ENVIRONMENTAL STATEMENT – VOLUME 1 – CHAPTER 12 WATER ENVIRONMENT

Drax Bioenergy with Carbon Capture and Storage

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12.1. INTRODUCTION

12.1.1. This chapter reports the outcome of the assessment of likely significant environmental effects arising from the Proposed Scheme on the Water Environment, including flood risk, water quality, groundwater, Water Framework Directive compliance and water quantity / drainage.

12.1.2. Impacts during the construction, operation and decommissioning phases of the Proposed Scheme are assessed. A full description of the Proposed Scheme is described in **Chapter 2 (Site and Project Description)** of this ES (document reference 6.1.2).

12.1.3. This chapter (and its associated figures (**Volume 2**) and appendices (**Volume 3**)) is intended to be read as part of the wider ES with particular reference to **Chapter 8 (Ecology)** (document reference 6.1.8)**, Chapter 11 (Ground Conditions)** (document reference 6.1.11)**, Chapter 14 (Climate Change Resilience)** (document reference 6.1.14) **and Chapter 18 (Cumulative Effects)** (document reference 6.1.18) and the following technical documents:

- **a.** **Flood Risk Assessment** (Appendix 12.1 of Volume 3) (document reference 6.3.12.1);
- **b.** **Water Framework Directive Screening and Scoping Assessment** (Appendix 12.2 of Volume 3) (document reference 6.3.12.2);
- **c.** **Surface Water Drainage Strategy** (Appendix 12.3 of Volume 3) (document reference 6.3.12.3);
- **d.** Water Environment effects that have been determined to be not significant (Appendix 12.4) (document reference 6.3.12.4); and
- **e.** **Geotechnical Desk Study, Report No A7101-17** (Appendix 12.5) (document reference 6.3.12.5).

12.1.4. This chapter:

- **a.** Summarises the legislative and policy framework;
- **b.** Describes consultation undertaken to date;
- **c.** Describes the methodology followed for the assessment;
- **d.** Identifies the potential impacts as a result of the Proposed Scheme;
- **e.** Details the design, mitigation and enhancement measures that have been identified;
- **f.** Reports the assessment of the significant effects of the Proposed Scheme; and
- **g.** Details the monitoring that should be carried out for the Proposed Scheme.

12.1.5. The Proposed Scheme has the potential to affect the Water Environment as a result of:

a. During construction / decommissioning:

i. Water quality of surface water and groundwater resources; and

ii. Flood risk to the Proposed Scheme, construction workers and properties and people elsewhere.

b. During operation:

i. Water quality of surface water resources; and

ii. Flood risk to the Proposed Scheme, properties and people elsewhere.

OPTIONALITY

12.1.6. For the purposes of this assessment the options, as described in **Chapter 2 (Site and Project Description)**, **para 2.2.44** affect the assessment of both the construction and operational phase because the proposed location of the Carbon Dioxide Delivery Terminal Compound is located in close proximity to Carr Dyke and in addition it is located in the area shown to be at risk of flooding during the 1 in 200 year event. The following has therefore been assessed:

a. Location of the new Carbon Dioxide Delivery Terminal Compound within the Order Limits as it provides the worst-case scenario in relation to the Water Environment.

12.2. LEGISLATIVE AND POLICY FRAMEWORK

LEGISLATIVE FRAMEWORK

12.2.1. A list of the current legislation, planning policy and guidance relevant to the assessment of impacts of the Proposed Scheme on the Water Environment is set out below.

LEGISLATION

12.2.2. The applicable legislative framework is summarised as follows:

National

Flood and Water Management Act 2010

12.2.3. The Flood and Water Management Act created the role of the Lead Local Flood Authority (LLFA) to take responsibility for leading the co-ordination of local flood risk management in their areas. In accordance with the Flood and Water Management Act, the Environment Agency (EA) is responsible for the management of risks associated with Main Rivers, the sea and reservoirs. LLFAs are responsible for the management of risks associated with local sources of flooding such as ordinary watercourses, surface water and groundwater. The Act is also guiding the role of the LLFA in the review and approval of surface water management systems, leading to LLFAs reviewing and commenting on significant development in regard to the Non-Statutory Technical Standards for Sustainable Drainage Systems (Department for

Environment, Food & Rural Affairs (b), 2015) (explained further in **Section 12.5 'Guidance'**).

Environmental Permitting (England and Wales) Regulations 2018

12.2.4. Under the Environmental Permitting Regulations, it is an offence to cause or knowingly permit a water discharge activity, including the discharge of polluting materials to freshwater, coastal waters, relevant territorial waters or groundwater, unless complying with an exemption or an environmental permit (obtained from the EA). The EA sets conditions which may control volumes and concentrations of particular substances or impose broader controls on the nature of the effluent, taking into account any relevant water quality standards from EC Directives. The Environment Permitting Regulations also manage works that have the potential to affect a watercourse under the jurisdiction of the EA. Any works in, under or near a Main River require permission from the EA to ensure no detrimental impacts on the watercourse. The River Ouse is the closest Main River to the Proposed Scheme and is located approximately 30 m to the north of the Order Limits. During consultation, the Environment Agency confirmed that an environmental permit is not needed for works in the defended areas of Flood Zone 3, unless these works are located within 16 m of flood defences. The Environment Agency also advised that environmental permit will be required for works located in undefended areas of Flood Zone 3. Furthermore, an environmental permit will be required in undefended areas of Flood Zone 3 for tree planting but only in the area within 16 m of flood defences, and / or if tree planting is associated with ground raising.

Land Drainage Act 1991

12.2.5. Local Authorities and Internal Drainage Boards (IDBs) have additional duties and powers associated with the management of flood risk under the Land Drainage Act. Consent must be given for any permanent or temporary works that could affect the flow within an ordinary watercourse under their jurisdiction in order to ensure that local flood risk is not increased. The Land Drainage Act also sets out the maintenance responsibilities riparian owners have in order to reduce local flood risks. Carr Dyke, which runs through the Drax Power Station Site, is an ordinary watercourse. No works within watercourses are proposed as part of the Proposed Scheme.

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

12.2.6. The Water Environment (Water Framework Directive) (England and Wales) Regulations (2017) aims to prevent deterioration of the water environment and improve water quality by managing water in natural river basin districts and through the protection of groundwater against pollution.

12.2.7. The regulations impose duties on the Secretary of State, Welsh Ministers, the Environment Agency and Natural Resources Wales (NRW) to ensure compliance with the EU directive 2000/60/EC in particular when deciding whether to grant, vary or revoke certain permits and licences which affect water quality.

12.2.8. Part 2 of the regulations requires the identification of river basin districts, and a number of other assessments to be carried out by the EA and NRW to characterise and classify the status of water bodies in those districts and assess the economic aspects of water use. River basin management plans must also be established for each river basin district.

12.2.9. Part 3 of the regulations makes provision for certain protected areas, includes requires the identification of bodies of water from which drinking water is abstracted, and specific measures are specified that must be included in a programme of measures to protect the quality of the water.

12.2.10. These Regulations have been considered by the Applicant in the **WFD Screening Report** (Appendix 12.2 of Volume 3) (document reference 6.3.12.2).

The Water Resource Act 1991

12.2.11. The Water Resource Act aims to regulate water resources, water quality and pollution and flood defence within the UK to minimise pollution of water.

12.2.12. Part II of the Act deals with management of water resources. This includes the licences required to abstract and impound controlled water. These licences are regulated by the Environment Agency in England and Wales. Part III of the Act deals with control of water pollution, including the discharge consent system and water pollution offences, regulated by the Environment Agency. Part IV deals with flood defence and Part VII deals with anti-pollution works and works notices. A works notice can be served on anyone that causes or knowingly permits a pollutant to enter controlled waters.

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

12.2.13. The Control of Pollution (Oil Storage) (England) Regulations (2001) were set out to enhance existing water pollution control measures in England. They should ensure that, in the future, contamination of controlled waters by oil is prevented or minimised. The Regulations require the person with custody or control of oil to carry out works, take precautions or other such action to minimise the risk of oil-related water pollution. The pollution prevention measures during construction works and during operational phase are discussed in **Section 12.10**.

The Environmental Damage (Prevention and Remediation) (England) Regulations 2015

12.2.14. The Environmental Damage (Prevention and Remediation) (England) Regulations 2015 apply in England and in specified marine waters and the seabed. They specify the types of damage to a protected species or natural habitat, a site of special scientific interest, water or land which constitute “environmental damage” for the purposes of the Regulations and the types of activity causing environmental damage to which the Regulations apply. There are certain exemptions and exclusions from the application of the Regulations.

12.2.15. The Regulations also specify the authorities whose function it is to enforce the Regulations. Environmental damage to groundwater means any damage to a body of groundwater such that its conductivity, level or concentration of pollutants changes

sufficiently to lower its status for the purposes of Directive 2000/60/EC and in relation to pollutants, for the purposes of Directive 2006/118/EC of the European Parliament and of the Council on the protection of groundwater against pollution and deterioration, whether or not the body of groundwater is in fact reclassified as being of lower status.

Integrated Pollution Prevention and Control Directive (2008/1/EC)

12.2.1. The Integrated Pollution Prevention and Control Directive (2008/1/EC) applies an integrated environmental approach to the regulation of certain industrial activities. This means that emissions to air, water (including discharges to sewer) and land, plus a range of other environmental effects, must be considered together. It also means that regulators must set permit conditions so as to achieve a high level of protection for the environment as a whole. Drax Power Ltd currently holds number of environmental permits, including discharge permits, which provide information on the monitoring regime and limits of certain substances which are allowed to be contained in the discharge to the environment. The nature of the discharge from Drax Power Station is not envisaged to change and it is expected to be within the current permit limits.

Local

Selby Area Internal Drainage Board Bye-Laws

12.2.2. Selby Area Internal Drainage Board bye-laws provide a summary of the requirements related to any works planned to be undertaken within or in close proximity to the ordinary watercourses located in the area under the jurisdiction of the IDB. The bye-laws also provides information on the requirements related to drainage discharge rates to the watercourses under the jurisdiction of the IDB. The requirements are summarised below:

a. Any works that may impact the IDB's watercourses and any discharge into these watercourses require appropriate consent from the IDB. The consent should be obtained prior to the works commencing;

b. No temporary or permanent structure should be constructed within 7 m of the edge of the watercourse without previous consent from the Board.

12.2.3. The **DCO** provides that these byelaws will be disapplied in the case of the Proposed Scheme, with the IDB to be a consultee on the detail of the drainage strategy pursuant to a Requirement.

POLICY FRAMEWORK

12.2.4. The applicable policy framework is summarised as follows:

Overarching National Planning Policy Statement for Energy (EN-1) (Department of Energy and Climate Change, 2011)

12.2.5. The Overarching National Policy Statement for Energy (NPS EN-1) (Department of Energy and Climate Change (a), 2011) recognises that infrastructure can have adverse effects on the water environment. It states that the effects could lead to adverse impacts on health or on protected species and habitats and could result in

surface waters, groundwaters or protected areas failing to meet environmental objectives established under the WFD.

12.2.6. It states that where projects are likely to have effects on the water environment, applicants should undertake an assessment of the existing status of, and impacts of, the proposed project on water quality, water resources and physical characteristics of the water environment as part of the Environmental Statement (ES). The ES should particularly describe existing quality of watercourses, existing water resources, existing physical characteristics of the water environment and impacts on protected waterbodies and areas.

12.2.7. Section 5.7 (Flood risk) of NPS EN-1 details that project of 1 hectare or greater in Flood Zone 1 in England and all proposals for energy projects located in Flood Zones 2 and 3 in England should be accompanied by a Flood Risk Assessment (FRA).

12.2.8. In determining an application for development consent, the Secretary of State (SoS) should be satisfied that where relevant (paragraph 5.7.9 and 5.7.10 of NPS EN-1):

- **a.** The application is supported by an appropriate FRA; the sequential test has been applied as part of site selection;
- **b.** A sequential approach has been applied at the site level to minimise risk by directing the most vulnerable uses to areas of lowest flood risk;
- **c.** The proposal is in line with any relevant national and local flood risk management strategy;
- **d.** Priority has been given to the use of sustainable drainage systems (SuDS);
- **e.** In flood risk areas the project is appropriately flood resilient and resistant, including safe access and escape routes where required and that any residual risk can be safely managed over the lifetime of the development.

12.2.9. These matters are set out in the **Flood Risk Assessment** (**Appendix 12.1** of Volume 3) (document reference 6.3.12.1) and the **Surface Water Drainage Strategy** (**Appendix 12.3** of Volume 3) (document reference 6.3.12.3).

12.2.10. Section 5.15 (Water quality and resources) of NPS EN-1 details that where the project is likely to have effects on the water environment, the applicant should undertake an assessment of the existing status of, and impacts of, the proposed project on water quality, water resources and physical characteristics of the water environment as part of the ES or equivalent. The ES should in particular describe:

- **a.** The existing quality of waters affected by the proposed project and the impacts of the proposed project on water quality, noting any relevant existing discharges, proposed new discharges and proposed changes to discharges;
- **b.** Existing water resources affected by the proposed project and the impacts of the proposed project on water resources, noting any relevant existing abstraction rates, proposed new abstraction rates and proposed changes to abstraction rates (including any impact on or use of mains supplies and reference to Catchment Abstraction Management Strategies);

c. Existing physical characteristics of the water environment (including quantity and dynamics of flow) affected by the proposed project and any impact of physical modifications to these characteristics; and

d. Any impacts of the proposed project on water bodies or protected areas under the Water Framework Directive (WFD) and source protection zones (SPZs) around potable groundwater abstractions.

12.2.11. The above are discussed in **Section 12.7 'Baseline Conditions'** and the potential impacts are assessed in **Sections 12.9** and **12.11** of this chapter, and in the **WFD Screening Report (Appendix 12.2)**.

Draft Overarching National Planning Policy Statement for Energy (EN-1) (consultation ended November 2021) (Department for Business, Energy & Industrial Strategy, 2021)

12.2.12. The draft NPS EN-1 (Department for Business, Energy & Industrial Strategy, 2021) sets out the national policy for energy infrastructure. It states that a site-specific flood risk assessment should be provided for all energy projects in Flood Zones 2 and 3 in England (i.e., this site).

12.2.13. The Draft NPS EN-1 also states that the impact on local water resources can be minimised through planning and design for the efficient use of water, including water recycling. The **Surface Water Drainage Strategy** (**Appendix 12.3** of Volume 3) (document reference 6.3.12.3) has been produced in accordance with these requirements.

12.2.14. In addition, where the project is likely to have effects on the water environment, the applicant should undertake an assessment of the existing status of, and impacts of the proposed project on, water quality, water resources and physical characteristics of the water environment as part of the ES. These matters are discussed in **Sections 12.7** to **12.11** of this chapter.

National Planning Policy Framework (Ministry of Housing, Communities & Local Government , 2021)

12.2.15. The NPPF (Ministry of Housing, Communities & Local Government , 2021) sets out the Government's planning policies for England and provides a framework which allows Local Authorities to produce their own plans that better reflect the specific needs of their communities. Planning Practice Guidance (PPG) has been published alongside the NPPF, and is regularly updated, to provide guidance on the implementation of the planning policies, including those relating to flood risk, set out in the NPPF. The NPPF also sets out the requirements for a site-specific FRA to be undertaken and states that development should not increase flood risk elsewhere.

12.2.16. A site-specific FRA is required for all sites located in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving sites of 1 ha or more, land which has been identified by the EA as having critical drainage problems, land identified in a SFRA as being at increased flood risk in the future, or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use. The **Flood Risk Assessment** (**Appendix 12.1** of Volume 3)

(document reference 6.3.12.1) has been produced in accordance with these requirements.

12.2.17. The NPPF provides detailed requirements related to climate change and sustainable drainage from a flood risk and planning perspective. The NPPF states that plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating from rising temperatures.

Local

Selby District Core Strategy Plan (Selby District Council, 2013)

12.2.18. The following policies relate to drainage and flood risk:

a. Policy SP15 (Sustainable Development and Climate Change) sets out to promote sustainable development, and determine scheme layouts which are resilient to climate change:

i. Section A Part D: Ensure that development in areas of flood risk is avoided wherever possible through the application of the sequential test and exception test; and ensure that where development must be located within areas of flood risk that it can be made safe without increasing flood risk elsewhere;

ii. Section A Part E: Support sustainable flood management measures such as water storage areas and schemes promoted through local surface water management plans to provide protection from flooding; and biodiversity and amenity improvements;

iii. Section B Part C: Incorporate water-efficient design and sustainable drainage systems which promote groundwater recharge.

12.2.19. Policy SP15 is considered in **Sections 12.7** and **12.10** of this chapter and the **FRA** (**Appendix 12.1** of Volume 3) (document reference 6.3.12.1).

a. Policy SP18 (Protecting and Enhancing the Environment) sets out to protect the District's environment, in particular by:

i. Section 7. Ensuring that new development protects soil, air and water quality from all types of pollution;

ii. Section 8. Ensuring developments minimise energy and water consumption, the use of non-renewable resources, and the amount of waste material;

iii. Section 9. Steering development to areas of least environmental and agricultural quality.

12.2.20. The requirements of Policy SP18 are discussed in **Section 12.10** of this chapter.

12.2.21. The Local Plan identifies a number of primary issues which should be considered. Two of these issues are relevant to the Proposed Scheme in relation to the water environment:

a. Protection of groundwater: The District is underlain by the Sherwood Sandstone and the Magnesian Limestone aquifers, both of which provide a significant groundwater supply. Where there are no superficial deposits over the aquifers, groundwater contamination is a serious concern so consideration must be given to the prevention of pollution and the protection of water quality within the groundwater. Water conservation measures are promoted across the District to adapt to the future pressures of climate change.

b. Flood Risk management: Significant flood risks exist across large areas of Selby District; most developments therefore require the application of the Sequential Test.

12.2.22. The promotion of SuDS across the District encourages infiltration and groundwater discharge.

Selby District Council Level 1 Strategic Flood Risk Assessment (SFRA) (AECOM (a), 2020)

12.2.23. The purpose of Selby District Council Level 1 Strategic Flood Risk Assessment (SFRA) (AECOM (a), 2020) was to collate and analyse the most up to date readily available flood risk information for all sources of flooding and provide an overview of the flood risk issues across the Selby District.

12.2.24. The SFRA highlights that the River Ouse is a designated Main River under the jurisdiction of the Environment Agency and that the River Ouse is tidally influenced with its tidal limit located at Naburn Weir (NGR 459200, 444500).

12.2.25. The SFRA also identifies that the area of Drax Power Station is protected by the flood defences located along the River Ouse and which stretch from the Upper Humber Estuary, northwest to Wistow.

12.2.26. The SFRA states that the SDC and developers should seek flood risk management opportunities to reduce the causes and impacts of flooding (e.g., through the use of SuDS and site-specific Flood Risk Assessments). Such measures are set out in the **Flood Risk Assessment** (Appendix 12.1 of Volume 3) (document reference 6.3.12.1) and **Surface Water Drainage Strategy** (Appendix 12.3 of Volume 3) (document reference 6.3.12.3)**.**

Selby District Council Level 2 SFRA (AECOM (b), 2021)

12.2.27. The Selby District Council Level 2 SFRA (AECOM (b), 2021) provides evidence to support Exception Tests. The purpose of the Level 2 SFRA is to ensure that new developments which need to be located in areas at risk of flooding, are supported by a detailed assessment which supports the application of the Exception Test for the identified development sites. The Level 2 SFRA does not provide any additional information for the Proposed Scheme as it is not identified by SDC as the site requiring the application of the Exception Test.

Sustainability Appraisal Strategic Flood Risk Assessment (North Yorkshire Council, City of York Council and the North York Moors National Park Authority, 2016)

12.2.28. North Yorkshire Strategic Flood Risk Assessment (North Yorkshire Council, City of York Council and the North York Moors National Park Authority, 2016) attempts to bring together the results of existing local SFRAs with the work that has already been undertaken in North Yorkshire to create the SFRA which is compliant with the NPPF in relation to Waste or Mineral sites. It presents the Sequential Test Results for the submitted sites, however as Drax Power Station is not a Waste or Mineral Site there is no further evidence to support the Proposed Scheme.

12.2.29. An assessment of the relevant policies is detailed further in the **Planning Statement** (document reference 5.2).

12.3. CONSULTATION

12.3.1. **Table 12.1** provides a summary of the consultation undertaken in support of the preparation of this assessment.

Table 12.1 - Consultation Summary Table

Date and Method of Consultation	Consultee	Summary of Key Topics discussed and Key Outcomes
30 June 2021 (email)	Environment Agency	The key points raised by the Environment Agency were: ~ The 2018 Upper Humber hydraulic model should be used along with the latest FRA climate change allowances; ~ The above model should be supplemented with outputs from the 2021 Humber Extreme Water Levels (HEWL) model; ~ A site-specific model scope can be agreed with the Environment Agency prior to commencement of the assessment; ~ Any changes in ground levels in the floodplain will need to be assessed to demonstrate that the flood risk to others is not exacerbated; ~ Floodplain compensatory storage for temporary construction compounds in Flood Zone 3 is not normally required; and ~ Floodplain compensation is not normally required for tree planting.
13 August 2021 (email)		It was agreed with the EA that existing environmental information from other projects, specifically Drax Re-Power Project, could be used to inform the EIA subject to a clear demonstration that this data is appropriate.
17 August 2021 (email)		~ Should the Proposed Scheme result in changes to the volume of abstracted water and / or the nature of the water discharged then the Applicant may need to apply for a variation to relevant abstraction licenses and discharge consents; ~ An Environmental Permit may be required for certain activities during the construction phase; ~ The Environment Agency recommend the implementation of a Construction Environmental Management Plan (CEMP) or similar to detail actions to minimise the risk of pollution; and ~ The Environment Agency agree with the approach of completing a WFD screening report in the first instance, this may lead to a full WFD impact assessment and identification of any mitigation required to achieve WFD compliance.
27 September 2021 (Conference call)		The modelling will confirm whether the location of the Proposed Scheme is tidally or fluvially dominated, or joint probability. The breach location used for the 2018 Drax Repower project remains suitable to assess the residual risk.
06 October 2021 (email)		The proposed study areas are agreeable subject to consideration of the potential impacts on nearby public water abstractions. As the Proposed Scheme is within Source Protection Zone (SPZ) 3 of a number of abstractions surrounding Carlton.
6 October 2021 (Conference call)		The Environment Agency agreed with the WFD screening and Scoping conclusion which involved all activities being screened out, other than the environmental improvement works which will be reassessed once the Proposed Scheme design fix has occurred.
21 October 2021 (Conference call)		The Applicant will provide a short hydraulic modelling methodology for the Environment Agency to approve. This will include details on: ~ The approach to updating the hydrology with that from the Humber Extreme Water Level model; ~ The approach to breach modelling; and ~ The climate change allowances / sea level rise to be adopted.
10 November 2021 (email)		The Environment Agency's breach modelling guidance was received by the Applicant.
11 November 2021 (post)		Humber Extreme Water Level model was received by the Applicant.
06 December 2021 (Conference call)		The Environment Agency agreed with the Applicant's proposed approach for the completion of the **FRA** (refer to **Appendix 12.1** for further detail).
10 December 2021 (email)		The Environment Agency provided their calculation of the tidal uplift and confirmed that the scenarios to be modelled are acceptable and advised that one additional scenario should also be assessed. Further details are provided in the **FRA** in **Appendix 12.1**
10 December 2021 (letter)		S42 response to Statutory Consultation on Preliminary Environmental Impact Report (PEIR) (WSP, 2021) received.

Date and Method of Consultation	Consultee	Summary of Key Topics discussed and Key Outcomes
10 February 2022 (conference call)		The change in design life of the Proposed Scheme was accepted by the Environment Agency.
10 February 2022 (conference call)		The Environment Agency agreed that a full WFD assessment is not required to support the DCO Application and that they expect the WFD screening report to be sufficient. The Applicant asked if the Environment Agency were able to identify any potential off site opportunities, if required, to help deliver the river habitat requirements for biodiversity net gain. The Environment Agency provided details for representatives of the Yorkshire Dales Rivers Trust and the Yorkshire Wildlife trust for the Applicant to contact to discuss further.
19 July 2021 (email)	Selby Area Internal Drainage Board (IDB)	Selby IDB advised that whilst the proposed surface water runoff is not envisaged to change from existing, the permitted discharge from the Site is 1.4 litres per second per hectare or no greater than existing runoff. This is due to the design of the IDB pumping station ("Lendall Pumping Station") since 1944.
04 February 2022 (email)		In response to Statutory Consultation on the PEIR (WSP, 2021), the IDB confirmed that their response provided in August 2021 is still valid.
1 March 2022 (teleconference)	Paul Jones (consulting engineer) Selby Area Internal Drainage Board	Meeting to discuss the BNG targets and how works on nearby IDB watercourses could contribute to achieving the target. Selby Area IDB provided information about its maintenance and operation works on Carr Dyke. Selby Area IDB set out its flood risk responsibilities and how these would limit potential improvements to the bed and banks of the Carr Dyke downstream of Drax Power Station Site. Therefore, on-site opportunities on the Carr Dyke are not suitable for meeting BNG targets currently. Opportunities for de-culverting of other IDB managed watercourses upstream of Drax Power Station were discussed and will be explored further. These options are under consideration along with potential off-site opportunities suggested by the Environment Agency. A feasibility assessment is ongoing to understand if appropriate measures on IDB watercourses could be suitably implemented whilst enabling IDB maintenance and operation works to continue.
15 June 2021 (email)	North Yorkshire County Council (NYCC) - Lead Local Flood Authority (LLFA)	LLFA confirmed that they do not hold any records of groundwater or surface water flooding within the Order Limits.
26 July 2021 (email)		The LLFA advised that as a minimum there must be no increase in runoff rates from the Site and this must be evidenced with supporting documentation and calculations. This and other matters related to surface water runoff and discharge rates are discussed in more details in the **Surface Water Drainage Strategy** (**Appendix 12.3** of Volume 3) (document reference 6.3.12.3).
10 September 2021		The LLFA requested further information on the proposed surface water drainage strategy to aid their interpretation of the Proposed Scheme.
18 September 2021 (email)		The LLFA confirmed that the proposed study area is acceptable.
20 September 2021 (email)		The LLFA advised that further evidence is required to demonstrate how additional surface water will be managed as a result of any additional impermeable area.
17 December 2021 (conference call)		The LLFA advised that further evidence is required to demonstrate how additional surface water will be managed including, exceedance flows, rational method flow calculations and how the proposed flows correlate to the existing operation and permits.
17 February 2022 (email)		Additional information on the existing and proposed surface water drainage systems was sent to the LLFA.
08 March 2022 (email)		The LLFA confirmed that the submitted documents demonstrate a reasonable approach to the management of surface water and are in line with what has been discussed and as such the LLFA confirmed its agreement in principle to the proposed surface water drainage strategy. In addition, the LLFA advised on further information which would be needed to allow the LLFA to accept the proposed surface water drainage strategy during DCO examination. The additional information requested by the LLFA is provided in the **Surface Water Drainage Strategy** (Appendix 12.3 of Volume 3) (document reference 6.3.12.3).

Date and Method of Consultation	Consultee	Summary of Key Topics discussed and Key Outcomes
27 May 2021 (email)	Selby District Council (SDC)	SDC stated that a FRA in accordance with the NPPF will need to be submitted, with the Sequential Test and an Exception Test (where necessary), however, the search area for the Sequential Test can be narrowed down to the area of Drax Power Station if functional (or other) reasons can be put forward to justify this.
7 June 2021 (email)		SDC provided baseline information on the Site, including in reference to Private Water Supplies (England) Regulations 2016. SDC confirmed that they have no recorded private water supplies within 1 km (and up to 5 km) of the Proposed Scheme.
23 September 2021 (email)		The proposed study area is accepted by SDC.
10 June 2021 (email)	Canal & River Trust	Canal & River Trust advised the following: Water discharge to the River Ouse: ~ If there are to be alterations to the existing discharges, the Trust should be consulted to determine whether the changes could affect navigation (i.e., siltation / bank stability / hazards / flows) on the Ouse; and ~ If infiltration is proposed within the north of the Habitat Provision Area or within the Jetty Area then the long stability of the river banks / navigational impacts should be considered.
19 November 2021 (letter)		S42 response was received on the PEIR (WSP, 2021). It is included in the **Consultation Report** (document reference 5.1). Canal and River Trust advised that depending on the nature of works proposed in the Habitat Provision Area, there is potential risk to the water quality of the local watercourses and the River Ouse caused by the mobilisation of soils or water. Potential impacts to the water environment caused by work proposed in Habitat Provision Area and Off-site Habitat Provisions Area have been scoped out of the assessment – justification is provided in Table 12.2 - Elements Scoped Out of the Assessment.
21 June 2021 (email)	Yorkshire Water (YW)	Yorkshire Water requested that their assets within the Order Limits are clearly identified on the drawings supporting the FRA / Environmental Statement with any diversion and / or protection measures identified to ensure that the public water supply and sewerage networks are not adversely impacted.
10 December 2021 (email)	Natural England	S42 response was received on the PEIR (WSP, 2021). It is included in the **Consultation Report**. Natural England requested further information on how potential contaminants will be removed from surface water runoff and excavation dewatering during construction phase. These are set out in Section 12.10 of this chapter.
6 December 2021 (letter)	UK Health Security Agency	S42 response was received on the PEIR. It is included in the **Consultation Report**. UK Health Security Agency requested further clarification on justification for the classification criteria and how the significance of the risk was derived.

12.3.2. An **EIA Scoping Opinion** (document reference 6.3.1.2) was received by the Applicant from the Planning Inspectorate (PINS) on behalf of the SoS on 26 February 2021, including formal responses from Statutory Consultees. The responses from PINS in relation to Water Environment and how these requirements are addressed by the Applicant are set out in **Appendix 4.2 Scoping Opinion Responses** (document reference 6.3.4.2).

12.4. SCOPE OF THE ASSESSMENT

12.4.1. The scope of this assessment has been established through a robust scoping process. Further information can be found in **Chapter 4 (EIA Methodology)** (document reference 6.1.4)**.**

12.4.2. This section provides an update to the scope of the assessment presented in the PEIR (WSP, 2021) and the evidence base for scoping out elements following further iterative assessment.

ELEMENTS SCOPED OUT OF THE ASSESSMENT

12.4.3. The elements shown in **Table 12.2** are not considered to give rise to likely significant effects as a result of the Proposed Scheme and have therefore not been considered within this assessment.

Table 12.2 - Elements Scoped Out of the Assessment

Element scoped out	Justification
Impacts to WFD status and potential of nearby water bodies	A WFD screening exercise (**Appendix 12.2**) has concluded that a full WFD assessment is not required as significant impacts to WFD water bodies are not anticipated.
River Derwent SSSI / SAC	The Planning Inspectorate in the **Scoping Opinion (Appendix 4.2)** agreed that this element could be scoped out. The River Derwent SSSI / SAC is located upstream of the 'purge' outfall which discharges the vast majority of water from Drax Power Station Site. Furthermore, no change to the nature of the discharge is expected as it will be in compliance with the limits of the existing discharge permit. Chapter 12 Water Environment does not assess potential effects on mobile species outside the boundaries of designated sites as this assessment is presented in **Chapter 8 Ecology** of Volume 1 of the ES (document reference 6.1.8) and in the **Habitats Regulations Assessment Report (HRA)** (document reference 6.8.1).
Habitat Provision Area and Off-Site Habitat Provision Area (including associated watercourses)	Works proposed in Habitat Provision Area and Off-Site Habitat Provision Area are limited to biodiversity improvements to planting. No increase in impermeable areas or runoff volumes / rates are expected. No works within watercourses and / or within 7 m of their banks are proposed. No increase of the existing ground levels associated with the proposed planting is expected. The works proposed in these areas would therefore not have impacts on the water environment.
Minor vegetation and street furniture management on the surrounding road network	Minor vegetation and street furniture management on the surrounding road network is required to facilitate the movement of large components or plant on to site and around site to allow for the transport of abnormal indivisible loads. No increase in impermeable areas or runoff volumes / rates are expected. No works to or in the vicinity of watercourses are proposed. The works proposed in these areas would therefore not have impacts on the water environment.
Chemical and physical alteration of the Sherwood Sandstone Principal Aquifer and Secondary A aquifers during operational phase	No identifiable risks to these elements during operational phase due to the Surface Water Drainage Strategy proposing no infiltration to groundwater and no change to the groundwater abstraction licences. The works proposed in these areas would therefore not have impacts on the water environment.
Impacts to groundwater abstractions for non-potable use during operational phase	
Impacts to public water supply abstractions	
Yorkshire Water - Assets	**Figure 12.2 (Water Constraints Part 3)** shows that the Yorkshire Water assets are located within the Order Limits but outside of the construction works areas and thus no impacts are anticipated.
Yorkshire Water – Potable Water Supply	The potable water demands will be within the headroom of the existing supply capacity with Yorkshire Water, given the additional on-site workers (1,500) during an outage maintenance period. The Proposed Scheme would therefore not have impacts on the water environment.
Foul Water Treatment	No discharge to Yorkshire Water sewers during construction and / or operational phases is proposed. Foul water is to be treated at the on-site waste water treatment works which has sufficient headroom for the additional on-site workers during construction in a similar manner as it does for the planned shut down periods when a similar work force is on site. The Proposed Scheme would therefore not have impacts on the water environment.
Changes to Water Abstraction	No significant changes to the volume of abstracted water are envisaged, there will be a minor reduction in abstractions immediately following heavy rainfall. The abstracted water required for construction and operation will be within the existing consent limits. No works are proposed in the vicinity of the River Ouse and / or near the existing flood defences.
Changes to the nature of water discharge from Drax Power Station	No changes to the nature (water quality) of the water discharge from Drax Power Station is envisaged as the Proposed Scheme has been designed to ensure compliance with the limits of the existing environmental permit. .
Humber Estuary Ramsar / SSSI / SAC /SPA	Potential deterioration of water quality and habitats within the boundary of the Humber Estuary designated Ramsar Site, SSSI, SAC and SPA are scoped out due to the significant dilution that would occur over the approximate 7 km distance from the Proposed Scheme. . The assessment of potential effects on mobile species outside the boundaries of designated sites is presented in **Chapter 8 Ecology** of Volume 1 of the ES (document reference 6.1.8) and in the **HRA** (document reference 6.8.1).
The following Selby Area IDB drains surrounding Drax Power Station: **Drax Abbey Drain, Sand Lane Drain, Hooks Field Drain, Long Drax Drain, Back Lane Drain, drains with reference**	Classified as ordinary watercourses under the jurisdiction of the Selby Area IDB. The drains are not connected hydraulically with the Proposed Scheme. They are also located a minimum of 700 m to the north of the Proposed Scheme. Considering this information, the Proposed Scheme is unlikely to have an impact on these water features.

Element scoped out	Justification
20/9,19/3, UN114, 18/1, 18/2, 18, 18/7, 18/9, 18/10, UN109, UN110, 13/14, UN13/16	
Selby Area IDB drains with reference UN135, UN134, UN136 located to the south of Drax Power Station	Classified as ordinary watercourses under the jurisdiction of the Selby Area IDB. These drains are located approximately 180 m to the south of the proposed improvements works to the A645. The proposed improvement works consist of removal of barriers, street furniture, overhead lines and trimming / pruning of the vegetation. No widening of the existing road is proposed. Considering this information, the Proposed Scheme is unlikely to impact these drains.
Field drains, private drains and drainage ditches surrounding Drax Power Station	These drains are not connected hydraulically with the areas of the proposed works and are located greater than 500 m from the Proposed Scheme. Considering this information, the Proposed Scheme is unlikely to have an impact on these water features.
Drains within the boundary of Drax Power Station (reference SW20, SW21, SW22, SW38 on the Water Constraints map)	The drains are part of the existing drainage system serving Drax Power Station. They are located greater than 500 m from the Proposed Scheme. These drains are also not hydraulically connected to the Proposed Scheme. **Chapter 8 (Ecology)** does not identify the presence of any protected species nor that the ditches are likely to be used by the local wildlife. Considering the distance between the drains and the Proposed Scheme, the latter is unlikely to have an impact on these features.
Pond (reference SW19 on the Water Constraints map)	Pond of unknown water quality. It is located approximately 600 m to the south of the East Construction Laydown Area, and approximately 800 m to the south - east of the Proposed Scheme. Considering the distance between these areas, the pond is unlikely to be affected by the Proposed Scheme.
Drains in the area of the Northern Cooling Towers in Drax Power Station (reference SW37 on the Water Constraints map)	Cooling water system serving the northern cooling towers, these have no environmental value and thus are scoped out for further assessment.
Groundwater Dependent Terrestrial Ecosystems (GWDTEs)	None identified located close enough to the Proposed Scheme to be impacted by it.
The effects arising from the settling of dispersed emissions from the Main Stack	Considering the combination dispersion of the emmissions over large distance resulting in very small concentrations, and dilution factor within watercourses, it is not anticipated that there would be specific water quality impacts due to the settling of dispersed emissions from the Main Stack. The potential impacts on ecology and air quality in relation to this are discussed in the relevant chapters (**Chapter 8 (Ecology)** and **Chapter 6 (Air Quality)** (document reference 6.1.6) of the ES respectively)

Elements Scoped into the Assessment

Construction and Decommissioning Phase

12.4.4. The effects on the water environment during the decommissioning stage would be similar to those identified during the construction phase. Although the flood risk to decommissioning workers could be greater as a result of climate change, the mitigation measures would be broadly similar and would be included in a Decommissioning Environmental Management Plan (DEMP) that would be approved by the LPA prior to commencing decommissioning.

12.4.5. The following elements are considered to have the potential to give rise to likely significant effects during construction and decommissioning of the Proposed Scheme and have therefore been considered within this assessment:

a. Increased sedimentation caused by surface water runoff from areas of land clearance, excavation, dewatering of excavations, stockpiles, wheel washings and movement of materials to and from the Site;

b. Increased pollution risks from spillage of fuels and other harmful substances that may migrate to local surface water features;

c. Increased flood risk to construction workers, residential properties, people and agricultural land associated with temporary works within areas of fluvial and tidal flood storage;

d. Chemical and physical alteration of the Sherwood Sandstone Principal Aquifer and Secondary A Aquifers;

e. Water quality impact to non-potable boreholes; and

f. Water quality or recharge alteration of Yorkshire Water abstraction boreholes protected by SPZ 3.

Operational Phase

12.4.6. The following elements are considered to have the potential to give rise to likely significant effects during operation of the Proposed Scheme and have therefore been considered within this assessment:

a. Increased flood risk to residential properties and agricultural land and associated users caused by potential loss or change of fluvial / tidal floodplain storage associated with the presence of the Proposed Scheme;

b. Increased flood risk to the Drax Power Station, including the Proposed Scheme and employees, associated with the potential of a breach or overtopping of defences along the River Ouse;

c. Increased risk of flooding to the Site and third-party land as a result of changes to the surface water drainage regime; and

d. Changes to water quality in the Carr Dyke and River Ouse as a result of the Proposed Scheme.

12.5. ASSESSMENT METHODOLOGY

ASSESSMENT OF SIGNIFICANCE

12.5.1. The assessment of significance has been undertaken in general accordance with the principles as set out within Design Manual for Roads and Bridges (DMRB) LA 113 - Road Drainage and the Water Environment Rev 1 (Highways England (b), 2020) and DMRB LA104 - Environmental Assessment and Monitoring (Highways England (a), 2020).

12.5.2. Although the DMRB is not directly applicable to the nature of the Proposed Scheme, as it was developed to provide guidance for assessing potential effects that road projects may have on the water environment, it provides a general framework which can be used to provide a consistent assessment of the effects of development proposals on the water environment and contains the following approach:

a. Estimation of the importance of the attribute;

b. Estimation of the magnitude of the impact; and

c. Assessment of the significance of the effect.

Receptor Importance

12.5.3. This stage considers how sensitive a receptor is to changes in surface water or groundwater conditions, including flow and water quality. The indicators used to establish the importance of a water feature include quality, scale, rarity and substitutability where:

a. Quality is a measure of the physical condition of the attribute;

b. Scale requires consideration of the geographical scale at which the attribute matters to both policy makers and stakeholders, at all levels;

c. Rarity requires consideration of whether the water feature is commonplace or scarce and the scale at which it matters; and

d. Substitutability requires consideration of whether water attributes are replaceable over a given time frame.

12.5.4. The adopted approach is detailed in **Table 12.3**, which is adapted from Table 3.70 of DMRB LA113 (Highways England (b), 2020).

Table 12.3 - Estimating the Importance of Water Environment Attributes

Importance	Criteria	Example
Very high	Nationally significant attribute of high importance	Watercourse having a Water Framework Directive ('WFD') classification shown in a River Basin Management Plan ('RBMP') and $Q_{95} \geq 1.0$ m^3/s. Site protected / designated under EC or UK legislation: Special Area of Conservation ('SAC'), Special Protection Area ('SPA'), Site of Special

Importance	Criteria	Example
		Scientific Interest ('SSSI'), Ramsar Site, salmonid water, species protected by under EC and UK legislation. Principal Aquifer providing a regionally important resource and / or supporting a site protected under EC and UK legislation. Groundwater locally supports Groundwater Dependant Terrestrial Ecosystems ('GWDTE'). Groundwater Source Protection Zone 1 ('SPZ 1'). Essential infrastructure or highly vulnerable development. With reference to the Planning Guidance 'Flood Risk and Costal Change' (Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government , 2021). Floodplain or defence protecting more than 100 residential properties or critical infrastructure from flooding. Water body of high amenity value, including areas of bathing and where water emersion sports are regularly practised.
High	Locally significant attribute of high importance	Watercourse having a WFD classification shown in a RBMP and Q_{95} < 1.0 m^3/s. Species protected under EC or UK legislation. Principal Aquifer providing locally important resource or supporting a river ecosystem. Groundwater supports a GWDTE. Groundwater SPZ 2. More vulnerable development. With reference to the Planning Guidance 'Flood Risk and Costal Change' (Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government , 2021). Floodplain or defence protecting between 1 and 100 residential properties or 10 or more industrial premises from flooding.

Importance	Criteria	Example
		Water body of a moderate amenity value including public parks, boating, non-contact water sports, popular footpaths adjacent to watercourses, or watercourses running through housing development / town centres.
Medium	Attribute of moderate quality and rarity	Watercourses not having a WFD classification shown in a RBMP and $Q_{95} > 0.001$ m^3/s. Aquifer providing water for agricultural or industrial use with limited connection to surface water. Groundwater SPZ 3. Less vulnerable development. With reference to the Planning Guidance 'Flood Risk and Coastal Change' (Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government , 2021). Floodplain or defence protecting 10 or fewer industrial properties from flooding. Water body of particular local social / cultural / educational interest. Water body of low amenity value with only casual access e.g., along a road or bridge in a rural area.
Low	Attribute of lower quality	Watercourses not having a WFD classification shown in a RBMP and $Q_{95} \leq 0.001$ m^3/s. Unproductive strata (non aquifer). Water compatible developments. With reference to the Planning Guidance 'Flood Risk and Costal Change' (Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government , 2021).
Negligible	Attribute of very low quality	Water features within Drax Power Station Site which form part of the drainage system with no other allocation.

Magnitude of Impact

12.5.5. Impacts may be adverse or beneficial, depending on the circumstances. Impacts are evaluated and the degree or magnitude of impact is assessed on a qualitative scale, to facilitate comparison with impacts on other environmental receptors.

12.5.6. The adopted approach is detailed in **Table 12.4** which has been adapted from Table 3.71 of DMRB LA113 (Highways England (b), 2020).

Table 12.4 - Estimating the Magnitude of an Impact

Magnitude	Criteria	Example
Major Adverse	Results in loss of attribute and / or quality and integrity of the attribute	Change to the environmental status / classification of a water feature, including water quality classification. Loss or extensive change to a fishery / designated nature conservation site. Loss of regionally important public water supply. Reduction in surface water body or groundwater WFD classification. Loss of, or extensive change to, an aquifer. Loss of regionally important groundwater supply. Loss of, or extensive change to GWDTE or baseflow contribution to protected surface water bodies. Loss or significant damage to major structures through subsidence or similar effects. Increase in peak flood level (1 in 100 year event) > 100 mm). Loss of flood storage areas. Changes to site resulting in an increase in surface / foul water discharge / runoff of > 75% with flood / sewerage exceedance potential.
Moderate Adverse	Results in effect on integrity of attribute, or loss of part of attribute	Partial loss in productivity of a fishery. Degradation of regionally important public water supply or loss of major commercial / industrial / agricultural supplies. Contribution to reduction in water body WFD classification. Partial loss or change to an aquifer.

Magnitude	Criteria	Example
		Pollution of a receiving water body, but insufficient to change the environmental status / classification, including water quality classification. Changes to site resulting in an increase in surface / foul water discharge / runoff of > 50% with flood / sewerage exceedance potential. Increase in peak flood level (1 in 100 year event) > 50 mm.
Minor Adverse	Results in some measurable change in attributes, quality or vulnerability	Potential low risk of some pollution to a surface water or groundwater body, but insufficient to cause loss in quality, fishery productivity or biodiversity. Changes to site resulting in an increase in surface or foul water discharge / runoff of > 25% with flood / sewerage exceedance potential. Increase in peak flood level (1 in 100-year event) > 10 mm.
Negligible	Results in effect on attribute, but of insufficient magnitude to affect the use or integrity	The Proposed Scheme is unlikely to affect the integrity of the water environment. No measurable impact upon an aquifer. Negligible change in peak flood level (1 in 100-year event) < + / -10 mm.
No Change	Results in no change to the receptor	No predicted adverse or beneficial impact to the receptor.
Minor Beneficial	Results in some beneficial effect on attribute or a reduced risk of negative effect occurring	Potential for slight reduction in pollution to a surface water or groundwater body, but insufficient to cause noticeable benefit in quality, fishery productivity or biodiversity. Reduction of groundwater hazard to existing structures. Reductions in waterlogging and groundwater flooding.

Magnitude	Criteria	Example
		Changes to site resulting in a decrease in surface / foul water discharge / runoff > 25%. Creation of flood storage and decrease in peak flood level (1 in 100-year event) > 10 mm.
Moderate Beneficial	Results in moderate improvement of attribute quality	Moderate improvement to a fishery / designated nature conservation site. Potential increase in the productivity of a fishery. Reduced pollution of a receiving water body, but insufficient to change the environmental status / classification, including water quality classification. Improvement in groundwater Catchment Abstraction Management Strategy (CAMS) (or equivalent) classification. Support to significant improvements in damaged GWDTE. Changes to site resulting in a decrease in surface / foul water discharge / runoff > 50%. Creation of flood storage and decrease in peak flood level (1 in 100-year event) > 50 mm.
Major Beneficial	Results in major improvement of attribute quality	Significant improvement to a fishery / designated nature conservation site. Removal of existing polluting discharge or removing the likelihood of polluting discharges occurring. Change to the environmental status / classification of a water feature, including water quality classification. Changes to site resulting in a surface / foul water decrease in discharge / runoff of > 75%. Creation of flood storage and decrease in peak flood level (1 in 100-year event) > 100 mm.

Significance Criteria

12.5.7. The following terms have been used to define the significance of the effects identified:

a. Major effect: where the Proposed Scheme could be expected to have a very significant effect (either positive or negative) on receptors;

b. Moderate effect: where the Proposed Scheme could be expected to have a noticeable effect (either positive or negative) on receptors;

c. Minor effect: where the Proposed Scheme could be expected to result in a small, barely noticeable effect (either positive or negative) on receptors; and

d. Negligible: where no discernible effect is expected as a result of the Proposed Scheme on receptors.

12.5.8. Potential effects are classified by considering both the importance of the feature and the magnitude of impact, using the matrix shown in **Table 12.5**, which is adapted from Table 3.8.1 of DMRB LA104 (Highways England (a), 2020). The overall significance of the effect is based on the importance of the attribute (**Table 12.3**) and the magnitude of the impact (**Table 12.4**). Noting, that where the significance of the effect is described as between two levels, professional judgement is used to identify the level of significance.

12.5.9. Potential effects associated with the Proposed Scheme, assessed as having a significance classified as moderate and above, are considered to have a likely significant effect on the water environment. Mitigation would therefore be required to reduce the magnitude of the impact. Potential effects assessed as having a negligible or minor impact are considered to not be significant as they are unlikely to have an impact on the water environment.

Table 12.5 - Criteria for Assessing Significance of Effect

		Magnitude of Impact				
		No Change	**Negligible**	**Minor**	**Moderate**	**Major**
Importance of Receptor	**Very High**	Neutral	Slight	Moderate or Large	Large or Very Large	Very Large
	High	Neutral	Slight	Slight or Moderate	Moderate or Large	Large or Very Large
	Medium	Neutral	Neutral or Slight	Slight	Moderate	Moderate or Large
	Low	Neutral	Neutral or Slight	Neutral or Slight	Slight	Slight or Moderate
	Negligible	Neutral	Neutral	Neutral or Slight	Neutral or Slight	Slight

WATER QUALITY AND QUANTITY

12.5.10. A qualitative assessment of potential effects that may arise during construction and decommissioning has been carried out that considers risks to the quality of surface water and groundwater receptors associated with pollutants typically experienced during construction and decommissioning and taking account of the information in **Chapter 2** of this ES.

12.5.11. An assessment of potential impacts of the Proposed Scheme on groundwater quality and quantity has been undertaken with respect to identified groundwater abstractions including licenced activities and private water supplies, and other groundwater dependent receptors.

12.5.12. The assessment of potential effects to the surface water quality that may arise during construction has been undertaken based upon expert judgement supported by the knowledge of the operational systems across the Drax Power Station Site.

12.5.13. The Applicant has undertaken surface water quality monitoring of both the water abstracted and discharged to the River Ouse, this information has been used were relevant to aid the assessment. No further water quality monitoring was undertaken to support this ES, as agreed with Selby Area IDB.

12.5.14. The assessment of the potential effects to the surface water quantity during the construction / decommissioning phase has been undertaken qualitatively.

12.5.15. A qualitative assessment of the impacts on water quality during the operational phase has been undertaken and is detailed in this chapter. The assessment of the potential effects to the surface water quantity during the operational phase has been undertaken quantitatively.

12.5.16. The Site is located within SPZ 3 for a number of sensitive abstractions to the south, the water quality impacts as a result of the Proposed Scheme have been assessed through a high-level qualitative assessment, for the construction and decommissioning phases only. Note, groundwater impacts are scoped out of the operational phase. This is deemed appropriate due to the **Surface Water Drainage Strategy** proposing no infiltration to groundwater and no change to groundwater abstractions during the operational phase and the nature of the aquifers present (in terms of groundwater flow type). Following discussion with Statutory Consultees the sensitive boreholes that are protected by the SPZ 3 have been assessed within this ES Chapter. This is due to the distance from the Site and protection level of an SPZ 3, and it has been determined that quantitative assessment is not required and the impact to the boreholes protected by the SPZ 3 will be considered using high level qualitative assessment.

12.5.17. In relation to sensitive groundwater abstractions for potable public supplies to the south of the Proposed Scheme, a high-level qualitative assessment of the potential impacts has been undertaken in **Section 12.9.25**.

12.5.18. Where mobile species are qualifying features of designated sites, these may sometimes be found outside the boundary of designated sites. For example, sea and river lamprey are migratory fish, that spend much of their adult life cycle in marine

and coastal waters, but migrate up freshwater rivers and streams to breed, with early life stages of the fish remaining in fresh water. River and sea lamprey are qualifying features of the Humber Estuary SAC, Ramsar, and SSSI, but migrate upstream through the River Ouse to reach spawning sites outside the SAC. As such, an impact that leds to significant effects on water quality within the River Ouse but not within the boundary of the Humber Estuary SAC, Ramsar, and SSSI could still lead to effects on lamprey populations, and hence on the Humber Estuary designations. The Water Environment Chapter does not assess potential effects on mobile species outside the boundaries of designated sites. This assessment is instead presented in **Chapter 8 (Ecology)** and in the **Habitats Regulations Assessment Report** (document reference 6.8.1).

FLOOD RISK

12.5.19. A quantitative assessment of impacts of flood risk and surface water drainage have been undertaken and are detailed in **Appendix 12.1** (**Flood Risk Assessment)** and **Appendix 12.3 (Surface Water Drainage Strategy)** of this ES. The FRA assessment has been informed by desk studies using available information, such as data on flood defences, literature review and consultation with the relevant authorities. In addition, the assessment of the fluvial / tidal flood risk was supported by detailed hydraulic modelling. The preparation of the FRA has involved significant consultation with relevant Statutory Authorities including the Environment Agency, NYCC, SDC and Selby Area IDB. The approach to the hydraulic modelling which supports the FRA was agreed with the Environment Agency. The results of the modelling were discussed with the Environment Agency, and they confirmed that the results do not look unexpected and they are broadly in agreement with the results. The hydraulic model will be submitted to the Environment Agency in parallel to the DCO submission with the aim to address any comments prior to hearings.

12.5.20. The FRA has been undertaken with due regard to the Energy NPS's and the NPPF to assess the potential implications of the Proposed Scheme on flood risk to people and property elsewhere, as well as to assess the potential risk of flooding to the Proposed Scheme.

12.5.21. The proposed **Surface Water Drainage Strategy** (**Appendix 12.3**) (document reference 6.3.12.3) was accepted in principle by the LLFA.

WATER FRAMEWORK DIRECTIVE

12.5.22. A qualitative assessment of the impacts on Water Framework Directive compliance during the construction and operational phases has been undertaken and is detailed in A**ppendix 12.2 (Water Framework Directive Screening Report)**. A WFD Screening assessment determined that a full WFD assessment is not required for the Proposed Scheme. The **WFD Screening Report (Appendix 12.2)**, details that the River Ouse from River Wharfe to Upper Humber (GB104027064270) was the only water body screened in for assessment, however all activities of the Proposed Scheme were screened out.

12.5.23. The **WFD Screening Report** has been prepared through consultation with the relevant authority (the Environment Agency), who have agreed within the findings in principle.

METHOD OF BASELINE DATA COLLECTION

Desk Study

12.5.24. A desk study was carried out to inform the water environment baseline and utilised the data sources described in **Section** '**Guidance and Data'** below. A desk study also involved discussions with the Applicant's engineering team to understand on-site conditions and consultations with Statutory bodies as described in the Consultation Table above (**Table 12.1**).

12.5.25. Geological information has been derived from the BGS GeoIndex online geological mapping bedrock geology 1:50,000 and 1:625,000 maps (British Geological Survey (b), n.d.), the Geological Survey of Scotland England and Wales, New Series 1:63,360/1:50,000 geological map series sheet 79 and a Geotechnical Desk Study by SOCOTEC UK Limited (SOCOTEC, 2017) and presented in **Appendix 12.5**; this study gathered information from the BGS and five previous Ground Investigation Reports from 1968 to 2021.

12.5.26. The breach location used in the hydraulic model supporting the FRA for the Proposed Scheme was the same as the breach location used in Drax Re-power project. This approach was agreed with the Environment Agency.

Surveys

12.5.27. Considerable local knowledge of the area of the Proposed Scheme has been developed by the project team, and shared with stakeholders, over previous projects on the Site and therefore only targeted surveys were therefore carried out for this assessment to confirm the underlying knowledge and associated validity.

Guidance and Data

12.5.28. The following guidance documents and data sources have been used during the preparation of this Chapter:

a. Environment Agency Approach to Groundwater Protection (Environment Agency (h), 2018);

b. North Yorkshire County Council SUDS Design Guidance (North Yorkshire County Council (c), 2018 (update));

c. Selby Area Internal Drainage Board Policy Statement on Flood Protection and Water Level Management; (Selby Area Internal Drainage Board (b), 2018);

d. Design Manual for Road and Bridges (DMRB) LA113 Road Drainage and the Water Environment (Highways England (b), 2020);

e. Design Manual for Road and Bridges (DMRB) LA104 Environmental Assessment and Monitoring (Highways England (a), 2020);

f. Guidance for Pollution Prevention (NetRegs, n.d.);

g. CIRIA 515 Groundwater Control (Construction Industry Research and Information Association (CIRIA) (a), 2000); and

h. CIRIA 753 The SuDS Manual (Construction Industry Research and Information Association (CIRIA) (b), 2015);

i. BGS Geological Map Sheet 079 Goole Drift and Solid Geology (British Geological Survey (a), n.d.), accessed online from the BGS website September 2021;

j. BGS Hydrogeology Maps 1:100,000 Hydrogeological Map of Southern Yorkshire and adjoining areas (British Geological Survey (b), n.d.), accessed September 2021;

k. British Geological Survey (BGS) Geology of Britain Viewer (British Geological Survey (a), n.d.). available online, accessed September 2021;

l. Catchment Data Explorer (Environment Agency (g), 2021);

m. Cranfield Soil and Agrifood Institute Soilscapes mapping (Cranfield Soil and Agrifood Institute Soilscapes, n.d.) available online, accessed September 2021;

n. Drax Power Limited Discharge Permit, including water quality monitoring information (Environment Agency (i));

o. National Planning Policy Guidance 'Flood Risk and Coastal Change' (Department of Levelling Up, Housing and Communities, Ministry of Housing, Communities & Local Government, 2022);

p. Drax Power Limited Full License to Abstract Water (Environment Agency (h));

q. Drax Power Station Drainage Plans (Drax Power Station Ltd);

r. Drax Power Station, Selby, Geotechnical Desk Study, Report No A7101-17 (SOCOTEC, 2017);

s. Drax Re-power Flood Risk Assessment (WSP (a), 2018);

t. Drax Re-power Preliminary Environmental Impact Report (WSP (b), 2018);

u. Drax Re-power Environmental Statement (WSP (c), 2018);

v. Flood Map for Planning (Environment Agency (a), n.d.) available online, accessed September 2021;

w. Flood Risk from Reservoirs (Environment Agency (c), n.d.) mapping available online, accessed September 2021;

x. Flood Risk from Surface Water (Environment Agency (b), n.d.) available online, accessed September 2021;

y. GWDTE Map of England (Data.gov.uk, n.d.) accessed online from data.gov website September 2021;

z. Humber River Basin Management Plan (Environment Agency/Department for Environment, Food and Rural Affairs DEFRA, 2016);

aa. Local Flood Risk Strategy (North Yorkshire County Council (b), 2021) downloaded from the Council's website in September 2021;

bb. Natural England's MAGIC online mapping (Department for Environment, Food and Rural Affairs DEFRA, n.d.), accessed September 2021;

cc. Ordnance Survey Mapping;

dd. River Ouse Catchment Flood Management Plan (CFMP) (Environment Agency (d), 2010);

ee. Selby Area Internal Drainage Board mapping (Selby Internal Drainage Board (b), 2021) showing the watercourses under the jurisdiction of the Board;

ff. Selby Level 1 Strategic Flood Risk Assessment (SFRA) (AECOM (a), 2020) October 2020;

gg. Selby Level 2 SFRA (AECOM (b), 2021);

hh. Summary of results for national scale recharge modelling under conditions of predicted climate change (Mansour & Hughes, 2017);

ii. Surface water abstraction licences (Environment Agency (e), 2021);

jj. Surface water discharge permits (Environment Agency (f), 2021);

kk. The physical properties of major aquifers in England and Wales. British Geological Survey Technical Report WD/97/34. Environment Agency R&D Publication 8 (Allen, et al., 1997);

ll. Upper Humber Flood Risk Mapping Study (Environment Agency (b), 2018);

mm. Upper Humber hydraulic model (Environment Agency (a), 2018); and

nn. Yorkshire Water Network Assets map (Yorkshire Water, 2021).

Assessment Assumptions and Limitations

12.5.29. The following assumptions and limitations apply to this chapter:

Assumptions

a. The assessment has relied upon the accuracy and level of detail of the documented data sources utilised as part of the desktop assessment. The approach to establishing the baseline was agreed with the relevant consultees;

b. The existing on-site foul water drainage system has sufficient capacity to manage the additional flows from the contractor village during construction works, in a similar manner as it does for the planned shut-down periods when a similar work force is on site;

c. The existing surface water drainage system is in a good condition as it is owned and maintained to a high standard by the Applicant;

d. The proposed drainage strategy would require minor changes to the existing surface water drainage network, as such in these instances the current design standards would be retained. In locations where more substantial works are required, the design standards will be in accordance with design principles specified in the **Surface Water Drainage Strategy (Appendix 12.3**);

e. The abstraction and discharge volumes and quality as a result of the Proposed Scheme would remain within the existing licence requirements;

f. No new permanent crossings over open watercourses and no new permanent outfalls are required;

g. Foundation piling required for the construction of new buildings would be to a maximum depth of 18 mBGL;

h. During the operational phase of the Proposed Scheme a workforce of 50 full time staff would be required for operation and maintenance activities. This increase can be accommodated within the foul water drainage infrastructure, as when the coal units were commercially operational (pre March 2021) the workforce had an additional 230 people than present;

i. As described in **Chapter 2 (Site and Project Description)**, the Applicant has full planning permission for the demolition of the redundant Flue Gas Desulphurisation (FGD) Plant and associated restoration works at Drax Power Station (2020/0994/FULM). The decommissioning and demolition works of Absorber Units 4, 5 and 6 are scheduled to take place prior to the start of the construction of the Proposed Scheme, whilst the demolition of Absorber Units 1, 2 and 3 are assumed to take place following the completion of the Proposed Scheme. Therefore, this assessment assumes no cumulative effects between the demolition works and construction of the Proposed Scheme. The demolition of Units 1, 2 and 3 are assessed in **Chapter 18 (Cumulative Effects)** (document reference 6.1.18);

j. Following the decommissioning and demolition of Absorber Units 4, 5 and 6 of the FGD as described in the bullet above, the surface water drainage infrastructure remains intact and in a usable condition;

k. The existing process water drainage system will be utilised wherever feasible and supplemented with a new system where required. However, the existing approach for treatment and discharge of process water will be maintained;

l. Decommissioning impacts are anticipated to be no worse than those during the construction phase following the implementation of a Decommissioning Environmental Management Plan for the works;

m. The surface water runoff from the parts of the Site that are not being developed will not impact the Proposed Scheme due to the existing surface water infrastructure which will be maintained;

n. The Proposed Scheme will not lead to additional loadings on the potable water infrastructure, over and above the current capacity / demand (pre-March 2021) when the on-site workforce was an additional 230 people; and

o. The total number of construction workers on-site will not exceed 1,500 (including workers for other on-site schemes).

Limitations

a. Given the on-going water quality sampling undertaken by Drax in accordance with their Environmental Permit conditions no additional sampling has been undertaken (surface and groundwater) to inform this assessment; and

b. The available groundwater level data used to inform the assessment was relatively limited in terms of spread of monitoring locations and duration of monitoring periods / intervals, meaning that the seasonal variability in groundwater rest water levels in the area of the Proposed Scheme has not been fully determined. However, it is considered that given the conservative approach adopted in the assessment, this would have no effect on the findings of the assessment.

12.6. STUDY AREA

12.6.1. The following study areas have been identified for this assessment. These study areas have been established based on professional judgment and experience, and have been agreed with the Environment Agency, NYCC and SDC.

Surface Water

12.6.2. The study area includes surface water features up to 0.5 km from the Proposed Scheme for the assessment of direct effects (i.e., associated with overland migration of pollutants directly to a surface feature, changes in overland flows and flood risk). Features that are further than 0.5 km from the Proposed Scheme but are in hydraulic connectivity with the study area are also included (i.e., surface water abstractions and downstream watercourses). Features located up to approximately 1 km from the Proposed Scheme are included for indirect impacts. Water features in hydraulic connectivity with the Proposed Scheme but located a distance greater than 1 km from the Proposed Scheme are not expected to be impacted by the Proposed Scheme due to the inclusion of pollution prevention measures, including spill kits, in the temporary construction drainage systems. Furthermore, pollutants that potentially are not managed by the on-site construction drainage system, are likely to be sufficiently diluted and / or trapped over the distance prior to reaching key water features. The study area is shown on the **Water Constraints Maps** (**Figures 12.1 to 12.3**).

Groundwater

12.6.3. The groundwater study area encompasses a 1 km area from the Order Limits and the Source Protection Zones for the abstractions surrounding Carlton These are shown on the **Water Constraints Map** (**Figure 12.1**).

WFD

12.6.4. The study area for the WFD screening assessment includes all water bodies within 1 km of the Proposed Scheme and any water bodies directly upstream or downstream (due to the River Ouse being tidal at this location). Eight surface water bodies and three groundwater bodies have been identified within the study area for the WFD screening exercise (**Appendix 12.2 (WFD Screening Report)**).

12.7. BASELINE CONDITIONS

EXISTING BASELINE

12.7.1. This section provides a description of the current baseline conditions with respect to the water environment.

Surface Water

Surface Water Features and Water Quality

12.7.2. The vast majority of the Drax Power Station Site is located within the Wharfe and Ouse Lower Management Catchment, with the southern part of the power station located in Aire and Calder Management Catchment. The quality of the River Ouse is monitored in accordance with the objectives of the WFD. The stretch closest to the study area (River Ouse from River Wharfe to Upper Humber) has a current (Cycle 2, 2019) (Environment Agency (g), 2021) overall status of moderate, with failing chemical status and moderate ecological status. The quality of the River Aire is also monitored in accordance with the objectives of the WFD. The stretch closest to the study area (Aire from River Calder to River Ouse) has a current (Cycle 2, 2019) (Environment Agency (g), 2021) overall status of moderate, with failing chemical status and moderate ecological status. Further information on WFD assessment is provided in **WFD Screening Report** (**Appendix 12.2**).

12.7.3. The main features within the study area that may be affected by the Proposed Scheme are summarised in **Table 12.6**. All these features are shown on the **Water Constraints Map (Figure 12.3).**

Table 12.6 - Surface Water Features within the study area that have the Potential to be Affected by the Proposed Scheme

Water Feature (reference on the Water Constraints map)	Description
Carr Dyke (reference SW01)	Designated as an ordinary watercourse under the jurisdiction of the Selby Area IDB. It is culverted under the north-western part of Drax Power Station, part of which is below the Proposed Scheme. Carbon Dioxide Delivery Terminal Compound is proposed to be constructed approximately 25 m to the north of the culvert outlet. The Carr Dyke flows in an easterly direction towards the River Ouse. It becomes Lendall Drain before its confluence with the River Ouse, via an IDB pumping station. Considering the short distance between the Carr Dyke and Carbon Dioxide Delivery Terminal Compound, the dyke is considered as a sensitive receptor for the purpose of this chapter. The quality of the watercourse is not specifically assessed against the objectives of the WFD. However, it is is within the 'Ouse from River Wharfe to Upper Humber' catchment with an overall status of moderate, with moderate ecological status and failing chemical status. The dyke is known to be used by otters (an EU protected species).
Unnamed drain north of the northern cooling towers (reference SW02)	Part of the drainage system serving the agricultural land. It flows alongside a footpath located approximately 90 m to the south east of the proposed Carbon Dioxide Delivery Terminal Compound, and then turns north and discharges to Carr Dyke. The quality of the drain is not assessed against the objectives of the WFD. This drain is considered to be suitable for commuting and foraging by otters and water voles. Considering the relatively short distance between the Proposed Scheme and the drain, the drain is considered as a sensitive receptor for the purposes of this chapter.
North Perimeter Ditch (reference SW03)	Part of the existing drainage system serving the Drax Power Station Site, located along the green area to the north of the northern cooling towers approximately 400 m and 540 m to the south and east of the proposed construction works respectively. Construction Laydown Areas proposed in the area of the northern cooling towers is located adjacent to North Perimeter Ditch. The North Perimeter Ditch discharges to Carr Dyke. Considering a construction laydown area being proposed to be adjacent to north Perimeter ditch, the ditch is considered as a sensitive receptor for the purposes of this chapter.
Pond 1 (reference SW32)	The pond is located north of the cooling towers, approximately 70 m north of the Construction Laydown Area proposed in the area of the northern cooling towers. The pond is of unknown water quality. Considering the close proximity to the power station infrastructure, the pond is not suitable habitat for protected species (Great Crested Newts). Considering the relatively short distance from the Proposed Scheme, the pond is considered as a sensitive receptor for the purposes of this chapter.
Unnamed Selby Area IDB drain with reference 44 (reference SW04)	Designated as an ordinary watercourse under the jurisdiction of the Selby Area IDB. It flows along the perimeter of the woodland area located in the north-eastern part of Drax Power Station Site and then flows along the eastern side of New Road towards the north-east. The drain is located approximately 80 m to the north of the East Construction Laydown Area. A review of OS mapping suggests that the existing highway drain serving New Road (reference SW06 on the Water Constraints map) and discussed below discharges to the IDB drain with reference 44. The quality of the drain is not assessed against the objectives of the WFD. This drain is considered to be suitable for commuting and foraging by otters and water voles. Considering the relatively short distance between the drain and the East Construction Laydown Area, the drain is considered as a sensitive receptor for the purposes of this chapter.
Pond 2 (reference SW05)	Located at Drax Abbey Farm, immediately to the west of New Road. It is located approximately 220 m north of the East Construction Laydown Area. It is understood that this is an irrigation pond, given the presence of an abstraction permit for agricultural use. The quality of the pond is not assessed against the objectives of the WFD. It is considered that protected species are unlikely to be present in the pond. The pond is located within alluvium deposits while the majority of the construction works occurs within the Hemingbrough Glaciolacustrine Formation which is unproductive clays. As such, the pond is unlikely to be hydraulically connected with the Proposed Scheme or construction laydown areas. Given that it is also a significant distance from the area of the Proposed Scheme, the pond is unlikely to be affected and is therefore not considered as a sensitive receptor for the purposes of this chapter.

Water Feature (reference on the Water Constraints map)	Description
Unnamed drain along the eastern side of New Road (reference SW06)	The drain is not identified on the Selby Area IDB plan and is therefore considered to be part of the existing highway drainage system. The drain flows along the western boundary of East Construction Laydown Area. The quality of the drain is not assessed against the objectives of the WFD. It is considered that the drain has limited suitability for otters and water voles or other protected species. Considering the location of the drain being adjacent to the East Construction Laydown Area, the drain is considered as a sensitive receptor for the purposes of this chapter.
Unnamed Selby Area IDB drain with reference 18/4 (reference SW07)	Designated as an ordinary watercourse under the jurisdiction of the Selby Area IDB. It flows along the woodland area approximately 120 m to the south of the East Construction Laydown Area. The quality of the drain is not assessed against the objectives of the WFD. It is considered that the drain is suitable for commuting and foraging by otters and water voles. Considering the relatively short distance between the drain and the East Construction Laydown Area, the drain is considered as a sensitive receptor for the purposes of this chapter.
Carr Lane Drain **(Reference SW08)**	Designated as an ordinary watercourse under the jurisdiction of the Selby Area IDB. It flows approximately 15 m to the south of East Construction Laydown Area, along the northern side of Carr Lane. The quality of the drain is not assessed against the objectives of the WFD. It is considered that the drain is suitable for commuting and foraging by otters and water voles. Considering the short distance between the drain and the East Construction Laydown Area, the drain is considered as a sensitive receptor for the purposes of this chapter.
Unnamed drain along the southern edge of Carr Lane (reference SW33)	The drain is not identified on the Selby Area IDB plan; hence it is considered to be part of the existing highway drainage system. It is located approximately 40 m to the south of the southern boundary of the East Construction Laydown Area. The quality of the drain is not assessed against the objectives of the WFD. It is considered that the drain is suitable for commuting and foraging by water voles. Considering the short distance between the drain and the East Construction Laydown Area, the drain is considered as a sensitive receptor for the purposes of this chapter.
River Ouse **(Reference SW09)**	Designated as a Main River under the jurisdiction of the Environment Agency. It flows approximately 30 m to the north of the northern boundary of the Order Limits, approximately 1.4 km downstream of the proposed Carbon Dioxide Delivery Terminal Compound (distance measured along Carr Dyke), and approximately 1.7 km downstream of the 'purge' pump at the Drax Power Station Site (measured along Carr Lane / Redhouse Lane). The cooling water is abstracted from the River Ouse and the cooling water is eventually discharged back to it along with other waters from the Site. The quality of the River Ouse is assessed against the objectives of the WFD (Ouse from River Wharfe to Upper Humber'); the overall status is assessed to be moderate, with moderate ecological status and failing chemical status. The River Ouse forms part of the Humber Estuary Ramsar Site, SAC, SPA and SSSI. The River Ouse is therefore considered a migratory path for protected species into the Humber Estuary. Considering the ecological importance of the River Ouse and that it is the closest designated Main River, the river is considered as a sensitive receptor for the purposes of this chapter.
Unnamed Drain **(Reference SW27)**	This drain is part of the existing drainage system serving Drax Power Station. It flows along the western boundary of Drax Power Station approximately 60 m to west of the Proposed Scheme. The quality of the drain is not assessed against the objectives of the WFD. There is potential that the drain provides suitable habitat for otters and water voles. Considering the relatively short distance between the drain and the Proposed Scheme, the drain is considered as a sensitive receptor for the purposes of this chapter.
Pond 3 (Reference SW28)	Located adjacent to the western boundary of the Order Limits within the proposed Habitat Provision Area approximately 300 m north of the proposed Carbon Dioxide Delivery Terminal Compound. The quality of the pond is not assessed against the objectives of the WFD. The project's ecologist advised that presence of Great Crest Newts (GCN) was recorded in this pond during a survey.

Water Feature (reference on the Water Constraints map)	Description
	The pond is unlikely to be hydraulically connected with the Proposed Scheme. Considering this information and the significant distance from the area of the proposed works, the pond is unlikely to be affected by the Proposed Scheme. It is therefore not considered as a sensitive receptor for the purposes of this chapter.
Pond 4 (Reference SW29)	Located within the proposed Habitat Provision Area approximately 500 m north of the proposed Carbon Dioxide Delivery Terminal Compound. The quality of the pond is not assessed against the objectives of the WFD. The project ecologist advised that no GCN were recorded in this during the survey. The pond is not hydraulically connected with the Proposed Scheme. Considering this information and the significant distance from the area of the proposed works, the pond is unlikely to be affected by the Proposed Scheme. It is therefore not considered as a sensitive receptor for the purposes of this chapter.
Pond 5 (Reference SW35)	Located in the area of the proposed Carbon Dioxide Delivery Terminal Compound. The quality of the pond is not assessed against the objectives of the WFD. The project ecologist advised that no GCN were recorded in this during the survey. Considering that the pond is located in the area where Carbon Dioxide Delivery Terminal Compound is proposed to be constructed, the pond is assessed to be a sensitive receptor for the purposes of this chapter.
Pond 6 (Reference SW34)	Located approximately 270 m to the north - west of the proposed Carbon Dioxide Delivery Terminal Compound. The quality of the pond is not assessed against the objectives of the WFD. The project ecologist advised that GCN were recorded in this pond during the survey. The pond is unlikely to be hydraulically connected with the Proposed Scheme. Furthermore, it is also a relatively long distance from the Proposed Scheme, the pond is unlikely to be affected. It is therefore not considered as a sensitive receptor for the purposes of this chapter.
Pond 7 (Reference SW36)	Located approximately 570 m to the north – east of the proposed Carbon Dioxide Delivery Terminal Compound . The quality of the pond is not assessed against the objectives of the WFD. GCN were recorded in this pond during ecology surveys. The pond is not hydraulically connected with the Proposed Scheme. Given that it is also a significant distance from the Proposed Scheme, the pond is unlikely to be affected. It is therefore not considered as a sensitive receptor for the purposes of this chapter.

Designated Sites

12.7.4. The Humber Estuary is located approximately 7.5 km downstream of the Order Limits connected via the River Ouse. This has been measured from approximate NGR SE67582873 along the centre line of the River Ouse to approximate NGR SE73352623. The Humber Estuary is a designated Ramsar Site, SSSI, SAC and SPA. It is a muddy, macro-tidal estuary, fed by the Rivers Ouse, Trent and Hull, Ancholme and Graveney. Suspended sediment concentrations are high, and are derived from a variety of sources, including marine sediments and eroding boulder clay along the Holderness coast.

Surface Water Abstractions and Discharges

12.7.5. The Environment Agency confirmed that there are five licenced tidal water abstractions and three licenced surface water abstraction (Environment Agency (e), 2021) used mostly for agricultural purposes within 1 km of the Proposed Scheme. One of the tidal water abstractions is used in the operation of the Drax Power Station.

12.7.6. Details of the surface water abstraction points are summarised based upon information provided by the Environment Agency in **Table 12.7** and their locations are shown on **Figure 12.1 Water Constraints**.

12.7.7. The Environment Agency also confirmed that there are seven licenced discharge permits (Environment Agency (f), 2021) to surface water features within 1 km of the Proposed Scheme. These discharge consents are for either water company or non-water company treated sewerage discharges. Drax Power Limited associated with Drax Power Station also holds an active discharge permit (reference DC12_S in **Table 12.8** below and on **Figure 12.1 (Water Constraints)**) to the River Ouse related to the effluent and surface water runoff generated within the Drax Power Station Site, this is known as the “Purge” outfall, which is located near to The Lodge adjacent to Redhouse Lane. The outfall to the river is located outside of the study area, but it is shown on the **Water Constraints** in **Figure 12.1**.

12.7.8. Details of the indicated surface water discharge points are shown in **Table 12.8** and their locations are shown on **Figure 12.1 (Water Constraints)**.

Table 12.7 - Active Licensed Surface Water Abstraction Points within 1 km of the Proposed Scheme (Environment Agency (e), 2021)

Reference on the Water Constraints Map	Location	Purpose	Daily Rate (m^3)	Yearly Rate (m^3)	NGR	
					E	N
WA02_S	River Ouse – Tidal – Long Drax	Drax Power Station - Production Of Energy-General Use Relating To Secondary Category (Medium Loss)	484,000	96,230,000	467580	428700
WA03_S	Carr Dyke / Lendall Drain - Tidal	General Agriculture: Spray irrigation – Direct	820	41000	466300	428000
WA06_S	Drax Abbey Fish Pond - Tidal	General Agriculture: Spray irrigation – Direct	820	10000	467000	428200
WA10_S	River Ouse 3 - Tidal	General Agriculture: Spray irrigation – Direct	1440	25000	467537	428825
WA11_S	River Ouse - Tidal	General Agriculture: Spray irrigation – Direct	898.56	40000	466047	430789
WA12_S	Lendall Drain At Drax Abbey Farm	General Agriculture: Spray irrigation – Direct	900	45000	466998	428510
WA16_S	River Derwent - Near Wressle	General Agriculture: Spray irrigation – Direct	1440	40000	468194	428757
WA17_S	River Derwent - Near Wressle	General Agriculture: Spray irrigation – Direct	1440	40000	470551	434785

Table 12.8 - Permitted Discharge Consent Points to Surface Water within 1km of the Proposed Scheme (Environment Agency (f), 2021) and (Environment Agency (i)))

Reference on the Water Constraints Map	Location	Discharge Type	Receiving Watercourse	Maximum Daily Discharge Volume (m3)	NGR	
					E	N
DC06_S	Barmby Tidal Barrage Housing Site	Sewage - NWC	Tidal River Ouse	2.75	468200	428600
DC07_S	Barmby on the Marsh STW	Sewage - Water Company	Tidal River Ouse & Bankfield Land Drain	No limit, but max. population of 250	468507	428289
DC08_S	East Holme	Sewage - NWC	Black Tom Drain	No limit	468806	428608
DC09_S	Drax WPC Works	Sewage - Water Company	River Ouse	662	467975	426997
DC10_S	Bungalow on Mill Lane	Sewage - NWC	Black Tom Drain	No limit	467082	426123
DC11_S	Bungalow on Mill Lane	Sewage - NWC	Unnamed tributary of River Ouse	No limit	467201	426084
DC12_S	‘Purge’ outfall near The Lodge adjacent to Redhouse Lane. Discharge point from Drax Power Station.	Sewage - NWC	River Ouse	302,400	468544	427536

Existing Drainage

12.7.9. Effluent water from all water streams (cooling, surface water runoff, foul water) across the Drax Power Station Site are eventually combined in the 'purge' pumping system prior to discharge to the River Ouse. Further context on the individual systems is provided below.

12.7.10. The total water discharged from the Site, which is understood to mainly comprise the cooling water, but also includes process water, silt from the sedimentation tanks and treated effluent is currently around 5,150 m^3/hour, this is significantly below the permitted discharge rate. This produces a large dilution capacity for any contaminants within the induvial discharge streams prior to discharge to the River Ouse. The silt collected in the sedimentation tanks is returned to the River Ouse via the purge pump together with the other water discharged from Drax Power Station Site.

12.7.11. Surface water runoff generated within the Drax Power Station is managed by a complex drainage system that combines gravity and pumped systems with open ditches, culverts, land drainage and lagoons.

12.7.12. Surface water runoff from the area of the existing Woodyard, the car park and offices located to the north of the northern cooling towers and partially from the area surrounding the northern cooling towers is discharged to the culverted section of Carr Dyke crossing the existing Woodyard, which eventually discharges into the River Ouse via the Lendall Pumping Station. Surface water runoff generated in the Proposed Scheme and partially from the area surrounding northern cooling towers is conveyed to the 'purge' pump from where it is pumped into the River Ouse, along with all other waters being discharged from the Drax Power Station Site (i.e., cooling and process water).

12.7.13. Surface water runoff generated within the Drax Power Station Site in areas likely to pick up hydrocarbons, such as oil tank storage areas and car parks, is passed through oil separators prior to discharge to the River Ouse and the Carr Dyke.

12.7.14. All foul water (i.e., from toilets and welfare facilities) generated across the Drax Power Station Site is drained via a separate drainage system to an on-site sewage treatment plant. From here, the treated foul effluent is pumped to the cooling water system then to the River Ouse via the consented purge water discharge detailed in **Table 12.8** above.

Geology

Made Ground

12.7.15. The Socotec Geotechnical Desk Study has indicated that Made Ground encountered across the Site was found to be variable in thickness and nature, comprising both granular and cohesive strata. Of the boreholes reviewed within the Order Limits, Made Ground was encountered to depths of 1.7 and 2.7 m, comprising hard surfacing over predominantly granular material (SOCOTEC, 2017).

Superficial Deposits

12.7.16. A review of British Geological Survey (BGS) mapping (British Geological Survey (c), 2022) shows that the Site is underlain by the Hemingbrough Glaciolacustrine Formation, Breighton Sand Formation, alluvium and Warp superficial deposits.

12.7.17. The Hemingbrough Glaciolacustrine Formation consists of laminated clays, silts and sands with rare dropstones (British Geological Survey (c), 2022) and is located below the majority of the southern and central region of the Order Limits as far north as the Foreman's Cottage.

12.7.18. The Breighton Sand Formation consists of slightly clayey sand to silty sand with a peaty base, typically composed of well sorted quartz grains (British Geological Survey (c), 2022). The deposit is located in isolated pockets below the central and southern region of the Order Limits. The alluvium deposits consist of unconsolidated clay, silt, sand and gravel, material deposited by a river (British Geological Survey (c), 2022). The Alluvium is found cutting in a narrow band across the central region and the northern region of the Order Limits to the north of the Foreman's Cottage. The Warp Clay is an artificially induced alluvium and is found to the north of the Order Limits adjacent to the River Ouse (British Geological Survey (c), 2022).

12.7.19. A review of BGS borehole logs (British Geological Survey (c), 2022) recorded within, and surrounding, the Order Limits has indicated that the Hemingbrough Glaciolacustrine Formation is between 0.5 – 17 m thick, the Breighton Sand Formation between 1 – 4 m thick and the Alluvium and Warp deposits are 0.5 – 3.2 m and 10 m thick respectively.

Bedrock

12.7.20. The superficial deposits are underlain by Sherwood Sandstone bedrock. The Sherwood Sandstone consists of sandstone which is part pebbly with subordinate red mudstone and siltstone (British Geological Survey (c), 2022). The Sherwood Sandstone underlies the full Order Limits but is confined or partly confined by superficial deposits.

12.7.21. A review of BGS borehole logs (British Geological Survey (c), 2022) recorded within the Order Limits has indicated that the Sherwood Sandstone is approximately 17 – 23 m below ground level (bgl). The Socotec Geotechnical Desk Study has indicated that the Sherwood Sandstone was encountered below the Hemingbrough Glaciolacustrine Formation across the Site, with the sandstone penetrated to a maximum of 5.8 m.

Hydrogeology

12.7.22. The Hemingbrough Glaciolacustrine Formation has been classified by the Environment Agency as Unproductive Strata, described as rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow (Department for Environment, Food and Rural Affairs, 2022). The Breighton Sand Formation, Alluvium and Warp Clay have all been classified by the Environment Agency as Secondary A Aquifers, described as permeable layers capable of supporting water supplies at a local rather than strategic scale, and in

some cases forming an important source of base flow to rivers (Department for Environment, Food and Rural Affairs, 2022).

12.7.23. The Sherwood Sandstone has been classified by the Environment Agency as a Principal aquifer described as layers of rock or drift deposits that have high intergranular and / or fracture permeability, meaning they usually provide a high level of water storage. Principal Aquifers may support water supply and/or river base flow on a strategic scale (Department for Environment, Food and Rural Affairs, 2022). (Allen, et al., 1997) states, "*in Yorkshire most of the outcrop area is low lying in the valley of the River Ouse. This results in low hydraulic gradients in the aquifer and only small seasonal fluctuations in water levels (typically 2 to 3 m). Much of the area is covered in glacial till, causing local artesian heads, and a complex hydrogeological relationship between the sandstone and the drift. Both fracture and intergranular flow are important methods of groundwater movement. The aquifer is extensively developed south of the river Wharfe for both public and private water supplies. Borehole yields are mainly good and may be in excess of 10 000 m^3/d*."

12.7.24. BGS Hydrogeological Map of Southern Yorkshire and adjoining areas (British Geological Survey, 2022) Reports that infiltration occurs mainly where the superficial deposits are clay free or absent.

Groundwater Levels and Flows

12.7.25. The Hydrogeological Map of Southern Yorkshire and adjoining areas (British Geological Survey (b), n.d.) available on the BGS website, provides a regional piezometric map for the Sherwood Sandstone Formation with 10 m contours on the estimated minimum level of the sandstone water table. The water table around the Proposed Scheme is approximately 10 mOD. Hydraulic gradients in the sandstone are gently sloping and the natural flow direction is towards the east and the River Ouse (approximately 2 km east of the Proposed Scheme). However, groundwater levels and flow gradients in the sandstone aquifer have been modified by large abstractions for public water supply. with two abstractions, identified on the Hydrogeological Map, approximately 3 km south of the Order Limits.

12.7.26. The BGS borehole logs show recorded groundwater strikes across the Site. Groundwater strikes are water ingress occurrences during the drilling process and do not represent Rest Water Levels (RWLs), however do indicate the presence of groundwater and layers which are water-bearing. Groundwater strikes have been recorded between 0.4 – 8.22 mBGL across the Site.

12.7.27. Rest Water Levels, which are the level at which water stands in the borehole when not being pumped / disturbed and approximately represents the level of the water table, have been recorded by various sources across the Site. Six BGS borehole logs have records of groundwater levels within the Site. The Environment Agency confirmed the location of five groundwater level OBHs (observation boreholes) within 3 km of the Proposed Scheme. Discontinuous groundwater level data is available for these sites from as early as 1976 to 2021. Groundwater level information in relation to boreholes on the two licenced abstractions on Site is also available. RWLs across the Site vary between 1 and 18 mBGL.

12.7.28. The groundwater level elevations from the various sources described above are summarised in **Table 12.9** below.

Table 12.9 - Groundwater elevation data within and surrounding the Proposed Scheme

Borehole ID / Data reference	Distance from Proposed Scheme (km)	Date of Measurement	Elevation (mOD)	Groundwater Elevation (mOD)			Easting	Northing
				Min	Max	Mean		
Drax Sandstone SE62DRX1SS	1.75	1994-2021	3.86	-5.16	-2.79	-4.27	468303	426178
Barmby Barrage SE62BBB0SS	0.23	1989-2021	4.56	-3.53	0.02	-2.17	468224	428672
Barlow Station SE62BLS0SS	1.73	1976-2021	6.57	-6.75	2.2	-2.87	463818	428149
Carlton Towers Station SE62CTS0SS	2.09	1976-2005	4.91	-12.61	-2.09	-7.34	464586	425000
Mill Lane BGS2 MOD	1.86	1994-2021	6.41	-18.02	-12.43	-16.06	465432	424669
SE62NE29	0	1979	7.00	-	-	2.15	466694	427703
SE62NE49	0	1969	11.00	-	-	10	466671	427102
SE62NE122	0	1963	9.00	-	-	4.8	466054	427753
SE62NE123	0	1963	3.00	-	-	0.6	466612	428037
SE62NE125	0	1963	2.00	-	-	-6.7	467306	428851
SE62NE126	0	1963	4.00	-	-	1.8	466411	426629
Drax Borehole 1	0.1	2020-2021	8.5	-6.5	-11.5	-9.2	465100	427300
Drax Borehole 2	0.19	2020-2021	8.5	-41.5	-46.5	-42.9	465200	427300

12.7.29. **Table 12.9** indicates that groundwater elevations have decreased over time, with the shallower measurements being recorded in the 1960/70s and the deepest measurements in 2000/10s. This likely represents the influence of increased abstraction rates across the Site and wider region, with historic groundwater elevations representing more natural conditions prior to the conditions, influenced by abstractions, that exist currently within the Site.

12.7.30. The Geotechnical Desk Study Report A7101-17 (SOCOTEC, 2017) suggested that there is likely to be a perched aquifer above the Hemingbrough Glaciolacustrine Formation generally within the Made Ground. This has been shown to vary between approximately 1.9 and 4.6 mOD in 2000 (SOCOTEC, 2017). Deep groundwater was mapped with groundwater contour lines in 2000 (SOCOTEC, 2017), these show a hydraulic gradient towards the two abstraction boreholes in the south-western part of the Site. Close to the abstraction boreholes the groundwater is shown at -10.8 mOD, rising to -3 mOD beyond the northern boundary of the power station at Foreman's Cottage (SOCOTEC, 2017).

12.7.31. From the information above, it is conceptualised that shallow groundwater is likely to be present within the Warp and Alluvium strata, as well as the deeper Breighton Sand Formation and Sherwood Sandstone which may be in hydraulic continuity with each other. Where the Hemingbrough Glaciolacustrine Formation is present in sufficient thickness, it is likely to act as an aquitard restricting the vertical flow of groundwater between the shallow and deeper aquifers. Shallow groundwater (within the Warp and Alluvium) is considered likely to flow broadly towards the east / north east and towards the River Ouse. Groundwater flow direction within the deeper groundwater (within the Breighton Sand Formation and Sherwood Sandstone) is likely to be greatly influenced by the Drax Power Station abstraction boreholes, and therefore the groundwater flow direction may vary over time, depending on abstraction rates.

Groundwater Abstractions and Discharges

12.7.32. Information received from the Environment Agency provided data on licenced groundwater abstractions and discharges within 5 km of the Proposed Scheme. Abstractions and discharges beyond the 1 km study area were scoped out, leaving five licenced groundwater abstractions and three groundwater discharges within 1 km of the Proposed Scheme (Environment Agency (i), 2021). Three of these abstractions are used for agricultural purposes while the remaining two licences are part of Drax Power Station industrial use. The three discharges are soakaways and drains to groundwater. Within 3 km of the Proposed Scheme, three Yorkshire Water Services Ltd public water abstractions are located to the south and are protected by a Groundwater Source Protection Zone. Although they are beyond the 1 km zone of influence, the abstractions were included due to their high sensitivity and due to the majority of the Proposed Scheme being situated within a total catchment (Zone 3) Source Protection Zone (SPZ 3) for these abstractions (Department for Environment, Food and Rural Affairs DEFRA, n.d.)

12.7.33. A total catchment (Zone 3) is a numerically predicted area around a water supply source within which all groundwater recharge will be received by the abstraction

source (no travel time defined). SPZs are defined by the Environment Agency to protect certain groundwater abstractions determined to be in need of such protection and normally delineated to protect sources used for Public Water Supply abstractions. The SPZ does not extend to the northern most extent of the Order Limits. Based on the geology of the area, it is likely that these abstractions target the Sherwood Sandstone Formation (Principal aquifer) and are public water supply abstractions operated by Yorkshire Water Services Ltd (**Table 12.10**).

12.7.34. The Environmental Health Department of Selby District Council was contacted (**Table 12.1**) to request any information that they hold with regard to private water supplies (PWS). A response was received from them on 10 June 2021 confirming that their records do not indicate any PWS within 3 km of the Proposed Scheme.

12.7.35. Details of the indicated licenced groundwater abstraction points are summarised in **Table 12.10** and groundwater discharges summarised in **Table 12.11** their locations are shown on **Figure 12.1 Water Constraints**.

Table 12.10 - Active Groundwater Abstractions within 3 km of the Proposed Scheme (Environment Agency (i), 2021)

Reference on the Water Constraints Map	Name	Purpose	Daily Rate (m^3)	Yearly Rate (m^3)	NGR	
					E	N
WA01_G	Yorkshire Water Services Ltd	Potable Water Supply - Direct	5000	1500000	463600	424200
WA02_G	Yorkshire Water Services Ltd	Potable Water Supply - Direct	10500	3800000	465570	424330
WA03_G	Yorkshire Water Services Ltd	Potable Water Supply - Direct	12000	3500000	467300	424300
WA09_G	APS Growers Ltd	Agriculture used for spray irrigation	303	68190	465750	426560
WA10_G					465770	426230
WA11_G	Drax Power Station (located on the Site)	Industrial, Commercial and Public Services	11300	2300000	465162	427340
WA12_G					465257	427321
WA20_G	The Hambleton Abstraction Partnership	Agriculture used for spray irrigation	1342	70000	464323	427187

Table 12.11 - Active Groundwater Discharges within 1 km of the Proposed Scheme (Environment Agency (i), 2021)

Reference on the Water Constraints Map	Name	Purpose	Max Daily Discharge Volume (m3)	NGR	
				E	N
DC01_G	The Cottages (Copper Cottage)	Discharging to groundwater via soakaway	5	468103	428498
DC02_G	Derwent House	Discharging to groundwater via soakaway	5	468399	428601
DC04_G	National Grid Transco Plc at Drax Substation	1. Discharging sewage to groundwater via soakaway 2. Discharging site drainage to groundwater via drain	1. 5 2. No limit	466626	426935

Groundwater Quality

12.7.36. The quality of groundwater bodies below the Order Limits are monitored by the Environment Agency in accordance with WFD objectives (Environment Agency (g), 2021). The Site is found within the Wharfe and Lower Ouse Sherwood Sandstone groundwater body, which has a current (2019, Cycle 2) assessment of Poor chemical, Good quantitative status and Poor overall status. The Poor chemical status has been attributed to Poor status of chemical drinking water protected area. The groundwater body had an objective to achieve Good overall classification by 2021 however this was not achieved, with reasons being disproportionately expensive and disproportionate burdens (Environment Agency (g), 2021).

12.7.37. The Magic Map (Department for Environment, Food and Rural Affairs, 2022) illustrates the groundwater vulnerability for the Site. It shows that the Site has a groundwater vulnerability ranging from Low to Medium-High. In areas where the Hemingbrough Glaciolacustrine Formation is present the groundwater vulnerability is generally classified as Low. Low vulnerability is described as low priority groundwater resources that have a high degree of natural protection. As a result, this somewhat reduces their overall risk rating for being polluted by surface activities.

12.7.38. In areas where the Breighton Sand Formation, Alluvium and Warp Clay are present, the groundwater vulnerability rating has been classified as Medium or Medium-High. Medium-High vulnerability is determined by the presence of high priority groundwater resources that have limited natural protection from surface pollutants. This results in a Medium-High overall pollution risk to groundwater from surface activities. Activities in these areas may require additional measures over and above good practice to ensure they do not cause groundwater pollution. Medium vulnerability is described as medium priority groundwater resources that have some natural protection resulting in a Moderate overall groundwater risk. **Figure 12.4 (Superficial Geology and Potential Piling Works)** (document reference 6.2.12.4) illustrates the position of the superficial deposits, and the location of potential pilling in which preferential pathways for pollution could occur.

12.7.39. The Magic Map indicates that along the southern border of the Order Limits a Nitrate Vulnerable Zone is found which extends further south. Nitrate Vulnerable Zones are areas designated as being at risk from agricultural nitrate pollution (Department for Environment, Food and Rural Affairs DEFRA, n.d.).

12.7.40. Groundwater quality data is available from BH 107 Deep and ABS BH, situated 0.1 and 0.2 km west of the Order Limits respectively. The data provides a range of chemical parameters from 2016 to 2020. When comparing the 2020 chemical measurements to The Water Supply (Water Quality) Regulations 2016, arsenic, iron and manganese in samples collected from BH 107 Deep and manganese in ABS BH exceed the maximum concentration for each of these determinants outlined in the regulations. This comparison has only been used as an indication for high chemical concentration as BH 107 Deep and ABS BH are not currently used as potable supplies, however they do lie within the SPZ 3 for the Yorkshire Water Services Ltd potable supplies.

Flood Risk

12.7.41. A detailed assessment of flood risk has been undertaken for the Proposed Scheme and is provided in the **Flood Risk Assessment in Appendix 12.1** of this ES. The paragraphs below summarise findings of the FRA.

Fluvial and Tidal Flood Risk

12.7.42. The River Ouse is tidally influenced at the location of the Proposed Scheme. The risk of flooding in this area is therefore a combination of fluvial and tidal flooding.

12.7.43. The flood records received from the Environment Agency in May 2021 (Environment Agency (b), 2018) show that there are no known historic records of flooding within the Order Limits.

12.7.44. A review of the Environment Agency's Flood Map for Planning (Environment Agency (a), n.d.) shows that the area of the Proposed Scheme is located partially in Flood Zone 1 and partially within Flood Zone 3, but in the area benefiting from flood defences, as such it is not located within the functional floodplain. The Environment Agency's Flood Map for Planning (Environment Agency (a), n.d.) shows the extent of the floodplain during the 'undefended scenario', not taking the presence of the existing flood defences into account, what means that this area would be flooded if there were no flood defences.

12.7.45. Flood Zone 1 is described as land having less than 1 in 1000 return period of fluvial or tidal flooding.

12.7.46. Flood Zone 3 is described as land having a 1 in 100 or greater return period of fluvial flooding, or land having a 1 in 200 or greater return period of tidal flooding.

12.7.47. The Level 1 SFRA (AECOM (a), 2020) mapping shows that of the Order Limits which are within Flood Zone 3 the majority are in Flood Zone 3a. There remains an isolated part of the Order Limits (located to the north of Drax Abbey Farm which is north of the Drax Power Station Site) within Flood Zone 3b which extends to the banks of the River Ouse.

12.7.48. Flood Zone 3b is considered to be a functional floodplain and is defined by the NPPF (Ministry of Housing, Communities & Local Government, 2021(a)) as land where water has to flow or be stored in times of flood.

12.7.49. During consultation, the Environment Agency confirmed that the existing flood defences located along the banks of the River Ouse are in 'fair' and 'good' condition and provide protection for flood events up to and including the 1 in 200 year return period event.

12.7.50. The Proposed Scheme, including Drax Power Station Site Construction Laydown Areas and East Construction Laydown Area are located in the areas protected for up to and including the 1in 200 year return period event in the present-day scenario by the existing flood defences.

12.7.51. Habitat Provision Areas located close to the River Ouse are located in the area shown to be at risk of flooding for the 1 in 100 year event.

12.7.52. The southern part of the Off-site Habitat Provision Area is shown to be at risk of flooding during the 1 in 100 year event with climate change allowance.

12.7.53. The Environment Agency advised that despite the fact that the risk of fluvial / tidal flooding in the area of the Proposed Scheme has been reduced by the presence of flood defences, there is still a residual risk of flooding in the case of breach of the flood defences (failure of the flood defence allowing water to flow through) or their overtopping by a flood greater than that for which they were designed.

12.7.54. It is noted that the risk of a breach of the existing flood defences is minimised as flood defences are regularly inspected and maintained by the Environment Agency to ensure they provide an appropriate level of protection.

12.7.55. Combined breach mapping outputs from the 2018 Upper Humber Flood Mapping Study (Environment Agency (b), 2018) indicate that in the present day, the entire Drax Power Station Site and Off-site Habitat Provision Area are outside of the floodplain during the breach scenario for the 1 in 200-year return period event.

12.7.56. However, the Environment Agency's breach mapping shows that the northern and southern ends of the East Construction Laydown Area may potentially be flooded during a breach of existing flood defences for the 1 in 200 year event. The breach mapping also shows that vast majority of Habitat Provision Area would be at risk of flooding during a breach event. This should be seen in the context that a breach (as opposed to overtopping) of the existing flood defences is unlikely to happen as the flood defences are regularly checked and maintained by the Environment Agency to ensure they provide appropriate protection.

Risk of Flooding from Surface Water

12.7.57. Flooding from surface water is typically associated with natural overland flow paths and local depressions in topography where surface water runoff can accumulate during or following heavy rainfall events.

12.7.58. A review of the Environment Agency's Flood Risk from Surface Water mapping (Environment Agency (c), n.d.) indicates localised areas within the area of the Proposed Scheme to be at low to high susceptibility to flooding from surface water.

12.7.59. Low susceptibility to flooding from surface water means flooding occurring as a result of rainfall of between 1 in 1000 and 1 in 100 year return period.

12.7.60. Medium susceptibility to flooding from surface water means flooding occurring as a result of rainfall of between 1 in 100 and 1 in 30 year return period.

12.7.61. High susceptibility to flooding from surface water means flooding occurring as a result of rainfall with a greater than 1 in 30 year return period.

12.7.62. The areas at medium to high risk of surface water flooding largely correspond to the existing network of onsite ponds and ditches, with the proposed new buildings located away from these areas. However, there is a low to medium risk of flooding in the location of the proposed Carbon Dioxide Delivery Terminal Compound and the laydown area in the north west of the Drax Power Station Site. Additionally, within the Habitat Provision Area there are localised areas at high risk of surface water ponding.

12.7.63. It should be noted that there is an existing surface water drainage system within the Drax Power Station Site which has not been considered in the Environment Agency's mapping. Therefore, it is likely that the flood risk to the Proposed Scheme is not as extensive as it is shown on the Environment Agency mapping.

Risk of Flooding from Reservoirs

12.7.64. The Environment Agency's Risk of Reservoir Flooding map (Environment Agency (c), n.d.) does not separate out the risk of flooding from individual reservoirs. As such under normal river conditions it is considered that the Drax Power Station Site is at risk of flooding from the failure of the two onsite reservoirs (the northern and southern cooling water reservoirs), these are the concrete structures beneath the cooling water towers. The risk of failure of these structures is considered to be low, given their construction, frequency of inspection and maintenance combined with the only inflows being artificial and heavily controlled.

12.7.65. The Selby Level 1 SFRA (AECOM (a), 2020) identifies that the nearest reservoir is the Barmby Raw Water Reservoir located approximately 4 km upstream of the Proposed Scheme, the flood risk shown may be a result of failure of additional reservoirs further upstream.

12.7.66. The Environment Agency is responsible for ensuring that reservoirs are inspected regularly, and essential safety works are carried out. Large reservoirs are regulated by law (Reservoirs Act 1975), which requires the appointment of a Supervising Panel Engineer (SupE). It is the role of the SupE to promote the safe operation of the reservoir by working with the owner to maintain accurate records, monitor the safety of the dam and to help the owner manage potential risks which can change over time. Furthermore, there has been no loss of life from reservoir-related flooding for nearly 100 years (British Dam Society, 2022). Considering this information, the risk of flooding from reservoirs is considered to be low.

Risk of Flooding from Groundwater

12.7.67. Groundwater flooding usually occurs in low-lying areas underlain by permeable rock and aquifers that allow groundwater to rise to the surface through the permeable subsoil following long periods of wet weather. Low-lying areas may be more susceptible to groundwater flooding because the water table is usually at much shallower depth below ground level and often intersects the surface in valley bottoms providing baseflow for rivers and streams.

12.7.68. The Selby District Level 1 SFRA (Selby District Council, 2020) used the Environment Agency's 'Areas Susceptible to Groundwater Flooding (AStGWE)' map, which is a strategic scale map illustrating areas susceptible to groundwater flooding on a 1 km^2 grid. It illustrates the proportion of each 1 km^2 grid square where geological and hydrogeological conditions indicate that groundwater emergence might occur. The Selby District Level 1 SFRA reproduces the relevant portion of AStGW map. The map indicates that the Drax Power Station Site is located in a 1 km^2 grid square where less than 25% of the land is considered to be susceptible to groundwater flooding.

12.7.69. The Groundsure report (Groundsure, 2021) contained within **Appendix 11.1 (Phase 1 Preliminary Risk Assessment** (document reference 6.3.11.1)) indicates that the

majority of the southern part of the Drax Power Station Site has a Moderate risk of groundwater flooding, whereas the northern portion of the Drax Power Station Site and the majority of the Habitat Provision Area have a high risk from groundwater flooding.

12.7.70. The Selby Area IDB advised that high groundwater levels are likely to occur within the Order Limits. The groundwater level information in **paragraph 12.7.25** would suggest that the high groundwater flooding risk in the northern region of the Order Limits is likely to arise from the shallow groundwater in the Warp and Alluvium deposits which has been recorded in several boreholes as less than 2 mBGL. While in the south of the Order Limits the unproductive Hemingbrough Glaciolacustrine Formation results in the Moderate risk of groundwater flooding.

FUTURE BASELINE

12.7.71. Future climate change impacts are envisaged to result in increased rainfall intensity, which would result in increased surface water runoff generated within Drax Power Station Site and this eventually may impact the capacity of the existing surface water drainage system. As a result, there is increased risk of flooding to Drax Power Station Site from the existing surface water drainage system.

12.7.72. No information on expected future changes to groundwater levels within the area of the Proposed Scheme has been identified from publicly available sources. The BGS have produced a national recharge model for climate change conditions which has indicated that recharge seasons will become shorter resulting in flashier groundwater level response and potentially greater drought vulnerability (Mansour & Hughes, 2017). Given that Drax Power Station is currently effectively controlling groundwater levels with its current abstraction operations, it is assumed that should there be any future rise in groundwater levels within the Order Limits that this would be managed through the existing licenced abstractions.

12.7.73. Hydraulic modelling of the future baseline was undertaken as part of the **FRA (Appendix 12.1)**, and this is summarised in the paragraphs below.

12.7.74. In the future baseline it is considered that the River Ouse in the area of the Order Limits is fluvially dominated, with minor tidal influence. The most significant change in the baseline conditions in the future is therefore likely to be associated with an increase in peak river flows and sea level and associated with the potential effects of climate change.

12.7.75. The design life of the Proposed Scheme is 25 years. The following climate change allowances which were used in the hydraulic modelling have been agreed with the Environment Agency:

a. Sea level rise of 252.6 mm uplift; and

b. Fluvial flows to be increased by 29% for the River Ouse catchment, 31% for the River Aire catchment, 36% for the River Don catchment and 38% for the River Trent catchment in line with the Upper End estimate of climate change in the Humber Estuary for the 2050s.

12.7.76. **Table 12.12** provides details of the mixed tidal / fluvial scenario (FT2) which was agreed with the Environment Agency to be used as a design scenario for the Proposed Scheme. Details of the other scenarios that were used to assess the residual risk to the scheme are also included in the below table.

Table 12.12 - Design Scenario for the Proposed Scheme Obtained from Table G.2 – JP Matrix 75-year to 200-year (Jacobs, 2020)

Return Period	River Aire	River Don	River Ouse	River Trent	Tidal	Event Type	ID
200	50	20	100	50	10	Mixed tidal / fluvial	FT2
200	100	50	200	100	5	Mixed tidal/fluvial	FT1
200	5	2	10	5	100	Mixed tidal/fluvial	FT5
200	2	2	5	2	200	Tidal	T
200	200	200	200	200	5	Fluvial	FD

12.7.77. The results of the future baseline modelling show parts of the Proposed Scheme are at risk of flooding, these include the area of the proposed Carbon Dioxide Delivery Terminal Compound and the area where the following structures are proposed to be located is at risk of potential flooding:

a. Carbon Dioxide Processing and Compression Plant;

b. Carbon Capture Wastewater Treatment Plant;

c. Solvent Storage and Make-up System;

d. Electrical Switchroom Buildings; and

e. Fire Water Tanks.

12.7.78. It is not expected that there would be significant changes between current and future baseline for surface water features. The WFD status of the River Ouse is targeted to achieve Good ecological potential by 2027. Once the water body has achieved Good ecological potential, the WFD would require this status to be maintained.

12.8. SENSITIVE RECEPTORS

12.8.1. The sensitive receptors which have been assessed (following the screening exercise set out in **Table 12.6**) are summarised in **Table 12.13.**

Table 12.13 - Sensitive Receptors

Receptor (reference on Water Constraints map)	Description	Sensitivity
Carr Dyke (Reference SW01)	Ordinary watercourse with unknown water quality. Presence of otters has been recorded. Known water abstraction for irrigation.	High
Unnamed drain north of the northern cooling towers (Reference SW02)	Part of the drainage system serving Drax Power Station. Watercourse of unknown quality. Suitable for commuting and foraging by otters and water voles.	High
North Perimeter Ditch (reference SW03)	Part of the drainage system serving Drax Power Station, eventually discharge to Carr Dyke. Watercourse of unknown quality. Unlikely to provide suitable habitat for protected species.	Negligible
Drains in the area of the Northern Cooling Towers in Drax Power Station (Reference SW37)	Cooling system serving the Northern Cooling Towers in Drax Power Station. Unlikely to provide suitable habitat for protected species.	Negligible
Pond 1 (reference SW32)	The quality of the pond is unknown. No known abstractions. Unlikely to provide suitable habitat for protected species.	Negligible
Unnamed Selby Area IDB drain with reference 44 (Reference SW04)	Ordinary watercourse of unknown water quality with no known abstractions. Suitable for commuting and foraging by otters and water voles.	High
Unnamed drain along the eastern side of New Road (Reference SW06)	Part of the existing highway drainage system. Watercourse of unknown quality. Periodically dry with limited suitability for otters and water voles or other protected species.	Medium
Unnamed Selby Area IDB drain with reference 18/4 (Reference SW07)	Ordinary watercourse of unknown quality and with no known abstractions. Suitable for commuting and foraging by otters and water voles	High
Carr Lane Drain (Reference SW08)	Ordinary watercourse of unknown quality and with no known abstractions. Suitable for commuting and foraging by otters and water voles.	High
Unnamed drain along the southern edge of Carr Lane (Reference SW33)	Part of the existing highway drainage system. Drain of unknown water quality. Suitable for commuting and foraging by otters and water voles.	High
River Ouse (Reference SW09)	Main River with moderate water quality. Known water abstraction for irrigation and production of energy. Considered to be a migratory path for protected species into the Humber Estuary Ramsar Site, SSSI, SAC and SPA.	Very High
Unnamed Drain (Reference SW27)	Part of the existing drainage system serving Drax Power Station. Drain of unknown water quality. It has potential to provide suitable habitat for commuting and foraging by otters and water voles.	High
Pond 5 (Reference SW35)	The quality of the pond is unknown. No known abstractions. Unlikely to provide suitable habitat for protected species.	Negligible
Sherwood Sandstone Formation (Principal aquifer)	A Principal aquifer which may be in hydraulic connectivity with the superficial aquifer. Also protected by a Groundwater SPZ 3. WFD Groundwater – 'Poor' chemical and 'Good' quantitative status.	High
Alluvium, Breighton Sand Formation and Wrap Superficial Deposits (Secondary A aquifer)	Secondary A aquifers providing water for agricultural or industrial use locally with shallow groundwater level. Considered to be in hydraulic connectivity with the River Ouse.	Medium
Hemingbough Glaciolacustrine Formation	Unproductive strata (non-aquifer). Not considered a target for supply (locally).	Low
Groundwater abstractions for non-potable use	Non-potable, industrial and agricultural water supplies.	Medium
Public water supply abstractions (Yorkshire Water)	Strategic public water supplies operated by Yorkshire Water, protected by an SPZ 3 at the Site.	Very High
Drax Power Station and employees	The Drax Power Station is classified as essential infrastructure in accordance with Planning Practice Guidance 'Flood Risk and Coastal Change' (Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government , 2021).	Very High
People and properties	The village of Drax and a number of farms are located in the area of the Proposed Scheme.	Very High

12.8.2. All key sensitive receptor locations are shown on **Figure 12.3 (Water Constraints Part 3)**.

12.9. PRELIMINARY ASSESSMENT OF LIKELY IMPACTS AND EFFECTS

12.9.1. This section details the preliminary assessment of significant effects taking account of primary mitigation, as described in **Chapter 2 (Site and Project Description)** but in the absence of secondary mitigation. Secondary mitigation for the Proposed Scheme is described in **Section 12.10** below. Effects of significance moderate or above are considered 'significant'. Effects that are considered to be "not significant" are summarised in **Appendix 12.4** (document reference 6.3.12.4).

CONSTRUCTION AND DECOMMISSIONING PHASES

12.9.2. The likely significant effects for Water Environment associated with the construction and decommissioning phases are set out below.

Increased Risk of Pollution from Increased Sediment Load

12.9.3. This is typically caused by site runoff containing elevated suspended sediment levels migrating to adjacent surface water features. This can result from land clearance, excavation, dewatering of excavations, stockpiles, wheel washing and movement of materials to and from the Site.

12.9.4. Runoff with high sediment load can have direct adverse effects on adjacent water bodies through increasing turbidity (thus reducing light penetration and reducing plant growth), and by smothering vegetation and bed substrates (thus impacting on invertebrate and fish communities through the destruction of feeding areas, refuges and breeding / spawning areas). Indirect adverse effects can also be associated with suspended sediments that have inorganic or organic contaminants (e.g., heavy metals and pesticides, respectively).

12.9.5. Carr Dyke (reference SW01 on **Water Constraints Part 3 (Figure 12.3)**) is culverted under the north-western part of Drax Power Station in close proximity to the proposed works and has the potential to be impacted by the Proposed Scheme during construction as follows:

a. The Carbon Dioxide Delivery Terminal Compound is proposed to be constructed approximately 25 m to the north of the downstream end of the culverted section of the dyke; and

b. The Drax Power Station Site Construction Laydown Area proposed in the existing Woodyard is located approximately 60 m to the west from the downstream end of the culverted section of the watercourse.

12.9.6. Considering the distance between the Proposed Scheme / laydown area proposed in the existing Woodyard and the open section of Carr Dyke, the vast majority of potential sediment load is likely to be trapped before it reaches the watercourse. Furthermore, surface water runoff generated in the area of the Drax Power Station Site Construction Laydown Areas located between the cooling towers, is currently captured and discharged to Carr Dyke via piped system approximately 400 m downstream of the cooling towers. Surface water runoff generated in this laydown

area has the potential to transport increased sedimentation load into Carr Dyke and impact its water quality. The sensitivity of Carr Dyke is high and the magnitude of potential impacts is considered to be moderate adverse. The significance of effects without mitigation is therefore envisaged to be temporary, indirect, short term **large adverse**.

12.9.7. The unnamed drain along the eastern side of New Road (reference SW06 on **Water Constraints Part 3 (Figure 12.3)**) is located along the western boundary of the proposed East Construction Laydown Area. There is a potential risk that increased sediment load generated by stored materials and construction activities within the East Construction Laydown area and also generated due to construction vehicles movement along New Road, would be conveyed into the drain and impact its quality. The sensitivity of the unnamed drain is medium, and the magnitude of potential impacts is considered to be major adverse. The significance of effects without mitigation is therefore envisaged to be temporary, direct, short term **moderate adverse**.

12.9.8. Carr Lane Drain (reference SW08 on **Water Constraints Part 3 (Figure 12.3)**) flows approximately 15 m to the south of East Construction Laydown Area. There is a potential risk that increased sediment load generated by stored materials, construction activities and movement of construction vehicles along Carr Lane, can be conveyed into the drain and impact its quality. The sensitivity of Carr Lane Drain is high and the magnitude of potential impacts is considered to be moderate adverse. The significance of effects without mitigation is therefore envisaged to be temporary, indirect, short term **moderate adverse**.

Increased Risk of Pollution to Surface Water Features from Accidental Spillages of Oil, Hydrocarbons and Hazardous Substances

12.9.9. The release of oils and hydrocarbons is typically caused by a larger number of vehicles accessing the Site, refuelling of vehicles and plant, leakage from oil / fuel storage tanks and accidental spillages leading to polluted runoff migrating to surface water features. The release of hydrocarbons and oils into on-site drainage systems or from direct runoff is the second most common form of pollution after increased sediment loading. Hydrocarbons form a film on the surface of the water body, deplete oxygen levels and can be toxic to freshwater fish. Even at very low concentrations the film can negatively impact on the visual appearance of the water body.

12.9.10. The use of hazardous products on site can present a pollution risk because of the potential for accidental spillages, and the uncontrolled release of washdown water and surface water runoff, particularly containing concrete and cement products. If materials and activities are not stored and carried out in designated areas, runoff and washdown may enter a water body and adversely affect the aquatic environment or contaminate surface water abstractions. The most common source of pollution is from concrete and cement products. These products are highly alkaline and corrosive - fish can be physically damaged and their gills blocked, and both vegetation and the bed of the receiving water body can be smothered.

12.9.11. As discussed above, the Carbon Dioxide Delivery Terminal Compound and one of Drax Power Station Site Construction Laydown Areas are proposed to be located

approximately 25 m and 60 m to the north and west of the downstream end of the culverted section of Carr Dyke (reference SW01 on **Water Constraints Map - Figure 12.3**) respectively. Furthermore, the area of the laydown proposed between the cooling towers is currently drained into Carr Dyke. The laydown areas will be used for laydown and fabrication. There is potential risk that pollution from accidental spillages and / or leakage of oil, hydrocarbons and hazardous substances would find their way to Carr Dyke and impact its water quality. The sensitivity of Carr Dyke is high, and the magnitude of impact is assessed to be moderate adverse. The significance of the potential effect without mitigation is therefore envisaged to be temporary, indirect, short term **moderate adverse**.

12.9.12. Unnamed Selby Area IDB drain with reference 44 (reference SW04 on **Water Constraints Map - Figure 12.3**) is located approximately 80 m to the north of the East Construction Laydown Area. A review of the OS map suggests that the highway drain located along New Road (reference SW06 on **Water Constraints Part 3 (Figure 12.3)**) discharges to that IDB drain. There is therefore a risk that potential pollution from accidental spillage and / or leakage of oil, hydrocarbons and hazardous substances would be transported via the highway drain to the IDB drain with reference 44. Considering the distance between the East Construction Laydown Area and the IDB drain, the potential pollution is unlikely to reach the drain. The sensitivity of the drain is high, and the magnitude of the potential impact is assessed to be moderate adverse. The significance of effects without mitigation is therefore envisaged to be temporary, indirect, short term **moderate adverse**.

12.9.13. The unnamed highway drains along New Road (reference SW06 on **Water Constraints Part 3 (Figure 12.3)**) is also located along the western boundary of the East Construction Laydown Area. There is therefore potential risk that potential pollution from accidental spillages and leakage would flow into the drain. The sensitivity of the drain is medium, and the magnitude of the potential impact is assessed to be major adverse. The significance of effects without mitigation is therefore assessed to be temporary, direct, short term **moderate adverse**.

12.9.14. Carr Lane Drain (reference SW08 on **Water Constraints Part 3 (Figure 12.3)**) flows approximately 15 m to the south of East Construction Laydown Area, along northern side of Carr Lane. There is an increased risk that pollution from potential spillages and / or leakage in the laydown area would be transported overland into the drain. The sensitivity of Carr Lane Drain is high, and the magnitude of the potential impact is assessed to be major adverse. The significance of effects without mitigation is therefore assessed to be temporary, indirect, short term **large adverse**.

12.9.15. River Ouse (reference SW09 on **Water Constraints Part 3 (Figure 12.3)**) flows approximately 1.4 km downstream of the proposed Carbon Dioxide Delivery Terminal Compound . In addition, surface water runoff generated within the Drax Power Station Site, including the areas where construction activities will take place and part of the Drax Construction Laydown Area between the cooling towers, is discharged to the River Ouse. Surface water runoff from Drax Power Station is pumped via a piped system approximately 1.8 km long into the River Ouse. Considering the distance between the Carbon Dioxide Delivery Terminal Compound and the River Ouse, the potential pollution is likely to be partially trapped and diluted before it reaches the

River Ouse. However, there is increased risk that pollution from accidental spillages and leakage of oil, hydrocarbons and hazardous substances accidently released during construction of the Proposed Scheme or in a laydown area located between the cooling towers can be transported via the existing surface water drainage system into the River Ouse. The sensitivity of the River Ouse is very high, and the magnitude of the potential impacts is assessed to be major adverse. The significance of the potential effects without mitigation is therefore envisaged to be temporary, indirect, short term **very large adverse**.

12.9.16. The unnamed drain flowing along the western boundary of the Order Limits (reference SW27 on **Water Constraints Part 3 (Figure 12.3)**) is located approximately 60 m to the west of the Proposed Scheme and Drax Construction Site Laydown Areas located in the western part of Drax Power Station Site. The laydown areas are to be used for laydown, fabrication and local construction. There is potentially increased risk that pollution released from accidental spillages and leakage of oil, hydrocarbons and hazardous substances can flow overland into that ditch and can impact its water quality. Considering the distance between the drain and construction activities within the Drax Power Station Site, it is unlikely that potential pollutants would reach the drain. The sensitivity of the drain is high, and the magnitude of the potential impact on the water quality of the drain is assessed to be moderate adverse. The significance of effects without mitigation is therefore assessed to be temporary, indirect, short term **moderate adverse**.

Chemical and Physical Alteration of the Sherwood Sandstone Principal Aquifer

12.9.17. The Proposed Scheme has the potential to increase pollution risks to the Sherwood Sandstone principal aquifer from spillage of fuels and other harmful substances during the construction phase. Where the Sherwood Sandstone is in hydraulic connectivity with the overlying deposits at surface, spills of fuels, oils or wet concrete could migrate through the topsoil and superficial deposits into the Sherwood Sandstone aquifer, causing it to be polluted by hazardous substances. Furthermore, the construction of the Proposed Scheme would involve piling, which could create a preferential pathway for contaminants to pollute groundwater. The Proposed Scheme will involve sub-surface pipelines which transport liquid CO_2 from Carbon Capture Plant to Carbon Dioxide Delivery Terminal Compound and cooling water from the Carbon Capture Wastewater Treatment Plant to the cooling system. Both the treated cooling water and liquid CO_2 are considered as inert non-contaminants to the principal aquifers.

12.9.18. Physical changes to the deeper subsurface (>5 m below ground surface) have potential to interrupt deeper groundwater flow paths. This would include earthworks and civil works such as the sheet piling. Due to the depth of the Sherwood Sandstone Principal aquifer (shallowest depth on site at 18.75 mBGL) it is not expected that deep groundwater flows or groundwater levels within this unit would be impacted by the Proposed Scheme.

12.9.19. The sensitivity of the Sherwood Sandstone Principal aquifer is High, and the magnitude of change, prior to mitigation, is Minor. Therefore, the likely effects of the Proposed Scheme on the Sherwood Sandstone aquifer during the construction

phase without mitigation, has been assessed as a temporary, direct, short term, **moderate adverse** effect.

Chemical and Physical Alteration of the Secondary A Aquifers

12.9.20. The Proposed Scheme has the potential to increase pollution risks to the Secondary A aquifers on Drax Power Station Site from spillage of fuels and other harmful substances during the construction phase. Areas in which the Secondary A aquifers are at surface, spills of pollutants such as fuels, oils or vehicle hydraulic fluids could infiltrate into the ground and then into the saturated aquifers causing pollution of groundwater. Furthermore, the construction of the Proposed Scheme would involve piling, which could create a preferential pathway for contaminants to pollute groundwater. The sub-surface pipelines which transport liquid CO_2 and cooling water (described in **paragraph 12.9.17**) are considered as inert non-contaminants to the Secondary A aquifers.

12.9.21. Physical changes to the shallow subsurface as a result of all excavation works have potential to interrupt shallow groundwater flow paths. This would include civil works sheet piling, any excavations related to the enabling works including the preparation of the laydown areas, car parks, haul roads, site preparation, levelling and piling, and any excavation or below ground structures related to the Carbon Capture Plant and Common Plant installations.

12.9.22. As the majority of the Drax Power Station Site is covered by the Hemingbrough Glaciolacustrine Formation, which is expected to act as an aquitard, only minor changes to groundwater flows would be expected through this deposit. This includes the area in which sheet piling is proposed, where the formation is recorded at over 10 m thickness (British Geological Survey (a), n.d.). Areas of the Site in which the Breighton Sand Formation, alluvium and Warp Clay are present are likely to be more susceptible to groundwater flow changes. Alteration of the deposits or introduction of no-flow barriers may result in a change in the shallow groundwater flow. Furthermore, any groundwater control or dewatering measures may result in a temporary loss of water from storage and the reduction in water levels within the Secondary A aquifers.

12.9.23. The sensitivity of the Secondary A aquifer receptors are Medium, and the magnitude of change, prior to mitigation, is Moderate. Therefore, the likely effects of the Proposed Scheme on the Secondary A aquifers during the construction phase has been assessed as a temporary, direct, short term, **moderate adverse** effect.

Pollution of the Groundwater abstractions for Non-Potable Use

12.9.24. There are five licenced industrial and agricultural abstraction boreholes within 1 km of the Order Limits that are expected to be abstracting from the Sherwood Sandstone; of these abstractions two are Drax Power Station abstraction boreholes. As outlined in **Section 12.7.25** deep groundwater flows are influenced by the Drax Power Station abstractions. The APS Grower Ltd and Hambleton Abstraction Partnership boreholes are to the west / southwest of the Order Limit and likely contribute to the groundwater flow direction; however, their abstraction rates are much lower than the Drax Power Station licenced abstraction rates. Therefore, any pollution spilled on Site into the

Sherwood Sandstone aquifer would likely migrate in a west / southwest direction towards the Drax Power Station abstractions, resulting in a negative water quality impact of the abstraction water.

12.9.25. The sensitivity of the groundwater abstractions for non-potable use are Medium, and the magnitude of change, prior to mitigation, is Moderate. Therefore, the likely effects of the Proposed Scheme to the non-potable groundwater abstractions operated by Drax Power Station during the construction phase, has been assessed as a temporary, indirect, short term, **moderate adverse** effect.

Pollution or Recharge Alteration of the Public Water Supply Abstractions (Yorkshire Water)s (SPZ 3 protection at Site)

12.9.26. The Proposed Scheme has the potential to increase pollution risks to the area of the Sherwood Sandstone Principal aquifer within the SPZ Zone 3, shown on the **Water Constraints Part (Figure 12.1)**. This SPZ 3 indicates that all groundwater found within it and within the Sherwood Sandstone Principal aquifer will eventually reach the public water supply abstractions to which the SPZ is assigned. Therefore, any pollutants (e.g., fuels, oils, lubricants etc.) spilled within the SPZ would have the potential to migrate to the abstraction also. This could result in pollution of the public water supply. Due to the distance of the Proposed Scheme from the Yorkshire Water Supplies (over 3 km), the likely dispersion / dissolution of any pollutants, the influence the Drax Power Station abstraction wells have on groundwater flow directions at the Site and the majority of the Site being covered by the Hemingbrough Glaciolacustrine Formation which is expected to act as an aquitard (limiting downwards flow potential where present), the potential magnitude of the effect is considered to already be significantly reduced.

12.9.27. The majority of the Site is currently covered by impermeable hardstanding, with the Proposed Scheme increasing the permanent impermeable area by ~1.86 ha. It needs to be noted that this figure is indicative and presents the worst-case scenario in terms of new hard surfaced area. It is likely that this indicative figure will be reduced at the detailed design stage of the project. Also, considering the size of the SPZ 3, which extends far beyond the Order Limits, any reduction in groundwater recharge to the Sherwood Sandstone within the SPZ 3 due to the Proposed Scheme is expected to be negligible.

12.9.28. The sensitivity of the Yorkshire Water public water supply abstractions is Very High, and the magnitude of change, prior to mitigation, is Minor. Therefore, the likely effect of the Proposed Scheme to the Yorkshire Water abstraction boreholes during the construction phase, has been assessed as a temporary, indirect, short term, **moderate adverse** effect.

Increased Risk of Flooding to Drax Power Station Site, Construction Workers, and People and Properties elsewhere caused by Temporary Works in the Existing Floodplain

12.9.29. Based on the present-day flood mapping received from the Environment Agency, the Drax Power Station Site, and East Construction Laydown Area are protected by the existing flood defences for flood events (including overtopping of the flood defences)

up to and including the 1 in 200 year event. The Environment Agency's flood mapping also shows that the entire Drax Power Station Site is outside the floodplain during the breach scenario. The breach mapping also shows that the northern and southern end of the East Construction Laydown Area may potentially be flooded during a breach of existing flood defences. Breach of the existing flood defences is minimised as the flood defences are regularly checked and maintained by the Environment Agency to ensure they provide appropriate protection. The construction works will therefore be undertaken in the area protected by the existing flood defences and will not increase risk of flooding to the local receptors. The sensitivity of the receptors is considered very high, and the magnitude of impact is no change. The significance of the potential effects is therefore envisaged to be **neutral**.

OPERATIONAL PHASE

12.9.30. The likely significant effects for Water Environment associated with the operational phase are set out below.

Deterioration of the Quality of Surface Water features caused by Potential Pollutants Contained in Routine Runoff Generated in the area of the Proposed Scheme

12.9.31. Some areas of the Proposed Scheme have potential for increased risk of accidental pollution from the leakage of amine, chemicals and oil which could be transported via the surface water drainage systems into the Carr Dyke and the River Ouse where this system currently discharges to. The sensitivity of Carr Dyke and the River Ouse is high and very high respectively. The magnitude of the potential impact on the water quality of Carr Dyke and the River Ouse is assessed to be major adverse, with the significance of effects assessed to be temporary, indirect, short term **very large adverse** for both water features.

Increased Flood Risk to Drax Power Station, People and Properties elsewhere Associated with an Increase in the Rate and Volume of Surface Water Runoff from an Increase in Impermeable Areas at Drax Power Station Site

12.9.32. Currently surface water runoff generated within the Drax Power Station Site is collected by a network of surface water sewers which direct these waters to the "purge", at which point they are joined by all other waters (i.e., cooling water) to be discharged to the water environment and pumped into the River Ouse. The Proposed Scheme will increase the amount of hard surfaced area within Drax Power Station Site, and this will result in an increase in the surface water runoff generated in this area. There is potential risk that the increased runoff from the Drax Power Station Site could increase the risk of flooding to Drax Power Station, people and properties downstream of the Proposed Scheme. The sensitivity of these receptors is very high, and the magnitude of the potential impact on them is assessed to be major adverse. The significance of effects is therefore envisaged to be temporary, indirect, long term **very large adverse**.

Future Risk of Flooding to the Proposed Scheme Associated with its Location within the Floodplain

12.9.33. As discussed in **Section 12.7 'Future Baseline'**, the results of the hydraulic modelling undertaken as part of the FRA, shows that part of the Proposed Scheme

would be built in the area shown to be at risk of flooding during the 1 in 200 year mixed fluvial / tidal event. There is therefore an increased risk that the Proposed Scheme, which is considered essential infrastructure and therefore needs to stay operational during flood events, would be flooded during the 1 in 200 year mixed fluvial / tidal flood event. The sensitivity of the Proposed Scheme is very high, and the magnitude of the potential impact is assessed to be major adverse. The significance of effects is therefore assessed to be permanent, direct, long term **very large adverse**.

12.9.34. Further details on the flood risk are provided in the **FRA** in **Appendix 12.1**.

Increased Risk of Flooding to Drax Power Station, People and Properties elsewhere caused by loss of Floodplain

12.9.35. Part of the existing infrastructure of Drax Power Station would be demolished to allow construction of the Proposed Scheme. The results of the hydraulic modelling carried out as part of the FRA, show that part of the demolished footprint area and part of the Proposed Scheme area are located within the area at risk of flooding. A comparison of these footprints shows that the area of the Proposed Scheme is approximately 1,900 m^2 greater than the footprint of the infrastructure which is to be demolished. As a result, construction of the Proposed Scheme would reduce the existing floodplain storage and increase the risk of flooding to the Drax Power Station, people and properties elsewhere if not appropriately mitigated. Further information is provided in the **FRA** in **Appendix 12.1**. Based on this, the magnitude of the potential increased risk of flooding to Drax Power Station, people and properties elsewhere caused by loss of floodplain is assessed to be major adverse. The sensitivity of these receptors is very high. The significance of effect is therefore assessed to be **very large adverse**.

12.10. DESIGN, MITIGATION AND ENHANCEMENT MEASURES

12.10.1. This section sets out the design, mitigation and enhancement measures which are likely to be required to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment.

DESIGN

12.10.2. The paragraphs below summarise the measures that need to be included in detailed design of the Proposed Scheme to mitigate risks to the sensitive receptors. These will be secured through a DCO requirement, as outlined in the **Register of Environmental Actions and Commitments (REAC)** (document reference 6.5).

POLLUTANTS CONTAINED IN ROUTINE RUNOFF GENERATED IN THE AREA OF THE PROPOSED SCHEME

12.10.3. The Proposed Scheme would include a system of containments to mitigate potential risk of pollution surrounding site area and / or environment.

12.10.4. The following areas would include containment measures to collect potentially contaminated surface water runoff:

a. Solvent Storage and Make-up System;

b. Chemicals for Carbon Capture Waste Water Treatment Plant;

c. Chemicals for Quench Column; and

d. Chemicals for Absorber Column.

12.10.5. These areas would be kerbed or bunded to collect surface water runoff. These would be designed in accordance with the COSHH / COMAH / HSE guidance / Guidance for Pollution Prevent (GPPs) (NetRegs, n.d.) requirements at the detailed design stage. Consideration would be given to any additional requirements to prevent damage to the sensitive infrastructure from debris during flood events. Discharge valves would be kept closed and water collected would be tested (approach subject to detailed design) to identify if contaminants are present. Where the water meets discharge criteria the surface water would be discharged in line with the Drax Power Station discharge consent. If the surface water does not meet consent conditions it would either be transferred to the Carbon Capture Waste Water Treatment Plant for treatment or, if contaminant levels are such that they cannot be treated on site, to a storage tank prior to removal and treatment off site under a waste transfer licence to a suitable licensed wastewater treatment facility. The environmental controls to operate these areas would be included in the Drax Power Station Environmental Management System (EMS) certified in accordance with the ISO 14001.

12.10.6. Oil Storage for the Flue Gas Booster Fans, CO_2 compressor and air compressor unit would be designed in accordance with the Control of Pollution (Oil Storage) (England) Regulations 2001. All potentially oil contaminated storm water in these areas would be collected into the oil water drain pit and transferred to the existing oily wastewater system.

12.10.7. Rich Solvent / Lean Solvent Heat Exchangers would be individually bunded. The bunds would be designed in accordance with the COSHH / COMAH / HSE guidance / GPPs requirements at the detailed design stage.

12.10.8. Tanker / chemical unloading bays dependant on risk / impact (the risk to be confirmed during detailed design) would either be designed as fully bunded areas or with suitable protection measures to prevent any spillages entry the on-site surface water drainage systems. The bunds, if required, would be designed in accordance with the COSHH / COMAH / HSE guidance / GPPs requirements at the detailed design stage.

12.10.9. There would be additional control measures in accordance with the ISO 14001 certified EMS for the Proposed Scheme in order to control surface water runoff that could become contaminated by chemicals and oil. These would include, but not be limited to, the following:

a. Minimum twice daily checks would be carried out to inspect for chemical and oil leakage. Furthermore, there is constant presence of the key operative staff at Drax Power Station Site, who would undertake informal inspections as part of their other duties and be able to immediately address any issues;

b. Drip trays, or similar, would be installed under pumps to capture any potential leaks; and

c. Containment trays / pans and shrouds will be installed for Plate Heat Exchanger (PHE).

12.10.10. Leakage detection systems will be considered for high risk areas during detailed design.

12.10.11. The surface water drainage network for the Proposed Scheme will include oil separators as required during detailed design in accordance with the best practice.

POLLUTANTS CONTAINED IN FIRE WATER RUNOFF

12.10.12. In accordance with the existing site operating procedures / emergency plan should a major fire incident occur at Drax Power Station Site, the valve in the main 'purge' pump (the discharge to the River Ouse) would be closed with fire waters retained within Drax Power Station Site. These would then be treated / transported off site if needed.

INCREASE IN THE RATE AND VOLUME OF SURFACE WATER RUNOFF FROM AN INCREASE IN IMPERMEABLE AREAS AT DRAX POWER STATION SITE

12.10.13. A surface water drainage strategy has been produced for the Proposed Scheme and is provided in **Appendix 12.3 (Surface Water Drainage Strategy)** (document reference 6.3.12.3). Surface water runoff is currently collected across the Drax Power Station Site via a network of surface water sewers. The Proposed Scheme would include a new arrangement whereby surface water would then be directed to a new sump and pump arrangement which would direct the waters to the Northern Cooling Water Reservoir. The collected runoff would then be utilised as cooling water. Current operations at Drax Power Station use water abstracted from the River Ouse for cooling and surface water is discharged to Carr Dyke and the River Ouse. The proposed surface water drainage strategy therefore provides a more sustainable solution and provides betterment to the existing situation.

CONSTRUCTION WITHIN THE EXISTING FLOODPLAIN

12.10.14. The hydraulic modelling carried out as part of the **FRA** (**Appendix 12.1**), show that parts of the Proposed Scheme, namely Carbon Dioxide Delivery Terminal Compound, Carbon Dioxide Processing and Compression Plant, Carbon Capture Wastewater Treatment Plant and Solvent Storage and Make-Up System, would be constructed in the areas indicated to be at risk of flooding during the 1 in 200 year mixed fluvial / tidal event.

12.10.15. In accordance with 'Flood Risk and Costal Change' guidance (Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government , 2021), the Proposed Scheme is considered as essential infrastructure which needs to stay operational during flood events. The proposed Scheme would include infrastructure which is required to maintain the operation of the Proposed Scheme ("sensitive infrastructure") and could be adversely impacted by flood waters. In order to mitigate the potential risk of flooding to the sensitive infrastructure, it is proposed that the sensitive infrastructure is elevated 800 mm above the modelled flood levels for the design scenario and for sensitive infrastructure located outside of the design and sensitivity floodplains a minimum

freeboard of 300 mm would be included. In addition, a sensitivity analysis was carried out as part of the hydraulic modelling exercise, to investigate potential impact of other more extreme scenarios on the Proposed Scheme. The proposed elevation of the sensitive infrastructure by 800 mm above the flood level modelled for the design scenario will also provide sufficient mitigation for the sensitivity check scenarios.

12.10.16. Further details on the flood risk mitigation are provided in the **FRA** in **Appendix 12.1**. The dDCO includes a requirement that the Proposed Scheme must be carried out in accordance with the FRA.

MITIGATION

Construction and Decommissioning

12.10.17. A **Register of Environmental Actions and Commitments (REAC)** has been produced for the Proposed Scheme (document reference 6.5). The **REAC** outlines how the actions and commitments set out within it (and described in this section) are secured and includes within it a requirement for a Construction Environmental Management (CEMP) and Decommissioning Environmental Management Plan (DEMP) to be produced for the Proposed Scheme. The CEMP and DEMP would be used to manage the potential environmental impacts that could result from the construction / decommissioning of the Proposed Scheme. Thus ensuring suitable actions are in place to mitigate the potential impacts.

12.10.18. This will set out how construction activities will be undertaken in accordance with appropriate good practice guidance, such as CIRIA's - Control of water pollution from construction sites (C532) (Construction Industry Research and Information Association (CIRIA) (c), 2001). GPP (NetRegs, n.d.) provide good practice guidance, particularly PPG1 - General guide to the prevention of water pollution; GPP 2 - Above ground oil storage tanks; GPP 5 - Works and maintenance in or near water; and GPP 6 - Working at construction and demolition sites.

12.10.19. The CEMP and DEMP will contain construction method statements and work instructions for on-site staff that will inform them of the way that they should work on Site to reduce the risk of polluting the surrounding environment. It will include instructions on dealing with certain situations such as general good site practice, adverse weather conditions, environmental incidents and complaints.

12.10.20. The CEMP / DEMP will include inspections and audits along with general monitoring and reporting of the effectiveness of control measures.

12.10.21. The mitigation strategies implemented would be reviewed regularly to best suit the practices currently being undertaken on Site.

12.10.22. The CEMP and DEMP will detail procedures such as sediment and pollution management in order to prevent potential deterioration of the WFD status of surface and groundwater features. The CEMP will also describe the procedures in the event of an environmental emergency such as a fuel or chemical spillage.

12.10.23. The CEMP and DEMP will implement, but it will not be limited to, the following mitigation measures in order to mitigate impacts to the water environment:

INCREASED SEDIMENT LOAD

12.10.24. The following measures would be implemented to reduce impacts due to increased sediment load:

a. Stockpiling of materials would be carried out at a minimum of 10 m from surface water features;

b. Stockpiles would be appropriately managed e. g. by using jute matting to mitigate release of sediment load;

c. No activities would take place in Carr Dyke or within 7 m its open channel or piped section without prior consent from the Selby Area IDB. As this will be secured pursuant to the DCO, no separate Land Drainage consent will be required. This rule also relates to any other ordinary watercourse within the Order Limits;

d. Surface water management plan would be prepared for construction phase to ensure that the runoff is appropriately managed, so it does not increase risk of pollution to the environment;

e. All loose materials would be covered;

f. Construction activities including vegetation clearance, earth moving, storage of materials and equipment and plant movement in the vicinity of any surface water feature or drainage lines would be minimised;

g. Land clearance in the vicinity of surface water features would be minimised. If land clearance in the vicinity of surface water features is unavoidable, the features would be protected with, but not limited to, silt traps, silt fences and filter bunds;

h. Temporary cut-off drains would be used uphill and downhill of the working areas to prevent clean runoff entering and dirty water leaving the working area without appropriate treatment;

i. Vegetation would only be removed when necessary and gradients kept as shallow as possible to prevent large amounts of earth being washed away during periods of heavy rainfall;

j. Areas of ground that have been exposed would be reseeded or surfaced as soon as reasonably practicable;

k. Facilities would be provided for wheel washing to prevent “track out” from vehicles. Wheel wash facilities would be appropriately contained to ensure that silt laden water would not reach surface water features;

l. Cut off ditches, silt fencing or similar measures, would be provided along the perimeter of the Site to capture any runoff from the Site;

m. Surface water run-off and excavation dewatering would be captured and settled out prior to water being discharged through the Purge to the River Ouse or to the IDB drains.. Runoff from potentially highly contaminated areas would be treated appropriately prior to discharge;

n. Measures to protect drains and surface water features from increased sediment load would be implemented for example by labelling / marking drains, using straw bales, silt fencing or silt traps;

o. All the existing drains and sewers within the Drax Power Station Site would be identified and labelled and measures implemented to prevent polluting substances from entering them; and

p. Soil and stockpiles would not be located within 10 m of water bodies or drainage lines.

RELEASE OF HYDROCARBONS AND OILS AND USE OF HAZARDOUS MATERIALS

12.10.25. The following measures would be implemented to reduce impacts as a result of the release of hydrocarbons, oil and hazardous materials:

a. Appropriate interceptors would be incorporated in the on-site drainage systems;

b. Spill containment equipment would be stored on the Site;

c. Hazardous substances, oil and fuel would not be located within 10 m of water bodies or drainage lines and would be stored in bunded areas holding at least 110% of the container or one quarter of the combined capacity of all containers where there are more than one. Storage and bunded areas would be constructed with impervious floors;

d. Refuelling of machinery would be undertaken in bunded areas, which would not be located within 10 m of water bodies or drainage lines;

e. All refuelling would be supervised and carried out in a designated area with appropriate cut-off drainage and located away from watercourses and drainage lines.

f. Drip trays would be used for diesel pumps and standing plant would be regularly maintained to prevent leaks;

g. Construction materials, such as cement, would be mixed in designated areas located away from water bodies and drainage lines;

h. Concrete wash out would only take place at designated concrete washout areas; and

i. Topsoil and other construction materials would not be stored in the northern and southern parts of East Construction Laydown Area, which is shown to be at risk of flooding in the breach scenario.

DUST AND DEBRIS

12.10.26. Dust management procedures would be applied to minimise air quality management issues which would also minimise impacts to the water environment. Refer to **Chapter 6 Air Quality** (document reference 6.1.6) of this ES for dust mitigation measures.

GROUNDWATER

12.10.27. If temporary pumping of groundwater in excavations is required, appropriate consents would be obtained from the Selby Area IDB and / or the Environment Agency.

12.10.28. A Piling Risk Assessment would be produced to outline measures to protect the underlying aquifers during construction and mitigate risks of creating preferential pathways for potential contamination to the aquifers. Additionally, risk assessments would be undertaken for any construction proposals entailing significant groundworks (especially those which are proposed to include excavations).

FLOOD RISK

12.10.29. No works would be carried out within the Order Limits when there is a risk of breach of the existing flood defences. Furthermore, should an event larger than the design event (1 in 200 years) be forecast then no works would be carried out within the Order Limits.

12.10.30. No stockpiles, no hazardous materials and / or site cabins, plant and equipment would be placed in the northern and southern ends of East Construction Laydown Area, which are shown to be at risk of flooding during a breach of existing flood defences for the 1 in 200-year event.

12.10.31. A Method Statement would be developed by the main contractor detailing the procedures for securing the Site and plant equipment for a flood event (breach of the defences), in particular with reference to safe working practises, harmful substances and fuels.

12.10.32. The appointed contractor would sign up to the Environment Agency flood warning service to receive up to date flood information and warnings.

Operation

12.10.33. The current environmental management system for the Drax Power Station Site, which is certified to ISO14001, would be updated to incorporate any new procedures and update current procedures in order to control environmental impacts as a result of the operation of the Proposed Scheme.

12.10.34. The proposed surface water drainage strategy is based on a principle of reuse of the runoff generated in the Proposed Scheme, which would require a new connection to the existing northern cooling water system. The proposed drainage strategy would require minor changes to the existing surface water drainage network, as such in these instances the current design standards would be retained. In locations where more substantial works are required, the design standards would be in accordance with design principles as per **Surface Water Drainage Strategy Report** (**Appendix 12.3**).

12.10.35. Construction of the Proposed Scheme in the existing floodplain would reduce the existing floodplain storage which would increase the risk of flooding to Drax Power Station, people and properties elsewhere. To mitigate the potential impact on the risk of flooding, floodplain storage compensation (a minimum floodplain area of 1,889 m^2)

will be provided by land lowering to create additional floodplain in land under the control of the Applicant. This will ensure that there is no change to the existing situation in terms of flood risk. Further details are provided in the **FRA** (**Appendix 12.1**). A DCO requirement ensures that the Proposed Scheme is carried out and operated in accordance with the FRA.

Opportunities for Environmental Enhancement

12.10.36. In order to achieve 10% net gain for biodiversity, there would be enhancements to river habitat in the local area. Enhancements may not be possible within the Order Limits, so opportunities to achieve the biodiversity net gain target are being considered elsewhere in consultation with the Environment Agency, Yorkshire Wildlife Trust, Yorkshire Dales Rivers Trust and Selby Area IDB.

12.10.37. Currently surface water runoff generated in the area of Drax Power Station Site is discharged into the River Ouse and Carr Dyke. In addition, water for the cooling process is abstracted from the River Ouse. The proposed surface water drainage strategy consists of utilisation of surface water runoff in the cooling process that would reduce the amount of water abstracted from the River Ouse, and also it would reduce the amount of water discharged from Drax Power Station Site. The proposed surface water drainage strategy provides sustainable solution, and it would provide a betterment to the existing situation.

12.11. ASSESSMENT OF LIKELY SIGNIFICANT EFFECTS

12.11.1. This section details the assessment of significant effects taking account of the secondary mitigation detailed in **Section 12.10** above.

CONSTRUCTION AND DECOMMISSIONING PHASES

Increased Risk of Pollution from Increased Sediment Load

12.11.2. The following water features could be affected by the increased sediment load:

- **a.** Carr Dyke (reference SW01 on Water Constraints map - Figure 12.3);
- **b.** Unnamed drain along the eastern side of New Road (reference SW06 on **Water Constraints Part 3 (Figure 12.3)**); and
- **c.** Carr Lane Drain (reference SW08 on **Water Constraints Part 3 (Figure 12.3)**).

12.11.3. The sensitivity of Carr Dyke and Carr Lane Drain is high and the sensitivity of the unnamed drain along New Road is medium. Taking into account the mitigation measures identified above, the magnitude of the impact would be negligible. It is therefore considered that there would be a temporary, indirect, short term **slight adverse** effect.

Increased Pollution Risk from Accidental Spillage and Leakage of Oil, Hydrocarbons and Hazardous Substances

12.11.4. The following water features could be affected by accidental spillage and leakage of oil, hydrocarbons and hazardous substances:

- **a.** Carr Dyke (reference SW01 on Water Constraints map - Figure 12.3);

b. Unnamed Selby Area IDB drain with reference 44 (reference SW04 on **Water Constraints Part 3 (Figure 12.3)**);

c. Unnamed highway drain along New Road (reference SW06 on **Water Constraints Part 3 (Figure 12.3)**);

d. Carr Lane Drain (reference SW08 on **Water Constraints Part 3 (Figure 12.3)**);

e. River Ouse (reference SW09 on **Water Constraints Part 3 (Figure 12.3)**); and

f. Unnamed drain (reference SW27 on **Water Constraints Part 3 (Figure 12.3)**).

12.11.5. Measures outlined above are considered adequate to reduce the likelihood of spillages. The sensitivity of the above receptors is medium to very high. Taking into account the mitigation measures identified above, the magnitude of the impact is considered to be negligible. It is therefore considered that there would be a temporary, indirect, short term **slight adverse** effect.

Chemical and Physical Alteration of the Sherwood Sandstone Principal Aquifer

12.11.6. It has been noted that the Sherwood Sandstone Principal aquifer could be affected by the spillage and subsequent infiltration of pollutants during the construction phase. Construction works would be undertaken in accordance with the mitigation outlined above and best practice and appropriate method statements. Implementation of measures identified in the Piling Risk Assessment would protect the aquifer from contamination via preferential flow pathways resulting from piling works. This will largely mitigate potential impacts to the Sherwood Sandstone Principal aquifer from this proposed activity.

12.11.7. The sensitivity of the Sherwood Sandstone receptor is High, and the magnitude of change following applied mitigation is Negligible. Therefore, the impact of the Proposed Scheme on the Sherwood Sandstone aquifer during the construction phase has been assessed as a temporary, direct, short term, **slight adverse** effect.

Chemical and Physical Alteration of the Secondary A Aquifers

12.11.8. The Secondary A aquifers could be affected by the spillage of pollutants during the construction phase. Construction works would be undertaken in accordance with the mitigation outlined above and best practice and appropriate method statements. Furthermore, implementation of the Piling Risk Assessment would protect the aquifer from contamination via preferential flow pathways resulting from piling works. This would mitigate potential impacts to the Secondary A aquifers and reduce the risk of pollution.

12.11.9. The sensitivity of the Secondary A aquifer receptors are Medium, and the magnitude of change following mitigation is Minor. Therefore, the impact of the Proposed Scheme on the Secondary A aquifers during the construction phase has been assessed as a temporary, direct, short term, **slight adverse** effect.

Pollution of the Groundwater Abstractions for Non-Potable Use

12.11.10. There are five licenced industrial and agricultural abstractions within 1 km of the Order Limits which could be affected by any pollutants spilled on site that would migrate into the Sherwood Sandstone aquifer from which they abstract water. As

outlined in **Section 12.10.10** The implementation of the mitigation measures outlined above, and the measures identified in the Piling Risk Assessment would mitigate potential impacts to the Sherwood Sandstone Principal aquifer. Therefore, the non-potable abstraction boreholes would also be protected by these same mitigation measures.

12.11.11. The sensitivity of the groundwater abstractions for non-potable use is Medium, and the magnitude of change following mitigation is Negligible. Therefore, the impact of the Proposed Scheme to the groundwater abstractions for non-potable use during the construction phase, has been assessed as a **neutral** effect.

Pollution or Recharge Alteration of the Public Water Supply Abstractions (Yorkshire Water) (SPZ 3 protection)

12.11.12. The public water supply abstractions (Yorkshire Water) could be affected by any pollution spilled on site that would migrate into the Sherwood Sandstone Principal aquifer. As outlined in **Section 12.10.10,** the implementation of the mitigation measures detailed above, and a Piling Risk Assessment would mitigate potential impacts to the Sherwood Sandstone aquifer. Therefore, the public water supply abstractions would be indirectly protected from receiving pollutants from the Sherwood Sandstone Principal aquifer. The increase in impermeable area was identified as having an insignificant effect on recharge to the SPZ 3 area due to the change in impermeable area only being 0.02% of the overall SPZ3 area, therefore no mitigation was required.

12.11.13. The sensitivity of the public water supply abstractions (Yorkshire Water) are Very High, and the magnitude of change following mitigation is Negligible. Therefore, the likely effects of the Proposed Scheme to the Yorkshire Water abstraction boreholes during the construction phase, has been assessed as a temporary, indirect, short term, **slight adverse** effect.

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Deterioration of the Quality of Surface Water Features caused by Potential Pollutants Contained in Routine Runoff Generated in the area of the Proposed Scheme

12.11.14. Taking into account the proposed pollution prevention measures described in **Section 12.10**, the magnitude of the potential deterioration of the water quality of Carr Dyke and the River Ouse caused by potential pollutants contained in routine runoff generated in the area of the Proposed Scheme is assessed to be no change. The sensitivity of Carr Dyke and the River Ouse is high and very high respectively. It is therefore considered that there would be a **neutral** effect.

Increased Flood Risk to Drax Power Station, People and Properties elsewhere Associated with an Increase in the Rate and Volume of Surface Water Runoff from an Increase in Impermeable areas at Drax Power Station Site

12.11.15. Taking into account the proposed **Surface Water Drainage Strategy** provided in **Appendix 12.3** (document reference 6.3.12.3), the magnitude of the potential impact to Drax Power Station, people and properties elsewhere associated with an increase in the rate and volume of surface water runoff from an increase in impermeable areas

at Drax Power Station Site would be minor beneficial. The sensitivity of these receptors is high. It is therefore considered that there would be a permanent, direct, long term **moderate beneficial** effect.

Increased Risk of Flooding to Drax Power Station, People and Properties Elsewhere caused by Loss of Floodplain by Construction Works

12.11.16. Taking into account the proposed mitigation measures described in **Section 12.10**, the magnitude of the potential increased risk of flooding to the Proposed Scheme, people and properties elsewhere would be no change. The sensitivity of these receptors is very high. It is therefore considered that there would be a **neutral** effect.

ASSESSMENT AGAINST FUTURE BASELINE

12.11.17. Hydraulic modelling undertaken as part of the FRA considers climate change impact during the design life of the Proposed Scheme. The climate change allowances (refer to the **FRA** which is provided in **Appendix 12.1**) used in the model were agreed with the Environment Agency. The proposed mitigation in relation to the risk of flooding, as discussed in **Section 12.10**, are based on the results of the hydraulic modelling, and therefore considers the impact of future climate change.

12.11.18. As discussed in **Section 12.7 'Future Baseline'**, future climate change impacts are envisaged to result in increased rainfall intensity, that could result in increased surface water runoff generated within Drax Power Station Site. This could eventually impact the capacity of the existing surface water drainage system. The existing surface water drainage system is planned to be redesigned as part of the Proposed Scheme as set out in the **Surface Water Drainage Strategy** (**Appendix 12.3**) so that surface water runoff is utilised in the existing cooling system. It is assumed that the surface water drainage system will be redesigned so it considers the impact of future climate change.

12.11.19. As determined through the WFD screening and scoping exercise, the Proposed Scheme is not anticipated to affect WFD status of nearby water bodies, nor prevent the nearby water bodies from achieving Good ecological status in the future.

12.12. CUMULATIVE EFFECTS

12.12.1. An assessment of intra-project combined effects and inter-project cumulative effects for the Proposed Scheme has been carried out and is presented in **Chapter 18 (Cumulative Effects)** of this ES.

12.13. IN-COMBINATION CLIMATE CHANGE IMPACTS

12.13.1. As discussed in **paragraph 12.11.17 (Assessment against future baseline)** above, the design mitigation measures recommended in relation to the risk of flooding consider impact of future climate on peak river flows and sea level rise for the design life of the Proposed Scheme.

12.14. MONITORING

CONSTRUCTION AND DECOMMISSIONING

12.14.1. No requirements for water quality monitoring during the construction and decommissioning phases have been identified.

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12.14.2. The existing discharge permit held by Drax Power Station requires water to be monitored prior to discharge to the River Ouse / Carr Dyke. The existing monitoring regime would be retained or enhanced as required to ensure permit compliance.

12.14.3. As detailed in **Section 12.10 paragraphs 12.10.21 to 12.10.24** monitoring would also be carried out prior to discharging water captured on the Drax Power Station Site to Carr Dyke and the River Ouse. These monitoring requirements would be incorporated into the Drax Power Station environmental management system.

Table 12.14 - Summary of Water Environment Effects

Receptor	Potential Effects	Additional Mitigation	Residual Effects
Construction and Decommissioning Phase			
Carr Dyke (reference SW01 on Water Constraints map - Figure 12.3)	Increased sedimentation caused by surface water runoff from areas of bare earth, construction materials such as aggregate and stockpiles of topsoil.	Implementation of measures during construction to minimise the creation of silt and dust, and to minimise silt laden run off reaching watercourses and drains.	**Slight Adverse (insignificant)** T / I / ST
Unnamed drain along the eastern side of New Road (reference SW06 on Water Constraints map - Figure 12.3)	Increased sedimentation caused by surface water runoff from areas of bare earth, construction materials such as aggregate and stockpiles of topsoil.	Implementation of measures during construction to minimise the creation of silt and dust, and to minimise silt laden run off reaching watercourses and drains.	**Slight Adverse (insignificant)** T / I / ST
Carr Lane Drain (reference SW08 on Water Constraints map – Figure 12.3)	Increased sedimentation caused by surface water runoff from areas of bare earth, construction materials such as aggregate and stockpiles of topsoil.	Implementation of measures during construction to minimise the creation of silt and dust, and to minimise silt laden run off reaching watercourses and drains.	**Slight Adverse (insignificant)** T / I / ST
Carr Dyke (reference SW01 on Water Constraints map - Figure 12.3)	Increased pollution risks in caused by accidental spillage of fuels and other harmful substances.	Implementation of measures on site to capture the release of harmful substances from accidental spillages.	**Slight Adverse (insignificant)** T / I / ST
Unnamed Selby Area IDB drain with reference 44 (reference SW04 on Water Constraints map - Figure 12.3)	Increased pollution risks in caused by accidental spillage of fuels and other harmful substances.	Implementation of measures on site to capture the release of harmful substances from accidental spillages.	**Slight Adverse (insignificant)** T / I / ST
Unnamed highways drain along New Road (reference SW06 on Water Constraints map - Figure 12.3)	Increased pollution risks in caused by accidental spillage of fuels and other harmful substances.	Implementation of measures on site to capture the release of harmful substances from accidental spillages.	**Slight Adverse (insignificant)** T / I / ST
Carr Lane Drain (reference SW08 on Water Constraints map - Figure 12.3)	Increased pollution risks in caused by accidental spillage of fuels and other harmful substances.	Implementation of measures on site to capture the release of harmful substances from accidental spillages.	**Slight Adverse (insignificant)** T / I / ST
River Ouse (reference SW09 on Water Constraints map - Figure 12.3)	Increased pollution risks in caused by accidental spillage of fuels and other harmful substances.	Implementation of measures on site to capture the release of harmful substances from accidental spillages.	**Slight Adverse (insignificant)** T / I / ST
Unnamed drain (reference SW27 on Water Constraints map - Figure 12.3)	Increased pollution risks in caused by accidental spillage of fuels and other harmful substances.	Implementation of measures on site to capture the release of harmful substances from accidental spillages.	**Slight Adverse (insignificant)** T / I / ST
Sherwood Sandstone Principal Aquifer Sherwood Sandstone Principal Aquifer	Increased pollution risks caused by accidental spillage of pollutants. Alteration of groundwater flow paths.	Implementation of measures on site to capture the release of harmful substances from accidental spillages. Provision of a Piling Risk Assessment (and other comparable assessments) which would include measures to protect the underlying aquifers during Construction.	**Slight Adverse (insignificant)** T / I / ST
Secondary A aquifers	Increased pollution risks caused by accidental spillage of pollutants. Alteration of groundwater flow paths.	Implementation of measures on site to capture the release of harmful substances from accidental spillages. Provision of a Piling Risk Assessment (and other comparable assessments) which would include measures to protect the underlying aquifers during Construction.	**Slight Adverse (insignificant)** T / D / ST
Groundwater abstractions for non-potable use	Increased pollution risks caused by accidental spillage of pollutants.	Implementation of measures on site to capture the release of harmful substances from accidental spillages. Provision of a Piling Risk Assessment (and other comparable assessments) which would include measures to protect the underlying aquifers during Construction.	**Slight Adverse (insignificant)** T / I / ST
Operational Phase			

Receptor	Potential Effects	Additional Mitigation	Residual Effects
Carr Dyke (reference SW01 on Water Constraints map - Figure 12.3)	Deterioration of the quality of surface water features caused by potential pollutants contained in routine runoff generated in the area of the Proposed Scheme.	Implementation of pollution prevention measures and a monitoring regime for surface water prior to discharge.	**Neutral**
River Ouse (reference SW09 on Water Constraints map - Figure 12.3)	Deterioration of the quality of surface water features caused by potential pollutants contained in routine runoff generated in the area of the Proposed Scheme.	Implementation of pollution prevention measures and a monitoring regime for surface water prior to discharge.	**Neutral**
Drax Power Station, people and properties elsewhere	Increased flood risk associated with an increase in the rate and volume of surface water runoff from an increase in impermeable areas at Drax Power Station Site.	Implementation of the surface water drainage strategy as detailed in **Appendix 12.3**.	**Moderate Beneficial P / D/ LT**
Drax Power Station	Increased risk of flooding due to the Proposed Scheme being within the existing floodplain.	Implementation of the proposed flood mitigation measures as per Section 12.10, raising sensitive equipment by 800 mm above modelled design flood level. The magnitude of the impact with the implementation of the mitigation is considered to be no change.	**Neutral**
Drax Power Station, people and properties elsewhere	Increased flood risk associated with loss of floodplain caused by construction of the Proposed Scheme.	Floodplain storage compensation will be provided by land lowering to create additional floodplain in land under the control of the Applicant.	**Neutral**

Key to table:

P/T = Permanent or Temporary, D/I = Direct or Indirect, ST/MT/LT = Short Term, Medium Term or Long Term, N/A = Not Applicable

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