FENWICK SOLAR FARM

Fenwick Solar Farm
EN010152

Environmental Statement

Volume I Chapter 9: Water Environment

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Prepared for:
Fenwick Solar Project Limited

Prepared by:
AECOM Limited

Table of Contents

Plates

Tables

9. Water Environment

9.1 Introduction

9.1.1 This chapter presents the findings of an assessment of the likely significant effects on the water environment as a result of the Scheme. This includes consideration of surface water features (such as rivers, streams, ditches, and lakes) and groundwater (in terms of quality, flows, levels and resources), flood risk and demand for water resources. However, any impacts on ponds are assessed in **ES Volume I Chapter 8: Ecology [EN010152/APP/6.1]**, which includes details of relevant protected species and aquatic ecology surveys. Where designated ecological sites are sensitive to changes in hydrology or water quality and are hydrologically linked (i.e. where they are 'water dependent') an assessment of the potential impact to them is also considered in this chapter.

9.1.2 Any effects of contaminated land on surface or groundwater are included within Preliminary Risk Assessments (PRAs) completed for the Solar PV Site and Grid Connection Corridor (**ES Volume III Appendices 14-3** to **14-4 [EN010152/APP/6.3]**). This is also covered in **ES Volume I Chapter 14: Other Environmental Topics [EN010152/APP/6.1]**.

9.1.3 For more details about the Scheme, please refer to **ES Volume I Chapter 2: The Scheme [EN010152/APP/6.1]**.

9.1.4 This assessment is supported by the following appendices that are presented in **ES Volume III [EN010152/APP/6.3]**:

a. **Appendix 9-1: Legislation, Policy and Guidance (Water Environment) [EN010152/APP/6.3];**

b. **Appendix 9-2: Water Framework Directive (WFD) Assessment [EN010152/APP/6.3]**;

c. **Appendix 9-3: Flood Risk Assessment [EN010152/APP/6.3]**; and

d. **Appendix 9-4: Framework Drainage Strategy [EN010152/APP/6.3]**.

9.1.5 The chapter is also supported by the following figures that are presented in **ES Volume II [EN010152/APP/6.2]**:

a. **Figure 9-1: Surface Water Features and their Attributes [EN010152/APP/6.2]**;

b. **Figure 9-2: Groundwater Features and their Attributes [EN010152/APP/6.2]**;

c. **Figure 9-3: Watercourses, Flood Zones and Internal Drainage Boards [EN010152/APP/6.2]**;

d. **Figure 9-4: Environment Agency Flood Map for Planning (Rivers and Sea) [EN010152/APP/6.2]**;

e. **Figure 9-5: Risk of Flooding from Surface Water [EN010152/APP/6.2]**;

f. **Figure 9-6: Superficial Deposits [EN010152/APP/6.2]**; and

g. **Figure 9-7: Bedrock Deposits [EN010152/APP/6.2]**.

9.2 Study Area

9.2.1 For the purposes of this assessment, a general Study Area of 1 km around the Order limits has been considered in order to identify water features that are hydrologically connected to the Scheme and have the potential to be impacted by the activities associated with it. The 1 km Study Area is based on professional judgement and is a generally accepted distance for a water environment Study Area. The Study Area around the Solar PV Site and the Grid Connection Corridor is shown in **ES Volume II Figure 9-1: Surface Water Features and their Attributes [EN010152/APP/6.2]**. The Grid Connection Corridor includes some local roads which may be impacted by the Scheme.

9.2.2 Given that watercourses flow and water quality and flood risk impacts may propagate downstream, where relevant the assessment also considers a wider Study Area to as far downstream as a potential impact may influence the quality or quantity of water available for any water features. In this case, watercourses across the Study Area generally drain to the River Don, which is considered the final receiving water feature that could conceivably be significantly affected. This is located approximately 5.5 km east and downstream from the Solar PV Site and adjacent to the eastern boundary of the Grid Connection Corridor at the southern end of the route. This is shown on **ES Volume II Figure 9-1: Surface Water Features and their Attributes [EN010152/APP/6.2]**.

9.3 Legislation, Planning Policy and Guidance

9.3.1 Legislation, planning policy, and guidance relevant to this assessment and pertinent to the Scheme is outlined in this section, as shown in more detail in **ES Volume III Appendix 9-1: Legislation, Policy and Guidance (Water Environment) [EN010152/APP/6.3]**. There are a number of regulations that are concerned solely with the transfer of powers to the United Kingdom Government to ensure that European Union legislation remains functional as intended but otherwise do not change the requirements of the legislation. These specific pieces of legislation are not detailed as they are not material to the outcome of this assessment.

Legislation

9.3.2 Legislation to be considered includes:

a. Environment Act 2021 (Ref. 9-1);

a. Water Act 2014 (Ref. 9-2);

b. Flood and Water Management Act 2010 (Ref. 9-3);

c. Environmental Protection Act 1990 (Ref. 9-4);

d. Land Drainage Act 1991 (Ref. 9-5);

e. Water Resources Act 1991 (Ref. 9-6);

f. Salmon and Freshwater Fisheries Act 1975 (Ref. 9-7);

g. Water Environment (Water Framework Directive) (WFD) (England and Wales) Regulations 2017 (Ref. 9-8);
h. Environmental Damage (Prevention and Remediation) Regulations 2017 (Ref. 9-9);
i. Environmental Permitting (England and Wales) Regulations 2016 (Ref. 9-10);
j. Eels (England and Wales) Regulation 2009 (Ref. 9-12): gives powers to the regulators to implement recovery measures in all freshwater and estuarine waters in England and Wales and for which new developments that could impact eels should take into account;
k. Control of Pollution (Oil Storage) (England) Regulations 2001 (Ref. 9-13);
l. Water Resources Act (Amendment) (England and Wales) Regulations 2009 (Ref. 9-14);
m. Control of Substances Hazardous to Health (Amendment) Regulations 2004 (Ref. 9-15);
n. Anti-Pollution Works Regulations 1999 (Ref. 9-16);
o. The Water Framework Directive (WFD) (Standards and Classification) Directions 2015 (Ref. 9-17); and
p. The Building Regulations. Approved Document Part H: Drainage and Waste Disposal (2010) (Ref. 9-18).

National Planning Policy

9.3.3 National planning policy and guidance to be considered includes:

a. Overarching National Policy Statement for Energy (EN-1) (November 2023) (Ref. 9-19);
a. National Policy Statement EN-3 (November 2023) (Ref. 9-20);
b. National Policy Statement EN-5 (November 2023) (Ref. 9-21);
c. National Planning Policy Framework (NPPF) (December 2023) (Ref. 9-22);
d. A Green Future: Our 25 Year Plan to Improve the Environment (Ref. 9-23);
e. The UK Government's Future Water Strategy (2011) (Ref. 9-24); and
f. Environmental Improvement Plan 2023 - First revision of the 25 Year Environment Plan (2023) (Ref. 9-11).

National Guidance

9.3.4 The National Planning Policy Guidance (NPPG) provides guidance for local planning authorities on assessing the significance of water environmental effects of proposed developments.

9.3.5 The NPPG includes guidance on Flood Risk and Coastal Change (Ref. 9-25) which recommends that Local Plans should be supported by a Strategic Flood Risk Assessment (SFRA) and should develop policies to manage flood risk from all sources taking account of advice from the Environment Agency and other relevant flood risk management bodies, such as Lead Local Flood Authorities (LLFAs) and Internal Drainage Boards (IDBs).

9.3.6 NPPG also includes guidance on renewable and low carbon energy (Ref. 9-26). This includes guidance to help local councils in developing policies for renewable and low carbon energy. A section on battery energy storage systems and the potential for fire risks is included.

9.3.7 The Environment Agency provides guidance on the approach to protection of groundwater in a number of position statements (Ref. 9-27). This includes Position Statement A (Risk Based Approach); Position Statement B (Protection of Water Intended for Human Consumption), Position Statement G (Discharge of Liquid Effluents into the Ground); and Position Statement N (Groundwater Resources and Abstraction).

9.3.8 The Planning Inspectorate's guidance 'Nationally Significant Infrastructure Projects: Advice on the Water Framework Directive' (Ref. 9-48) contains advice on the preparation and submission of any separate WFD assessment reports by DCO applications. This guidance includes advice of bodies to be consulted, and screening, scoping and impact assessment, together information on Article 4.7 derogations.

Regional Policy

9.3.9 At a regional level, water management is coordinated through ten River Basin Management Plans (RBMPs). Each RBMP is prepared by the Environment Agency for six-year cycles and sets out how organisations, stakeholders and communities will work together to improve the water environment.

9.3.10 The water bodies within the Study Area fall under the Humber RBMP (Ref. 9-28). The most recent RBMP for the Humber river basin districts were updated in October 2022 and will remain in place until 2027, after which the monitoring and protection regime is uncertain until new Government targets and guidance is released. Until then the RBMPs set legally binding, locally specific, environmental objectives, and contain the current WFD status of the water bodies in the area. More information on these is included in the baseline section of this chapter.

Local Planning Policy

9.3.11 The following local planning policies are of relevance to the water environment.

City of Doncaster Council

9.3.12 The following policies from the Doncaster Local Plan 2015-2035 (Ref. 9-29), adopted in September 2021 are of relevance to the water environment assessment:

a. Policy 1: Settlement Hierarchy (Strategic Policy), Section 7 Flood Risk;

a. Policy 33: Landscape (Strategic Policy), Part D;

b. Policy 54: Pollution, Part D;

c. Policy 55: Contamination and Unstable Land, Part A;

d. Policy 56: Drainage;

e. Policy 57: Flood Risk Management Parts A-D; and

f. Policy 60: Protecting and Enhancing Doncaster's Soil and Water Resources, Parts E and F.

Guidance Documents

9.3.13 The following guidance is relevant to the water environment assessment.

Connected by Water Action Plan (Ref. 9-30)

9.3.14 The Study Area is located within the boundary of the City of Doncaster metropolitan borough. City of Doncaster Council and various stakeholders published the Connected by Water Action Plan in January 2023 (Ref. 9-30), which proposes actions covering flood risk such as the Doncaster Borough Wide Surface Water Alleviation Scheme.

Yorkshire and Humber Business Plan 2020/2021 (Ref. 9-31)

9.3.15 City of Doncaster Council is a member of the Yorkshire Leaders Board, and the Study Area is located within land included in the Yorkshire and Humber Business Plan 2020/21. The Yorkshire Leaders Board has identified flooding as a priority area in the Yorkshire and Humber Business Plan 2020/21 and published the Yorkshire and Humber Flood Resilience Forum 2022, which aims to support the integration of flood resilience into wider strategy and policy (Ref. 9-31).

The Don Catchment Flood Management Plan (2010) (Ref. 9-32)

9.3.16 The Don Catchment Flood Management Plan (2010) (Ref. 9-32) that covers the Study Area considers all types of inland flooding and sets policies for managing flood risk within the catchment. The Study Area is located within sub-area 6 where the policy is: "*Areas of moderate to high flood risk where we can generally take further action to reduce flood risk*".

Strategic Flood Risk Assessment (SFRA)

9.3.17 A SFRA is a study carried out by one or more local planning authorities to assess the risk to an area from flooding from all sources, now and in the future taking account of the impacts of climate change, and to assess the impact that land use changes and development in the area will have on flood risk.

9.3.18 The Doncaster Metropolitan Borough Council Level 1 SFRA (November 2015) (Ref. 9-33) is available for the Study Area, which is located in the administrative area of the City of Doncaster Council and has been used to inform the FRA.

9.3.19 The Doncaster Metropolitan Borough Council SFRA (Ref. 9-33) states that the majority of fluvial flood risk in the Council area comes from the River Don and its tributaries to the north of Doncaster. The southeast section of the Grid Connection Corridor is at risk of flooding from the River Don.

9.3.20 The flood zone mapping in the SFRA differentiates between Flood Zone 3a and Flood Zone 3b, which is functional floodplain. Definitions of the Flood

Zones are provided in Section 9.7 of this chapter. Flood Zone 3b is based on the 5% annual probability of flooding or the 4% annual probability of flooding. The sections of the Order limits in Flood Zone 3b are located within the northern section of the PV Solar Site (functional floodplain of the River Went), and the southeastern section of the Grid Connection Corridor (functional floodplain of River Don).

9.4 Assumptions, Limitations and Uncertainties

9.4.1 With regards to walkover surveys, it is considered that visual inspection up or downstream on the crossing locations, together with desk study information, provides a robust basis for the assessment. During surveys all of the known surface water features on the Order limits were visited, including at locations of proposed crossings (where practicable). However, access and vegetation constraints prevented full coverage of the Order limits. In addition, seasonally dry and ephemeral watercourses, especially in locations close to the headwaters of a catchment are very difficult to identify in the field. For these small, minor water features, a best endeavours approach has been adopted. However, by their very nature their importance will be low and thus significant effects are unlikely.

9.4.2 The WFD reportable reaches of watercourses (but not necessarily including smaller tributaries within a WFD water bodies catchment) will be crossed using underground techniques that would pass beneath the hard bed of the watercourse by a minimum of 1.5m so as not to disturb the channel or risk being exposed by future bed scour. Where a crossing of a watercourse is at least 1.5m below the bed of a Main River, the cable crossing would be exempt from the requirement of attaining an Environmental Permit due to the activity being of low risk to the watercourse flow, providing all other conditions for the exemption can be met (e.g. the crossing needs to be at least 1.5m below the bed of a Main River, and the same height needs to be maintained for at least 5m beyond each bank) (Ref. 9-10).

9.4.3 This assessment assumes the Grid Connection Cables will be constructed within the Grid Connection Corridor to link the On-Site Substation to the National Electricity Transmission System (NETS) at the Existing National Grid Thorpe Marsh Substation, and has carried out an impact assessment for the construction, operation and maintenance and decommissioning of this connection. The feasibility of connecting the On-Site Substation via a Grid Connection Line Drop from existing overhead power lines running north south across the east of the Solar PV Site is being explored and will be determined by National Grid after the DCO is granted. The On-Site Substation would be at the same location and the same maximum footprint for either grid connection option. Should the Grid Connection Line Drop option be feasible, this would supersede the requirement for Grid Connection Cables exiting the Solar PV Site into the Grid Connection Corridor, and the Grid Connection Line Drop Cables would be confined to the Solar PV Site; in this event, the associated working areas within the Grid Connection Corridor would no longer form part of the Order limits or Scheme and there will be no impacts and effects on the water environment within the Grid Connection Corridor.

9.4.4 The Solar PV Panels and ancillary infrastructure (such as Field Stations) will be set back from all water features by at least 10m (measured from the bank top) to create a buffer zone. This is slightly greater than the 9m from the bank top the IDB has requested to take account of the uncertain distance of the bank top around the watercourse (which are generally steep). This may require survey work (prior to construction) in some locations to adequately define and agree the top of bank position.

9.4.5 The buffer from water features, together with the measures to be outlined within the Construction Environmental Management Plan (CEMP) (see **Framework Construction Environmental Management Plan (CEMP) [EN010152/APP/7.7]**), will ensure all construction activities for the installation of Solar PV Panels and infrastructure would be offset from surface watercourses, other than where there is a need for crossing of a watercourse (such as for cabling installation or possible temporary access) or connection for surface water drainage (that may be for temporary works or for the operational Scheme). Any works to enhance watercourses would also require direct works to the channel and banks, although given the beneficial aim of these works, their small-scale and 'soft-engineering' nature, construction impacts would be minimal (e.g. bank scrapes or the creation of low flow berms). Overall, the inclusion of this buffer reduces the risk of any pollutants entering the watercourse directly, whilst also providing space for mitigation measures (e.g. fabric silt fences) where they are required.

9.4.6 The risk from surface water runoff from new hard standing (i.e. surfaces where diffuse urban pollutants may accumulate) to surface or groundwater features has been assessed according to the Simple Index Approach presented in the C753 The SuDS Manual (Ref. 9-34). This is presented in the **Framework Drainage Strategy** included in **ES Volume III Appendix 9-4: Framework Drainage Strategy[EN010152/APP/6.3]**. It is expected on the basis of experience of other similar developments and professional judgement that the pollutant risk will not be very high from surface water runoff and so that only one or two layers of treatment would be required. It is also expected that there will be sufficient space within the Solar PV Site for a treatment solution following SuDS principles. However, there is also potential to use proprietary measures if there is a greater risk around certain infrastructure or there are localised constraints.

9.4.7 It is assumed from professional experience of other solar schemes, that the foundations required for the Field Stations in the Solar PV Site will be constructed using blocks or plinths with maximum excavation being assumed to be in the region of 1m for the plinths. There may be a requirement for some narrow piles depending on local geology.

9.4.8 The Solar PV Panels will be held above ground on narrow diameter piled legs, which may be 1.8-3m in depth, or mounted on concrete blocks (measuring 4m by 0.5m in footprint) in areas of archaeological mitigation defined within the **Draft Archaeological Mitigation Strategy [EN010152/APP/7.19]**. This prevents sealing the ground with an impermeable surface and will allow any rainwater to infiltrate into the ground. In order to limit the potential for channelisation from rainfall dripping off the end of the Solar PV Panels, the areas between, under and surrounding the Solar PV Panels will be planted with native grassland. This planting will intercept and absorb rainfall running off the Solar PV Panels, preventing it from concentrating and potentially forming channels in the ground. The pollution risk from this runoff is minimal as Solar PV Panels do not contain any liquid (hazardous or not) that could contaminate rainwater.

9.4.9 The Solar PV Panels may be cleaned on occasion, assumed to be every two years, with the cleaning taking place with no added chemical cleaning agents. The cleaning water will be obtained from mains supply and thus this water will not lead to any significant pollution risk or require any local abstraction.

9.4.10 As described in the **Framework Drainage Strategy** (**ES Volume III Appendix 9-4: Framework Drainage Strategy [EN010152/APP/6.3]**) the impermeable, gravel filled attenuation basins of the BESS Area are drained via a penstock to a swale that collects flow from all of the basins. The swale carries the flow south, towards the nearby drainage ditch, discharging via a flow control structure and pipe. The drainage strategy for the On-Site Substation consists of a filter drain running along the northern edge of the Solar PV Site, which discharges into an attenuation basin in the southwestern corner. Runoff from the hard-standing car park is collected by standard gullies and discharges to the attenuation basin. The drains pass flow to a surface attenuation basin that releases to the nearby watercourse via a flow control and pipe. Both systems assume no infiltration is possible, but can be adapted if testing shows it to be a viable discharge route. Each basin will be sized to store surface water and fire water. The fire water portion of the storage will allow for a volume of 300 m^3 to contain a fire water requirement of no less than 1,900 litres per minute for at least 2 hours. In addition to this supply requirement, a 30% additional capacity has been applied. The final storage volumes and discharge rates will be subject to approval and agreement to ensure compliance with all applicable safety and operational requirements. This is secured by the **Framework Battery Safety Management Plan [EN010152/APP/7.16]**. Above ground storage tanks would be used to store water required for any firefighting. This water is assumed to be supplied from mains water. For more information on battery safety management refer to the **Framework Battery Safety Management Plan[EN010152/APP/7.16].**

9.4.11 There would also be some perimeter swales to collect any exceedance surface water flows from the Solar PV Site which would discharge to watercourses. Where outlets are constructed which discharge surface water flows into local ditches and watercourses, it is assumed that the site survey and micro-siting of outlets would occur following grant of the DCO. This is described further in Section 9.8 Embedded Mitigation.

9.4.12 Within the impact assessment, flood risk is considered in terms of the potential for the Scheme to change existing flood risk (from all sources) and to impact on receptors that are determined based on the land uses present in the areas that a flood risk applies to, and their associated vulnerability class as defined in the NPPF (December 2023) (Ref. 9-22) and NPPG (Ref. 9-25). The FRA considers the suitability of the Order limits for a solar development. The FRA is included as **Volume III Appendix 9-3: Flood Risk Assessment [EN010152/APP/6.3]** to this report.

9.4.13 The FRA (**ES Volume III Appendix 9-3: Flood Risk Assessment [EN010152/APP/6.3]**) and Framework Drainage Strategy (**ES Volume III**

Appendix 9-4: Framework Drainage Strategy [EN010152/APP/6.3]) are based on desktop surveys, Site walkover, Site layout proposals and modelling outcomes where appropriate. Where available, topographical data has been used to support the FRA. In the absence of topographical data, LiDAR data was used to inform the FRA and Framework Drainage Strategy. The use of LiDAR data is not a limitation to the conclusions provided in these documents as it is the best available topographic data for the entire Study Area, and it is considered sufficiently accurate for these purposes.

9.4.14 To further inform flood risk to the Solar PV Site, hydraulic models were received from the Environment Agency and a new hydraulic model was created of the River Went, Fleet Drain and Fleet Common Drain. The modelling approach undertaken as part of the FRA was agreed with the Environment Agency. The results from the hydraulic modelling have been used to inform the design and subsequent mitigation. The FRA which is included as **ES Volume III Appendix 9-3: Flood Risk Assessment [EN010152/APP/6.3]** to this report, includes more detail about the modelling approach.

9.4.15 With regard to flood risk, temporary works have not been assessed unless they have the potential to adversely affect flood risk or impact the quality or form of water features. The temporary works where such risks are considered to have potential adverse effects on flood risk or the water environment (for example, excavations for the Grid Connection Corridor), have been identified and assessed within the FRA and impact assessment (within this chapter).

9.4.16 There will be welfare facilities associated with the Scheme for an anticipated one to two permanent (full time equivalent) members of staff, with some part time day attendance as required, during the operation and maintenance phase. Given the low daily occupancy only small volumes of foul drainage will be generated.

9.4.17 During operation and maintenance, self-contained portable welfare units which store foul/wastewater for collection/emptying by specialist licenced contractors would be deployed on an ad hoc basis (e.g. if required by maintenance crews) at the further reaching sites where the use of the Operations and Maintenance Hub is not feasible.

9.4.18 It is anticipated that the water supply for the Operations and Maintenance Hub would come from an existing water supply of mains water. Foul water and grey water would be treated off-site. Foul drainage from any permanent welfare facilities would be directed to an on-site cesspit for treatment prior to discharge. The cesspit (i.e. sealed tank) would be emptied by a suitable tanker as and when required. It is not proposed to have a permanent discharge to sewer, watercourse or to ground via an infiltration field. As there would be no discharge of foul water to a watercourse/ground, and no discharge to the public foul sewer is anticipated, no further assessment of foul waste from the Scheme has been undertaken.

9.4.19 It has been assumed that trenchless crossings would likely be undertaken using HDD, although other techniques such as micro-tunnelling and boring may also be used.

9.5 Assessment Methodology

Sources of Information

Desktop Survey

9.5.1 The water environment baseline conditions have been determined by a desk study of available Order limits and Scheme information, and a range of online data sources including:

a. Online Ordnance Survey (OS) maps viewed to identify any surface water features within the Study Area (Ref. 9-35);
b. Online aerial photography (Ref. 9-36);
c. Part 1: Humber River Basin District River Management Plan (Ref. 9-28);
d. The Met Office website (Ref. 9-37);
e. National Rivers Flow Archive website (Ref. 9-38);
f. Environment Agency's Catchment Data Explorer Tool (Ref. 9-39);
g. Environment Agency's Water Quality Archive website (Ref. 9-40);
h. Environment Agency's Fish and Ecology Data View (Ref. 9-41);
i. Multi-agency geographical information for the countryside (MAGIC) website (Ref. 9-42);
j. British Geological Survey (BGS) Borehole and Geology Mapping Geoindex website (Ref. 9-43);
k. The Cranfield University Soilscape website (Ref. 9-44);
l. Natural England Designated Site website (Ref. 9-45);
m. Gov.uk Online Interactive Maps (Ref. 9-46):
    i. Flood map for planning (rivers and sea).
    ii. Risk of flooding from surface water.
    iii. Risk of flooding from reservoirs.
    iv. Flood warning areas and risk.
n. City of Doncaster Council Private Water Supplies information; and
o. Environment Agency information on pollution incidents, and water activity permits.

9.5.2 The FRA presented within **ES Volume III Appendix 9-3: Flood Risk Assessment [EN010152/APP/6.3]** provides further details of relevant catchment and flood risk data, and flood risk desktop survey information.

Field Survey

9.5.3 The hydromorphological character for the Solar PV Site has been assessed from field survey walkover information on 27 July 2023 and 8 November 2023. For the survey walkovers completed in July, the antecedent weather conditions were dry, resulting in generally low flow conditions throughout. For the survey walkover in November 2023, the antecedent weather conditions were rainfall, resulting in moderate flow conditions observed. The character of watercourses within the Grid Connection Corridor has been assessed from field survey walkover information on the 20 June 2024. This included site visits of all proposed watercourse crossings by the Grid Connection Corridor, or by access track crossing locations, whether they are proposed to be permanent or temporary. For the survey walkover, the antecedent weather conditions were dry, resulting in generally low flow conditions being observed.

9.5.4 No water quality monitoring has been carried out for the assessment of the Scheme for the ES. The Environment Agency currently carries out monitoring of the more significant watercourses in the area. This data has been used as a proxy for watercourses within the area of the Scheme. Importance of water features has been determined from a holistic review of water features attributes and not just water quality, which varies temporarily. The importance level does not rely on whether water quality is Poor, or Good, due to the principle that no controlled water may be polluted (with a controlled water having the meaning as set out in section 104 Part 3 of the Water Resources Act 1991; i.e. essentially all water features that are not sewers and drains to sewers). Overall, water quality impacts will be based on a qualitative risk assessment that does not require input of raw background water quality data.

Source-Pathways-Receptor Approach

9.5.5 Based on professional judgement and experience of other similar schemes, a qualitative assessment of the likely significant effects on surface water quality and water resources has been undertaken.

9.5.6 The qualitative assessment of the likely significant effects has considered the construction, operation and maintenance, and decommissioning phases, as well as cumulative effects with other developments. It is based on a source-pathway-receptor approach. For an impact on the water environment to exist the following is required:

a. An impact source (e.g. such as the release of polluting chemicals, particulate matter, or biological materials that cause harm or discomfort to humans or other living organisms, or the loss or damage to all or part of a water feature, or the change to water volume or flow rate within a watercourse);
b. A receptor that is sensitive to that impact (i.e. water features and the services they support); and
c. A pathway by which the two are linked.

9.5.7 The first stage in applying the source-pathway-receptor approach is to identify the causes or ‘sources’ of potential impact from a development. The sources have been identified through a review of the details of the Scheme, including the Order limits and nature of the Scheme, potential construction methodologies and timescales.

9.5.8 The next step in the model is to undertake a review of the potential receptors, that is, the water environment receptors themselves that have the potential to be affected. Water features, including their attributes, have been identified through desk study and site surveys.

9.5.9 The last stage of the model is, to determine if there is a viable exposure pathway or a 'mechanism' linking the source to the receptor. This has been undertaken in the context of local conditions relative to water receptors within the Study Area, such as topography, geology, climatic conditions and the nature of the impact (e.g. the mobility of a liquid pollutant or the proximity to works that may physically impact a water feature).

9.5.10 To support the assessment, a number of sub-topic specific assessments have been undertaken. These are described in more detail in the following sections.

Hydromorphology

9.5.11 The hydromorphological character of the watercourses within the Solar PV Site and Grid Connection Corridor has been assessed based on desk top and field survey information.

9.5.12 Consideration has also been given to how the Scheme is likely to impact upon the WFD objectives for the relevant watercourses within **ES Volume III Appendix 9-2: Water Framework Directive (WFD) Assessment [EN010152/APP/6.3]**. Effects are described according to the method for determining effect significance set out in **ES Volume I Chapter 5: EIA Methodology [EN010152/APP/6.1]**.

9.5.13 Further information on the hydromorphology of the watercourses is included within the baseline and as part of the WFD Assessment that is presented within **ES Volume III Appendix 9-2: Water Framework Directive (WFD) Assessment [EN010152/APP/6.3]**.

Flood Risk Assessment

9.5.14 A FRA is provided in **ES Volume III Appendix 9-3: Flood Risk Assessment [EN010152/APP/6.3]** which assesses the current risk of flooding from all sources including fluvial, tidal, surface water, groundwater, sewer and artificial sources. Please refer to the FRA for a full description of the flood risk baseline, which is also summarised in the baseline section of this ES chapter.

Framework Drainage Strategy

9.5.15 For this ES, a Framework Drainage Strategy has been prepared and is presented within **ES Volume III Appendix 9-4: Framework Drainage Strategy [EN010152/APP/6.3].** The Framework Drainage Strategy provides initial drainage design details for new impermeable areas within the Solar PV Site which includes the BESS Area and On-Site Substation. The design includes attenuation features in the form of attenuation basins, which will aim to mimic the natural drainage regime as far as practicable. The assessment includes the estimation of surface water attenuation requirements.

Assessment of Surface Water Runoff for the Operation and Maintenance Phase

9.5.16 During operation, surface water runoff from the Scheme may contain pollutants derived from impermeable surfaces (e.g. inert particulates, litter, hydrocarbons, metals, nutrients and de-icing salts). Although each pollutant may itself not be present in harmful concentrations, the combined effects over the long term can cause chronic (i.e. persistent and long lasting) adverse impacts. Changes in impermeable surface area within the Order limits may lead to increases in the rate and quantities of these pollutants being runoff to receiving watercourses. An assessment is therefore undertaken to determine the potential risk to the receiving water features and to inform the development of suitable mitigation and treatment measures.

9.5.17 The appropriateness of design within the Framework Drainage Strategy has been assessed with reference to the Simple Index Assessment method described in the SuDS Manual (Ref. 9-34). This is included within **ES Volume III Appendix 9-4: Framework Drainage Strategy [EN010152/APP/6.3]**. The Simple Index Approach follows three steps:

a. Step 1 – Determine suitable pollution hazard indices for the land use(s);

b. Step 2 – Select SuDS with a total pollution mitigation index that equals or exceeds the pollution hazard index (for three key types of pollutants - total suspended solids, heavy metals and hydrocarbons). Only 50% efficiency should be applied to second, third etc. treatment train components; and

c. Step 3 – If the discharge is to a water feature protected for drinking water, consider a more precautionary approach.

9.5.18 The SuDS Manual (Ref. 9-34) only provides a limited number of land use types and so those selected will be the most suitable for the components of the Scheme, based on professional judgement. Where more than one pollution hazard category applies to a component of the Scheme, the worst pollution hazard will be selected for the conveyance features.

Water Framework Directive Assessment

9.5.19 Development proposals having the potential to impact on current or predicted WFD status are required to assess their compliance against the objectives defined for potentially affected water features. As part of its role, the Environment Agency must consider whether proposals for new developments have the potential to:

a. Cause a deterioration of a water body from its current status or potential; and/or

b. Prevent future attainment of Good Status (or potential where not already achieved) taking into account the conservation objectives of any relevant Protected Areas.

9.5.20 The following guidance on how to undertake WFD assessments have been used to inform this assessment:

a. Environment Agency Advice Note - Water Framework Directive Risk Assessment: How to assess the risk of your activity' (Ref. 9-47); and

b. The Planning Inspectorate's Guidance: Nationally Significant Infrastructure Projects: Advice on The Water Framework Directive (Ref. 9-48), which is the updated Advice Note 18.

9.5.21 The WFD assessment is undertaken in three stages. The first stage is 'screening', the aim of which is to identify the Scheme components that could affect WFD status and 'screen out' aspects of the Scheme that do not require any further consideration. The second stage is ‘scoping’, whereby WFD receptors that are potentially at risk are identified and it is determined how the risk will be assessed. Finally, the third stage involves a full impact assessment and, potentially, consideration of the criteria for derogation of the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (Ref. 9-8), if required. The WFD regulations set out the conditions that must be met to justify derogation of compliance with WFD objectives.

9.5.22 Watercourses that do not have individual WFD classifications take the classification of the receiving water body. **ES Volume III Appendix 9-2: Water Framework Directive (WFD) Assessment [EN010152/APP/6.3]** presents the screening (Stage 1), scoping (Stage 2) and full impact assessment (Stage 3).

<u>Matters Scoped out of the Assessment</u>

9.5.23 Within **ES Volume III Appendix 1-1: EIA Scoping Report [EN010152/APP/6.3]**, it was presented that the area is not within an area affected by Natural England nutrient management restrictions. Also, as the Scheme would reduce the runoff of nutrients into the surrounding watercourses, it was proposed nutrient neutrality can be scoped out of the assessment. Within the **ES Volume III Appendix 1-2: EIA Scoping Opinion [EN010152/APP/6.3]**, the scoping out of nutrient neutrality was agreed by the Planning Inspectorate.

<u>Determining the Significance of Effects</u>

9.5.24 The significance of effects has been determined using the principles of the guidance and criteria set out in the Design Manual for Roads and Bridges (DMRB) LA113 Road Drainage and the Water Environment (Ref. 9-49) and LA 104 (Ref. 9-50) adapted for this assessment to take account of hydromorphology. Although these assessment criteria were developed for road infrastructure projects, this method is suitable for use on any development project and it provides a robust and well tested method for predicting the significance of effects. The criteria that have been used to determine receptors importance are presented in Table 9-1. Further information on the general assessment methodology is included within **ES Volume I Chapter 5: EIA Methodology [EN010152/APP/6.1]**.

9.5.25 Whilst other disciplines may consider ‘receptor sensitivity’, instead ‘receptor importance’ is considered when determining the significance of effects on the water environment. This is because, when considering the water environment, the availability of dilution means that there can be a difference in the sensitivity and importance of a water feature. For example, a small drainage ditch of low conservation value and biodiversity with limited other socio-economic attributes is very sensitive to impacts, whereas an important regional scale watercourse, that may have conservation interest of international and national significance and support a wider range of important socio-economic uses, is less sensitive by virtue of its ability to assimilate discharges and physical effects. Irrespective of importance, all controlled waters in England are protected by law from being polluted.

9.5.26 In accordance with the stages of the methodology, there are three stages to the assessment of effects on the water environment, which are as follows:

a. A level of importance (low to very high) is assigned to the water resource receptor based on a combination of attributes (such as the size of the watercourses, WFD designation, water supply and other uses, biodiversity, and recreation etc.) and on receptors to flood risk based on the vulnerability of the receptor to flooding.

b. The magnitude of potential and residual impact (classed as negligible, low, medium and high adverse/beneficial) is determined based on the criteria listed in Table 9-2 and the assessor's professional judgment. Embedded or standard mitigation measures are taken into account in the initial assessment, but any other mitigation is not considered until the assessment of residual effects.

c. A comparison of the importance of the resource and magnitude of the impact (for both potential and residual impacts) results in an assessment of the overall significance of the effect on the receptor using the matrix presented in Table 9-3. The significance of each identified effect (both potential and residual) is classed as major, moderate, minor, negligible or neutral significance, either beneficial or adverse.

9.5.27 The following significance categories have been used for both potential and residual effects:

a. Negligible: An imperceptible effect or no effect to a water resource receptor;

b. Beneficial: A beneficial/positive effect on the quality of a water resource receptor; or

c. Adverse: A detrimental/negative effect on the quality of a water resources receptor.

9.5.28 In the context of this assessment, an effect can be temporary or permanent, with temporary effects further quantified as being short-term (0-5 years), medium term (6-10 years) and long-term (>10 years).

9.5.29 At a spatial level, 'local' effects are those affecting the Scheme within the Order limits and neighbouring receptors within the Study Area, while effects upon receptors including and beyond the vicinity of the Study Area but within the same region of the country, are considered to be at a 'regional' level. Effects which affect different parts of the country, or England as a whole, are considered being at a 'national' level. Spatial importance is built into the criteria for determining importance as outlined in Table 9-1 and is therefore taken into account in the process of determination significance of effects.

9.5.30 The importance of the receptor (Table 9-1) and the magnitude of impact (Table 9-2) are determined independently from each other and are then used to determine the overall significance of effects (Table 9-3). Options for mitigation are considered and secured where practicable to avoid, minimise and reduce adverse impacts, particularly where significant effects may have otherwise occurred. The residual effects of the Scheme with identified mitigation in place are then reported. Effects of moderate or greater are considered significant.

Table 9-1: Criteria to Determine Receptor Importance (Adapted from DMRB LA113) (Ref. 9-49)

Importance	General Criteria	Surface Water	Groundwater	Hydromorphology	Flood Risk
Very high	The receptor has little or no ability to absorb change without fundamentally altering its present character, is of very high environmental value, or of international importance.	Salmonid fishery. Watercourse having a WFD classification as shown in a River Basin Management Plan (RBMP) and Q95 ≥ 1.0 m^3/s; site protected/designated under international or UK habitat legislation (Special Areas of Conservation (SACs), Special Protection Areas (SPAs), Sites of Special Scientific Interest (SSSIs), WPZ, Ramsar site. Critical social or economic uses (e.g. public water supply and navigation).	Source Protection Zone (SPZ) 1; Principal aquifer providing a regionally important resource and/or supporting a site protected under international and UK legislation; Groundwater locally supports GWDTE; Water abstraction: >1,000 m^3/day.	Unmodified, pristine (or near to) conditions, with well-developed and diverse geomorphic forms and processes characteristic of river and lake type.	Essential Infrastructure or highly vulnerable development.
High	The receptor has low ability to absorb change without fundamentally altering its present character, is of high environmental value,	Watercourse having a WFD classification as shown in a River Basin Management Plan (RBMP) and Q95 < 1.0 m^3/s; Major Cyprinid Fishery;	Principal Aquifer providing locally important source supporting rover ecosystem; SPZ2; Groundwater supports GWDTE; Water	Conforms closely to natural, unaltered state and will often exhibit well-developed and diverse geomorphic forms and processes characteristic of river and lake type. Deviates from natural conditions due to direct	More vulnerable development.

Importance	General Criteria	Surface Water	Groundwater	Hydromorphology	Flood Risk
	or of national importance.	Species protected under international or UK habitat legislation. Critical social or economic uses (e.g. water supply and navigation). Important social or economic uses such as water supply, navigation or mineral extraction.	abstraction: 500-1,000 m^3/day.	and/or indirect channel, floodplain, bank modifications and/or catchment development pressures.	
Medium	The receptor has moderate capacity to absorb change without significantly altering its present character, has some environmental value or is of regional importance.	Watercourse detailed in the Digital River Network but not having a WFD classification as shown in a RBMP. May be designated as a local wildlife site (LWS) and support a small/limited population of protected species. Limited social or economic uses.	Secondary Aquifer providing water for agricultural or industrial use with limited connection to surface water SPZ 3; Water abstraction: 50-499 m^3/day.	Shows signs of previous alteration and/or minor flow/water level regulation but still retains some natural features, or may be recovering towards conditions indicative of the higher category.	Less vulnerable development.
Low	The receptor is tolerant of change without detriment to its character, is low environmental value, or local importance.	Surface water sewer, agricultural drainage ditch; non-aquifer WFD Class ‘Poor’ or undesignated in its own right. Low aquatic	Generally Unproductive strata. Water abstraction: <50 m^3/day.	Substantially modified by past land use, previous engineering works or flow/water level regulation. Watercourses likely to possess an artificial cross-section (e.g. trapezoidal) and will probably	Water compatible development.

Importance	General Criteria	Surface Water	Groundwater	Hydromorphology	Flood Risk
		fauna and flora biodiversity and no protected species. Minimal economic or social uses.		be deficient in bedforms and bankside vegetation. Watercourses may also be realigned or channelised with hard bank protection, or culverted and enclosed. May be significantly impounded or abstracted for water resources use. Could be impacted by navigation, with associated high degree of flow regulation and bank protection, and probable strategic need for maintenance dredging. Artificial and minor drains and ditches will fall into this category.	
Negligible	The receptor is resistant to change and is of little environmental value.	Not applicable.	Not applicable.	Not applicable.	Not applicable.

Table 9-2: Magnitude of Impact Criteria (Adapted from DMRB LA113) (Ref. 9-49)

Magnitude of Impact	Description
High Adverse	Results in a loss of attribute and/or quality and integrity of the attribute.
Medium Adverse	Results in impact on integrity of attribute, or loss of part of attribute.
Low Adverse	Results in some measurable change in attribute's quality or vulnerability.
Very Low Adverse/Beneficial	Results in impact on attribute, but of insufficient magnitude to affect the use or integrity.
Low Beneficial	Results in some beneficial impact on attribute or a reduced risk of negative impact occurring.
Medium Beneficial	Results in moderate improvement of attribute quality.
High Beneficial	Results in major improvement of attribute quality.
No change	No comment.

Table 9-3: Matrix for Assessment (Adapted from DMRB LA104) (Ref. 9-50)

Importance of Receptor	Magnitude of Impact				
	High	**Medium**	**Low**	**Very Low**	**No change**
Very High	Major	Major	Major	Minor	Neutral
High	Major	Major	Moderate	Minor	Neutral
Medium	Major	Moderate	Minor	Negligible	Neutral
Low	Moderate	Minor	Negligible	Negligible	Neutral
Negligible	Minor	Negligible	Negligible	Negligible	Neutral

9.6 Stakeholder Engagement

Scoping Opinion

9.6.1 A scoping exercise was undertaken in Spring 2023 to establish the content of the assessment and the approach and methods to be followed. The scoping exercise outcomes were presented in the Scoping Report (**ES Volume III Appendix 1-1: EIA Scoping Report [EN010152/APP/6.3]**) which was submitted to the Planning Inspectorate on 1 June 2023. The Scoping Report records the findings of the scoping exercise and details the technical guidance, standards, good practice and criteria to be applied in the assessment to identify and evaluate the likely significant effects of the Scheme on the Water Environment.

9.6.2 A Scoping Opinion was received from the Planning Inspectorate on 11 July 2023 (ES **Volume III Appendix 1-2: EIA Scoping Opinion [EN010152/APP/6.3]**).

9.6.3 A full review of all comments raised in the Scoping Opinion is provided in **ES Volume III Appendix 1-3: EIA Scoping Opinion Responses [EN010152/APP/6.3]**. This also outlines how and where the Scoping Opinion comments have been addressed within this ES.

Statutory Consultation

9.6.4 Further consultation in response to formal pre-application engagement was undertaken through the Preliminary Environmental Information Report (PEIR), issued in Spring 2024. Responses to this statutory consultation are presented in the **Consultation Report [EN010152/APP/5.1]**.

9.6.5 Statutory consultation responses relating to the Water Environment are presented in **Appendix O** of the **Consultation Report [EN010152/APP/5.1]**.

Additional Consultation

9.6.6 Additional meetings have been held with the Environment Agency, on 3 October 2023, and the Danvm IDB on 4 August 2023. The meeting with the Environment Agency was to confirm the availability of the River Went modelling data and request any survey data on the existing flood defences. The meeting with the IDB was to present the approach to drainage from the Solar PV Site, and gain agreement over the approach to watercourse crossings, and their requirement for a 9m buffer from the bank top. A consultation meeting was also held with City of Doncaster Council on 9 June 2023. This presentation was to introduce the Scheme, the advantages of the location and benefits from the Scheme.

9.6.7 Additional meetings were held with the Danvm IDB on 19 July 2024 and 4 September 2024 to update the IDB on the proposed crossing strategy for board-maintained watercourses and agree on the PRoW and traffic management proposals at Haggs Lane in order to allow for maintenance of Fenwick Lane Drain (East) (URN AAA892) by the IDB.

9.6.8 Further meetings with the Environment Agency on the subject of flood risk modelling were held on 17 May 2024 (discussing flood risk modelling methodology and survey limitations) and on 5 September 2024 (presenting flood risk modelling results and proposed mitigation measures).

9.7 Baseline Conditions

Existing Baseline: Solar PV Site

Topography, Climate and Land Use

9.7.1 The topography of the Solar PV Site and its 1 km Study Area is relatively flat, with existing ground levels under 10m Above Ordnance Datum (AOD) according to online OS mapping (Ref. 9-35). There are flood plains associated with:

a. The River Went, a Main River, flowing from west to the east, discharging into the River Don; and

b. Fenwick Common Drain, transforming into Fleet Drain, which discharges into the River Went at the north eastern border of the Solar PV Site.

9.7.2 In addition, there are numerous other Ordinary Watercourses within the Study Area that fall under the jurisdiction of the LLFA, City of Doncaster Council, or Danvm IDB. These watercourses drain surface water from the surrounding agricultural areas.

9.7.3 Based on the Meteorological Office website (Ref. 9-37), the nearest weather station is located in Robin Hood Doncaster Sheffield Airport, approximately 17 km southeast of Fenwick. Using data from this weather station, for the period 1991 to 2020, it is estimated that the Study Area experiences approximately 582 mm of rainfall per year, with it raining more than 1 mm on approximately 113 days per year, which are both low in the UK context. This is relevant to the whole Study Area.

9.7.4 The area is currently used mainly for agriculture, with a mosaic of predominantly mixed agricultural fields. There are several small villages, hamlets and farms located throughout the Study Area.

Surface Water Features

9.7.5 The Scheme may interact directly with seven surface water features within the Solar PV Site. These are:

a. River Went;

b. Fenwick Common Drain;

c. Fleet Drain;

d. North tributary to Fleet Drain;

e. South Tributary to Fleet Drain;

f. Ell Wood and Fenwick Grange Drain; and

g. Clay Dike.

9.7.6 These watercourses flow eastwards to the River Don, located approximately 5.5 km downstream of the Solar PV Site. This is considered the ultimate receptor for any potential water quality impacts.

River Went

9.7.7 The River Went is the only Main River within the Study Area of the Solar PV Site. Main Rivers are defined according to criteria set under the Water Resources Act 1991 (Ref. 9-6) as usually larger rivers and streams with a potentially significant flood risk associated with them, for which the Environment Agency is the regulating authority.

9.7.8 The River Went (which discharges to the River Don at Selby Road outside of the Study Area) forms the northern boundary to the Solar PV Site. This is shown on **ES Volume II Figure 9-1: Surface Water Features and their Attributes [EN010152/APP/6.2]**.

9.7.9 In addition, there are numerous Ordinary Watercourses within the Study Area. Section 72 of the Land Drainage Act 1991 (as amended) (Ref. 9-5) defines an Ordinary Watercourse as "*a watercourse that does not form part of a Main River*", and a 'watercourse' as "*all rivers and streams and all* *ditches, drains, cuts, culverts, dikes, sluices, sewers (other than public sewers within the meaning of the Water Industry Act 1991) and passages, through which water flows*." The LLFA (i.e. City of Doncaster Council) is the regulating authority for these, other than those that are IDB drains (where they are maintained by the Danvm IDB).

9.7.10 The River Went flows in an easterly direction, towards the confluence with the River Don (Main River) at Selby Road, outside of the Study Area. Multiple agricultural ditches drain into the River Went from the north and south, within the Solar PV Site and the 1 km Study Area.

9.7.11 The nearest gauging station on the River Went is located upstream of the Study Area (approximately 3.5 km) at Walden Stubbs (Ref. 9-38) (see **ES Volume II Figure 9-1: Surface Water Features and their Attributes [EN010152/APP/6.2]**). The catchment area upstream is 83.7 km^2.The daily mean flow is 0.575 cubic metres per second (m^3/s), with a flow that is exceeded 95% of the time (Q95) of 0.164 m^3/s, or 164 litres per second (Ref. 9-38).Therefore, the flow in the area of the Solar PV Site would be expected to be higher than the gauged flow. Sections of the River Went, particularly where it interacts with the Solar PV Site and downstream of the 1 km Study Area appear to be overly straight and have likely been modified. Within the River Went European Bullhead, *Cottus gobio*, have been found upstream of the Solar PV Site. This is an Annex II species which requires protection. More information on the aquatic ecology can be found within **ES Volume I Chapter 8: Ecology [EN010152/APP/6.1]**.

Fenwick Common Drain

9.7.12 Fenwick Common Drain (Ordinary Watercourse) flows through the Solar PV Site, in an easterly and northeasterly direction, as shown on **ES Volume II Figure 9-1: Surface Water Features and their Attributes [EN010152/APP/6.2]**. It crosses the Solar PV Site Boundary between Haggs Lane and Lawn Lane and flows east for approximately 1 km before flowing north, around Bunfold Shaw towards its confluence with Fleet Drain. An estimate of the Q95 flow for Fenwick Common Drain and Fleet Drain catchment is included in the section below.

Fleet Drain

9.7.13 Fleet Drain (Ordinary Watercourse) is located within the Solar PV Site and flows northeast then directly north towards its confluence with the River Went (west of Topham Ferry Lane) (see **ES Volume II Figure 9-1: Surface Water Features and their Attributes [EN010152/APP/6.2]**). An unnamed drainage ditch, known as southern tributary to Fleet Drain, flows east past Riddings Farm and Fenwick Hall and into Fleet Drain at NGR SE 61224 16460. Similarly, further downstream, another unnamed drainage ditch, known as northern tributary to Fleet Drain, flows into Fleet Drain at NGR SE 61661 16938. Fleet Drain is an overly straight and heavily modified drain.

9.7.14 There are no gauging stations on Fenwick Common Drain or Fleet Drain. The catchment area for Fenwick Common Drain and Fleet Drain is estimated to be 8.7 km^2, which is approximately 10% of the area of River Went at the point of the gauging station described above. Assuming a similar catchment character a proportional method can be used to estimate the flow along Fleet

Drain. With the area being estimated to be 10% of the area of the Walden Stubbs gauging station, the Q95 is estimated to be 10% of that flow, or 0.016 m^3/s (i.e. 16 litres per second). However, this should only be used as a guide as it is hard to estimate the catchment area due to the impact of human modification on the drainage of the area.

Ell Wood and Fenwick Grange Drain

9.7.15 Ell Wood and Fenwick Grange Drain (Ordinary Watercourse) flows in an easterly direction, along the south edge of the Solar PV Site beginning north of Moss at the southwest corner of the Solar PV Site, as shown on **ES Volume II Figure 9-1: Surface Water Features and their Attributes [EN010152/APP/6.2]**. This drain continues to flow east, north of Moseley House Farm towards Flashley Carr Lane. This drain flows to outside of the 1 km Study Area for the Solar PV Site into Flashley Carr Drain, leading to Braithwaite Town Drain and Bramwith Drain.

9.7.16 There are multiple other smaller unnamed agricultural ditches and drains located within the Solar PV Site, which drain to the surface water features noted above. Further detail on their characteristics is given in the Hydromorphology section later in this chapter.

Clay Dike

9.7.17 Clay Dike (Ordinary Watercourse) is located within the 1 km Study Area of the Solar PV Site and is located to the southeast corner of the Solar PV Site. Clay Dike appears to flow east, away from the Solar PV Site towards Blackshaw Dike before eventually draining to the River Don. The Solar PV Site works do not take place within the catchment area of Clay Dyke as it is located 750m southeast of the Order limits, so this is scoped out of further assessment.

Ponds

9.7.18 Ponds that are not hydrologically linked to watercourses are included within **ES Volume I Chapter 8: Ecology [EN010152/APP/6.1]**. Ponds south of the River Went near to Topham at NGR SE 62153 17114 and SE 61984 17121 are located to the west of the Solar PV Site, approximately 0.25 km and 0.075 km west, respectively. These are hydrologically linked to a tributary to Fleet Drain, but on the east side of the watercourse. The Solar PV Site is to the west of Fleet Drain so any impacts will not affect these pond features, so they are scoped out of further assessment.

Hydromorphology

9.7.19 The Scheme interacts with six watercourses within the Solar PV Site. The River Don is noted as a receptor within the water quality section above, due to the pathway of flow from the catchment via watercourses to the River Don. However, as the River Don is located 5.5 km east and downstream of the Order limits, and the Solar PV Site does not interact with the channel of the River Don, this is not covered in this section. The baseline hydromorphological information on each watercourse is provided in Table 9-4, informed by desk study and site visits.

Table 9-4: Hydromorphology

Waterbody	Baseline
River Went	The River Went within the Study Area is designated as the Went from Blowell Drain to the River Don WFD water body, which is classed as heavily modified for its hydromorphological designation. The Went throughout the Study Area has a small degree of sinuosity and is approximately 10m wide. Some sections appear overly straight and have likely been modified, as shown in Plate 9-1 though any such modification will have been undertaken prior to 1900 as historic mapping (Ref. 9-58) shows no changes in the River Went's course since this date. Geology mapping shows the River Went to possess a wide corridor of alluvium deposits that indicate the extent to which the river may have previously meandered across the floodplain. Wider superficial deposits consist of glaciolacustrine clay and silt. The riparian zone is scrub with occasional trees, providing some buffer from surrounding arable fields. The soils within the area local to the river are slowly permeable, seasonally wet, slightly acid, but base-rich loamy and clayey, of moderate fertility and indicative of areas (Ref. 9-44) of grassland and woodland, though arable and agriculture is the prevailing land use.  **Plate 9-1: River Went, looking Upstream (NGR SE 59017 17153) (27 July 2023)**

Waterbody	Baseline
Fenwick Common Drain	Fenwick Common Drain does not have a WFD classification, therefore takes the classification of its receiving water body, the River Went. Fenwick Common Drain Plate 9-2 is highly modified with a trapezoidal channel, which has moderate sinuosity through the Study Area, although straightened sections indicate historic modification. Such modification will have been undertaken prior to 1900 as historic mapping (Ref. 9-58) shows no changes in the course since this date. Superficial deposits local to the channel consist of glaciolacustrine clay and silt. The channel is over-deep with approximately 2m bank height, with little flow in the channel (during visits). The channel has a narrow riparian habitat of grasses, scrub vegetation, and trees, providing a limited buffer from fines and nutrient ingress from adjacent fields. The soils within the area local to the channel are slowly permeable, seasonally wet, slightly acid, but base-rich loamy and clayey, of moderate fertility and indicative of areas of grassland and woodland (Ref. 9-44), though arable and agriculture is the prevailing land use.

Plate 9-2: Fenwick Common Drain, looking upstream (NGR SE 59685 15780) (27 July 2023)

Waterbody	Baseline
Fleet Drain	Fleet Drain does not have a WFD classification, therefore takes the classification of its receiving water body, the River Went. Fleet Drain (Plate 9-3) displays some natural sinuosity in places but is generally straight, over deep and disconnected from the adjacent floodplain. The over-deep and straightened character suggests that the channel has been historically modified. A narrow band of alluvium in the downstream extent of the Study Area suggests that the channel would previously have been connected to its floodplain. Elsewhere, superficial deposits consist of glaciolacustrine clay and silt. The channel is heavily silted, which is likely a result of the general lack of a buffer from agricultural run-off through most of the Study Area, although as can be seen in Plate 9-3, there are some localised areas which have a larger buffer habitat. The soils within the area local to the channel are slowly permeable, seasonally wet, slightly acid, but base-rich loamy and clayey, of moderate fertility and indicative of areas of grassland and woodland Ref. 9-44, though arable and agriculture is the prevailing land use.  **Plate 9-3: Fleet Drain, looking downstream (NGR SE 60837 15853) (27 July 2023)**
North tributary of Fleet Drain	This unnamed tributary of Fleet Drain takes the classification of its receiving water body, the River Went. This channel is an artificially straight drainage channel. Through the majority of the Study Area the channel is dry or has no flow with water pooled and stagnant. The lack of flow observed in the channel may be explained due to the dry weather during the survey visit in summer. As shown in Plate 9-4, the banks are grassy with regularly spaced trees acting to engineer the bank into its straightened planform. In the upstream

Waterbody	Baseline
	extent there is evidence of cattle poaching of the banks, resulting in fine material entering the channel. Superficial deposits consist of glaciolacustrine clay and silt (Ref. 9-43). The soils within the area local to the channel are slowly permeable, seasonally wet, slightly acid, but base-rich loamy and clayey, of moderate fertility and indicative of areas of grassland and woodland (Ref. 9-44), though arable and agriculture is the prevailing land use.

Plate 9-4: North tributary of Fleet Drain, looking upstream (NGR SE 61505 17003) (27 July 2023)

Waterbody	Baseline
South tributary of Fleet Drain	This unnamed tributary of Fleet Drain takes the classification of its receiving water body, the River Went. This is an artificially straight drainage channel, which is over-deep and disconnected from its floodplain (Plate 9-5). Woody material in the channel acts to provide some flow and geomorphic diversity, although there was little flow present in the channel at the time of survey during a dry period in summer. Additionally, riparian habitat is provided by scrub vegetation, acting as a buffer to nutrients and fines from adjacent agricultural land use. The soils within the area local to the channel are slowly permeable, seasonally wet, slightly acid, but base-rich loamy and clayey, of moderate fertility and indicative of areas of grassland and woodland (Ref. 9-44), though arable and agriculture is the prevailing land use.  **Plate 9-5: South tributary of Fleet Drain, looking downstream (NGR SE 61104 16464) (27 July 2023)**
Ell Wood and Fenwick Grange Drain	Ell Wood and Fenwick Grange Drain, which flows along the southern edge of the Solar PV Site, does not have a WFD classification and therefore takes the classification of its receiving water body, the River Don. The watercourse has a straightened, trapezoidal channel as it flows through agricultural fields in the Study Area (Plate 9-6). The channel has likely been modified for agricultural drainage; however this would have taken place prior to OS mapping in the early 1900s (Ref. 9-58). Superficial deposits local to the channel consist of glaciolacustrine clay and silt. The channel generally has a buffer of scrub and grass vegetation, potentially limiting ingress of fines and nutrients from surrounding arable land. The soils within the area local to the channel are slowly permeable, seasonally wet, slightly acid, but base-rich loamy and

Waterbody	Baseline
	clayey, of moderate fertility and indicative of areas of grassland and woodland (Ref. 9-44), though arable and agriculture is the prevailing land use.

Plate 9-6: Ell Wood and Fenwick Grange Drain, looking downstream (8 November 2024)

WFD classification

9.7.20 The present (i.e. Cycle 3, 2022) WFD classifications of the surface water bodies underlying the Solar PV Site are given in Table 9-5 (Ref. 9-39), as identified through the WFD screening and scoping assessment included as **ES Volume III Appendix 9-2: Water Framework Directive Assessment [EN010152/APP/6.3]**.

9.7.21 There is also one groundwater body, the Aire and Don Sherwood Sandstone, which is discussed under the section entitled 'Hydrogeology and Groundwater'.

Table 9-5: WFD Classification (Cycle 3 data) for WFD Surface Water Bodies Underlying the Solar PV Site (Ref. 9-39)

Classification Item	Went from Blowell Drain to the River Don	Don from Mill Dyke to River Ouse
Water Body ID	GB104027064260	GB104027064243
Hydromorphological designation	Heavily modified	Artificial
Ecological	Moderate	Moderate
Biological quality elements	Poor	Poor

Classification Item	Went from Blowell Drain to the River Don	Don from Mill Dyke to River Ouse
Physico-chemical quality elements	Moderate	Moderate
Hydromorphological supporting elements	Supports Good	Supports Good
Hydrological regime	Supports Good	Supports Good
Supporting elements (Surface Water)	Moderate	Moderate
Mitigation measures assessment	Moderate or less	Moderate or less
Specific pollutants	High	High
Chemical	Does not require assessment	Does not require assessment
Priority hazardous substances	Does not require assessment	Does not require assessment
Priority substances	Good	Fail
Other pollutants	Does not require assessment	Does not require assessment

9.7.22 Reasons for not achieving good (RNAGs) for the Don from Mill Dyke to River Ouse Water Body include diffuse source pollution resulting from agriculture and transport, point source pollution from sewage discharge from the water industry and physical modification for agriculture and urban purposes.

9.7.23 RNAGs for the Went from Blowell Drain to the River Don Water Body include diffuse source pollution as a result of poor nutrient management from agriculture, point source pollution from domestic and water industry sewage discharge, and physical modification due to flood protection structures.

Water Quality

9.7.24 This section sets out the baseline water quality conditions at the Order limits.

9.7.25 Water quality data for the River Went has been interrogated from the Environment Agency's Water Quality Archive website (Ref. 9-40). Within the Solar PV Site and associated Study Area, there is one water quality sampling location on the River Went, at Topham Ferry Bridge, shown in **ES Volume II Figure 9-1: Surface Water Features and their Attributes [EN010152/APP/6.2]**. This monitoring location is located less than 100m downstream of the Solar PV Site. Further upstream (outside of the Study Area, approximately 3 km upstream of the Solar PV Site) there is the Went at A19 Askern monitoring location, and further downstream (outside of the Study Area, approximately 5.5 km downstream of the Solar PV Site) there is the Went at Sykehouse monitoring location.

9.7.26 The water quality within the River Went (averaged across all three sampling locations) is slightly alkaline to circum-neutral in nature with an average pH of 7.95 but falls within the WFD high classification. A 10th percentile dissolved oxygen saturation from all three sites of 71.02 % is within the High WFD classification (with 70% being high). There has been no monitoring of Biochemical Oxygen Demand (BOD) in the last few years of data. Ammonia levels are on average 0.12 mg/l, which is within the High WFD Classification (with 0.3 mg/l or less being High).

9.7.27 Nitrate and orthophosphate values are somewhat elevated in the River Went within the Solar PV Site, at Topham Ferry Bridge with average values of 8.9 mg/l nitrate and 0.47 mg/l orthophosphate and indicates probable pressure from the surrounding agricultural land uses through use of fertilisers and other products which may runoff to the watercourses.

Water Resources

9.7.28 Within the Solar PV Site, there are no Drinking Water Protected Areas or Drinking Water Safeguard Areas. Approximately 900m north of the Study Area for the Solar PV Site is the Great Heck and Pollington Drinking Water Safeguard Zone (Groundwater) (Water body ID GB40401G701000), although this will not be affected by the Scheme and therefore not considered any further.

9.7.29 These safeguard zones are catchment areas that influence the water quality for their respective Drinking Water Protected Area (DrWPA), which are at risk of failing the drinking water protection objectives. In this area, the water quality pressures are associated with risk of impacts from nitrate pollution. There are two areas of Source Protection Zone (SPZ) 1 and Zone 2 for public water supply abstractions located to the north of the Solar PV Site outside of the Study Area. The Study Area to the north of the Solar PV Site lies within the total catchment (SPZ 3) for these sources. This extends into the Solar PV Site at the SPZ 3 southern boundary for a distance of up to 200 m.

9.7.30 Groundwater SPZs are defined catchment zones centred on groundwater sources such as wells, boreholes and springs used for public drinking water supply (see **ES Volume II Figure 9-2: Groundwater Features and their Attributes [EN010152/APP/6.2]**). These zones show the risk of contamination from any activities that might cause pollution to the source and surrounding area. The closer the activity to the source, the greater the risk. The SPZs are subdivided into 3 Zones; where Zone 1 is the Inner Protection Zone, Zone 2 is the Outer Protection Zone and Zone 3 is the Total catchment.

9.7.31 The Solar PV Site lies within four Nitrate Vulnerable Zones (NVZs) for both groundwater and surface water. NVZs are statutory designated areas as being at risk from agricultural nitrate pollution and includes about 55% of land in England. The NVZs are summarised below.

9.7.32 The groundwater NVZs consist of:

a. Selby NVZ (Number G108); and

b. Yorkshire Mag Limestone NVZ (Number G101).

9.7.33 The surface water NVZs consist of:

a. Went from Blowell Drain to the River Don NVZ (Number S299); and

b. Bramwith Drain from Source to River Don NVZ (Number S280).

9.7.34 Information on pollution incidents which have occurred in the area have been obtained from the Environment Agency. Pollution incidents to water are classified as Category 1 (serious impact) through to Category 4 (No impact). Category 1 to Category 3 (minor impact) incidents have been reviewed within the 6 years (2017–2023).

9.7.35 There have been five water pollution incidents within the Solar PV Study Area. Three incidents were recorded at Manor Farm, located to the south west of the Study Area. The causes were listed as ‘unauthorised discharge or disposal’ of unidentified oil (Incident number 1558088) and ‘cause not identified’ (Incident number 1743973 and 1866407). One incident was recorded at Jett Hall to the south west of the Study Area. The cause for incident number 1679776 was listed as ‘septic tank or sewage treatment plant failure’. One incident was recorded at Sykehouse, located just outside the north east of the Solar PV Site. The cause for incident number 1801135 was not identified.

9.7.36 There are a number of water activity permits (discharge consents) within the Solar PV Site and wider Study Area (see **ES Volume II Figure 9-1 [EN010152/APP/6.2]**). These are listed in the table below provided by the Environment Agency.

Table 9-6: Discharge Consents Within the Solar PV Site and 1 km Study Area

Consent number	NGR	Discharge type
D1	SE6283016960	Wastewater Treatment Works
D2	SE6250616302	Farm
D3	SE5900016300	Domestic property
D4	SE5903116259	Farm
D5	SE5928115963	Domestic property
D6	SE5928015960	Domestic property
D7	SE5850715752	Domestic property
D8	SE5849315735	Domestic property
D9	SE5815015150	Farm

9.7.37 Records provided by City of Doncaster Council indicates that there are two private water supply abstraction boreholes within the 1 km Study Area. One (PWS1) of this is located approximately 600m east of the Solar PV Site (see **ES Volume II Figure 9-2: Groundwater Features and their Attributes [EN010152/APP/6.2]**) is recorded as used for irrigation purposes (and so may not be an actual potable PWS). The second (PWS2) is located to the south in the Grid Connection Corridor and is described later in this chapter.

Internal Drainage Boards

9.7.38 The Study Area is located within one IDB area, the Danvm Drainage Commissioners, part of the Yorkshire and Humber Drainage Boards. The IDB serves communities between the River Don and the River Aire. The whole of the Solar PV Site and 1 km Study Area is within the area of this IDB.

Aquatic Ecology and Nature Conservation Sites

9.7.39 This section describes the statutory sites designated for nature conservation that are relevant to the water environment assessment.

9.7.40 Statutory sites that are designated for nature conservation and are relevant to the water environment assessment were identified through a review of MAGIC (Ref. 9-42). The following are located within the Study Area, or within a few km downstream (considered in order of proximity to the Order limits):

a. The Humber Estuary Ramsar Site, SPA, SAC and SSSI is located approximately 16 km downstream of the Solar PV Site. Due to the high dilution within the River Don (which has a Q95 flow of 4.95 m3/s (or 4950 litres per second at a site that is 8 km upstream of the Grid Connection Corridor), this is scoped out for further assessment. Full details of these ecological designations are provided within **ES Volume I Chapter 8: Ecology [EN010152/APP/6.1]**; and

b. Went Ings Meadows SSSI is located outside of the 1 km Study Area for the water resources assessment. These are meadows a few metres above sea level subject to waterlogging and seasonal flooding. Traditional hay meadows have led to wet neutral grassland developing into tall fen vegetation. This is located approximately 3 km downstream from the Order limits within the catchment area of the River Went. The Went Ings Meadows SSSI appears to be linked to drains parallel to the River Went and is therefore scoped into further assessment as part of the River Went water feature (Ref. 9-45).

9.7.41 Information available from **ES Volume I Chapter 8: Ecology [EN010152/APP/6.1]** includes information on local wildlife sites and protected aquatic species. The following non-statutory designated sites are located within the 1 km Study Area:

a. River Went Oxbow: candidate Local Wildlife Site (cLWS). This comprises the old course of the River Went now forms a loop south of the present canalised river. Approximately one-third to almost a half of this old course is now a dry, or only seasonally wet, depression choked by tall ruderal and scattered wetland vegetation and shaded throughout much of this western half by dense to scattered scrub and tree cover. This is located to the approximately 1.7 km west of the Solar PV Site, upstream on the River Went and is therefore scoped out of further assessment; and

b. Riddings Farm Form: cLWS. This is a small pond and wetland feature containing small populations of a scarce dropwort and good numbers of submerged species. This is located at Riddings Farm, within the central section of the Solar PV Site, but not within the Order limits . The pond is located offline to the southern tributary to Fleet Drain and is therefore scoped out of further assessment.

9.7.42 Two notable records of fish species are available in the 2 km aquatic ecology Study Area. European Bullhead, *Cottus gobio*, and European Eel, *Anguilla anguila*, were noted in 2017 and 2019 surveys respectively at Stubbs Grange on the River Went, approximately 2 km west of the village of Fenwick.

9.7.43 Records of Otter are available for the River Went. Further information can be found within **ES Volume I Chapter 8: Ecology [EN010152/APP/6.1]**.

Geology and Hydrogeology

9.7.44 The bedrock and superficial geology for the Study Area is identified by the BGS GeoIndex online mapping (Ref. 9-43). The Solar PV Site is wholly underlain by the Sherwood Sandstone Group (see **ES Volume II Figure 9-7: Bedrock Deposits [EN010152/APP/6.2]**). The Sherwood Sandstone Group comprises yellow, red brown sandstones, part pebbly with conglomerates in the lower part.

9.7.45 An outcrop of the Roxby Formation is mapped along the western boundary of the 1 km Study Area around the Solar PV Site. The Roxby Group consists of Mudstones and Siltstones with layers of sandstone (see **ES Volume II Figure 9-7: Bedrock Deposits [EN010152/APP/6.2]**).

9.7.46 Overlying the bedrock geology, there are several superficial strata identified. The majority of the Solar PV Site is underlain by the Hemingbrough Glaciolacustrine Formation comprising laminated clays, silts and sands. Pockets of Breighton Sand Formation (typically consisting of yellowish brown clayey silty sand) are present across the Solar PV Site. Alluvial deposits associated with the watercourses, in particular along the alignment of the River Went at the northern Order limits of the Solar PV Site (see **ES Volume II Figure 9-6: Superficial Deposits [EN010152/APP/6.2]**).

9.7.47 A review of BGS borehole scans available online on the BGS GeoIndex website (Ref. 9-43) indicates that the superficial deposits at the Solar PV Site are up to 11m thick underlain by the Sherwood Sandstone Group. The Solar PV Site is located within the Nottingham Coal Mining Report Area (Ref. 9-51) and there are several deep coal exploration boreholes recorded on the BGS GeoIndex website (Ref. 9-43).

9.7.48 The Soilscape Map viewer describes the soils beneath the Solar PV Site as slowly permeable seasonally wet, loamy and clayey soils with naturally high groundwater and poor drainage characteristics (Ref. 9-44).

9.7.49 The Sherwood Sandstone Group is classified by the Environment Agency as a Principal Aquifer and the Roxby Formation as a Secondary B Aquifer (Ref. 9-42).

9.7.50 The overlying alluvial deposits and permeable pockets of Breighton Sand Formation are designated as Secondary A aquifers. All other superficial deposits such as the Hemingbrough Glaciolacustrine Formation are designated unproductive aquifers, covering a large proportion of the Solar PV Site.

9.7.51 Principal aquifers are important rock units that have high permeability, meaning they usually provide a high level of water storage and transmission. They usually support water supply and/or river baseflow on a strategic scale.

9.7.52 Secondary A aquifers comprise permeable layers that can support local water supplies and may form an important source of baseflow to rivers.

9.7.53 Secondary B aquifers comprise 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.

9.7.54 Secondary undifferentiated aquifer has been 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.

9.7.55 Groundwater vulnerability for the Solar PV Site is generally low, however, there are small areas of medium/medium to high vulnerability where the Breighton Sand Formation and the alluvial deposits are mapped within the Solar PV Site and surrounding 1 km Study Area (Ref. 9-42).

9.7.56 The Solar PV Site lies within the Humber (WFD groundwater) Management Catchment. The Aire and Don Sherwood Sandstone (WFD ID: GB40401G701000) which is within the Humber Management Catchment underlies the Solar PV Site (Ref. 9-39).

9.7.57 The Aire and Don Sherwood Sandstone (WFD ID: GB40401G701000) has an overall classification of Poor (Cycle 3, 2019), with both quantitative and chemical elements being Poor. The limiting element within the quantitative status is the quantitative water balance. The limiting elements within the chemical status are the chemical drinking water protected area and the general chemical test. The reasons for not achieving good status are due to pressures from poor nutrient management predominantly from the agricultural industry. The water body has an overall objective of Poor by 2015, which it has met. The reasons for the Poor objective are due to disproportionate burdens.

9.7.58 There are a number of borehole scans available online on the BGS GeoIndex website and on the Environment Agency Hydrology Data Explorer (Ref. 9-43 and Ref. 9-52) across the Solar PV Site, however very few include groundwater level information as the majority are for deep coal exploration purposes. Recent groundwater level data in the underlying bedrock is presented in Table 9- below.

Table 9-7: Groundwater Level Information from BGS GeoIndex

Ref.	Location	NGR	Depth (m)	Aquifer	Water struck (mbgl)	Rest Water Level (mbgl)
SE51SE5	Lady Thorp Farm, Fenwick, located 1.5 km southwest of Fenwick	SE 581 148	45.72	Sherwood Sandstone	Not recorded	2.44
SE61NW6	New Housing Site, Sykehouse, located 0.9 km east of Fenwick	SE 628 170	45.72	Sherwood Sandstone	Not recorded	2.82
SE51NE5	Went Farm, Fenwick, located 0.5 km west of Fenwick	SE 585 161	32.92	Sherwood Sandstone	Not recorded	2.44

9.7.59 Plate 9-7 presents more recent groundwater level data (between September 2017 and September 2023) for the Sherwood Sandstone Aquifer in the area received from the Environment Agency. The nearest observation borehole to the Solar PV Site data is at Lowgate Balne (NGR SE5914918024), approximately 800m north of River Went. There are no nearby observation boreholes in the southern part of the Solar PV Site, within the 1 km Study Area.

9.7.60 The available data shows that the groundwater level in the Sherwood Sandstone at Lowgate Balne to the north of the River Went varies between 2.7m bgl (2.7m AOD) and 4.9m bgl (0.55m AOD).

9.7.61 The data suggest that the groundwater in the Sherwood Sandstone likely provides baseflow to the nearby watercourses (i.e. the Rivers Went and the Don). Regionally, groundwater flows towards the River Don from the west (Ref. 9-53). Close to the River Don, the groundwater levels are locally influenced by the river due to the effects of the tides.

9.7.62 Locally, shallow groundwater will be present within the permeable superficial deposits across the area and in the vicinity of the River Went in the north of the Solar PV Site. Shallow groundwater may be encountered close to the drains, but this is not significant.

9.7.63 The majority of the Solar PV Site is underlain by Glaciolacustrine deposits consisting of clays and interbedded with pockets of Sand. Where these deposits are of low permeability, they are likely to confine the groundwater body within the Sandstone aquifer.

9.7.64 Pockets of shallow/perched groundwater is also likely to be encountered within the superficial Glaciolacustrine deposits. Where the superficial deposits are more cohesive, there will be less significant groundwater present.

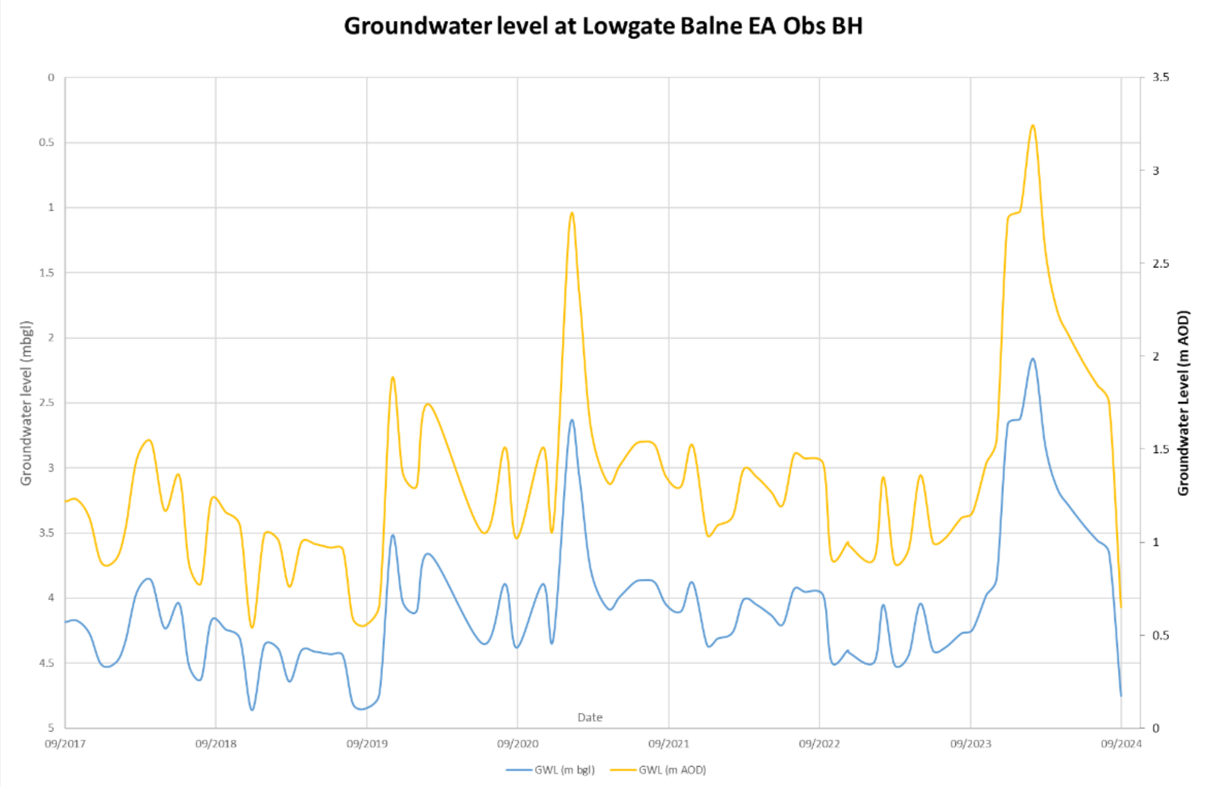

Plate 9-7: Sherwood Sandstone Groundwater level in nearest EA Observation borehole

Flood risk from all sources

9.7.65 Section 14 of the NPPF (December 2023) (Ref. 9-22) and the 2022 Flood Risk and Coastal Change NPPG (Ref. 9-25) both advise how the planning process can take account of the risks associated with flooding. The main sources of flooding that are used to steer development at the planning stage are Main Rivers and the sea. The predicted flood risk from these sources is shown on the Environment Agency's Flood Map for Planning (Refer to **ES Volume II Figure 9-4: Environment Agency Flood Map for Planning (Rivers and Seas [EN010152/APP/6.2])**) which outlines three main zones of risk as follows:

a. Flood Zone 1: This zone comprises land assessed as having a less than 1 in 1,000 chance of river or sea flooding in any year (<0.1% annual exceedance probability (AEP));

b. Flood Zone 2: This zone comprises land assessed as having between a 1 in 100 and 1 in 1,000 chance of river flooding in any year (1% - 0.1% AEP), or between a 1 in 200 and 1 in 1,000 chance of sea flooding in any year (0.5% – 0.1% AEP);

c. Flood Zone 3a: This zone comprises land assessed as having a 1 in 100 year or greater chance of river flooding in any year (>1% AEP), or a 1 in 200 year or greater chance of flooding from the sea in any year (0.5% AEP); and

d. Flood Zone 3b 'functional floodplain': A sub-part of Zone 3, this zone comprises of land having an annual probability of 1 in 30 (greater than

3.3% AEP) of flooding, with existing flood risk management features and structures 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). This zone is not usually included within the EA Flood Map for Planning (Ref. 9-46) and is calculated where necessary during detailed hydraulic modelling.

9.7.66 Annex 3 of the NPPF (December 2023) outlines what development is suitable within each Flood Zone based upon the level of vulnerability of the development. The vulnerability classifications indicate that solar farm development i.e. the Scheme is considered to be 'Essential Infrastructure'.

9.7.67 In accordance with the NPPF (December 2023), the construction of Essential Infrastructure is permitted in Flood Zones 1, 2 and an Exception Test is required for Flood Zones 3a and 3b. The Exception Test in the NPPF (December 2023) and NPS EN-1 (November 2023) requires it to be demonstrated that:

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

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

9.7.68 In response to meeting part (a) of the Exception Test a summary of the need for the Scheme and its wider sustainability benefits is set out in **ES Volume I Chapter 3: Alternatives and Design Evolution [EN010152/APP/6.1]**. In response to meeting part (b) of the Exception Test, this is addressed through the site-specific FRA set out in **ES Volume III Appendix 9-3 Flood Risk Assessment [EN010152/APP/6.3]**, which demonstrates that the Scheme will be safe from flooding throughout its lifetime without increasing flood risk elsewhere. The **Planning Statement [EN010152/APP/7.1]** includes discussion of the wider sustainability benefits of the Scheme.

9.7.69 Flood risk from all sources of flooding to the Solar PV Site is summarised in Table 9-8. Refer to **ES Volume II Figure 9-4: Environment Agency Flood Map for Planning (Rivers and Seas) [EN010152/APP/6.2]** for mapping of tidal/fluvial flood risk and **ES Volume II Figure 9-5: Risk of Flooding from Surface Water [EN010152/APP/6.2]** for mapping of surface water flood risk.

Table 9-8: Summary of Flood Risk to the Solar PV Site

Flood Source	Risk Level	Comments
Fluvial	Low	The Environment Agency's Flood Map for Planning (Ref. 9-46) shows that the majority of the south and west areas of the Solar PV Site are located within Flood Zone 1, including the BESS Area and On-Site Substation. The north and east areas of the Solar PV Site are located within Flood Zone 2 and Flood Zone 3 associated with the River Went and Fleet Drain. Areas of Flood Zone 3 within the Solar PV Site are shown to be in areas where there is a reduction in risk of flooding from

Flood Source	Risk Level	Comments
		rivers and the sea due to the presence of flood defences Hydraulic modelling has been undertaken for these watercourses which has demonstrated that the majority of the Solar PV Site and all Field Stations are located outside of the modelled flood extents during the 1% AEP plus 38% climate change event (i.e. the design flood event). Two solar PV panel Fields are shown to be partially located within the modelled flood extent: SW5 and SE3 with depths reaching approximately 0.5 m. No elements of the Scheme are located within Flood Zone 3b. As a sensitivity scenario was undertaken as part of the hydraulic modelling, simulating the Credible Maximum Scenario (H++) which includes a 60% uplift on model inflows. This shows greater extents and depths when compared to the defended 1% AEP plus 38% climate change event, but the majority of the Solar PV Site remains unaffected. Some solar PV Fields are shown to be partially located within the modelled flood extent including SW5, SE2, SE3, SE4, SE5, NE11, NE9 and NE10 with depths reaching up to approximately 0.8 m. This could potentially reach the lower edge of the Solar PV Panels without mitigation. One Field Station in Field NE9 is also located within the modelled flood extent with depths reaching up to 0.2 m.
Tidal	Low	The closest tidal source to the Solar PV Site is the River Don located to the south and east of the Solar PV Site and is tidally influenced. The River Don at its closest point is located approximately 3.6 km to the south of the Solar PV Site. The Humber Estuary is another tidal source in the surrounding area, the tidal limit of the Humber Estuary is located approximately 14 km to the northeast of the Solar PV Site. Due to the distance from the tidal sources, the flood risk to the Solar PV Site from tidal flooding is considered to be low and is not considered further within this assessment.
Tidal/Fluvial Residual Risk	High	Due to the presence of flood defences along sections of the River Went and River Don, there is a residual risk of flooding to the Solar PV Site if there was overtopping or a breach of the flood defences. To understand residual risk, breach modelling has been undertaken at two locations

Flood Source	Risk Level	Comments
		including one at the River Went Outfall as failure of this structure is likely to have the largest impact at the Solar PV Site, and one to the south of the Order limits at the River Don defences between Thorpe in Blane and Kirk Bramwith. The breach events have been simulated during the 1% AEP + 50% climate change event as a conservative approach. During the River Went Outfall breach, maximum flood depths across the Solar PV Panels reach up to approximately 1.0m in Field SE3. The maximum flood depth reached at any Field Station is approximately 0.3m located in Field NE9. During the River Don breach the entire area between the River Don and River Went including the settlements of Moss and Trumfleet are located within the modelled flood extent. Maximum flood depths at the On-Site Substation, BESS Area and across the Solar PV Panels reach 0.5 m, 0.8m and 2.0 m, respectively. Overall, the likelihood of a breach occurring is low as the flood defences in the area are maintained by the Environment Agency. However, based on the hydraulic modelling results, the fluvial/tidal residual risk in the event of a breach and the consequences of this risk are considered to be high.
Surface water	Very low (majority), low – high (localised areas)	The Environment Agency's Long Term Flood Risk Map (Ref. 9-46) shows that the majority of the Solar PV Site is located within an area of very low risk of surface water flooding. There are isolated areas at low to high risk of flooding which are likely associated with areas of low topography. The map also shows areas at low to high risk associated with smaller Ordinary Watercourses and/or local land drains. All Field Stations and the On-Site Substation are shown to be outside of the surface water flood extents. The BESS Area is partially located within the surface water flood extents, however the Framework Drainage Strategy (**ES Volume III Appendix 9-4: Framework Drainage Strategy [EN010152/APP/6.3]**) includes measures to manage this risk.
Groundwater	Low	The BGS Groundwater Flood Map shows that the Solar PV Site is located in an area where there is no or limited potential for groundwater flooding to occur. The Doncaster SFRA (Ref. 9-33) also

Flood Source	Risk Level	Comments
		indicates that the Solar PV Site is located in an area where there is a <25% chance of groundwater emergence and is not considered further within this assessment.
Sewers	Very low	The Solar PV Site is located within a rural area where there is unlikely any existing connections to sewer networks. The Doncaster SFRA mapping shows no historic sewer flood incidents at the Solar PV Site and is not considered further within this assessment.
Artificial sources	Low	The Environment Agency's Long Term Flood Risk Map (Ref. 9-46) shows that the north, east and southern areas of the Solar PV Site are located within an area at risk of flooding from reservoirs when there is also flooding from rivers. The consequences from reservoir failure can be severe, however, the Environment Agency note that this is a worst case prediction; reservoirs are maintained to a very high standard and are extremely unlikely to fail. The New Junction Canal is located 1.8m to the east of the Solar PV Site and is therefore unlikely to pose a risk. Artificial sources are not considered further within this assessment.

Existing Baseline: Grid Connection Corridor

Topography, Climate and Land Use

9.7.70 The topography of the Grid Connection Corridor (which includes the Existing National Grid Thorpe Marsh Substation) is mostly similar to that of the Solar PV Site as detailed above; existing ground levels are under 10m AOD according to online OS mapping (Ref. 9-35). There are areas of slightly higher elevation at Bentley Community Woodland (31m AOD) to the southwest of the Grid Connection Corridor, and at Thorpe Marsh Nature Reserve (11 to 14m AOD). There are floodplains and flood storage areas associated with The River Don, flowing southwest to northeast, adjacent to the Grid Connection Corridor.

9.7.71 Within the Grid Connection Corridor there are floodplains associated with numerous Ordinary Watercourses and two Main Rivers, including:

a. The River Don;

b. Bramwith Drain; and

c. Thorpe Marsh Drain which discharges into the River Don on the southern part of the Study Area.

9.7.72 The climate and land use within the Grid Connection Corridor are the same as for the Solar PV Site, as described above.

Surface Water Features

9.7.73 Within the Grid Connection Corridor, there are many surface water features including Main Rivers and Ordinary Watercourses. These are shown on **ES Volume II Figure 9-1: Surface Water Features and their Attributes [EN010152/APP/6.2]**.

River Don

9.7.74 The River Don (Main River) and River Don Navigation (Ordinary Watercourse) enter the Study Area from the south, and flow in a northerly direction. The River Don flows adjacent to the east side of the Grid Connection Corridor for approximately 2.5 km before crossing the River Don Navigation near Kirk Bramwith/Braithwaite area and continuing northeast. The River Don Navigation also flows northeast through the Study Area, past Kirk Bramwith towards the Aire and Calder Navigation.

9.7.75 The nearest gauging station on the River Don is located upstream of the Thorpe Marsh area (approximately 8 km) at Doncaster (see **ES Volume II Figure 9-1: Surface Water Features and their Attributes [EN010152/APP/6.2]**). At this location the daily mean flow is 16.488 cubic metres per second (m^3/s), with a flow that is exceeded 95% of the time (Q95) of 4.95 m^3/s (Ref. 9-38).Therefore, the flow in the area of the Order limits would be expected to be higher than the gauged flow. From Ordnance Survey mapping, the River Don Navigation is hydrologically separated from the River Don (although there may be some transfer of flows), and therefore is scoped out of further assessment.

Hawkehouse Green Dike/Bramwith Drain

9.7.76 Hawkehouse Green Dike (which monitored as the WFD Bramwith Drain Water Body) is an Ordinary Watercourse which rises approximately 1 km south of the village of Moss. It flows east to join with Flashley Carr Drain to become Bramwith Drain and then flows south along a straightened course towards the village of Braithwaite. It flows under the River Don Navigation, and into the River Don near Kirk Bramwith.

Thorpe Marsh Drain

9.7.77 Thorpe Marsh Drain (Main River) enters the Grid Connection Corridor in the southwest, and flows west to east before it becomes Thorpe Marsh Drain (Main River). It then continues to flow across the Grid Connection Corridor into the River Don (located in the Grid Connection Corridor Study Area). Cockshaw Dike (Ordinary Watercourse) drains into the Smallholme and Tilts Drain within the Grid Connection Corridor.

Ordinary Watercourses within Grid Connection Corridor

9.7.78 The following Ordinary Watercourses are located within the Grid Connection Corridor:

a. Wrancarr Drain is located centrally flowing west to east within the Grid Connection Corridor.

b. Mill Dike located centrally flows west to east into Wrancarr Drain.

c. Engine Dike flows north within the Grid Connection Corridor and then northeast towards Kirk Bramwith, where it becomes Kirk Bramwith New Cut within the Grid Connection Corridor Study Area.

d. An unnamed tributary of Hawkehouse Green Dike, flows west to east along Brick Kiln Lane to the north of the Grid Connection corridor.

e. Wilsick House Drain flows south within the Grid Connection Corridor to join Engine Dike.

f. Engine Dike, a tributary of Bentley and Arskey Common Drain, flows south east within the south of the Grid Connection Corridor Study Area.

g. Moss Road and London Hill Drain flows west to east to the north of the Grid Connection Corridor Study Area along Moss Road.

Ordinary Watercourses within the Grid Connection Corridor 1 km Study Area

9.7.79 In addition, there are a number of watercourses located within the 1 km buffer of the Grid Connection Corridor:

a. Fur Water Drain located in the south is a tributary of the River Don;

b. Bentley and Arksey Common Drain located in the south flows east and north before draining to Thorpe Marsh Drain;

c. Side Cutting Drain located on the western side of the Grid Connection Corridor Study Area flows adjacent to the Transpennine Express railway line;

d. Green Dike located in the northeast flows west towards the Grid Connection Corridor, and becomes Clay Dike;

e. Flashley Carr Drain becomes Bramwith Drain before flowing south into Wrancarr Drain; and

f. Carrs Drain located centrally flows west to east adjacent to Mill Dike until it flows into Wrancarr Drain.

Ponds within the Grid Connection Corridor and 1 km Study Area

9.7.80 The ponds located within the Study Area, and within the Grid Connection Corridor itself are listed below, together with reasons why they are scoped out of further assessment in this chapter:

a. Pond south of Moss within Grid Connection Corridor SE 60269 13789. No hydrological connections to surface watercourses, therefore scoped out of further assessment;

b. Linear pond/drainage feature south of Mill Dyke/Wrancarr Drain confluence: SE60392 12321. They are located just 30m south of Wrancarr Drain. There is the potential for hydrological connectivity through groundwater within the superficial deposits. Therefore, this is scoped in to the assessment as is listed as a part of Wrancarr Drain receptor1;

c. Pond southeast of Trumfleet, SE 60506 11467 within the Order limits , it is considered there would no hydrological connectivity as it is located 400m east of Engine Dike. Therefore, it is scoped out of further assessment;

d. Two surface water features, SE 60604 10084 located north of railway line. These show no hydrological connectivity with the surface watercourses, and are scoped out of the assessment. These appear to be industrial settlement ponds associated with Thorpe Marsh Power Station from Ordnance Survey mapping;

e. West of moss within Study Area, SE 58652 14183. These have no hydrological connection to surface watercourses and are therefore scoped out of the assessment;

f. West of Moss within Study Area, SE 58923 14190. These have no hydrological connection to surface watercourses and are therefore scoped out of the assessment;

g. East of Moss within Study Area, SE 60970 13360, 200m east of Flashley Carr Drain. These have no hydrological connection to surface watercourses and are therefore scoped out of the assessment;

h. Four ponds to east and north of Thorpe in Balne, centred on SE 59890 10940. These have no hydrological connection to the local Engine Dike and are therefore scoped out of the assessment;

i. Broad Ings, several ponds, and old oxbow of River Don centred on SE 60770 11210. As these are located south of River Don, there is no hydrological connectivity to area where the Scheme would be constructed/operated, thus these are scoped out of the assessment;

j. Linear side drain south of Thorpe Marsh Drain, SE59940 10510, potential hydraulic connection through superficial deposits. Therefore, this is scoped in to the assessment, and is assessed as part of the Thorpe Marsh Drain receptor;

k. River Don (old course), pond near Barnby Dun Bridge and linear feature south of Thorpe Marsh Bridge, centred on SE61110 09450. Esat of River Don, thus no hydrological connectivity. As these are located south of River Don, there is no hydrological connectivity to area where the Scheme would be constructed/operated, thus these are scoped out of the assessment;

l. Pond southwest of Thorpe Marsh Power Station, SE29970 08610. Ordnance survey mapping shows no hydrologic connectivity with surface watercourses. It is close to surface drains which discharge to Fur Water Drain. However, there are no works areas within the upstream catchment of the local watercourse, therefore, this is scoped out of further assessment.

Hydromorphology

9.7.81 The baseline hydromorphological information on each watercourse is provided in Table 9-9, informed by desk study and site visits.

Table 9-9: Hydromorphology

Water feature	Baseline
Hawkehouse Green Dike (also known as Bramwith Drain)	Hawkehouse Green Dike is within catchment of the Bramwith Drain (and is a WFD designated water body entitled ‘Bramwith Drain from Source to River Don’) which underlies much of the Grid Connection Corridor, with a series of drains running across the northern half of it. The water body is classified under the WFD as artificial for hydromorphological designation as the watercourses are embanked and artificial drainage channels. Hawkehouse Green Dike is aligned along the boundary of agricultural fields and therefore collects agricultural runoff. Hawkehouse Green Dike ultimately drains to the River Don to the east, with no modification to its alignment for over a century. During the survey, the depth of flow was shallow and the silty bed was visible (Plate 9-8). Soils are slowly permeable, seasonally wet, slightly acid, but base-rich, loamy, and clayey with impeded drainage and moderate fertility (Ref. 9-44).  **Plate 9-8: Hawkehouse Green Dike, looking upstream (NGR SE 60044 12663) (20 June 2024)**
Thorpe Marsh Drain	Thorpe Marsh Drain is part of the WFD designated water body ‘Ea Beck from the Skell to River Don’ and forms the southern tip of the Grid Connection Corridor. Thorpe Marsh Drain flows northwards past the Existing National Grid Thorpe Marsh Substation to its confluence with the River Don. The channel is highly embanked, modified, and artificial and its hydromorphological designation is classed as ‘heavily modified’. The channel appears unmoved from its pre 1900 alignment, which is between a series of agricultural fields. During the survey, macrophytes were present in the channel, however Himalayan balsam (*Impatiens glandulifera)*, an invasive non-native species (INNS) was present on the banks (Plate 9-9).

Water feature	Baseline
	Soils within the water body are a mix of slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils in the west and loamy and clayey floodplain soils with naturally high groundwater in the east (Ref. 9-44). Away from the alluvium corridor associated with the River Don, superficial geology deposits consist of clay and silt (Ref. 9-43).

Plate 9-9: Looking upstream on Thorpe Marsh Drain at (NGR SE 60235 10882) (20 June 2024)

Water feature	Baseline
Engine Dike	Engine Dike does not have a WFD classification, therefore takes the classification of its receiving water body, Bramwith Drain. Engine Dike demonstrates a small degree of sinuosity, which is aligned along a field boundary, with uniform channel form. This planform suggests historic modification, which would have been undertaken prior to 1900 as historic mapping (Ref. 9-58) shows no changes in the course since this date. The channel has a riparian buffer of scrub and trees, limiting potential ingress of fines from neighbouring fields. Macrophytes were present within the channel during the site visit, as shown in Plate 9-10. The soils within the area local to the channel are slowly permeable, seasonally wet, slightly acid, but base-rich loamy and clayey, of moderate fertility and indicative of areas of grassland and woodland (Ref. 9-44), though arable and agriculture is the prevailing land use.

Plate 9-10: Engine Dike, looking upstream (NGR SE 60432 11844) (20 June 2024)

Water feature	Baseline
Wrancarr Drain	Wrancarr Drain does not have a WFD classification, therefore takes the classification of its receiving water body, Bramwith Drain. Wrancarr Drain (Plate 9-11) exhibits a better quality than other watercourses surveyed in the Study Area. There is a moderate flow, with some diversity in flow types as well as some sinuosity throughout the Study Area. However, the channel is incised with steep, vegetated banks of 3 m, which suggests some historic modification. Such modification will have been undertaken prior to 1900 as historic mapping (Ref. 9-58) shows no changes in the course since this date. The soils within the area local to the channel are slowly permeable, seasonally wet, slightly acid, but base-rich loamy and clayey, of moderate fertility and indicative of areas of grassland and woodland (Ref. 9-44), though arable and agriculture is the prevailing land use.

Plate 9-11: Wrancarr Drain, looking downstream (NGR SE 60280 12355) (20 June 2024)

Water feature	Baseline
Mill Dike	Mill Dike does not have a WFD classification, therefore takes the classification of its receiving water body, Bramwith Drain. Mill Dike has a straight course within a uniform, trapezoidal and narrow channel, which is likely the result of historic modification. Such modification will have been undertaken prior to 1900 as historic mapping (Ref. 9-58) shows no changes in the course since this date. During the survey, the banks were overgrown with vegetation and there was little flow in the channel (Plate 9-12). The soils within the area local to the channel are slowly permeable, seasonally wet, slightly acid, but base-rich loamy and clayey, of moderate fertility and indicative of areas of grassland and woodland (Ref. 9-44), though arable and agriculture is the prevailing land use.  **Plate 9-12: Mill Dike, looking downstream (SE 60044 12663) (20 June 2024)**

Water feature	Baseline
Wilsick House Drain	Wilsick House Drain does not have a WFD classification, therefore takes the classification of its receiving water body, Bramwith Drain. The channel is narrow and the banks overgrown with vegetation during the site visit (Plate 9-13). During the survey there was little water in the channel which was slow flowing and stagnant in places which has created conditions for fine sediment to be deposited and to accumulate on the bed. The soils within the area local to the channel are slowly permeable, seasonally wet, slightly acid, but base-rich loamy and clayey, of moderate fertility and indicative of areas of grassland and woodland (Ref. 9-44), though arable and agriculture is the prevailing land use.

Plate 9-13: Wilsick House Drain, looking upstream (NGR SE 60032 11075) (20 June 2024)

Water feature	Baseline
Unnamed Drain (Brick Kiln Lane)	This Unnamed Drain does not have a WFD classification, therefore takes the classification of its receiving water body, Bramwith Drain. This watercourse is ephemeral with no morphological features. The channel is aligned along Brick Kiln Lane and was dry during the site visit (Plate 9-14).  **Plate 9-14: Unnamed Drain, looking upstream (SE 59722 13724) (20 June 2024)**

Water feature	Baseline
Engine Dike (Forstead Lane)	Engine Dike does not have a WFD classification, therefore takes the classification of the receiving water body, the River Don. The watercourse within the Study Area follows a straight, uniform course between a road and agricultural fields which is likely the result of historic modification. Such modification will have been undertaken prior to 1900 as historic mapping (Ref. 9-58) shows no changes in the course since this date. As shown in Plate 9-15, the channel has some buffer habitat of grasses and riparian trees which would help to limit ingress of fines. Geology mapping shows that the channel sits within the alluvial floodplain of the River Don. The soils within the area local to the channel are slowly permeable, seasonally wet, slightly acid, but base-rich loamy and clayey, of moderate fertility and indicative of areas of grassland and woodland (Ref. 9-44) within the left bank floodplain.  **Plate 9-15: Unnamed drain, looking upstream (NGR SE 60327 08889)**

WFD classification

9.7.82 The present (i.e. Cycle 3, 2022) WFD classifications of the surface water bodies underlying the Grid Connection Corridor are given in Table 9-10 (Ref. 9-39), as identified through the WFD screening and scoping assessment included as **ES Volume III Appendix 9-2: Water Framework Directive (WFD) Assessment [EN010152/APP/6.3]**.

Table 9-10: WFD Classification (Cycle 3 data) for the WFD Surface Water Bodies Underlying the Grid Connection Corridor (Ref. 9-39)

Classification Item	Bramwith Drain from Source to River Don	EA Beck from the Skell to River Don (Thorpe Marsh Drain)
Water Body ID	GB104027063290	GB104027057591
Hydromorphological designation	Artificial	Heavily modified
Ecological	Moderate	Moderate
Biological quality elements	Good	Poor
Physico-chemical quality elements	Moderate	Moderate
Hydromorphological Supporting Elements	Supports Good	Supports Good
Hydrological Regime	High	Supports Good
Supporting elements (Surface Water)	Good	Moderate
Mitigation Measures Assessment	Good	Moderate or less
Specific Pollutants	Not given	High
Chemical	Fail	Fail
Priority hazardous substances	Fail	Fail
Priority substances	Good	Good
Other pollutants	Good	Good

Water Quality

9.7.83 This section sets out the baseline water quality conditions for water features along the Grid Connection Corridor. Water quality data for some watercourses is available within the Grid Connection Corridor and associated Study Area from the Environment Agency's Water Quality Archive website (Ref. 9-40). The data from the sampling point locations identified in Table 9-10 and shown on **ES Volume II Figure 9-1: Surface Water Features and their Attributes [EN010152/APP/6.2]** is summarised in Table 9-12 and Table 9-13.

9.7.84 The water quality at Thorpe Marsh Drain is circum-neutral with a mean pH of 7.76 and this falls within the WFD High classification. Biochemical Oxygen Demand (BOD) is within the High WFD classification with a concentration of 1.6 mg/l, suggesting low levels of organic pollution. However, this was only based on one sample taken at this sampling location. Ammonia levels fall within the WFD classification for Good at a mean of 0.345 mg/l, which similarly suggests pollution from organics is limited. Nitrate values are elevated (mean of 12.3 mg/l N), as are orthophosphate concentrations (mean 0.76 mg/l), which indicates probable pressure from the surrounding agricultural land uses through use of fertilisers and other products which may runoff to the watercourse.

9.7.85 The Don at Kirk Bramwith is circum-neutral with a mean pH of 7.73 and falls within WFD high classification. Mean dissolved oxygen saturation is within the WFD High classification range, suggesting that the water body is well oxygenated. Average ammonia concentrations fall within High WFD classification. Nitrate values are high (mean of 9.03 mg/l) and indicate pressure from surrounding agricultural land uses.

9.7.86 Bramwith Drain at South Bramwith is circum-neutral with a mean pH of 7.83 and falls within WFD high classification. Mean dissolved oxygen saturation is 75.9% which falls within High WFD classification, suggesting that the water body is well oxygenated. Average ammonia concentrations fall within the High WFD classification. Nitrate values are high (mean of 8.12 mg/l) and indicate pressure from surrounding agricultural land uses. Orthophosphate values have a mean of 0.326 mg/l).

9.7.87 Mill Dike at Askern is circum-neutral with a mean pH of 7.63 and falls within WFD high classification. Mean dissolved oxygen saturation is 52.2% which falls within Poor WFD classification, suggesting that the water body is not well oxygenated. Average ammonia concentration is 0.69 mg/l which falls within Moderate WFD classification, indicating elevated levels of organic pollution. Nitrate values (3.4) and orthophosphate levels (1.032) are somewhat elevated, indicating probable pressure from the surrounding agricultural land uses through use of fertilisers and other products which may runoff to the watercourses.

Table 9-11: Water Quality Available Data for Watercourses Within the Grid Connection Corridor

Watercourse	Proxy for watercourse	Sampling point	ID	Comment	Summary
Thorpe Marsh Drain	Side Cutting Drain Smallholme and Tilts Drain	Ea Beck At Thorpe Marsh	NE49300665	Within Grid Connection Corridor	243 samples taken between 2000 and 2021
River Don	N/A	Don At Kirk Bramwith	E49301600	Within the Grid Connection Corridor Study Area	268 samples taken between 2000 and 2022
Bramwith Drain	Engine Dime Wrancarr Drain	Bramwith Drain at	NE-49300294	Within the Grid Connection	191 samples taken between

Watercourse	Proxy for watercourse	Sampling point	ID	Comment	Summary
		South Bramwith		Corridor Study Area	2000 and 2022
Mill Dike	Thistle Golt Carrs Drain	Mill Dike at Askern	NE-RSN0196	Within Grid Connection Corridor Study Area	19 samples taken between 2022 and 2023

Table 9-12: Summary of Environment Agency water quality monitoring data (2020-2024)

Determinant	Units	Ea Beck at Thorpe Marsh			Don at Kirk Bramwith		
		Max	Min	Average	Max	Min	Average
pH	pH Units	7.95	7.52	7.76	7.85	7.49	7.73
Temperature of Water	°C	18.6	5.7	11.9	19.2	8.6	12.9
Conductivity at 25°C	µs/cm	1207	671	1045.4	998	551	732.6
Biochemical Oxygen Demand (BOD): 5 Day ATU	mg/l	1.6	1.6	1.6	1.9	1.9	1.9
Ammoniacal Nitrogen as N	mg/l	0.72	0.068	0.345	0.45	0.13	0.27
Nitrogen, Total Oxidised as N	mg/l	17	5.6	13.66	11	8.3	9.15
Nitrate as N	mg/l	16.9	0.192	12.3	10.9	7.98	9.03
Nitrite as N	mg/l	0.25	0.0083	0.1653	0.32	0.072	0.1895
Ammonia un-ionised as N	mg/l	0.00934	0.00064	0.00385	0.00401	0.00284	0.00325
Alkalinity to pH 4.5 as CaCO3	mg/l	250	150	219.1	160	29	119.8

Determinant	Units	Ea Beck at Thorpe Marsh			Don at Kirk Bramwith		
		Max	Min	Average	Max	Min	Average
Orthophosphate, reactive as P	mg/l	1.2	0.26	0.76	0.93	0.4	0.64
Oxygen, Dissolved, % Saturation	%	86.7	49.4	74.9	101.8	84.8	92.5
Oxygen, Dissolved as O2	mg/l	10.6	4.61	8.43	11.1	7.81	9.84

Table 9-13: Summary of Environment Agency water quality monitoring data (2020-2024)

Determinant	Units	Bramwith Drain at South Bramwith			Mill Dike at Askern		
		Max	Min	Average	Max	Min	Average
pH	pH Units	8.06	7.59	7.83	8.02	7.36	7.63
Temperature of Water	°C	16.8	4.6	10.8	15.6	1.3	11.16
Conductivity at 25°C	µs/cm	1423	1174	1312	1235	384	775
Biochemical Oxygen Demand (BOD): 5 Day ATU	mg/l	-	-	-	-	-	-

Determinant	Units	Bramwith Drain at South Bramwith			Mill Dike at Askern		
		Max	Min	Average	Max	Min	Average
Ammoniacal Nitrogen as N	mg/l	0.43	0.05	0.14	2.2	0.1	0.69
Nitrogen, Total Oxidised as N	mg/l	10	5.4	8.2	11	1.3	4.76
Nitrate as N	mg/l	9.92	5.34	8.12	10.9	0.176	3.406
Nitrite as N	mg/l	0.081	0.02	0.048	0.13	0.013	0.044
Ammonia un-ionised as N	mg/l	0.00803	0.00067	0.002076	0.0396	0.00055	0.00843
Alkalinity to pH 4.5 as CaCO3	mg/l	250	160	211	440	120	288
Orthophosphate, reactive as P	mg/l	0.53	0.084	0.326	4.6	0.026	1.032
Oxygen, Dissolved, % Saturation	%	98.3	60.5	75.9	103.2	18.3	52.2
Oxygen, Dissolved as O2	mg/l	12.2	5.89	8.56	11.5	1.83	5.96

Water Resources

9.7.88 There is one Drinking Water Safeguard Zone within the Grid Connection Corridor, the Armthorpe Drinking Water Safeguard Zone (Water body ID GB40401G301500), which is located approximately 1 km to the southeast of the Grid Connection Corridor within the Study Area. Given the distance from the Order limits and nature of the works, the Drinking Water Safeguard Zone is unlikely to be impacted by the Scheme and is therefore not considered any further.

9.7.89 The southeastern part of the Grid Connection Corridor including the Existing National Grid Thorpe Marsh Substation falls within the total catchment (SPZ 3) for three public water supply abstractions located to the southeast of the Study Area.

9.7.90 The Grid Connection Corridor lies within five NVZs for both groundwater and surface water. NVZs are statutory designated areas as being at risk from agricultural nitrate pollution and includes about 55% of land in England. The NVZs are summarised below.

9.7.91 The groundwater NVZs consist of:

a. Nottinghamshire NVZ (Number G40).

9.7.92 The surface water NVZs consist of:

a. Bramwith Drain from Source to River Don NVZ (Number S280);
b. Lower Don NVZ (Number S298);
c. EA Beck from Abbess Dyke to River Don NVZ (Number S279); and
d. Bentley Mill Stream Lower to River Don NVZ (Number S263).

9.7.93 Records provided by City of Doncaster Council indicate that there are three PWS abstraction boreholes within the 1 km of the Study Area. One (PWS2) is located approximately 300m west of the Grid Connection Corridor (see **ES Volume II Figure 9-2: Groundwater Features and their Attributes [EN010152/APP/6.2]**). This PWS is for domestic supply and agricultural uses. The second PWS borehole (PWS3) is for commercial use is located approximately 800m south of the Study Area. Given the distance from the Order limits and nature of the works, the PWS3 is unlikely to be impacted by the Scheme, and is therefore not considered any further. The third (PWS4) is located to the southeast of the Study Area and is for commercial use and is unlikely to be impacted by the Scheme due to being outside the Study Area.

9.7.94 Information received from the Environment Agency on abstraction in the Study Area show there are no groundwater abstraction licences within 1 km of the Order limits. For surface water there are 11 abstractions within the Study Area. These are shown on **ES Volume II Figure 9-1: Surface Water Features and their Attributes [EN010152/APP/6.2].** The abstractions are listed below, together with a summary of why these are scoped in, or out, of further assessment:

a. Licence NE/027/0009/032 (SW1, SW3 and SW4) abstracts from the River Went for spray irrigation with a maximum abstraction rate of 900 m^3/d. This abstraction is scoped in for further assessment due to being located upstream of the Scheme as SW4 is located downstream of the Scheme;

b. Licence 2/27/09/203/R01 (SW2) abstracts from the River Went for spray irrigation with a maximum abstraction rate of 523m^3/d. This abstraction is scoped out from further assessment due to being located upstream of the Scheme;

c. Licence 2/27/09/117 (SW5) abstracts from the River Went for spray irrigation with a maximum abstraction rate of 411 m^3/d. This abstraction is scoped in for further assessment due to being located downstream of the Scheme;

d. Licence 2/27/09/210/R01 (SW6) abstracts from Engine Dike for spray irrigation with a maximum abstraction of 1000 m^3/d. This abstraction is scoped in for further assessment due to being located downstream of the Scheme;

e. Licence 2/27/09/199/R01 (SW7) abstracts from the River Don for 'transfer between sources' with a maximum abstraction of 1531 m^3/d. This abstraction is scoped in for further assessment due to being located downstream of the Scheme;

f. Licence 2/27/09/200/R01 (SW8) abstracts from the River Don old course for spray irrigation with a maximum abstraction rate of 1392 m^3/d. This abstraction is scoped out from further assessment due to not being hydrologically connected to the Scheme;

g. Licence 2/27/09/065 (SW9) abstracts from the River Don old course for spray irrigation with a maximum abstraction rate of 727 m^3/d. This abstraction is scoped out from further assessment due to not being hydrologically connected to the Scheme;

h. Licence 2/27/09/197/R01 (SW10) abstracts from the River Don Navigation for spray irrigation with a maximum abstraction rate of 514 m^3/d. This abstraction is scoped out from further assessment due to not being hydrologically connected to the Scheme; and

i. Licence 2/27/09/198/R01 (SW11) abstracts from the River Don Navigation for spray irrigation with a maximum abstraction rate of 2160 m^3/d. This abstraction is scoped out from further assessment due to not being hydrologically connected to the Scheme.

9.7.95 Information on pollution incidents which have occurred in the area have been obtained from the Environment Agency. Pollution incidents to water are classified as Category 1 (serious impact) through to Category 4 (No impact). Category 1 to Category 3 (minor impact) incidents have been reviewed between 2017 and 2023 (2024 data not yet available).

9.7.96 Three pollution incidents were recorded within the Grid Connection Corridor Study Area. Two incidents were recorded at Barnby Dun, just outside the southeast of the Grid Connection Corridor. The causes were listed as 'unauthorised discharge or disposal' of oil (Incident number 1571493), and flooding (Incident number 1767476). One incident was recorded within the centre of the Grid Connection Corridor at Wrancarr House due to unauthorised discharge or disposal of oil.

9.7.97 There are a number of water activity permits (discharge consents) within the Grid Connection Corridor and wider Study Area. These are listed in Table 9-14 below provided by the Environment Agency.

Table 9-14: Discharge Consents Within the Grid Connection Corridor Study Area

Consent number	NGR	Discharge type
D10	SE6061914522	Domestic property
D11	SE6076014400	Domestic property
D12	SE5985014350	Farm
D13	SE5959614294	Domestic property
D14	SE5972014290	Other
D15	SE5979014280	Other
D16	SE5955414272	Domestic property
D17	SE5958114266	Domestic property
D18	SE5960014000	Domestic property
D19	SE5998212482	Farm
D20	SE6105012050	Farm
D21	SE5990009900	Substation
D22	SE6145009280	Pumping station
D23	SE5910009100	Substation

Internal Drainage Boards

9.7.98 The Study Area for the Grid Connection Corridor is located within one IDB area, the Danvm Drainage Commissioners, part of the Yorkshire and Humber Drainage Boards. This is the same as for the Solar PV Site and is shown on **ES Volume II Figure 9-1: Surface Water Features and their Attributes [EN010152/APP/6.2]**.

Aquatic Ecology and Nature Conservation Sites

9.7.99 There are no water dependent sites designated for nature conservation identified through a review of MAGIC (Ref. 9-42) within the 1 km Study Area for the Grid Connection Corridor.

9.7.100 There are no groundwater dependent terrestrial ecosystems (GWDTEs) within the Order limits or the 1 km Study Area considered for the water resources assessment. The nearest SSSI that are considered to be groundwater dependent are the Shirley Pool SSSI and the Owston Hay Meadows SSSI, located more than 1.7 km to the west of the Grid

Connection Corridor and are therefore scoped out of any further assessment.

Geology and Hydrogeology

9.7.101 The northern part of the Grid Connection Corridor is underlain by the Sherwood Sandstone Group, while the southern section is underlain by the Chester Formation, which is also part of the Sherwood Sandstone Group (see **ES Volume II Figure 9-7: Bedrock Deposits [EN010152/APP/6.2]**). The Chester Formation is composed of sandstone and pebbly gravel. Similar to the Solar PV Site, the bedrock is overlain by superficial deposits comprising the Hemingbrough Glaciolacustrine Formation with pockets of Breighton Sand Formation. Alluvium deposits are also present along the River Don valley in the eastern part of the Grid Connection Corridor (see **ES Volume II Figure 9-6: Superficial Deposits [EN010152/APP/6.2]**). The Grid Connection Corridor is also located within the Nottingham Coal Mining Report Area (Ref. 9-51) with several deep coal exploration boreholes recorded on the BGS GeoIndex website (Ref. 9-43).

9.7.102 The Soilscape Map viewer describes the soils beneath the Grid Connection Corridor as slowly permeable seasonally wet, loamy and clayey soils with naturally high groundwater and poor drainage characteristics (Ref. 9-44).

9.7.103 The Sherwood Sandstone Group and Chester Formation are both classified by the Environment Agency as a Principal Aquifer (Ref. 9-42).

9.7.104 The overlying alluvial deposits associated with the River Don are designated as a Secondary A aquifer. All other superficial deposits such as the Hemingbrough Glaciolacustrine Formation are designated unproductive aquifers, covering a large proportion of the Grid Connection Corridor. However, there are permeable layers of the Breighton Sand Formation that are also designated Secondary A aquifer.

9.7.105 Groundwater vulnerability for the Grid Connection Corridor is generally low, however, there are small areas of medium vulnerability where the Breighton Sand Formation and the alluvial deposits associated with the River Don are areas of medium-high groundwater vulnerability (Ref. 9-42).

9.7.106 The Grid Connection Corridor lies within the Humber (WFD groundwater) Management Catchment (Ref. 9-39). The Aire and Don Sherwood Sandstone (WFD ID: GB40401G701000) which is within the Humber Management Catchment underlies the Grid Connection Corridor (Ref. 9-39). The Aire and Don Sherwood Sandstone (WFD ID: GB40401G701000) has an overall classification of poor (Cycle 3, 2019), with both quantitative and chemical elements being poor. The limiting element within the quantitative status is the quantitative water balance. The limiting elements within the chemical status are the chemical Drinking Water Protected Area and the general chemical test. The reasons for not achieving Good status are due to pressures from poor nutrient management predominantly from the agricultural industry. The water body has an overall objective of poor by 2015, which it has met. The reasons for the poor objective are due to pollution from domestic, industrial and agricultural sources, and a higher status may not be achievable without creating disproportionate burdens for particular sectors or parts of society.

9.7.107 There are a number of borehole scans available online on the BGS GeoIndex website and on the Environment Agency Hydrology Data Explorer (Ref. 9-43 and Ref. 9-52) within the Grid Connection Corridor. However, very few include groundwater level information as the majority are for deep coal exploration purposes. Records from selected boreholes located within the Grid Corridor are summarised in Table 9-15: Groundwater Level Information from BGS GeoIndex**.** BGS borehole SE51SE45 located at Elmstone Farm appears to be at the same location as the private water supply borehole PWS2 (see **ES Volume II Figure 9-2: Groundwater Features and their Attributes [EN010152/APP/6.2]**).

Table 9-15: Groundwater Level Information from BGS GeoIndex

Ref.	Location	NGR	Depth (m)	Aquifer	Water struck (mbgl)	Rest Water Level (mbgl)
SE60NW10	Thorpe Marsh, SE edge of the Order limits	SE60 5066	121	Sherwood Sandstone	2	2.9
SE50NE24	Thorpe Marsh Power Station, south of railway line within the Order limits	SE59 9098	80	Sherwood Sandstone	No record	7.31
SE50NE257		SE59 9092	80	Sherwood Sandstone	No record	7.31
SE51SE45	Elmstone Farm, Thorpe-In-Balne	SE59 8108	50	Sherwood Sandstone	18.9	2.57
SE61SW6	Thorpe-In-Balne Station	SE60 1109	33.53	Sherwood Sandstone	No record	1.22
SE51SE51	Heyworth Lane, Moss, Askern, central part of Grid Connection Corridor	SE58 8139	30	Sherwood Sandstone	13	4.9
SE51SE50	Moss Road, Heyworth Lane, Askern, central part of Grid Connection Corridor	SE58 6138	30	Sherwood Sandstone	13	4.75

9.7.108 Plate 9-16 presents recent groundwater level data between November 2010 and November 2020 from the nearest observation in the Sherwood Sandstone Aquifer in the vicinity of the Grid Connection Corridor. The data obtained from the Environment Agency records is from the Sandall Common Farm observation borehole (NGR SE62960698), approximately 1.3 km to the east of the Study Area and also east of the River Don. No observation boreholes to west of the river is available on this part of the Study Area.

9.7.109 The available data shows that the groundwater level in the Sherwood Sandstone at this observation borehole showed limited fluctuation during the period with the levels varying between 9.1m bgl (1.9m AOD) to 10.8m bgl (0.16m AOD) during this period with the lower levels in the summer period. The groundwater level in the Sherwood Sandstone across the area is likely to be providing base flow to the River Don.

9.7.110 Locally shallow groundwater will be present within the permeable superficial deposits across the area and in the vicinity of the River Went in the north of the Solar PV Site. Shallow groundwater may be encountered close to the drains, but this is not significant.

9.7.111 The majority of the Grid Connection Corridor is underlain by Glaciolacustrine deposits consisting of clays and interbedded with pockets of Sand. Where these deposits are of low permeability, they are likely to confine the groundwater body within the Sandstone aquifer.

9.7.112 Pockets of shallow/perched groundwater is also likely to be encountered within the superficial Glaciolacustrine deposits. Where the superficial deposits are more cohesive, there will be less significant groundwater present.

9.7.113 Towards the River Don valley in the southeastern part of the Study Area underlain by the alluvial deposits, groundwater levels in the superficial deposits are expected to be shallower due to the interaction with the surface watercourse across the area.

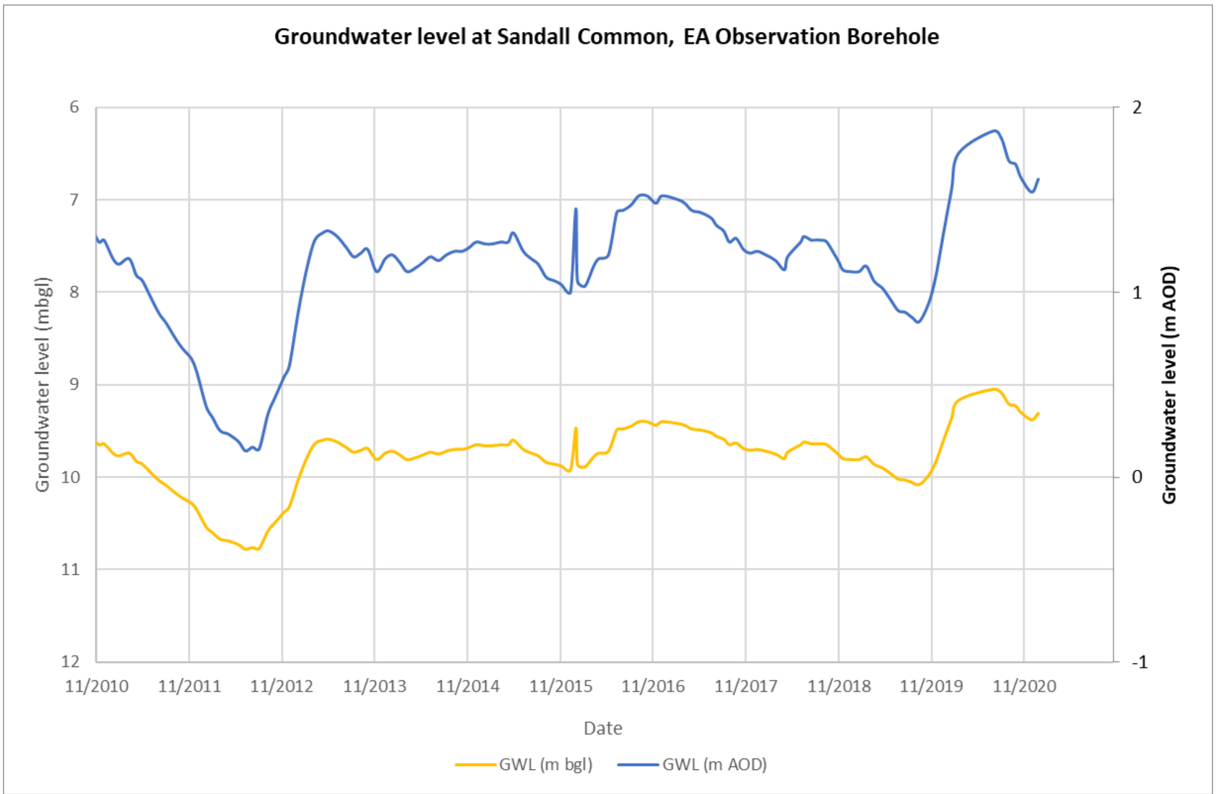

Plate 9-16: Observation Boreholes in the Sherwood Sandstone (m AOD)

Flood Risk from All Sources

9.7.114 Flood risk from all sources of flooding to the Grid Connection Corridor is summarised in Table 9-16. Refer to **ES Volume II Figure 9-4: Environment Agency Flood Map for Planning (Rivers and Seas) [EN010152/APP/6.2]** for mapping of tidal/fluvial flood risk and **ES Volume II Figure 9-5: Risk of Flooding from Surface Water [EN010152/APP/6.2]** for mapping of surface water flood risk.

Table 9-16: Summary of Flood Risk to the Grid Connection Corridor

Flood Source	Risk Level	Comments
Fluvial	High	The Grid Connection Corridor is largely located within areas of Flood Zone 3 with smaller areas of Flood Zone 2 along its central section. Approximately 0.7 km of the Grid Connection Corridor is located within Flood Zone 1 towards its northern extent. The majority of the Flood Zone 3 area along the Grid Connection Corridor is not located within an area where the Environment Agency indicates that there is a reduction in risk of flooding from rivers and the sea due to the presence of flood defences.
Tidal	High	The closest tidal source to the Grid Connection Corridor is the River Don, which is located to the south and east of the Order limits and is tidally influenced near to the Order limits. The Grid Connection Corridor runs parallel to the River Don at its southern extent.
Surface water	Very low (majority), low – high (localised areas)	The Environment Agency's Long Term Flood Risk Map (Ref. 9-46) shows that the majority of the Grid Connection Corridor is located within an area of very low risk. There are isolated areas at low to high risk of flooding which are likely associated with areas of low topography. The map also shows areas at low to high risk associated with smaller Ordinary Watercourses and/or local land drains.
Groundwater	Low (northern section), Medium (middle section), high (southern section)	The BGS Groundwater Flood Map shows that the northern part of the Grid Connection Corridor is in an area where there is no potential for groundwater flooding to occur. The middle stretch of the Grid Connection Corridor is in an area where there is limited potential or potential for groundwater flooding of property situated below ground level. The southern stretch of the Grid Connection Corridor is located in an area where there is potential for groundwater flooding of property situated below ground and potential for groundwater flooding to occur at surface. The Doncaster SFRA (Ref. 9-33) indicates that the northern stretch of the Grid Connection Corridor is located in an area where there is a >25% chance of

Flood Source	Risk Level	Comments
		groundwater emergence. The middle stretch of the Grid Connection Corridor is in an area where there is between >25% and >=50% chance of groundwater emergence. The southern stretch of the Grid Connection Corridor where it connects to the Existing National Grid Thorpe Marsh Substation is located in an area where there is a >=75% chance of groundwater emergence.
Sewers	Very low	The Grid Connection Corridor is located within a rural area and a search undertaken did not identify any Yorkshire Water sewerage assets. The Doncaster SFRA mapping shows no historic sewer flood incidents within the Grid Connection Corridor and is not considered further within this assessment.
Artificial sources	Low	The Environment Agency's Long Term Flood Risk Map (Ref. 9-46) shows that the majority of the Grid Connection Corridor is located within an area at risk of flooding from reservoirs when there is also flooding from rivers. Small areas of the Grid Connection Corridor are located within areas where there is a risk of flooding from reservoirs when river levels are normal. The consequences from reservoir failure can be severe, however, the Environment Agency note that this is a worst case prediction; reservoirs are maintained to a very high standard and are extremely unlikely to fail. The Don Navigation Canal is located approximately 0.1 km to the east of the Grid Connection Corridor at its closest point. However, the canal levels are monitored and maintained by the Canal and Rivers Trust, therefore overtopping is unlikely. Artificial sources are not considered further within this assessment.

Future Baseline

9.7.115 The future baseline scenarios are set out in **ES Volume I Chapter 5: EIA Methodology [EN010152/APP/6.1]** and are described below.

Surface Water and Hydromorphology

9.7.116 The Don from Mill Dyke to River Ouse WFD water body is currently at its target objective from 2015 (Moderate Ecological Status). The Went from

Blowell Drain to the River Don, Ea Beck from the Skell to the River Don, Bramwith Drain from Source to River Don WFD water bodies have a target of Good by 2027. Therefore, there may be improvements in WFD designation between the time of writing and the construction and operation and maintenance of the Scheme. However, the importance level of the water feature is based on, among other features having a WFD status and its flow, so an increase in WFD designation from Moderate to Good would not change the importance attributed to the water feature.

9.7.117 It is likely that through the action of new legislative requirements and ever more stringent planning policy and legislation, the health of the water environment will continue to improve post 2028. The Environment Act 2021 and the Levelling-Up and Regeneration Act 2023 include measures to tackle storm sewage discharges and set new requirements on phosphate removal from sewage treatment works, respectively, although the Applicant is unaware of any sewage treatment works or combined sewer overflows that discharge into River Went or other local watercourses, there are however, significant challenges such as adapting to a changing climate and pressures of population growth that could have a retarding effect. It is also difficult to forecast these changes with any certainty.

9.7.118 However, the current receptor importance criteria presented in Table 9-1 is largely based on the presence or not of various attributes (e.g. Drinking Water Protected Area, designated nature conservation site or WFD designation) and flow (i.e. the size of the watercourse). The application of these criteria is therefore not sensitive to more subtle changes or improvements in water quality as may be experienced over time. Thus, no significant changes to current baseline conditions are predicted for the future baseline in the absence of the Scheme, as the principal reasons for differences in water body importance are unlikely to change. For this reason, the impact assessment within this chapter is undertaken against existing baseline conditions.

Groundwater

9.7.119 The WFD groundwater body (Aire and Don Sherwood Sandstone (WFD ID: GB40401G701000) is at their target WFD objective of Poor Status. However, the chemical status of Good by 2027 has not been achieved as of Cycle 3. Therefore, there may be improvements in WFD designation between the time of writing and the construction of the Scheme. However, the importance level of the groundwater feature is based on SPZs, abstractions, and the Principal or other status of the aquifer. Thus, an increase in WFD designation from Poor to Good would not change the importance attributed to the groundwater feature.

9.7.120 No significant changes to current baseline conditions are predicted for the future baseline for the same reasons as outlined above for surface water. The impact assessment within this chapter is therefore undertaken against existing baseline conditions.

Flood Risk

9.7.121 Climate change is predicted to alter both future tidal and fluvial flood risk and this has been taken into account in the FRA.

9.7.122 As the Scheme has a development lifetime of 40 years, the impact of climate change needs to be considered.

9.7.123 The Order limits is located within the Don and Rother Management Catchment. Climate change allowances relate to predicted percentage increase in peak river flows and peak rainfall that the Scheme design must consider.

9.7.124 Peak river flow allowances are based on WFD catchment areas. The Environment Agency Website 'Climate change allowances for peak river flow in England' has been consulted to confirm the revised climate change allowances for the catchment areas that cover the Study Area.

9.7.125 Guidance from Environment Agency states that for 'Essential Infrastructure' developments in Flood Zone 2 or 3a the Higher Central allowance should be used. As the lifetime of the development is 40 years, the 2050 epoch would need to be considered. This results in a necessary allowance of 21% for the Don and Rother Management Catchment. As a conservative approach, the 2080 epoch higher central allowance of 38% has been applied as the design event within the hydraulic modelling, as agreed with the Environment Agency.

9.7.126 For peak rainfall intensity, the Scheme is covered by the management catchment as for peak river flow. Based on the assessed development lifetime of the Scheme being between 2061 and 2100, the central allowance for the 2070s epoch should be applied. This allowance is:

a. 3.3% AEP –25%.

b. 1% AEP – 25%

9.7.127 These peak rainfall allowances have been considered within the Framework Drainage Strategy (**ES Volume III Appendix 9-4: Framework Drainage Strategy [EN010152/APP/6.3]**) for the lifetime of the development.

9.7.128 In line with the Environment Agency climate change guidance for Nationally Significant Infrastructure Projects (NSIPs), such as power stations and power lines, flood risk should also be assessed for a credible maximum climate change (extreme climate change) scenario. The Credible Maximum Scenario includes the following:

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

b. The upper end allowance for peak river flow for the relevant management catchment (60% for Don and Rother Management Catchment);

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

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

9.7.129 The Credible Maximum Scenario sensitivity assessment has been undertaken as part of the FRA which has involved modelling the upper end allowance for peak river flows (+60%).

Future Baseline (Decommissioning)

9.7.130 It is considered that continued environmental improvements, tighter regulation at both national, regional and local scales, and environmental enhancements would lead to a gradual improvement over current baseline conditions in terms of water quality.

9.7.131 Climate change has the potential to significantly impact on drainage and flood risk, for example through increased storm intensity and changes in future rainfall patterns. However, the design of the Scheme will incorporate the climate change projections required by the EA to ensure that potentially increased surface water flows are accounted for and managed across the lifetime of the Scheme. Therefore, it is assumed that there would be no significant adverse changes to current baseline conditions within the next 40 years, and so the impact assessment within this chapter is undertaken against existing baseline conditions.

Importance of Receptors

9.7.132 Table 9-15 provides a summary of the water features that may be impacted by the Scheme (i.e. there is a source and a possible pathway) for both the Solar PV Site and the Grid Connection Corridor. A description of their attributes and the importance of the water feature as used in this assessment is described. Importance is based on the criteria presented in Table 9-1.

9.7.133 Separate importance classifications are provided for water quality and morphological aspects of water features as it is not always appropriate to have the same rating (e.g. a water feature may be heavily modified or even artificial and thus have a low morphology importance, but the water quality may be high by virtue of supporting protected species or other important potable or socio-economic and recreational uses).

9.7.134 From a groundwater perspective, the Roxby Formation and Hemingbrough Glaciolacustrine Formation are unlikely to be impacted by the Scheme and therefore are scoped out and not included in this table.

Table 9-17: Importance of Receptors

Water Feature	Importance
Solar PV Site	
River Don (Main River)	**Very high** importance for water quality on the basis of being a WFD designated watercourse, and with a Q95 flow of 4.95 m^3/s (8 km upstream of the Study Area. Water quality monitoring indicates that the watercourse is under pressure from agricultural pollution. Otter presence is recorded on the River Went which flows into the River Don. European Bullhead, *Cottus gobio*, and European Eel, *Anguilla anguilla*, have been found on a tributary to the River Don so it is likely these are present in the River Don also. This watercourse is not used for navigation, as navigation use takes place along the separate River Don Navigation. Abstractions for ‘transfer between

Water Feature	Importance
	sources' from River Don are located within the Study Area to the east of Thorpe in Balne, as shown on Figure 9-1.
River Went (Main River)	**Very high** importance for water quality on the basis of being a WFD designated watercourse and with a Q95 flow of 0.164 m^3/s (3.5 km upstream of the Study Area). The Solar PV Site is likely to be in hydrological continuity through groundwater connection in the alluvial deposits with the Went Ings Meadow SSSI. Water quality monitoring indicates that the watercourse is under pressure from agricultural pollution. Otter presence is recorded on the river in the vicinity of the Solar PV Site. European Bullhead, *Cottus gobbio*, and European Eel, *Anguilla anguilla*, have been found upstream of the Solar PV Site, which are an Annex II species. Abstractions for spray irrigation, SW4 and 5, are located within the Study Area. This watercourse is not used for navigation, as navigation use takes place along the separate River Don Navigation. **Low importance** for morphology due to showing evidence of substantial modification, including channel straightening.
Fenwick Common Drain (Ordinary Watercourse)	**Medium importance** for water quality as the watercourse does not have a WFD classification, and the Q95 is assumed to be over 1 l/s. This is a small watercourse which rises just 1 km west of the Order limits. This watercourse is not used for navigation, as it is too small. **Low importance** for morphology on the basis of showing evidence of modification including channel straightening, a trapezoidal planform and being over-deep.
Fleet Drain (Ordinary Watercourse), and its north and south tributary	**Medium importance** for water quality as the watercourse does not have a WFD classification, and the Q95 is assumed to be over 1 l/s. This watercourse is not used for navigation, as it is too small. **Low importance** for morphology due to having a generally straight and over-deep channel, indicative of modification. With the tributaries being artificially straight channels.
Ell Wood and Fenwick Grange Drain (Ordinary Watercourse)	**Medium importance** for water quality as the watercourse does not have a WFD classification, and the Q95 is assumed to be over 1 l/s. This watercourse is not used for navigation, as it is too small. **Low importance** for morphology due to being a straightened and trapezoidal channel, indicative of modification.
Other unnamed drains (Ordinary Watercourses)	As artificial, generally ephemeral agricultural drains and ditches, these are considered **Low importance** water features for water quality and morphology. These watercourses are not used for navigation, as it is too small

Water Feature	Importance
Sherwood Sandstone Group	High importance based on being a Principal aquifer. Groundwater may support potable abstraction, and there is an area of SPZ3 which extends into the north of the Solar PV Site.
Private Water Supply Abstraction	**Medium importance** as used for agricultural purposes (irrigation) although the source of the abstraction is likely to be underlying Sherwood Sandstone aquifer.
Breighton Sand Formation	**Medium importance** based on being a Secondary A aquifer of limited lateral continuity.
Alluvium	**Medium importance** based on being a Secondary A aquifer of limited lateral continuity.
The Aire and Don Sherwood Sandstone WFD waterbody	**High importance** based on being a WFD waterbody (WFD ID: GB40401G701000). Although the water body has quantitative and qualitative elements classified as Poor, this will not limit the importance of the water body, as there is the potential for improvement in future years.
Flood risk importance	The Scheme developed is designated as Essential Infrastructure, and as such is **very high** importance. Residential housing is located off-site which is classed as More Vulnerable and therefore High importance.
Grid Connection Corridor	
River Don (Main River)	**Very high importance** receptor as the Q95 is > 1 m^3/s, and the watercourse has a WFD designation. As a watercourse downstream of the River Went, the European Bullhead, *Cottus gobio*, European eel, *Anguilla anguilla*, and otter, *Lutra lutra*, are likely to be present in this watercourse also. It appears to be hydrologically linked to the New Junction Canal and the Stainforth and Keadby canal which are used for leisure purposes.
Ell Wood and Fenwick Grange Drain (Ordinary Watercourse)	**Medium importance** for water quality as the watercourse does not have a WFD classification, and the Q95 is assumed to be over 1 l/s. **Low importance** for morphology due to being a straightened and trapezoidal channel, indicative of modification.
Bramwith Drain from Source to River Don (Ordinary Watercourse), and its tributaries from Moss Road and Heyworth Lane	**High importance** for water quality on the basis of being a WFD waterbody (Bramwith Drain from Source to River Don) and assumed to have a Q95 flow <0.001 m^3/s. **Low importance** for morphology, due to be designated as artificial.

Water Feature	Importance
Mill Dike, Engine Dike and Wrancarr Drain (Ordinary Watercourses)	These are located within the Grid Connection and may be water features which are crossed by temporary access tracks of the grid connection corridor. **Medium importance** for water quality as the watercourse does not have a WFD classification, and the Q95 is assumed to be over 1 l/s. As part of Wrancarr Drain, a linear water features 30m south of the drain is included, as it may be hydrologically linked. Engine Dike provides water for a surface water abstraction, SW6, for spray irrigation. **Low importance** for morphology due to being heavily modified.
Thorpe Marsh Drain (Main River)	**Very high importance** for water quality: The is no flow gauging station on the channel, but it is assumed to have a Q95 > 1 m^3/s, based on it is large catchment, and 6m wide channel. The channel to be crossed is the WFD monitored reach of the Ea Beck from the Skell to River Don Water body. This includes the linear drain parallel to, and south, of Thorpe Marsh Drain which may have hydrological connectivity. **Low importance** for morphology due to being heavily modified.
Unnamed channel south from Marsh Lane Bridge (Ordinary Watercourse)	**Medium importance** for water quality: This is an IDB maintained channel which will be crossed by the Grid Connection Corridor, which does not have a WFD classification. **Low importance** for morphology due to being an artificial channel.
Sherwood Sandstone Group	**High importance** based on being a Principal aquifer. Groundwater may support potable abstraction.
Private Water Supply Abstraction	**High importance** as it is used for domestic supply as well as agricultural purposes (based on information provided by City of Doncaster Council). It is considered that the source of the abstraction is likely to be underlying Sherwood Sandstone aquifer.
Breighton Sand Formation	**Medium importance** based on being a Secondary A aquifer of limited lateral continuity.
Alluvium	**Medium importance** based on being a Secondary A aquifer of limited lateral continuity.
The Aire and Don Sherwood Sandstone WFD water body	**High importance** based on being a WFD water body (WFD ID: GB40401G701000). Although the water body has quantitative and qualitative elements classified as Poor, this will not limit the importance of the water body, as there is the potential for improvement in future years.
Flood risk importance	The Existing National Grid Thorpe Marsh Substation in the Grid Connection Corridor is designated as Essential Infrastructure, and as such is **Very high importance**.

9.8 Embedded Mitigation

9.8.1 This section contains the mitigation measures relevant to this chapter that are already incorporated into the Scheme design, as described in the **ES Volume I Chapter 2: The Scheme [EN010152/APP/6.1].** It forms part of the **Framework CEMP [EN010152/APP/7.7]).**

Framework Construction Environmental Management Plan

9.8.2 A **Framework CEMP [EN010152/APP/7.7]** has been provided as part of the DCO Application. The **Framework CEMP [EN010152/APP/7.7]** details the measures that would be undertaken during construction to mitigate temporary effects on the water environment. The **Framework CEMP [EN010152/APP/7.7]** sets out the structure and content for the detailed CEMP, which will be completed once a contractor is appointed, following submission of the DCO Application. Production of the detailed CEMP in a form which is substantially in accordance with the Framework CEMP, is secured through Requirement 11, within Schedule 2 of the **Draft DCO [EN010152/APP/3.1]**.

9.8.3 The **Framework CEMP [EN010152/APP/7.7]** comprises good practice methods that are established and effective measures to which the Scheme will be committed through the development consent. In relation to the water environment, the measures within the Framework CEMP focus on managing the risk of pollution to surface waters and the groundwater environment. It also considers the management of activities within floodplain areas (i.e. kept to a minimum and with temporary land take required for construction to be located out of the floodplain as far as reasonably practicable).

9.8.4 The **Framework CEMP [EN010152/APP/7.7]** will be reviewed, revised and updated as the Scheme progresses towards construction to ensure all potential impacts and residual effects are considered and mitigated as far as practicable, in keeping with available good practice at the relevant point in time. The principles of the mitigation measures set out below are the minimum standards that will be implemented. However, it is acknowledged that for some issues, there are multiple ways in which they may be addressed and methods of dealing with pollutant risk will be continually reviewed and adapted as construction works progress (e.g. the management of construction site runoff containing excessive levels of fine sediments).

9.8.5 The **Framework CEMP [EN010152/APP/7.7]** sets out the standard procedure for the Scheme and describes the principles for the protection of the water environment during construction. The final detailed CEMP will be supported by a Water Management Plan (WMP) that will provide greater detail regarding the mitigation to be implemented to protect the water environment from adverse effects during construction. The potential for adverse impacts will be minimised by the adoption of the general mitigation measures outlined below, which will be described and secured in the WMP and CEMP.

Solar PV Site Cable Watercourse Crossings

9.8.6 There will be a requirement to cross water features for On-Site cabling connections between the Solar PV Panels, Field Stations and the On-Site

Substation within the Solar PV Site. The On-Site cabling will be incorporated into existing bridge crossings of the IDB south tributary to Fleet Drain (Field NW7 to NW8), Fenwick Common Drain (Field SW1 to SW3), Ell Wood and Fenwick Grange Drain (southwest of Field SW8). This would avoid the need for disturbance of the channel.

9.8.7 There may be minor ephemeral drainage channels which are within the Solar PV Site which may not have been identified during the site visits (See Assumptions Section 9.4). These would be crossed intrusively. In such cases, if there is a water flow this will be maintained (e.g. by over-pumping or fluming around the works. It will be a requirement that the watercourses are reinstated as found and water quality monitoring will be undertaken prior to, during, and following on from construction activity.

Grid Connection Corridor Cable Watercourse Crossings

9.8.8 The high voltage Grid Connection Cables will be below ground, requiring trenching typically at a depth of up to 1.5m below ground level, but will need to vary and go deeper depending on crossings and detailed design. Horizontal Directional Drilling (HDD) or other non-intrusive methods will be used to install Grid Connection Cables beneath certain watercourses. Installation would be a minimum of 1.5m below the bed of the watercourse, except for Mill Dike, Wrancarr Drain, Engine Dike and Thorpe Marsh Drain where the minimum installation depth would be 5.0m below the lowest surveyed point of the watercourse within the route corridor (due to the connectivity of these watercourses to the River Don). Locations of HDD crossings and their associated compounds are shown in **ES Volume II Figure 2-4: Location of Temporary Construction Compounds and Indicative HDD Areas [EN010152/APP/6.2]**.

9.8.9 Smaller channels which are not to be crossed using HDD would be crossed using an open-cut technique. In such cases water flow will be maintained (e.g. by over-pumping or fluming around the works). It will be a requirement that the watercourses are reinstated as found and water quality monitoring will be undertaken prior to, during, and following on from construction activity.

9.8.10 Integrity of flood defences along the River Don and Thorpe Marsh Drain would be maintained with works undertaken in accordance with Environment Agency access requirements for future works to, and maintenance of, the flood defences. No works would be undertaken within 16m of the landward toe of the flood defences, as set out in the **Framework CEMP [EN010152/APP/7.7]**. As stated within the **Framework CEMP [EN010152/APP/7.7]** the depth of construction will be identified through consultation with the Environment Agency to ensure sufficient depth of construction to avoid detrimental effects on the flood defences.

9.8.11 A pre-works survey of the condition of any flood defences that will be crossed by HDD will be undertaken prior to construction. The pre-works survey is to ensure that there is a formal record of the condition of the flood defences prior to commencement of works. This is specified in the **Framework CEMP [EN010152/APP/7.7]**.

Good Practice Guidance

9.8.12 The construction of the Scheme will be undertaken in accordance with good practice, including the relevant Guidance for Pollution Prevention (GPP) documents as described in this section. Where not disapplied through the DCO, there may be the need for a number of secondary permissions for temporary and potentially some permanent works affecting watercourses or groundwater. All temporary works will be carried out under the necessary consents/permits and that the contractor will comply with any conditions imposed by any relevant permission. Some of these secondary consents will be sought through the DCO. The requirement for these consents and permits is explained in the **Consents and Agreements Position Statement [EN010152/APP/3.3]**.

9.8.13 The following GPPs have been released to date on the NetRegs website (Ref. 9-59) and are listed below. While these are not regulatory guidance in England, where the UK government website outlines regulatory requirements, they remain a useful resource for good practice due to their clear and concise presentation. They are documented in the **Framework CEMP [EN010152/APP/7.7]**:

a. GPP 1: Understanding your environmental responsibilities – good environmental practices;
b. GPP 2: Above ground oil storage;
c. GPP 3: Use and design of oil separators in surface water drainage systems;
d. GPP 4: Treatment and disposal of wastewater where there is no connection to the public foul sewer;
e. GPP 5: Works and maintenance in or near water;
f. GPP 6: Working at construction and demolition sites;
g. GPP 8: Safe storage and disposal of used oils;
h. GPP 13: Vehicle washing and cleaning;
i. GPP 19: Vehicles: Service and Repair;
j. GPP 20: Dewatering underground ducts and chambers;
k. GPP 21: Pollution Incident Response Plans;
l. GPP 22: Dealing with spills; and
m. GPP 26: Safe storage – drums and intermediate bulk containers.

9.8.14 Where new GPPs are yet to be published, previous Pollution Prevention Guidance (PPGs), which were withdrawn on 14 December 2015, but not yet replaced, still provide useful advice on the management of construction to avoid, minimise and reduce environmental impacts, although they should not be relied upon to provide accurate details of the current legal and regulatory requirements and processes. Construction phase operations would be carried out in accordance with guidance contained within the following PPGs:

a. PPG7: Safe storage – the safe operation of refuelling facilities (Ref. 9-60); and

b. PPG18: Managing fire water and major spillages (Ref. 9-61).

9.8.15 Additional good practice guidance for mitigation to protect the water environment can be found in the following key Construction Industry Research Information Association (CIRIA) documents and British Standards Institute documents:

a. British Standards Institute (2009) BS6031:2009 Code of Practice for Earth Works (Ref. 9-62);

b. British Standards Institute (2013) BS8582 Code of Practice for Surface Water Management of Development Sites (Ref. 9-63);

c. C753 (2015) The SuDS Manual (second edition) (Ref. 9-34);

d. C811C (2023) Environmental good practice on site guide (fifth edition) (Ref. 9-64);

e. C648 (2006) Control of water pollution from linear construction projects, technical guidance (Ref. 9-65);

f. C609 (2004) Sustainable Drainage Systems, hydraulic, structural and water quality advice (Ref. 9-66);

g. C532 (2001) Control of water pollution from construction sites – Guidance for consultants and contractors (Ref. 9-67); and

h. C736F Containment systems for prevention of pollution (Ref. 9-68).

Management of Construction Runoff

9.8.16 The measures outlined below will be required for the management of fine particulates in surface water runoff that may occur as a result of the construction activities:

a. All reasonably practicable measures will be taken to prevent the deposition of fine sediment or other material in, and the pollution by sediment of, any existing watercourse, arising from construction activities. The measures will accord with the principles set out in industry guidelines including the CIRIA report ‘C532: Control of water pollution from construction sites’ (Ref. 9-67) and CIRIA report ‘C648 Control of water pollution from linear construction sites’ (Ref. 9-65). Measures may include use and maintenance of temporary lagoons, tanks, bunds and fabric silt fences or silt screens, as well as consideration of the type of plant used. This also may include the use of silt matts on the bed of watercourses, and baffles on any discharges to watercourses to avoid bed and bank erosion.

b. A temporary drainage system will be developed to prevent runoff contaminated with fine particulates from entering surface water drains without treatment. This will include identifying all land drains and water features on and near the Order limits and ensuring that they are adequately protected using drain covers, sand or pea gravel bags (the latter being more appropriate in or near watercourses), earth bunds, geotextile silt fences, straw bales etc. or proprietary treatment (e.g. lamella clarifiers).

c. Mitigation measures (see below) will be implemented to control fine sediment laden runoff during wet weather. Water may also be required to dampen earthworks during dry weather to reduce dust impacts, and any runoff generated will need to be appropriately managed by the Contractor in accordance with the pollution prevention principles described in this chapter.

d. To protect watercourses from fine sediment runoff, topsoil/subsoil will be stored a minimum of 20m from watercourses on flat lying land. Where this is not practicable measures (such as silt fencing) to prevent sediment laden runoff draining to the watercourse without prior treatment will be provided as necessary. Furthermore, if it is to be stockpiled for longer than a two-week period, the material will either be covered with geotextile mats, seeded to promote vegetation growth, or other measures employed to prevent runoff containing excess fine sediment or particulates draining to a watercourse untreated.

e. Appropriately sized runoff storage areas for the settlement of excessive fine particulates in runoff will be provided.

f. Construction Site runoff will either be treated on the Solar PV Site and discharged (potentially also including infiltration to ground) or to the nearest public sewer with sufficient capacity for treatment following discussions with Yorkshire Water, or else removed from the Solar PV Site for disposal at an appropriately licensed Waste Management Facility.

g. Equipment and plant are to be washed out and cleaned in designated areas within the Scheme compound only, where runoff can be isolated for treatment before disposal as outlined above.

h. Mud deposits will be controlled at entry and exit points to the Solar PV Site using wheel washing facilities and/or road sweepers operating during earthworks activities or other times as required.

i. Debris and other material will be prevented from entering surface water drainage, through maintenance of a clean and tidy Solar PV Site, provision of clearly labelled waste receptacles, grid covers and the presence of site security fencing.

j. The WMP (which will be produced post consent) will include details of pre, during and post-construction water quality monitoring. The specification of which will be determined at a later stage, but is likely to include a combination of visual observations and onsite monitoring to establish a baseline, which can rapidly be compared with during construction monitoring to establish there are no deleterious effects evident in the watercourses during construction.

Location of Construction Compounds

9.8.17 The temporary construction compounds locations are shown on **ES Volume II Figure 2-4 [EN010152/APP/6.2]**. The temporary construction compounds for the Solar PV Site have been located for operational reasons (e.g. in terms of suitable access), but also avoid being located close to the water features which have a higher importance. The temporary compounds within Fields NW7 and SE2 are adjacent to a receptor of medium importance (southern tributary to Fleet Drain) and the main compound within SW10 is north of Ell Wood and Fenwick Grange Drain, a receptor of medium importance. The final location of the compounds will ensure there is a buffer of at least 10m to watercourses.

9.8.18 The two construction compounds for the Grid Connection Corridor are not located near to surface watercourses.

Management of Spillage Risk

9.8.19 The measures outlined below will be implemented to manage the risk of accidental spillages within the Order limits and potential conveyance to nearby water features via surface runoff or land drains. These measures are included in the **Framework CEMP [EN010152/APP/7.7]** and will be adopted during the construction works:

a. Fuel will be stored and used in accordance with the Control of Substances Hazardous to Health Regulations 2002, and the Control of Pollution (Oil Storage) (England) Regulations 2001 (Ref. 9-13). Particular care will be taken with the delivery and use of concrete and cementitious substances as it is highly corrosive and alkaline;

b. Fuel and other potentially polluting chemicals will either be in self-bunded leak proof containers or stored in a secure impermeable and bunded area (minimum capacity of 110% of the capacity of the containers, which includes 10% more capacity than is needed);

c. Any plant, machinery or vehicles will be inspected before every use and maintained to ensure they are in good working order and clean for use in a sensitive environment. This maintenance is to take place off-Site if possible or, if on-Site, only at designated areas within the Order limits. Only construction equipment and vehicles free of all oil/fuel leaks will be permitted on the Solar PV Site. Drip trays will be placed below static mechanical plant;

d. All washing down of vehicles and equipment will take place in designated areas and wash water will be prevented from passing untreated into watercourses;

e. All refuelling, oiling and greasing of plant will take place above drip trays or on an impermeable surface which provides protection to underground strata and watercourses, and away from drains as far as reasonably practicable. A minimum distance of 20m from watercourses for refuelling will be observed to minimise risk to watercourses (greater distances should be considered on very uneven land). Vehicles will not be left unattended during refuelling;

f. As far as reasonably practicable, only biodegradable hydraulic oils will be used in equipment working in or over watercourses. Oil booms to be deployed in watercourses where equipment is working in, over or adjacent of a watercourses and there is a risk of oil spillages occurring;

g. All fixed plant used on the Solar PV Site will be self-bunded;

h. Mobile plant is to be in good working order, kept clean, fitted with absorbent plant 'nappies' at all times and are to carry spill kits;

i. The WMP (which will be produced post consent) will include details for pollution prevention and will be prepared and included alongside the final CEMP. Spill kits and oil absorbent material will be carried by mobile plant and located at high risk locations across the Solar PV Site and regularly topped up. All construction workers will receive spill response training and tool box talks;

j. The Solar PV Site will be secure to prevent any vandalism that could lead to a pollution incident;

k. Construction waste/debris are to be prevented from entering any surface water drainage or water feature;

l. Surface water drains on public roads trafficked by plant or within the construction compound will be identified and, where there is a risk that fine particulates or spillages could enter them, the drains will be protected (e.g. using covers or sand bags) or the road regularly cleaned by road sweeper;

m. Suitable facilities for concrete wash water (e.g. geotextile wrapped sealed skip, container or earth bunded area) will be adequately contained, prevented from entering any drain, and removed from the Order limits for appropriate disposal at a suitably licenced Waste Management Facility; and

n. Water quality monitoring of potentially impacted watercourses will be undertaken to ensure that pollution events can be detected against baseline conditions and can be dealt with effectively.

9.8.20 In addition, any Solar PV Site welfare facilities will be appropriately managed, and all foul waste disposed of by an appropriate contractor to a suitably licensed facility and treated off site.

Management of Flood Risk

9.8.21 The **Framework CEMP [EN010152/APP/7.7]** incorporates measures to prevent an increase in flood risk or pollution during the construction works, in addition to the provision of temporary settlement and drainage measures as detailed above.

9.8.22 Construction works undertaken adjacent to, beneath and within watercourses will comply with relevant guidance, including Environment Agency and Defra guidance (e.g. GPP 5: Works and maintenance in or near water (Ref. 9-59)).

9.8.23 The CEMP will incorporate measures aimed at preventing an increase in flood risk during the construction works. Examples of measures that could be implemented include:

a. Topsoil and other construction materials will be stored outside of the 1 in 100 year floodplain extent where feasible. If areas located within Flood Zone 2/3 are to be utilised for the storage of construction materials, this would be done in accordance with the applicable flood risk activity regulations, if required;

b. Connectivity will be maintained between the floodplain and the adjacent watercourses, with no changes in ground levels within the floodplain as far as practicable;

c. During the construction phase, the contractor will monitor weather forecasts on a monthly, weekly and daily basis, and plan works accordingly. For example, works in the channel of any watercourse will be avoided or halted were there to be a significant risk of high flows or flooding.

d. The construction laydown area site office and supervisor will be notified of any potential flood occurring by use of the Floodline Warnings Direct or equivalent service; and

e. The Main Construction Compound along with the northern most temporary Construction Compound will be located outside of areas of fluvial Flood Zones 2 and 3. The eastern most temporary Construction Compound is located in Flood Zones 2 and 3. However, the River Went 2024 hydraulic modelling shows that it is located outside of the 1% AEP plus climate change flood extent. Therefore, it is not considered that any temporary floodplain compensatory storage is required.

f. Some of the Grid Connection Corridor temporary Construction Compounds are located within areas of Flood Zones 2 and 3 associated with the River Don. Mitigation measures are included within the **Framework CEMP [EN010152/APP/7.7]** as mentioned above and an Emergency Response Plan will be produced as detailed below.

9.8.24 The Contractor will produce an Emergency Response Plan following the grant of DCO and prior to construction, which will provide details of the response to an impending flood and include:

a. A 24-hour availability and ability to mobilise staff in the event of a flood warning. This could be provided by a text alert service;

b. The removal of all plant, machinery and material capable of being mobilised in a flood for the duration of any holiday close down period where there is a forecast risk that the Solar PV Site may be flooded;

c. Details of the evacuation and Solar PV Site close down procedures;

d. Arrangements for removing any potentially hazardous material and anything capable of becoming entrained in floodwaters, from the temporary works areas;

e. The contractor will sign up to EA flood warning alerts and describe in the Emergency Response Plan the actions it will take in the event of a flood event occurring. These actions will be hierarchical meaning that as the risk increases the contractor will implement more stringent protection measures;

f. If water is encountered during below ground construction, suitable dewatering methods will be used. Any groundwater dewatering required in excess of the exemption thresholds will be undertaken in line with the requirements of the Environment Agency (under the Water Resources Act 1991 as amended) (Ref. 9-14) and the Environmental Permitting Regulations (2016) (Ref. 9-10) and/or the provisions of the DCO; and

g. Safe egress and exits are to be maintained at all times when working in excavations. When working in excavations a banksman is to be present at all times.

Grid Connection Corridor: Management of Risk to Morphology of Watercourses

9.8.25 The watercourses within the Grid Connection Corridor are proposed to be crossed using non-intrusive, or trenchless, techniques (such as HDD) as has been agreed during consultation with relevant statutory stakeholders. There is the potential for additional and minor ephemeral drainage ditches to be present on the Solar PV Site that may not have been picked up during the site visit that would need to be crossed by the Grid Connection Corridor. These will be crossed by open cut techniques.

9.8.26 In total, there are nine watercourses which will be crossed within the Grid Connection Corridor. These are shown on **ES Volume II Figure 9-1: Surface Water Features and their Attributes**, and from north to south are:

a. Ell Wood and Fenwick Grange Drain;

b. Moss Road and London Hill Drain;

c. Moss Little Common Drain;

d. Hawkehouse Green Dike (also known as Bramwith Drain);

e. Mill Dike;

f. Wrancarr Drain;

g. Engine Dike;

h. Thorpe Marsh Drain; and

i. A parallel unnamed IDB drain.

9.8.27 Ten potential HDD, or other non-intrusive method, crossing locations have been identified, of which eight will cross watercourses. One HDD crossing will be for an existing high pressure fuel pipeline and one for a private field and public right of way and will not cross watercourses. The precise locations of the HDD, or other non-intrusive method, crossing points within the Order limits will be determined at detailed design stage post-consent, however indicative locations are illustrated on **ES Volume II Figure 2-4: Location of Temporary Construction Compounds and Indicative HDD Areas [EN010152/APP/6.2]**.

9.8.28 During the construction of the Grid Connection Cables, the non-intrusive (HDD) techniques would not disturb the bed of the watercourses. All cables will be installed a minimum of 1.5m below the bed level of the watercourses, except for Thorpe Marsh Drain, and Engine Dike, Wrancarr Drain, and Mill Dike due to connectivity to the River Don where the minimum installation depth would be 5.0m below the watercourse within the Grid Connection Corridor.

9.8.29 A pre-works morphology survey of the channel of each watercourse to be crossed will be undertaken prior to construction. This requirement has been included within the **Framework CEMP [EN010152/APP/7.7]**. The pre-works survey is to ensure that there is a formal record of the condition of each watercourse prior to commencement of works to install Grid Connection Cables. The survey is a precautionary measure so that if there are any unforeseen adverse impacts there is a record against which any remedial action can be determined. This would take place for an agreed distance up and downstream of the crossing location.

9.8.30 Where intrusive crossings are required water flow will be maintained by damming and over pumping or fluming. Works will be carried out in the drier months where practicable as this would reduce the risk of pollution propagating downstream, particularly in the case of ephemeral watercourses.

9.8.31 Once the watercourses are reinstated, silt fences, geotextile matting or straw bales will be used initially to capture mobilised sediments until the watercourse has returned to a settled state – the method chosen according to what is appropriate in that location. Watercourses will be reinstated as found and water quality monitoring will be undertaken prior to, during, and following on from the construction activity.

9.8.32 Regular observations of the watercourses will be undertaken post-works during vegetation re-establishment of the banks, especially following wet weather, to ensure that no adverse impacts have occurred. These requirements will be described in the WMP.

Design

9.8.33 Detailed information on Scheme design and infrastructure is provided in **ES Volume I Chapter 2: The Scheme [EN010152/APP/6.1]**.

9.8.34 A large proportion of the Solar PV Site is located within Flood Zone 1 (including the BESS Area and On-Site Substation), with the remaining areas within Flood Zone 2, with some areas within Flood Zone 3. Where Solar PV Panels and associated On-Site Cables are located within Flood Zone 3, the panels will be raised to ensure a 300 mm freeboard above the design flood event (1% AEP plus 38% climate change) in that location; On-Site Cables are submersible by design.

9.8.35 Where Solar PV Panels are located within the Credible Maximum Scenario flood extent, these will be raised 400 mm above the flood level associated with this event.

9.8.36 All Field Stations are located outside of the Credible Maximum Scenario modelled flood extent apart from the Field Station in Field NE9. The flood depths during this event at this location reach up to 0.2 m. The Field Station in this location will be raised 300 mm above the Credible Maximum Scenario modelled flood level.

9.8.37 The Solar PV Site is shown to be at risk of tidal/fluvial flooding during a breach scenario. The Operator will be required to develop an Emergency Response Plan as part of the detailed Operational Environmental Management Plan (OEMP) which will include details of the response to an impending flood, such as an evacuation plan. This is secured through the **Framework OEMP [EN010152/APP/7.8]**. The On-Site Substation and BESS Area are shown to be at risk of tidal/fluvial flooding during a breach scenario. As the most vulnerable aspects of the development, these features will be bunded to provide protection during the unlikely event of a breach of the flood defences. These vulnerable assets are not located within the design flood event when no breach occurs.

9.8.38 The Solar PV Panels will be offset from watercourses by a minimum of 10 m, as some assets may be further from watercourses. The buffer of 10m is to account for site specific position of the bank top along IDB watercourses noting that the IDB require only a 9m buffer from that point (bank top location is variable). This may require survey work (prior to construction) in some locations to adequately define and agree the top of bank position.

9.8.39 Indicative foundation depths associated with the development include maximum depths of up to a maximum of 3m for piling and erection of the Solar PV Mounting Structures, typical trench depth of up to 1.4m for On-Site Cables, and up to 1.5m for the Grid Connection Cables, but will need to vary and go deeper depending on crossings.

9.8.40 In areas of archaeological mitigation (as defined within the **Draft Archaeological Mitigation Strategy [EN010152/APP/7.19]**) where required – the Solar PV Mounting Structures will be mounted on pre-cast concrete blocks avoiding disturbance of any below ground features with impacts to the ground no deeper than 0.1m (see **ES Volume I Chapter 2: The Scheme [EN010152/APP/6.1]**). For the purposes of the groundwater assessment, a “worst case” estimate of 4,000 1-tonne blocks measuring approximately 4m by 0.5m in plan footprint each have been assumed, although the number of blocks, and their size and weight will only be determined upon final detailed design.

Framework Drainage Strategy

9.8.41 A Framework Drainage Strategy has been prepared within **ES Volume III Appendix 9-4: Framework Drainage Strategy [EN010152/APP/6.3]**. This Framework Drainage Strategy provides attenuation of surface water runoff from the Scheme, whilst minimising flood risk to the Solar PV Site and surrounding areas. In accordance with planning policy guidance (as outlined in Section 9.3), runoff from the Scheme will be attenuated to ensure no increase in surface water discharge rates and to provide water quality treatment of runoff water. This will be secured through the inclusion of a detailed Drainage Strategy as a Requirement of the **Draft DCO [EN010152/APP/3.1]**.

9.8.42 Individual Solar PV Panels will be held above the ground surface on the Solar PV Mounting Structures (see **ES Volume I Chapter 2: The Scheme [EN010152/APP/6.1]**). This prevents sealing the ground with an impermeable surface beneath the Solar PV Panels, allowing rainfall/runoff to infiltrate to ground throughout the Solar PV Site. As a result, it is considered that the Solar PV Site’s impermeable area within Solar PV Panel areas will remain substantively consistent to its pre-development state. Despite not contributing towards the impermeable areas, in order to limit the potential for channelisation from rainfall dripping off the end of the Solar PV Panels, the areas between, under and surrounding the Solar PV Panels will be planted with native grassland mix. This planting will intercept and absorb rainfall running off the Solar PV Panels, preventing it from concentrating and potentially forming channels in the ground.

9.8.43 For the new impermeable areas associated with the BESS Area and On-Site Substation additional attenuation in the form of basins will be incorporated to control any increase in the rate of flow towards receiving watercourses, and to provide treatment for any contaminants collected on areas of hardstanding. The rate of runoff from each development location within the Scheme would ensure nil detriment in terms of no increase in runoff rate from the Order limits to receiving watercourses.

Drainage Outfalls

9.8.44 Where practicable, surface water will drain from the Scheme's drainage system to local receiving watercourses via new engineered outlets. Appropriate micro-siting of the outlets will minimise loss of bank habitat, the need for bed scour or hard bank protection, and localised flow disturbance or disruption to sediment transport processes. It will also avoid the creation of 'dead' spaces with sedimentation and vegetation blockage risks and to that effect it is not proposed that outlets are recessed into the bank. It is assumed that the site survey and micro-siting of outlets would occur following grant of the DCO.

Foul Drainage

9.8.45 During the operation and maintenance phase of the Scheme it is expected that there would be only a low volume of foul drainage generated (related to an anticipated one to two full time operational staff members and four days part time per month). This would be self-contained in a non-mains, cess pit sealed tank, or portable welfare units, with no discharge to ground. These would be regularly emptied under contract with a registered recycling and waste management contractor.

9.8.46 As there would be no discharge of foul water to a watercourse, no discharge to foul sewer is proposed. Thus, no further assessment of foul waste from the Scheme is undertaken.

Access Track Crossing of Watercourses

9.8.47 Access tracks will be constructed across the Solar PV Site. These are to access the Field Stations, the BESS Area, the On-Site Substation and the Operations and Maintenance Hub for the duration of the operation of the Scheme. These will typically be 4m wide compacted stone tracks with 1:2 gradient slopes on either side where required, with fire service access tracks being up to 8m wide. The internal road layout has been designed to avoid drainage ditch and watercourse crossings wherever possible. As stated in **ES Volume I Chapter 2: The Scheme [EN010152/APP/6.1]**, the design life is 40 years. After this time infrastructure would be removed but is likely that access track crossings may be retained by the landowner.

9.8.48 Existing watercourse crossing locations have been utilised to avoid the need for new crossing locations where practicable. Where a new ditch crossing is required an open span bridge will be provided with abutments set back from the top of the bank sufficiently to avoid encroaching on the watercourse, with the type of crossing selected based on site-specific factors and in consultation with the relevant authority (generally the IDB/lead local flood authority). There are four areas labelled as Bridge Options where the access track will cross watercourses. Two Bridge Options are proposed for Fenwick Common Drain (one northwest of Field SW3, and one southeast of Field SW5 in the area of the confluence with Fleet Drain), one Bridge Option is proposed on south tributary to Fleet Drain, west of Riddings Farm, northwest of Field NW8, and one southwest of Field SW8 over Ell Wood and Fenwick Grange Drain. The Bridge Options are shown on **ES Volume II Figure 2-3 Indicative Site Layout Plan [EN010152/APP/6.2]**.

9.8.49 No new culverts are proposed, however, the access track design around the Solar PV Site utilises an existing culvert over the north tributary to Fleet Drain to cross from Field NE7 to NE8. The existing culvert may be extended by up to 2m with length-for-length equivalent watercourse enhancements required or this may be a new bridge as per the paragraph above. A further culvert extension may be required for the access track crossing an existing culvert between Field NW8 and SW1/SW2 (Access Point 13), and on the Grid Connection Corridor at Access Point 1. Extensions to the existing culverts will be designed to maintain connectivity along the watercourse for aquatic species and riparian mammals. All culverts to convey watercourses will be set 150 mm below bed level to allow sedimentation and a naturalised bed to form, which will maintain longitudinal connectivity for aquatic fauna.

9.8.50 As part of the Scheme a section of culverted Fleet Drain will have the culvert removed. This current culvert is located on Fleet Drain east of Fenwick Hall, and west of Field SE3.

Operational Cleaning

9.8.51 The Solar PV Panels will be cleaned using clean water with no added chemical cleaning agents.

9.8.52 The operator of the Scheme will be required to obtain water from a mains water connection for ongoing requirements for panel cleaning. However, panel cleaning is not a frequent operation, and is assumed to occur every two years.

On-Site Substation Operation

9.8.53 The operation of the On-Site Substation will include a backup generator in order to provide power in the event of an electrical failure for a restart if required. This will be a diesel generator and it is assumed to be required for a maximum of eight hours in any one year. **The Framework Operational Environmental Management Plan [EN010152/APP/7.8]** includes methodology for maintenance and refuelling operations for the backup generator to ensure the prevention of spills, and leaks are prevented.

Emergency Response Plan

9.8.54 An Emergency Response Plan will provide details of the response to an impending flood event, including an evacuation plan. The preparation of the Emergency Response Plan is secured through the **Framework CEMP [EN010152/APP/7.7]**, the **Framework OEMP [EN010152/APP/7.8]**, and the **Framework DEMP [EN010152/APP/7.9]**.

Solar PV Panel Maintenance

9.8.55 The operation and maintenance of the Solar PV Site will be covered by procedures to be contained within the **Framework OEMP [EN010152/APP/7.8]**.

9.8.56 The final OEMP (to be produced post-construction and prior to operation, as secured by Requirement 12, Schedule 2 of the **Draft DCO [EN010152/APP/3.1]**) will include measures to regulate the environmental effects of the operation and maintenance phase of the Scheme, and to ensure any maintenance activities take place in a way to avoid and minimise any potential environmental impacts. This would include measures to manage the risk of pollution from proposed infrastructure spillages and maintenance activities, such as correct storage in appropriately bunded areas of any hazardous materials, and appropriate, regular inspection and maintenance of all equipment on site. A **Framework OEMP [EN010152/APP/7.8]** contains measures to regulate the operation and maintenance phase of the Scheme. This includes measures for maintenance of watercourse buffers, maintenance of swales, and a regular schedule of inspection of any equipment on site.

9.8.57 The OEMP for the Scheme will be finalised prior to operation and would include a regular schedule for visual inspection and cleaning of the Solar PV Panels. The Solar PV Panels do not contain any liquid (hazardous or not). The Solar PV Panels are constructed in a robust manner and their components cannot be separated except with a considerable mechanical load. Therefore, no specific mitigation measures (in terms of the management of leaks) are required for the Solar PV Mounting Structures themselves during operation.

Management of Fire Risk

9.8.58 The BESS Area requires fire water tanks for the emergency services to utilise to supress a fire, if one broke out. In the unlikely event of a malfunction to one of the battery arrays, there is a range of integrated controls that will activate depending on the extent and severity of the event. In case the malfunction progresses to a catastrophic fire event and so long as there are no lives under threat, the fire brigade would ensure surrounding elements and structures (intact battery arrays nearby, other electrical equipment, trees etc.) are kept adequately wet and cool to prevent the fire from expanding any further but the battery infrastructure would be allowed to burn within the controlled area.

9.8.59 It is proposed to contain the fire water runoff within the lined gravel filled attenuation basins surrounding the containers within the BESS Area. The water can be held and tested before either being released into the surrounding watercourses or taken off site by a tanker for treatment elsewhere. The basin will then be cleaned of all contaminants.

9.8.60 The gravel filled attenuation basins will be underlain with an impermeable liner to prevent any contaminants entering the ground.

9.8.61 Discharge from the gravel filled attenuation basins will be controlled by a penstock valve that can be closed before fire suppression is carried out.

9.8.62 The Applicant has already been engaging with South Yorkshire Fire and Rescue Service to gain their input on the BESS Container design. Further details regarding management of fire water are outlined in the **Framework Drainage Strategy** (**ES Volume III Appendix 9-4 [EN010152/APP/6.3]**). Details on battery safety management are provided within the **Framework Battery Safety Management Plan [EN010152/APP/7.16]**. Engagement with

South Yorkshire Fire and Rescue Service will be ongoing, and consultation with other emergency services will be undertaken as part of the Applicant's post-application work.

Permits and Consents

9.8.63 Various water-related permissions may be required where it is not agreed with the relevant regulating authority to disapply them through the DCO. These permissions may include:

a. Land drainage consent(s) under section 23 of the Land Drainage Act 1991 (Ref. 9-5) for works affecting the flow in Ordinary Watercourses and for works within 9 metres of a watercourse including existing culvert modifications and cable crossings. As stated in the **Consents and Agreements Position Statement [EN010152/APP/3.3]** these consents are proposed to be included for in the draft DCO **[EN010152/APP/3.1]** subject to consent of the relevant body;

b. Flood risk activity permit(s) from the Environment Agency under the Environmental Permitting Regulations (England and Wales) 2016 (Ref. 9-10) in connection with drainage outfall installation. As stated in the **Consents and Agreements Position Statement [EN010152/APP/3.3]** these permits are proposed to be included for in the draft DCO **[EN010152/APP/3.1]** subject to consent of the Environment Agency;

c. Water activity permit(s) from the Environment Agency under the Environmental Permitting Regulations (England and Wales) 2016 (Ref. 9-10) for temporary construction discharges;

d. Trade effluent consent under the Water Industry Act 1991 (Ref. 9-55) for the purposes of discharging trade effluent from welfare facilities during construction. As stated in the **Consents and Agreements Position Statement [EN010152/APP/3.3]** these consents are proposed to be included for in the draft DCO **[EN010152/APP/3.1]** subject to consent of the Environment Agency;

e. Full or temporary water abstraction licence(s) under section 24 of the Water Resources Act 1991 (Ref. 9-6) (if more than 20 m^3/d is to be dewatered/over-pumped and exemptions do not apply) – see further detail below; and

f. Temporary water impoundment licence under section 25 of the Water Resources Act 1991 (Ref. 9-6) in connection with the laying of cables.

9.8.64 There is the potential for the need for either full or temporary water abstraction licence(s) from the Environment Agency for the abstraction of water from the entry and exit pits associated with the underground watercourse crossings or other excavations where groundwater may be encountered, other than where exemptions apply. A full licence is required when more than 20 m^3 per day of water may need to be abstracted for more than 28 days. A temporary licence is applicable where the abstraction is less than 28 days. Where less than 20 m^3 per day of water needs to be abstracted, no licence is required. However, in all circumstances it may be necessary to obtain a water activity permit(s) from the Environment Agency to discharge the water to ground or a watercourse if the water is considered to be 'unclean'.

9.9 Assessment of Likely Significant Effects

9.9.1 The Scheme as outlined in the **ES Volume I Chapter 2: The Scheme [EN010152/APP/6.1]** has been considered in assessing the likely impacts and effects on the water environment, whilst considering the embedded mitigation described in Section 9.8. More information on the EIA methodology is included in **ES Volume I Chapter 5: EIA Methodology [EN010152/APP/6.1]**.

Construction (Assumed to be 2028 to 2030): Solar PV Site

9.9.2 During construction the following adverse impacts on the water environment may occur:

a. Pollution of surface water (and any designated ecology sites that are water dependent) due to deposition or spillage of soils, sediments, oils, fuels, or other construction chemicals, or through uncontrolled site run-off including dewatering of excavations;

b. Temporary impacts on the hydromorphology of watercourses from open-cut watercourse crossings or temporary vehicle access as may be required. Temporary access from vehicles has been assessed as part of the overall construction activities taking place;

c. Potential impacts on groundwater quality and resources, including licenced and unlicenced (private) water supplies.

d. Potential impact on baseflow to watercourses from temporary dewatering of excavations or changes in hydrology; and

e. Temporary changes in flood risk from changes in surface water runoff (e.g. disruption of stream flows during any potential culvert construction works) and exacerbation of local flood risk due to deposition of silt, materials or other debris in drains, and ditches, and construction of the Solar PV Panels.

Pollution of Surface Water Features

<u>Construction of Solar PV Panels and Field Stations</u>

9.9.3 Construction activities such as earthworks, excavations, site preparation, levelling and grading operations result in the disturbance of soils. Exposed soil is more vulnerable to erosion during rainfall events due to loosening and removal of vegetation to bind it, compaction, and increased runoff rates. Surface runoff from such areas can contain excessive quantities of fine sediment, which may eventually be transported to watercourses where it can result in adverse impacts on water quality, flora and fauna. Construction works within, along the banks and across watercourses can also be a direct source of fine sediment mobilisation. Other potential sources of sediment during construction works include water runoff from earth stockpiles, dewatering of excavations (surface and groundwater), mud deposited on site and local access roads, and that which is generated by the construction works themselves or from vehicle washing.

9.9.4 Generally, excessive fine sediment in runoff is chemically inert and affects the water environment through smothering riverbeds and macrophytes, temporarily changing water quality (e.g. increased turbidity and reduced photosynthesis) and causing physical and physiological adverse impacts on aquatic organisms (such as abrasion or irritation).

9.9.5 During construction, fuel, hydraulic fluids, solvents, grouts, paints and detergents and other potentially polluting substances will be stored and/or used on-site. Leaks and spillages of these substances could pollute the nearby surface watercourses if their use or removal is not carefully controlled, and spillages enter existing flow pathways or water features directly. Like excessive fine sediment in construction site runoff, the risk is greatest where works occur close to and within water features.

9.9.6 Within Section 9.8 Embedded Mitigation, the On-Site Cable Watercourse Crossings are noted. As noted in Paragraph 9.8.6, this includes three potential watercourse crossings by On-Site cabling.

9.9.7 As shown on **ES Volume II Figure 9-1: Surface Water Features and their Attributes [EN010152/APP/6.2]** the River Went borders the Solar PV Site to the north, with Fenwick Common Drain flowing into Fleet Drain through the Solar PV Site. For the **very high** Importance River Went, it is considered that with the proposed embedded mitigation measures in place (including a 10m buffer zone and standard construction mitigation measures) this would result in a **very low adverse** impact on the water features, and its two surface water abstractions. This would result in a **minor adverse effect (not significant)** for the River Went. For the **medium** importance Fenwick Common Drain and Fleet Drain, a **very low** adverse impact, with the embedded mitigation measures in place, would result in a **Negligible effect (not significant).**

9.9.8 Ell Wood and Fenwick Grange Drain borders the south of the Solar PV Site. It is considered that with the proposed embedded mitigation in place (including a 10m buffer zone and standard construction measures) this would result in a low adverse impact on the **medium** importance drain. A **low** adverse impact would result in a **minor effect (not significant).**

9.9.9 There are also artificial unnamed drains located at some field boundaries within the Solar PV Site. It is considered that with the proposed embedded mitigation in place (including a 10m buffer zone and standard construction measures) this would result in a very low adverse impact on the low importance drains. A **very low** adverse impact would result in a **Negligible effect (not significant).**

<u>Construction of the BESS Area and On-Site Substation</u>

9.9.10 The BESS Area will be located within Field SW10, and the On-Site Substation in the northwest of Field SW8. This will include the construction of two engineered outfalls discharging from each area into the Ell Wood and Fenwick Grange Drain. Elsewhere, within the embedded mitigation measures there is a requirement for a 10m buffer from watercourses to ensure minimisation of risk to watercourses from any spills or leaks, together with ensuring any equipment or plant washing takes place in designated areas. It is considered that with the proposed embedded mitigation in place (including a 10m buffer zone and standard construction measures) this would result in a **very low adverse** impact on the **medium importance** receptors (Ell Wood and Fenwick Grange Drain). This results in a **negligible effect (not significant).**

Temporary Construction Compounds

9.9.11 There is one main Construction Compound and two temporary Construction Compounds within the Solar PV Site. The main Construction Compound is located towards the southwest of the Solar PV Site, within area SW10, adjacent to the north of Ell Wood and Fenwick Grange Drain. The temporary compound within area NW7 is to the north of southern tributary to Fleet Drain. The temporary compound within SE2 is adjacent to the east of Fleet Drain, this is the smallest compound. All construction compounds are outlined in **ES Volume II Figure 2-4: Location of Temporary Construction Compounds and Indicative HDD Areas [EN010152/APP/6.2]**.

9.9.12 Within these compounds there is intended to be materials storage, carparking, and potential for refuelling activities. Within the embedded mitigation measures there is a requirement for a 10m buffer from watercourses to ensure minimisation of risk to watercourses from any spills or leaks, together with ensuring any equipment or plant washing takes place in designated areas. It is considered that with the proposed embedded mitigation in place (including a 10m buffer zone and standard construction measures) this would result in a **very low adverse** impact on the **medium importance** receptors (Ell Wood and Fenwick Grange Drain, Fleet Drain and Southern tributary to Fleet Drain). This results in a **negligible effect (not significant).**

Access

9.9.13 Where a new ditch crossing is required for permanent access, an open span bridge will be provided, with abutments set back from the top of the bank sufficiently to avoid encroaching on the watercourse, with the type of crossing selected based on site-specific factors and in consultation with the relevant authority (generally the IDB/lead local flood authority).

9.9.14 There are four areas labelled as Bridge Options where the access track will cross watercourses on open span bridges. Two Bridge Options are proposed for Fenwick Common Drain (one northwest of Field SW3, and one southeast of Field SW5 in the area of the confluence with Fleet Drain), and one Bridge Option is proposed on south tributary to Fleet Drain, west of Riddings Farm, northwest of Field NW8. The fourth Bridge Option is located to the southwest of Fields SW8 over Ell Wood and Fenwick Grange Drain. Bridge Options are shown on **ES Volume II Figure 2-3 Indicative Site Layout Plan [EN010152/APP/6.2]**. In addition, there are two areas where culvert extensions may be required (one of which may be decided to be a Bridge option, northwest of Field NW8), as stated in Paragraph 9.8.49.

9.9.15 Within the Solar PV Site the receptors are considered to be **medium** (Fenwick Common Drain, south tributary to Fleet Drain and Ell Wood and Fenwick Grange Drain) importance for water quality. Works for construction of bridges, and the two culvert extensions are considered to have a **low adverse** magnitude of impact with standard mitigation measures in place. This would result in **Minor adverse effect** (**not significant**) for Fenwick

Common Drain, south tributary to Fleet Drain and Ell Wood and Fenwick Grange Drain.

9.9.16 A section of Fleet Drain is currently culverted, it is proposed as part of the Scheme to consider de-culverting this section of Fleet Drain. Daylighting the existing culvert on Fleet Drain would require works within the channel. With the embedded mitigation in place, including standard construction methodologies, it is considered this would have a **low adverse** magnitude of impact on Fleet Drain, a **medium** importance receptor. This results in a **Minor Adverse effect (not significant).** However, the removal of a culvert is a long-term beneficial impact which is assessed in Paragraph 9.9.98 under the Operational and maintenance phase.

<u>Outfalls</u>

9.9.17 The outlet of the surface water drainage systems from the BESS Area and the On-Site Substation will discharge into the local watercourse Ell Wood and Fenwick Grange Drain via a pipe network. Although it is assumed that construction of any outlets would be within a dry working area, their construction would result in some temporary disturbance to the bed and banks and the risk of chemical spillages, especially if pre-cast headwalls cannot be used requiring pouring of wet concrete close to water.

9.9.18 Ell Wood and Fenwick Grange Drain, within the Solar PV Site, is of **medium** importance, and outlet construction would result in a localised, short term and temporary **low adverse** magnitude of impact, which would result in a **minor effect (not significant)**.

Temporary Impacts on the Downstream Receptor, River Don

9.9.19 For the **very high** Importance River Don, the downstream receptor of all the works above, it is considered that with the proposed embedded mitigation measures in place (including a 10m buffer zone and standard construction mitigation measures), and the dilution available, this would result in a **very low adverse** impact on the River Don, and its abstractions. This would result in a **minor adverse effect (not significant)** for the River Don.

Temporary Impacts on the Hydromorphology of Watercourses

9.9.20 There will be a requirement to cross water features for On-Site Cabling connections, which will be carried on open span bridge structures. For Fenwick Common Drain (an IDB maintained watercourse), of morphologically low importance, with the embedded and standard mitigation described earlier, a short term, temporary **low** adverse magnitude of impact, resulting in a **negligible effect** (**not significant**). During the works for On-Site Cabling crossings there may be localised flow disturbance or disruption to sediment transport processes.

9.9.21 For the south tributary to Fleet drain, a **low** morphology importance receptor, a short term temporary **low adverse** impact is predicted, which would result in a **negligible effect (not significant)**.

9.9.22 There is also the potential for open cut crossings of small ephemeral ditches, of **low** importance. It is considered that there is potential for **low** impact, resulting in a **negligible effect (not significant).**

9.9.23 Changes in hydromorphology that may be associated with new permanent surface water outfalls and access across watercourses, including culvert extension, are considered under the operation and maintenance phase.

9.9.24 Although Ell Wood and Fenwick Grange Drain is close to the main compound in SW10; the south tributary of Fleet Drain is close to the temporary compound in NW7; and Fleet Drain is close to the temporary compound in SE2, there will be no direct, physical impacts as a result of the implementation of the 10m buffer zone. Therefore, it is considered there would be a **No Change** magnitude of impact, resulting in a **Neutral effect (not significant)**.

Groundwater

Risk of Pollution from Construction Works, and Construction Compounds

9.9.25 The On-Site Cables will require trenches up to 1.4m deep, with deeper excavation required in some areas. Other structures within the subsurface include the Solar PV Mounting Structures (galvanised steel poles to support the Solar PV Panels). The depth of these poles will be 1.8-3m depth depending on ground conditions. These poles are typically installed by driving them directly into the ground without the need for excavation for foundation purposes and avoids disturbing the surrounding ground. There may also be shallow excavations of 1-2m (depending on geology and structural calculations) for concrete plinths, depending on the local geology associated with the hardstanding areas of the Solar PV Site, for example for the Field Stations, BESS Containers and the water storage tanks within the BESS Area. The construction compounds (within area SW10, with two smaller ones in area NW7 and SE2) (**ES Volume II Figure 2-4: Location of Temporary Construction Compounds and Indicative HDD Areas [EN010152/APP/6.2]**) will be for above ground storage and management of the construction process.

9.9.26 There is limited groundwater level data across the Order limits, however there is evidence that there may be shallow groundwater within superficial deposits less than 3m below the ground surface at times. Therefore, groundwater in the superficial deposits may be encountered during construction.

9.9.27 Groundwater (piezometric level) in the Sherwood Sandstone Principal Aquifer is estimated to be at least 3m below surface based on Environment Agency monitoring data and topographic elevation and confined by overlying clay deposits. Groundwater in the Sherwood Sandstone may be encountered if deeper foundations are required (e.g. piling) that are installed through the superficial deposits into the bedrock although the need for this appears unlikely.

9.9.28 Taking into account the scale of the construction works, and the thickness of the underlying superficial deposits (i.e. up to 11 m), the works are mainly likely to encounter shallow groundwater (within the superficial deposits) across the Solar PV Site. Therefore, the potential impact on the groundwater quality is generally low. The groundwater in the Sherwood Sandstone Principal Aquifer will be protected by the overlying predominantly low permeability superficial deposits.

9.9.29 Taking into account the embedded mitigation measures to be secured within the **Framework CEMP [EN010152/APP/7.7]**, there is **no change** predicted on the groundwater quality below the Solar PV Site due to the construction works, or the location of the three construction compounds. This results in a **neutral effect (not significant)** from the construction works, and Construction Compounds, on groundwater including within the Principal Aquifer (**high** importance), and the Secondary A aquifer (Breighton Sand Formation, the Alluvium, both **medium** importance).

9.9.30 Similarly, **no change** is predicted on the PWS abstraction of **medium** importance located approximately 600m from the Solar PV Site due to the distance between the Solar PV Site and the receptor. The source is used for agricultural purposes and is likely to be abstracting from the underlying Sandstone aquifer, therefore a **neutral effect (not significant)** is predicted.

<u>Impacts on Groundwater Flow</u>

9.9.31 The shallow foundations required for the Solar PV Mounting Structures in archaeologically sensitive areas will have surface impacts no deeper than 100 mm, will be regularly spaced and discontinuous. The cable trenches are likely to be generally within 1.4m of ground level, although in the case of the Grid Connection Line Drop the 400 kV cables will be up to 1.5m below ground level. The piled foundations for the Solar PV Panels and cable trenching will generally be within the superficial deposits and not expected to extend into the underlying bedrock. The BESS Area and the On-Site Substation Area are also not expected to extend into the underlying bedrock. Given the above and the predominantly low permeability nature of the superficial deposits underlying the Solar PV, BESS and Substation Sites (i.e. the Glaciolacustrine deposits and the Alluvium), significant groundwater flows are not expected. Where pockets of the more permeable Breighton Sand Formation is present slightly higher groundwater flows may be encountered.

9.9.32 Overall, there are no impacts (**no change**) predicted on the groundwater flow in the underlying Sherwood Sandstone Principal Aquifer (**high importance**) and the PWS supply boreholes, resulting in **neutral** change **(not significant)**.

9.9.33 Taking into account the embedded mitigation measures as part of the **Framework CEMP [EN010152/APP/7.7]**, any impacts of the foundation and cable trenching works on the groundwater flows within the **medium importance** Secondary A superficial aquifer will be short term, very localised and temporary (**very low adverse impact**), resulting in a **negligible effect (not significant)**.

9.9.34 Cable routes beneath watercourses are anticipated to be below the water table over part of their routes as they pass through the Solar PV Site. The profile of the cable ducting is considered to be small compared to the spatial and vertical extent of the secondary aquifers, and therefore is considered likely to have minimal impact on groundwater flow in the superficial aquifers.

9.9.35 Where the groundwater in underlying Principal Aquifer is encountered by this activity, there may be localised, short term temporary impact on the groundwater flow within the aquifer. For both the Principal and Secondary A aquifers, this is predicted to have a **very low adverse impact** on groundwater flow. On the **high importance** Sherwood Sandstone Aquifer, this results in **minor effect (not significant).** For the **medium importance** groundwater features, (i.e. the Secondary A aquifer (Breighton Sand Formation and the Alluvium), this results in a **negligible effect (not significant)**.

9.9.36 Due to the short term, temporary nature of the proposed work, **no change** is predicted on the PWS (PWS1) that is within 600m of the Solar PV Site, resulting in a **neutral effect** (not significant). No public water supply abstractions are identified within the Study Area.

Groundwater Dewatering Impacts

9.9.37 As shown on **Figure 2-4, ES Volume II Location of Temporary Construction Compounds and Indicative HDD Areas [EN010152/APP/6.2]**, the Cable crossing of the existing high pressure fuel pipeline will be implemented via HDD unless the pipeline is found to be at a sufficient depth (i.e. below 5 m); and elsewhere on the Solar PV Site trenchless crossing techniques for cables may be selected at the detailed design stage. The use of drilling or boring techniques may involve a temporary pit either side of the feature being crossed (but for watercourses will be >10m measured from the water's/channel edge under normal flows) as well as regularly spaced jointing pits and link boxes along the length of the Grid Connection Line Drop Cables (should the Grid Connection Line Drop option be implemented). Maximum parameters for the jointing pit dimensions are expected to be 3m x 10m and up to 2.4m deep bgl; link boxes will be 2.0m by 2.0m and less than 2.0m deep; the HDD send and receive pits are expected to be 5m x 10m and normally 1.5m deep depending on the size of the bore. As outlined above, there may be shallow groundwater in parts of the Solar PV Site, and so there is potential for groundwater ingress to the pits. This would be managed following standard construction techniques potentially including pumping, damming or shoring up the pits with sheet piling. Significant groundwater ingress is not anticipated as these works are expected to be within the thick superficial deposits (up to 11 m) which are largely of low permeability material.

9.9.38 As stated in the Embedded Mitigation Section 9.8 a temporary abstraction licence may be required from the Environment Agency when abstracting more than 20 m^3 of water per day. Any discharge of groundwater to the watercourse may also require a discharge consent from the Environment Agency if it is considered to be 'unclean' and the conditions of the Environment Agency's Regulatory Position Statement 'Temporary dewatering from excavations to surface water' (April 2021) cannot be met. This document states that uncontaminated, clean water, is water that is wholly or mainly clear rainwater or infiltrated groundwater that has collected in the bottom of temporary excavations on an uncontaminated site (Ref. 9-54).

9.9.39 The pits would be backfilled with 1m of Cement Bound Sand and with the original excavated material to the surface upon completion and will not affect groundwater flow in the longer term. Given the potential to encounter groundwater temporarily during construction but taking into account that it would be appropriately managed in line with any required permit conditions and best industry practice as outlined in the **Framework CEMP [EN010152/APP/7.7]**, there is the likelihood of a short term, temporary and localised **very low adverse** magnitude of impact on groundwater levels and flow. For the **medium importance** groundwater bodies in the Secondary A aquifers (i.e. the Breighton Sand Formation and Alluvium), this results in a **negligible effect (not significant)**.

9.9.40 No impacts on the underlying Principal Aquifer of **high importance** and the PWS abstraction approximately 600m away (**no change**, resulting in a **neutral effect (not significant)**. No public water supply abstractions are identified within the Study Area.

Flood Risk

9.9.41 Long term flood risk resulting from the Scheme within the Solar PV Site is not envisaged to impact fluvial, tidal, groundwater, sewers, or artificial risk levels of flooding within or surrounding the Solar PV Site. Any potential increase in surface water runoff rates as a result of the with-Scheme scenario will be managed via sustainable drainage techniques proposed to mimic the pre-Scheme conditions detailed within the **ES Volume III Appendix 9-4: Framework Drainage Strategy [EN010152/APP/6.3]**, resulting in no impact to flooding from surface water sources within or surrounding the Order limits.

9.9.42 A summary of the pre- and post-Scheme scenario flood risk levels for all sources to the Solar PV Site is provided in Table 9-18 below, details of which have been taken from Table 5-2 of the FRA (**ES Volume III Appendix 9-3: Flood Risk Assessment [EN010152/APP/6.3]**).

Table 9-18: Summary of Construction Phase Effects on Flood Risk to the Solar PV Site

Flood Risk Source	Baseline Flood Risk Level	Post-Mitigation Flood Risk Level	Proposed Mitigation/Comments
Fluvial	Low	Low	Emergency Response Plan as part of the detailed **Framework CEMP [EN010152/APP/7.7]**. The main construction compound and northern temporary construction compound have been sequentially located to be outside of fluvial flood risk. The eastern temporary construction compound will have appropriate mitigation methods implemented (included within the **Framework CEMP [EN010152/APP/7.7]**).
Tidal	Low	Low	No change to flood risk level.
Tidal/Fluvial Residual Risk	High	Low	Due to the presence of flood defences along sections of the River Went and River Don,

Flood Risk Source	Baseline Flood Risk Level	Post-Mitigation Flood Risk Level	Proposed Mitigation/Comments
			there is a residual risk of flooding to the Solar PV Site if there was overtopping or a breach of the flood defences. Emergency Response Plan as part of the detailed CEMP (as per the **Framework CEMP [EN010152/APP/7.7]**).
Surface Water	Very low to high	Very low to high	Increased surface water runoff is proposed to be managed to mimic the pre-Scheme conditions for up to and including the 1% AEP event plus climate change.
Groundwater	Low	Low	No change to flood risk level.
Sewers	Very low	Very low	No change to flood risk level.
Artificial Sources	Low	Low	No change to flood risk level.

9.9.43 With the exception of the north and east areas of the Solar PV Site, the remaining area is considered to be at low risk from all sources of flooding.

9.9.44 Construction activities would take place with a detailed CEMP and WMP in place to ensure no increase in the risk of localised flooding from deposition of sediment in new drainage pathways and existing ditches. A temporary drainage system will be in use where required (see Section 9.8).

9.9.45 The flood risk receptor is very high as the Solar PV Site is classified as essential infrastructure. However, the impact on flooding during construction within the Solar PV Site is considered to result in a temporary **no change** impact, which would result in a **neutral effect**, that is considered **not significant**.

9.9.46 The change of land use within the Solar PV Site has the potential to result in a change of flood potential for fluvial and surface water sources to off-site receptors during construction. The most important of these being Residential Housing, which is a **high** importance receptor. However, through the implementation of the CEMP, WMP and temporary drainage system these risks will be managed. Therefore, it is considered there would be a **no change** impact to the flood potential to this receptor, which would result in a **neutral effect** (not significant).

Summary of Construction Phase Effects on the Water Environment for the Solar PV Site

9.9.47 Table 9-19 below provides a summary of the potential impacts and effects on the water environment during construction of the Solar PV Site on surface water, groundwater and hydromorphology environment. The summary of the pre and post potential effects of construction on flood risk receptors is summarised in Table 9-20.

Table 9-19: Summary of Significance of Effects from Construction of the Solar PV Site

Receptor	Importance	Description of Impact	Magnitude of Impact	Effect
Construction of Solar PV Panels and Field Station				
River Went	Very high	Potential pollution of surface water during construction of the Solar PV Site, fine sediments, any spillages of polluting substances from construction of solar array and associated infrastructure.	Very Low adverse	Minor adverse (not significant)
Fenwick Common Drain/Fleet Drain	Medium	As above	Very low adverse	Negligible effect (not significant)
Ell Wood and Fenwick Grange Drain	Medium	As above	Low adverse	Minor adverse (not significant)
Unnamed agricultural drains	Low	As above	Very low adverse	Negligible effect (not significant)
Construction of the BESS Area and On-Site Substation				
Ell Wood and Fenwick Grange Drain	Medium	Potential pollution of surface water during construction of BESS and On-Site Substation areas, from fine sediments, any spillages of polluting substances.	Very low adverse	Negligible effect (not significant)

Receptor	Importance	Description of Impact	Magnitude of Impact	Effect
Temporary Construction Compounds				
Ell Wood and Fenwick Grange Drain/Fleet Drain and Southern Tributary to Fleet Drain	Medium	Potential pollution of surface water during the operation of the construction compounds, from fine sediments, any spillages of polluting substances and runoff.	Very low adverse	Negligible effect (not significant)
Access				
Fenwick Common Drain/South tributaries to Fleet Drain/Ell Wood and Fenwick Grange Drain	Medium	Construction of open span bridge crossings and culvert extensions resulting in potential pollution of surface water.	Low adverse	Minor adverse (not significant)
Fleet Drain	Medium	Construction works to de-culvert a section of Fleet Drain	Low adverse	Minor adverse (not significant)
Construction of Outfalls				
Ell Wood and Fenwick Grange Drain	Medium	Outlet construction with potential for impact on surface water quality of the Ell Wood and Fenwick Grange Drain	Low adverse	Minor adverse (not significant)
Temporary Impacts on the Downstream Receptor, River Don				
River Don	Very High	Potential for propagation of all the above impacts to the River Don	Very low adverse	Minor adverse (not significant)

Receptor	Importance	Description of Impact	Magnitude of Impact	Effect
Temporary Impacts on the Hydromorphology of Watercourses				
Fenwick Common Drain/north and south tributary to Fleet Drain	Low	Localised disruption to sediment transport processes and impacts to channel morphology during On-Site Cabling construction.	Low adverse	Negligible effect (not significant)
South tributary to Fleet Drain	Low	Potential pollution of surface water during by fine sediment and accidental spillages of polluting substances during construction of access tracks and crossings. Impacts to channel morphology from access track crossings.	Low adverse	Negligible effect (not significant)
Small ephemeral ditches	Low	Potential for open cut cable crossings for any small ephemeral ditches encountered.	Low adverse	Negligible effect (not significant)
Ell Wood and Fenwick Grange Drain	Low	Potential pollution of fine sediments affecting transport processes.	No change	Neutral effect (not significant)

Receptor	Importance	Description of Impact	Magnitude of Impact	Effect
Groundwater Risk of Pollution from Construction Works				
Breighton Sand and Alluvium (Secondary A Aquifers)	Medium	Pollution risk on groundwater quality during construction works associated with the Solar PV Site and cable route	No change	Neutral (not significant)
Sherwood Sandstone (Principal Aquifer)	High		No change	Neutral (not significant)
PWS abstraction (used for irrigation purpose)	High		No change	Neutral (not significant)
Impacts on Groundwater Flow				
Breighton Sand and Alluvium (Secondary A Aquifers)	Medium	Construction works associated with the Solar PV Site on groundwater flow	Very Low Adverse	Negligible (not significant)
Sherwood Sandstone (Principal Aquifer)	High		No change	Neutral (not significant)
PWS abstraction (used for irrigation purpose)	Medium		No change	Neutral (not significant)
Impact on Groundwater Flow from Cable Routes				
Breighton Sand and Alluvium (Secondary A Aquifers)	Medium	Cable route that may be below watercourses and potential impact on groundwater flow	Very Low Adverse	Negligible (not significant)
Sherwood Sandstone (Principal Aquifer)	High		Very Low Adverse	Minor (not significant)

Receptor	Importance	Description of Impact	Magnitude of Impact	Effect
PWS abstraction (used for irrigation purpose)	Medium		No change	Neutral (not significant)
Groundwater Dewatering Impacts				
Breighton Sand and Alluvium (Secondary A Aquifers)	Medium	Groundwater dewatering impacts associated with excavating drill pits for installation of cables	Very Low Adverse	Negligible (not significant)
Sherwood Sandstone (Principal Aquifer)	High		No change	Neutral (not significant)
PWS abstraction (used for irrigation purpose)	Medium		No change	Neutral (not significant)
Flood Risk				
Essential Infrastructure, the Scheme is classed as 'Essential Infrastructure'.	Very high	Temporary changes in fluvial and surface water sources during construction and decommissioning	No change	Neutral (not significant)
Residential Housing	High	Temporary changes in fluvial and surface water sources during construction and decommissioning	No change	Neutral (not significant)

Construction (Assumed to be 2028 to 2030): Grid Connection Corridor

9.9.48 During construction of the Grid Connection Corridor the following adverse impacts may occur:

a. Pollution of surface water (and any designated ecology sites that are water dependent) due to deposition or spillage of soils, sediments, oils, fuels, or other construction chemicals, or through uncontrolled site runoff including dewatering of excavations;

b. Temporary impacts on the hydromorphology of watercourses from open-cut watercourse crossings or temporary vehicle access as may be required;

c. Potential impacts on groundwater quality and resources, local water supplies (licenced and unlicenced abstractions) and potentially the baseflow to watercourses from temporary dewatering of excavations or changes in hydrology; and

d. Temporary changes in flood risk from changes in surface water runoff (e.g. disruption of stream flows during any potential culvert construction works) and exacerbation of localised flooding, due to deposition of silt, sediment in drains, ditches; and changes.

9.9.49 These are summarised in Table 9-21 at the end of this section, with discussion presented below in the following paragraphs.

Surface Water Features

9.9.50 The Grid Connection Corridor crosses the water features listed in the Grid Connection Corridor Surface Water Features section (Paragraphs 9.7.73–9.7.78). Similar impacts are likely to occur from the construction of the Grid Connection Corridor as those discussed in the Construction (2028 to 2030) of the Solar PV Site.

9.9.51 For non-intrusive watercourse crossings, there is a small risk of ‘frac-out’ events (i.e. hydraulic fluid break out) from drilling under the watercourse if not appropriately mitigated for site specific conditions. A site-specific hydraulic fracture risk assessment will be produced prior to commencing works to define the mitigation required based on ground conditions. This requirement has been included within the **Framework CEMP [EN010152/APP/7.7]** and will minimise the risk of a ‘frac-out’ event. Water quality monitoring will also be undertaken prior to, during, and following on from the construction activity to ensure any spillages or other pollution is identified. This requirement is included within the **Framework CEMP [EN010152/APP/7.7]**. These mitigation requirements will be outlined in a WMP (which will be produced post consent).

Grid Connection Cable Crossings

9.9.52 With regard to the crossing of Hawkehouse Green Dike (which is the WFD monitored Channel for Bramwith Drain Water Body) and Thorpe Marsh Drain by non-intrusive methods, there is considered to be negligible potential for impact from works to install a Grid Connection Cable beneath them given the mitigation measures in place and the location of the launch/receiving pits at a distance of at least 10m from the banks (or 16m from the landward toe of flood defences). For the **high** importance Hawkehouse Green Dike (also known as Bramwith Drain) and **very high** importance Thorpe Marsh Drain, a **very low** magnitude of impact results in a **minor adverse effect (not significant)**.

9.9.53 With regard to the non-intrusive crossing methods for **medium** importance Moss Road and London Hill Drain, Tributary to Flashley Carr Drain, Tributary to Mill Dike, Mill Dike, Wrancarr Drain and unnamed channel south of Marsh Lane Bridge with the mitigation measures in place, it is considered it would be a **very low** adverse magnitude impact. This includes the surface water abstraction from Engine Dike. This would result in a **negligible effect (not significant**) on all the receptors and the abstraction from Engine Dike. Where intrusive open cut methods are used for lower importance receptors, for example agricultural ditches, a **very low** magnitude of impact on a **low** importance receptor would result in a **negligible adverse effect (not significant).**

9.9.54 Whilst the IDB watercourses will be non-intrusively crossed, there is the potential to encounter ephemeral ditches within the Grid Connection Corridor. These would be crossed using intrusive open cut techniques. Therefore, there is the potential for unavoidable short term, temporary adverse impacts on the watercourse hydrological and sediment regimes during construction. However, given mitigation measures in place, including over-pumping or fluming of the flow, reinstatement as found and implementation of good practice measures, which will be outlined in the **Framework CEMP [EN010152/APP/7.7]** and WMP, these impacts would be a temporary and localised **low adverse** magnitude of impact in terms of water quality. A **low adverse** magnitude of impact on a **low** importance receptor would result in a **negligible effect** (**not significant**).

Temporary Impacts on the Downstream Receptor, River Don

9.9.55 For the **very high** Importance River Don, the downstream receptor of all the works above, it is considered that with the proposed embedded mitigation measures in place (including a 10m buffer zone and standard construction mitigation measures), and the dilution available, this would result in a **very low adverse** impact on the River Don. This would result in a **minor adverse effect (not significant)** for the River Don.

Access

9.9.56 There is potential for adverse impacts on surface water quality of water features during construction of a culvert extension over Moss Road and London Hill Drain (Access Point 1), and temporary crossings for access. It is considered that the installation and removal of temporary crossings that may be required to facilitate the non-intrusive crossings of watercourses, and the construction of the culvert extension, may result in short term, temporary **very low adverse** magnitude of impact. For crossings of **high** importance water feature, Hawkehouse Green Dike (also known as Bramwith Drain) and **very high** importance, Thorpe Marsh drain, this would result in a **minor adverse effect (not significant).** For any **medium** importance receptors which need to be crossed (Ell Wood and Fenwick Grange Drain, Mill Dike, Wrancarr Drain and unnamed channel south of Marsh Lane Bridge), a **very low** adverse impact would result in a **negligible effect (not significant).**

Temporary Impacts on the Hydromorphology of Watercourses

9.9.57 The crossing of watercourses may be via intrusive techniques (for small ephemeral ditches encountered), or non-intrusive techniques (such as HDD). A culvert extension will be required at Access Point 1 off Moss Road.

9.9.58 The crossing of watercourses with the extension of culverts both have the potential to result in **medium adverse** impacts to the channel and riparian habitat of the watercourse. However, as the water features are of **low importance** for hydromorphology, agricultural ditches, this results in a **minor effect (not significant)**.

9.9.59 Non-intrusive crossings, including HDD techniques, for watercourse cable crossings for the Grid Connection Corridor is outlined in **ES Volume II Figure 2-4: Location of Temporary Construction Compounds and Indicative HDD Areas [EN010152/APP/6.2]**.

9.9.60 Where HDD, or other non-intrusive methods, are used for crossing Hawkehouse Green Dike (also known as Bramwith Drain) and Thorpe Marsh Drain, it is considered there would be a **no change** magnitude of impact on their hydromorphology, which on **low importance** water features for hydromorphology (Hawkehouse Green Dike and Thorpe Marsh Drain) results in a temporary **neutral adverse effect (not significant)**.

9.9.61 With regard to the non-intrusive crossing methods for **low** importance Moss Road and London Hill Drain, Tributary to Flashley Carr Drain, Tributary to Mill Dike, Mill Dike, Engine Dike, Wrancarr Drain and unnamed channel south of Marsh Lane Bridge with the mitigation measures in place, it is considered a **very low** magnitude adverse impact would occur. A very low magnitude adverse impact on London Hill Drain for the culvert extension is also considered possible. This would result in a **negligible effect (not significant**).

9.9.62 For the intrusive open cut crossings of small ephemeral ditches for the Grid Connection Corridor there is likely to be unavoidable short term, temporary adverse impacts on the channel morphology, their riparian habitats, and the hydrological and sediment regimes during construction. With the proposed mitigation measures, including reinstatement of the channel as found this would be a temporary and localised low adverse impact. A **low** adverse magnitude of impact, on a **low** importance receptor, would result in a **negligible effect (not significant).**

Groundwater

<u>Risk of Pollution from Construction Works</u>

9.9.63 As indicated in **ES Volume I Chapter 2: The Scheme [EN010152/APP/6.1]** the Grid Connection Cables will require trenches up to 1.5m deep. However, this may vary at different points along the Grid Connection Cable route when required. Works that open excavations potentially create new pathways to groundwater and thus potential impacts have been assessed.

9.9.64 There is limited groundwater level data across the Grid Connection Corridor and 1 km Study Area, however it is likely that groundwater within the Alluvium is shallow at less than 3m below the ground surface, therefore, shallow groundwater in the superficial deposits may be encountered during the construction works particularly in the vicinity of the River Don valley.

9.9.65 Where HDD, or other non-intrusive methods, are used to install the Grid Connection Cables beneath watercourses, installation would be a minimum of 1.5m below the bed of the watercourse, except for Mill Dike, Wrancarr Drain, Engine Dike and Thorpe Marsh Drain due to the connectivity to the River Don where the minimum installation depth would be 5.0m below the lowest surveyed point of the watercourse. Where the HDD, or other non-intrusive method, extends to deeper levels confined groundwater within the bedrock may be encountered. Taking into account the embedded mitigation measures to be secured within the **Framework CEMP [EN010152/APP/7.7]**, the potential impact on groundwater quality during construction of the Grid Connection Corridor is considered to be short term and temporary.

9.9.66 Accordingly, **very low adverse** impact is predicted on the groundwater quality. This results in a **negligible effect (not significant)** on the **medium important** groundwater of the Secondary A aquifers (Breighton Sand Formation and the Alluvium). The impact results in **minor effects (not significant)** within the Principal Aquifer and PWS2, located approximately 300m from the Grid Connection Corridor (both of **high importance**).

Groundwater Flow Impacts

9.9.67 It is anticipated that the trenches required for the Grid Connection Corridor Cables will predominantly be within the superficial deposits, however where the HDD, or other non-intrusive method, are deeper, this may encounter the bedrock of the Sherwood Sandstone and Chester Formation.

9.9.68 Generally, it is considered that the cable trenches will have minimal impact on groundwater flows, any impact will be temporary and short term. Therefore, taking into account the embedded mitigation measures **a very low adverse** impact is predicted on the groundwater flow in the groundwater receptors. This results in **minor effect (not significant)** on the Sherwood Sandstone Group Principal Aquifer and the PWS2 used for domestic supply, both of which are of **high importance**. **Negligible effect (not significant)** is predicted on the **medium importance** Secondary A aquifers (Alluvium and Breighton Sand Formation).

9.9.69 The Grid Connection Corridor is planned to cross a number of roads, watercourses and a rail line. The cable routes beneath watercourses are anticipated to be below the water table over part of their routes. The profile of the cable ducting is considered to be small compared to the spatial and vertical extent of the secondary aquifers, and therefore is considered to have minimal impact on groundwater flow in the superficial aquifers. Where the groundwater in underlying Principal Aquifer is encountered by this activity, there may be localised, short term temporary impact on the groundwater flow within the aquifer.

9.9.70 For the Principal and Secondary A aquifers and the PWS (PWS2), this is predicted to have a **very low adverse impact** on groundwater flow, which on the **high importance** Principal Aquifer and PWS2, this results in **minor**

effect (not significant). For the **medium importance** Secondary A aquifer (Breighton Sand Formation and Alluvium), this results in a **negligible effect (not significant)**.

Groundwater Dewatering Impacts

9.9.71 Construction works to install Grid Connection Cables beneath specified watercourses using drilling or boring techniques (such as HDD) would involve a temporary pit either side of the watercourse (>10m measured from the water's/channel edge under normal flows) as well as regularly spaced jointing pits and link boxes along the length of the Grid Connection Corridor. Maximum parameters for the jointing pit dimensions are expected to be 3m x 10m and up to 2.4m deep bgl; link boxes will be 2.0m by 2.0m and less than 2.0m deep; the HDD send and receive pits are expected to be 5m x 10m and normally 1.5m deep depending on the size of the bore. As outlined above, there may be shallow groundwater in parts of the Grid Connection Corridor, and so there is potential for groundwater ingress to the pits. This would be managed following standard construction techniques, potentially including pumping, damming or shoring up the pits with sheet piling.

9.9.72 A temporary abstraction licence may be required from the Environment Agency when abstracting more than 20 m^3 of water per day lasting less than 28 days. Any discharge of groundwater to the watercourse may also require a discharge consent from the Environment Agency if it is considered to be 'unclean' and the conditions of the Environment Agency's Regulatory Position Statement 'Temporary dewatering from excavations to surface water' (April 2021) cannot be met (Ref. 9-54).The pits would be backfilled with 1m of Cement Bound Sand and with the original excavated material to the surface upon completion and would not affect groundwater flow in the longer term. Given the potential to encounter groundwater temporarily during construction but taking into account that it would be appropriately managed in line with any required permit conditions and best industry practice as outlined in the **Framework CEMP [EN010152/APP/7.7]**, there is the likelihood of a short term, temporary **very low adverse impact** on groundwater levels and flow.

9.9.73 For the **medium importance** groundwater bodies in the Secondary A aquifers (Breighton Sand Formation and the Alluvium), this results in a **negligible effect (not significant)**. As these pits are likely to be within the superficial deposits, **no change impacts** are predicted on the underlying Principal Aquifer and PWS2 of **high importance** (**no change**, resulting in a **neutral effect**).

Flood Risk

9.9.74 Long term flood risk resulting from the Scheme to and from the Grid Connection Corridor is considered to be as existing, as the infrastructure will be buried throughout the Grid Connection Corridor with no permanent above ground built development. A summary of the pre- and post-Scheme scenario flood risk levels for all sources to the Grid Connection Corridor is provided in Table 9-20 below.

Table 9-20: Comparison of Flood Risk Pre and Post Scheme

Flood Risk Source	Baseline Flood Risk Level	Post-Mitigation Flood Risk Level	Proposed Mitigation/Comments
Fluvial	High	Low	Grid Connection Corridor is via buried cables therefore unlikely to impact above ground fluvial sources.
Tidal	High	Low	Grid Connection Corridor is via buried cables therefore unlikely impact above ground tidal sources.
Surface Water	Very low to high	Very low to high	Grid Connection Corridor is via buried cables therefore unlikely impact above ground surface water sources.
Groundwater	Low to high	Low to high	No change to flood risk level as only localised impacts to groundwater anticipated due to buried cable.
Sewers	Very low	Very low	No change to flood risk level.
Artificial Sources	Low	Low	No change to flood risk level.

9.9.75 The Grid Connection is considered to be a medium to high risk of flooding from tidal/fluvial sources of flooding, and at low risk of flooding from all other sources of flooding. The FRA provides an assessment of flood risk from all sources and is included in **ES Volume III Appendix 9-3: Flood Risk Assessment [EN010152/APP/6.3]**.

9.9.76 Construction activities would take place with a detailed CEMP and WMP in place to ensure no increase of localised flooding from deposition of sediment in new drainage pathways and ditches. Overall, the impact during construction within the Grid Connection Corridor on the essential infrastructure receptor, of very high importance, is considered to be a temporary **no change** magnitude of impact. This would result in a **neutral effect** (**not significant**).

9.9.77 The construction of the Grid Connection Corridor has the potential to result in a change of flood potential for fluvial, tidal surface water and groundwater sources to off-site receptors. The most important of these being Residential Housing, which is a **high** importance receptor. However, through the implementation of the CEMP, WMP and temporary drainage system these risks will be managed. It is considered there would be a **no change** magnitude of impact to off-site receptors. It which would result in a **neutral effect**, that is **not significant**.

Summary of Construction Phase Effects on the Water Environment for the Grid Connection Corridor

9.9.78 Table 9-21 summarises the construction phase effects on the water environment for the Grid Connection Corridor.

Table 9-21: Summary of Significance of Effect for the Construction of the Grid Connection Corridor

Receptor	Importance	Description of Impact	Impact	Effect
Grid Connection Cable Crossings				
Hawkehouse Green Dike (also known as Bramwith Drain)	High	Water quality impacts during construction of cable crossing of Hawkehouse Green Dike using non-intrusive technique.	Very Low	Minor adverse (not significant)
Thorpe Marsh Drain	Very high	Water quality impacts during construction of cable crossing of Thorpe Marsh Drain using non-intrusive technique	Very Low	Minor adverse (not significant)
Moss Road and London Hill Drain, tributary to Flashley Carr Drain, Mill Dike and its tributary, Wrancarr Drain, Unnamed channel south of Marsh Lane Bridge	Medium	Water quality impacts during construction of Cable crossing to surface water features using non-intrusive technique (HDD or other)	Very low adverse	Negligible (not significant)
Any unnamed agricultural ditches	Low	Potential pollution of surface water during by fine sediment and accidental spillages of polluting substances during construction of cable crossing using intrusive technique. Temporary disturbance to sediment transport processes and channel morphology.	Low adverse	Negligible (not significant)

Receptor	Importance	Description of Impact	Impact	Effect
Temporary Impacts on the Downstream Receptor, River Don				
River Don	Very high	Downstream receptor of any impact from the impacts above	Very low adverse	Minor adverse (not significant)
Access				
Hawkehouse Green Dike (also known as Bramwith Drain)	High	Potential pollution of surface water during by fine sediment and accidental spillages of polluting substances during installation and removal of any temporary crossings	Very Low adverse	Minor adverse (not significant)
Thorpe Marsh Drain	Very high	Potential pollution of surface water during by fine sediment and accidental spillages of polluting substances during installation and removal of any temporary crossings.	Very Low adverse	Minor adverse (not significant)
Moss Road and London Hill Drain, Mill Dike, Wrancarr Drain, Unnamed channel south of Marsh Lane Bridge	Medium	Potential pollution of surface water during by fine sediment and accidental spillages of polluting substances during installation and removal of any temporary crossings, and culvert extension on Moss Road and London Hill Dran.	Very Low adverse	Negligible (not significant)
Temporary Impacts on the Hydromorphology of Watercourses				
Hawkehouse Green Dike (also known as Bramwith Drain)	Morphology Low	Potential impact on Hydromorphology and sediment transport processes	No change	Neutral (not significant)

Receptor	Importance	Description of Impact	Impact	Effect
		using non-intrusive crossings of cables		
Thorpe Marsh Drain	Morphology low	As above	No change	Neutral (not significant)
Moss Road and London Hill Drain, Mill Dike, Wrancarr Drain, Unnamed channel south of Marsh Lane Bridge	Morphology Low	Potential impact on Hydromorphology and sediment transport processes using non-intrusive cable crossings, and extension of culvert on Moss Road and London Hill Drain.	Very low adverse	Negligible (not significant)
Small ephemeral ditches	Morphology Low	Potential impact on Hydromorphology and sediment transport processes using intrusive cable crossings	Very low adverse	Negligible (not significant)
Groundwater Risk of Pollution from Construction Works				
Sherwood Sandstone (Principal Aquifer)	High	Potential impact on groundwater quality from cable trenching and installation	Very low adverse	Minor effect (not significant)
Breighton Sand and Alluvium (Secondary A Aquifers)	Medium		Very low adverse	Negligible effect (not significant)
PWS abstraction (used for domestic and agricultural purposes)	High		Very low adverse	Minor effect (not significant)
Groundwater Flow Impacts				
Sherwood Sandstone (Principal Aquifer)	High	Groundwater level and flow from cable trenching and installation	Very low adverse	Minor effect (not significant)
Breighton Sand and Alluvium (Secondary A Aquifers)	Medium		Very low adverse	Negligible effect (not significant)

Receptor	Importance	Description of Impact	Impact	Effect
PWS abstraction (used for domestic and agricultural purposes)	High		Very low adverse	Minor effect (not significant)
Groundwater Dewatering Impacts				
Sherwood Sandstone (Principal Aquifer)	High	Groundwater dewatering impacts associated with excavating drill pits for installation of cables	No change	Neutral effect (not significant)
Breighton Sand and Alluvium (Secondary A Aquifers)	Medium		Very low adverse	Negligible effect (not significant)
PWS abstraction (used for domestic and agricultural purposes)	High		No change	Neutral effect (not significant)
Flood Risk				
Essential Infrastructure	Very high	Temporary changes in flood risk to fluvial, tidal, surface water and groundwater during construction and decommissioning	No change	Neutral effect (not significant)
Residential Housing	High	Temporary changes in flood risk to fluvial, tidal, surface water and groundwater during construction and decommissioning	No change	Neutral effect (not significant)

Operation: Solar PV Site

9.9.79 During operation of the Solar PV Site the following adverse impacts may occur:

a. Potential for permanent morphological physical impacts to watercourses if crossings are required for access and depending on the design of the structure used;

b. Potential impacts on groundwater resources: quality, flow and level and potential risk from firefighting at the BESS Area;

c. Potential impacts on the rate and volumes of surface water run-off entering local watercourses and increasing the risk of flooding; and

d. Potential for impact of foul drainage/water supply in the area due to the offices/maintenance facilities required as part of the Scheme.

9.9.80 These are summarised in Table 9-23 at the end of this Section, with discussion presented below in the following paragraphs.

9.9.81 The operational Grid Connection Corridor has not been assessed as the whole cable will be installed beneath ground level with no impact on the water environment following completion of construction and reinstatement.

Surface Water Features

Impacts from Runoff

9.9.82 The drainage arrangements propose to attenuate surface water runoff and contain chemical spillages from the Solar PV Site once operational, whilst minimising flood risk to the Solar PV Site and surrounding areas (see Section 9.8 Embedded Mitigation). More detailed surface water drainage proposals are presented in the **Framework Drainage Strategy** (**ES Volume III Appendix 9-4 [EN010152/APP/6.3]**). The operation of the Solar PV Site will be managed in accordance with an OEMP (**Framework Operational Environmental Management Plan [EN010152/APP/7.8]** is included with the DCO Application).

9.9.83 Surface water runoff would mainly be low risk roof or panel runoff as this will consist mainly of rainfall. In addition to permanent structures, there would be runoff from hardstanding areas such as the BESS Area, On-Site Substation, Operations and Maintenance Hub, access tracks and car parking areas which will form part of the above land uses.

9.9.84 Within the area of Solar PV Panels, the impermeable area would remain largely consistent with its pre-development state as Solar PV Panels are elevated above ground and incident rainfall will run off them to ground as it does now.

9.9.85 In order to limit the potential for channelisation from rainfall dripping off the end of the Solar PV Panels, the areas between, under and surrounding the Solar PV Panels will be planted with native grassland mix. This planting will intercept and absorb rainfall running off the Solar PV Panels, preventing it from concentrating and potentially forming channels in the ground.

9.9.86 Additional SuDS attenuation such as filter drains, attenuation basins, and swales will be incorporated to control any increase in the rate of flow from new impermeable areas towards the receiving watercourses, and to provide treatment for any contaminants collected on areas of hardstanding that may also be positively drained.

9.9.87 Formal drainage systems are limited to the BESS Area and On-Site Substation and these systems will provide a controlled discharge to the Ell Wood and Fenwick Grange watercourse.

9.9.88 The SuDS Manual's Simple Index Approach (Ref. 9-34) has been used to demonstrate the suitability of the SuDS treatment trains within the design. This approach would take into account different land uses, including offices and access roads. It is likely that one or two treatment trains would be considered to provide significant mitigation.

9.9.89 The Solar PV Site would operate using good practice and comply with environmental legislation through the application of a **Framework Landscape and Ecological Management Plan (LEMP) [EN010152/APP/7.14]** that has been produced as part of the DCO Application, including appropriate maintenance of SuDS and other drainage infrastructure included within the **Framework Operational Environmental Management Plan[EN010152/APP/7.8]**. Overall, it is anticipated that with the embedded mitigation of an appropriate drainage strategy mimicking natural flow status there would be no material impact on existing surface water flow pathways from runoff from the Scheme. The inclusion of SuDS treatment train components would result in no impact to surface water quality from any site runoff.

9.9.90 Overall, given the implementation of a Drainage Strategy including SuDS provision, it is predicted that there would be a **no change** magnitude of impact to any receiving water feature from surface water runoff. The outlet of the proposed systems from the BESS Area and On-Site substation will discharge into Ell Wood and Fenwick Grange Drain of **medium importance.** This would result in a **neutral effect (not significant**).

<u>Potential Pollution Impacts on Water Resources from Fire-Fighting Water at the BESS Area</u>

9.9.91 If there is a fire within the BESS Area there is a risk that contaminated water may pollute nearby watercourses if it is not contained. As stated in Section 9.8 Embedded Mitigation, the operational Scheme design will include both fire water tanks and associated fire water containment. Any fire water will be stored on Site in tanks. In the event of a fire, any fire water runoff will be stored in lined, gravel filled attenuation basins surrounding the battery units within the BESS Area. These basins will have an impermeable liner and the outlet from the basins will be controlled via a penstock to allow the containment of all stored fire water if it becomes necessary. This means there would be no pathway whereby firewater could access surface water runoff and enter surface water features. Any fire water that collects in the lined basins would be tested and if found to be contaminated, it would be pumped out by a suitable contractor for off-site disposal at a licenced Waste Management Facility. If not contaminated, this would be released with agreement of the Environment Agency if a permit was required.

9.9.92 Overall, due to the lack of pathway from potential contaminated fire water to surface water features, it is considered there would be **no change** impact to surface water quality of the Ell Wood and Fenwick Grange Drain (**medium** importance receptors respectively), resulting in a **neutral effect (not significant)** regardless of water feature importance.

Potential Impacts on Hydrology

9.9.93 Once the Solar PV Site is operational, there is the potential for a change in surface water runoff or change in hydrology of the watercourses within the area. However, the **Framework Drainage Strategy (ES Volume III Appendix 9-4** [**EN010152/APP/6.3**]**)**. has been designed so as to mimic the natural drainage conditions within the Order limits and ensure no impact on the flow in receiving surface water features. Therefore, it is considered there would be a **no change** impact on the surface water features in the area. These are of **very high** (River Went), and **medium** importance (Fenwick Common Drain, north and south tributary to Fleet Drain and Ell Wood and Fenwick Grange Drain)). For all receptors, a no change impact results in a **neutral effect (not significant)**.

Potential for Morphological Impacts to Watercourses

9.9.94 The potential for morphological physical impacts to watercourses are covered below under ‘access’, with access track features, and ‘outfalls’ where drainage from the Order limits would enter the watercourse system.

Access

9.9.95 There is a commitment for no new culverts to be used for watercourse crossings. Where a new ditch crossing is required, an open span bridge will be suggested, with the type of crossing selected based on site-specific factors and in consultation with the relevant authority (generally the IDB/lead local flood authority). Extensions or modifications of existing culverts will be designed to maintain connectivity along watercourses.

9.9.96 For any watercourses within the Solar PV Site that are to be crossed, there would be localised and permanent moderate impacts to the water feature’s riparian and bank habitat for installation of the structures, and localised shading effects to the watercourse bed habitat. This reduces light intensity, photosynthesis, metabolic activity, and biochemical cycling within the watercourse, thereby impacting on the aquatic ecosystem, albeit for a short length for each crossing. However, it is assumed that there would be no interruption of flow or sediment conveyance, and interaction with groundwater can be maintained.

9.9.97 It is considered that, with mitigation, **low adverse** magnitude of impacts are likely, given the commitment for no new culverts being constructed. However, as the morphology receptors are assessed as being of **low** importance, this results in a potentially **negligible effect (not significant)**.

9.9.98 A section of culvert on Fleet Drain, downstream of Fenwick Common Drain, would be removed. This is located to the east of Fenwick Hall. The removal of a culverted section is considered to be a beneficial change, however, as it is a small section of culvert the magnitude of the impact of the benefit is limited. It is considered a medium beneficial impact. On the **low** importance for morphology, Fleet Drain, this result in a **minor beneficial effect (not significant).**

Outfalls

9.9.99 The Scheme will require two engineered surface water outfalls to Ell Wood and Fenwick Grange Drain. As a worst case, hard engineered connections to outfalls will be used. The final location, position and orientation of the new outfalls will be carefully determined and informed by a hydromorphological survey to minimise any adverse local impacts on river processes. If headwalls are required, appropriate micro-siting of the outfalls will minimise loss of bank habitat, the need for bed scour or hard bank protection, and localised flow disturbance or disruption to sediment transport processes. It is anticipated that agricultural drainage ditches would be impacted by outfalls from the Scheme.

9.9.100 Overall, the operation and maintenance of new engineered outlets would result in a localised, permanent **low adverse** impact on the Ell Wood and Fenwick Grange Drain receptor of morphologically **low** importance, which would result in a **negligible effect (not significant)**.

Potential Impacts on Groundwater Resources

Groundwater – Water Quality Impacts

9.9.101 During operation, there is the potential for impact to groundwater quality from any spillages of chemicals used onsite. However, the use of the OEMP will ensure any potential for impact is minimised. Therefore, no significant risks to the groundwater receptors in terms of groundwater quality are anticipated during the operation and maintenance phase of the Scheme, provided that the operation is conducted in accordance with the Embedded Mitigation (Section 9.8) which will be secured in the DCO via the **Framework OEMP [EN010152/APP/7.8]**, including adoption of good industry practice to manage the risk of chemical spillages. For the medium importance superficial groundwater aquifers (Breighton Sand Formation and alluvial deposits) this is considered to have a **very low adverse** impact therefore resulting in a **negligible effect (not significant)**. **No change** predicted on the Sandstone aquifer of high importance and the PWS of medium importance due to the protection provided by the superficial deposits, resulting in a **neutral effect (not significant**).

Groundwater – Flow and Level Impacts

9.9.102 The drainage design for the Scheme has been prepared and is included as **ES Volume III Appendix 9-4: Framework Drainage Strategy [EN010152/APP/6.3].** The Framework Drainage Strategy states that rainfall within the Solar PV Site will directly permeate into the ground. Within the BESS Area, gravel filled attenuation basins will collect runoff and discharge into a swale, which is expected to partly infiltrate to the underlying aquifer. The portion of rainfall that does not have the opportunity to infiltrate will be conveyed towards the local watercourses. The On-Site Substation would contain a series of drains that are focussed to drain the impermeable elements of the Solar PV Site. The drains pass flow to a surface attenuation basin that releases to the nearby watercourse, Ell Wood and Fenwick Grange Drain via a flow control and pipe.

9.9.103 Construction of building foundations, plinths, and areas of new hardstanding will prevent recharge of rainfall directly under their footprint, with runoff again being managed appropriately using SuDS. These areas of hardstanding are very limited in size therefore the majority of the Solar PV Site which will remain permeable, therefore it is considered there would be no impact to infiltration of rainwater into the ground.

9.9.104 As such, there may be negligible localised changes in the spatial distribution and quantity of recharge of groundwater across the Solar PV Site, BESS Area and On-Site Substation. It is considered there would be **very low adverse** impact on groundwater recharge, level and flow. For the **medium importance** superficial groundwater aquifers (Breighton Sand Formation and alluvial deposits), this results in a **negligible effect (not significant)**. **No change** is predicted on the Sandstone aquifer of **high importance** and the PWS (PWS1) of **medium importance** resulting in a **neutral effect (not significant**).

Pollution Risk from Fire Fighting at the BESS Area

9.9.105 There is potential for the use of firefighting water in the event of a fire. As stated in Section 9.8 Embedded Mitigation, the operational design will include both fire water tanks and associated fire water containment. Fire water will be stored on-site at the BESS Area. Associated with this will be impermeable lined gravel filled attenuation basins with penstocks for fire water runoff, to allow the containment of all fire water if it becomes necessary to be used. In this way there would be no pathway whereby firewater can infiltrate to ground.

9.9.106 Therefore, due to the lack of pathway from potential fire water to ground or surface water features, it is considered there would be a **very low adverse** impact to groundwater quality in the superficial deposits. For the **medium** importance receptors (Secondary A aquifers), this results in a **negligible effect (not significant)**. No impact predicted on the Principal Aquifer of high importance and the PWS of medium importance.

Flood Risk

9.9.107 Flood risk impacts and effects for flood risk are summarised in Table 9-22 for the operation and maintenance phase for the Solar PV Site.

Table 9-22: Summary of Operation and Maintenance Phase Impacts and Effects on Flood Risk for the Solar PV Site

Flood Risk Source	Baseline Flood Risk Level	Post-Mitigation Flood Risk Level	Proposed Mitigation
Fluvial	Low	Low	Solar PV infrastructure within Flood Zones 2 and 3 will be raised above the modelled design flood level and are not expected to

Flood Risk Source	Baseline Flood Risk Level	Post-Mitigation Flood Risk Level	Proposed Mitigation
			impact existing flood extents or mechanisms. The volume of floodplain storage lost as a result of panel mounts within the design flood extent is approximately 1.3 m^3 which is considered negligible. In Field SE3, concrete block footings for the Solar PV Panels may be required for archaeological mitigation; this would result in a negligible loss of floodplain storage of approximately 13 m^3. The main construction compound and northern temporary construction compound have been sequentially located to be outside of fluvial Flood Zone 2 and 3. The eastern temporary construction compound is located in Flood Zone 2 and 3 however the hydraulic modelling shows that it is located outside of the 1% AEP plus climate change flood extent.
Tidal	Low	Low	No change to flood risk level.
Tidal/Fluvial Residual Risk	High	Low	Emergency Response Plan as part of the detailed OEMP. The On-Site Substation and BESS Area to be bunded to provide protection during the unlikely event of a breach of the flood defences. The height of this bund will be 300 mm above the maximum flood depths during the River Don breach scenario. These vulnerable assets are not located within the design flood event when no breach occurs.
Surface Water	Very low to high	Very low to high	Increased surface water runoff is proposed to be managed to mimic the pre-Scheme conditions for up to and including the 1% AEP event plus climate change.
Groundwater	Low	Low	No change to flood risk level.

Flood Risk Source	Baseline Flood Risk Level	Post-Mitigation Flood Risk Level	Proposed Mitigation
Sewers	Very low	Very low	No change to flood risk level.
Artificial Sources	Low	Low	No change to flood risk level.

9.9.108 During the operation and maintenance phase, there would be surface water runoff from the permanent structures, roofs, Solar PV Panels and access roads. This could impact surrounding watercourses and water features. A surface water Framework Drainage Strategy has been prepared, included as **ES Volume III Appendix 9-4: Framework Drainage Strategy [EN010152/APP/6.3]**. This is a method to assess water quality risk from different land uses so that sufficient treatment can be provided, preferably using SuDS. According to this risk assessment the proposed SuDS treatment train will provide adequate treatment of diffuse urban pollutants.

9.9.109 The Framework Drainage Strategy includes SuDS provision; therefore, it is predicted that there would be a **No change** impact to any receiving water feature from surface water runoff. This results in a **Neutral effect (not significant)** whatever the level of importance of the receiving watercourse.

9.9.110 The flood risk receptor is very high as the Solar PV Site is classified as essential infrastructure. However, the impact on flooding during operation within the Solar PV Site is considered to result in a **no change** impact, which would result in a **neutral effect**, that is considered **not significant**.

9.9.111 The change of land use within the Solar PV Site has the potential to result in a change of flood potential for fluvial and surface water sources to off-site receptors. It is considered there would be a **no change** impact, which would result in a **neutral effect** (not significant).

Summary of Operational Effects on the Water Environment for the Solar PV Site

9.9.112 Table 9-23 provides a summary of the potential impacts and effects on the water environment during operation from the Solar PV Site.

Table 9-23: Summary of Significance of Effects from Operational Scheme

Receptor	Importance	Description of Impact	Impact	Effect
Impacts from urban runoff to surface water quality				
Ell Wood and Fenwick Grange Drain	Medium	Impact on surface water quality from the discharge into the Ell Wood and Fenwick Grange Drain	No change	Neutral (not significant)
Potential Pollution impacts on water resources from fire-fighting water at the BESS Area				
Ell Wood and Fenwick Grange Drain	Medium	Impact on surface water quality from fire-fighting water	No change	Neutral (not significant)
Potential Impacts on Hydrology				
River Went	Very High	Impact on change in surface water runoff, or change in hydrology of the watercourses in the area	No change	Neutral (not significant)
Fenwick Common Drain, north and south tributary to Fleet Drain, and Ell Wood and Fenwick Grange Drain	Medium	As above	No change	Neutral (not significant)
Hydromorphology impacts from access				
Fenwick Common Drain/north and south tributary to Fleet Drain, Ell Wood and Fenwick Grange Drain	Low morphology	Potential for hydromorphological impact to watercourses from access track crossings.	Low adverse	Negligible (not significant)

Receptor	Importance	Description of Impact	Impact	Effect
Fleet Drain	Low morphology	De-culverting of a section of Fleet Drain east of Fenwick Hall.	Medium beneficial	Minor beneficial effect (not significant)
Fenwick Common Drain/unnamed watercourse	Low morphology	Potential for hydromorphological impact to watercourses from access track crossings	Low adverse	Negligible effect (not significant)
Ell Wood and Fenwick Grange Drain	Low morphology	Operation of discharge outfalls.	Low adverse	Negligible effect (not significant)
Groundwater water quality impacts				
Sherwood Sandstone (Principal Aquifer)	High	Potential impact on groundwater quality.	No change	Neutral effect (not significant)
Breighton Sand and Alluvium (Secondary A Aquifers)	Medium		Very low adverse	Negligible effect (not significant)
PWS abstraction (used for agricultural purposes)	High		No change	Neutral effect (not significant)
Groundwater – flow and level impacts				
Sherwood Sandstone (Principal Aquifer)	High	Groundwater level and flow.	No change	Neutral effect (not significant)
Breighton Sand and Alluvium (Secondary A Aquifers)	Medium		Very low adverse	Negligible effect (not significant)
PWS abstraction (used for agricultural purposes)	High		No change	Neutral effect (not significant)

Receptor	Importance	Description of Impact	Impact	Effect
Groundwater pollution risk from firefighting at the BESS Area				
Breighton Sand and Alluvium (Secondary A Aquifers)	Medium		Very low adverse	Negligible effect (not significant)
Flood Risk				
Essential Infrastructure	Very high	Changes in flood risk to fluvial and surface water sources.	No change	Neutral effect (not significant)
Residential Housing	High	Changes in flood risk to fluvial and surface water sources.	No change	Neutral effect (not significant)

Decommissioning

9.9.113 Potential impacts from the decommissioning of the Solar PV Site are similar in nature to those during construction, as some ground works would be required to remove infrastructure installed. A separate assessment of decommissioning effects is therefore not provided. A **Framework Decommissioning Environmental Management Plan (DEMP) [EN010152/APP/7.9]** is included with the DCO Application. This sets out the general principles to be followed in the decommissioning phase of the Scheme. A detailed Decommissioning Environmental Management Plan (DEMP) will be prepared prior to decommissioning to identify required measures to prevent pollution and flooding during this phase of the development. This must be prepared in substantial accordance with the **Framework DEMP [EN010152/APP/7.9]** per Requirement 18, Schedule 2 of the **Draft DCO [EN010152/APP/3.1]**.

9.9.114 The mode of cable decommissioning for the Grid Connection and On-Site Cables will be dependent upon government policy and good practice at that time. Currently, the most environmentally acceptable option is considered to be leaving the cables in situ, as this avoids disturbance to overlying land and habitats and to neighbouring communities. Alternatively, the cables can be removed by opening up the ground at regular intervals and pulling the cable through to the extraction point, avoiding the need to open up the entire length of the cable route.

9.9.115 The pits will be sensitively located so as not to impact watercourses. Given that all cables will be a minimum of 1.5m below the bed of watercourses, this is not anticipated to prevent natural geomorphic evolution or potential future restoration of affected areas. As a result, it is considered the decommissioning impacts and effects would be no greater than those of the construction phase and **no additional impacts are anticipated.**

9.10 Additional Mitigation and Enhancements

Additional Mitigation: Monitoring

9.10.1 The WMP will set out details of water quality monitoring to be undertaken during construction. Due to the low level of risk posed by the construction works, this monitoring will consist of visual and olfactory observations plus in-situ testing using hand-held water quality meters only.

9.10.2 It is important that during the operation of the Scheme there is regular inspection and maintenance of the drainage systems, proposed SuDS and watercourse crossings. This will be carried out in accordance with good practice guidance. The drainage system will be designed in accordance with current guidance to ensure that the potential for siltation and blockages is minimised under normal operation. If there is any evidence of excessive erosion or sedimentation associated with new structures further actions will be considered to remedy that impact in as sustainable a way as possible. This requirement is included within the **Framework OEMP [EN010152/APP/7.8]**.

Additional Mitigation: Soft Green Ditch Connection

9.10.3 Soft green ditch connections between swales and outfalls to watercourses will be implemented, where practicable. This will be secured within the detailed drainage strategy (which will be produced post consent). This requirement is included within the **Framework CEMP [EN010152/APP/7.8]**.

Enhancements

9.10.4 This chapter has considered the possible impacts of the Scheme on the water environment in the area. No enhancements over and above that already set out in this chapter are proposed with regard to Water Resources.

9.10.5 It is however noted that the Scheme will provide enhancements to the margins of the River Went and Fleet Drain where large offsets are being provided for Ecology Mitigation areas. This will include vegetation which is suitable for damp areas. More details are provided within the **Framework Landscape and Ecological Management Plan (LEMP) [EN010152/APP/7.14]**. These enhancements have not been specifically assessed separately for water resources, to avoid "double counting" their benefits with those that are being provided for ecological reasons.

9.11 Residual Effects and Conclusions

9.11.1 There are no likely significant effects on surface water, groundwater or flood risk resulting from the construction, and operation and maintenance of this Scheme. Effects for decommissioning are considered to be the same as those identified for construction. As no likely significant effects have been identified, taking into account the embedded and additional mitigation measures, therefore there are no relevant residual effects to highlight that differ from the significance assessments outlined in Section 9.9 (Table 9-19, Table 9-21 and Table 9-23).

9.11.2 Effects for decommissioning are considered to be the same as those identified for construction.

9.12 Cumulative Effects

9.12.1 This section assesses the potential effects of the Scheme in combination with the potential effects of other proposed and committed plans and projects including other developments (referred to as 'cumulative developments') within the surrounding area.

9.12.2 The short list cumulative developments to be considered in combination with the Scheme has been prepared and shared with City of Doncaster Council, North Yorkshire Council and East Riding of Yorkshire Council; these cumulative developments are listed in **ES Volume I Chapter 15: Cumulative Effects and Interactions [EN010152/APP/6.1]** and presented in **ES Volume II Figure 15-3: Location of Short List Schemes [EN010152/APP/6.2]**. The assessment has been made with reference to the methodology and guidance set out in **ES Volume I Chapter 5: Environmental Impact Assessment Methodology [EN010152/APP/6.1]**.

9.12.3 This cumulative effect assessment identified, for each receptor, the areas where the predicted effects of the Scheme could interact with effects arising from other plans and/or projects on the same receptor based on a spatial and/or temporal basis.

Construction and Decommissioning

9.12.4 There is potential for overlap between construction of the Scheme and impacts from adjacent cumulative developments. Thus, there is the potential for short term, temporary construction related pollutants generated from both the Scheme and adjacent developments to impact on watercourses in the Study Area.

9.12.5 From the short list of cumulative developments, there are three which are scoped out of further assessment, due to the cumulative developments being located within a different surface water catchment area, and therefore there being no surface water pathway for cumulative effects. For groundwater, the three scoped out on the basis of surface water catchment area, are also scoped out for groundwater as these are located at such a distance that it is considered there would be no cumulative impacts through groundwater interaction. These developments are 19/03034/FULM (Carbon Action Limited excavation of sand), 20/01774/TIPA (BH Energy Gap (Doncaster) Ltd construction of an energy recovery facility) and 21/02567/FULM (Enso Green Holdings Limited installation of solar farm).

9.12.6 Potential construction phase cumulative effects for the remaining six developments, as well as mitigation proposed and the overall significance of effects assessed are summarised in Table 9-24 below. Similar cumulative effects would be anticipated during decommissioning.

Table 9-24: Cumulative Effects Assessment for Water Environment

Scheme ID Application Reference	Scheme Name	Distance from the Order limits	Summary of Cumulative Effect
23/00537/FULM	Reclamation through construction and operation of Energy Hub including BESS.	0 km	This cumulative development would be located in the Thorpe-in-Balne area, with works within the area of the EA Beck from Skell to River Don catchment, and the Bramwith Drain from source to River Don waterbody catchments. Much of the boundary for this development lies to the west of the Order limits, but the works share an access road, and there is a small area of overlap. Therefore, there is the potential for cumulative potential pollution to local watercourses and/or groundwater from construction site runoff containing pollutants and fine sediment; chemical

Scheme ID Application Reference	Scheme Name	Distance from the Order limits	Summary of Cumulative Effect
			spillages; increased flood risk during construction. However, within the application document there is an Outline Construction Environmental Management Plan, and a Surface Water Management Plan. This includes measures to control runoff, concrete washout, drainage and water treatment, and use of SuDS during operation. As such, with this in place, it is considered there would be **no change from the residual effects assessed for the Scheme (not significant).**
23/01241/FULM	Installation of underground cable	0 km	This linear application area starts within the area of the Order limits, within the Thorpe Marsh area. It then extends east and south out of the 1 km Study Area. Therefore, there is the potential for cumulative potential pollution to local watercourses and/or groundwater from construction site runoff containing pollutants and fine sediment; chemical spillages; increased flood risk during construction. However, within the application decision notice this states that '*no development shall commence until a Construction Method Statement has been submitted and approved in writing*'. This is to ensure there are methods to control potential water pollution and other emissions from the Solar PV Site during construction. It is considered that with this in place, it is considered there would be **no change from the residual effects assessed for the Scheme (not significant).**

Scheme ID Application Reference	Scheme Name	Distance from the Order limits	Summary of Cumulative Effect
4 and 5 220/01537/LBC and 22/01536/FUL	Demolition of Lily Hall, and erection of one dwelling	0.2 km	The potential for cumulative potential pollution to local watercourses and/or groundwater from construction site runoff containing pollutants and fine sediment; chemical spillages; increased flood risk during construction. Assuming the Lily Hall demolition development would follow all legislative and regulatory requirements, and therefore appropriately mitigate these effects, it is considered there would be **no change from the residual effects assessed for the Scheme (not significant).**
6 23/01746/FULM	Installation of 180 MW BESS	0.5 km west of the Scheme, upstream within EA Beck from Skell to River Don catchment	This is located 545m west of the Order limits, but within the same surface watercourse catchment so it has been considered as potential for cumulative effects. The potential for cumulative potential pollution to local watercourses and/or groundwater from construction site runoff containing pollutants and fine sediment; chemical spillages; increased flood risk during construction. Assuming the BESS development would follow all legislative and regulatory requirements, and therefore appropriately mitigate these effects, it is considered there would be **no change from the residual effects assessed for the Scheme (not significant).**
11 23/01082/SCRE	Novus Renewable Services Limited screening opinion for	1.7 km to the west, north of Arksey upstream, and within EA Beck from	This is located 1.7 km west of the Order limits, but within the same surface watercourse catchment so it has been considered as potential for cumulative effects.

Scheme ID Application Reference	Scheme Name	Distance from the Order limits	Summary of Cumulative Effect
	61.7 ha solar farm.	Skell to River Don catchment.	The potential for cumulative potential pollution to local watercourses and/or groundwater from construction site runoff containing pollutants and fine sediment; chemical spillages; increased flood risk during construction. Assuming the Novus Renewables development would follow all legislative and regulatory requirements, and therefore appropriately mitigate effects, it is considered there would be **no change from the residual effects of this Scheme (not significant).**
36 22/02088/FULM	Installation of 2.5 MW solar array.	3.9 km west, near Carcroft village, upstream, and within EA Beck from Skell to River Don catchment.	This is located 3.9 km west of the Order limits, but within the same surface watercourse catchment so it has been considered as potential for cumulative effects. The potential for cumulative potential pollution to local watercourses and/or groundwater from construction site runoff containing pollutants and fine sediment; chemical spillages; increased flood risk during construction. Assuming the solar array development would follow all legislative and regulatory requirements, and therefore appropriately mitigate effects, it is considered there would be **no change from the residual risk of the Scheme (not significant).**
37 08/01077/OUTA	Residential development	2.9 km to the west, south of Askern, upstream and within	This is located 2.9 km west of the Order limits, but within the same surface watercourse catchment so it has been

Scheme ID Application Reference	Scheme Name	Distance from the Order limits	Summary of Cumulative Effect
		Bramwith Drain from Source to River Don Water Body catchment.	considered as potential for cumulative effects. The potential for cumulative potential pollution to local watercourses and/or groundwater from construction site runoff containing pollutants and fine sediment; chemical spillages; increased flood risk during construction. Assuming the residential development would follow all legislative and regulatory requirements, and therefore appropriately mitigate effects, it is considered there would be **no change from the residual effects of the Scheme (not significant).**

9.12.7 A **Framework CEMP [EN010152/APP/7.7]** for the Scheme accompanies the DCO Application. This details the measures that would be undertaken during construction to mitigate the temporary effects on the water environment. Provided that standard and good practice mitigation is implemented on the construction sites through their respective CEMPs, which would be considered to follow similar good practice measures, and as per the conditions of the relevant planning permissions, environmental permits and licences which are assumed to be required, as is being proposed for this Scheme, the cumulative effects risk can be effectively managed and there would not be a significant increase in the risks to any relevant waterbodies. As such, there are expected to be **no significant cumulative effects** during construction on the basis of the above assessment.

9.12.8 Potential impacts from the decommissioning of the Scheme are considered to be similar in nature to those impacts and effects during construction. These impacts would be controlled by a DEMP. A **Framework DEMP [EN010152/APP/7.9]** has been produced and accompanies the DCO application.

Operation and Maintenance

9.12.9 Drainage strategies for all cumulative developments would be produced with reference to the relevant policies and guidance documents outlined in Section 9.3. It is assumed that flood risk assessments and appropriate drainage strategies are to be developed in line with good practice.

9.12.10 The Scheme assessed in this chapter will similarly be designed to ensure no long-term deterioration in water quality or increase in flooding. Attenuation and treatment will be provided for runoff from the Scheme prior to discharge to waterbodies or ground. As such, provided that all the mitigation measures are implemented for all cumulative developments, then the cumulative impacts from the Scheme and any cumulative developments would not be anticipated to produce any significant effects. Therefore, the potential for operation and maintenance cumulative effects are scoped out of further assessment.

9.13 References

Ref. 9-1 His Majesty's Stationery Office (HMSO) (2021) Environment Act. Available at: https://www.legislation.gov.uk/ukpga/2021/30/contents/enacted [Accessed 25 September 2024].

Ref. 9-2 HMSO (2014) Water Act 2014. Available at: https://www.legislation.gov.uk/ukpga/2014/21/contents [Accessed 25 September 2024].

Ref. 9-3 HMSO (2010) Flood and Water Management Act 2010. Available at: https://www.legislation.gov.uk/ukpga/2010/29/contents [Accessed 25 September 2024].

Ref. 9-4 HMSO (1990) Environmental Protection Act 1990. Available at: https://www.legislation.gov.uk/ukpga/1990/43/contents [Accessed 25 September 2024].

Ref. 9-5 HMSO (1991) Land Drainage Act 1991. Available at: https://www.legislation.gov.uk/ukpga/1991/59/section/37 [Accessed 25 September 2024].

Ref. 9-6 HMSO (1991) Water Resources Act 1991. Available at: https://www.legislation.gov.uk/ukpga/1991/57/contents [Accessed 25 September 2024].

Ref. 9-7 HMSO (1975) Salmon and Freshwater Fisheries Act 1975. Available at: https://www.legislation.gov.uk/ukpga/1975/51/2010-01-12 [Accessed 25 September 2024].

Ref. 9-8 HMSO (2017) The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. Available at: https://www.legislation.gov.uk/uksi/2017/407/2019-10-31 [Accessed 25 September 2024].

Ref. 9-9 HMSO (2017) The Environmental Damage (Prevention and Remediation) (England) (Amendment) Regulations 2017. Available at: https://www.legislation.gov.uk/uksi/2017/1177/contents/made [Accessed 25 September 2024].

Ref. 9-10 HMSO (2016) The Environmental Permitting (England and Wales) Regulations 2016 Available at: https://www.legislation.gov.uk/uksi/2016/1154/regulation/12/2018-04-18 [Accessed 25 September 2024].

Ref. 9-11 HM Government (2023) Environmental Improvement Plan 2023. Available at: https://assets.publishing.service.gov.uk/media/64a6d9c1c531eb000c64fffa/environmental-improvement-plan-2023.pdf [Accessed 25 September 2024].

Ref. 9-12 HMSO (2009) Eels (England and Wales) Regulation 2009. Available at: https://www.legislation.gov.uk/uksi/2009/3344/contents [Accessed 25 September 2024].

Ref. 9-13 HMSO (2001) Control of Pollution (Oil Storage) (England) Regulations 2001. Available at: https://www.legislation.gov.uk/uksi/2001/2954/contents [Accessed 25 September 2024].

Ref. 9-14 HMSO (2009) The Water Resources Act (Amendment) (England and Wales) Regulations 2009. Available at: https://www.legislation.gov.uk/uksi/2009/3104/contents [Accessed 25 September 2024].

Ref. 9-15 HMSO (2004) The Control of Substances Hazardous to Health (Amendment) Regulations 2004. Available at: https://www.legislation.gov.uk/uksi/2004/3386/contents [Accessed 25 September 2024].

Ref. 9-16 HMSO (1999) The Anti-Pollution Works Regulations 1999. Available at: https://www.legislation.gov.uk/uksi/1999/1006/introduction/made [Accessed 25 September 2024].

Ref. 9-17 HMSO (2015) The Water Framework Directive (Standards and Classification) Directions 2015. Available at: https://www.legislation.gov.uk/uksi/2003/3242/pdfs/uksiod_20033242_en_002.pdf [Accessed 25 September 2024].

Ref. 9-18 Ministry of Housing, Communities and Local Government (2010) The Building Regulations 2010 Approved Document Part H: Drainage and Waste Disposal. Available at: https://www.gov.uk/government/publications/drainage-and-waste-disposal-approved-document-h [Accessed 25 September 2024].

Ref. 9-19 Department for Energy Security and Net Zero (DESNZ) (November 2023). Overarching National Policy Statement for Energy (EN-1). Available at: https://assets.publishing.service.gov.uk/media/65a7864e96a5ec0013731a93/overarching-nps-for-energy-en1.pdf [Accessed 25 September 2024].

Ref. 9-20 DESNZ (November 2023) National Policy Statement for Renewable Energy (EN-3). Available at: https://assets.publishing.service.gov.uk/media/65a7889996a5ec000d731aba/nps-renewable-energy-infrastructure-en3.pdf [Accessed 25 September 2024].

Ref. 9-21 DESNZ (November 2023). National Policy Statement for Electricity Networks (EN-5). Available at: https://assets.publishing.service.gov.uk/media/65a78a5496a5ec000d731abb/nps-electricity-networks-infrastructure-en5.pdf [Accessed 25 September 2024].

Ref. 9-22 Department for Levelling up, Housing and Communities (December 2023) National Planning Policy Framework. Available at: https://www.gov.uk/government/publications/national-planning-policy-framework--2 [Accessed 25 September 2024].

Ref. 9-23 HM Government (2018, updated in 2021) A Green Future: Our 25 Year Plan to Improve the Environment. Available at: https://assets.publishing.service.gov.uk/media/5ab3a67840f0b65bb584297e/25-year-environment-plan.pdf [Accessed 25 September 2024].

Ref. 9-24 Department for Environment, Food and Rural Affairs (2011) Future Water: The UK Government Water Strategy. Available at: https://assets.publishing.service.gov.uk/media/5a78a61c40f0b632476990fe/pb13562-future-water-080204.pdf [Accessed 25 September 2024].

Ref. 9-25 Gov.uk (2022) National Planning Practice Guidance: Flood Risk and Coastal Change. Available at: https://www.gov.uk/guidance/flood-risk-and-coastal-change [Accessed 25 September 2024].

Ref. 9-26 Gov.uk (2023) National Planning Practice Guidance: Renewable and Low Carbon Energy. Available at: https://www.gov.uk/guidance/renewable-and-low-carbon-energy [Accessed 25 September 2024].

Ref. 9-27 Environment Agency (2018) The Environment Agency's approach to groundwater protection Version 1.2. Available at: https://assets.publishing.service.gov.uk/media/5ab38864e5274a3dc898e29b/Envirnment-Agency-approach-to-groundwater-protection.pdf [Accessed 25 September 2024].

Ref. 9-28 Gov.uk (2022) Humber River Basin District River Management Plan: updated 2022. Available at: https://www.gov.uk/guidance/humber-river-basin-district-river-management-plan-updated-2022 [Accessed 25 September 2024].

Ref. 9-29 City of Doncaster Council (adopted September 2021) Doncaster Local Plan 2015-2035. Available at: https://dmbcwebstolive01.blob.core.windows.net/media/Default/Planning/Documents/Local%20Plan/Submission/Doncaster%20Local%20Plan%20Adopted%2023%20Sept%202021.pdf [Accessed 25 September 2024].

Ref. 9-30 South Yorkshire Alliance (2023) Connected by Water Action Plan January 2023. Available at: https://connectedbywater.co.uk/files/action-plan.pdf [Accessed 25 September 2024].

Ref. 9-31 Yorkshire and Humber Councils (2021) Yorkshire and Humber Business Plan 2020/2021. Available at: https://www.yhcouncils.org.uk/wp-content/uploads/2021/07/Exec-Summary-YH-business-plan.pdf [Accessed 25 September 2024].

Ref. 9-32 Gov.uk (2010) Don Catchment Flood Management Plan. Available at: https://assets.publishing.service.gov.uk/media/5a7ce231ed915d36e95f03f2/River_Don_Catchment_Flood_Management_Plan.pdf [Accessed 25 September 2024].

Ref. 9-33 BA Consulting (2015) 2015s2340 Doncaster MBC Level 1 Strategic Flood Risk Assessment. Final Report. November 2015. Available at: JBA Consulting (windows.net) [Accessed 25 September 2024].

Ref. 9-34 Construction Industry Research Information Association (CIRIA) (2016) Report C753 The SuDS Manual 2nd Edition.

Ref. 9-35 Ordnance Survey maps (2023). Available at: https://www.bing.com/maps?cp=51.506606%7E.126343&lvl=11.0&style=s. [Accessed 25 September 2024].

Ref. 9-36 Aerial Photographic maps (2023). Available at: https://www.bing.com/maps?cp=52.165266%7E-0.393514&lvl=12.4&style=h. [Accessed 25 September 2024].

Ref. 9-37 Met Office (2023), Robin Hood Doncaster Sheffield Airport. Available at: https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages/gcx21p9fr [Accessed 25 September 2024]

Ref. 9-38 National River Flow Archive (2023), Went at Walden Stubbs. Available at: https://nrfa.ceh.ac.uk/data/station/meanflow/27064 [Accessed 25 September 2024]

Ref. 9-39 Environment Agency (2023) Catchment Data Explorer website. Available at: https://environment.data.gov.uk/catchment-planning/ [Accessed 25 September 2024]

Ref. 9-40 Environment Agency (2023) Water Quality Archive website. Available at https://environment.data.gov.uk/water-quality/view/landing [Accessed 25 September 2024]

Ref. 9-41 Environment Agency (2023) Fish and Ecology Data Viewer. Available at: https://environment.data.gov.uk/ecology/explorer/ [Accessed 25 September 2024]

Ref. 9-42 Defra (2023) Multi-Agency geographical information for the countryside (MAGIC) map. Available at: https://magic.defra.gov.uk/MagicMap.aspx [Accessed 25 September 2024]

Ref. 9-43 British Geological Survey (2023); Geoindex viewer, Available at: https://mapapps2.bgs.ac.uk/geoindex/home.html [Accessed 25 September 2024]

Ref. 9-44 Cranfield Soils and Agrifood Institute (2023) Soilscapes Viewer. Available at: https://www.landis.org.uk/soilscapes/ [Accessed 25 September 2024]

Ref. 9-45 Natural England (2023) Designated Sites website. Available at https://designatedsites.naturalengland.org.uk/SiteSearch.aspx [Accessed 25 September 2024]

Ref. 9-46 Gov.uk (2023) Flood risk mapping. Available at: https://check-long-term-flood-risk.service.gov.uk/map?easting=441119&northing=329552&map=RiversOrSea [Accessed 25 September 2024]

Ref. 9-47 Environment Agency (2016) Advice Note - Water Framework Directive Risk Assessment: How to assess the risk of your activity. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/522426/LIT_10445.pdf [Accessed25 September 2024]

Ref. 9-48 The Planning Inspectorate (2024) Nationally Significant Infrastructure Projects: Advice on the Water Framework Directive. https://www.gov.uk/guidance/nationally-significant-infrastructure-projects-advice-on-the-water-framework-directive#:~:text=Guidance-,Nationally%20Significant%20Infrastructure%20Projects%3A%20Advice%20on%20the%20Water%20Framework%20Directive,Infrastructure%20Project%20(NSIP)%20applications [Accessed 25 September 2024]

Ref. 9-49 National Highways (2020) Design Manual for Roads and Bridges (DMRB) LA113 Road Drainage and the Water Environment. Available at: https://www.standardsforhighways.co.uk/tses/attachments/d6388f5f-2694-4986-ac46-b17b62c21727?inline=true [25 September 2024]

Ref. 9-50 National Highways (2020) DMRB LA 104 - Environmental Assessment and Monitoring. Available at:

https://www.standardsforhighways.co.uk/search/0f6e0b6a-d08e-4673-8691-cab564d4a60a [Accessed 25 September 2024]

Ref. 9-51 The Coal Authority (2023) Interactive Map Viewer. Available at: https://mapapps2.bgs.ac.uk/coalauthority/home.html [Accessed 25 September 2024]

Ref. 9-52 Environment Agency (2023), Hydrology Data Explorer. Available at: https://environment.data.gov.uk/hydrology/explore [Accessed 25 September 2024]

Ref. 9-53 British Geological Survey (2023); Hydrogeological map of Southern Yorkshire and adjoining areas. Available at: https://largeimages.bgs.ac.uk/iip/hydromaps.html?id=southern-yorkshire.jp2 [Accessed 25 September 2024]

Ref. 9-54 Environment Agency (2023) Regulatory Position Statement (RPS), updated 6th January 2023, Guidance: 'Temporary dewatering from excavations to surface water: RPS 261'. Available at: https://www.gov.uk/government/publications/temporary-dewatering-from-excavations-to-surface-water [Accessed 25 September 2024]

Ref. 9-55 HMSO (1991) Water Industry Act, Available at: https://www.legislation.gov.uk/ukpga/1991/56/contents [Accessed 25 September 2024]

Ref. 9-56 Environment Agency (2023) Long Term Flood Risk Map. Available at: https://www.gov.uk/check-long-term-flood-risk [Accessed 25 September 2024]

Ref. 9-57 Environment Agency (2023) Flood Risk Map for Planning. Available at: https://flood-map-for-planning.service.gov.uk/ [Accessed 25 September 2024]

Ref. 9-58 National Library of Scotland (2023) Historic mapping. Available at: https://maps.nls.uk/ [Accessed 25 September 2024]

Ref. 9-59 NetRegs (2022) Environmental Guidance for Pollution Prevention [Online]. Available at: https://www.netregs.org.uk/media/1898/guidance-for-pollution-prevention-1-2022-update.pdf [Accessed 25 September 2024]

Ref. 9-60 Environment Agency (2011) Pollution Prevention Guidance. Safe storage – the safe operation of refuelling facilities: PPG7. Available at: https://www.netregs.org.uk/media/1673/ppg-7.pdf [Accessed 25 September 2024]

Ref. 9-61 Environment Agency. Pollution Prevention Guidance (1991). Managing Fire Water and Major Spillages: PPG18. Available at: https://www.netregs.org.uk/media/1674/ppg-18.pdf [Accessed 25 September 2024]

Ref. 9-62 British Standards Institute (2009) BS6031:2009 Code of Practice for Earth Works. Available at: https://knowledge.bsigroup.com/products/code-of-practice-for-earthworks?version=standard [Accessed 25 September 2024]

Ref. 9-63 British Standards Institute (2013) BS8582 Code of Practice for Surface Water Management of Development Sites. Available at: https://knowledge.bsigroup.com/products/code-of-practice-for-surface-water-management-for-development-sites?version=standard&tab=preview [Accessed 25 September 2024]

Ref. 9-64 CIRIA C811 (2023) Environmental good practice on site guide (fifth edition). Available at: https://www.ciria.org/ItemDetail?iProductCode=C811&Category=BOOK&WebsiteKey=17be687b-0441-4487-b752-43d52261e129 [Accessed 25 September 2024]

Ref. 9-65 CIRIA C648 (2006) Control of water pollution from linear construction projects, technical guidance. Available at: https://www.ciria.org/CIRIA/CIRIA/Item_Detail.aspx?iProductCode=C649&Category=BOOK [Accessed 25 September 2024]

Ref. 9-66 CIRIA C609 (2004) Sustainable Drainage Systems, hydraulic, structural and water quality advice. Available at: https://www.ciria.org/CIRIA/CIRIA/Item_Detail.aspx?iProductCode=C609B [Accessed 25 September 2024]

Ref. 9-67 CIRIA C532 (2001) Control of water pollution from construction sites – Guidance for consultants and contractors. Available at: https://www.ciria.org/CIRIA/CIRIA/Item_Detail.aspx?iProductCode=C532&Category=BOOK [Accessed 25 September 2024]

Ref. 9-68 CIRIA C736F (2014) Containment systems for prevention of pollution. Available at: https://www.ciria.org/ItemDetail?iProductCode=C736F&Category=FREEPUBS [Accessed 25 September 2024]

Ref. 9-69 Gov.uk (2022) Flood Risk Activities: environmental permits. Available at: Flood risk activities: environmental permits - GOV.UK (www.gov.uk) [Accessed 25 September 2024]

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