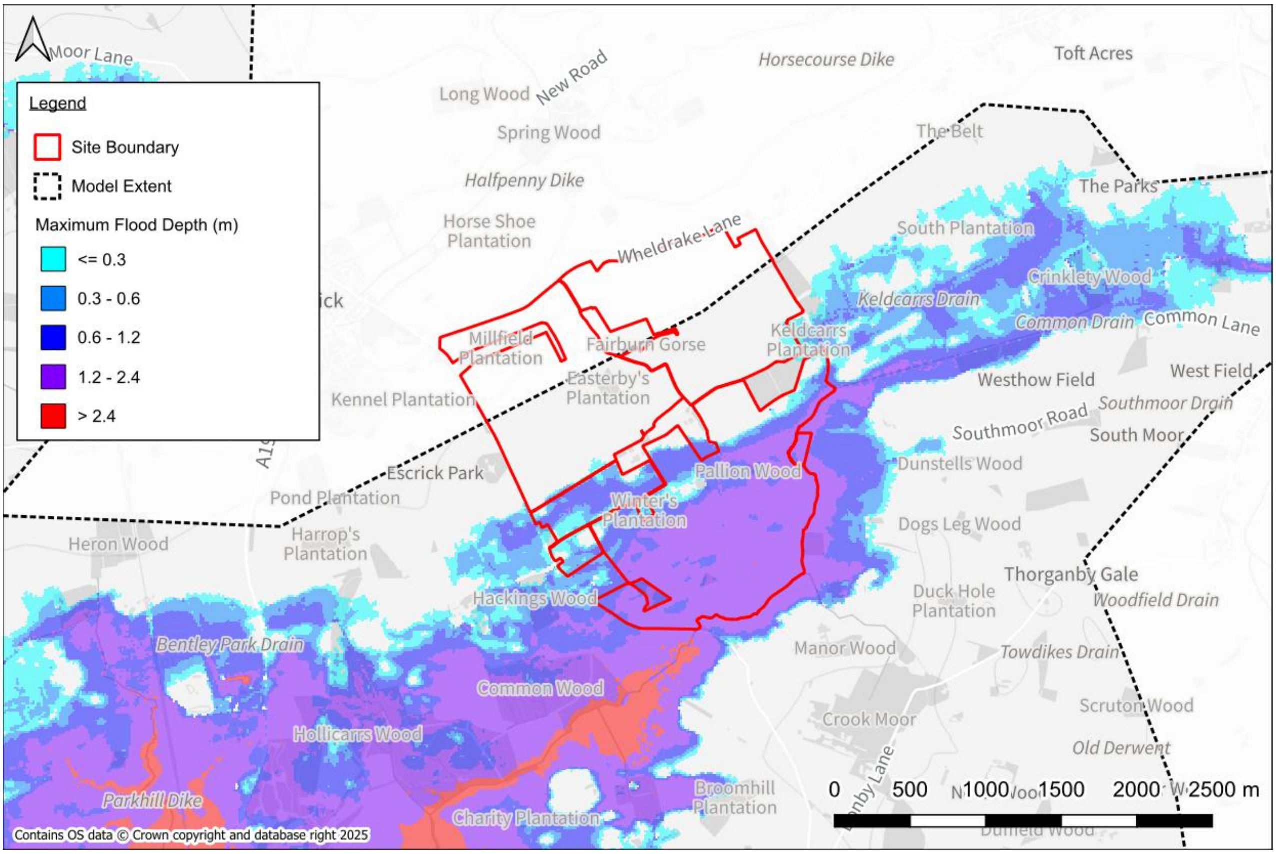

Figure 18: Maximum flood depths at Site 1, 1% AEP +31%CC fluvial event, baseline site layout

5.7 Sensitivity Testing

5.7.1 Sensitivity testing was undertaken on key model parameters to assess the robustness of results. The following variations were applied to the 1% AEP +30%CC simulation:

- Roughness (global): ±20%
- Downstream boundary slope: ±20%
- Flows: uplift set to +50%/+20% *

** The 2018 Ouse and Wharfe Washlands Study model included climate change uplifts of +20%, +30%, and +50%. The +50% simulation can be considered to represent the credible maximum scenario for the Wharfe and Lower Ouse Management Catchment, equivalent to a +48% uplift projected for the 2080s.*

5.7.2 The model outputs were found to be partially sensitive to roughness depths at Site 1 varing by between +200mm and -400mm. Roughnesses remain unchanged from the 2018 Lower Ouse and Wharfe Washlands Study and are considered representative of the existing site layout.

5.7.3 Adjusting the slope value within the downstream boundary has a minor impact on levels at Site 1, with depths varying by just over ±20mm, providing confidence in the baseline model outputs.

5.7.4 Increasing or decreasing the climate change uplift affects flood depths throughout the model as expected. Depths across Site 1 change by between +290mm and -230mm. Climate change parameters have been set in line with the current EA climate change allowance guidance at the time of writing.

5.7.5 The sensitivity testing shows that model results respond to changes in key parameters, with roughness and flow uplifts having the greatest influence on flood depths. However, the parameter ranges tested reflect those previously adopted by the EA for catchment scale modelling, and outputs remain within the range of expected behaviour. This indicates that the model setup is consistent with EA-accepted practice and provides a suitable basis for assessing flood risk at Site 1.

6. Conclusions and Recommendations

6.1 Conclusions

6.1.1 Four hydraulic models have been used or developed to inform the assessment of fluvial flood risk to the proposed solar sites:

Site 1 Model: A new direct rainfall model was built to represent Pallion Dike and its tributaries, as these watercourses were not explicitly modelled in the 2018 Lower Ouse and Wharfe Washlands Study. The 2D rainfall-driven approach, supported by topographic survey and 1 m LiDAR, captures small ungauged catchments and local paleochannels with appropriate resolution. Verification against ReFH2-derived flows and sensitivity testing demonstrates the model provides a robust representation of catchment response.

Site 2 Model: A second direct rainfall model was developed to quantify flood risk from an unnamed ditch and its contributing catchment at Site 2. The methodology mirrors Site 1, combining detailed survey and high-resolution LiDAR to capture localised flow pathways. Comparison with ReFH2 outputs and sensitivity testing confirms the model behaves consistently with expected hydrological response for a catchment of this scale.

2017 Lower Aire Study Model: The existing Lower Aire model was updated to incorporate new LiDAR (2019–2022) and extended to cover Site 2 following evidence of potential overbank flooding and defence-breach scenarios. The 2017 hydrology has been retained due to the size and stability of the Aire/Calder system and supported by sensitivity testing. The downstream boundary has been cross-checked against the Upper Humber model, confirming its suitability for assessing flood levels in the vicinity of Sites 3, 4, and 5.

2018 Lower Ouse and Wharfe Washlands Model: The existing EA strategic model was used to assess fluvial and tidal flood risk at Sites 1 and 5. No hydrological re-analysis was undertaken due to the scale of the contributing catchment and the robustness of the existing joint-probability inflows derived from long-term gauge records. The model has been run with updated climate change scenarios and sensitivity testing confirms the outputs are stable to reasonable variations in flows and boundary conditions.

6.2 Recommendations

6.2.1 The four models described in this report provide an appropriate technical basis for assessing fluvial flood risk to the proposed solar development sites. It is recommended that the outputs from the Site 1, Site 2, 2017 Lower Aire and 2018 Lower Ouse and Wharfe Washlands models are used to inform the Flood Risk Assessment prepared for the scheme.

Appendices

Appendix A- Limitations

Limitations

This report contains recommendations from Arthian, which are based on the information listed in the report and reflect the professional opinions of an experienced Environmental Consultant. Arthian obtained, reviewed, and evaluated information from the Client and others to prepare this report. The conclusions, opinions, and recommendations presented in this report are based on this information. However, Arthian does not guarantee the accuracy of the information provided and will not be held responsible for any opinions or conclusions reached based on information that is later proven to be inaccurate.

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Light Valley
Solar

W: Lightvalleysolar.co.uk
E: info@lightvalleysolar.co.uk