



HABITATS REGULATIONS ASSESSMENT – VOLUME 3 – APPENDIX 7

SAC Habitat Monitoring

Drax Bioenergy with Carbon Capture and Storage

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations, 2009 – Regulation 5(2)(g)

Document Reference Number: 6.8.3.7

Applicant: Drax Power Limited

PINS Reference: EN010120



REVISION: 01

DATE: February 2022

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PUBLIC

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1. INTRODUCTION

1.1. BACKGROUND

- 1.1.1. WSP UK Ltd (WSP) was commissioned by Drax Power Limited (the 'Applicant') to undertake habitat survey work to support a Habitats Regulations Assessment (HRA) (APP-185) which was prepared for the Drax Bioenergy Carbon Capture and Storage (BECCS) 'Proposed Scheme' (as it will be hereafter referred). The Proposed Scheme is a Nationally Significant Infrastructure Project (NSIP). A Development Consent Order (DCO) application was submitted to the Secretary of State (SoS) in May 2022 and accepted for examination in June 2022.
- 1.1.2. The habitat survey forms part of several other elements of technical work to support the HRA process. Select publicly accessible points along the River Derwent Special Area of Conservation (SAC) and the Lower Derwent Valley (SAC, SPA, and Ramsar) were selected and were subjected to habitat monitoring to understand condition and habitat composition. This document is a factual report which sets out the results of this habitat survey.

1.2. RATIONALE

- 1.2.1. Air quality modelling has been undertaken for the Proposed Scheme. Part of the modelling has been used to assess the impacts of the Proposed Scheme and the resulting effects on relevant designated sites of international and national importance. To facilitate the modelling, certain habitat types were selected (usually comprising one or more habitat types or related habitat types for which each of the designated sites were designated). Comparing the air quality effects of the Proposed Scheme against the relevant critical loads supports assessment and understanding of air quality effects on designated sites.
- 1.2.2. The assessment was made with regard to 'critical loads'¹ of relevant habitat types within designated sites. River habitats do not usually have critical loads associated with them. On this basis, the Applicant completed their submission Habitats Regulations Assessment report (document reference APP-184) with reference to a Technical Note that examined the relative balance of phosphate and nitrate in the River Derwent, informed by Environment Agency water quality monitoring data (APP-194).
- 1.2.3. As per the Environment Agency monitoring data, the ratio of N:P in the River Derwent was found to be heavily skewed towards phosphate limitation; i.e. phosphate rather than nitrate, is the limiting macronutrient. In addition, the River Derwent is in a partly agricultural watershed, and inputs of nutrient nitrogen arising from aerial deposition

¹ Critical loads are defined as 'a quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge' Source:

will therefore be outweighed by inputs from agricultural run-off. On this basis, the Applicant HRA's report concludes that aerial inputs of nitrogen from the Proposed Scheme would not trigger LSE to the River Derwent.

1.2.4. In their Relevant Representation ('RR') (AS-011), Natural England stated that:

'...As stated in our advice dated 5 May 2022, potential air quality impacts on supporting habitats associated with the River Derwent SAC, including riparian habitats, such as wet woodland and fen, should be assessed. We note that no critical load has been provided for nitrogen deposition for the River Derwent SAC in the Environmental Statement - Volume 3 - Appendix 6.5: Operational Phase Air Quality Results Tables: Ecological Receptors. As previously stated, we recommend that the critical load for the most sensitive riparian habitat type is used as a proxy value; the relevant critical levels/loads for 'Fen, Marsh and Swamp' and 'Broadleaved, Mixed and Yew Woodland' can be found on Air Pollution Information System (APIS) (2022) to inform the assessment...'

1.2.5. Habitat-specific critical loads are assigned on the APIS website². Critical loads are typically assigned against EUNIS (European Union Nature Information System) habitat classes, although where no suitable EUNIS class exists they may be classified against the Annex 1 habitat type(s) for which a site has been designated. The EUNIS habitat classification is a system covering the terrestrial and marine habitat types of the European land mass and its surrounding seas. It is hierarchical in structure, with three levels. For example, EUNIS category D includes 'Mires, bogs, and fens'. EUNIS category D4 refines this further, including 'base-rich fens and calcareous spring mires'. EUNIS category D4.1 refines this yet further, including the habitat type 'Rich fens, including eutrophic tall-herb fens and calcareous flushes and soaks'. At the finest scale of habitat classification, EUNIS category D4.1G identifies the habitat type 'Small herb alkaline fens'.

1.2.6. Habit-specific critical loads are typically assigned against levels two and three of the EUNIS system. For example, a critical load range of 10 – 20kg N/ha/yr is provided for 'broadleaved deciduous woodland', which is EUNIS habitat G1. Critical load ranges are also provided for more defined woodland habitats. A critical load range of 15 – 20kg N/ha/yr is provided for 'meso- and eutrophic Quercus woodland', which is EUNIS habitat G1.A.

1.2.7. Given the heavily phosphate-limited nature of the River Derwent, the Applicant considers that the Technical Note (APP-194) appended to the DCO submission HRA Report (APP-085) supports a finding of no adverse effects on integrity in relation to nitrogen deposition impacts on the River Derwent SAC and SSSI.

² Relevant pages for this Note include: [REDACTED] 965, which provides information for the broad woodland habitat type recommended for use by NE; and [REDACTED] which provides information for the broad fen, marsh and swamp habitats recommended for use by NE.

- 1.2.8. The Applicant has nevertheless considered the advice offered by Natural England in relation to use of proxy habitats and completed additional work in response. This has included use of air quality dispersion modelling data to quantify theoretical nitrogen deposition to relevant habitat types requested by Natural England. The Applicant has also completed ground-truthing surveys, in order to confirm the presence (or potential presence) of the habitat types identified by Natural England in their RR, as quoted above.

1.3. PURPOSE OF THIS NOTE

- 1.3.1. The purpose of this Note is therefore to:
- a. Report the factual findings of the field surveys undertaken;
 - b. Assign appropriate EUNIS or Annex 1 habitat classification types to the River Derwent and its supporting habitat;
 - c. Assign the appropriate critical loads for nitrogen deposition against the River Derwent SAC and SSSI, for use in the assessment of air quality effects;
 - d. Present the outcomes of dispersion (air quality) modelling for the River Derwent SAC including comparison against the selected critical loads; and
 - e. Revisit the assessment of potential for LSE on the qualifying interests of the River Derwent SAC, notwithstanding the Applicant considers the finding of no LSE presented in the Applicants HRA Report (APP-185) remains valid.

2. METHODOLOGY

2.1. APPROACH

FIELD SURVEY

- 2.1.1. A field visit was undertaken in November 2022 at select points along the River Derwent, including habitats in proximity to the river but also upstream along tributaries and within the surrounding habitats, largely located within the Lower Derwent Valley SAC, SPA, and Ramsar Site. Locations visited were all within 15km of the Main Stack at the existing Drax Power Station Site. The field visit was based on existing habitat survey techniques including JNCC's Phase 1 habitat survey and Nature Conservation Council's (NCC) National Vegetation Classification (NVC) and targeted habitats specific to the River Derwent SAC and the Lower Derwent SAC. The survey did not though comprise a full extended Phase 1 habitat or NVC survey.
- 2.1.2. The habitat survey was undertaken to identify whether areas of marsh, water-fringed vegetation, and/or fen habitats were present. The habitat survey also included inspection of blocks of woodland within and in proximity to the Lower Derwent SAC, including the banks of and tributaries to the River Derwent. Where blocks of woodland were present, the survey sought to identify the tree species present and assess the evident ground conditions, in order to identify the type(s) of woodland habitats present. Survey point locations for targeted data gathering and recording were chosen at various locations ranging from ~1.5km from the Drax Power Station Site to approximately 15km north of the Main Stack (upstream) along the River Derwent.
- 2.1.3. Locations likely to support woodland habitats within ~100m of the River Derwent and within the Lower Derwent Valley SAC were located from aerial imagery. This aerial imagery analysis was completed to enable the survey to be targeted to locations with woodland cover, in case these may not have been apparent when completing survey of the banks of the River Derwent itself.
- 2.1.4. The survey point locations are represented by 'P' and a number, such as P1, P2 up to P15. Habitat features, characteristics and vascular plant species were noted at each point and used to make an assessment of the habitat type. Each survey point location is displayed on Figure 1.
- 2.1.5. The habitat survey was undertaken by a suitably competent ecologist who holds a Botanical Society of Britain and Ireland (BSBI) Level 4 Field Identification Skills Certificate (FISC).

DISPERSION (AIR QUALITY) MODELLING

- 2.1.6. A detailed description of the technical approach to the dispersion modelling is set out in Section 6.5 of the Air Quality Chapter of the Environmental Statement (APP-042). Additional detail on updated emissions abatement measures and the resulting changes to the dispersion modelling is set out in the Revised Emissions Abatement Technical Note (document reference 8.9.4).

2.2. NOTES AND LIMITATIONS

- 2.2.1. The habitat survey was not undertaken during the optimal time for habitat or botanical surveying, being completed in late-autumn 2022. As a result, some botanical indicator species may not have been evident. This may pose a limitation on identifying specific indicator species, which in turn introduces some limitations on the reliability of habitat classification (e.g. because many annual flowering plants have died back by the time of the year the survey was completed).
- 2.2.2. This was considered a relatively greater limitation for habitats that might comprise 'Fen, Marsh, and Swamp', as these habitats include a high proportion of vegetation that dies back over the winter. A range of wetland and grassland forms could however still be identified in these areas as set out in the results. For areas of potential 'Broadleaved, Mixed and Yew Woodland', the majority of deciduous trees were still in leaf and could be identified to genus or species level; hence the seasonality of the survey was considered at most a minor limitation for woodland habitats.
- 2.2.3. Overall, the survey work enabled broad classification of the habitats present, including where applicable assignment of an appropriate EUNIS habitat category. Evidence of habitat management and presence of biennial and perennial vascular plant species enabled a sufficient assessment of each habitat type studied.

3. RESULTS

3.1. OVERVIEW

- 3.1.1. This section summarises the results of the habitat survey at each survey point location including the types of habitats present and vascular plants species recorded. Photographs of each survey point location are included in **Appendix A, Table 2**. **Figure 1** displays each survey point location and the relevant international sites.

3.2. SURVEY LOCATIONS

Table 1 - Survey Point Location Reference and Habitat Descriptions

Survey Point Location	Habitat Description
P1	Mosaic of farmland habitats, fringes of bramble <i>Rubus fruticosus</i> agg. scrub, <i>Rumex</i> sp. stands, and an isolated parcel of young willow <i>Salix</i> sp. dominated scrub.
P2	Farmland / improved grassland parcels within Lower Derwent Valley SAC and alongside River Derwent with <i>Rumex</i> sp. And nettle <i>Urtica dioica</i> patches. River Derwent fringed by common reed <i>Phragmites australis</i> .
P3	River Derwent banksides dominated by common reed with intermittent <i>Rumex</i> sp. Grassland parcels show evidence of improvement either side of river with numerous stands of <i>Rumex</i> sp. and <i>Heracleum sphondylium</i> , <i>Cirsium</i> sp. <i>Taraxacum</i> sp. and <i>Ranunculus</i> sp.
P4	<i>Salix</i> dominated woodland with <i>Fraxinus excelsior</i> . Woodland parcel is located outside of Lower Derwent Valley SAC boundary but comprises typical alluvial forest species.
P5	Managed grassland with intermittent bankside <i>Crataegus</i> and <i>Salix</i> scrub stands with <i>Rumex</i> sp.
P6	<i>Salix</i> and <i>Alnus</i> dominated tree line with intermittent <i>Fraxinus excelsior</i> within Lower Derwent Valley SAC.
P7 – P9, P11	Mosaic of grasslands with evidence of agricultural improvement. Bordered by <i>Salix</i> sp. and <i>Alnus</i>

	dominated woodland parcels including <i>Alnus</i> treelines and <i>Salix</i> sp. scrub.
P10	<i>Alnus</i> dominated woodland with <i>Quercus</i> sp. and coniferous species present. Evidence of grassland improvement beyond woodland parcel.
P12	River Derwent bankside dominated by <i>Phragmites australis</i> and scattered <i>Crataegus monogyna</i> with intermittent <i>Salix</i> sp. scrub. Grasslands showed signs of improvement with <i>Rumex</i> sp. and <i>Cirsium</i> sp. scattered throughout.
P13	<i>Salix</i> sp. dominated woodland with intermittent <i>Fraxinus excelsior</i> trees.
P14	River Derwent bankside dominated by <i>Phragmites australis</i> and <i>Crataegus monogyna</i> with intermittent <i>Salix</i> sp. Evidence of agricultural improvement within adjacent grasslands.
P15	Evidence of agricultural improvement within grasslands either side of river. Some <i>Salix</i> sp. stands along riverbank.
P16	Managed grasslands with evidence of agricultural improvement either side of River Derwent. Intermittent <i>Salix</i> sp. scrub located along bankside with <i>Phragmites australis</i> .
P17	Managed grasslands either side of River Derwent. <i>Phragmites australis</i> and <i>Rumex</i> sp. located along river banksides.

3.3. INTERPRETATION OF FIELD SURVEY

FEN, MARSH AND SWAMP HABITAT PRESENCE

- 3.3.1. The surveys did not record any habitats that were determined to comprise ‘fen, marsh, or swamp’ habitats (EUNIS category D). Common reed *Phragmites australis* was recorded in several locations subject to survey. This species is listed in the habitat description for the EUNIS habitat type ‘rich fens, including eutrophic tall-herb fens and calcareous flushes and soaks’ (EUNIS category D4.1³).
- 3.3.2. Whilst common reed can be a constituent species of habitat type D4.1, its presence on the fringes of the River Derwent is better-aligned with one of the habitats falling under the ‘littoral zone of inland surface waterbodies’ habitat type (EUNIS category C3). ‘Water-fringing reedbeds and tall helophytes other than canes’ (EUNIS category C3.2⁴) is considered to be the most appropriate fit for the available habitat data.
- 3.3.3. Some of the categories under the ‘sedge and reedbeds, normally without free-standing water’ habitat category (EUNIS category D5⁵) include common reed as a listed species in the habitat description. However, these habitats do not typically support free-standing water, and hence are not considered a good fit for habitats in the littoral zone of the River Derwent, which are regularly under water.
- 3.3.4. No species included in the descriptions of the other ‘fen, marsh and swamp’ habitat category used on APIS (valley mires, poor fens and transition mires, EUNIS Category D2⁶) were recorded.

WOODLAND HABITAT TYPES PRESENT

- 3.3.5. Several woodland blocks were recorded during the November habitat survey, as described in Table 1 (see rows P4, P6, P7 – P9, P10, and P13). These were typically dominated by alder *Alnus glutinosa*, willows *Salix sp.*, ash *Fraxinus excelsior*, and oak *Quercus sp.*
- 3.3.6. Given the species composition recorded and their setting in the floodplain of the River Derwent and its tributaries, these woodlands are best characterised as the ‘alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)’. This habitat type is understood not to have a EUNIS category and does not have a critical load assigned by APIS due to not being sensitive to aerial nitrogen deposition. It is however a qualifying interest of the Lower Derwent Valley SAC, with Annex 1 habitat code 91E0⁷. The presence of this habitat type is therefore also indicated by the Lower Derwent Valley SAC citation information.

³ Habitat description available at [REDACTED]

⁴ Habitat description available at [REDACTED]

⁵ Habitat description available at [REDACTED]

⁶ Habitat description available at [REDACTED]

⁷ Annex 1 habitat description available at [REDACTED]

3.3.7. On the basis of the tree and ground flora species recorded and the floodplain setting, 'broadleaved, mixed and yew woodland' is not considered to be an appropriate classification for the surveyed woodlands.

3.4. AIR QUALITY OUTPUTS

SELECTED CRITICAL LOADS

3.4.1. The survey data has been used to confirm the likely presence or absence of habitats Natural England advised should be used to model nitrogen deposition impacts on the River Derwent SAC and SSSI. Table 2, below, sets out the habitats that have been selected as proxies for modelling nitrogen deposition impacts on the River Derwent. The table includes a description of why each habitat and its corresponding critical load range has been selected.

Table 2 – Selected Habitats and Critical Loads

Habitat Type	Critical Load range (kg N/ha/yr)	Reason for selection
Rich fens, including eutrophic tall-herb fens and calcareous flushes and soaks (EUNIS category D4.1)	15 – 30	The habitat category 'water-fringing reedbeds and tall helophytes other than canes' (EUNIS category C3.2) is considered the best fit for the habitats recorded. There is however no critical load range or other advice assigned to habitat category C3.2 on APIS. Given the indications of agricultural improvement recorded during the field survey and the presence of common reed, EUNIS category D4.1 (falling under the 'fen, marsh and swamp' broad habitat category) is considered the closest fitting habitat for assignment of a critical load range.
Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i>, <i>Alnion incanae</i>, <i>Salicion albae</i>)	None – habitat not sensitive to nitrogen deposition ⁸	Habitat survey data and Lower Derwent Valley SAC citation indicate the woodland blocks surveyed are characteristic of this habitat type.

⁸ As set out on APIS, available at [REDACTED] and summarised in Appendix 193 of the Applicant's submission HRA Report (APP-193).

PROPOSED SCHEME IMPACTS ASSESSED AGAINST CRITICAL LOADS

3.4.2. Table 3 below, summarises the results of the updated dispersion modelling for the River Derwent SAC ‘Fen, Marsh and Swamp’ habitats. It should be noted that the modelled outputs are based on the main ‘mid-merit’ scenario assessed in the Environmental Statement (see Appendix B of the Applicant’s Responses to Relevant Representations and Additional Submissions Rev 1 (ASS-038) with the modelling reflecting the updated mitigation position on emissions abatement as discussed in the Revised Emissions Abatement Technical Note (document reference 8.9.4).

Receptor	Critical Load used (kgN/ha/yr)	Max Baseline Predicted Environmental Concentration (PEC) (kgN/ha/yr)	Max Cumulative PEC (kgN/ha/yr)	Max Process Contribution (PC) (Impact) (kgN/ha/yr)	Max PC as % of Critical Load	Max Cumulative PEC as % of Critical Load
River Derwent SAC & SSSI	15 ⁹	30.25	30.34	0.10 – Cumulative PC 0.04 – Proposed Scheme Alone PC	0.6% - Cumulative 0.3% - Proposed Scheme Alone	202.3%

⁹ In accordance with the methodology used for dispersion modelling for the Proposed Scheme to date and general good practice for assessing air quality impacts on habitats, the lower end of the critical load range (i.e 15 kgN/ha/yr) has been used for this assessment

4. ASSESSMENT OF LIKELY SIGNIFICANT EFFECTS




- 4.1.1. Following EA guidance (Environment Agency, 2021), if the change in Process Contribution (PC) associated with the With Proposed Scheme mid-merit (cumulative) scenario meets both of the following criteria, impacts are considered to be insignificant and further assessment is not required:
- a. The short-term PC is less than 10% of the short-term environmental standard for the ecological receptor; and
 - b. The long-term PC is less than 1% of the long-term environmental standard for the ecological receptor.
- 4.1.2. If the above criteria are not met, additional criteria are applied as follows:
- a. If the short-term PC exceeds the above screening criteria, significant effects cannot be screened out and further assessment is needed; and
 - b. If the long-term PC is greater than 1% and the PEC is less than 70% of the long-term environmental standard, the emissions are insignificant, and no further assessment is required; or
 - c. If the PEC is greater than 70% of the long-term environmental standard, significant effects cannot be screened out and further assessment is needed.
- 4.1.3. The assessment of nitrogen deposition against critical loads is assessed against a long term (annual) standard. In other words, if annual deposition of nitrogen is modelled to exceed 1% of the critical load and the PEC is greater than 70% of critical load, further assessment would be needed. If annual deposition of nitrogen is modelled to be less than 1% of the critical load, impacts are considered to be insignificant and further assessment is not required.
- 4.1.4. The Proposed Scheme alone leads to a maximum cumulative impact of up to 0.3% of critical load. The cumulative impact with other plans and projects is modelled to be up to 0.6% of critical load. In both instances this is less than 1% of the critical load, i.e. the long-term PC is less than 1% of the long-term environmental standard. Following the EA guidance referred to above at paragraph 4.1.1, the impacts of the Proposed Scheme, both alone and in-combination, are considered to be insignificant in relation to fen marsh and swamp habitats. As set out in Table 2, alluvial forest habitats are not considered sensitive to the effects of aerial nitrogen deposition, and hence no significant effects are predicted to occur.




Figure 1: River Derwent SAC / Lower Derwent Valley SAC Habitat Monitoring

APPENDIX A: PHOTOGRAPHS

Table 3: Photographs of Survey Point Locations

Photograph	Survey Point Location
	P1
	P1
	P2

	<p>P3</p>
	<p>P4</p>
	<p>P5</p>
	<p>P5</p>

	P6
	P10
	P11



P11



P12



P13



P14



P15



P16

