# Chapter 8: Hyrdology, Hyrdogeology, Flood Risk and Drainage

Preliminary Environmental Information Report

**Volume 1**

**Steeple Renewables Project**

Land at Sturton le Steeple, Nottinghamshire

# 8 Hydrology, Hydrogeology, Flood Risk and Drainage

## 8.1 Introduction

8.1.1 This chapter presents a preliminary assessment of the likely significant effects arising from the construction, operation (including maintenance) and decommissioning phases of the Proposed Development in the context of the surface water and groundwater environment. It should be read in conjunction with the following figures:

- Figure 8.1a Watercourses (East);
- Figure 8.1b Watercourses (West);
- Figure 8.2a Environment Agency Flood Zones (East);
- Figure 8.2b Environment Agency Flood Zones (West);
- Figure 8.3a Environment Agency Surface Water Flood Extents (East);
- Figure 8.3b Environment Agency Surface Water Flood Extents (West); and
- Figure 8.4 Groundwater and Surface Water Abstractions.

8.1.2 This assessment has considered potential impacts in relation to:

- Hydrology including Main Rivers and Ordinary Watercourses;
- Surface water and groundwater quality, including consideration of the Water Framework Directive (WFD);
- Hydrogeology, including impacts on groundwater abstractions and Groundwater Dependant Terrestrial Ecosystems (GWDTEs);
- Water resources with regard to water usage; and
- Flood risk from all sources.

8.1.3 Impacts on aquatic flora and fauna, including the potential effects related to the release of pollution and sediment to watercourses and the impact of culverting of watercourses on habitats and species, are addressed in Chapter 7 Ecology and Biodiversity.

8.1.4 The subsequent ES that will follow this PEIR will be supported by a Flood Risk Assessment (FRA) which is currently in preparation in consultation with the Environment Agency (EA), Nottinghamshire County Council in their role as Lead

Local Flood Authority (LLFA), Trent Valley Internal Drainage Board (IDB) and other stakeholders on flood risk and drainage. The FRA will be appended to the ES. Initial findings are discussed within this PEIR.

8.1.5 A WFD screening assessment is being developed and will be appended to the ES. Initial findings are discussed within this PEIR.

8.1.6 This assessment includes an appraisal of the effects of the Proposed Development in combination with other developments within the zone of influence of the Proposed Development.

8.1.7 Details of the lead author of this Chapter are set out in **Appendix 1.4 'EIA Statement of Competence'.**

## 8.2 Legislation and Planning Policy

### Legislation

8.2.1 Key national legislation of relevance to the water environment is set out below.

#### The Environment Act 2021

8.2.2 The Environment Act 2021 includes laws that relate to environmental protection including nature protection, water quality and clean air. It offers new powers to set new binding targets, including for air quality, water, biodiversity, and waste reduction.

#### The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017

8.2.3 The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 implemented the Water Framework Directive 2000/60/EC. The Regulations were retained in UK law after EU Exit via the EU Withdrawal Act 2018. They aim to achieve good qualitative and quantitative health for water bodies by reducing and removing pollution and by ensuring that there is enough water to support wildlife at the same time as human needs. The WFD requires a 6-yearly cycle of river basin management, with the next comprehensive update of classifications for all water bodies due in 2025. England aims to reach 'good' chemical and ecological status in inland and coastal waters by 2027 at the latest.

#### Environmental Permitting (England and Wales) Regulations 2016

8.2.4 The Environmental Permitting (England and Wales) Regulations 2016 establish a permitting structure for those activities which have the potential to cause harm to

human health or the environment. Environmental permits are required from the EA for certain industrial and waste installations, as well as for the discharge or abstraction of surface water or groundwater, and for activities on or near a Main River or flood defence that could have flood risk impacts.

### Nitrate Pollution Prevention Regulations 2015

8.2.5 These Regulations allow for the designation of land as nitrate vulnerable zones and impose annual limits on the amount of nitrogen from organic manure that may be applied to a crop in a nitrate vulnerable zone.

### Flood and Water Management Act 2010

8.2.6 The Flood and Water Management Act 2010 aims to improve flood risk management in England and Wales and ensures that flood risk responsibilities are better defined. It encourages more sustainable forms of drainage in new developments and allows for the creation of LLFAs who have responsibilities for co-ordinating the management of flood risk from local sources.

### Flood Risk Regulations 2009

8.2.7 The Flood Risk Regulations 2009 implement the EU Floods Directive 2007/60/EC. The Regulations require the LLFAs to prepare Preliminary Flood Risk Assessments, flood hazard and flood maps, and Flood Risk Management Plans.

### The Groundwater (England and Wales) Regulations 2009

8.2.8 These regulations make it an offence to cause or knowingly permit the discharge of hazardous substances or non-hazardous pollutants to groundwater unless carried out in accordance with a permit granted by the EA under these regulations.

### Control of Pollution (Oil Storage) (England) Regulations 2001

8.2.9 These regulations make requirements for the safe above ground storage of oil, including requirements for secondary containment and drip trays. Further obligations relate to pipework, fittings and pumps serving fixed and mobile oil bowsers.

### Water Resources Act 1991

8.2.10 The Water Resources Act 1991 focuses on the management of water resources, water quality and flood defence. The Act includes a definition of 'Main Rivers' and requires prior written EA consent for any works or structures in, over, under or within 8m of any watercourse designated as a Main River.

### Land Drainage Act 1991

8.2.11 The Land Drainage Act 1991 sets out the responsibilities of Local Authorities and Drainage Boards in relation to land drainage. It requires that a watercourse is maintained by its owner in such a condition that the free flow of water is not impeded.

### Water Industry Act 1991

8.2.12 This Act sets out the main powers and duties of the water and sewerage companies. The Water Act 2003 and the Water Act 2024 have modified the framework set out under the Water Industry Act 1991, including making changes to abstraction licensing, enabling greater competition within the water industry and making provisions relating to flood insurance and drainage boards.

## National Policy

### National Policy Statements

8.2.13 The National Policy Statements (NPS) comprise the Government's objectives for the development of nationally significant infrastructure in a particular sector and state. The NPSs of relevance to the project with specific reference to water-related requirements are as follows.

#### *Overarching NPS for Energy (EN-1)*

8.2.14 In relation to flood risk, this NPS sets out requirements for application of the Sequential and Exception Tests (paragraphs 5.89 to 5.8.10 and paragraphs 5.8.21 to 5.8.23), as well as a sequential approach within the application boundary (paragraph 5.8.29). It describes policy aims to make development safe for its lifetime without increasing flood risk elsewhere (taking account of climate change) and, where possible, reducing flood risk overall (paragraph 5.8.36). Specifically, there should be no net loss of floodplain storage and any deflection or constriction of flood flow routes should be safely managed within the site (paragraph 5.8.12). The NPS sets out the minimum requirements for FRAs (paragraph 5.8.15).

8.2.15 In relation to climate change, paragraph 4.10.11 of this NPS 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"***. However, it goes on to state in paragraph 4.10.12 that the credible maximum climate change scenario should be applied ***"where energy***

***infrastructure has safety critical elements"***. The NPS advises that the resilience of the Proposed Development to climate change should be assessed in the EIA, for example, the impact of increased risk of drought as a result of higher temperatures should be covered in the water quality and resources section of the EIA.

8.2.16 In relation to water quality and resources, paragraph 5.16.3 of the NPS states that **"*where the project is likely to have effects on the water environment, the applicant should undertake an assessment of the existing status of, and impacts of the proposed project on, water quality, water resources and physical characteristics of the water environment, and how this might change due to the impact of climate change on rainfall patterns and consequently water availability across the water environment*".** It sets out how existing water resources, and impacts on those resources, should be described within the EIA (paragraph 5.16.7).

8.2.17 The requirements of NPS EN-1 relating to flood risk will be addressed within the FRA supporting the ES and within a separate Sequential Test assessment. The FRA will include consideration of the Exception Test (where appropriate) and will describe the measures taken to ensure the Proposed Development will be safe without increasing flood risk elsewhere. The applicable climate change allowances will be considered within the FRA. The potential impacts of the Proposed Development on water quality and water resources, taking account of climate change, are considered in this PEIR and will be assessed in the ES.

### *NPS for Renewable Energy Infrastructure (EN-3)*

8.2.18 Paragraph 2.10.84 of this NPS states that an FRA **"*will need to consider the impact of drainage, but that as solar PV panels will drain to the existing ground, the impact will not, in general, be significant*"**. Paragraph 2.10.85 states that permeable access tracks should be used, as well as localised SuDS such as swales and infiltration trenches, to control any runoff where recommended.

8.2.19 Paragraph 2.10.86 of the NPS states that **"*sites should be configured or selected to avoid the need to impact on existing drainage systems and watercourses*"**. Paragraphs 2.10.87 to 2.10.88 state that culverting existing watercourses or drainage ditches should be avoided but where culverting is necessary for access, **"*applicants should demonstrate that no reasonable alternatives exist and where necessary will only be in place for the construction period*".**

8.2.20 Paragraph 2.10.154 of the NPS states that **"*where previous management of the site has involved intensive agricultural practice, solar sites can deliver significant ecosystem services value in the form of drainage, flood attenuation, natural wetland habitat, and water quality management*"**.

8.2.21 The FRA supporting the ES will include a surface water drainage strategy that will assess the impacts of the Proposed Development on drainage. It will describe how permeable access tracks and SuDS will be used within the Proposed Development to control runoff. The FRA will describe how consideration has been given to existing watercourses in the layout of the Proposed Development, with appropriate easements provided for these watercourses and culverting used only where necessary for access.

### *NPS for Electricity Networks Infrastructure (EN-5)*

8.2.22 In relation to climate change, paragraph 2.3.2 of this NPS requires applicants to set out how development has been designed to be resilient to flooding, **"*particularly for substations that are vital to the network, and especially in light of changes to groundwater levels as a result of climate change*"**. Paragraph 2.9.19 of the NPS states that applicants should protect as far as reasonably practicable surface and ground waters.

8.2.23 Although the proposed substation is not considered vital to the network, the FRA supporting the ES will assess the resilience of the Proposed Development to the effects of climate change in relation to all forms of flooding. The PEIR and ES will describe how surface water and groundwater resources will be protected through the use of suitable mitigation.

## Local Policy

### Bassetlaw Local Plan

8.2.24 The Bassetlaw Local Plan was adopted on the 29th May 2024. It contains the following key policies of relevance to this chapter:

- Policy ST50: Flood Risk and Drainage - requires developments to be supported by a FRA which demonstrates that the development will be safe for its lifetime, without increasing flood risk elsewhere and where possible will reduce flood risk overall. Where relevant, proposals must pass the Sequential Test and where appropriate the Exceptions Test. All development where practicable should incorporate SuDS in line with national standards; and

- Policy ST51: Protecting Water Quality and Management - seeks to ***"minimise the impact of development on the quality of surface water and the Sherwood Sandstone Principal Aquifer and its ground source protection zones. Surface water flows from areas like car parks or service yards should have appropriate pollution prevention measures built in to protect groundwater and watercourses from pollutants. Proposals that improve or enhance existing waterbodies will be supported. All proposals must ensure that appropriate infrastructure for water supply, sewerage and sewage treatment, is available or can be made available at the right time to meet the needs of the development".***

## 8.3 Assessment Methodology

8.3.1 The purpose of the PEIR Chapter is to provide preliminary information with respect to:

- Identifying the hydrological, hydrogeological and flood risk baseline for the Site;
- Assessing the potential effect of the Proposed Development on the identified baseline environment;
- Proposing suitable mitigation for the reduction of any significant effects;
- Presenting the predicted residual effects; and
- Identifying any cumulative effects.

8.3.2 The zone of influence for impacts on surface water and groundwater is considered to be 1km due to the significant reduction in magnitude of impacts beyond this distance due to dilution / dispersion of contaminants and deposition of silts. Similarly for flood risk, significant effects are unlikely to be observed more than 1km from the cause of increased risk, due to the effect of floodwater spreading out across a flood envelope, with the impacts quickly reducing in magnitude towards the edge of the flood extent. This approach is consistent with the advice in the Department of Transport's Design Manual for Roads and Bridges which states ***"for assessment of impacts associated with soluble pollutants, outfalls within 1km (measured along the watercourse) shall be aggregated for purposes of cumulative assessment"*** (paragraph 3.11, document LA113[1]). This is a generalised

[1] Highways England, Design Manual for Roads and Bridges, LA113: road drainage and the water environment, March 2020

approach, however more specific assessment may indicate a much-reduced zone of influence, for example when considering areas up-gradient of the Site, within separate hydrological catchments, or from a hydrogeological perspective when located on low permeability geology.

8.3.3 The baseline assessment includes a review of the following data:

- EA flood mapping datasets, including fluvial / tidal Flood Map for Planning, Surface Water Flood Risk mapping and Reservoir flood risk mapping;
- Ordnance Survey (OS) mapping;
- Defra's Catchment Data Explorer platform;
- British Geological Survey (BGS) mapping;
- Defra's MAGIC maps;
- Modelled flood data from the EA (fluvial / tidal sources);
- Mapping and data relating to surface water flood risk, reservoir flood risk, groundwater flood risk and other sources of flooding from the LLFA and IDB;
- Details of any historical flood events obtained from the EA, LLFA and IDB;
- Details of nearby surface water abstractions (public and private) obtained from the EA, the LLFA and / or a third party data provider (e.g. Envirocheck); and
- Local Authority Surface Water Management Plan and Strategic Flood Risk Assessment.

8.3.4 A targeted visual inspection of key hydrological features was undertaken in July 2024 focussing on the main watercourses within the study area, existing flood defences, areas where historical flooding has been reported and locations with infrastructure proposed within the flood zones.

8.3.5 An FRA is currently being prepared and will be appended to the ES that will follow this PEIR. The FRA will be prepared in accordance with the requirements of the relevant National Policy Statements. This will include a review of the above data sources, an assessment of the flood risk to the Proposed Development from all flooding sources (including consideration of climate change), and identification of any mitigation measures required to ensure the Proposed Development will be safe, will remain operational during a design flood event, and will not result in an increase in flood risk elsewhere.

8.3.6 Following consultation with the EA, the FRA will include consideration of a breach of the flood defences, an assessment of the flood risk from the Ordinary Watercourses crossing the Site (these watercourses are not included in the EA flood models) and a high level assessment of any displacement of floodwater resulting from development within the Flood Zones.

8.3.7 The FRA will include a Surface Water Drainage Strategy based on the use of SuDS, which will demonstrate how surface water runoff from the Proposed Development will be managed.

8.3.8 Assessing the environmental impacts of an NSIP requires consideration of how a site was selected for development and how any alternatives to the Proposed Development were reviewed. National policy on NSIPs also requires an explanation of alternatives considered when a proposal involves development of a site in a flood zone. These are both processes that continue through the life of an application culminating in a final body of assessment material upon which a recommendation is made by the Examining Authority and a decision is made by the Secretary of State. The subsequent ES will demonstrate how a wide range of factors, including flood risk, were considered by the Applicant in identifying a site for development and then how through an iterative design process the Proposed Development has been formulated and assessment made of the likely impacts, including on site flood risks, can be minimised and mitigated.

8.3.9 The Sequential Test will be submitted in support of the FRA and the Exception Test will form part of the FRA. Further details will be made available within the subsequent ES.

8.3.10 A WFD Screening Assessment is being prepared in consultation with the EA, in accordance with the guidance in Nationally Significant Infrastructure Projects - Advice Note Eighteen: the Water Framework Directive. This will form an appendix to the ES. The Screening Assessment will identify any WFD waterbodies that could be impacted by the Proposed Development and will determine whether any activities associated with the Proposed Development require further consideration through subsequent stages of WFD assessment.

8.3.11 The EIA methodology includes consultation with the EA for further details of the modelled flood levels and floodplain extents within the Site and for data regarding flood risk from non-fluvial sources (e.g. surface water, reservoir flooding). The Lead

Local Flood Authority (LLFA) (Nottinghamshire County Council) has been consulted for details of any Ordinary Watercourses within the study area, details of flood risk from surface water and groundwater, details of any historical flood events and records of any surface water abstractions. Trent Valley IDB has been consulted regarding any issues or constraints associated with the Ordinary Watercourses within their control. Initial consultation responses are discussed within this PEIR.

8.3.12 The assessment of impacts and identification of appropriate mitigation is based on experience of similar projects and professional judgement. Reference is made to the following guidance / best practice:

- Department of Transport's Design Manual for Roads and Bridges Volume 11, Section 3, Part 10[2];
- The CIRIA SuDS Manual C753[3];
- Defra's Non-Statutory National Standards for Sustainable Drainage Systems[4];
- Planning Practice Guidance – Flood Risk and Coastal Change[5];
- EA 'Flood risk assessments: climate change allowances' guidance[6]; and
- EA 'Flood risk assessment: flood zones 1, 2, 3 and 3b' guidance[7];
- EA and Defra 'Oil Storage Regulations for Businesses' guidance[8]; and
- EA Pollution Prevention Guidance Notes[9] (withdrawn from use in 2015 but still considered to contain useful advice on best practice in the absence of any replacement 'good practice' guidance);

[2] Department of Transport, Design Manual for Roads and Bridges https://www.standardsforhighways.co.uk/dmrb
[3] CIRIA, The SuDS Manual (C753), December 2015
[4] Department for Environment, Food and Rural Affairs, Sustainable Drainage Systems – Non-Statutory technical standards for sustainable drainage systems, March 2015
[5] Communities and Local Government, 'Planning Practice Guidance - Flood Risk and Coastal Change, ID 7', published March 2014 and last updated August 2022
[6] Environment Agency, 'Flood risk assessments: climate change allowances', published February 2016 and last updated May 2022
[7] Environment Agency, Flood risk assessment: flood zones 1, 2, 3 and 3b', published May 2024, last updated July 2024
[8] Environment Agency and Defra, 'Oil storage regulations for businesses', published May 2015 and last updated May 2023
[9] https://webarchive.nationalarchives.gov.uk/ukgwa/20140328090931/http://www.environment-agency.gov.uk/business/topics/pollution/39083.aspx

8.3.13 The assessment of effects assumes that the relevant embedded mitigation and standard good practice measures and any applicable consents / permits are in place before assessing the potential effects of the Proposed Development. The assessment is based on a source-pathway-receptor methodology, where the sensitivity of the receptors and the magnitude of change upon those receptors is identified within the study area. The significance of the likely effects of the Proposed Development has been classified by taking into account the sensitivity of receptors and the magnitude of the effect on them.

8.3.14 Likely significant effects within this chapter pertain to those effects identified as comprising moderate or major significance.

8.3.15 The assessment uses standard criteria to describe the sensitivity/importance of the existing receptor that may be impacted (**Table 8.1**) and definitions of the magnitude of envisaged effects (**Table 8.2**). The significance matrix is set out in **Table 8.3**.

*Table 8.1 Sensitivity / importance of the water environment*

| Receptor Sensitivity / Importance | Description |
|---|---|
| High | • Area of international designations i.e. Ramsar site, Special Protection Areas (SPAs) and Special Areas of Conservation (SACs).<br>• Area of national and regional importance i.e. Site of Special Scientific Interest (SSSI) and National Nature Reserves (NNR).<br>• A waterbody which is of high or good ecological status and highly sensitive to change.<br>• EA designated Main Rivers.<br>• Areas of high surface water flood risk or critical drainage areas.<br>• EA groundwater Source Protection Zone 1 – inner protection zone and EA defined highly vulnerable Principal Aquifers.<br>• Areas of Flood Zone 3a and 3b (high fluvial flood risk and the functional floodplain).<br>• Water sensitive and 'highly vulnerable' developments in the area.<br>• Local flood defences/flood storage areas/major schemes necessary to protect highly vulnerable development in the area. |
| Medium | • Non-statutory sites of regional importance designated for water dependent ecosystems.<br>• A waterbody of moderate ecological status and moderately sensitive to change.<br>• EA designated Ordinary Watercourses.<br>• Areas of medium surface water flood risk.<br>• EA Groundwater Source Protection Zone 2 – outer protection zone and EA defined Secondary Aquifers.<br>• Areas of Flood Zone 2 (medium fluvial flood risk).<br>• 'More vulnerable' developments in the area.<br>• Local flood defences/flood storage areas/schemes necessary to protect 'more vulnerable' development in the area. |
| Low | • Areas of local importance which are not formally designated. |

| Receptor Sensitivity / Importance | Description |
|---|---|
| | • A waterbody of poor ecological status with little sensitivity to change.<br>• Minor local drainage networks or land drains.<br>• Areas of low surface water flood risk.<br>• EA groundwater Source Protection Zone 3 – total catchment protection zone and EA defined Unproductive Strata.<br>• Areas of Flood Zone 1 (low fluvial flood risk).<br>• 'Less vulnerable' and 'water compatible' development.<br>• Local embankments for minor drains. |
| Negligible | • A water resource with little or no interest or value. |

8.3.16 Once the sensitivity of the identified receptor has been established, the magnitude of the impact is determined. The nature and characteristics of impacts are described to enable their magnitude to be determined. The nature of the impacts is expressed as:

- Adverse: detrimental or negative impacts on an environmental resource or receptor;
- Beneficial: advantageous or positive impact on an environmental resource or receptor; or
- Neutral: an impact on a resource/receptor of insufficient magnitude to affect the use/integrity.

8.3.17 The magnitude of any identified adverse or beneficial impacts is assessed using the criteria described in **Table 8.2**.

*Table 8.2 Magnitude of Impact*

| Magnitude | Definition |
|---|---|
| High | Total loss or major alteration to key elements of features of the baseline conditions to the extent that post-development character or composition of baseline conditions will be fundamentally changed. |

| Magnitude | Definition |
|---|---|
| Medium | Loss or alteration to one or more key elements/features of the baseline conditions to the extent that post-development character or composition of the baseline conditions will be materially changed. |
| Low | Minor shift away from baseline conditions. Changes arising will be detectable but not material; the underlying character or composition of the baseline conditions will be similar to the pre-development situation. |
| Negligible | Very little change from baseline conditions. Change is barely distinguishable, approximating to a 'no change' situation. |

8.3.18 **Table 8.3** illustrates the Significance of Effect. The shaded boxes indicate effects considered significant in current EIA regulations.

*Table 8.3 Significance of effect*

| Magnitude | Sensitivity / Importance | | | |
|---|---|---|---|---|
| | **High** | **Medium** | **Low** | **Negligible** |
| **High** | Major | Moderate | Minor | Minor |
| **Medium** | Moderate | Moderate | Minor | Negligible |
| **Low** | Minor | Minor | Negligible | Negligible |
| **Negligible** | Minor | Negligible | Negligible | Negligible |

## 8.4 Assessment Assumptions and Limitations

8.4.1 Analysis of flood extents is dependent on the accuracy of the EA Flood Map and the flood model outputs provided by the EA. The EA has confirmed (on 11th December 2024 via email – **see Table 8.4** below) that their modelling represents the best available data and is appropriate to support the assessment of flood risk.

## 8.5 Stakeholder Engagement

8.5.1 **Table 8.4** details the stakeholder engagement undertaken to date, key points raised and how these have been addressed.

*Table 8.4 Stakeholder engagement*

| Stakeholder | Date & Method | Key Points Discussed | Action Taken |
|---|---|---|---|
| Anglian Water (AW) | 03.06.24 Scoping Opinion | Location and nature of existing water supply infrastructure to be identified and protected. Diversions to be avoided if possible.<br><br>Need to set out in detail how the project will be supplied with water and if new connections to network required. Consider impacts of climate change on water availability.<br><br>AW would advise whether new supplies (if required) are feasible. Applicant to submit water resources assessment setting out daily demand and nature of use for each stage of the project.<br><br>AW would welcome the use of SuDS or rainwater harvesting for non-potable uses (construction and operation).<br><br>CEMP to include steps to remove risk of damage to AW assets. | Proposed Development layout takes account of existing infrastructure.<br><br>ES will detail water usage and identify a water source for all stages of Proposed Development.<br><br>Drainage strategy, including any SuDS / rainwater harvesting, to be included in FRA.<br><br>Outline CEMP to include measures to avoid damage to AW assets, final CEMP to be secured post-consent. |
| Nottinghamshire Fire and Rescue Service | 03.06.24 Scoping Opinion | Require details of fire suppression system. Calculations for sufficient water supply to be undertaken by competent person taking account of risk and duration of fire. As a minimum, hydrant supplies should be capable of delivering no less than 1,900 litres per minute for at least 2 hours. This may be increased dependent on location of facility and ability of fire and rescue services to bring | Fire safety arrangements to be detailed in |

| Stakeholder | Date & Method | Key Points Discussed | Action Taken |
|---|---|---|---|
| | | supplementary supplies in a timely fashion.<br><br>Storage and management of runoff to be considered. Sites in flood zones to have details of flood protection or mitigation measures. | |
| Canal and River Trust (CRT) | 03.06.24 Scoping Opinion | Consideration to be given to any changes in drainage to the River Trent. Consider impact of any increase in discharge to the river / new outfalls on passing boat traffic. | Drainage arrangements to be detailed in FRA. No new outfalls anticipated to River Trent. |
| Nottinghamshire County Council | 03.06.24 Scoping Opinion | LLFA support the preparation of an FRA and Surface Water Drainage Strategy for the operation phase and the scoping in of flood risk during the construction phase. | Flood risk and drainage addressed in PEIR, FRA and ES. |
| Planning Inspectorate | 03.06.24 Scoping Opinion | Potential for drilling fluid break out to impact watercourses noted.<br><br>ES should include details of location of bridge / culvert structures and include sufficient detail to assess effects on watercourse hydraulics.<br><br>Impacts on surface water and groundwater resources through abstraction at the construction phase can be scoped out subject to confirmation of the need for and scale of any abstraction.<br><br>Hydrology impacts on Clarborough Tunnel SSSI can be scoped out if supported by sufficient baseline evidence.<br><br>Pollutant release to groundwater during construction / | Drilling fluid breakout addressed in Outline CEMP (final CEMP to be secured post-consent).<br><br>Bridge / culvert structures to be identified in FRA with consideration of effect on hydrology of watercourses.<br><br>Need for abstraction during construction phase to be addressed in ES.<br><br>Evidence in relation to hydrology impacts on Clarborough Tunnel SSSI detailed in PEIR.<br><br>Phase 1 Geoenvironmental Desk Study Report to address potential pollutant linkages. |

| Stakeholder | Date & Method | Key Points Discussed | Action Taken |
|---|---|---|---|
| | | decommissioning can be scoped out if evidence (e.g. Phase 1 Contaminated Land Report) is provided showing that there is an absence of contaminated land and no likelihood of any pathway being created.<br><br>Impact of construction works on groundwater flow can be scoped out, subject to further information being provided in the ES.<br><br>Impacts on surface water and groundwater resources through abstraction at the operational phase can be scoped out.<br><br>Impact on groundwater quality during the operational phase can be scoped out.<br><br>Impact of subsurface structures on groundwater flow can be scoped out, subject to provision of evidence that foundations, piles or underground pipes will not impact on groundwater flow.<br><br>ES should include assessment of impacts from construction compounds on the water environment and how any mitigation will be secured.<br><br>ES should consider how the steel poles supporting the solar panels could impact drainage patterns within the Site, in addition to any changes in surface water runoff from the panels. | Impact of construction works on groundwater flow addressed in this PEIR.<br><br>Although PINS agreed to scope out operational phase abstractions, further information will be provided in the ES due to concerns raised by AW and the EA.<br><br>Impact of subsurface structures on groundwater flow addressed in PEIR and to be discussed in ES.<br><br>Impact of construction compounds on water environment discussed in PEIR and ES.<br><br>Changes to drainage patterns and surface water runoff to be addressed in the FRA.<br><br>Flood Zones 3a and 3b to be differentiated in the FRA.<br><br>Impact on WFD waterbodies during construction and decommissioning to be addressed in WFD Assessment.<br><br>Study area defined in PEIR.<br><br>Design of SuDS to be addressed in FRA.<br><br>Impacts from trenchless HDD discussed in ES and further details provided in drilling fluid breakout plan that will form part of the |

| Stakeholder | Date & Method | Key Points Discussed | Action Taken |
|---|---|---|---|
| | | ES should differentiate between Flood Zones 3a and 3b.<br><br>ES should include assessment of the potential impact of the Proposed Development on WFD waterbodies from construction and decommissioning.<br><br>ES should clearly define the study area based on the zone of influence, hydrology and potential for significant effects, following consultation with relevant consultation bodies.<br><br>Design of SuDS to be informed by relevant current climate change allowances for the lifetime of the development.<br><br>ES should assess impacts from trenchless HDD, drilling fluid breakout plan should be submitted.<br><br>Assessment of floodplain loss and floodplain compensation required, including consideration of solar panel mountings.<br><br>Any 'essential infrastructure' should be designed to remain operational and safe in times of flood and throughout the lifetime of the development, taking account of climate change.<br><br>Possibility for enhancement by providing SuDS features to reduce the known risk of flooding in Sturton le Steeple is noted. | Outline CEMP (final CEMP secured via DCO requirement).<br><br>Floodplain loss, floodplain compensation and flood mitigation measures to be addressed in FRA.<br><br>Possibility of flood reduction to Sturton le Steeple to be discussed in ES and FRA.<br><br>Management of routine emissions, accidental releases and land management during operational phase detailed in outline OEMP / Soil Management Plan / Battery Safety Management Plan and discussed in ES.<br><br>Outline DEMP to be submitted with application, final DEMP to be secured post-consent.<br><br>Flood mitigation measures to be discussed with consultees and detailed in FRA. |

| Stakeholder | Date & Method | Key Points Discussed | Action Taken |
|---|---|---|---|
| | | ES should explain why operational phase would not result in routine emissions of chemicals or sediment and how emergency releases would be managed within an Operation Environment Management Plan (OEMP) and/or Soil Management Plan and Battery Safety Management Plan.<br><br>Mitigation measures relating to land management should be contained in the OEMP or equivalent plan and the drainage strategy.<br><br>A Decommissioning Environmental Management Plan (DEMP) should be produced and implemented to manage decommissioning activities.<br><br>Design and mitigation measures for flood risk should be agreed with the EA, LLFA and IDB and cross-reference should be made to relevant information in the FRA. | |
| Environment Agency National Infrastructure Team | 22.06.24<br><br>Meeting (online video conference call) | The EA was advised that solar infrastructure was proposed within fluvial Flood Zone 3. The EA was in acceptance of this in principle, subject to further details of flood risk assessment and mitigation. The EA requested that sensitive equipment be raised 300mm above the 'design' 1 in 100 year plus climate change flood level and that consideration be given to sensitivity testing for greater climate change and breach flooding scenarios. The EA | Details of flood mitigation to be included in FRA.<br><br>Consideration of relevant climate change scenarios and breach events to be discussed in FRA.<br><br>High level assessment of flood risk from Catchwater Drain and Mother Drain to be included in FRA. |

| Stakeholder | Date & Method | Key Points Discussed | Action Taken |
|---|---|---|---|
| | | requested that a high-level assessment is undertaken of the flood risk from the Catchwater Drain and Mother Drain as these are not included in the EA's River Trent flood model. The EA requested a high-level assessment of any displacement of floodwater. | High level assessment of displacement of floodwater to be included in FRA. |
| Environment Agency National Infrastructure Team | 06.08.24<br>Scoping Opinion | WFD assessment should include potential impacts to on-site watercourses from e.g. sediment pollution and potential to impact hydrologically linked watercourses.<br>River crossings (bridges, culverts and buried cables) should have geomorphologically robust designs that will have minimal impacts on natural fluvial processes operating in the river / floodplain.<br>Any development on the River Trent or its floodplain should be designed to have minimal impact on natural river dynamics and should not restrict future river restoration projects.<br>Infrastructure developments should take account of the likelihood for increased lateral and vertical river dynamics resulting from continued hydro-climatic intensification (i.e. flood-proofed designs that are not just based on present-day baseline geomorphological configuration / behaviour). | Impact on WFD watercourses to be included in WFD Assessment.<br>Impact of river crossings on natural fluvial processes to be discussed in FRA and ES.<br>Impact of Proposed Development on river dynamics discussed in PEIR and ES.<br>Sequential Test to be submitted, and sequential approach and Exception Test to be detailed in FRA.<br>Floodplain compensation requirements to be assessed within FRA.<br>Flood risk from Ordinary Watercourses to be assessed in FRA.<br>Appropriate climate change scenarios to be considered in FRA.<br>FRA to detail whether site will remain operational during a flood and access / egress arrangements. |

| Stakeholder | Date & Method | Key Points Discussed | Action Taken |
|---|---|---|---|
| | | The Sequential Test will need to be passed and a Sequential Approach taken within the boundary with critical infrastructure positioned in Flood Zone 1. If solar panels are positioned in Flood Zones 2 / 3, the Exception Test will need to be applied.<br><br>Built development within the floodplain should be quantified to establish the need for compensatory flood storage.<br><br>Consideration should be given to the flood risk from the Ordinary Watercourses crossing the Site.<br><br>A 1 in 100 year fluvial flood event using the 2080s epoch higher central climate change allowance (39%) should be used as the design flood event, with panels and equipment raised 300mm above this level.<br><br>A Credible Maximum scenario should also be considered, with proposals able to be adapted over their lifetime to this level (62%) climate change.<br><br>Confirmation required of whether the Site will remain operational and staff will remain on Site during a flood event. Consideration should be given to access and egress during a flood event.<br><br>The FRA should include a comparison of the published flood zones with the undefended 1 in 100 year and 1 in 1000 year model | FRA to consider undefended, defended and breach flooding scenarios.<br><br>Potential for ground contamination to be addressed in Phase 1 Geoenvironmental Desk Study.<br><br>Details of private abstractions included in PEIR and ES.<br><br>HDD impacts to be detailed in ES, and drilling fluid breakout plan (forming part of the Outline CEMP), and CEMP itself (final CEMP secured via DCO requirement) to be submitted.<br><br>Measures for controlling runoff, including fire fighting water, to be detailed in FRA.<br><br>Surface water usage during construction and operation phases to be discussed in ES. |

| Stakeholder | Date & Method | Key Points Discussed | Action Taken |
|---|---|---|---|
| | | outputs. Defended scenarios with appropriate climate change allowances can then be used in further detailed assessment.<br><br>The EA hold records of historical flooding in this location in 1932, 1947, 1977 and 2000.<br><br>It would be sensible to consider the residual risk to the development in the event of a breach of the Trent embankments. This would not be used as a design scenario but would help to understand the resilience of the development in a breach scenario.<br><br>Evidence should be provided of historical site uses and the potential for ground contamination.<br><br>The potential for shallow groundwater beneath the Site is noted.<br><br>The baseline assessment should include details of private groundwater abstractions.<br><br>CEMP should include risk assessment for use of drilling muds during HDD and any risk to controlled waters. Drilling fluid breakout plan also required for HDD.<br><br>Consideration should be given to the impacts on groundwater and surface water from the escape of firewater / foam in the BESS area and the measures required for containing and managing runoff | |

| Stakeholder | Date & Method | Key Points Discussed | Action Taken |
|---|---|---|---|
| | | (multiple layers of protection recommended).<br><br>Consumptive uses of surface water during construction and operation to be scoped into the EIA. | |
| Nottinghamshire County Council Lead Local Flood Authority | 02.08.24 | The Applicant approached the LLFA to consult it on watercourse easements, flood modelling for Ordinary Watercourses, approach to managing surface water flood risk and creation of new drainage ditches.<br><br>**Response awaited**. | A 5m easement has been allowed for Ordinary Watercourses in accordance with initial advice from the LLFA.<br><br>Modelling of key Ordinary Watercourses has been discussed with the EA and will be described within the FRA.<br><br>A sequential approach has been taken to the location of sensitive equipment outside the high surface water flood risk areas, this will be discussed within the FRA. Creation of any new ditches will be in accordance with best practice and any advice received from the EA, IDB or LLFA (responses currently awaited). |
| Trent Valley Internal Drainage Board | 02.08.24 | The Applicant approached the IDB to consult it on management of IDB watercourses, flood modelling for IDB watercourses, flood records, abstractions and creation of new drainage ditches.<br><br>**Response awaited.** | The FRA will take account of the IDB Byelaws and will respond to any additional comments provided by the IDB (currently awaited). Details of abstractions have already been provided by the EA and Bassetlaw District Council. |

| Stakeholder | Date & Method | Key Points Discussed | Action Taken |
|---|---|---|---|
| Sturton le Steeple Parish Council | 02.08.24 | The Applicant approached the Parish Council to consult it on any records of flooding, proposed drainage improvements in Sturton le Steeple, ownership of watercourses in Sturton le Steeple and abstraction records.<br><br>**Response awaited.** | The FRA will respond to any comments provided by the Parish Council (currently awaited). Details of abstractions have already been provided by the EA and Bassetlaw District Council. |
| **Environment Agency National Infrastructure Team** | 11.12.24<br><br>Email correspondence | The EA confirmed that the 1 in 100 year plus 23% climate change event (represented conservatively by the 1 in 100 year plus 29% climate change event, in the absence of specific data for the 23% climate change scenario) is an appropriate design flood event.<br><br>For the decommissioning phase, any works beyond 2070 will require reference and assessment of the Higher Central climate change allowance for the 2080s epoch as a sensitivity test rather than a design event.<br><br>The EA confirmed that the Credible Maximum climate change scenario did not need to be applied.<br><br>Breach flood data for Breach Location 29 should be considered with regard to the residual risk to the Proposed Development. | The FRA will take into account the EA's comments regarding appropriate climate change allowances and consideration of the breach flood event. |

## 8.6 Baseline Conditions

### Scope

8.6.1 A baseline assessment has been undertaken for the Site including a chosen buffer of 1km based on the likely zone of influence for hydrological, hydrogeological and flood risk impacts as discussed in the Assessment Methodology.

## Topography

8.6.2 Reference to Ordnance Survey (OS) mapping and the topographic survey (**Figure 3.2**) confirms that the Site generally slopes from west to east, towards the River Trent. Levels along the eastern boundary are at approximately 3m AOD, rising gradually westwards towards the village of Sturton le Steeple at approximately 10m AOD, then rising more steeply to high ground at approximately 75m AOD along the western boundary. A vegetated earth bund (flood defence) runs along the eastern Site boundary with a crest level of approximately 7m AOD and a height 3-4m above adjacent land.

## Hydrology

8.6.3 OS mapping and the EA's web-based mapping indicates that the nearest EA Main River is the River Trent which runs along the eastern Site boundary. It flows in a northerly direction, eventually discharging into the Humber Estuary at Blacktoft Sands approximately 38km north of the Site. A large flood storage area is located on the River Trent approximately 3km north (downstream) of the Site, to the west of Gainsborough.

8.6.4 OS mapping also identifies a number of Ordinary Watercourses crossing the Site, as shown in **Figures 8.1a and 8.1b**. The EA categorise these watercourses as primary, secondary and tertiary rivers. Primary watercourses consist of Main Rivers and major Ordinary Watercourses, secondary watercourses consist of smaller Ordinary Watercourses, and tertiary watercourses comprise drainage ditches and Ordinary Watercourses receiving limited flows. Two primary rivers are shown within the Site. The first is the Catchwater Drain which flows from south to north through the eastern part of the Site, discharging to the River Trent approximately 1km to the northeast of the Site. The second is the Mother Drain which flows from south to north just within the southeastern Site boundary, also discharging into the River Trent to the northeast of the Site. A significant number of unnamed secondary and tertiary watercourses pass through the Site, generally flowing from west to east, and discharging into the Catchwater Drain or the Mother Drain. Many of these were noted as dry during the site visit, which was undertaken on a dry sunny day.

8.6.5 The Ordinary Watercourses in the eastern half of the Site, including and to the east of the Catchwater Drain, are managed by the Trent Valley IDB. Those Ordinary Watercourses that do not fall under the IDB's jurisdiction are the responsibility of

Nottinghamshire County Council, the LLFA. The River Trent (Main River) falls within the EA's control.

### Geology

8.6.6 Based on published geological records for the area (BGS online mapping), the eastern part of the Site between the Catchment Drain and the River Trent is underlain by Alluvium (clay, silt, sand and gravel) and River Terrace Deposits. A small, isolated area of Till is located in the northeast of the Site. The western part of the Site has limited linear areas of Head deposits in the vicinity of Springs Lane and along Oswald Beck. The bedrock geology for the whole Site is recorded as Mercia Mudstone Group (mudstone, siltstone and sandstone).

### Hydrogeology

8.6.7 Hydrogeological information was obtained from the online Magic Maps service. These maps indicate that the Alluvium and River Terrace Deposits are classified as a Secondary A superficial aquifer. The pockets of Till and Head deposits are classified as a Secondary (Undifferentiated) aquifer. The bedrock geology is classified as a Secondary B aquifer.

8.6.8 Defra's MAGIC maps confirm that the Site is not located within 1km of a groundwater Source Protection Zone or within 1km of a Drinking Water Safeguard Zone (surface water or groundwater). However, the eastern part of the Site (land lying east of the Catchwater Drain) falls within a Drinking Water Protected Area. These are defined as locations where raw water is abstracted for human consumption providing, on average, more than 10 cubic metres per day, or serving more than 50 persons, or is intended for such future use.

8.6.9 The following publicly available BGS borehole records have been reviewed for the Site and its immediate surrounds:

- Boreholes reference SK78 SE52 and SK78SE53 respectively, both located in Sturton le Steeple village centre, recorded groundwater with a rest level of 1.8m and 4.8m below ground level respectively;
- Borehole reference SK88SW37 located to the south of Littleborough Road in the eastern part of the Site recorded groundwater at 1.05m below ground level;
- Borehole reference SK78SE50 located approximately 250m northwest of the Site recorded groundwater at a depth of approximately 37m below ground level; and

- Borehole reference SK78NE35 located at West Burton Power Station immediately to the north of the Site recorded groundwater with a rest level of 80m below ground level.

8.6.10 The significant variation in groundwater levels across the Site is consistent with the varying geology, with absent or deep groundwater in those areas directly overlying the Mercia Mudstone Group (western part of the Site), and shallow groundwater recorded where superficial deposits overly the Mudstone in the eastern part of the Site.

### Statutory Designations

8.6.11 MAGIC maps show there are no SSSIs, SACs, SPAs or Ramsar sites within the Site boundary. The Clarborough Tunnel SSSI is located adjacent to the western Site boundary. It is an area of calcareous grassland designated due to its biological interest. No other statutory designations for nature conservation and ecology are identified within 1km of the Site. EA mapping confirms that no GWDTEs are located within, or within 1km of, the Site.

### Flood Risk

#### Fluvial / Tidal Flood Risk

8.6.12 The latest EA published Flood Zone map included as **Figures 8.2a and 8.2b** shows that the western c.50% of the Site lies within Flood Zone 1, representing a less than 1 in 1000 annual probability of fluvial or tidal flooding. A central band of the Site (affecting approximately 5% of the Site) lies within Flood Zone 2, representing a 1 in 100 to 1 in 1000 annual probability of fluvial flooding or a 1 in 200 to 1 in 1000 annual probability of tidal flooding. The eastern part of the Site (approximately 45% of the Site) falls within Flood Zone 3 with a greater than 1 in 100 annual probability of fluvial flooding or a greater than 1 in 200 annual probability of tidal flooding. The flood risk in this area is primarily fluvial but there is a degree of tidal influence on the River Trent. Flood defences are present along the River Trent.

8.6.13 The EA has provided outputs from its latest flood model undertaken by Jacobs in 2023. These show a significant reduction in flood extents when the flood defences are taken into account. Flood risk analysis is ongoing and will be reported within the ES and FRA supporting the application. The FRA will include a comparison of defended and undefended flood extents, impacts of relevant climate change allowances and impact of a breach of the flood defences. As the Catchwater Drain,

Mother Drain and New Ings Drain have not been modelled as part of the EA flood modelling exercise, the FRA will include an assessment of the fluvial flood risk associated with these watercourses. The FRA will differentiate between areas of Flood Zone 3a and Flood Zone 3b for the River Trent.

### Surface Water Flood Risk

8.6.14 Areas of surface water flood risk are shown on the EA's mapping, most notably along the flow paths of the Ordinary Watercourses and within the fields to the east of the Catchwater Drain. The majority of the Site is at 'very low' risk of surface water flooding, with areas of 'low', 'medium' and 'high' surface water risk identified at various locations across the site, The village of Sturton le Steeple has an identified area of 'high' surface water flood risk at the crossroads at the southern end of Cross Street which corresponds to an area of reported flooding as discussed below. The EA's Surface Water Flood Risk Mapping is included as **Figures 8.3a and 8.3b**.

### Other Sources of Flooding

8.6.15 EA mapping shows that the eastern part of the Site, to the east of Catchwater Drain, has a risk of reservoir flooding when there is also flooding from rivers, but no part of the Site has a risk of reservoir flooding when river levels are normal.

8.6.16 As the majority of the Site overlies the Mercia Mudstone, the risk of groundwater flooding is considered to be low for most of the Site. There is the potential for shallow groundwater to be encountered during groundworks particularly in the eastern part of the Site where superficial deposits are present and where BGS borehole records have recorded groundwater close to the surface.

### Flooding Records

8.6.17 The EA holds records of flood events 1932, 1947, 1977 and 2000 which affected the eastern part of the Site to varying extents. Local residents have advised of recent incidents of surface water flooding in the centre of Sturton le Steeple following heavy rainfall due to runoff being conveyed from the land higher in the catchment and being funnelled along the roads running into the village and ponding at a low point at the bottom end of Springs Lane.

### Existing Drainage

8.6.18 Given the rural setting of the Proposed Development, runoff is likely to be conveyed across undeveloped areas via overland (and subsurface) flow at greenfield rates

towards the existing surface watercourses and field drains, or infiltrate directly into the ground should ground conditions permit.

### Surface water quality and WFD designation

8.6.19 The Catchwater Drain (located on the Site) and the River Trent (Carlton-on-Trent to Laughton Drain) (located adjacent to the eastern boundary) were both classified as of 'moderate' ecological status under Cycle 3 of the WFD. Chemical quality for both watercourses had been 'fail' under previous Cycles but 'does not require assessment' under Cycle 3. Wheatley Beck, which lies approximately 750m north of the Site at its closest point, also has the same Cycle 3 WFD ecological and chemical classifications. In the baseline situation, it is likely that the watercourses within the Site would be subject to limited inputs of pollutants, particularly nutrients and metals, associated with farming activities, urban runoff and sewer company discharges. Further assessment of the WFD status of local watercourses will be provided in the WFD Screening Assessment supporting the ES.

### Groundwater quality and WFD designation

8.6.20 No local groundwater bodies have a classification under the WFD. Shallow groundwater within the superficial deposits may have been impacted to a degree by the historical power generation and agricultural activities within the area.

### Abstractions

8.6.21 The EA has provided a list of live water abstraction licences within a 2km radius of grid reference the Site, all of which are from surface water (no groundwater abstractions recorded). A total of 26 current surface water abstractions are recorded, 19 of which are from the River Trent, one from Seymour Drain, 4 from Wheatley Beck and its tributaries and 2 from Marton Drain. Of these, 19 are for agricultural use (licenced to farms) and 6 are for uses related to power generation (licenced to West Burton B and EDF Energy). Abstractions of less than $20m^3$/day would not be licenced by the EA. The location of the recorded abstractions is shown on **Figure 8.4**.

8.6.22 Bassetlaw District Council hold records of one private water supply within a 2km radius of the Site. This is at Caddow Wood Farm, Mill Lane, North Leverton, Nottinghamshire, DN22 0BA. This is approximately 430m south of the Site. The abstraction is from groundwater and is for potable use. The location of this abstraction is shown on **Figure 8.4.** Given the absence of superficial deposits

mapped in this location, the abstraction is likely to be drawn from groundwater at significant depth within the sandstone beneath the Mercia Mudstone.

### Water Resource Availability

8.6.23 The EA has advised that there is water available for abstraction within the Lower Trent catchment although access to water may be limited during times of low flows. Anglian Water has advised that supply for domestic use is prioritised and that any requests for new connections for non-domestic use will need to be assessed for viability.

### Receptors Summary

8.6.24 **Table 8.1** provides criteria for defining the sensitivity or importance of receptors. Using these criteria, the key receptors to impacts associated with the Proposed Development and their sensitivity / importance are identified in **Table 8.5.**

*Table 8.5 Key receptors for Proposed Development*

| Receptor | Sensitivity / Importance | Reason |
|---|---|---|
| River Trent | Medium | Main River, 'moderate' ecological status and 'does not require assessment' for chemical status under the WFD, no associated statutory designations and no nearby sensitive (potable) abstractions, a number of abstractions for agricultural use outside the Site boundary. |
| Ordinary Watercourses crossing site including Catchwater Drain and Mother Drain | Medium | Ordinary Watercourses, 'moderate' ecological status and 'does not require assessment' for chemical status under the WFD. No abstractions recorded within or downstream of the Site. |
| Clarborough Tunnel SSSI | High | SSSI designation due to biological interest. |
| Areas of high fluvial and surface water risk | Medium | Existing areas of fluvial and surface water flood risk on the Site and known areas of flooding off-site, may be sensitive to changes in flood risk resulting from the Proposed Development. |
| Underlying aquifer | Low | Shallow groundwater recorded within superficial deposits beneath parts of site, main aquifer located at depth beneath Mercia Mudstone. One local groundwater abstraction from potable use 430m south of the Site, likely to be drawn from the sandstone at depth. Site not within groundwater Source Protection Zone, no nearby GWDTEs. Local groundwater bodies not classified under WFD. |
| Water resources (for water supply) | Medium | Local surface water resources noted by EA to be depleted during dry periods. Mains water supply is prioritised for domestic use, this could be jeopardised by any large-scale abstraction for non-domestic use. |

## Future Baseline

8.6.25 Climate change is likely to result in wetter winters and longer drier summers. This will result in increased risk of flooding from all sources but particularly from surface

water flooding as 'flash' flooding becomes more frequent. It will also place greater pressure on water supply, with reduced availability and increased demand particularly during the summer months with droughts becoming more frequent.

8.6.26 Geomorphological processes including erosion and sediment deposition will over time affect the vertical and lateral morphology of watercourses and their floodplains.

8.6.27 The impacts of the Proposed Development in the context of future flood risk and water availability, taking account of potential future geomorphology, will be assessed in the ES.

## 8.7 Assessment of Likely Significant Effects

### Construction Phase

#### Hydrology

8.7.1 Construction activities have the potential to result in the release of chemicals, concrete washout and silt laden runoff which could be conveyed via overland flow or local drainage features into nearby watercourses. The Proposed Development includes measures to reduce this risk, for example construction compounds will be located at least 10m from existing watercourses as shown on the **Construction Parameter Plan at Figure 2.1**. However, there remains the potential for release of hazardous materials which could impact on local watercourses.

8.7.2 There is also the potential for construction works to result in physical changes to the existing watercourse channels. However, the Proposed Development includes measures to mitigate this. Trenchless HDD methods are likely to be used for laying any cables beneath existing watercourses, and any applicable permits or consents will be obtained from the EA / LLFA / IDB for works close to watercourses, and any conditions imposed on those permits will be adhered to.

8.7.3 Taking account of the measures proposed as part of the Proposed Development, the sensitivity of the receptor to water quality and hydrological impacts during the construction phase is medium and the magnitude of impact is low, resulting in an effect of **minor adverse** significance. The effect would be temporary, direct and of local importance.

8.7.4 A WFD Screening assessment is currently being prepared and will support the assessment of water quality impacts on surface watercourses in the ES.

### Water Resources

8.7.5 Limited water usage would be required during the construction phase for potable and welfare use, and for construction activity uses including dust suppression and wheel washing. Although the volume of water required is considered to be small, given the current uncertainty around the viability of a new connection to the Anglian Water supply or a new licenced abstraction from the River Trent, this aspect will require additional assessment as part of the ES. The potential benefits to be gained from rainwater harvesting and re-use will be investigated, in combination with consultation with Anglian Water and the EA where a new connection is considered necessary to meet demand.

8.7.6 In view of the current uncertainty regarding the source of water for construction uses, the sensitivity of the receptor is considered to be medium and the magnitude of impact low, giving rise to an effect on surface water reserves (including existing surface water abstractions) and public water supply of **minor adverse** significance. The effect would be temporary, direct and of local importance.

### Hydrogeology

8.7.7 Construction activities have the potential to result in the release of chemicals to the ground which could infiltrate into any underlying aquifers. Construction activities could also mobilise any historical ground contamination beneath the Site. The low permeability Mudstone beneath the site will inhibit vertical migration in the unlikely event of any contamination occurring during construction works. However, there remains the potential for localised contamination of the underlying aquifers to occur.

8.7.8 The impact on hydrogeology is considered to be of low magnitude, with groundwater considered to be of low sensitivity resulting in an effect of **negligible** significance. The effect would be temporary, direct and of local importance.

8.7.9 There are no anticipated impacts on GWDTEs in the absence of any such designations within the zone of influence of the Proposed Development.

### Flood Risk

8.7.10 During the construction phase, there is the potential for increased surface water runoff from temporary hardstanding areas or areas of compacted ground which could result in increased flows in local watercourses and a resulting increase in flood risk from those watercourses to nearby residential receptors.

8.7.11 There is also the potential for a reduction in channel capacity due to creation of new crossings or culverts. However, as part of the Proposed Development, existing watercourse crossings will be utilised where possible. Any new bridges / culverts will be designed to ensure flow capacity is retained and access to watercourse for maintenance is maintained.

8.7.12 Taking account of the measures proposed as part of the Proposed Development, the impact on flood risk is considered to be of low magnitude, with flood risk considered to be of medium sensitivity, resulting in an effect of **minor adverse** significance. The effect would be temporary, direct and of local importance.

## Operational Phase

### Hydrology

8.7.13 During the operational phase, without mitigation there is the potential for water quality impacts to local watercourses due to accidental releases of chemicals or contaminated runoff, for example associated with chemical use within the BESS and substation areas and the release of contaminated runoff in the event of a fire (considered a possibility particularly for the BESS area). However, as part of the Proposed Development, a leak detection system and alarm will be fitted to the cooling system, and the drainage strategy for the BESS area will include provision for the automatic retention of any contaminated fire-fighting runoff in the event of a fire.

8.7.14 Taking account of the embedded mitigation measures, the sensitivity of the receptor to water quality impacts during the operational phase is medium and the magnitude of impact is negligible, resulting in an effect of **negligible** significance. The effect would be temporary, direct and of local importance.

8.7.15 A WFD Screening Assessment is currently being prepared and will support the assessment of water quality impacts on surface watercourses in the ES.

8.7.16 The area of the Site closest to the River Trent is proposed for biodiversity mitigation only. The nearest proposed infrastructure to the River Trent is approximately 950m from the watercourse. Given the separating distance of these works from the River Trent, they are considered to have negligible magnitude impact on natural fluvial processes (taking account of the potential for lateral geomorphological changes over the lifetime of the Proposed Development) and are not considered to restrict future river restoration projects. Although the sensitivity of the receptor is medium, the effect of the works on the hydrology of the River Trent would have negligible

magnitude of impact and is therefore classed as **negligible** significance. The effect would be temporary, direct and of local importance.

8.7.17 The creation of the proposed access road / haulage road will require a number of new watercourse crossings over Ordinary Watercourses. Additionally, buried cables are proposed beneath and in close proximity to the Ordinary Watercourses. As part of the Proposed Development, a minimum 9m development-free easement has been allowed for either side of the IDB watercourses, and a minimum 5m easement either side of the LLFA Ordinary Watercourses, as stipulated by the IDB and LLFA. Watercourse crossings will be via clear span bridges to ensure existing channel flows are maintained, and cable crossing depths will take account of potential deepening of watercourse channels over the lifetime of the Proposed Development. The sensitivity of the receptor is medium and the magnitude of impact is negligible, resulting in an effect on the hydrology of Ordinary Watercourses of **negligible** significance. The effect would be temporary, direct and of local importance.

8.7.18 The Clarborough Tunnel SSSI is located adjacent to the west of the Site, the nearest area of infrastructure associated with the Proposed Development is approximately 370m from the SSSI. Due to the location of the SSSI, it is topographically up-gradient of the Site and above an area of low permeability mudstone geology; therefore, the potential for mobilisation of sediment or pollutants to this area is considered to be low.

8.7.19 At present there are anticipated to be no increases in runoff to, or new outfalls created in the River Trent, therefore there will be no impact on passing boat traffic.

### Water Resources

8.7.20 It is understood that the Proposed Development will require minimal water resource during the operational phase (limited process water for BESS cooling, firefighting water and limited welfare requirements). However, given the current uncertainty around the viability of a new connection to the Anglian Water supply or a new licenced abstraction from the River Trent, this aspect will require additional assessment as part of the ES. The potential benefits to be gained from rainwater harvesting and re-use will be investigated, in combination with consultation with Anglian Water and the EA where a new connection is considered necessary to meet demand.

8.7.21 Due to the current uncertainties, provision of water to support demand during the operational phase has the potential to place additional strain on existing water resources. This will be of increased importance over the lifetime of the Proposed

Development as climate change is likely to place increased pressure on existing supplies. The sensitivity of the receptor is considered to be medium and the magnitude of impact low, giving rise to an effect on surface water reserves (including existing surface water abstractions) and public water supply of **minor adverse** significance. The effect would be temporary, direct and of local importance.

8.7.22 One private groundwater abstraction has been recorded for potable use at a farm 430m south of the Site. In view of the low permeability of the underlying geology and the significant distance of this abstraction from the Site, the operational phase of the Proposed Development is not considered to impact on existing groundwater abstractions.

### Hydrogeology

8.7.23 The bedrock geology beneath the whole Site comprises low permeability Mercia Mudstone. In the western part of the Site, only limited localised superficial deposits (Head) are present. BGS borehole logs have recorded groundwater at significant depth in the western part of the Site and beneath West Burton Power Station to the north. In these areas, the impact on shallow groundwater flow of foundations, piles and underground pipes, including the substation, BESS and cable route adjacent to West Burton Power Station, is considered to be of negligible magnitude, with groundwater considered to be of low sensitivity resulting in an effect of **negligible** significance. The effect would be temporary, direct and of local importance.

8.7.24 The eastern part of the Site is underlain by sand and gravel superficial deposits above the Mercia Mudstone. BGS borehole records indicate that shallow groundwater is present within these superficial deposits. In this eastern part of the Site is the eastern biodiversity mitigation area and areas of solar panels, invertors and transformers that comprise the Proposed Development. In view of the small diameter and significant spacing of the steel poles supporting the panels (spacing of c.2.6m between each string of panels), the impact on shallow groundwater flow is considered to be of negligible magnitude, with groundwater considered to be of low sensitivity resulting in an effect of **negligible** significance. The effect would be temporary, direct and of local importance.

8.7.25 Overall, the significance of the effect of sub-surface elements of the Proposed Development on groundwater flow patterns is considered to be **negligible**.

8.7.26 There are no anticipated impacts on GWDTEs in the absence of any such designations within the zone of influence of the Proposed Development.

## Flood Risk

8.7.27 The eastern part of the Site is within fluvial Flood Zones 2 and 3. All infrastructure in the western part of the Site, and the BESS and substation in the north, forming the Proposed Development respectively, are to be located within Flood Zone 1 (low probability of fluvial flooding). The eastern part of the Site within Flood Zones 2 and 3 will comprise a biodiversity mitigation area (land closest to the River Trent) and solar PV panels and associated equipment.

8.7.28 Some of the proposed infrastructure within the Site is also likely to be located within areas at increased risk of surface water flooding although as for fluvial flood risk all flood sensitive equipment has been positioned outside these areas.

8.7.29 All flood sensitive equipment will be located 300mm above the design 1 in 100 year plus climate change defended flood level. Consideration will also be given to a breach flood event and the credible maximum climate change scenario. However, it is noted that there is no requirement to design to the breach flood level as this is a residual risk only. Additionally, EN-1 states that the credible maximum climate change scenario should be applied **"*when energy infrastructure has safety critical elements*"**. As outlined below, the Proposed Development is not considered to have safety critical elements and would not be required to operate during more extreme residual / breach / worse-case climate change flood scenarios. For the following reasons, the 1 in 100 year plus higher central climate change flood level is considered an appropriate 'design' flood level with resilience not required for the more extreme / breach scenarios:

- The Proposed Development will not form part of the National Grid and therefore there will be no disruption to supply to the wider public in the event power generation is disrupted in scenarios more extreme than the 'design' flooding scenario. This is solely a commercial risk;
- The Proposed Development will be unmanned and will be monitored (by way of CCTV) and controlled remotely, so it can be safely shut down if necessary prior to or during a flood event, with no in-person attendance. The monitoring and control equipment will be located within Flood Zone 1; and
- Maintenance visits will be undertaken on a regular basis and will be timed to ensure there is no staff presence at times of increased flood risk No staff will be permanently located on the Site during the operational phase of the Proposed Development.

8.7.30 An assessment will be undertaken as part of the FRA to quantify any displacement of floodwater as a result of infrastructure proposals within the 1 in 100 year plus climate change flood extent.

8.7.31 The FRA will include a Surface Water Drainage Strategy based on the use of SuDS to control any additional runoff generated by the proposed infrastructure.

8.7.32 Overall, the Proposed Development will be safe from a flooding perspective and will not result in any increase in flood risk either on or off the Site, taking account of the embedded mitigation. Given the medium sensitivity of the setting with respect to flood risk, the overall significance of effect with regard to flood risk is **negligible**. The effect would be temporary, direct and of local importance.

### Decommissioning Phase

8.7.33 During the decommissioning phase, works will be subject to similar mitigation measures to those during construction. Impacts are therefore considered to be no greater than for the construction phase i.e. no greater than **negligible** or **minor adverse** significance of effect.

## 8.8 Mitigation and Enhancement

### Mitigation

8.8.1 The following mitigation measures are committed to as part of the Proposed Development and its construction, operation, and decommissioning phases. These will be secured via DCO requirement.

#### Construction Phase

- A Construction Environmental Management Plan (CEMP) will be prepared for the construction phase to ensure best practice is followed to minimise the risk of release of pollution or sediment (Outline CEMP submitted with application, final CEMP to be secured post-planning);
- Trenchless HDD methods will be supported by a drilling fluid breakout plan (forming part of the CEMP);
- A Flood Management Plan will be prepared for the construction and decommissioning phases to ensure the works are scheduled to avoid periods of increased flood risk; and
- A temporary drainage strategy will be implemented during construction works to control runoff rates and sediment mobilisation.

### Operational Phase

- An outline Operation Environment Management Plan (OEMP) / Soil Management Plan / Battery Safety Management Plan will be prepared detailing how potentially harmful materials will be controlled and how emergency releases will be managed.

### Decommissioning Phase

- An outline DEMP will be prepared for the decommissioning phase to ensure best practice is followed to minimise the risk of release of pollution or sediment; and
- Other mitigation measures will to a large extent replicate those proposed for the construction phase.

### Enhancement

8.8.2 An opportunity for enhancement has been identified through the design and installation of a SuDS basin solely for the retention of runoff derived up-gradient of the Site, with the aim of alleviating the reported flooding issues within Sturton le Steeple. This is not a policy requirement and is not required to mitigate the effects of the Proposed Development. Instead, an opportunity has been identified to set aside part of the Proposed Development's area to attenuate surface water flows that pass over the Site in an attempt to alleviate flooding off-site within Sturton le Steeple.

8.8.3 This SuDS basin is additional to and separate from the SuDS measures that are required for incorporation into the scheme to manage runoff and ensure no increase in runoff from the Proposed Development.

## 8.9 Residual Effects

8.9.1 During the construction phase, the implementation of a CEMP, temporary drainage strategy and drilling fluid breakout plan will ensure the magnitude of impact on surface water and groundwater quality will be reduced to negligible, meaning the overall of water quality effect is reduced from minor adverse to **negligible** significance.

8.9.2 The implementation of the construction phase surface water drainage strategy and Flood Management Plan for the duration of the construction works will also reduce the magnitude of impact on flood risk during the construction phase to negligible,

meaning the overall flood risk effect is reduced from minor adverse to **negligible** significance.

8.9.3 The proposed flood risk enhancement works aim to provide a reduction in flood risk to Sturton le Steeple during the operational phase of the Proposed Development. A low magnitude reduction in flood risk could be achieved, with the sensitivity classed as medium, resulting in a **minor beneficial** significance effect on flood risk.

8.9.4 Mitigation proposals are still being developed and will be fully documented in the ES. Should any additional mitigation requirements be identified through the ongoing consultation and assessment, this will be detailed in the ES. Further assessment and consultation is required in relation to water usage. Assessments of flood risk and WFD impacts are ongoing.

## 8.10 Cumulative and In-combination Effects

8.10.1 The following schemes have been considered in the assessment of cumulative effects (see **Figure 2.3 'Cumulative Schemes Plan'** that visualises the locations of the below cumulative schemes):

- One Earth Solar Farm – 9km south;
- Gate Burton Energy Park – 300m east;
- West Burton C Power Station – 500m northeast;
- West Burton B Power Station – 560m northeast;
- West Burton Solar Project – cable route passes through Site;
- Cottam Solar Project – 1.5km south;
- Tillbridge Solar Project – 8km northeast;
- North Humber to High Marnham Electricity Transmission – cable corridor passes through Site;
- Great North Road Solar Project – 17km south;
- 22/00358/FUL – Installation of a solar farm and battery storage facility with associated infrastructure. Land to the East of Bumble Bee Farm. Granted permission July 2022. Located approximately 2.5km north of the Site;

- 21/01147/FUL - Installation of a solar farm and battery storage with associated infrastructure (49.9 MW). Application Approved December 2021. Located approximately 12km south of the Site;
- 20/01405/FUL – Installation and operation of a solar fam with all associated works, equipment and necessary infrastructure. Application Approved (Delegated Decision) February 2021. Located approximately 3.6km west of the Site; and
- 20/00117/FUL – Installation and operation of a solar farm comprising an array of ground mounted solar PV panels with associated infrastructure including housing for inverters a substation compound, point of connection mast, fencing, security cameras, cabling, access tracks and a temporary construction compound. Application Approved August 2020. Located adjacent to the west of the Site.

8.10.2 It is assumed that the other proposals considered will be subject to the same policy and regulatory requirements as the Proposed Development (or equivalents at the time of submission). On this basis, appropriate mitigation will need to be incorporated in all schemes to ensure there is no increase in flood risk and to control any releases of pollutants / sediment to the water environment. The relevant consents will need to be obtained for work affecting watercourses and for any abstraction of water or connection to the mains water supply. On this basis, the cumulative effect is considered to be **negligible**.

8.10.3 No in-combination effects are anticipated in relation to hydrological, hydrogeological, flood risk and drainage receptors.

## 8.11 Summary

8.11.1 A range of measures have been included in the construction, operation and decommissioning phases of the Proposed Development to minimise impacts on the surface water and groundwater environment, on flood risk and on water resources (water supply). On the basis these measures are implemented, this PEIR has identified effects on the water environment of no greater than negligible or minor adverse significance. Additional mitigation has been identified during the construction phase (CEMP, temporary drainage strategy, drilling fluid breakout plan and Flood Management Plan) to reduce the significance of construction stage effects on water quality and flood risk to negligible. An opportunity for

enhancement will be further explored to provide flood risk reduction to the village of Sturton le Steeple by intercepting and storing overland flow that currently represents a risk of flooding within the village centre. It is considered that a minor beneficial significance effect on flood risk could be achieved.

8.11.2 It is noted that assessment of flood risk is ongoing in consultation with the EA, and that a WFD assessment is currently in preparation. Consultation is also ongoing with AW and the EA regarding the most appropriate source of water for usage during all stages of the Proposed Development, with opportunities for rainwater harvesting being explored in order to minimise requirement for supply from external sources.

*Table 8.6 Summary and Residual Effects*

| Receptor/ Receiving Environment | Description of Effect | Nature of Effect | Sensitivity Value | Magnitude of Effect | Geographical Importance | Significance of Effects | Mitigation/ Enhancement Measures | Residual Effects |
|---|---|---|---|---|---|---|---|---|
| **Construction** | | | | | | | | |
| Hydrology | Water quality reduction and physical impacts to local watercourses | Temporary direct | Medium | Low | Local | Minor adverse | Implementation of CEMP<br>Drilling fluid breakout plan<br>Temporary drainage strategy during construction to ensure treatment of runoff | Negligible |
| Water resources | Depletion of water reserves and impact on existing abstractions | Temporary direct | Medium | Low | Local | Minor adverse | TBC – appropriate source of water supply to be discussed and agreed with EA / AW / IDB | TBC in ES |

| Receptor/ Receiving Environment | Description of Effect | Nature of Effect | Sensitivity Value | Magnitude of Effect | Geographical Importance | Significance of Effects | Mitigation/ Enhancement Measures | Residual Effects |
|---|---|---|---|---|---|---|---|---|
| Hydrogeology | Water quality reduction to aquifers | Temporary direct | Low | Low | Local | Negligible | Implementation of CEMP<br>The findings of the Phase 1 Geoenvironmental Desk Study will be taken into account to ensure any historical contamination is not mobilised | Negligible |
| Flood risk | Increase in flood risk due to increased runoff from temporary hardstanding or compacted areas | Temporary direct | Medium | Low | Local | Minor adverse | Temporary drainage strategy implemented to control runoff rates<br>Flood management plan to ensure works are scheduled to | Negligible |

| Receptor/ Receiving Environment | Description of Effect | Nature of Effect | Sensitivity Value | Magnitude of Effect | Geographical Importance | Significance of Effects | Mitigation/ Enhancement Measures | Residual Effects |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | avoid periods of increased flood risk | |
| **Operation** | | | | | | | | |
| Hydrology | Water quality impacts to local watercourses | Temporary direct | Medium | Negligible | Local | Negligible | Outline Operation Environment Management Plan (OEMP) / Soil Management Plan / Battery Safety Management Plan | Negligible |
| Hydrology | Impacts on natural fluvial processes | Temporary direct | Medium | Negligible | Local | Negligible | None required | Negligible |
| Hydrology | Impact on flows within | Temporary direct | Medium | Negligible | Local | Negligible | None required | Negligible |

| Receptor/ Receiving Environment | Description of Effect | Nature of Effect | Sensitivity Value | Magnitude of Effect | Geographical Importance | Significance of Effects | Mitigation/ Enhancement Measures | Residual Effects |
|---|---|---|---|---|---|---|---|---|
| | Ordinary Watercourses | | | | | | | |
| Water resources | Depletion of water reserves and impact on existing abstractions | Temporary direct | Medium | Low | Local | Minor adverse | TBC – appropriate source of water supply to be discussed and agreed with EA / AW / IDB | TBC in ES |
| Hydrogeology | Impact of substructures on shallow groundwater flow | Temporary direct | Low | Negligible | Local | Negligible | None required | Negligible |
| Flood risk | Increase in flood risk due to displacement of floodwater or increased runoff | Temporary direct | Medium | Negligible | Local | Negligible | Attenuation basins to provide flood risk reduction to Sturton le Steeple | Minor beneficial |

| Receptor/ Receiving Environment | Description of Effect | Nature of Effect | Sensitivity Value | Magnitude of Effect | Geographical Importance | Significance of Effects | Mitigation/ Enhancement Measures | Residual Effects |
|---|---|---|---|---|---|---|---|---|
| **Cumulative and In Combination** | | | | | | | | |
| n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a |