



Longcroft Wind Farm Technical Appendix 8.7: Shadow Habitats Regulations Appraisal: (Screening)

In Support of Proposed Planning Application for Onshore
Wind Farm

RES

Prepared by:

SLR Consulting Limited

Quartermile Two, 2nd Floor, 2 Lister Square,
Edinburgh, EH3 9GL

SLR Project No.: 405.064862.00001

25 October 2023

Revision: Draft

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
01	25 October 2023	Peter Wigglesworth and Sally Wilding	Nicola Tyrrell	Nicola Tyrrell
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Executive Summary

SLR Consulting Ltd was commissioned by Renewable Energy Systems Ltd (RES) (the applicant) in March 2023 to undertake a Shadow Habitats Regulations Appraisal (HRA) to include screening in support of an onshore wind farm, named Longcroft Wind Farm (the proposed development). The proposed development is located north-east of the A697, approximately 8.5km north-north-east of Lauder in the Scottish Borders. The site is within the administrative boundary of Scottish Borders Council.

For the purpose of this appraisal, the term 'site' refers specifically to the area within the red line boundary, within which up to 19 wind turbines will be erected along with associated electrical infrastructure, a network of access tracks (including 12 watercourse crossings of which 8 are new (i.e., no existing track)), and temporary construction compounds and areas for the erection of cranes. Only the areas that have been assigned for wind turbines and their associated infrastructure will be cleared for development.

This appraisal was informed by relevant SLR reports including an Ecology Desk Study Report¹, UKHab and NVC Survey Report² and Environmental Impact Assessment³; including the Terrestrial Ecology a chapter therein. Designated site citation sheets are provided in Appendix A. Relevant scoping response provided by NatureScot is detailed herein.

This appraisal meets the requirements of a HRA by assessing applicable International and European statutory designated sites that have the potential to be affected by development. Applicable statutory designated sites; including, Ramsar sites, Special Protection Area (SPAs) and Special Areas of Conservation (SACs). Noting that this assessment addresses non-avian receptors only and, as such, ornithological sites and receptors are screened out of assessment (e.g., SPAs). These will be addressed in separate assessment.

The appraisal process consists of two components known as screening and Appropriate Assessment (AA). **Chapter 8: Terrestrial Ecology** of the EIA provided robust and detailed assessment to provide for an appropriate assessment that concludes no potential likely significant effect(s) (LSE) to an International/ European site/feature, or where the screening process could not provide evidence to disprove the likelihood of potential LSEs, in the absence of mitigation.

The River Tweed SAC and Fala Flow Ramsar site was included within the appraisal given that the River Tweed SAC is located within the site/within the same catchment and the Fala Flow Ramsar is located within 10km of the site. A source-pathway-effect approach has been taken and no additional sites of non-avian interest are required to be included in this assessment. The River Tweed SAC is designated for its riverine system, otter and fish species, whilst the Fala Flow Ramsar site is designated for its wetland habitat consisting of blanket mire and pools.

Greenlaw Moor Ramsar, that includes two pools surrounded by an area of moorland which are habitats that underpin the Ramsar site designation, was initially considered within this screening assessment yet since the non-avian receptor (habitat) is c.16km from the site it is concluded the feature is beyond the zone of influence (ZOI) of works (i.e., lack of ecological/hydrological connectivity to the site for non-avian receptors).

¹ SLR Consulting (2023) Longcroft Wind Farm, *Environmental Impact Assessment Report. Chapter 8: Terrestrial Ecology, Technical Appendix 8.1: Desktop Study.*

² SLR Consulting (2023) Longcroft Wind Farm, *Environmental Impact Assessment Report. Chapter 8: Terrestrial Ecology, Technical Appendix 8.2: NVC Survey Report.*

³ SLR (2023) Longcroft Wind Farm, *Environmental Impact Assessment Report. Chapter 8: Terrestrial Ecology*



The screening assessment identified pathways that could lead to potential LSEs to the qualifying habitat and species of the River Tweed SAC or undermine the conservation objectives of the site/receptors during the construction, operation and decommission phases of the proposed development.

No pathways of effect were identified for the Fala Flow Ramsar after assessing pathways of effects, screening parameters and lack of ecological/hydrological connectivity; therefore, Fala Flow Ramsar was excluded from the need for further assessment accordingly.

Specifically, these effects identified in this screening assessment are in relation to potential direct or indirect effects of **direct and indirect habitat loss/degradation, impacts to aquatic receptors from in/near water works, reduced water quality (water and soil contamination), changes to waterflow, reduced air quality, mortality, disturbance due to noise/ vibration, lighting/ visual disturbance, displacement or introduction/ spread of invasive non-native species (INNS)** that could be introduced /exacerbated in the absence of mitigation measures.

As such, the River Tweed SAC and designated receptors required further assessment (provided for in **Chapter 8: Terrestrial Ecology, Chapter 10: Hydrology, Hydrogeology & Geology** and Technical Appendices including the Biodiversity Enhancement and Restoration Plan (BERP)). Proportionate and achievable avoidance, mitigation and enhancements were detailed to prevent adverse effects upon features of the European site, designated features and their conservation objectives. The avoidance and mitigation measures include, yet are not limited to adopting a comprehensive Construction Environmental Management Plan (CEMP) adhering to SEPA Guidelines for Pollution Prevention; the use of the least noise and vibration causing methods; avoidance of piling where possible; minimising watercourse crossings; and operation of site lighting to prevent light disturbance. A mitigation strategy will require to be fully defined (assuming planning permission will be granted) with the aim of no appreciable impact on any of the conservation objectives of the River Tweed SAC/receptors and therefore no adverse effects on the integrity of any European site.

This Shadow appraisal is provided to assist the Scottish Borders Council in its own assessment of the 'likely significant effects' of the proposed development and its own AA where relevant.



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1.0 Introduction

1.1 Background and Purpose of this Report

SLR Consulting were commissioned by Renewable Energy Systems (RES) Ltd (the applicant), in March 2023, to carry out a Shadow Habitats Regulations Appraisal (HRA) for the proposed construction and operation of an onshore wind farm, Longcroft Wind Farm (the proposed development).

It includes information for the Competent Authority (in this case the Scottish Borders Council) to determine if the proposed development works are likely to have a significant effect on 'European'/Internationally important sites with regard to their conservation objectives and whether there will be an adverse effect on the integrity of any the site/their features, with and without mitigation.

It should be noted that this appraisal covers non-avian elements only and that ornithology elements will be addressed separately as a Technical Appendix to **Chapter 9: Ornithology** (Ecology Consulting, 2023)⁴.

1.2 The Proposed Development

1.2.1 General Description

The applicant is proposing to construct, operate and eventually decommission an onshore wind farm, named Longcroft Wind Farm. The proposed development will consist of up to 19 wind turbines, with associated electrical infrastructure, crane hardstands and access tracks. Borrow pits may also be dug on-site (depending on availability of stone) for the purpose of gathering material for the various areas of hardstand required on-site. Temporary compounds will also be constructed to provide secure locations for office facilities and storage during the period of construction. The location of the proposed development can be found in **Drawing 01**. The proposed development is expected to operate for up to 50 years, following which decommissioning of the wind turbines and other infrastructure would be undertaken as required.

The likely significant effects (LSE) relevant with the decommissioning phase are anticipated at this time to present similarly to the construction phase; however, with the passage of time and changes to technical capabilities and ecological conditions, an HRA would be best repeated at that juncture and a recommendation to provide for this should be accounted for in the commitments of the proposed development.

The proposed development is entirely within the administrative bounds of Scottish Border Council ('SBC').

1.2.2 Phases

1.2.2.1 Timeline

A detailed time scale programme is yet to be fully defined; therefore, a start date is currently unknown. However, a general timescale has been provided below.

The timeline will be dependent on planning application approval (if successful) and appointment of a construction main works contractor among other requirements.

⁴ Ecology Consulting Ltd (2023) Longcroft Wind Farm EIA Chapter 9: Ornithology.



1.2.2.2 Pre-construction Forestry Clearance

No tree clearance is currently planned for the proposed development.

1.2.2.3 Construction Stage

Construction is estimated to last 16 months and will include the following construction/ installation activities (in chronological order and with indicative timescales):

- Activity 1 – mobilisation; to be undertaken in month one and two.
- Activity 2 – site entrance and access tracks; to be undertaken in months one to seven;
- Activity 3 – crane hardstands; to be undertaken in months two to eight;
- Activity 4 – wind turbine foundations; to be undertaken in months five to eleven;
- Activity 5 – substation and BESS compounds; to be undertaken in months seven to twelve;
- Activity 6 – cable installation; to be undertaken in months eight to twelve;
- Activity 7 – wind turbine deliveries; to be undertaken in months eleven to thirteen;
- Activity 8 – wind turbine erection; to be undertaken in months eleven to fifteen and;
- Activity 9 – operational takeover to be undertaken in months fifteen to sixteen.

Construction will adhere to considerate construction standards, with works generally occurring between Monday and Saturday 7:00am-19:00pm. Some exceptions will need to be made to the working hours during foundation pours and wind turbine erection.

Drawing 02 indicates 12 watercourse crossings of which 8 are new (i.e., no existing track). The design of the new crossings is to be fully determined by the Principal Contractor. For the purposes of this assessment, a worst case scenario is taken forward as a precautionary approach, in that the design will be mainly closed culverts and some bridges (e.g., WC11) with the natural watercourse bed lost for the full crossing width (estimated at 7m). The watercourses are narrow or dry in these areas so we have used a precautionary watercourse width of 50cm (equivalent to 7m x 0.5m x 8 new crossings = 28m², < 0.001 ha). Water flow and up-down stream connectivity for wildlife will be maintained. WC01 is an existing slab bridge to be upgraded.

1.2.2.4 Operational Stage

The proposed development is expected to operate for up to 50 years. Once operational the wind turbines on-site will be automated and there will be no permanent staff with minimal traffic associated. Maintenance and servicing will occur periodically and comprise the main source of traffic and other activity.

1.2.2.5 Decommissioning Stage

The proposed development would be designed with an operational life of 50 years. At the end of its operational life the proposed development would then be decommissioned in accordance with a Decommissioning and Restoration Plan (DRP) which would be submitted to SBC for approval prior to the start of decommissioning. Alternatively, a new application could be made to extend its operational life.

Decommissioning will involve similar levels of activity and disturbance as the construction phase with a few exceptions such as the cables being left in place to avoid unnecessary ground disturbance. The assessment of LSEs from the decommissioning phase are currently assumed to be similar to that of the construction phase of this assessment at this juncture,



yet it is advised this assessment be revisited at a future date in advance of decommissioning.

1.2.3 The Need for the Proposed Development

The creation of onshore wind farms is supported at both the national government and local level due to growing concern of carbon and other greenhouse gas emissions with regards to a changing climate. The National Planning Policy Framework states that the planning system should support the transition to a low carbon future by increasing the use and supply of low carbon energy sources⁵ and from a local standpoint the Scottish Borders Local Development Plan includes Policy ED9 which details renewable energy development and its support of onshore wind farms and wind turbines⁶.

The proposed development aims to capitalise on modern wind turbine technologies which will maximise the renewable energy capacity of the site. In light of the climate emergence the Scottish Government have set ambitious climate change and renewable energy targets in particular by setting statutory targets through the Climate Change (Emissions Reductions Targets) (Scotland) 2019 which now commit Scotland to cut greenhouse gas emissions by 75% by 2030 before reaching net zero in 2045. With the onshore wind sector likely to play the greatest role in achieving this substantial increase in renewable energy generation in the next decade, the Scottish Government's Onshore Wind Policy Statement 2022 has quantified this as requiring between 8 to 12GW of additional onshore wind generation by 2030.

The proposed development will deliver approximately 125.4MW of wind energy towards these targets.

1.2.4 General Description of the Site

For the purpose of this appraisal, the term 'site' refers specifically to the area within the red line boundary. The site is located c.8.5km north-north-east of Lauder and lies within the Scottish Borders Council area (centred on Ordnance Survey grid reference NT 55000 56000 central Ordnance Survey National Grid Reference NT 54410 55930). Access to the site can be gained via a network of private tracks leading from Longcroft Farm, which itself is accessed via the D124 leading from the A697. It covers an area of c.1,290ha with the proposed development occupying hills known locally as Hogs Law, Hunt Law, Peat Law and Riddel Law.

The topography of the site is undulating, ranging from c.215 metres (m) Above Ordnance Data (AOD) within the river valley at the site entrance, to c.490m AOD near the summit of Hunt Law within the north-west of the site. Landscape within the site is defined by two main watercourses and associated river valleys, the Soonhope Burn and Whalplaw Burn, which intersect the site in a north-east to south-west direction. Upland areas within the site are managed primarily as active grouse moor, while lower elevations are managed largely for sheep grazing.

1.3 Requirement for a Habitat Regulations Appraisal

This appraisal meets the requirements of a shadow HRA by assessing applicable statutory designated sites that have the potential to be affected by development. Applicable statutory

⁵ Department for Levelling Up, Housing and Communities (2023). *National Planning Policy Framework*; <https://www.gov.uk/government/publications/national-planning-policy-framework--2>

⁶ Scottish Borders Council (2016). *Local Development Plan*, Volume 1 Policies; https://www.scotborders.gov.uk/downloads/file/2017/ldp_-_volume_1_policies



designated sites include Ramsar wetlands of International importance and Special Protection Area (SPAs) and Special Areas of Conservation (SACs) of European importance. This non-avian assessment will consider SACs and Ramsars designated for non-avian features for a primary or secondary designation reason (ornithological sites and receptors will be covered in a separate assessment).

Due to the protection that international and European sites receive, it is necessary to undertake a HRA for any project that may have a functional connectivity to sites and their designated features (either ecologically or hydrologically connected). This appraisal consists of one component known as screening. An appropriate assessment (AA) or other assessment (in this case integration to **Chapter 8: Terrestrial Ecology**) is undertaken if a significant risk to a European or International site was deemed likely, or where the screening process could not provide evidence to disprove the likelihood of potential effects. Further details of the HRA processes are provided in Section 2.2.

It should be noted that a formal HRA must be undertaken by the Competent Authority, which in this case is SBC. This Shadow HRA Screening and the robust integration of AA to **Chapter 8: Terrestrial Ecology** aims to provide sufficient information to inform the Competent Authority and the applicant to determine the need for a further formal HRA (where required).

1.4 Consultation

NatureScot provided the following ecological advice regarding the site and its potential to impact international/ European designated sites:

'A Habitats Regulation Appraisal (HRA) will be required. We advise that sufficient information is provided in the EIA Report to enable the competent authority to carry out an appraisal of the likely impact of the proposed development on the qualifying interests of the River Tweed SAC.'

This Shadow HRA Screening forms a Technical Appendix to supplement the Environmental Impact Assessment (EIA) Report. **Chapter 8: Terrestrial Ecology** of the EIA Report takes forward the outcomes of the screening assessment to provide a full and robust assessment to address all potential LSEs.

1.5 Evidence of Technical Competence and Experience

Sally Wilding, MSc and associate member of the Chartered Institute of Ecology and Environmental Management (ACIEEM) has 5 years ecological consultancy experience and is a Senior Ecologist with experience in undertaking HRA assessments.

Peter Wigglesworth MA (Oxon) MSc has 5 years of ecological experience including working in the 3rd sector for environmental organisations and more recently working for SLR in the ecology and natural capital teams on a variety of projects.

Nicola Tyrrell BSc MSc CEnv MCIEEM is Technical Director with 17 years ecological consultancy experience, which has included preparing and overseeing assessments under the Habitats Regulations/Directive for multiple projects, including wind farm projects, throughout the UK. Nicola is the lead ecologist for the project and has reviewed each version of the HRA report prior to issue.



2.0 The HRA Process

2.1 Legislative Context

2.1.1 Habitats Directive and Habitats Regulations

The Habitats Directive (92/43/EEC) on the Conservation of Natural Habitats and of Wild Fauna and Flora (the 'Habitats Directive') protects habitats and species of European conservation importance. The Habitats Directive combines with the Council Directive (2009/147/EC) on the conservation of wild birds (the 'Birds Directive'), which protects rare, vulnerable and migratory bird species, to create the 'Natura 2000' network of European protected sites. European sites designated under the Habitats Directive are called Special Areas of Conservation (SACs), and those designated under the Birds Directive are Special Protection Areas (SPAs).

In Scotland these directives are implemented through the Conservation (Natural Habitats &c.) Regulations 1994 (the 'Habitats Regulations'), which cover terrestrial areas and territorial waters out to 12 nm. Waters beyond 12 nm, up to the extent of the British Fishery Limits and UK Continental Shelf Designated Area, are covered by the Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2017 (the 'Offshore Habitats Regulations').

Additionally, the Conservation on Wetlands of International Importance especially as Waterfowl Habitat 1971 (the 'Ramsar Convention') designates wetland sites for protection ('Ramsar sites'). The Scottish Government reiterated its policy on the protection of Ramsar sites in 2019⁷, specifically stating that "where Ramsar interests coincide with Natura qualifying interests protected under an SPA or an SAC, as the case may be, the interests are thereby given the same level of (legal) protection as Natura sites" and "where Ramsar interests are not the same as Natura qualifying interests but instead match Sites of Special Scientific Interest (SSSI) features, these receive protection under the SSSI regime".

2.1.2 Amendments Post EU Exit

Post-Brexit, The Habitats Regulations, S36 Habitats Regulations, and the Offshore Habitats Regulations remain in force, with the same protections retained, but UK sites are no longer part of the EU's Natura 2000 network, instead forming a national network of protected sites. Key terminology is primarily unchanged, with the terms 'European site', 'European marine site', 'European offshore marine site', 'Special Area of Conservation (SAC)' and 'Special Protection Area (SPA)' all being retained⁸.

In cases where no adverse effect on integrity (AEOI) can be proven, the Competent Authority (i.e., SBC, for projects of this type) would previously have been required to seek the opinion of the European Commission on whether the plan or project should be carried out for imperative reasons of overriding public interest (IROPI). Since exiting the EU, this now falls under the remit of the Scottish Ministers, who must seek the opinion of the Secretary of State, the Joint Nature Conservation Committee (JNCC), and any other person the Scottish Ministers consider appropriate.

2.1.3 National and Local Planning Policy

The need for HRA is re-iterated in national planning policy in Scotland and in Scottish Borders Local Development Plan. The Scottish Borders Local Development Plan provides a

⁷<https://www.gov.scot/publications/implementation-of-scottish-government-policy-on-protecting-ramsar-sites/>

⁸ <https://www.gov.scot/publications/eu-exit-habitats-regulations-scotland-2/documents/>



detailed approach to HRA in their Scottish Borders Council Habitats Regulation Appraisal document⁹, which was written as part of the updated Local Development Plan 2.

2.2 The Staged Methodology Process for HRA

Figure 2.1 summarises the steps to take when determining if a plan or project could affect a European Site.

With regards to the proposed development, an onshore wind farm project being progressed through the planning system is the answer to **Step 1** (further detail provided in Section 1.2). With respect to **Step 2**, as the proposed development is not directly connected with or necessary to site management for nature conservation, the proposed development is expected to progress to Step 3.

- Screening (included in Figure 2.1 as **Step 3**): Determination of potential for likely significant effect (LSE) of the proposal on International / European sites, either alone or in combination with other projects or plans. Mitigation measures cannot be considered at this stage.

Screening is provided in Section 3.0.

The need for and content of each stage subsequent to screening will be informed by the previous, with progression post Screening informed by each subsequent stage. Together, the stages identified above are referred to in Scotland as Habitats Regulations Appraisal (HRA).

- Appropriate Assessment (AA) (included in Figure 2.1 as **Steps 4 and 5**): A Shadow AA can be prepared, to provide the Competent Authority with the necessary information to determine whether the plan or project will have an adverse effect on the integrity (AEOI) of any European Site. Consideration is here given to any planned mitigation measures within the proposal.

This appraisal provides the information required to inform future assessment with **Chapter 8: Terrestrial Ecology** of the EIA Report providing a full and robust assessment to address any potential LSEs.

Further Steps, where required, are taken forward by the Competent Authority:

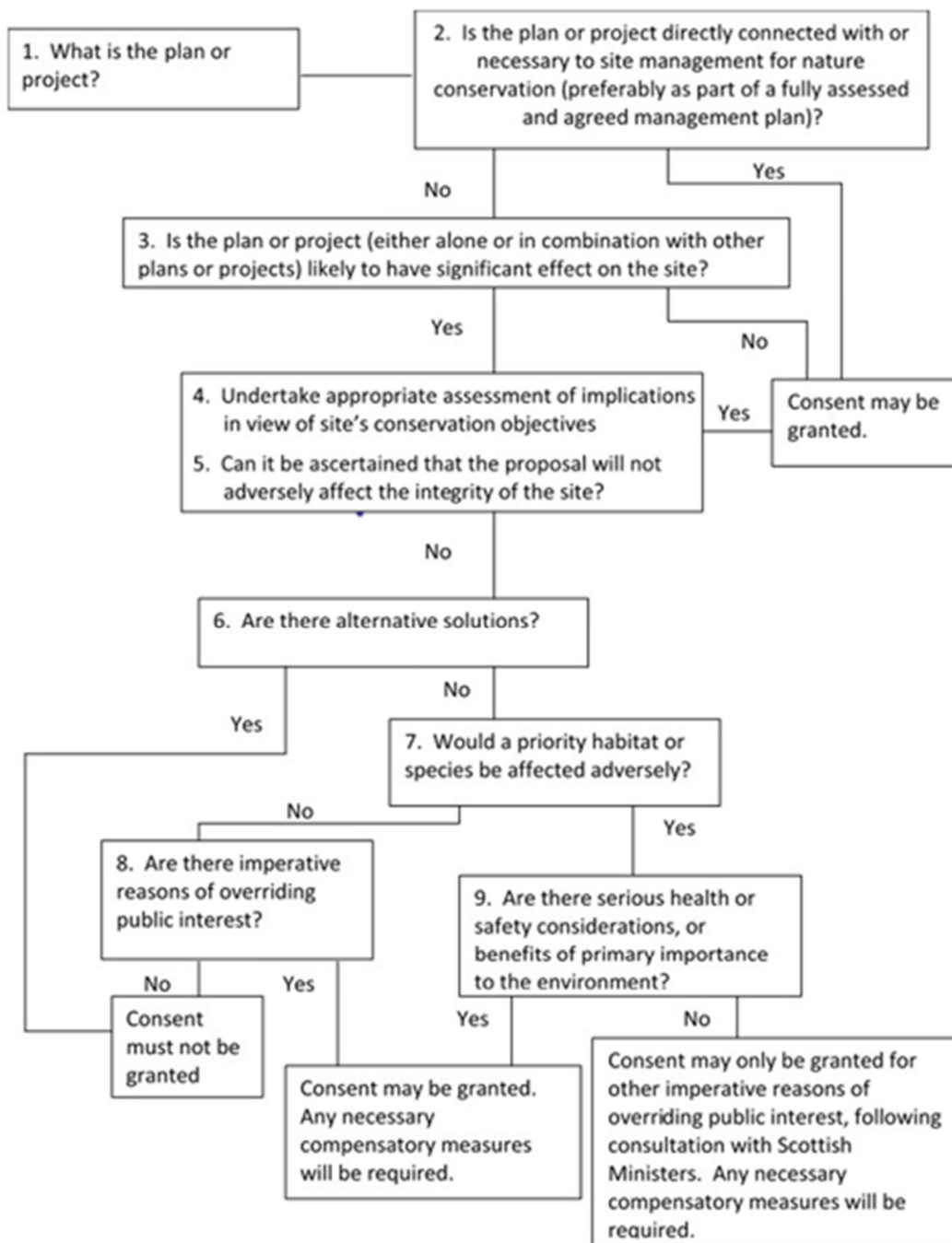
- Examination of Alternative Solutions (included in Figure 2.1 as Step 6): If the AA cannot rule out potential AEOI, then alternative options for the plan or project must be considered.
- Assessment of IROPI (Imperative Reasons of Overriding Public Interest) (included in Figure 2.1 as Step 8 or (for priority habitats and species) Step 9): Where no alternative solutions are determined to be possible, assessment will be undertaken to determine whether there is an overriding public interest for the proposed development to be consented.

In the case of this assessment, **Chapter 8: Terrestrial Ecology**, **Chapter 10: Hydrology, Hydrogeology & Geology** (plus Technical Appendices) fully address all potential LSEs identified in the screening assessment so that no LSEs remain that could significantly adversely effect the conservation objectives of the River Tweed SAC and designated features.

⁹ Scottish Borders Council (2023). *Habitats Regulations Appraisal*; Scottish Borders Local Development Plan (2023 Update); https://www.scotborders.gov.uk/downloads/file/12372/habitats_regulations_appraisals_updated_sept_2023



Figure 2-1: How to consider plans and projects which could affect European Sites (from NatureScot)¹⁰



2.3 Initial Search Area & Source-Pathway-Receptor Model

All European sites within 10km of the site were searched for in the first instance. Regarding the proposed development alone and in combination, the search area for wind farms in

¹⁰<https://www.nature.scot/professional-advice/planning-and-development/environmental-assessment/habitats-regulations-appraisal-hra>



relation to International/ European sites discussed in this HRA related to the specific features of the designated sites and pathways of effect; for example, yet not limited to, the home ranges of the relevant species.

Section 3.2 provides more detail per site and receptor. This influenced the full site search area in tune with the 'source-pathway-receptor' model.

The relevant designated sites and their primary and secondary designated features are considered to be the 'receptors' in this model. The 'pathway' is the route or means through which the 'receptors' could be positively or negatively impacted by the 'source.' The 'source' is the design of the proposed development. If no pathway exists between the receptor and the source, then impacts on the receptor can be screened out. If a pathway does exist, then the impact on the receptor site must be quantified and it must be determined whether a likely significant effect will occur on the receptor.

2.4 Relevant Guidance

Screening, which includes Steps 1 to 3 in Figure 2.1, will be undertaken with reference to key HRA guidance documents, including:

- Scottish Government 'Habitats Regulations Appraisal (HRA)'¹¹;
- NatureScot 'Habitats Regulations Appraisal'¹²; and
- UK Government including recent guidance 'Guidance on the use of the Habitats Regulations Assessment'¹³.

Noting that the above also include links to relevant European guidance (maintained via the 'EU Exit Bill').

2.5 Meaning of Likely

For Habitats Regulations Appraisals, a 'likely' effect is one that 'may reasonably be predicted' and cannot be excluded (or ruled out) without further assessment or mitigation.

2.6 Meaning of Significant

A 'significant' effect is one where the proposed development undermines the conservation objectives of one or more of the qualifying interest features.

¹¹ <https://www.gov.scot/policies/environmental-assessment/habitats-regulations-appraisal-hra/>

¹² <https://www.nature.scot/professional-advice/planning-and-development/environmental-assessment/habitats-regulations-appraisal-hra>

¹³ <https://www.gov.uk/guidance/appropriate-assessment>



3.0 Step 3: Screening

3.1 Characteristics and Biodiversity Baseline

The following summarises the main sources of information that will be drawn on for the HRA process. This includes existing data sources that are in the public domain together with completed site-specific surveys.

3.1.1 For the Project Alone

3.1.1.1 Development Site Baseline

The site topography is undulating, ranging from c.215 metres (m) Above Ordnance Data (AOD) within the river valley at the site entrance, to c.490m AOD near the summit of Hunt Law within the north-west of the site.

Upland areas within the site are managed primarily as active grouse moor, while lower elevations are managed largely for sheep grazing. Upland heathland (c.350ha); degraded blanket bog (c.270ha); and bracken (c.185ha) make up the majority of the site in addition to several large areas of grassland consisting of upland acid grassland (c.140ha) with some smaller areas of upland calcareous grassland (c.1ha), other neutral grassland (<1ha), and an area of c.40ha of modified grassland around the access tracks. Two small areas of upland birchwood were recorded with 10ha of other coniferous woodland, both of which were located to the south of the site. There are also smaller parcels of purple moor grass and rush pasture (c.25ha) and upland flushes, fens, and swamps (c.3ha). There is also an area used for growing cereal crops around the access track. Several small areas of dense scrub were also recorded on site.

Two main watercourses and associated minor tributaries intersect the site; the Whaplaw Burn and Soonhope Burn. These are relatively narrow (up to c.5m wide) and shallow in nature, meandering through river valleys within the survey area. Both watercourses form part of the River Tweed SAC and are classified as priority habitat. In addition, Allers Burn runs through the access track survey area until reaching a confluence with Whaplaw Burn. Allers Burn is narrow and shallow and does not fall within the River Tweed SAC. There are also a number of man-made and natural ponds, two within and several just outside the site.

3.1.1.2 Desk-based Study

Initial information for the site was gathered through a desk-based study which was undertaken by SLR in February 2023. The desk-based study considered previous data, reports and survey work which was collated into an Ecology Desk Study Report¹⁴. Data sources for the desk-based study are provided below:

- An ecological data search was requested from The Wildlife Information Centre (TWIC). Protected and notable species data were taken from all years and within 2km of the site for all species.
- Environmental Impact Assessment (EIA) reports submitted as part of planning applications and any post consent/construction information for wind farms and other developments within 10km of the site (where available) were reviewed.

¹⁴ SLR (2023). Longcroft Wind Farm, *Ecology Desk Study Report*. SLR Project Number: 405.064862.00001, Version 1



Information regarding designated sites in the area surrounding the site was obtained from the MAGIC online GIS tool¹⁵ and the NatureScot Sitelink website¹⁶. Sites designated for their ecological interests were searched for within 10km for statutory designated sites, an up to 2km for locally designated sites. Designation types searched for that are relevant to this appraisal include, SACs and Ramsar sites. In addition to the above sites within 10km, Greenlaw Moor Ramsar site is also considered within this appraisal. Greenlaw Moor Ramsar is c.16km from site but has been included further within this report as it was detailed within NatureScot's scoping response with regards to HRA (noting that it is screened out at an early stage due to the site and its receptors being beyond the predicted zone of influence of the proposed project).

The following sites which are considered relevant to this appraisal are provided below:

- River Tweed SAC
- Fala Flow Ramsar
- Greenlaw Moor Ramsar

Full citation sheets for the aforementioned designated sites can be found in Appendix A.

The Scottish Border Local Development Plan 2016 and the Scottish Border Council planning portal were used to determine plans and projects that may apply for the 'in combination' effects assessment by searching for active planning applications within the local area.

3.1.1.3 Site Specific Surveys

SLR carried out a UKHab and NVC Survey Report¹⁷ in August 2023 to gain a detailed description of the habitats found on site. The survey area incorporated all land within the site and an associated 250m survey buffer, to accord with Scottish Environmental Protection Agency (SEPA) guidelines relating to areas with potential groundwater dependency.

In addition, a suite of protected species surveys was undertaken in 2023 (excluding ornithological surveys). Species survey included surveys for otter (*Lutra lutra*), water vole (*Arvicola amphibius*) and badger (*Meles meles*), bats, fish habitat assessment and electrofishing and great crested newt Habitat Suitability Assessment (*Triturus cristatus*). Additionally, an assessment of the site for other notable species such pine marten (*Martes martes*), red squirrel (*Sciurus vulgaris*), wildcat (*Felis silvestris*), European brown hare (*Lepus europaeus*), European beaver (*Castor fiber*) and European hedgehog (*Erinaceus europaeus*) and a search for invasive non-native species was also undertaken.

With regards to qualifying species within the River Tweed SAC otter and fish habitat assessment and electrofishing surveys were considered particularly relevant for this shadow HRA and 'as such' as summarised below.

Otter Survey

The three main watercourses of the site; Soonhope Burn, Whaplaw Burn and Jock's Burn were all generally deemed to have low potential for otter with the exception of the southern section of the Soonhope Burn which was considered to provide moderate value for short-term shelter for otter with degraded banks leaving overhangs and potential lay-ups. Notable

¹⁵ DEFRA MAGIC online GIS Tool. Available Online: [MAGIC \(defra.gov.uk\)](https://magic.defra.gov.uk)

¹⁶ NatureScot Sitelink. Available Online: [SiteLink \(nature.scot\)](https://sitelink.nature.scot)

¹⁷ SLR (2023). Longcroft Wind Farm, *UKHab and NVC Survey Report*. SLR Project Number: 405.064.862.00001, Version V01



features that could be used for shelter such as overhanging banks, tree root systems and rock piles were infrequent or entirely absent along most of all surveyed watercourses.

Bankside vegetation within the site was of generally poor value for otter with few areas of dense scrub offering potential areas of shelter. The tributaries and drains running throughout the site were either dry at the time of survey or deemed too shallow to provide higher potential for commuting or foraging otter at any time other than periods of heavy rainfall.

No places of otter shelter were identified within the direct footprint of the proposed development, however, evidence of three otter spraints and a single couch was identified along the Soonhope Burn (within a 250m buffer) indicating that they use this watercourse for commuting and foraging and as a temporary resting area.

Fish Habitat Assessment and Electrofishing

Fish habitat surveys were conducted at 13 locations within and near to the site in August 2023 (see Technical Appendix 8.5). The methodology for habitat assessment employed for the fieldwork was conducted under a modified version of the Scottish Fisheries Coordination Centre (SFCC) outlined in the Environment Agency document '*Restoration of Riverine Salmon Habitats: A guidance Manual*'.

Where spawning gravels were present and accessible, an assessment of their quality in terms of stability, compaction and siltation was made. In addition, the bankside structure and surrounding land use was also described where appropriate. Areas surveyed included 100m² sections with target notes recorded up to 250m upstream and downstream of the survey locations.

Data analysis was undertaken, and evaluations were made for locations suitability for fish spawning and fish habitat quality. Each survey location was then given a rating for fish habitat quality of High, Good, Moderate, Low or Poor. Salmonid spawning potential was assessed via the SFCC Walkover Habitat Survey Protocol and Habitat Surveys Training Course Manual¹⁸. Survey locations were graded as having Optimal, Sub-Optimal or Not Suitable salmonid spawning potential.

Electrofishing surveys were conducted across three days from 26th to 28th September 2023 by two experienced and SFCC qualified team leads. Electrofishing surveys were led by Leigh Kelly BA MRes (licence holder - CMS-18-102) and in full accordance with SFCC protocols. Weather conditions on the day of sampling were moderate (light rain/ clear) with an ambient temperature of 13°C. Survey locations were determined prior to revisiting the site using fish habitat assessment data collected and reported by SLR Consulting Ltd in August 2023. Fully quantitative electrofishing methods were adopted at eight survey locations, and a semi-quantitative survey was undertaken at one additional location.

Supplementary fish habitat assessment were conducted alongside the electrofishing assessments. The methodology for habitat assessment employed for the fieldwork was conducted under a modified version of the SFCC outlined in the Environment Agency document '*Restoration of Riverine Salmon Habitats*'.

Densities of fish were calculated separately for fry (young of the year) and parr for both salmon and trout. Estimates of minimum density were calculated by dividing the number of fish caught by the area of habitat surveyed.

For full details of the electrofishing methodology see Section 2.0 of **Technical Appendix 8.5**.

¹⁸ SFCC. 2007. Habitat Surveys: Training Course Manual. Scottish Fisheries Co-ordination Centre, August 2007.



The result of the surveys indicated:

- Fish habitat survey results:
 - Quality ranged from: Good (T1, T3b); Moderate (T3a, T4, T6, T7, T8, T10, T11); Poor (T2, T5, T12); and Low (T9). No habitat identified at the time were deemed to be High. Optimal (T3b, T6, T7); Sub-Optimal (T1, T3a, T4, T5, T8, T10, T11) and Not Suitable (T2, T9, T12). No large areas surveys regarding substrate composition were deemed Optimal/ Sub-Optimal habitat for juvenile lamprey, though undercutting of banks has the potential to support European eel.
 - No suitable eel habitat was found across all surveyed locations, as undercut banks were very shallow, and there was lack of rock formation providing suitable hiding substrate.
 - Lamprey habitat was found at the control site (C1) where sand substrate in large patches was found to have residing river lamprey and where fast water flow was present.
 - For more detailed results and information on the survey locations see **Technical Appendix 8.5** of the EIA Report.
- Fish presence/ likely absence:
 - Both Atlantic salmon and brown/ sea trout were present across survey locations within the site. Atlantic salmon parr (1++) were present on the Whalplaw Burn, below an in-river barrier/ obstacle (2m height) identified during the September 2023 fish habitat surveys. This barrier was deemed impassable under low water conditions due to the rock formation which is most likely why salmon were not present within the most upper reaches of the Whalplaw Burn at survey locations T5 and T6.
 - Atlantic salmon fry (0+) were present at sites only within Soonhope Burn (T7, T8) at locations where undercut banks with more prominent and faster waters were observed. Trout fry (0+) and parr (1++) were present across all electrofished survey locations, though it is mostly likely trout found within the Whalplaw Burn above T3a are brown trout as up-stream migration of sea trout is unlikely to be possible. In addition, only trout were found at survey location T10 where migrating is likely to be impeded by a culvert. Thus, all trout found within Whalplaw Burn above the culvert are most likely to be remain as brown trout.
 - For full details of electrofishing results see **Technical Appendix 8.5** of the EIA Report.

An evaluation of fish of relevance to this assessment is provided in **Table 3-1**.

Table 3-1: Evaluation of fish receptors of relevance (based on Terrestrial Ecology Chapter assessment)

Species	Protection/ Conservation Status*	Description of signs and justification for evaluation	Evaluation
European eel <i>Anguilla anguilla</i>	OSPAR, RLGLB.CR, ScotBL, UKBAP, FFFCE	No eels were captured during electrofishing and habitat on site was considered to be typically unsuitable. Eel are therefore considered to be either absent at site or present at only very low density. The site is there for considered to be of less than local value for eel.	Less than local value



Species	Protection/ Conservation Status*	Description of signs and justification for evaluation	Evaluation
Atlantic salmon <i>Salmo salar</i>	Bern3, HabRegs4, HSD2p, HSD5, OSPAR, ScotBL, UKBAP, SFFA	Juvenile salmon were present at multiple locations on site. In addition, the populations on site are hydrologically connected with the River Tweed SAC which is designated among other things for Atlantic salmon and otter. Otter are a wide ranging species and the trout on site and migrating to site likely for part of the diet of the Tweed otter population. The salmon on site likely form part of the River Tweed meta-population. However, reflection the small portion of the River Tweed catchment on site they represent only a small part of the meta-population and are therefore considered of regional rather than national or higher importance in the context of the site.	Regional value
Brown trout <i>Salmo trutta</i>	ScotBL, UKBAP, SFFA	Juvenile trout were present at multiple locations on site. In addition, the populations on site are hydrologically connected with the River Tweed SAC which is designated among other things for Otter. Otter are a wide ranging species and the trout on site and migrating to site likely for part of the diet of the Tweed otter population. However, reflection the small portion of the River Tweed catchment. The trout population on site is therefore considered of local importance.	Local value
River Lamprey <i>Lampetra fluviatilis</i>	SFFA	Juvenile river lamprey were present at one location, a control site on the Kelphope burn outwith the site and not hydrologically connected to the proposed development's potential downstream zone of influence. None were found on site however due to their presence within the same sub-catchment as the site and their patchy nature of sample locations we have assumed that they are present. The assumed population on site is hydrologically connected with the River Tweed SAC which is designated among other things for. The Lamprey on site likely form part of the River Tweed meta-population. However, reflection the small portion of the River Tweed catchment on site they represent only a small part of the meta-population and are therefore considered of regional rather than national or higher importance in the context of the site.	Regional value

3.1.2 For the Project In-combination

The assessment of potential 'in-combination' effects on the International/European sites/features has been informed by a review of available information on consented and proposed wind farms in the region. This data was accessed via the NatureScot website which was last updated in November 2022. The Scottish Borders Planning portal was also used to search for other relevant wind farm applications within the area. A list of projects is provided in **Table 3-6**.

Relevant baseline features will be presented where relevant to the screening assessment.



3.2 Potential Pressures, Pathways of Effects and Zone of Influence (Screening Parameters)

A precautionary approach has been adopted in screening to ensure that all potential for LSE are identified. The implication of this approach is that protected sites and features are screened in unless a clear conclusion of no LSE can be made. In some circumstances, effects can be considered de minimis. A de minimis change is one that has no appreciable effect on the protected site; in other words, no negligible, restricted or remote from the protected site that the effect would not undermine the conservation objectives for the site either alone or in combination¹⁹.

The aim of screening is to identify which protected sites and features to take forward into further assessment (if required). The methodology is set out here for a structured and systematic approach to screening. Potential connectivity is first established through the use of a screening parameter, which is specific to the receptor/ feature and linked to the relevant pressure, followed by consideration of the potential for LSE to result.

For assessment purposes, the terms pathway, pressure, impact and effect are used regularly and are key to how the spatial criteria applied in screening have been defined. An effect is the result of an impact(s) to receptors, which can occur when a pressure acts via (impact) pathways. Impacts may be quantified (or a view taken on magnitude) whereas an effect is simply the consequence of an impact. Possible pressures arising from the Project during the construction and operational phases have been analysed and potential impact pathways identified. For each pathway-pressure combination, a spatial criteria is defined to establish potential connectivity. Due to the varying ecology of different receptor groups, different spatial criteria are applied to different receptors. These spatial parameters relate to the range (spatial extent) of impacts and the ranging behaviour of mobile species.

As each receptor group will be sensitive to different pressures, the list of pressures will vary between receptor group.

3.2.1 Ecological Connections

Migratory fish will travel upstream for spawning. Given direct hydrological connectivity between the site and the River Tweed SAC, which is designated in part for migratory fish, there is the potential for ecological connectivity to the site. The effects of the works associated with the proposed development has potential to effect the downstream sections also.

It should be noted that, given the reliance of freshwater pearl mussels on salmonids for survival this species would usually require consideration in terms of ecological connectivity; however, this species does not exist in the Tweed catchment (as confirmed by the River Tweed Foundation in previous consultation correspondence).

Otters may have a home range of up to 50km (Chanin, 2003) and can range along water courses but also between catchments. Given the complexity and abundance of the freshwater network in the catchment, it is assumed that otters that may disperse out from the River Tweed SAC (one designated feature) will likely be ecologically connected to the site and within the zone of influence of the works. A range of 250m is assumed for potential direct impacts and up to 10km geographic distance is assumed for potential indirect effect (given that 50km of watercourse home range could be accommodated within a 10km direct range).

¹⁹ David Tyldesley and Associates (2015) Habitats Regulations Appraisal of Plans. Guidance for Plan-making Bodies in Scotland Version 3.0, January 2015 SNH Ref 1739.



Section 3.1.1.3 provides a summary of baseline records of fish and otters on and near to the site.

Assessment of LSEs will consider ecological connectivity considering habitats within 10km and species home ranges in terms in the absence of mitigation. The assessment for terrestrial habitats the zone would extend up to 30m for peatland and carbon rich soils (as defined above), 100m for ground water dependant terrestrial ecosystems (GWDTEs) up to 1m depth and up to 250m buffer from any direct footprint below 1m.

3.2.2 Hydrological Connections

The site is within the River Tweed catchment. A full account of hydrological connectivity is provided within the EIA Report **Chapter 10: Hydrology, Hydrogeology & Geology**.

Assessment of LSEs will consider hydrological connectivity/water quality/habitat degradation up to 10km as within the zone of 'discernible' effects on aquatic receptors including aquatic habitats in their own right and species home range in hydrological terms in the absence of mitigation.

3.2.3 Potential Pressures and Pathways of Effect

3.2.3.1 Direct Habitat Loss and Habitat Degradation (Works in and near Watercourses)

Construction: There will be minimal losses of riparian habitat on site to accommodate the widening of 4 existing access tracks across watercourses and an additional 8 watercourse crossings equating to c. 28km² of direct habitat loss. Direct habitat losses have potential to take naturalised small sections of habitat or degrade the immediately adjacent habitat. Other non-riparian losses are detailed in the Terrestrial Ecology Chapter. Loss/degradation can also occur during site remediation, preparation and construction activities via machinery and plant operations. Such events could directly impact aquatic features; including the riverine habitat, otters, and migratory/ spawning fish. This aspect **will require to be assessed in the Shadow HRA Assessment of LSE (ALSE)**.

Operation: It is unlikely that any watercourses will be directly impacted during the operational phase as there will be reduced traffic limited only to site maintenance works. During maintenance visits it is anticipated that vehicles and personnel will use existing access tracks to access the wind turbines and substation. This aspect has been screened out and **will not require to be assessed in the Shadow HRA ALSE**.

Decommissioning: The risks of destruction or alterations to the watercourses during the decommissioning process will be similar to during construction. This aspect **will require to be assessed in the Shadow HRA ALSE**.

3.2.3.2 Indirect Habitat Loss and Habitat Degradation (Works in and near Watercourses)

Construction: Indirect riparian habitat loss/degradation can result from an indirect impact to a receptor from a direct habitat loss, the pathway and screening parameter will be species specific in that case. This aspect **will require to be assessed in the Shadow HRA ALSE**.

Operation: It is unlikely that any watercourses will be indirectly impacted during the operational phase as there will be reduced traffic limited only to site maintenance works. During maintenance visits it is anticipated that vehicles and personnel will use existing access tracks to access the turbines and substations. This aspect has been screened out and **will not require to be assessed in the Shadow HRA ALSE**.



Decommissioning: The risks of indirect habitat loss to the watercourses during the decommissioning process will be similar to during construction. This aspect **will require to be assessed in the Shadow HRA ALSE.**

3.2.3.3 Direct and Indirect Impacts to Aquatic Receptors (Reduced Water Quality)

Construction: Water quality could be reduced in the vicinity of the proposed development during construction, through increased suspended solids, reduced dissolved oxygen and release of contaminants via release of toxic chemicals, spillage of fuel or other contaminants. Such pollution events could either impact habitat and otters, and migratory or spawning fish directly or could deplete prey items available for such species. The parameter/pathway of effect for aquatic features is taken to be 10km. Windblown terrestrial toxic contamination is afforded a screening parameter of 2km. This aspect **will require to be assessed in the Shadow HRA ALSE.**

Operation: Potential impacts are likely to be more limited than the potential water quality impacts encountered during construction due to the reduced traffic and activity occurring on site yet cannot be completely discounted at this stage; therefore, reduced water quality during the operational phase **will require to be assessed in the Shadow HRA ALSE.**

Decommissioning: The risks of a contamination incident during the decommissioning process will be similar to during construction. Therefore, likely significant effects for the project alone cannot be excluded and contamination risk during decommissioning **will require to be assessed in the Shadow HRA ALSE.**

3.2.3.4 Direct and Indirect Habitat Degradation (Changes to Waterflow)

Construction: Waterflow could be altered within the watercourses during construction, through interference with the channel or deposition of sediments or altered groundwater runoff events. Such pollution events could impact riverine habitat, otters, and migratory or spawning fish directly or could deplete prey items available for such species. This aspect **will require to be assessed in the Shadow HRA ALSE.**

Operation: It is unlikely that any watercourses will be impacted during the operational phase by increased sediment buildup as there will be reduced site works and traffic limited only to site maintenance works (i.e., no planned interference with the channel or deposition of sediments or altered groundwater runoff events). During maintenance visits it is anticipated that vehicles and personnel will use existing access tracks to access the turbines and substations, therefore, this aspect has been screened out and **will not require to be assessed in the Shadow HRA ALSE.**

Decommissioning: The risks of increased sedimentation events during the decommissioning process will be similar to during construction. Therefore, likely significant effects for the project alone cannot be excluded during decommissioning and **will require to be assessed in the Shadow HRA ALSE.**

3.2.3.5 Direct and Indirect Habitat Degradation (Reduced Air Quality)

Construction: Site remediation, preparation and construction works will require to break through hard standings and engage the use of machinery and plant. This may give rise to air quality impacts that could impact habitat directly (through windblown dust for example) and indirect impacts to qualifying species. Detailed assessment **will require to be assessed in the Shadow HRA ALSE.**

Operation: Reduced air quality is not likely to impacts encountered during the operation phase due to the reduced traffic and activity occurring on site; therefore, **will not require to be assessed in the Shadow HRA ALSE.**



Decommissioning: Similar to construction phase activities, air quality impacts may arise, and impact qualifying species. Detailed assessment **will require to be assessed in the Shadow HRA ALSE.**

3.2.3.6 Direct or Indirect Mortality (Killing or Injury)

Construction: Qualifying aquatic and terrestrial species of features have potential to be directly impacted through killing or injury during site remediation, preparation and construction activities via machinery and plant operation works. **Will require to be assessed in the Shadow HRA ALSE.**

Operation: Despite reduced traffic and activities on site, site operation and maintenance works can pose potential pressures to terrestrial and aquatic receptors; for example, pollution impacts and site traffic vehicle collisions in the absence of mitigation will be assessed in terms of aquatic receptors. **Will require to be assessed in the Shadow HRA ALSE.**

Decommissioning: The risks of killing or injury to qualifying features during the decommissioning process poses similar potential impacts as during construction. **Will require to be assessed in the Shadow HRA ALSE.**

3.2.3.7 Direct and Indirect Disturbance to Species (Increased Noise and Vibration)

Increased in-water and in-air noise poses potential to impact qualifying species. **Will require to be assessed in the Shadow HRA ALSE.**

Construction: During construction, site clearance and watercourses crossing works have potential to impact species; particularly riparian mammals and fish. The likely presence and potential pathways of effect require to be considered to determine if noise will cause significant avoidance behaviours at locations where qualifying species may be present. **Will require to be assessed in the Shadow HRA ALSE.**

For migratory fish species associated noise impacts will require to be assessed in relation to medium and low sensitivity fish. For medium sensitivity fish such as Atlantic salmon, the minimum noise threshold level is approximately 95 dB re 1 μ Pa between 30 to 400 Hz, for low sensitivity fish, such as lamprey, the minimum noise threshold level is 118dB 1 μ Pa between 30 to 200 Hz. Threshold for a strong avoidance reaction by medium sensitivity fish, is around 170 dB re 1 μ Pa and the threshold for significant avoidance is 193 dB re 1 μ Pa for low sensitivity fish²⁰.

During construction in water noise levels may exceed the minimum thresholds for medium sensitivity fish (Atlantic salmon) and for low sensitivity fish (lamprey species), to determine whether the minimum threshold would be exceeded. The seasonal and daily timing of construction would be a factor to consider whether works would pose an impact to migratory lamprey (that move most often nocturnally).

In the absence of avoidance and mitigation measures, increased noise and vibration levels may also induce behavioural change effects on otters that use Soonhope Burn and other watercourses for commuting, foraging route and shelter (e.g., one couch was found with evidence of historic use along the Soonhope Burn confirming otter presence on site).

The potential impact of increased noise on qualifying fish species and otter **will require to be assessed in the Shadow HRA ALSE.**

²⁰ Nedwell, J.R., Turnpenny, A.W.H., Lovell, J., Parvin, R., Wrokmán, J.A.L., and Howell, D. (2007) A validation of the dBht as a measure of the behavioural and auditory effects of underwater noise. Subacoustech Report ref: 534R1231. Subacoustech Ltd, Hampshire



Operation: With no plans for in-water works and all wind turbines located away from watercourses, it is considered unlikely that noise levels for the proposed development alone would not exceed appropriate levels and undermine the conservation objectives for migratory fish or otter. Therefore, noise impacts during operations can be screened out and **will not require further assessment.**

Decommissioning: The noise levels during decommissioning will be similar to during construction; although, in reality the noise is likely to be less as substructure works will not be required. Therefore, decommissioning **will require to be assessed in the Shadow HRA ALSE.**

3.2.3.8 Direct and Indirect Disturbance to Species (Lighting and Visual Disturbance)

Construction: Depending on the time of year and the stage of the construction programme, temporary lighting may be required at the temporary compounds and at work areas during working hours. It is not proposed that the lighting will be on outside of working hours, however, as lighting has the potential to illuminate watercourses and visually disturb qualifying species such as nocturnal lamprey migration and otter commuting and foraging, lighting during construction **will require to be assessed in the Shadow HRA ALSE.**

Operation: The operational phase requires all wind turbines will be fitted with medium intensity steady red lights on their highest practicable point. Given the distance of wind turbines from watercourses, the height of light and the use of red light that is less disturbing to species it is considered unlikely that this will have an effect on qualifying species. Additionally, it is not anticipated that any additional artificial lighting will be required and it is unlikely that any significant effect to qualifying species will occur. Therefore, likely impacts from lighting at the operational phase have been **screened out** and **will not require to be assessed in the Shadow HRA ALSE.**

Decommissioning: The lighting levels will be similar during decommissioning to construction with additional lighting required to enable safe operations. Therefore, as for the construction phase lighting during decommissioning **will require to be assessed in the Shadow HRA ALSE.**

3.2.3.9 Direct and Indirect Disturbance to/Displacement of Species (Visual Disturbance: Plant, Machinery, Site Operatives and Construction Activities)

Construction: Otters can be disturbed by visual stimuli, for example people, vehicles and construction activities via mobile plant and their operators, causing behavioural changes by reducing foraging time, altering commuting routes or site avoidance. Additional vehicle movements (not currently defined) may serve to undermine the conservation objectives, by increasing disturbance. Therefore, likely significant effects cannot be excluded at this stage and **will require to be assessed in the Shadow HRA ALSE.**

Operation: It is unlikely that any qualifying features will be directly impacted through visual disturbances during the operational phase as there will be reduced traffic limited only to site maintenance works. During maintenance visits it is anticipated that vehicles and personnel will use existing access tracks to access the wind turbines and substations, therefore, this aspect has been screened out and **will not require to be assessed in the Shadow HRA ALSE.**

Decommissioning: During decommissioning all materials would be removed via road. As discussed for the operation stage, vehicles and construction workers will be present during decommissioning and a risk of visual disturbance remains for site activities. Likely significant effects cannot be excluded at this stage; therefore, this pathway **will require to be assessed in the Shadow HRA ALSE.**



3.2.3.10 Direct and Indirect Disturbance to/Displacement of Species Prey

Construction: Terrestrial and aquatic fauna can be disturbed by the aforementioned stimuli and pressures, causing changes to availability to prey species (e.g., aquatic invertebrates that are preyed upon by mammals and fish). This can act to reduce prey availability in the home range of individuals and populations. Necessitating changes to commuting routes or site avoidance. Therefore, likely significant effects cannot be excluded at this stage and **will require to be assessed in the Shadow HRA ALSE.**

Operation: It is unlikely that any pressures will significantly impact prey species of qualifying features during the operational phase as there will be reduced traffic and limited activities on site to facilitate maintenance works. During maintenance visits it is anticipated that vehicles and personnel will use existing access tracks to access the wind turbines and substations, therefore, this aspect has been screened out and **will not require to be assessed in the Shadow HRA ALSE.**

Decommissioning: During decommissioning, vehicles and construction workers will be present and a risk of disturbance of prey species remains for site activities. Likely significant effects cannot be excluded at this stage; therefore, this pathway **will require to be assessed in the Shadow HRA ALSE.**

3.2.3.11 Invasive Non-native Species (INNS)

A screening parameter of the footprint of the site plus 10km buffer is considered when assessing potential pathway of effect of INNS via hydrological spread and 2km overland to account for potential air dispersal/vehicle/plant movements in the absence of mitigation.

Construction, Operation, and Decommissioning: INNS have the potential to affect habitats and species during all phases of the proposed development through transport, air, and water vectors. Increased risk is expected during construction and decommissioning phases due to increased traffic and activity onsite. Therefore, biosecurity measure **will require to be assessed in the Shadow HRA ALSE.**

3.2.4 Migratory and Diadromous Fish

Based on the NatureScot consultation response for the Salamander project, advice on assessment of migratory fish in HRA Screening²¹ is:

'Due to uncertainty on where migratory fish (Atlantic salmon, sea trout and sea and river lamprey) go within marine waters and connectivity back to natal rivers we consider these species should be assessed through EIA only and not through HRA...For diadromous fish species we do not have population data for any salmon or lamprey SAC on the data forms. This inability to understand connectivity to and within individual rivers to the development area, currently prohibits an informed assessment of the impact on individual site integrity. We are aware of work being led by ScotMER on diadromous fish and this is an area of research that may change conclusions on how diadromous fish are treated in both EIA and HRA going forward.'

On that basis and, taken forward in other HRA Screening reports in the public domain and in production, we intend to screen out assessment of impacts on migratory and diadromous fish *when within the marine environment* within this assessment (leaving for migratory fish in the marine environment to be assessed solely in **Chapter 8: Terrestrial Ecology** if relevant, noting the distance between the site and the coast); including, for any designated sites not within the site or within a 10km reach (watercourse length) that has a direct connectivity.

²¹ Marine Scotland – Planning and Policy – Response to Scoping Opinion for Proposed Section 36 Application and marine Licences for the Salamander Offshore Wind Farm Located 35km East Off the Coast of Peterhead. Available online: https://marine.gov.scot/sites/default/files/appendix_i_-_consultation_representations_and_advice_5.pdf



Therefore, migratory and diadromous fish **will require to be assessed in the Shadow HRA ALSE.**

3.3 European/ International Site Details that are Relevant to the Project

3.3.1 International and European Sites of the National Network

All European/ international sites within 10km of the site have been included within the appraisal. This is considered appropriate as pathways of effect for non-avian features are unlikely to exist beyond 10km, any designated sites above 10km are considered to be outside of the ZOI and are not considered further within this appraisal.

As this shadow HRA is for non-avian features only any sites that have avian related species designations have not been included henceforth within this appraisal, as such the Fala Flow SPA has been excluded from screening given that the primary designation feature is avian related. It is expected that an avian related HRA for the proposed development site will be undertaken by another party to include the Fala Flow SPA.

Greenlaw Moor SPA has not been considered within the screening assessment as its qualifying features are avian based and therefore are covered within **Chapter 9 – Ornithology** and the relevant shadow HRA **Technical Appendix 9.7**. It should be noted that Greenlaw Moor SPA is coincident with Greenlaw Moor Ramsar. Greenlaw Moor SPA and Ramsar include two pools surrounded by an area of moorland which are habitats that underpin the Ramsar site designation. The habitats underpinning the Ramsar site have not been considered within this screening assessment as they are c.16 km from the site and therefore considered beyond the zone of influence (ZOI) of works.

All non-avian relating European/ International sites within 10km of the site are shown in **Drawing 03** with **Table 3-2** providing a description of the qualifying features and characteristics of the sites. Full designated site citation sheets can be found in Appendix A.

Table 3-2: European/ Internationally Designated Sites Which May Be Affected by the Project

Site Name	Distance From Site	Qualifying Interest	Brief Description
River Tweed SAC	0m	<p>Primary Annex I Habitat feature: Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation</p> <p>Annex II primary species: Atlantic salmon (<i>Salmo salar</i>) and otter (<i>Lutra lutra</i>)</p> <p>Annex II species (non-primary): River lamprey (<i>Lampetra fluviatilis</i>), Brook lamprey (<i>Lampetra planeri</i>) and Sea lamprey (<i>Petromyzon marinus</i>)</p>	<p>The River Tweed is the most species rich example of a river with <i>Ranunculus</i> in Scotland and is designated as a “whole river system”.</p> <p>It provides important habitat for migratory fish species and otter.</p>
Fala Flow Ramsar	8.9km	Wetland: Consisting of a blanket mire and pools which support internationally important populations of Pink-footed goose	A blanket mire, with some pools, developed at a lower altitude than most blanket mires in Midlothian. Such mires are scarce and



Site Name	Distance From Site	Qualifying Interest	Brief Description
			declining in Midlothian and this example is relatively undisturbed.

Given that avian elements are not being discussed here it has been concluded that only the River Tweed SAC and the Fala Flow Ramsar will be taken forward in this appraisal as the River Tweed is a European site designated for its riverine qualifying species and the Fala Flow Ramsar has wetland habitat as part of its designation status. **Drawing 03** shows the location of the River Tweed SAC and Fala Flow Ramsar with regards to the proposed development.

The River Tweed SAC is within the proposed development boundary as Whalplaw and Soonhope Burns form part of the SAC (which are located within site). The qualifying interest features consist of the river assemblage itself, otter, and fish species.

The Fala Flow Ramsar is outside of the proposed development. The proposed development area is located c.8.9km to the west of the designated site. The qualifying interest feature is its wetland status, consisting of blanket mire and pools.

3.3.1.1 River Tweed SAC

The River Tweed (site ref UK0012691) is a large river system (3,742ha) with the designation applying to the river itself along with its major tributaries and many smaller tributaries. For part of its length it forms the border between Scotland and England.

The current condition of the River Tweed SAC is considered to be favourable for 66.6% of features and unfavourable for 33.3% of features, specifically rivers with floating vegetation often dominated by water-crowfoot and sea lamprey. The key pressures on the SAC have been identified as modification of the river channel, water quality issues (including resulting from the prior), invasive species, over grazing, forestry and agriculture operations, and climate change²².

Qualifying Migratory Fish within the River Tweed SAC

Migratory fish species including Atlantic salmon, sea lamprey, river lamprey and brook lamprey, will pass within the River Tweed SAC, running through the site at certain times of the year, including, when moving to the sea to begin their adult phase and when returning to the River Tweed to breed. Timings for migration and spawning events for each species were taken from the NatureScot website^{23, 24}. Information on migratory and spawning events are provided below:

- **Atlantic salmon** may enter Scotland's rivers throughout the year. Salmon that return to Scottish rivers from January to June are called 'spring salmon'. Atlantic salmon usually spawn from November to December but may extend from October

²² [Protected Nature Sites \(sepa.org.uk\)](https://www.sepa.org.uk/protected-nature-sites) accessed 22/09/23

²³ <https://www.nature.scot/plants-animals-and-fungi/fish/freshwater-fish/atlantic-salmon#:~:text=From%20spawning%20ground%20to%20sea,some%20areas%2C%20particularly%20larger%20rivers>

²⁴ <https://www.nature.scot/plants-animals-and-fungi/fish/freshwater-fish/lamprey#:~:text=After%20spending%2018%20to%2024,the%20spring%20and%20early%20summer>



to late February in some areas, particularly in larger rivers. Juveniles begin to leave rivers for the sea in late spring, with most fish gone by June;

- **Adult sea lamprey** migrate up rivers in the spring and early summer. They spawn from May to July in areas of pebble and cobble substrate. Following this transformed pre-adults will then begin their migration to the sea from late autumn onwards;
- **River lamprey** migrate from their coastal feeding grounds into freshwater, to get ready to spawn, during the autumn and spring. They migrate upstream at night and the adults rest in cover during the day. Spawning takes place from April to May on pebble/gravel substrates. Following spawning pre-adults will begin their migration to the sea from late autumn onwards; and
- **Brook lamprey** are an entirely freshwater species and the smallest of the British lamprey. They undergo limited spawning migrations, though some such movements may be passive. Active upstream migrations of pre-adults and adults occur through the winter. On reaching suitable gravel areas, these fish hide until spawning takes place from April to June.

3.3.1.2 Fala Flow Ramsar

The Fala Flow Ramsar (site ref:UK13015) is described as an area of blanket mire on deep peat relatively undisturbed and lower lying than other blanket bogs in Midlothian. It also has a number of open pools considered unusual for a site at its elevation.

The condition of the Fala Flow Ramsar was classified as favourable for pink-footed geese and unfavourable (recovering) for blanket bog²⁵.

3.3.2 Conservation Objectives

3.3.2.1 River Tweed SAC

The conservation objectives for the River Tweed SAC is as follows:

- To ensure that the qualifying features of the River Tweed SAC are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status;
- To ensure that the integrity of the River Tweed SAC is restored in the context of environmental changes by meeting objectives 2a, 2b and 2c for each qualifying feature;
- The populations of qualifying features are viable components of the site;
- The distributions of the qualifying features throughout the site are maintained/restored by avoiding significant disturbance of the species; and
- The supporting habitats and processes relevant to the qualifying features and their prey/food resources are maintained, or where appropriate restored, at the River Tweed SAC.

3.3.2.2 Fala Flow Ramsar

The conservation objectives for the Fala Flow Ramsar are as follows:

²⁵ <https://informatics.sepa.org.uk/ProtectedNatureSites/> accessed 22/09/23



- To improve the current condition of the blanket mire habitat and maintain the habitat in favourable condition;
- To maintain and increase the diversity and extent of *Sphagna* communities;
- To maintain favourable conservation status for the pink-footed goose roost according to the EC Directive, thereby maintaining the nature conservation interest of the pink-footed geese using the Flow; and
- To maintain the open nature of the bog and the Fala Loch water feature so that the site remains an acceptable roost for wintering pink-footed geese.

3.3.3 Current Pressures

Table 3-3 details current pressures of the designated sites under assessment.

Table 3-3: Current Pressures of River Tweed SAC and Fala Flow Ramsar

Designated Site	Feature(s)	Current Pressures
River Tweed SAC	Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation (riverine system)	Risks from invasive species, water management, and water quality.
	Otter	Risks from forestry operations and recreation/disturbance.
	Atlantic salmon	Risk from agricultural operations, climate change, forestry operations, invasive species, over grazing, and water management.
	Sea lamprey	Risks from water management and water quality.
	River lamprey	Risks from water management and water quality.
	Brook lamprey	Risk from water management.
Fala Flow	Blanket Mire	Risk from water management.

3.4 Assessment of Likely Significant Effects

This Section assess the likely significant effects to International/ European designated sites by identifying direct or indirect pathways of effect that may occur from development. If no effects are identified, then a site can be ruled out and an AA is not required. Otherwise, the specific LSEs will be taken forward. The identification of significant effects must also take into account the conservation objectives for the identified International/ European designated Sites.

3.4.1 For the Proposed Development Alone

This section identifies the potential pressures and effect pathways through which the proposed development could impact the qualifying features of the River Tweed SAC and Fala Flow Ramsar. Specifically, the aim is to establish if a potential impact is likely to cause



a significant impact. For Habitats Regulations Appraisals, ‘a likely impact’ is one which cannot be excluded (or ruled out) without further assessment or mitigation, and a ‘significant impact’ is one which could undermine the conservation objectives of one of the qualifying interest features.

Pressures are detailed. Both direct and indirect pathways of effect of pressures have been considered for the River Tweed SAC as the proposed development lies within the designated site. Only indirect pathways have been considered for the Fala Flow Ramsar proposed development lies outwith the designated site. Potential pressures and pathways of effect are provided in **Table 3-4**.

Table 3-4: Summary of Potential Pathways of Effect on Qualifying Interest Features of Designated European and International Sites

Designated Site & Closest Distance to the Project (km)	Qualifying Feature(s)	Potential Pathways of Effect on Qualifying Interest Features	Project Phase
River Tweed SAC (0km)	Riverine system Otter Atlantic salmon Sea lamprey River lamprey Brook lamprey	Direct and indirect habitat loss/degradation of watercourses (including water quality, changes to waterflow and reduced air quality) via mobile plant and works affecting the integrity of the riverine system. There will be minimal direct loss of watercourse habitat (28m ²) to accommodate widening of existing tracks and creation of new access tracks. All wind turbines/associated infrastructure will be minimum 50m from watercourses.	Construction Decommissioning
	Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation (riverine system) Otter Atlantic salmon Sea lamprey River lamprey Brook lamprey	Direct and indirect impacts to aquatic receptors via reduced water quality may occur in the absence of mitigation. May occur through release of chemicals and suspended solids into the river during ground remediation, spillage of fuels or other fluids affecting qualifying features directly and indirectly, through loss of life, depleting prey items, and altering behaviour. This may also have the potential to indirectly affect off site habitats.	Construction Operation Decommissioning
	Otter Atlantic salmon Sea lamprey River lamprey Brook lamprey	Increased noise and vibration disturbance may indirectly affect qualifying through the presence of plant, machinery, site operatives, and activities which alters species behaviour.	Construction Decommissioning



Designated Site & Closest Distance to the Project (km)	Qualifying Feature(s)	Potential Pathways of Effect on Qualifying Interest Features	Project Phase
	Otter	Lighting on site leading to direct visual disturbance have potential to impact upon use of the site and watercourses and surrounding habitat by otter.	Construction Decommissioning
	Otter	Visual disturbance/ displacement of species from plant, machinery, site operatives and activities.	Construction Decommissioning
	Otter Atlantic salmon Sea lamprey River lamprey Brook lamprey	Direct and indirect mortality: Potential for killing, Injury or life stage disruptions of qualifying species affecting loss of life at an individual level and decreasing mortality rate by altering behaviours at a population level.	Construction Operation Decommissioning
	Otter Atlantic salmon Sea lamprey River lamprey Brook lamprey	Direct and indirect disturbance to/ displacement of species prey may result.	Construction Decommissioning
	Otter Atlantic salmon Sea lamprey River lamprey Brook lamprey Riverine system	Invasive Non-Native Species (INNS) impacts through the spread via hydrological, air, or transport vectors which may act to outcompete native habitat with further or additional impacts to native flora/fauna.	Construction Operation Decommissioning
Fala Flow Ramsar (8.9km, NW of the site)	Blanket Mire	It is considered unlikely that there will be any potential effects to the wetland as no potential pathways of effect exist that could impact the wetland habitat (i.e., no hydrological connectivity and beyond the screening parameter/zone of influence of airborne pollution or any other indirect effects). No significant effects are predicted. The Fala Flow Ramsar designated site and it's features and screened out of this assessment.	n/a

3.4.1.1 River Tweed SAC

Potential pressures and screening parameters are described in **Table 3-5** for the River Tweed SAC.



Table 3-5: Assessment of Likely Significant Effects

Potential Pressures	Feature	Project Phase	Screening Parameter	Justification	Determination of LSE
Direct Habitat Loss and Habitat Degradation (Works in and near Watercourses)	Riverine system	Construction (C) Decommission (D)	Works footprint	Restricted to footprint of direct habitat loss associated with the watercourses crossings within the River Tweed catchment.	Due to direct pressure within designated site, potential LSEs may result. Most notably in the riparian habitats during C and D phases.
Indirect Habitat Loss and Habitat Degradation (Works in and near Watercourses)	Otter Atlantic salmon Sea lamprey River lamprey Brook lamprey Riverine system	C D	30m for any peat/carbon rich soils, up to 250m for GWDTE potential habitats plus up to 250m downstream for watercourses	NatureScot guidance on Peatland and Carbon Rich Soils and precautionary distance downstream for direct instream habitat alterations beyond footprint in absence of mitigation.	Due to indirect pressure within designated site, potential LSEs may result. Most notably in the riparian habitats during C and D phases.*
Direct and Indirect Impacts to Aquatic Receptors (Reduced Water Quality)	Otter Atlantic salmon Sea lamprey River lamprey Brook lamprey	C Operation (O) D	The parameter/pathway of effect for aquatic features is taken to be 10km. Windblown terrestrial toxic contamination entering riparian zone is afforded a screening parameter of 2km.	Precautionary approach in absence of mitigation. LSEs will be isolated and temporary in nature.	Due to direct and indirect pressure within designated site, potential LSEs may result. Most notably in the riparian habitats during C and D phases.



Potential Pressures	Feature	Project Phase	Screening Parameter	Justification	Determination of LSE
	Riverine system				
Direct and Indirect Habitat Degradation (Changes to Waterflow)	Otter Atlantic salmon Sea lamprey River lamprey Brook lamprey Riverine system	C D	The parameter/pathway of effect for aquatic features is taken to be 10km.	Precautionary approach in absence of mitigation. LSEs will be isolated and temporary in nature.	Due to direct and indirect pressure within designated site, potential LSEs may result. Most notably in the riparian habitats during C and D phases.
Direct and Indirect Habitat Degradation (Reduced Air Quality)	Otter Atlantic salmon Sea lamprey River lamprey Brook lamprey Riverine system	C D	Windblown terrestrial toxic contamination entering terrestrial zone is afforded a screening parameter of 2km.	Precautionary approach in absence of mitigation. LSEs will be isolated and temporary in nature.	Due to direct and indirect pressure within designated site, potential LSEs may result. Most notably in the terrestrial and riparian habitats during C and D phases.
Direct or Indirect Mortality (Killing or Injury)	Otter Atlantic salmon	C O D	Home range for otter is up to 50km stretch of watercourse - a 10km geographic site buffer taken to	Precautionary approach in absence of mitigation. Refer to	Due to indirect pressure within designated site, potential LSEs may result to all noted



Potential Pressures	Feature	Project Phase	Screening Parameter	Justification	Determination of LSE
	Sea lamprey River lamprey Brook lamprey		represent 50km of watercourses in this area. Migratory and diadromous fish parameter taken to be the freshwater range of the species (i.e., to the mouth of the River Tweed).	Section 3.2.1 for justification in full.	species. Most notably in the riparian habitats for all species and also associated terrestrial zones for otter during C, O and D phases.
Direct and Indirect Disturbance to Species (Increased Noise and Vibration)	Otter Atlantic salmon Sea lamprey River lamprey Brook lamprey	C D	Up to 200m for otter when using a natal holt and 30m otherwise if using a place of shelter or for the individual(s) at any location within these ranges. For medium sensitivity fish such as Atlantic salmon, the minimum noise threshold level is approximately 95 dB re 1 µPa between 30 to 400 Hz, for low sensitivity fish, such as lamprey, the minimum noise threshold level is 118dB 1 µPa between 30 to 200 Hz. Threshold for a strong avoidance reaction by medium sensitivity fish, is around 170 dB re 1 µPa and the threshold for significant avoidance is 193 dB re 1 µPa for low sensitivity fish.	NatureScot guidance suggests up to 200m disturbance distance for otter at or using a breeding holt and within the range of 30m for otter in or using a non-breeding place of shelter (depending on nature of works for otter) ²⁶ . Based on Nedwell, J.R., et. al (2007) ²⁷ <i>A validation of the dBht as a measure of the behavioural and auditory effects of underwater noise for fish.</i>	Due to direct and indirect pressure within designated site, potential LSEs may result. Most notably in the riparian habitats during C and D phases via effects of in-water and in-air noise and vibration.

²⁶ NatureScot *Standing advice for planning consultations – Otters*. Available online: <https://www.nature.scot/doc/standing-advice-planning-consultations-otters> [accessed 25.10.23]

²⁷ Nedwell, J.R., et. al (2007) *A validation of the dBht as a measure of the behavioural and auditory effects of underwater noise for fish*. Subacoustech. Available online: <https://tethys.pnnl.gov/sites/default/files/publications/Nedwell-et-al-2007.pdf> [accessed 25.10.23].



Potential Pressures	Feature	Project Phase	Screening Parameter	Justification	Determination of LSE
				LSEs will be isolated and temporary in nature.	
Direct and Indirect Disturbance to Species (Lighting and Visual Disturbance)	Otter	C D	Location of lighting and light spill plus visual disturbances, with indirect effects extending to the riparian home range of the species.	Precautionary approach in absence of mitigation. Refer to Section 3.2.1 for justification in full. LSEs will be isolated and temporary in nature.	Due to direct and indirect pressure within designated site, potential LSEs may result. Most notably in the riparian habitats during C and D phases.
Direct and Indirect Disturbance to/ Displacement of Species (Visual Disturbance: Plant, Machinery, Site Operatives and Construction Activities)	Otter	C D	Location of site footprint (i.e., Plant, Machinery, Site Operatives and Construction Activities) plus access areas, with indirect effects extending to the riparian home range of the species.	Precautionary approach in absence of mitigation. Refer to Section 3.2.1 for justification in full. LSEs will be isolated and temporary in nature.	Due to direct and indirect pressure within designated site, potential LSEs may result to otter. Most notably in the riparian habitats (watercourses and bankside habitats) during C and D phases.
Direct and Indirect Disturbance to/Displacement of Species Prey	Otter Atlantic salmon Sea lamprey River lamprey Brook lamprey	C D	Location of site footprint (i.e., Plant, Machinery, Site Operatives and Construction Activities) plus access areas, with indirect effects extending to the riparian home range of the species.	Precautionary approach in absence of mitigation. Refer to Section 3.2.1 for justification in full. LSEs will be isolated and temporary in nature.	Due to direct and indirect pressure within designated site, potential LSEs may result. Most notably to aquatic receptors including macro-invertebrates and their habitats in the riparian zones during C and D phases.



Potential Pressures	Feature	Project Phase	Screening Parameter	Justification	Determination of LSE
Invasive Non-native Species (INNS)	Otter	C	A screening parameter of the footprint of the site plus 10 km buffer is considered when assessing potential pathway of effect of INNS via hydrological spread and 2km overland to account for potential air dispersal/vehicle/plant movements in the absence of mitigation.	Precautionary approach in absence of mitigation.	Due to direct and indirect pressure within designated site, potential LSEs may result. Most notably in the riparian and terrestrial habitats associated with the SAC and downstream during C and D phases.
	Atlantic salmon	O			
	Sea lamprey	D			
	River lamprey				
	Brook lamprey				
	Riverine system				

* **Chapter 10: Hydrology, Hydrogeology & Geology** determined that most of the areas identified using NVC as having moderate or high GWDTE potential are more likely to be surface water dependant and therefore have low GWDTE potential. The exception is a mosaic of U20/U4a/M23b which is partially associated with a spring and while likely largely surface water dependant may benefit some ground water input. This areas has been fully avoided by the proposed development. A full GWDTE assessment is provided in Chapter 10.



3.4.1.2 Fala Flow Ramsar

Fala Flow Ramsar is located c.8.9km from the site and is designated for its wetland status. It is considered unlikely that the proposed development will have any significant effect on the designated site either alone or in combination with other projects given that there are no direct or indirect pathways of effect. No hydrological pathways exist, and it is considered far enough away from development for pathways such as air quality and noise and vibration to have any effect on the wetland habitat for which the Ramsar site is designated. Therefore, the Fala Flow Ramsar has been **screened out** and **will not require further assessment**.

3.4.2 In-combination with Other Projects

3.4.2.1 Other Projects and Plans with Potential for In Combination Effects

Cumulative effects can result from individually insignificant but collectively significant actions taking place over a period of time or concentrated in a particular location. The potential for cumulative effects with other development proposals has been assessed here.

For aquatic receptors potential cumulative effects are only likely to be significant for other developments located relatively close by (i.e., within 10km) and within the same hydrological sub-catchments, therefore, this appraisal has assessed the cumulative effects on aquatic receptors within the same sub-catchment (in this instance considered to be the Leader Water catchment, the largest watercourse hydrologically connected to the site within 10km). As a precautionary approach, beyond 10km no discernible effects of pollution, with or in absence of mitigation, is deemed to have the potential to result in LSEs and they are considered outside of the ZOI.

Projects considered for inclusion for cumulative effects are detailed in **Table 3.6**. These include developments within the relevant study areas which are either operational, under construction, consented or for which a planning application has been submitted.

Table 3-6: Other Projects Considered for Cumulative Effects

Project	Status	Distance from Site (km)	Number of Wind Turbines	River Sub-Catchment
Fallago Rig Wind Farm	Operational	<5	48	Dye Water - White Adder Water - Tweed
Ditchers Law Wind Farm	Application	<5	15	Leader Water - Tweed
Dunside Wind Farm	Application	<5	15	Dye Water- White Adder Water - Tweed
Newlands Hill Wind Farm	Scoping	5-10	17	Faseny Water - White Adder Water - Tweed
Keith Hill Wind Farm	Operational	5-10	5	Humbie Water - Birns Water - Tyne
Pogbie I Wind Farm	Operational	5-10	6	Humbie Water - Birns Water - Tyne
Pogbie II Wind Farm	Operational	5-10	6	Humbie Water - Birns Water - Tyne



Project	Status	Distance from Site (km)	Number of Wind Turbines	River Sub-Catchment
Dun Law I Wind Farm	Operational	5-10	26	Humbie Water - Birns Water - Tyne
Dun Law II Wind Farm	Operational	5-10	35	Humbie Water - Birns Water - Tyne Leader Water - Tweed
Toddleburn Wind Farm	Operational	5-10	12	Leader Water - Tweed Gala Water - Tweed

Seven of the sites are screened out of this assessment. Three are within the same sub-catchment (Leader Water) as the site, these will require to be assessed in relation to cumulative impacts on aquatic receptors. All potential LSEs for riparian habitat, otter and fish species will require to be assessed, as for the project alone.

3.4.2.2 In Combination Assessment

Should construction of the proposed development and one or more of the other projects currently in application or scoping happen at the same time, then any direct or indirect effects of **direct and indirect habitat loss/degradation, impacts to aquatic receptors from in/near water works, reduced water quality (water and soil contamination), changes to waterflow, reduced air quality, mortality, disturbance due to noise/vibration, lighting/ visual disturbance, displacement or invasive non-native species (INNS)** could be exacerbated. In addition, any of the currently operational wind farms within the area could, in theory, in combination with the proposed development exacerbate these issues.

The geographical and temporal boundaries for assessment for different types of impact will be taken forward within **Chapter 8: Terrestrial Ecology** and **Chapter 10: Hydrology, Hydrogeology & Geology** with due regard to full details of project plans made available. Upon which a prediction of magnitude/extent of identified likely cumulative effects is defined.



4.0 Screening: Conclusions and Recommendations

The screening assessment highlighted that in the absence of mitigation significant effects to habitats, individuals and populations of qualifying interest species could not yet be completely ruled without further assessment and/or mitigation. Further assessment was required for the River Tweed SAC and its designated features.

The Fala Flow Ramsar was screened out as no pathways of effect that could cause likely significant effects were identified during the screening stage; therefore, the Fala Flow Ramsar requires no further consideration.

The qualifying features of the River Tweed SAC require to be considered in further assessment:

- Riverine systems;
- Atlantic salmon;
- Sea lamprey;
- River lamprey;
- Brook lamprey; and
- Otter.

The following pressures will require to be included in the appropriate assessment:

- Direct and indirect habitat loss/degradation during construction and decommissioning;
- Direct and indirect impacts to aquatic receptors from:
 - In/near water works during construction and decommissioning,
 - Reduced water quality (water and soil contamination) during construction, operation and decommissioning;
 - Changes to waterflow during construction and decommissioning;
- Direct and indirect habitat degradation resulting from:
 - Changes to waterflow during construction and decommissioning;
 - Reduced air quality during construction and decommissioning;
- Direct and indirect mortality (killing or injury) during construction, operation and decommissioning;
- Direct and indirect disturbance to species due to:
 - Noise/ vibration during construction and decommissioning;
 - Lighting/ visual disturbance during construction and decommissioning;
 - Visual disturbance from plant/ machinery, site operatives and construction activities during construction and decommissioning;
 - Direct and indirect displacement of prey species during construction and decommissioning; and
- Invasive non-native species (INNS) during construction, operation and decommissioning.

Further, more detailed assessment for the project alone and in-combination with other projects is provided within **Chapter 8: Terrestrial Ecology** and **Chapter 10: Hydrology**,



Hydrogeology & Geology with due regard to full details of project plans made available alongside the requirement for avoidance and mitigation measures, to address LSEs, prior to reaching a conclusion.

The HRA test is whether the proposed development will have an adverse effect on the integrity of any International/ European site in the light of the conservation objectives for the qualifying interest features detailed within this screening assessment.

In conclusion, no effect was found to undermine the conservation objectives that is considered an adverse effect on the integrity of the site, and vice versa.





Drawing 01: Proposed Development

Longcroft Wind Farm Technical Appendix 8.7: Shadow Habitats Regulations Appraisal: (Screening)

In Support of Proposed Planning Application for Onshore Wind Farm

RES

SLR Project No.: 405.064862.00001

25 October 2023

















LONGCROFT WIND FARM

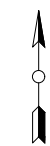
TECHNICAL APPENDIX 8.7 HRA

DRAWING 01 PROPOSED DEVELOPMENT

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2023 LICENCE NUMBER 0100031673.

KEY:

-  TURBINES
-  SITE BOUNDARY
(CENTRE OF LINE DENOTES BOUNDARY)
-  UPGRADED SITE TRACKS
-  NEW SITE TRACKS
-  WATERCOURSE CROSSING
-  EXISTING PUBLIC ROAD
-  BORROW PIT SEARCH AREA
-  TEMPORARY BATCHING PLANT
-  SUBSTATION LOCATION
-  TEMPORARY CONSTRUCTION COMPOUND
-  BATTERY STORAGE COMPOUND
-  TRANSFER STATION
-  HARDSTANDING
-  SITE ENTRANCE LOCATION



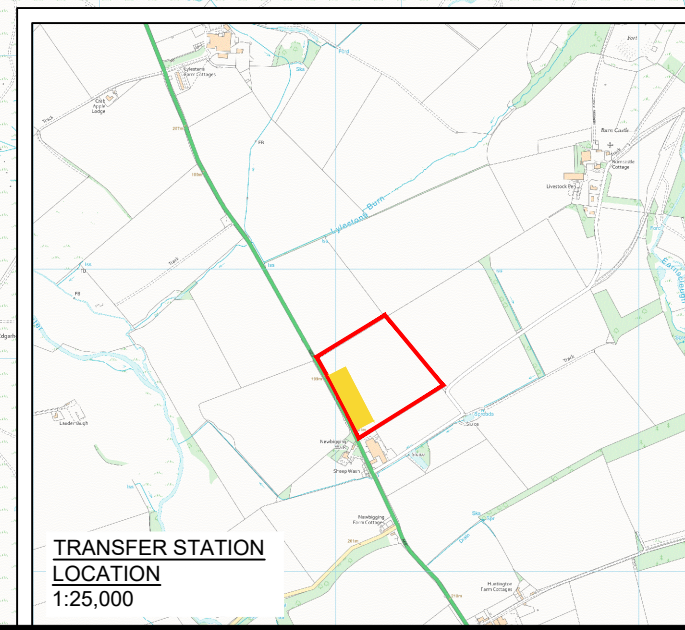
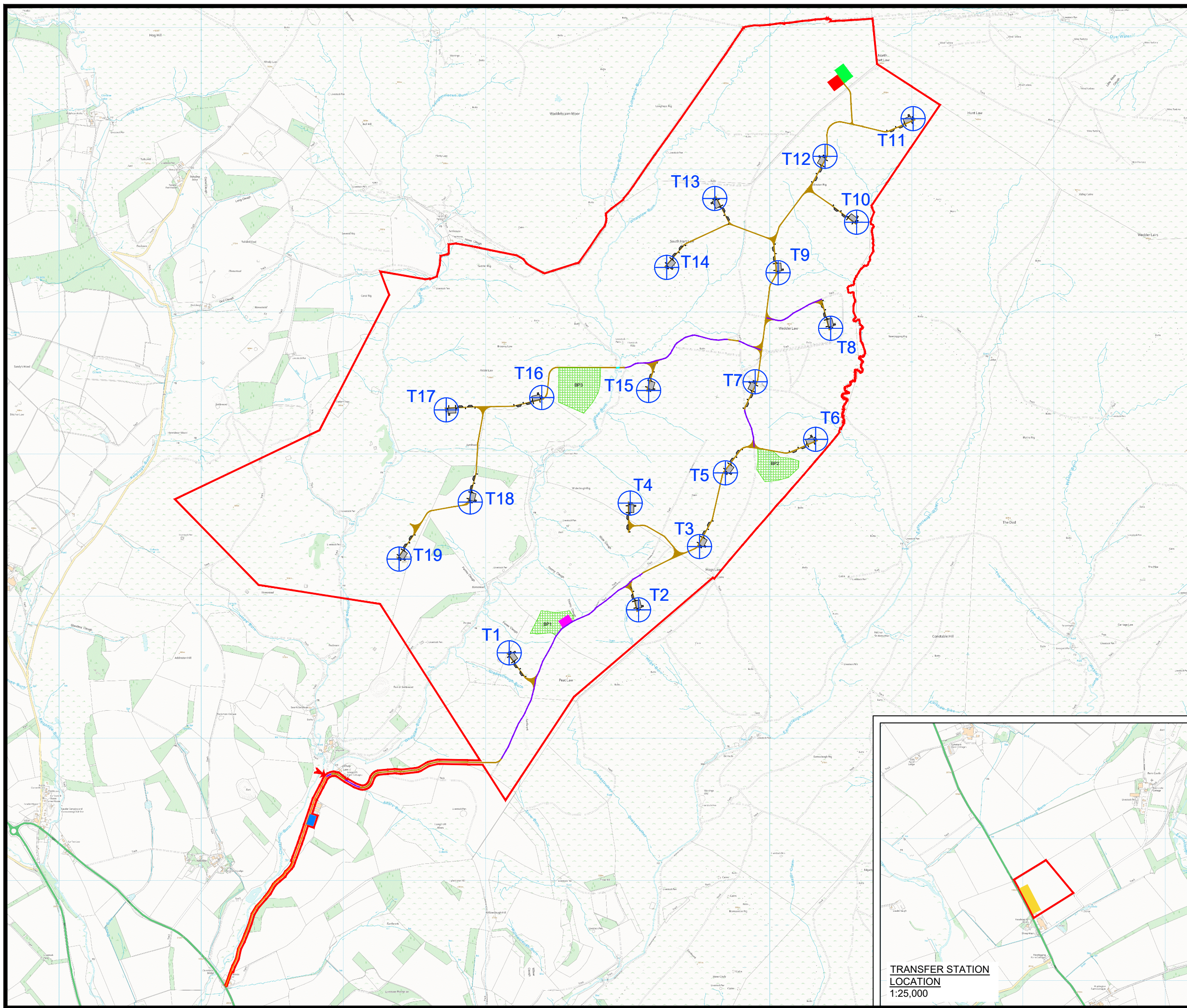
LAYOUT DWG N/A T-LAYOUT NO. PSCOLCF021

DRAWING NUMBER REV 6

SCALE - 1:25,000 @ A3

ENVIRONMENTAL IMPACT
ASSESSMENT REPORT 2023

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Drawing 02: Watercourse Crossing Schedule

**Longcroft Wind Farm Technical Appendix 8.7: Shadow
Habitats Regulations Appraisal: (Screening)**

In Support of Proposed Planning Application for Onshore Wind Farm

RES

SLR Project No.: 405.064862.00001

25 October 2023

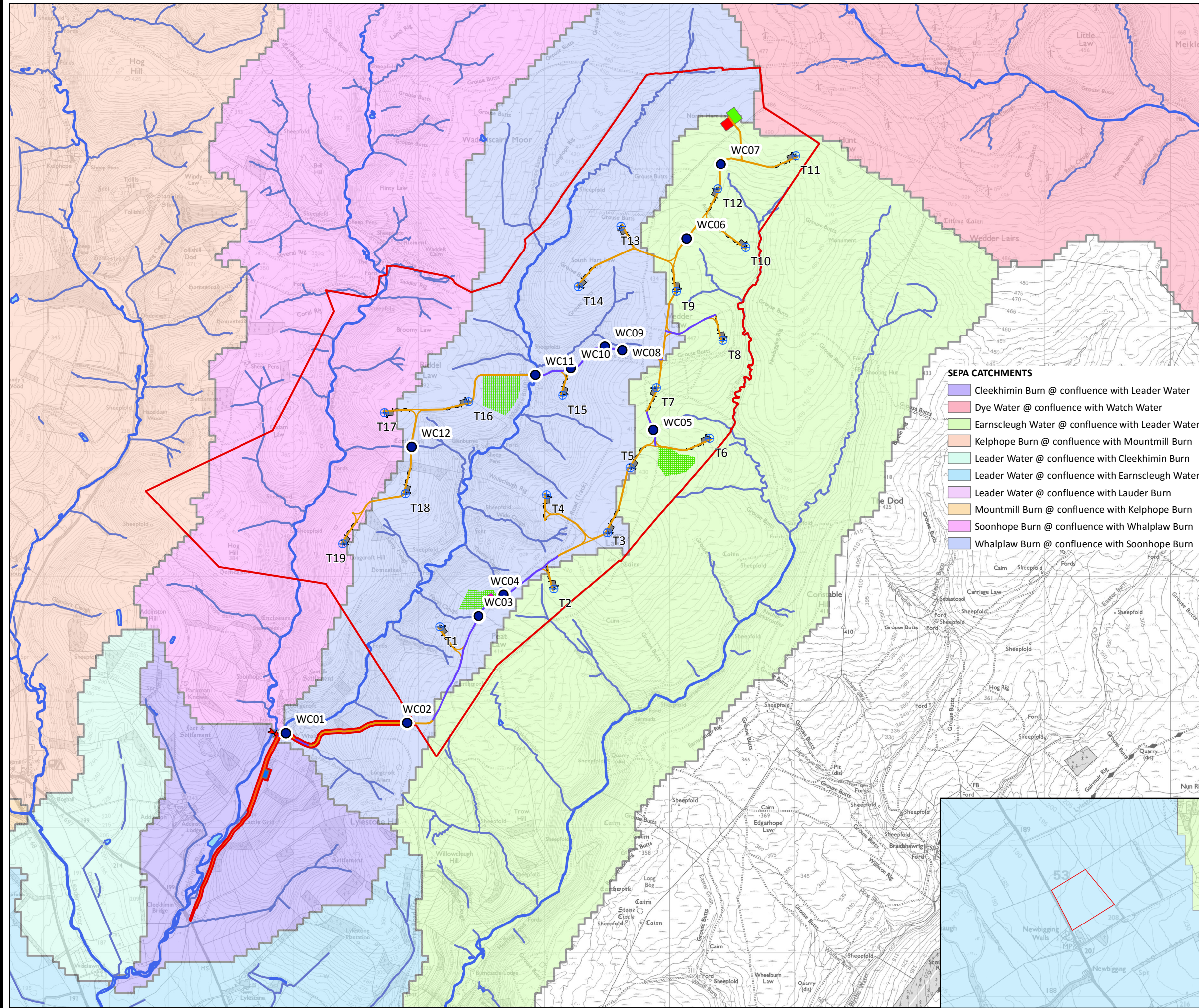


LONGCROFT WIND FARM

TECHNICAL APPENDIX 8.7 HRA

DRAWING 02 WATERCOURSE CROSSINGS

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- SEPA CATCHMENTS**
- Cleekhimin Burn @ confluence with Leader Water
 - Dye Water @ confluence with Watch Water
 - Earnscleugh Water @ confluence with Leader Water
 - Kelphope Burn @ confluence with Mountmill Burn
 - Leader Water @ confluence with Cleekhimin Burn
 - Leader Water @ confluence with Earnscleugh Water
 - Leader Water @ confluence with Lauder Burn
 - Mountmill Burn @ confluence with Kelphope Burn
 - Soonhope Burn @ confluence with Whalplaw Burn
 - Whalplaw Burn @ confluence with Soonhope Burn

- KEY**
- Site Boundary
 - Turbines
 - Upgraded Tracks
 - Proposed Tracks
 - Existing Public Road
 - Watercourse Crossing
 - Temporary Construction Compound
 - Temp Concrete Batching Plant
 - Substation Compound
 - Site Entrance
 - Hardstandings
 - Borrow Pit Search Areas
 - Battery Storage Compound
 - Watercourses
 - Waterbodies
 - Watercourse Crossings

LAYOUT DWG: 04728-RES-LAY-DR-PE-003
T-LAYOUT NO.: PSCOLCF021

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SCALE - 1:30,000 @ A3

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Drawing 03: Designated Sites Map

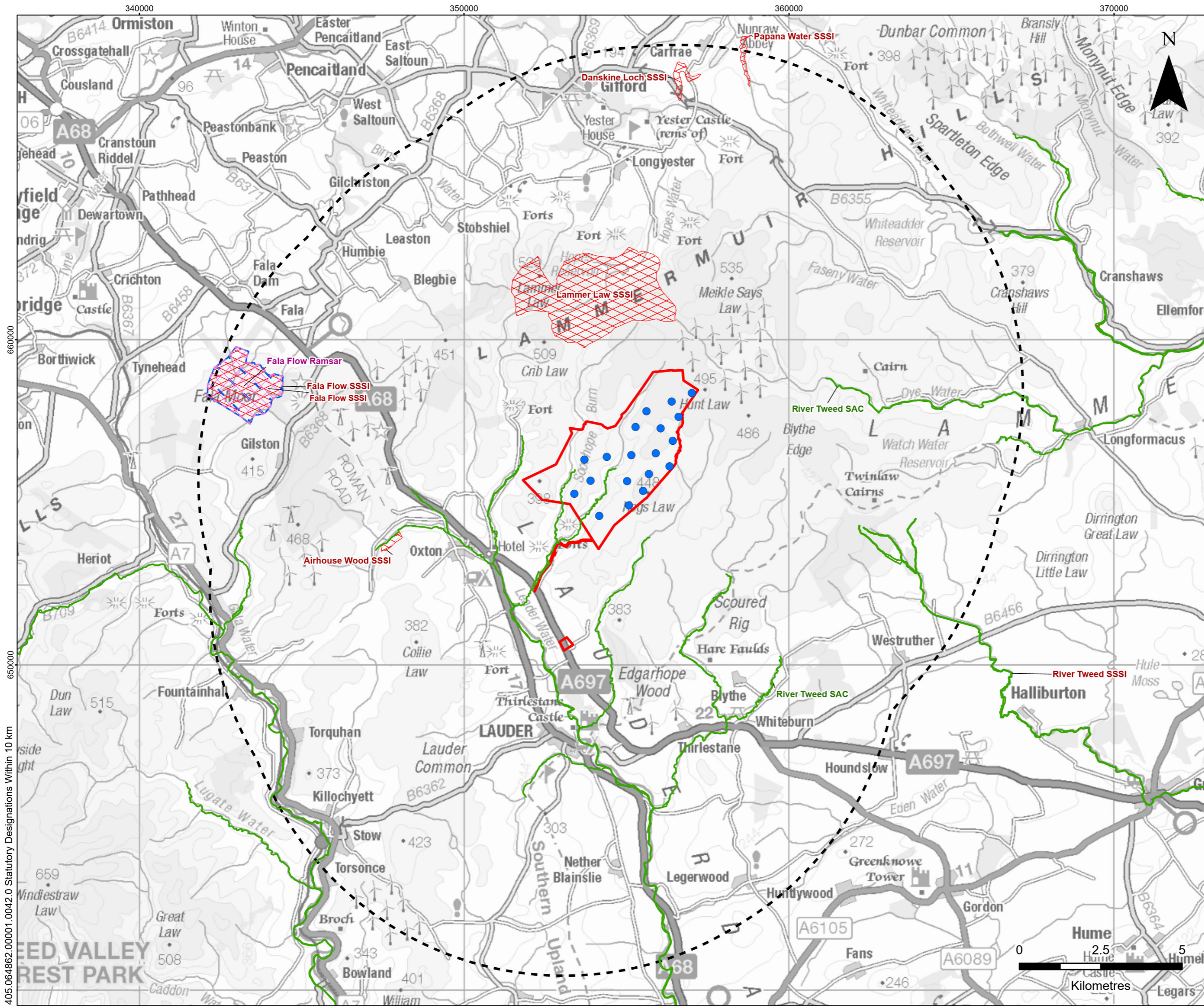
Longcroft Wind Farm Technical Appendix 8.7: Shadow Habitats Regulations Appraisal: (Screening)

In Support of Proposed Planning Application for Onshore Wind Farm

RES

SLR Project No.: 405.064862.00001

25 October 2023



LEGEND

- Site Boundary
- Site Boundary 10 km Buffer
- Proposed Turbine Location
- Ramsar
- Site of Special Scientific Interest (SSSI)
- Special Area of Conservation (SAC)
- Special Protection Area (SPA)



LONGCROFT WIND FARM
HRA REPORT
STATUTORY DESIGNATIONS
WITHIN 10 KM
DRAWING 03

Scale 1:110,000 @ A3 Date OCTOBER 2023



Appendix A Designated Site Citation Sheets

Longcroft Wind Farm Technical Appendix 8.7: Shadow Habitats Regulations Appraisal: (Screening)

In Support of Proposed Planning Application for Onshore Wind Farm

RES

SLR Project No.: 405.064862.00001

25 October 2023

RIVER TWEED SPECIAL AREA OF CONSERVATION (SAC)

Designation date: 17 March 2005

Administrative area: Northumberland; Scottish Borders

Qualifying Interests for which the site is designated:

SCIENTIFIC NAME	COMMON NAME
<i>Lampetra fluviatilis</i>	River lamprey
<i>Lampetra planeri</i>	Brook lamprey
<i>Lutra lutra</i>	Otter
<i>Petromyzon marinus</i>	Sea lamprey
<i>Salmo salar</i>	Atlantic salmon
Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation	Rivers with floating vegetation often dominated by water-crowfoot

EC Directive 92/43 on the Conservation of Natural Habitats and of Wild Fauna and Flora

Citation for Special Area of Conservation (SAC)

Name:	River Tweed
Unitary Authority/County:	Northumberland, Scottish Borders
SAC status:	English part designated on 1 April 2005 Scottish part designated on 17 March 2005
Grid reference:	NT503338
SAC EU code:	UK0012691
Area (ha):	3797.41
Component SSSI:	Abbey St Bathans Woodlands SSSI, Kirkhope Linns SSSI, Lennel, Charley's Brae SSSI, Riskinhope SSSI, River Tweed SSSI, Tweed Catchment Rivers – England: Lower Tweed and Whiteadder SSSI, Tweed Catchment Rivers – England: Till Catchment SSSI, Tweed River SSSI

Site description:

The River Tweed drains a large catchment on the east coast of the UK, with sub-catchments in both Scotland and England. It shows a strong nutrient gradient along its length, with oligotrophic (nutrient-poor) conditions in its headwaters, and nutrient-rich lowland conditions just before it enters the sea at Berwick. The river has a high ecological diversity which reflects the mixed geology of the catchment. Stream water-crowfoot *Ranunculus penicillatus* ssp. *pseudofluitans*, a species of southern rivers and streams, here occurs at its most northerly location as does fan-leaved water-crowfoot *R. circinatus*, along with river water-crowfoot *R. fluitans*, common water-crowfoot *R. aquatilis*, pond water-crowfoot *R. peltatus* and a range of hybrids.

The fish fauna of the river is one of the richest in Great Britain. The Tweed supports a very large, high-quality Atlantic salmon *Salmo salar* population with large seasonal migrations: one run in the spring and a larger one in the autumn. The high proportion of the River Tweed accessible to salmon, and the variety of habitat conditions in the river, has resulted in it supporting the full range of salmon life-history types, with sub-populations of spring, summer salmon and grilse all being present. Salmon require clean gravel beds for spawning. The presence of brook *Lampetra planeri*, river *Lampetra fluviatilis* and sea lampreys *Petromyzon marinus* throughout the catchment is also important. These species prefer the lower gradient, fast flowing rivers with boulders as spawning grounds and the juveniles show preference for silty areas in slower flowing waters.

The extensive water and riparian habitats of the Tweed provide conditions suitable for all necessary aspects of otters' *Lutra lutra* life cycles. The extensive tributary burns provide good feeding habitat.

Qualifying habitats: The site is designated under **article 4(4)** of the Directive (92/43/EEC) as it hosts the following habitats listed in Annex I:

- Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitriche-Batrachion* vegetation. (Rivers with floating vegetation often dominated by water-crowfoot)

Qualifying species: The site is designated under **article 4(4)** of the Directive (92/43/EEC) as it hosts the following species listed in Annex II:

- Atlantic salmon *Salmo salar*
- Brook lamprey *Lampetra planeri*
- Otter *Lutra lutra*
- River lamprey *Lampetra fluviatilis*
- Sea lamprey *Petromyzon marinus*

This citation relates to a site entered in the Register of European Sites for Great Britain.

Register reference number: UK0012691

Date of registration: 14 June 2005

Signed: *Trevor Salmon*

On behalf of the Secretary of State for Environment, Food and Rural Affairs

European Site Conservation Objectives for River Tweed Special Area of Conservation Site Code: UK0012691



With regard to the SAC and the natural habitats and/or species for which the site has been designated (the 'Qualifying Features' listed below), and subject to natural change;

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;

- **The extent and distribution of qualifying natural habitats and habitats of qualifying species**
- **The structure and function (including typical species) of qualifying natural habitats**
- **The structure and function of the habitats of qualifying species**
- **The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely**
- **The populations of qualifying species, and,**
- **The distribution of qualifying species within the site.**

This document should be read in conjunction with the accompanying *Supplementary Advice* document (where available), which provides more detailed advice and information to enable the application and achievement of the Objectives set out above.

Qualifying Features:

H3260. Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation; Rivers with floating vegetation often dominated by water-crowfoot

S1095. *Petromyzon marinus*; Sea lamprey

S1096. *Lampetra planeri*; Brook lamprey

S1099. *Lampetra fluviatilis*; River lamprey

S1106. *Salmo salar*; Atlantic salmon

S1355. *Lutra lutra*; Otter

This is a cross border site

This site crosses the border between England and Scotland. Some features may only occur in one Country. The advice of [Scottish Natural Heritage](#) should therefore be sought separately.

Explanatory Notes: European Site Conservation Objectives

These Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2017 as amended from time to time (the “Habitats Regulations”). They must be considered when a competent authority is required to make a ‘Habitats Regulations Assessment’, including an Appropriate Assessment, under the relevant parts of this legislation.

These Conservation Objectives and the accompanying Supplementary Advice (where available) will also provide a framework to inform the measures needed to conserve or restore the European Site and the prevention of deterioration or significant disturbance of its qualifying features.

These Conservation Objectives are set for each habitat or species of a [Special Area of Conservation \(SAC\)](#). Where the objectives are met, the site will be considered to exhibit a high degree of integrity and to be contributing to achieving Favourable Conservation Status for that species or habitat type at a UK level. The term ‘favourable conservation status’ is defined in regulation 3 of the Habitats Regulations.

Publication date: 27 November 2018 (version 4). This document updates and replaces an earlier version dated 22 February 2016 to reflect the consolidation of the Habitats Regulations in 2017.

RIVER TWEED SPECIAL AREA OF CONSERVATION (SAC)

CONSERVATION ADVICE PACKAGE



The Yarrow from the bridge at the Gordon Arms © NatureScot

Site Details

Site name:	River Tweed
Site map:	https://sitelink.nature.scot/site/8369
Location:	Scottish Borders; Northumberland
Site code:	UK0012691
Area (ha):	3,742.65 (length 1,284.69 km)
Date designated:	17 March 2005

Qualifying features

Qualifying feature	SCM assessed condition	SCM visit date	UK overall Conservation Status
Rivers with floating vegetation often dominated by water-crowfoot (water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation). [H3260]	Unfavourable No change	27 September 2013	Unfavourable- bad
Sea lamprey (<i>Petromyzon marinus</i>) [S1095]	Unfavourable Declining	22 November 2018	Unknown
Brook lamprey (<i>Lampetra planeri</i>) [S1096]	Favourable Maintained	22 November 2018	Unknown
River lamprey (<i>Lampetra fluviatilis</i>) [S1099]	Favourable Maintained	22 November 2018	Favourable
Atlantic salmon (<i>Salmo salar</i>) [S1106]	Favourable Maintained	5 August 2011	Unfavourable - Inadequate
Otter (<i>Lutra lutra</i>) [S1355]	Favourable Maintained	11 December 2011	Favourable

Notes:

Assessed condition refers to the condition of the SAC feature assessed at a site level as part of NatureScot's [Site Condition Monitoring \(SCM\)](#) programme.

Conservation status is the overall condition of the feature throughout its range within the UK as reported to the European Commission under Article 17 of the Habitats Directive in 2019.

Overlapping Protected Areas:

The River Tweed, its major tributaries and many smaller tributaries are designated as the River Tweed SAC. In Scotland, the River Tweed and six major tributaries only (the Blackadder and Whiteadder, Bowmont, Teviot, Ettrick and Yarrow), are also notified as the River Tweed Site of Special Scientific Interest (SSSI). The Site Management Statement provides information on the wider ecological importance of the River Tweed SSSI, including its plant and invertebrate populations.

The River Tweed SAC partly overlaps with the Moorfoot Hills SAC.

The SAC also at least partly overlaps with the following SSSIs: Abbey St Bathans Woodlands; Airhouse Wood; Avenel Hill and Gorge; Glenkinnon Burn; Kirkhope Linns; Lennel, Charley's Brae; Lintmill Railway Cutting; Makerstoun - Corbie Craigs to Trows' Craigs; Moorfoot Hills; Newtown St Boswells Woods; Riskinhope; St Mary's Loch; Tweedwood – Gateheugh; Whiteadder Water.

Further information on these protected areas can be found on [SiteLink](#).

Key factors affecting the qualifying features

Rivers with floating vegetation often dominated by water-crowfoot

This feature type relates to the river habitat as a whole, including its aquatic plant communities. It is often characterised by the abundance of water-crowfoot species (*Ranunculus* spp., subgenus *Batrachium*), which form floating mats within river channels and have white flowers in early to mid-summer.

The River Tweed is the most species-rich example of a river with *Ranunculus* in Scotland. It has been designated as a 'whole river system', with all major tributaries and sub-tributaries included within the designation. This therefore covers the full ecological continuum that is characteristic of river ecosystems. The river has a high ecological diversity which reflects the size, mixed geology and altitudinal range of the catchment.

The feature has been assessed through NatureScot's site condition monitoring programme as being in unfavourable condition at this SAC. This is largely due to modification of the river channel through caulds, croys and other structures. In a river survey from 2013, all 18 survey areas were in unfavourable condition due to river modification. In addition, a further six factors were identified that had a significant, but more local impact on the river. These issues were: lack of bankside trees; lack of riparian buffer; lack of woody debris; siltation; presence of invasive non-native species, presence of filamentous algae. Although many aspects of the wider river ecosystem are largely in good condition, much work still needs to be done to bring the river itself into favourable condition.

The river habitat can be adversely affected by nutrient enrichment, mainly from sewage inputs and agriculture, and where agriculture has caused serious siltation. It is also vulnerable to artificial reductions in river flows caused by abstractions or flow diversions and to unsympathetic channel or bank engineering works.

Brook, river and sea lamprey

The brook lamprey is a primitive species of jawless fish that is eel-like in shape. It is the most abundant, widespread, and smallest species of lamprey found in Scotland and spends its entire life in fresh water. Larval lamprey (also termed ammocoetes) are filter feeders that trap water-borne fine organic matter. Their habitat commonly comprises fine sediment in which they remain buried until they metamorphose into adults. Following metamorphosis, the adults migrate upstream to spawn in clean gravel beds.

River and sea lamprey are primitive anadromous species of jawless fish that are eel-like in shape. They spend the majority of their lives as larvae buried in fine sediment in rivers where they filter feed by trapping water-borne fine organic matter. The larval phase of river lamprey lasts for approximately four years after which it metamorphoses and migrates to estuaries where it resides for one to two years and feeds on a variety of fish. The mature river lamprey then migrate upstream to spawn. The larval phase of sea lamprey lasts for approximately five years after which it metamorphoses and migrates to sea. Relatively little is known about its marine phase, but adult sea lamprey have been found in both shallow coastal and deep off-shore waters where they feed on a variety of fish. After approximately one to two years the adults will return to fresh water to spawn.

Adult river and sea lamprey require migration routes that are free of obstacles. Impassable manmade structures, e.g. dams and weirs, will restrict their distribution across a catchment – natural obstacles, e.g. waterfalls, will also do the same.

The sea lamprey has been assessed through NatureScot's site condition monitoring programme as being in unfavourable condition at this SAC due to a restricted distribution within the Tweed catchment. The Mertoun weir at St Boswells is potentially a significant obstacle for sea lamprey, although other fish species are largely successful at migrating upstream of the structure. Despite the presence of a fish pass, river flow rates over the weir, particularly during upstream migrations, may not be suitable for the species. As a result, sea lamprey may be largely restricted to the lower Tweed.

There is a level of uncertainty over this, however. *An assessment of Lamprey Distribution and Abundance in the River Tweed cSAC / SSSI* (report by Tweed Foundation, November 2004) noted sea lamprey records from the Gala Water and the Ettrick, both considerably upstream of the Mertoun weir. The site condition monitoring report does acknowledge that flow conditions suitable for upstream migration will vary from year to year, and could be highly unpredictable. It is possible, therefore, that sea lamprey could migrate upstream of the weir if suitable river conditions coincide with migration times, although this may not be identified by individual surveys. Furthermore, it is recognised that traditional survey techniques may not be sufficiently effective at recording the true distribution of sea lamprey.

Based on current survey data, sea lamprey is in unfavourable condition, but better evidence is required to give a true picture of the species distribution and the impacts of the Mertoun weir on this. Use of techniques such as eDNA will be helpful in this regard.

Habitat degradation is one of the key factors affecting brook, river and sea lamprey. They require clean, well oxygenated water and suitable substrates to use as spawning and nursery habitats. Activities such as river engineering or poor catchment management that could result in these habitats being damaged or removed could affect them. Indirect unwanted effects such as the smothering of habitat with fine material as a result of eutrophication could also affect lamprey.

Atlantic salmon

Atlantic salmon live in both freshwater and marine environments as part of their lifecycle. They hatch and live in freshwater as juveniles and then migrate to sea as adults. After one year or more at sea the adults return to their natal river to spawn. This homing behaviour has resulted in the development of genetically distinct populations of Atlantic salmon between Scottish rivers and several distinct populations may exist within the same river.

Atlantic salmon numbers have declined throughout their geographic range, including in Scottish rivers. They may be impacted by a range of pressures in the freshwater and marine phases of their lifecycle. In the freshwater environment these pressures may include, amongst others: over-fishing, loss of habitat connectivity, habitat degradation, climate change-related changes to surface water temperature and hydrology, built development (such as hydropower), invasive non-native species, direct and diffuse pollution, predation and the inappropriate stocking of conspecifics.

The Tweed is the largest and most important salmon rod fishery in Europe. This significance has long been recognised, with salmon-related bequests, royal assents and legislation dating back to the 12th century. Historically, most salmon were caught by netting, with 300 people directly employed in this activity at the end of the 18th century. The industry was also of considerable export value.

In the early 1900s there were over 80 salmon nets active on the Tweed and Berwickshire coast. There are now only five registered salmon nets, although even at those locations the purpose is now conservation and research. The impact of netting on salmon numbers should not be under-estimated. A 2011 site condition monitoring report on salmon SACs reported findings by the Environment Agency that about 70% of the salmon catch by the North East England net fishery was from Scottish rivers and potentially half of this was from the Tweed catchment. Closure of this fishery will therefore have brought significant benefits to wild salmon numbers in the Tweed.

On a much smaller scale, fish-eating birds, will take salmon - an entirely natural process of the river system. Where there is concern about predation by birds, fishery managers can apply for a control license. In recent years, licenses to control up to 54 goosander and 15 cormorant have been approved annually. Research has recently been carried out to give a better understanding of predation by fish-eating birds. This may influence the need for licences in future

Historically, water quality issues and blockages to fish migration were significant concerns across the River Tweed catchment. Principal issues of industrial and domestic pollution have now been addressed, and major blockages to fish migration have been amended to allow fish passage. As such, aquatic habitats in the river are generally in good condition. Tackling diffuse pollution remains a priority for river enhancement, with efforts focused on the agriculture, forestry and development sectors.

Maintaining good water quality and river habitat condition is progressed through a regulatory process that involves the Scottish Borders Council and the River Tweed

Commission. Proactive enhancement of river ecology is also promoted by these organisations and by nature charities such as the Tweed Forum.

In Scotland Atlantic salmon SACs extend to the tidal limit of rivers only. Marine mortality is however one of the key issues facing Atlantic salmon in Scotland and elsewhere. Environmental factors, climate change, marine developments, enhanced sea lice burdens associated with aquaculture, by-catch in pelagic fisheries, over-exploitation, prey availability, pollution and predation are all key factors that could affect this species. However, the exact nature of these interactions is not fully understood.

Otter

Otter require continued proximity to unpolluted open water either freshwater or coastal. There should be a plentiful food supply and features for providing shelter for both resting and breeding. They are wide ranging and occur at low densities throughout the catchment of the River Tweed and its tributaries.

Previous population declines in otters were primarily due to pollution and persecution. A report in 2011 (Site Condition Monitoring for Otters, SNH commissioned report No 521) showed that the presence of otter in survey locations on the Tweed had increased from about 45% occupancy in the late 1970s to about 95% occupancy between 2005 and 2011. A large scale survey has not been repeated since, but anecdotal evidence suggests that otter continue to be found throughout the Tweed catchment and in healthy numbers.

The main human impacts on otter are likely to be through materials or equipment discarded in the river or coastal waters that may trap otter, or through road traffic accidents. Although these factors could have a local impact on otter there is no evidence to suggest that they affect the Tweed population as a whole.

Further information about these [species](#) and [habitats](#) can be found on the JNCC website.

Conservation Priorities

There is unlikely to be any conflict between management of the features of the River Tweed SAC as they require similar environmental conditions. If any conservation management conflicts between the qualifying features of the River Tweed were to arise, consideration should first be given to those features in unfavourable condition. However, the impact of any proposed management measure on all the qualifying features should first be considered as part of a Habitats Regulations Appraisal.

The River Tweed SAC partly overlaps with Moorfoot Hills SAC, which has blanket bog as a Priority Feature. Broadly similar management is likely to be suitable for both blanket bog and the river SAC features although careful consideration would be needed before planting trees adjacent to the river to benefit the river SAC features within Moorfoot Hills SAC.

Any pro-active management for the River Tweed SAC or assessment of plans or projects will need to take account of all the interests of Moorfoot Hills SAC where the

sites overlap. If any management conflicts were to arise between the qualifying features of the River Tweed SAC and Moorfoot Hills SAC where the sites overlap, blanket bog should be given priority, followed by any features in unfavourable condition. This is because blanket bog is a Priority Feature and because management to benefit the River Tweed SAC could be done outwith the Moorfoot Hills SAC.

Conservation Objectives for rivers with floating vegetation often dominated by water-crowfoot (water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation).

1. To ensure that the qualifying feature of the River Tweed SAC is in favourable condition and make an appropriate contribution to achieving favourable conservation status.

Favourable Conservation Status (FCS) is considered at a European biogeographic level. When determining whether management measures may be required to ensure that the conservation objectives for this site are achieved, the focus should be on maintaining or restoring the contribution that this site makes to FCS.

When carrying out appraisals of plans and projects against these conservation objectives, it is not necessary to understand the status of the feature in other SACs in this biogeographic region. The purpose of the appraisal should be to understand whether the integrity of the site (see objective 2) would be maintained. If this is the case then its contribution to FCS across the Atlantic Biogeographic Region will continue to be met. Further details on how these appraisals should be carried out in relation to maintaining site integrity is provided by objective 2 (including parts a, b and c). If broader information on the feature is available then it should be used to provide context to the site-based appraisal.

Note that “appropriate” within this part of the conservation objectives is included to indicate that the contribution to FCS varies from site to site and feature to feature.

2. To ensure that the integrity of the River Tweed SAC is restored by meeting objectives 2a, 2b and 2c for the qualifying feature.

The aim at this SAC is to restore the qualifying habitat to a favourable condition as a contribution to its wider conservation status. Therefore any impacts to the objectives shown in 2a, 2b or 2c below must not persist so that they prevent the achievement of this overall aim. When carrying out appraisals of plans or projects the focus should be on restoring site integrity, specifically by meeting the objectives outlined in 2a, 2b and 2c. If these are met then site integrity will be restored. Note that not all of these will be relevant for every activity being considered. Any impacts on the objectives shown in 2a, 2b or 2c below must not persist so that they prevent the restoration of site integrity. Temporary impacts on these objectives resulting from plans or projects can only be permitted where they do not prevent the ability of a feature to recover and there is certainty that the features will be able to quickly recover.

This objective recognises that the qualifying habitat is exposed to a wide range of drivers of change. Some of these are natural and are not a direct result of human influences. Such changes in the habitats’ extent, distribution or condition within the site which are brought about by natural processes, directly or indirectly, are normally considered compatible with the site’s conservation objectives. An exception to this is when the favourable condition of a habitat is dependent on halting or managing natural succession. An assessment of whether a change is natural or anthropogenic, or a combination of both, will need to be looked at on a case by case basis.

2a. Maintain the extent and distribution of the habitat within the River Tweed SAC

80% of the River Tweed catchment is within Scotland. This area of the River Tweed designation extends to over 3,740 ha with a cumulative river length of over 1,280 km. The extent of water crowfoot-related vegetation within this habitat has been recorded in the Standard Data Form as 254.5ha, amounting to about 6.8% of the River Tweed SAC area. Survey work for the latest site condition monitoring exercise found that this vegetation type is reasonably well spread throughout most of the SAC.

The extent of river habitat within the designation, and the distribution of its characteristic species should be maintained.

2b. Restore the structure, function and supporting processes of the habitat

The river system should provide unpolluted and natural habitat. This condition should not be restricted by pollution or human activities. Where the river habitat has deteriorated, natural river conditions should be restored.

The distribution, extent and viability of the habitat within the River Tweed SAC, together with the structure, function and supporting processes of the habitat, should be restored.

Six attributes are relevant to the structure, function and supporting processes of the river.

(i) Flow

River flow affects a range of factors of critical importance to riverine flora and fauna, including current velocity, water depth, wetted area, substrate quality, dissolved oxygen levels and water temperature. The maintenance of both flushing flows and seasonal base flows, based on natural hydrological processes, is vital. There already exist some significant abstractions from the River Tweed as well as compensation flows from reservoirs connected to the River Tweed to reduce impacts of low flows. These should ensure they contribute effectively to as natural a flow regime as possible.

Target: the flow regime of the river should be protected and daily flows should be close to what would be expected in the absence of abstractions and discharges (the naturalised flow). Flow targets for Water Framework Directive (WFD) 'high' ecological status should be used to avoid deterioration and for restoration where this is technically feasible.

(ii) Water quality

Water quality strongly influences the condition of riverine plant communities and other species that inhabit these rivers. Organic pollution from (point and diffuse sources) is a particular threat to water quality, leading to enrichment and adverse impacts on the characteristic plants and animals. Acidification can also cause major changes to plants, animals and ecosystem functioning. Upland streams are particularly susceptible to acidification, owing to the higher levels of precipitation in these areas.

Targets: the CSM Guidance for Rivers includes water quality targets, as follows:

- 10%ile DO (% saturation) 85
- Mean BOD (mg L-1) 1.5
- 90%ile total ammonia (NH₃-N, mg L-1) 0.25
- 95%ile un-ionised ammonia (NH₃-N, mg L-1) 0.025
- Mean pH >6.54

Nutrient concentrations should be near-natural. Soluble reactive phosphorus (SRP) is particularly important and targets should vary depending upon river size, site altitude and alkalinity. Given that the River Tweed SAC covers a large catchment and each of these

elements varies throughout the site, it is not appropriate to set one catchment-wide target for SRP.

Water quality targets for Water Framework Directive (WFD) should be used to avoid deterioration and for restoration where required. Data from SEPA's Water Environment Hub shows that water quality on 85% of individual water courses in the Tweed catchment is classed as High or Good (2014). The remainder were classed as Moderate water quality, with no water courses classed as Poor or Bad.

Rivers of High water quality were all towards the upper reaches of the catchment. There was no coherent distribution pattern of rivers with Moderate water quality. The Tweed downstream of Coldstream, and some of its tributaries, are historic problem areas for diffuse agricultural pollution, but Moderate water quality was also found in the middle reaches of the catchment (e.g. the Leader and the Whiteadder) and the upper reaches (e.g. the Lyne Water and Eddleston Water).

The projected water quality for 2021 is for 91% of water courses in the Tweed catchment to be classed as Good or High. By 2027 this figure should be 95%.

Control of diffuse pollution from agriculture is important and many farms have now fenced off river banks to prevent access by livestock, or have implemented buffer margins around arable fields. This has been supported by agri-environment schemes, but SEPA has also targeted different sub-catchments to identify pollution risks on farms and ensure that they are addressed.

(iii) Physical habitat structure

Watercourses with a high degree of naturalness are governed by dynamic processes that result in a variety of constantly changing physical habitat features, including a range of substrate types, variations in flow, channel width and depth, in-channel and side-channel sedimentation features, erosion features and both in-channel and bankside vegetation cover. Modifications to physical habitat structure, or prevention of natural change processes, may be detrimental to any or all of these features. Ecological connectivity between habitats is also important, both within the river and between the river and its banks, riparian zone and wider floodplain and catchment. The river should therefore follow its natural course with little modification and near-natural bank and riparian zone vegetation. Restoration of modified water courses may be necessary. Where modifications have been made to the river and its corridor in urban areas, significant restoration may sometimes be impractical.

The Tweed is a post-industrial river that was modified extensively through the 1800s to provide water and water power for various industries throughout the catchment. Agricultural improvements at this time resulted in the straightening of meanders and the drainage of flood plains to provide grazing and tillage. Bridges and other transport infrastructure have further modified the river bank.

The pace of river modification has slowed considerably since then, although additional strengthening works are still required or requested on a more local scale. Restoration of some stretches of river has taken place, most notably the re-meandering work on the Eddleston Water. Other similar projects have also been implemented, but further restoration works are required to move the river channel into a natural condition.

(iv) Sediment regime

Many characteristic species of different river types are susceptible to elevated solids levels, through reduced light availability (for photosynthesis), the clogging of respiratory structures, impaired visibility or siltation of coarse substrates. There should therefore be no unnaturally high levels of siltation in the river, including their frequency, duration and scale of elevated

silt levels.

See comments for (ii) Water Quality. Some lower stretches of the SAC show impacts from agricultural diffuse pollution. This will include from suspended solids.

(v) Biological assemblages: aquatic plants

Aquatic plant communities form the principle basis for SAC selection for habitat H3260. Furthermore, they form an important structural and functional element in rivers, including rare plant taxa that contribute to local distinctiveness, such as river jelly lichen.

Target: the LEAFPACS WFD monitoring tool should give a result of 'high' ecological status for an assessment unit.

(vi) Absence of high-impact invasive non-native species

Invasive Non-native Species (INNS) can constitute a major threat to the River Tweed.

A number of invasive plant species are recorded on the Tweed catchment, most notably Japanese knotweed (*Reynoutria japonica*), giant hogweed (*Heracleum mantegazzianum*) and Himalayan balsam (*Impatiens glandulifera*). These species can smother existing native vegetation but also make the river bank unstable resulting in erosion.

Signal crayfish (*Pacifastacus leniusculus*) has also been recorded in the Tweed, primarily on the Till (England) but unconfirmed reports suggest the species is also present on the Leithen Water.

Bullhead (*Cottus gobio*) is not considered native to Scotland and competes effectively for resources. Populations of salmon and trout are known to decline when bullhead are introduced to a river. It is resident on the Teviot in sufficient abundance that control measures are not practical. Pacific (pink) salmon (*Oncorhynchus gorbuscha*) are also present in small number although there is no evidence that they are breeding on the Tweed.

Mink (*Neovison vison*) are occasionally recorded within the Tweed catchment. Although they are certainly an unwanted predator, there are only a few observations each year and there is no sense that the species is present in significant number.

Restoration work is therefore required so as to meet this conservation objective. The Tweed Invasives Project is hosted by the Tweed Forum and aims to control the presence of invasive plants on the Tweed. Contractors and teams of volunteers are used to monitor and spray populations of plants. A rust (*Puccinia komarovii* var. *glanduliferae*) has also been released on the Tweed to control Himalayan balsam. Along with project partners, the 'Check, Clean, Dry' campaign is promoted to reduce the spread or introduction of invasive species from elsewhere.

Target: no 'high-impact' alien species established, i.e. self-sustaining populations. Removal of existing populations of all of the above INNS.

2c. Restore, the distribution and viability of typical species of the habitat

Sufficiently high water quality and natural, river morphology and flow conditions, should be in place to provide the necessary conditions for the habitat and its typical species

This river habitat is characterised by the abundance of water-crowfoot *Ranunculus* spp., subgenus *Batrachium*. Floating mats of these white-flowered species are characteristic of river channels in early to mid-summer. This vegetation may modify water flow, promote fine sediment deposition, and provide shelter and food for fish and invertebrate animals within the river.

The River Tweed SAC is the most species-rich example, by far, of a river with *Ranunculus* in Scotland. The river has a high ecological diversity which reflects the mixed geology of the catchment. The species found in the SAC include: stream water-crowfoot *Ranunculus penicillatus* ssp. *pseudofluitans*; fan-leaved water-crowfoot *R. circinatus*; river water-crowfoot *R. fluitans*; common water-crowfoot *R. aquatilis*; pond water-crowfoot *R. peltatus*; a range of hybrids, including the nationally scarce Kelso water crowfoot *R. peltatus x fluitans*. The Tweed is also the most northerly site for flowering-rush *Butomus umbellatus*.

The wider assemblage of river and bankside plants also forms part of the River Tweed SSSI citation. 13 species were included in the latest site condition monitoring survey, including flat sedge (*Blysmus compressus*) shady horsetail (*Equisetum pratense*) and hairy stonecrop (*Sedum villosum*). Although distribution of some species was highly restricted, the catchment as a whole scored well above the threshold for a designated site.

Many of these species require specific habitat conditions, often including a level of grazing or soil disturbance. It is possible that water quality initiatives such as fencing-off the river bank could remove grazing and thereby affect the viability of some of these species. Fencing off sections of water course is important from a water quality perspective but it should not be a universal management tool. It is important to identify the locations of rarer species to determine specific management prescriptions that will enhance water quality without compromising other aspects of biodiversity.

The diversity of habitat across the catchment will support a broad range of species, although the natural dynamics of the river may mean that individual populations are relatively transient. Species that occupy exposed gravel bars, for example, will be resident only as long as the gravel bar is present and un-vegetated.

Wading birds, including oystercatcher and the much rarer little ringed plover, will use gravel bars for nesting. This could cause conflict between nesting birds and some river management operations. Since these birds are often camouflaged, or timid and evasive, nesting birds may not always be obvious during simple walk-over surveys. It is possible, therefore, that some river-works during the breeding season will disturb nesting birds. This is a wildlife crime and landowners and contractors should be aware of the risks. With appropriate planning this risk can be avoided.

Other birds on the Tweed include dipper, kingfisher, heron, goosander, red-breasted merganser and mallard.

The range of habitats in the catchment, from gravel bars to wet flushes and wooded canopies, supports a broad diversity of invertebrate. Eight nationally scarce or Red data Book flies have been recorded from various habitats, including the empid *Tachydromia woodi*, the soldier fly *Oxycera paradalina* and the cranefly *Tipula cheethami*.

This vegetation and other riverine flora and fauna can be affected by pressures impacting on the SAC habitat, including:

- Pollution: from a wide range of sources (both point and diffuse) throughout the catchment. Consequences include eutrophication, anoxia, siltation, toxicity and acidification.
- Invasive non-native species: riparian plant species are present (and extensive) in some areas of the River Tweed catchment. Himalayan balsam, Japanese knotweed and giant hogweed lead to the exclusion or suppression of native plant communities and a fundamental alteration to the integrity of the riparian habitat structure.
- Flow and habitat modifications: physical habitat modifications and modifications to the natural flow regime occur. These affect plants, fish and invertebrates adapted to high

current velocities. Abstraction and diversion also affect habitat extent, resulting in rivers of smaller size, power and velocity.

Overarching Conservation Objectives for all species

1. To ensure that the qualifying features of the River Tweed SAC are in favourable condition and make an appropriate contribution to achieving favourable conservation status.

Favourable Conservation Status (FCS) is considered at a European biogeographic level. When determining whether management measures may be required to ensure that the conservation objectives for this site are achieved, the focus should be on maintaining or restoring the contribution that this site makes to FCS.

When carrying out appraisals of plans and projects against these conservation objectives, it is not necessary to understand the status of the feature in other SACs in this biogeographic region. The purpose of the appraisal should be to understand whether the integrity of the site (see objective 2) would be maintained. If this is the case then its contribution to FCS across the Atlantic Biogeographic Region will continue to be met. Further details on how these appraisals should be carried out in relation to maintaining site integrity is provided by objective 2 (including parts a, band c). If broader information on the feature is available then it should be used to provide context to the site-based appraisal.

Note that “appropriate” within this part of the conservation objectives is included to indicate that the contribution to FCS varies from site to site and feature to feature.

2. To ensure that the integrity of the River Tweed SAC is restored by meeting objectives 2a, 2b and 2c for each qualifying feature.

The aim at this SAC is to maintain, or where appropriate restore, the qualifying species in a favourable condition as a contribution to their wider conservation status. Therefore any impacts to the objectives shown in 2a, 2b or 2c below must not persist so that they prevent the achievement of this overall aim. When carrying out appraisals of plans or projects the focus should be on restoring site integrity, specifically by meeting the objectives outlined in 2a, 2b and 2c. If these are met then site integrity will be restored. Note that not all of these will be relevant for every activity being considered. Any impacts on the objectives shown in 2a, 2b or 2c below must not persist so that they prevent the restoration of site integrity. Temporary impacts on these objectives resulting from plans or projects can only be permitted where they do not prevent the ability of a feature to recover and there is certainty that the features will be able to quickly recover.

This objective recognises that the qualifying species are exposed to a wide range of drivers of change. Some of these are natural (e.g. population fluctuations/ shifts or habitat changes resulting from natural processes) and are not a direct result of human influences. Such changes in the qualifying species’ distribution and use of the site, which are brought about by natural processes, directly or indirectly, are normally considered compatible with the site’s conservation objectives. An assessment of whether a change is natural or anthropogenic, or a combination of both, will need to be looked at on a case by case basis.

Conservation Objectives for sea lamprey (*Petromyzon marinus*)

2a. Restore the population of the species as a viable component of the site

The conditions for the long-term existence of the sea lamprey at the River Tweed SAC should be restored.

An estimate of the number of sea lamprey occupying the site is not available and, due to the difficulties of surveying the species, is unlikely to become so. The actual number may vary both inter-annually and intra-annually according to a variety of environmental factors including changes in the amount of larval habitat as it is altered, removed, or created by variations in flow and the availability of sediment. Because we cannot measure absolute population numbers we use distribution and relative abundance as a measure of population viability.

This conservation objective will be considered to have been met if the conditions necessary for the long-term survival of the sea lamprey remain. These include:

- Avoiding direct or indirect effects that could lead to a permanent reduction in the number of sea lamprey through mortality, injury, disturbance, or displacement. The effects may be caused by the direct or indirect physical alteration of habitat as a result of development or river engineering, or by pollution associated with these activities or from point or diffuse catchment sources - see conservation objective 2c.
- Ensuring that the sea lamprey are able to gain access to and use all parts of the site in which they would be expected to occur naturally - see conservation objective 2b.
- Ensuring that sea lamprey are able to migrate unhindered to the sea.

When assessing the effects of any plan or project consideration should be given to whether impacts outwith the SAC could affect achievement of this conservation objective. The appraisal should also consider the life cycle and life history of sea lamprey and the scale and duration of the impact being assessed. For example, an activity that prevented access to or altered spawning habitat during the period when sea lamprey spawn could lead to a reduction in the number of larvae produced and so eventually a reduction in the number of adults associated within the affected cohort.

2b. Restore the distribution of the species throughout the site

The spatial extent of sea lamprey within the boundary of the River Tweed SAC should be restored.

Distribution of the sea lamprey within the River Tweed SAC should not be restricted by pollution, artificial structures or human activities.

Relatively little is known about the distribution and density of sea lamprey within the SAC due to limitations in current survey methods. To date, conventional electrofishing surveys have recorded relatively few sea lamprey larvae and the total has frequently been two orders of magnitude less than that for *Lampetra*. It is thought that sea lamprey larvae may occupy similar habitat to that used by *Lampetra* but in deeper water that is beyond the reach of conventional electrofishing surveys.

When considering the impact of a plan or project any accessible suitable habitat should be considered to have the potential to contain sea lamprey larvae, although in practice some may be naturally unoccupied.

The distribution of sea lamprey across the site may be affected by disturbance originating from within or outside it (including at sea) this includes the Berwickshire and North

Northumberland Coast SAC and coastal plus deep off-shore waters. Plans or projects that lead to the displacement of sea lamprey or which impede or prevent the species movement may also affect its distribution. Examples of activities that may affect the distribution of sea lamprey include: the construction of engineered structures (e.g. bridge abutments or piers) or the removal of accumulations of sediment to maintain the conveyance capacity of culverts, both of which may lead to the direct loss of juvenile habitat; poor land use that leads to fine organic matter or sediment being washed into a river and smothering spawning habitat; and the construction of hydroelectric power offtake weirs which may prevent adults from reaching spawning sites. A number of other artificial structures, such as weirs and dams, likely impeded the movement of sea lamprey to certain parts of the catchment.

Mertoun weir is potentially a significant obstacle for upstream migration of sea lamprey, as discussed on page 4.

2c. Restore the habitats supporting the species within the site and availability of food

The distribution and extent of sea lamprey habitat within the River Tweed SAC, together with the structure, function and supporting processes of the habitat, should be restored.

Sufficiently high water quality and natural flow conditions should be in place to provide the necessary conditions for sea lamprey.

Sea lamprey larvae feed by filtering fine organic particles, especially diatoms and other algae, as well as protozoans and detritus, from the surface of the silt around the mouths of their burrows. A naturally functioning river system in a well-managed catchment should provide adequate food. Adult sea lamprey feed on a variety of fish in estuaries and the sea.

Both the larval and adult phases of sea lamprey require clean, well oxygenated water. The larvae commonly burrow into soft sediment in the margins of streams and rivers. They may also be found in detritus overlying coarse substrate, amongst submerged tree roots, emergent vegetation rooted in silt, shallow patches of fine sediment among coarser substratum, or submerged branches or twigs that have trapped fine sediment. The unconsolidated nature of their habitat means that it may be readily altered by sufficiently powerful flows. The distribution and abundance of habitat may therefore undergo significant intra-annual or inter-annual change in a naturally functioning river system. Adult sea lamprey spawn in nests comprising gravel and some sand in flowing water. Suitable conditions are often found at the tail-end of pools.

Low flow conditions may leave sea lamprey habitats unusable, influencing both:

- juvenile habitat, particularly that in the margins as the wetted width of a watercourse is reduced and
- adult spawning habitat.

The natural flow regime of the river should be protected. Low and high flow conditions may occur artificially e.g. through poor hydroelectric power scheme flow management. However, daily flows should be close to those expected in the absence of abstractions and discharges, with no obvious problems with water availability. Water flow and quality standards for Good Ecological Status (GES) under the Water Framework Directive should be met. These targets are intended to support a healthy, naturally functioning riverine ecosystem which protects the whole biological community and individual species to a degree characteristic of the river.

The geomorphology and so the physical sea lamprey habitat available in a river may change in response to changes in flow, but also as a direct or indirect result of human intervention. River engineering may, for example, result in hydraulic conditions that cause the erosion of larval habitat.

The morphology of a naturally functioning river system will provide the range of habitats needed by sea lamprey. For this the river should follow its natural course, with little modification and a natural riparian zone with emergent vegetation and native trees. There should also be no unnaturally high levels of siltation. Artificial in-channel structures, e.g. weirs, dams and fords, should not bar or impede the movement of sea lamprey (see observations on Mertoun weir on page 4) and the movement of sediment which may limit the availability of material needed to replenish spawning habitat.

Man-made (and natural) changes to the water quality of the site may have direct or indirect effects on sea lamprey habitat. Examples of manmade effects include: silt laden runoff from poorly managed tilled land smothering redds; and pollution caused by inadequately treated discharges, e.g. from sewage treatment works.

Conservation Objectives for brook lamprey (*Lampetra planeri*) and river lamprey (*Lampetra fluviatilis*)

2a. Maintain the population of lamprey species as a viable component of the site

The conditions for the long-term existence of the brook and river lamprey at the River Tweed SAC should be maintained.

An estimate of the number of brook and river lamprey occupying the site is not available and, due to the difficulties of surveying the species, is unlikely to become available. The actual number may vary both inter-annually and intra-annually according to a variety of environmental factors including changes in the amount of juvenile habitat as it is altered, removed, or created by variations in flow and the availability of sediment. Because we cannot measure absolute population numbers we use distribution and relative abundance as a measure of population viability.

This conservation objective will be considered to have been met if the conditions necessary for the long-term survival of these species remain. These include:

- Avoiding direct or indirect effects that could lead to a permanent reduction in the number of brook and river lamprey through mortality, injury, disturbance, or displacement. The effects may be caused by the direct or indirect physical alteration of habitat as a result of development or river engineering, or by pollution associated with these activities or from point or diffuse catchment sources - see conservation objective 2c.
- Ensuring that these species are able to gain access to and use all parts of the site in which they would be expected to occur naturally - see conservation objective 2b.
- Ensuring that the river lamprey are able to migrate unhindered to estuaries.

When assessing the effects of any plan or project consideration should be given to whether impacts outwith the SAC could affect achievement of this conservation objective. The appraisal should also consider the life cycle and life history of the species and the scale and duration of the impact being assessed. For example, an activity that prevented access to or altered spawning habitat during the period when lamprey spawn could lead to a reduction in the number of larvae produced and so eventually a reduction in the number of adults associated within the affected cohort.

2b. Maintain the distribution of lamprey species throughout the site

The spatial extent of brook and river lamprey within the boundary of the River Tweed SAC should be maintained.

Distribution of the brook and river lamprey within the River Tweed SAC should not be restricted by pollution, artificial structures or human activities.

Thus far surveys have reported the number and distribution of brook and river lamprey combined. Distinguishing between the larvae of brook and river lamprey using physical characteristics, is not possible.

Collectively, *Lampetra* species remain widespread across the Tweed catchment, with a high percentage occupancy rate of sampled locations in recent site condition monitoring surveys (2011 and 2018). Lamprey were found in the upper, middle and lower Tweed, the Ettrick, Teviot, Whiteadder and Leithen Water. Heathstanes was the most upstream sampling site on the Tweed, with lamprey larvae being found about 16 km from the source of the river. This suggests that the physical and biological conditions in the river system favour these species.

When considering the impact of a plan or project any accessible suitable habitat should be expected to contain the larvae of lamprey species', although in practice some may be naturally unoccupied.

The distribution of brook and river lamprey across the site may be affected by disturbance originating from within or outside it this includes the Berwickshire and North Northumberland Coast SAC. Plans or projects that lead to the displacement of lamprey species' or which impede or prevent the species' movement may also affect its distribution. Examples of activities that may affect the distribution of lamprey include: the construction of engineered structures (e.g. bridge abutments or piers) or the removal of accumulations of sediment to maintain the conveyance capacity of culverts, both of which may lead to the direct loss of juvenile habitat; poor land use that leads to fine organic matter or sediment being washed into a river and smothering spawning habitat; and the construction of hydroelectric power offtake weirs which may prevent adults from reaching spawning sites.

2c. Maintain the habitats supporting lamprey species within the site and availability of food

The distribution and extent of brook and river lamprey habitat within the River Tweed SAC, together with the structure, function and supporting processes of the habitat, should be maintained.

Sufficiently high water quality and natural flow conditions should be in place to provide the necessary conditions for lamprey species'.

Lamprey larvae feed by filtering fine organic particles, especially diatoms and other algae, as well as protozoans and detritus, from the surface of the silt around the mouths of their burrows. A naturally functioning river system, in a well-managed catchment, should provide adequate food. Adult river lamprey feed on a variety of fish in estuaries.

Both the larval and adult phases of lamprey require clean, well oxygenated water. The larvae commonly burrow into soft sediment in the margins of streams and rivers. They may also be found in detritus overlying coarse substrate, amongst submerged tree roots, emergent vegetation rooted in silt, shallow patches of fine sediment among coarser substratum, or submerged branches or twigs that have trapped fine sediment. The unconsolidated nature of their habitat means that it may be readily altered by sufficiently powerful flows. The distribution and abundance of habitat may therefore undergo significant intra-annual or inter-annual change in a naturally functioning river system. Adult brook lamprey spawn in nests created in gravel beds and typically at the tail-end of pools. The size of the gravel beds vary, ranging from < 1 m² to > 10 m². Adult river lamprey spawn in nests comprising gravel and

some sand in flowing water. Suitable conditions are often found at the tail-end of pools.

Low flow conditions may leave lamprey habitats unusable, influencing both:

- juvenile habitat, particularly that in the margins as the wetted width of a watercourse is reduced and
- adult spawning habitat.

The natural flow regime of the river should be protected. Low and high flow conditions may occur artificially e.g. through poor hydroelectric power scheme flow management. However, daily flows should be close to those expected in the absence of abstractions and discharges, with no obvious problems with water availability. Water flow and quality standards for Good Ecological Status (GES) under the Water Framework Directive should be met. These targets are intended to support a healthy, naturally functioning riverine ecosystem which protects the whole biological community and individual species to a degree characteristic of the river.

The geomorphology and so the physical lamprey habitat available in a river may change in response to changes in flow, but also as a direct or indirect result of human intervention. River engineering may, for example, result in hydraulic conditions that cause the erosion of larval habitat.

The morphology of a naturally functioning river system will provide the range of habitats needed by lamprey. For this the river should follow its natural course, with little modification and a natural riparian zone with emergent vegetation and native trees. There should also be no unnaturally high levels of siltation. Artificial in-channel structures, e.g. weirs, dams and fords, should not bar or impede the movement of lamprey and the movement of sediment which may limit the availability of material needed to replenish spawning habitat.

Man-made (and natural) changes to the water quality of the site may have direct or indirect effects on lamprey habitat. Examples of manmade effects include: silt laden runoff from poorly managed tilled land smothering redds; and pollution caused by inadequately treated discharges, e.g. from sewage treatment works.

Conservation Objectives for Atlantic salmon (*Salmo salar*)

2a. Maintain the population of the species, including range of genetic types, as a viable component of the site

The conditions for the species' long-term existence at the River Tweed SAC should be maintained.

This conservation objective is considered to be met if the conditions for the species' long-term existence are in place. These conditions include:

- Effects should be avoided that could lead to a permanent reduction in the Atlantic salmon population or that prevent the population recovering, through mortality, injury, or impacts caused by disturbance or displacement. This includes for example the effects caused by the construction of in-stream barriers to migration, changes in water flow rates or water quality. Observed densities therefore need to be assessed in relation to the expectation for the River Tweed overall and for each river reach, based on productivity and natural habitat character of the system. However, these should not differ significantly from those expected for the river type/reach under conditions of high physical and chemical quality.
- The numbers of returning Atlantic salmon should be sufficient to maintain the long-term viability of each life history type. All returning adults and emigrating smolts must have

unhindered access between freshwater and marine habitats (see conservation objective 2b). All supporting freshwater habitats must be of sufficient quality and quantity to support both adult and juvenile fish (see conservation objective 2c). Different rivers have different seasonal patterns of adult migration associated with the environmental characteristics of the catchment and river system. Multi-sea winter fish are an important component of a natural Atlantic salmon run and the spring run component has declined considerably in recent years. The seasonal pattern of migration characteristic of the river and, in particular, the multi-sea-winter stock component, should be maintained.

When assessing the effects of any plan or project consideration should be given to whether impacts outwith the SAC could affect achievement of this conservation objective. The appraisal should also consider the life history traits of the species, including maintaining all genetic types of Atlantic salmon, and the scale and duration of the impact being assessed. Impacts resulting in the loss of genetically distinct populations of Atlantic salmon would not be considered temporary in nature as these adaptive traits may have evolved over generations and could not be recovered if lost.

2b. Maintain the distribution of the species throughout the site

The distribution of Atlantic salmon within the River Tweed SAC should not be restricted by pollution or human activities.

Access to spawning sites, juvenile rearing sites and areas where adult Atlantic salmon may rest prior to spawning (some may be present within the river for a year prior to spawning), should all be maintained. Juvenile Atlantic salmon should be present in all areas of the catchment to which they, and adult fish, have natural access. This does not include areas above naturally impassable barriers, but areas where access has been limited by man-made obstructions.

A 2011 site condition monitoring assessment of salmon in Scottish SACs concluded that the Tweed catchment sustained consistently high juvenile fish densities. This was due variously to: good quality salmon-related habitat; a high number of adult salmon reaching spawning grounds; the absence of negative pressures on fish numbers. Various initiatives in the catchment over the last 30 years will have aided this situation, including the continued removal of river obstructions through the 1990s and the significant reduction in salmon netting in the early 2000s. All major blockages to fish migration in the Tweed catchment have now been addressed, although minor or localised issues may remain.

The distribution of Atlantic salmon within the site may be affected by disturbance originating both within and outwith the site (including estuarine and coastal areas). Plans and projects that cause displacement and barrier effects to the species, for example by impeding access to spawning areas or downstream passage of smolts to the sea, can also affect species distribution. Examples may include: the provision of compensation flows which are inadequate to allow adult Atlantic salmon to reach known spawning areas; the presence of physical in-stream structures such as flow deflectors, coffer dams etc. which may increase flow velocity to that which is beyond the swimming capacity of migrating fish or sustained noise generation (such as that caused by piling) in places that cannot be avoided by migrating Atlantic salmon.

2c. Maintain the habitats supporting the species within the site and availability of food

The distribution and extent of Atlantic salmon habitat within the River Tweed SAC should be maintained, together with the structure, function and supporting processes of the habitat.

Sufficiently high water quality and natural flow conditions should be in place to provide the necessary conditions for Atlantic salmon.

Atlantic salmon spawn in late autumn and early winter, depositing their eggs in redds which they excavate in gravel and pebble beds. Eggs are often deposited in areas of accelerating flow, such as the tail end of pools and glides, upstream from riffles. However, in upland streams eggs may be deposited in any areas of gravel that can be physically moved by the fish. A good supply of oxygen is essential for eggs to develop and this is facilitated by a flow of water through the gravel. Therefore, clogging these fine sediments with silt and fine sand can reduce the water and oxygen flow resulting in egg mortality. Egg survival is also affected by redd 'washout' during winter spates, resulting in the physical scouring out of eggs from the gravel. Substrate stability, the dynamics of water flow and the weather all influence the extent of siltation and scale of washouts.

After hatching the young fry remain in the gravel until March to early May, when they disperse and set up territories. Atlantic salmon fry prefer fast flows (>30 cm/s) and favour areas with surface turbulence (riffle habitat). They require a rough bed of pebble, cobble and gravel and water <20 cm deep. Good cover is essential for maintaining high fry densities, such as cover from stones, plants or debris.

Atlantic salmon that have survived their first winter (parr) prefer deeper water than fry (typically 20-40 cm) and a coarser substrate of pebbles, cobbles and boulders. Cover remains important for adult Atlantic salmon particularly in smaller streams and rivers. In larger rivers and lochs this type of cover may be less important.

Favoured habitat used by adult fish include pools of at least 1.5 m depth, with cover from features such as undercut banks, instream vegetation, submerged objects and even surface turbulence. Spawning habitat is defined as stable coarse substrate without an armoured layer, in the pebble to cobble size range (16-256 mm) but with the majority being <150 mm. Water depth during the spawning and incubation periods should be 15-75 cm. Coarse woody debris should be retained where appropriate as it plays a significant role in the formation of new gravel beds.

Juvenile Atlantic salmon (fry and parr) maintain feeding stations within rivers and defend these aggressively. The invertebrates which they feed upon are intercepted by juvenile fish as they drift downstream, and may be of aquatic or terrestrial origin.

At sea, adult Atlantic salmon feed on range of prey items, including marine amphipods, shrimps and squid and fish, such as sand eels, capelin and herring. Adults do not feed once they return to freshwater.

As a result of their life history Atlantic salmon stocks can be impacted in both freshwater and marine habitats. In freshwater, both water quality and water quantity are key issues. Salmonids require access to rivers with unpolluted and well-oxygenated water with a habitat mosaic which comprises suitable spawning gravels, cobbles and boulders. In terms of water quality, these fish also require enough water to ensure access to and from spawning areas, as well as enough water to maintain an adequate level of juvenile habitat.

Over-exploitation, inappropriate stocking activities, riparian land management operations (such as those related to forestry and agriculture), in-stream engineering and alterations to natural water flow regimes (including those relating to hydropower development), invasive non-native species, physical barriers to migration (such as historic caulds and lades), pollution (direct and diffuse) and direct damage to spawning habitat (e.g. through mineral or gravel extraction) can all impact the quality of freshwater environments and their value to Atlantic salmon. Climate change, and the rises in water temperatures during summer, may also be a factor in determining the suitability of some waterbodies for Atlantic salmon. Therefore cover is important for Atlantic salmon, particularly in smaller streams. The shade

from bushes next to the river or overhanging trees is likely to help to prevent fish from becoming stressed due to high water temperatures which often occur in combination with low water levels. Where the river is larger, this may be less important as deep water can provide cool refuge.

Water quality, hydrology, and habitat standards for Good Ecological Status (GES) under the Water Framework Directive should be met. These targets are intended to support a healthy, naturally functioning riverine ecosystem which protects the whole biological community and individual species to a degree characteristic of the river.

Conservation Objectives for otter (*Lutra lutra*)

2a. Maintain the population of otter as a viable component of the site

The conditions for the long-term existence of the otter at the River Tweed SAC should be maintained.

An estimate of the number of otters occupying the River Tweed SAC is not available and therefore there is no numerical baseline that can be given for the SAC.

This conservation objective is considered to be met if the conditions for the species' long-term existence are in place. This includes:

- Avoiding effects that could lead to a permanent reduction in the otter population through mortality, injury, or impacts caused by disturbance or displacement. This includes for example the effects caused by development, river engineering, water pollution, roads without adequate crossing provision for otters or suitable culverts, or entanglement in fishing gear. Otters can drown in unprotected or disused fishing gear such as eel traps or fyke nets, so these should be removed, or if active, an otter guard fitted.
- Maintaining the species' ability to use all areas of importance within the site (to be considered under conservation objective 2b)
- Maintaining access to, and availability of, undisturbed resting places
- Maintaining access to, and availability of, supporting habitats and prey (to be considered under conservation objective 2c).

Otter is a wide-ranging and highly mobile species. The population at the River Tweed SAC is reliant on suitable habitat in the surrounding countryside including the adjoining Moorfoot Hills SAC and Berwickshire and North Northumberland Coast SAC, it is unlikely to be viable (capable of being self-sustaining) in isolation. The home range of an otter will vary depending on their sex, habitat quality and food availability. It will also vary between freshwater and coastal environments. At this SAC some otters that have parts of their territories within the site may also feed in coastal waters that lie outwith the boundary of the site (for example in the Berwickshire and North Northumberland Coast SAC). In coastal areas otter densities may be as high as 0.5 - 0.7 animals/km. Males living in rivers and streams can have a mean linear range size of around 40km and females living in the same habitat can have a linear home range of around 20km. Males have been known to range as far as 80km.

When assessing the effects of any plan or project consideration should be given to whether impacts outwith the SAC could affect achievement of this conservation objective.

Otters are a European protected species (EPS) and it is an offence to deliberately or recklessly capture, injure, kill, harass or disturb them in certain circumstances, or to damage or destroy their breeding or resting places anywhere in Scotland unless a licence has been issued to do so. A licence can only be issued for particular purposes which the law allows. Further, there must be no satisfactory alternative and no detrimental impact on the

contribution to the maintenance of otter at a favourable conservation status for a licence to be issued. This assessment considers impacts on the otter population at a local and regional level. The licensing requirement is in addition to considering whether a plan or project will result in any impacts (including incidental impacts) to the otter population within the SAC.

2b. Maintain the distribution of otter throughout the site

The spatial extent of otter within the River Tweed SAC should be maintained.

The ability for otter to use and access all areas of importance within the River Tweed SAC should be maintained.

Otters could occur throughout the Tweed river system, with higher population densities (smaller home ranges) expected in habitats with more abundant food and resting places.

Distribution of otters within the site can be affected by disturbance originating both within and outwith the site. Plans and projects that cause displacement and barrier effects to the species can also affect species distribution. Examples include use of night-time floodlighting of watercourses, road and bridge construction works and general disturbance from human activity (and dogs) by watercourses especially at dusk/night-time.

2c. Maintain the habitats supporting otter within the site and availability of food

The distribution and extent of otter habitat within the River Tweed SAC should be maintained, together with the structure, function and supporting processes of the habitat.

Sufficiently high water quality and natural flow conditions should be maintained to provide the necessary conditions for otter and their prey.

Otters require suitable habitat for foraging, breeding and resting. In freshwater environments abundant boulders, riverbank crevices, or other cavity-forming features such as tree root systems are needed to provide secure holt sites above high water. Dense scrub is also valuable for providing lie-ups and couches. Suitable areas supporting a healthy fish population within a nearby watercourse or still water body are required within each otter's home range, to enable foraging for key prey species such as salmonids and eels. Access to ponds, ditches, reedbeds and wetlands where amphibians may breed is also important. Otters which forage along the coast as well as using the site, also need freshwater within the site to remove salt from their fur.

The Tweed Forum, Borders Forest Trust and other organisations have been effective at working with landowners to improve habitat quality throughout the Tweed catchment. Tree planting and riparian fencing has been particularly prominent and should allow the development of a more natural and wooded river corridor. Such work has been achieved through successive agri-environment schemes as well as specific initiatives such as the Eddleston Re-meandering Project.

Changes to water flow and water quality can adversely affect otter habitat and prey on which they depend. Otters' food supply is normally associated with good water quality and therefore the Water flow and quality standards for Good Ecological Status (GES) under the Water Framework Directive should be met. These targets are intended to support a healthy, naturally functioning riverine ecosystem which protects the whole biological community and individual species to a degree characteristic of the river.

As a European Protected Species, as well as listed specifically in the SSSI citation, otters are a material consideration in planning and forestry assessments. Both industries should

have well-developed survey and operational techniques for preventing disturbance to the species.

Conservation Measures

Parts of the River Tweed SAC are notified as a Site of Special Scientific Interest (SSSI) and management changes described on the SSSI list of Operations Requiring Consent must have prior consent from SNH (NatureScot).

Current and recommended management for rivers with floating vegetation often dominated by water-crowfoot, sea lamprey, river lamprey, brook lamprey, Atlantic salmon and otter

Issue	Measure	Responsible party
Ongoing species protection for salmon, lamprey species and otter	Legislation is in place to manage and protect Atlantic salmon in freshwater and at sea. This includes a statutory close season and catch & release period.	All
	Develop an Atlantic salmon conservation plan for all rivers, or Atlantic salmon management units (if several small rivers are considered to be so close in terms of geography and stock size as to merit a single plan).	Marine Scotland Science Fishery managers NatureScot SEPA
	Voluntary catch and release policy for anglers.	Fishery managers
	The Scotland Act 1998 (River Tweed) Order 2006 charges The River Tweed Commission with the general preservation and increase of Atlantic salmon, sea trout, trout and other freshwater fish (lamprey species') in the River Tweed and its tributaries.	The River Tweed Commission
	Otter are a European protected species and therefore the species protection provisions of the Habitats Regulations apply.	All
Forest planting and harvesting operations resulting in silt/nutrients entering the river – may affect salmon and lamprey species' spawning areas	Planning and implementation of forest operations should better identify high risk areas. Management should include improved pollution control, blocking of drains and careful harvesting in riparian areas.	Scottish Forestry, Forestry & Land Scotland, Forestry owners and managers
	Promote adherence to the Forest and Water Guidelines, and published best practice, during forest restructuring and highlight the need to strictly control fine sediment and other diffuse pollution release into the river. Forestry planting and harvesting in the catchment needs to be planned so that heavy rainfall and droughts are buffered by the forest rather than exacerbating high/low extremes in flow.	Scottish Forestry, Forestry & Land Scotland, Forestry owners and managers
	Review the Forest & Water guidelines to reflect the needs of river SACs. This will ensure adequate protection of the water course and development of an appropriate riparian zone across the catchment.	Scottish Forestry (South of Scotland area), Forestry & Land Scotland, NatureScot,

		forestry industry representatives
Sediment load in river from un-forested land – may affect salmon and lamprey species spawning areas	Ensure minimal poaching, tracking, or trampling by deer, livestock, visitors and vehicles to prevent an unnatural sediment load from being washed into the river.	Land managers, NatureScot, SGRPID (GEAC)
	Drain blocking in open peatland in the catchment to help to buffer high/low extremes in flow rate and reduce sediment run-off into the river.	Land managers
Water quality	Implement and maintain monitoring of key water quality parameters.	NatureScot/SEPA,
	Any development proposals in the catchment should include appropriate measures to minimise sediment run-off and prevent pollutants from entering the river.	Scottish Borders Council
River development– otter	Near the river, minimise habitat loss, deterioration, disturbance and displacement related to development (including night-time lighting).	Scottish Borders Council, SEPA, NatureScot
	Prevent or mitigate significant new disturbance to river banks from developments which can lead to recreational use of the riparian corridor.	Scottish Borders Council, NatureScot
Road mortality - otter	Any upgrading or bridges or culverts, or widening of roads such as the A68, or other work on roads, should be assessed and adequate allowance made for otters to safely use underpasses or culverts, so they are not forced to cross the road.	Transport Scotland, Scottish Borders Council, NatureScot
	Implement mitigation measures where areas of excessive mortality are identified, e.g. urban areas or at road crossing points.	Landowner, NatureScot
Beneficial habitat management	Evaluation of diffuse pollution and morphological pressures through the river basin planning process and the implementation of restoration measures to maintain or improve habitat for lamprey species', Atlantic salmon and otter.	RPID, SEPA, NatureScot, Tweed Forum
	Secure funding and build upon current river and catchment restoration projects, (e.g. for the Eddleston Water, Gala Water and River Till) to extend restoration initiatives into other parts of the catchment.	
	Promotion of measures to increase resilience to climate change, particularly the creation of native riparian woodland and improved connection with floodplains. Measures to promote coordinated, catchment-scale activity are particularly important. Native tree planting in appropriate locations would help improve	River Tweed Commission, NatureScot, SEPA, SBC, FCS, RPID, Tweed Forum

	the riparian habitat for lamprey species, Atlantic salmon and otter.	
	Restore riparian and catchment peatlands to reduce fine sediment concentrations, improve floodplain connectivity and restore more natural hydrological regime to benefit lamprey species', Atlantic salmon and otter. Continue this work via the Peatland ACTION project, agri-environment measures and good forestry design and management.	NatureScot, SEPA, FCS, RPID, Tweed Forum.
	Establish a gazetteer of notable or sensitive species across the Tweed catchment, along with their habitat requirements. This will inform land management decisions.	The Wildlife Information Centre, NatureScot
	Encourage specific conservation management where rarer or more sensitive plant species occur. This is to prevent loss of species diversity through land use changes or through water quality initiatives such as fencing of river banks.	NatureScot, Scottish Forestry, RPID
	Raise awareness among landowners and contractors about CAR licenses, SSSI consents, and the potential for river operations to disturb birds during the breeding season.	SEPA, NatureScot, Land managers, contractors
Population size	Encourage the natural processes of river flow and morphology through a policy of non-intervention and thereby improve salmonid and lamprey species' recruitment and survival, plus otter survival.	All
By-catch – otter	Disused eel or fyke nets should be removed when found. Any active nets should use otter guards.	Land managers
River barriers – Atlantic salmon and lamprey species'	Removal of barriers to fish passage. The Solway Tweed River Basin Management Plan has identified rivers where fish migration is impeded and has established a timescale for remedial work.	SEPA, Land managers, Fishery managers, NatureScot
	Assess the conditions around Mertoun weir and the impact this may have on migration of sea lamprey, and other fish species.	SEPA, Tweed Foundation, NatureScot
Invasive species	All anglers and other water users (such as canoeists or researchers) should follow the Check, Clean, Dry biosecurity procedures to help prevent the spread of problem non-native species. Continue to monitor, control and eradicate all 'high-impact' invasive non-native species in the catchment with the continuation of the 'Tweed Invasives Project'. This is being	All, Tweed Forum

	implemented to control and eradicate giant hogweed, Himalayan balsam and Japanese knotweed. Signal crayfish have been recorded in the Tweed catchment, but monitoring is required to understand distribution and numbers.	
Research – salmon	Development and introduction of long-term monitoring protocols for juvenile Atlantic salmon in SACs.	Marine Scotland Science
Low numbers of adult and/or juvenile Atlantic salmon	Develop and implement monitoring protocol to allow robust, catch independent, assessment of adult population size.	Marine Scotland Science
	Monitor the presence and distribution of aquatic non-native species which may adversely impact Atlantic salmon.	SEPA
	Investigate genetic diversity of salmon from different tributaries.	Tweed Foundation
Atlantic salmon marine survival -	Monitoring of post-smolt Atlantic salmon to determine their behaviour at sea and better understand the impact of enhanced sea lice burdens.	Marine Scotland (Marine Scotland Science and Farmed Fish Health Inspectorate) Atlantic Salmon Trust
Research – lamprey species To improve knowledge of the species	Distinguishing between the larvae of river or brook lamprey (i.e. Lampetra) and those of sea lamprey (i.e. Petromyzon) is possible, using physical characteristics. However, the number of sea lamprey larvae caught during conventional electrofishing surveys is low and there is a consensus amongst lamprey experts that sea lamprey larvae may occupy similar habitat to that used by Lampetra, but in areas of deeper water. Alternative survey methods are being investigated.	NatureScot, Universities
	Distinguishing between the larvae of brook and river lamprey is not possible, using physical characteristics. To date assessments have reported the number and distribution of Lampetra, i.e. brook and river lamprey combined. Initial eDNA research suggests that brook and river lamprey are too genetically similar to allow them to be differentiated. However, work is ongoing and a technique that allows the independent assessment of brook and river lamprey populations may be established.	
	Establish an accurate distribution map of sea lamprey across the catchment.	Tweed Foundation
Water Flow – Atlantic salmon and lamprey species'	Manage abstraction and water transfers to ensure that access to essential habitats by Atlantic salmon is maintained and water flow is not lowered/raised in a way that would	SEPA, NatureScot, Scottish Water, water companies

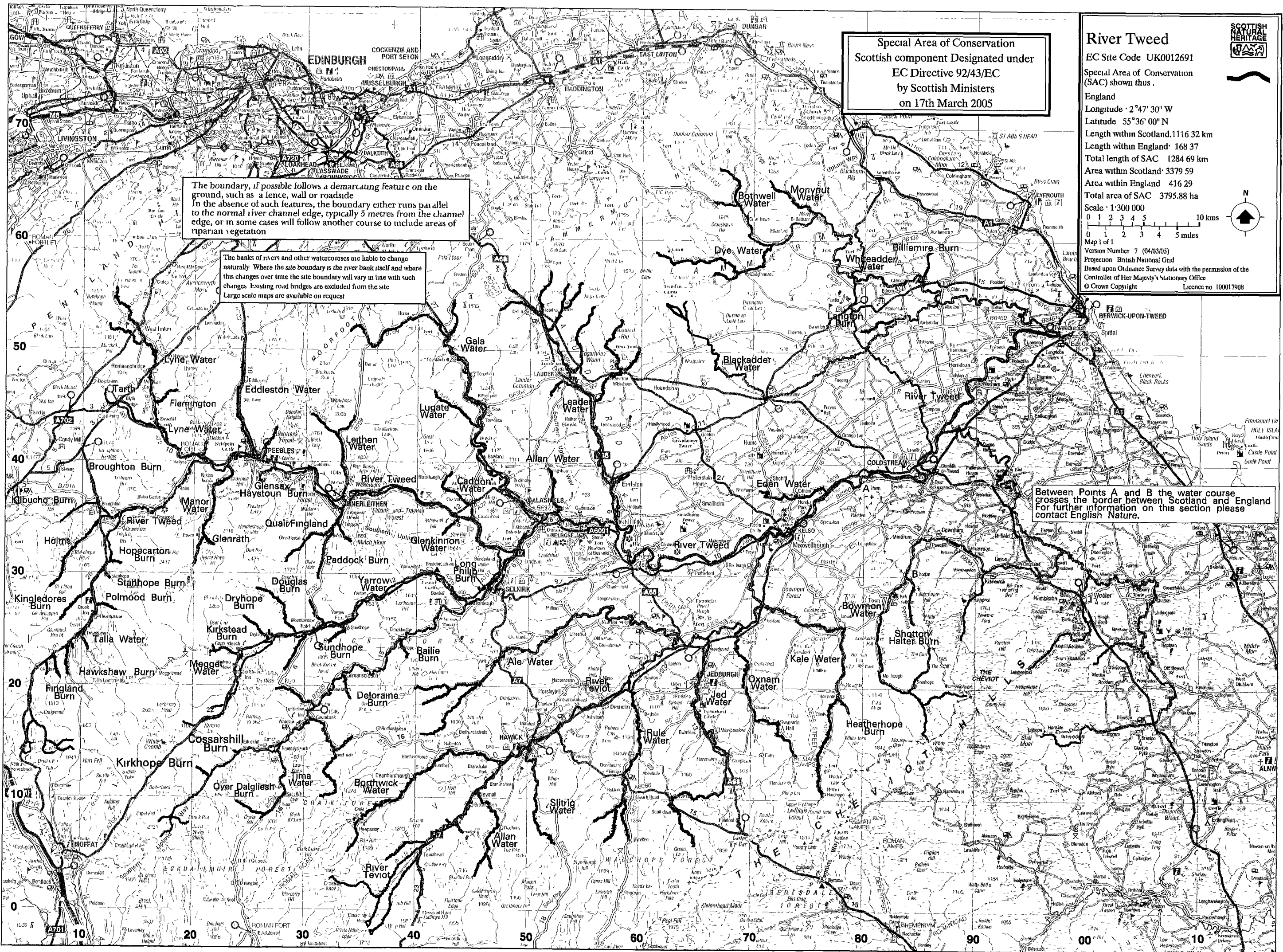
	reduce the populations of lamprey species'.	
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Contact details: NatureScot
Anderson's Chambers
Market Street
Galashiels
TD1 3AF
Tel: 01896 661 710

Approved on 26 March 2020 by:

Greg Mudge
Principal Advisor
International Designations

Denise Reed
Area Manager
Tayside and Grampian



Special Area of Conservation
 Scottish component Designated under
 EC Directive 92/43/EC
 by Scottish Ministers
 on 17th March 2005

The boundary, if possible follows a demarcating feature on the ground, such as a fence, wall or roadside
 In the absence of such features, the boundary either runs parallel to the normal river channel edge, typically 5 metres from the channel edge, or in some cases will follow another course to include areas of riparian vegetation

The banks of rivers and other watercourses are liable to change naturally
 Where the site boundary is the river bank itself and where this changes over time the site boundary will vary in line with such changes
 Existing road bridges are excluded from the site
 Large scale maps are available on request

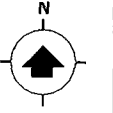
Between Points A and B the water course crosses the border between Scotland and England
 For further information on this section please contact English Nature.

River Tweed
 EC Site Code UK0012691
 Special Area of Conservation (SAC) shown thus

England
 Longitude 2°47'30" W
 Latitude 55°36'00" N
 Length within Scotland: 1116.32 km
 Length within England: 168.37
 Total length of SAC: 1284.69 km
 Area within Scotland: 3379.59
 Area within England: 416.29
 Total area of SAC: 3795.88 ha

Scale: 1:300 000
 0 1 2 3 4 5 10 kms
 0 1 2 3 4 5 miles

Map 1 of 1
 Version Number 7 (04/03/05)
 Projection: British National Grid
 Based upon Ordnance Survey data with the permission of the Controller of Her Majesty's Stationery Office
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Ramsar Convention on Wetlands of International Importance Especially as
Waterfowl Habitat

CITATION FOR RAMSAR SITE

(Kampala criteria, 2005)

FALA FLOW (UK13015)

Site Description:

Fala Flow Ramsar site is situated within the Lammermuir Hills in the Scottish Southern Uplands. The Flow is a blanket mire, unusual due to the presence of pools which seldom occur in blanket mires located at such low altitudes.

Interest Feature (marked in bold): N.B All bird figures relate to numbers at the time of designation:

Fala Flow Ramsar site qualifies under Ramsar Criterion 6 by regularly supporting 1% or more of the individuals in a population of waterbirds:

- **Pink-footed goose** *Anser brachyrhynchus* (an average peak of 2,400 individuals, 2% of the Eastern Greenland/Iceland/UK biogeographic population).

Area: 317.75 ha
National Grid Ref: NT436585
OS Sheet 1:50,000 – 66

Designated on 25 April 1990.

This (amended) citation adopted on 1 November 2021.

Other Designations that underpin the Ramsar Site:

These provide the statutory mechanisms for protection and management of the Ramsar site.

The boundary of the Ramsar site is coincident with Fala Flow Special Protection Area (SPA), which underpins the bird feature of the Ramsar site. It is also coincident with Fala Flow Site of Special Scientific Interest (SSSI).

Information Sheet on Ramsar Wetlands (RIS)

Categories approved by Recommendation 4.7, as amended by Resolution VIII.13 of the Conference of the Contracting Parties.

Note for compilers:

1. The RIS should be completed in accordance with the attached *Explanatory Notes and Guidelines for completing the Information Sheet on Ramsar Wetlands*. Compilers are strongly advised to read this guidance before filling in the RIS.
2. Once completed, the RIS (and accompanying map(s)) should be submitted to the Ramsar Secretariat. Compilers are strongly urged to provide an electronic (MS Word) copy of the RIS and, where possible, digital copies of maps.

1. Name and address of the compiler of this form:**Joint Nature Conservation Committee**

Monkstone House

City Road

Peterborough

Cambridgeshire PE1 1JY

UK

Telephone/Fax: +44 (0)1733 – 562 626 / +44 (0)1733 – 555 948

Email: RIS@JNCC.gov.uk

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DD MM YY

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Designation date

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Site Reference Number

2. Date this sheet was completed/updated:

Designated: 25 April 1990; updated 15 May 2005

3. Country:

UK (Scotland)

4. Name of the Ramsar site:

Fala Flow

5. Map of site included:Refer to Annex III of the *Explanatory Notes and Guidelines*, for detailed guidance on provision of suitable maps.**a) hard copy** (required for inclusion of site in the Ramsar List): *yes* ✓ -or- *no***b) digital (electronic) format** (optional): Yes

6. Geographical coordinates (latitude/longitude):

55 49 00 N

02 54 20 W

7. General location:

Include in which part of the country and which large administrative region(s), and the location of the nearest large town.

Nearest town/city: Edinburgh

On the edge of the Lammermuir Hills, 20 km south-east of Edinburgh

Administrative region: Midlothian

8. Elevation (average and/or max. & min.) (metres): **9. Area** (hectares): 318.04

Min. 315

Max. 325

Mean 320

10. Overview:

Provide a short paragraph giving a summary description of the principal ecological characteristics and importance of the wetland.

Fala Flow is in the Lammermuir Hills to the south-east of Edinburgh. It is a blanket mire, with some pools, developed at a lower altitude than most blanket mires in Midlothian. The vegetation comprises heather *Calluna vulgaris*/cottongrass *Eriophorum* spp., with other characteristic species including cowberry *Vaccinium vitis-idaea* and *Sphagnum* bog-mosses. Such mires are scarce and declining in Midlothian and this example is relatively undisturbed. The mire and pools support an internationally important goose roost.

11. Ramsar Criteria:

Circle or underline each Criterion applied to the designation of the Ramsar site. See Annex II of the *Explanatory Notes and Guidelines* for the Criteria and guidelines for their application (adopted by Resolution VII.11).

6

Secretariat comment: The RIS provides information requiring the application of Criterion 4. This needs to be included in the next update.

12. Justification for the application of each Criterion listed in 11. above:

Provide justification for each Criterion in turn, clearly identifying to which Criterion the justification applies (see Annex II for guidance on acceptable forms of justification).

Ramsar criterion 6 – species/populations occurring at levels of international importance.

Qualifying Species/populations (as identified at designation):

Species with peak counts in winter:

Pink-footed goose , <i>Anser brachyrhynchus</i> , Greenland, Iceland/UK	6719 individuals, representing an average of 2.7% of the population (5 year peak mean 1991/92-1995/96)
--	--

Contemporary data and information on waterbird trends at this site and their regional (sub-national) and national contexts can be found in the Wetland Bird Survey report, which is updated annually. See www.bto.org/survey/webs/webs-alerts-index.htm.

13. Biogeography (required when Criteria 1 and/or 3 and /or certain applications of Criterion 2 are applied to the designation):

Name the relevant biogeographic region that includes the Ramsar site, and identify the biogeographic regionalisation system that has been applied.

a) biogeographic region:

Atlantic

b) biogeographic regionalisation scheme (include reference citation):

Council Directive 92/43/EEC

14. Physical features of the site:

Describe, as appropriate, the geology, geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth, water permanence; fluctuations in water level; tidal variations; downstream area; general climate, etc.

Soil & geology	acidic, peat, nutrient-poor, sedimentary
Geomorphology and landscape	upland
Nutrient status	oligotrophic
pH	strongly acidic
Salinity	fresh
Soil	mainly organic

Water permanence	usually permanent
Summary of main climatic features	Annual averages (Edinburgh, 1971–2000) (www.metoffice.com/climate/uk/averages/19712000/sites/edinburgh.html) Max. daily temperature: 12.2° C Min. daily temperature: 5.1° C Days of air frost: 54.5 Rainfall: 676.2 mm Hrs. of sunshine: 1405.8

General description of the Physical Features:

Fala Flow is located in the Lammermuir Hills. It is blanket mire, with some pools, developed at a lower altitude than most blanket mires in Midlothian. Such mires are scarce and declining in Midlothian, and this example is relatively undisturbed.

15. Physical features of the catchment area:

Describe the surface area, general geology and geomorphological features, general soil types, general land use, and climate (including climate type).

Fala Flow is blanket mire, with some pools, developed at a lower altitude than most blanket mires in Midlothian.

16. Hydrological values:

Describe the functions and values of the wetland in groundwater recharge, flood control, sediment trapping, shoreline stabilization, etc.

No special values known

17. Wetland types

Inland wetland

Code	Name	% Area
O	Freshwater lakes: permanent	0.4
U	Peatlands (including peat bogs swamps, fens)	92.6
Other	Other	7

18. General ecological features:

Provide further description, as appropriate, of the main habitats, vegetation types, plant and animal communities present in the Ramsar site.

This site is a marginal upland blanket bog, dominated by *Calluna/Eriophorum* with significant *Sphagnum* cover. The periphery of the site is minerotrophic acid grassland. The site is relatively undisturbed and the lowest intact blanket bog in the Lothians. Open-water areas mostly dystrophic with fringing *Carex nigra* and *Carex rostrata*.

19. Noteworthy flora:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 12. Justification for the application of the Criteria) indicating, e.g. which species/communities are unique, rare, endangered or biogeographically important, etc. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

None reported

20. Noteworthy fauna:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 12. Justification for the application of the Criteria) indicating, e.g. which species/communities are unique, rare, endangered or biogeographically important, etc., including count data. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

Birds

Species Information

None reported

21. Social and cultural values:

e.g. fisheries production, forestry, religious importance, archaeological sites, social relations with the wetland, etc.
Distinguish between historical/archaeological/religious significance and current socio-economic values.

- Aesthetic
- Livestock grazing
- Non-consumptive recreation
- Sport hunting

22. Land tenure/ownership:

Ownership category	On-site	Off-site
Private	+	+

23. Current land (including water) use:

Activity	On-site	Off-site
Nature conservation	+	
Recreation	+	
Current scientific research	+	
Commercial forestry		+
Permanent arable agriculture		+
Rough or shifting grazing	+	
Permanent pastoral agriculture		+
Hunting: recreational/sport	+	+

24. Factors adversely affecting the site's ecological character, including changes in land (including water) use and development projects:

Explanation of reporting category:

1. Those factors that are still operating, but it is unclear if they are under control, as there is a lag in showing the management or regulatory regime to be successful.
2. Those factors that are not currently being managed, or where the regulatory regime appears to have been ineffective so far.

NA = Not Applicable because no factors have been reported.

Adverse Factor Category	Reporting Category	Description of the problem (Newly reported Factors only)	On-Site	Off-Site	Major Impact?
No factors reported	NA				

For category 2 factors only.

What measures have been taken / are planned / regulatory processes invoked, to mitigate the effect of these factors?

Is the site subject to adverse ecological change? NO

25. Conservation measures taken:

List national category and legal status of protected areas, including boundary relationships with the Ramsar site; management practices; whether an officially approved management plan exists and whether it is being implemented.

Conservation measure	On-site	Off-site
Site/ Area of Special Scientific Interest (SSSI/ASSI)	+	
Special Protection Area (SPA)	+	
Site management statement/plan implemented	+	

26. Conservation measures proposed but not yet implemented:

e.g. management plan in preparation; official proposal as a legally protected area, etc.

None information available

27. Current scientific research and facilities:

e.g. details of current research projects, including biodiversity monitoring; existence of a field research station, etc.

None reported

28. Current conservation education:

e.g. visitor centre, observation hides and nature trails, information booklets, facilities for school visits, etc.

None reported

29. Current recreation and tourism:

State if the wetland is used for recreation/tourism; indicate type(s) and their frequency/intensity.

Activities, Facilities provided and Seasonality.

A footpath runs through site and is used throughout the year, although mainly in the summer months.

30. Jurisdiction:

Include territorial, e.g. state/region, and functional/sectoral, e.g. Dept. of Agriculture/Dept. of Environment, etc.

Scottish Executive, Environment and Rural Affairs Department

31. Management authority:

Provide the name and address of the local office(s) of the agency(ies) or organisation(s) directly responsible for managing the wetland. Wherever possible provide also the title and/or name of the person or persons in this office with responsibility for the wetland.

Scottish Natural Heritage, 2 Anderson Place, Edinburgh, EH6 5NP

32. Bibliographical references:

Scientific/technical references only. If biogeographic regionalisation scheme applied (see 13 above), list full reference citation for the scheme.

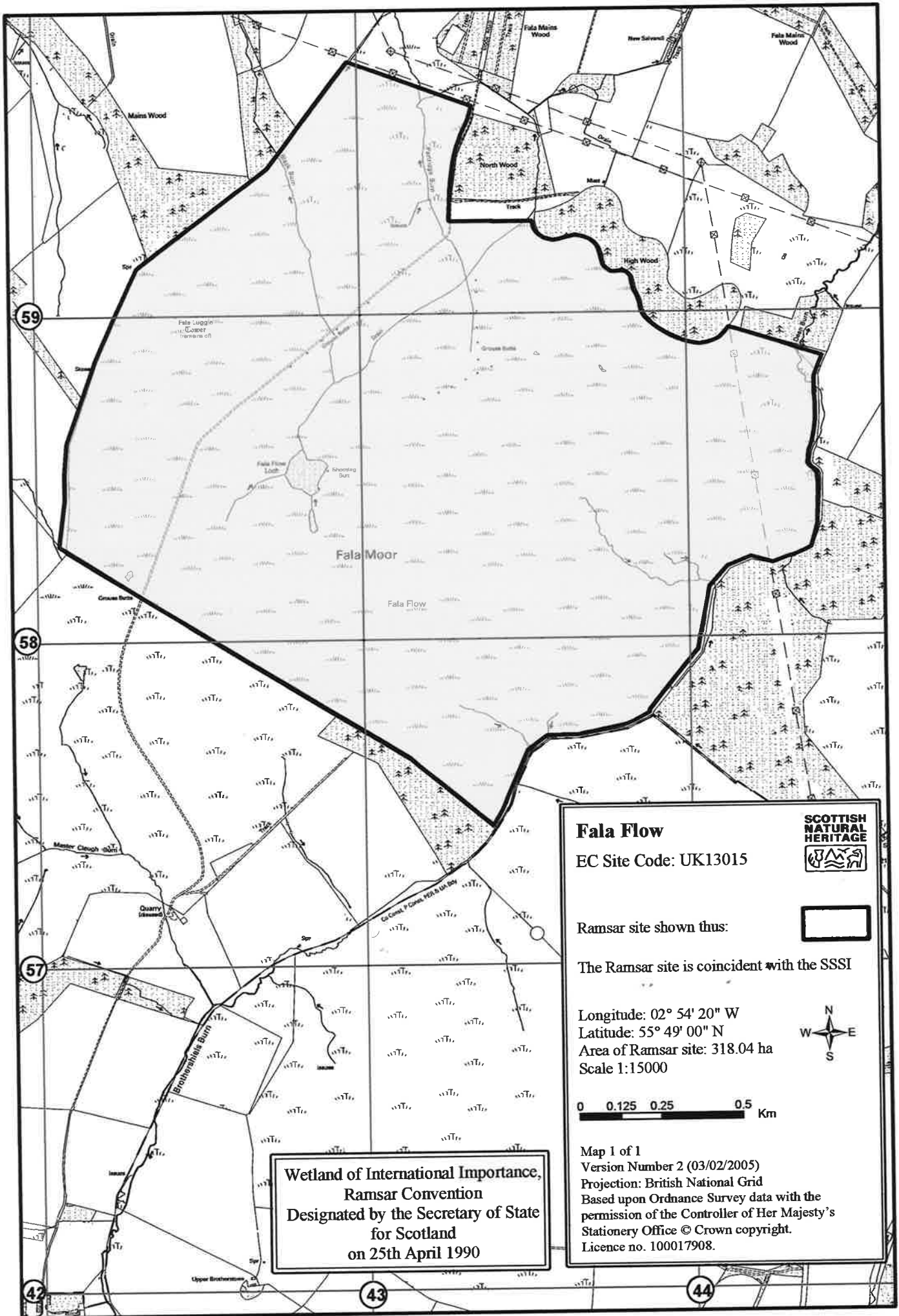
Site-relevant references

Ratcliffe, DA (ed.) (1977) *A Nature Conservation Review. The selection of biological sites of national importance to nature conservation in Britain*. Cambridge University Press (for the Natural Environment Research Council and the Nature Conservancy Council), Cambridge (2 vols.)

Stroud, DA, Chambers, D, Cook, S, Buxton, N, Fraser, B, Clement, P, Lewis, P, McLean, I, Baker, H & Whitehead, S (eds.) (2001) *The UK SPA network: its scope and content*. Joint Nature Conservation Committee, Peterborough (3 vols.)
www.jncc.gov.uk/UKSPA/default.htm

Please return to: **Ramsar Secretariat, Rue Mauverney 28, CH-1196 Gland, Switzerland**

Telephone: +41 22 999 0170 • Fax: +41 22 999 0169 • email: ramsar@ramsar.org



Wetland of International Importance,
Ramsar Convention
Designated by the Secretary of State
for Scotland
on 25th April 1990

Fala Flow

EC Site Code: UK13015

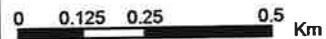


Ramsar site shown thus:



The Ramsar site is coincident with the SSSI

Longitude: 02° 54' 20" W
Latitude: 55° 49' 00" N
Area of Ramsar site: 318.04 ha
Scale 1:15000



Map 1 of 1
Version Number 2 (03/02/2005)
Projection: British National Grid
Based upon Ordnance Survey data with the
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Ramsar Convention on Wetlands of International Importance Especially as
Waterfowl Habitat

CITATION FOR RAMSAR SITE

(Kampala criteria, 2005)

GREENLAW MOOR (UK13022)

Site Description:

Greenlaw Moor Ramsar site is located in the southern Lammermuir Hills. The site includes two pools surrounded by an area of moorland.

Interest Feature (marked in bold): N.B All bird figures relate to numbers at the time of designation:

Greenlaw Moor Ramsar site qualifies under Ramsar Criterion 6 by regularly supporting 1% or more of the individuals in a population of waterbirds:

- **Pink-footed goose** *Anser brachyrhynchus* (1987/1988 to 1991/1992, an average peak of 14,200 individuals, 7% of the Eastern Greenland/Iceland/UK biogeographic population).

Area: 246.02 ha

National Grid Ref: NT712490

OS Sheet 1:50,000 – 74

Designated on 15 March 1996.

This (amended) citation adopted on 1 November 2021.

Measured site area corrected from 247.6 ha

Other Designations that underpin the Ramsar Site:

These provide the statutory mechanisms for protection and management of the Ramsar site.

The boundary of the Ramsar site is coincident with Greenlaw Moor Special Protection Area (SPA), which underpins the bird feature of the Ramsar site. It lies within Greenlaw Moor Site of Special Scientific Interest (SSSI).

Information Sheet on Ramsar Wetlands (RIS)

Categories approved by Recommendation 4.7, as amended by Resolution VIII.13 of the Conference of the Contracting Parties.

Note for compilers:

1. The RIS should be completed in accordance with the attached *Explanatory Notes and Guidelines for completing the Information Sheet on Ramsar Wetlands*. Compilers are strongly advised to read this guidance before filling in the RIS.
2. Once completed, the RIS (and accompanying map(s)) should be submitted to the Ramsar Secretariat. Compilers are strongly urged to provide an electronic (MS Word) copy of the RIS and, where possible, digital copies of maps.

1. Name and address of the compiler of this form:**Joint Nature Conservation Committee**

Monkstone House

City Road

Peterborough

Cambridgeshire PE1 1JY

UK

Telephone/Fax: +44 (0)1733 – 562 626 / +44 (0)1733 – 555 948

Email: RIS@JNCC.gov.uk

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DD MM YY

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Designation date

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Site Reference Number

2. Date this sheet was completed/updated:

Designated: 15 March 1996; updated 12 May 2005

3. Country:

UK (Scotland)

4. Name of the Ramsar site:

Greenlaw Moor

5. Map of site included:Refer to Annex III of the *Explanatory Notes and Guidelines*, for detailed guidance on provision of suitable maps.**a) hard copy** (required for inclusion of site in the Ramsar List): *yes* ✓ -or- *no***b) digital (electronic) format** (optional): Yes

6. Geographical coordinates (latitude/longitude):

55 44 06 N

02 27 06 W

7. General location:

Include in which part of the country and which large administrative region(s), and the location of the nearest large town.

Nearest town/city: Berwick-upon-Tweed

Located in the southern Lammermuir Hills, in the Scottish Borders west of Berwick-upon-Tweed.

Administrative region: Scottish Borders

8. Elevation (average and/or max. & min.) (metres): **9. Area** (hectares): 247.6

Min. 229

Max. 232

Mean 231

10. Overview:

Provide a short paragraph giving a summary description of the principal ecological characteristics and importance of the wetland.

This area consists of heather moorland to the east, and raised mire to the west. The heather is the largest remaining example of moorland at mid-altitude in the Borders. There are two pools at Hule Moss which support an internationally important wintering population of pink-footed geese. The area of raised moss is well developed with a fairly typical flora, including some regionally uncommon bryophytes.

11. Ramsar Criteria:

Circle or underline each Criterion applied to the designation of the Ramsar site. See Annex II of the *Explanatory Notes and Guidelines* for the Criteria and guidelines for their application (adopted by Resolution VII.11).

6

Secretariat comment: The RIS provides information requiring the application of Criterion 4. This needs to be included in the next update.

12. Justification for the application of each Criterion listed in 11. above:

Provide justification for each Criterion in turn, clearly identifying to which Criterion the justification applies (see Annex II for guidance on acceptable forms of justification).

Ramsar criterion 6 – species/populations occurring at levels of international importance.

Qualifying Species/populations (as identified at designation):

Species with peak counts in spring/autumn:

Pink-footed goose, <i>Anser brachyrhynchus</i> , Greenland, Iceland (br)	8504 individuals, representing an average of 3.5% of the flyway population (5 year peak mean 1998/9-2002/3)
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Contemporary data and information on waterbird trends at this site and their regional (sub-national) and national contexts can be found in the Wetland Bird Survey report, which is updated annually. See www.bto.org/survey/webs/webs-alerts-index.htm.

13. Biogeography (required when Criteria 1 and/or 3 and /or certain applications of Criterion 2 are applied to the designation):

Name the relevant biogeographic region that includes the Ramsar site, and identify the biogeographic regionalisation system that has been applied.

a) biogeographic region:

Atlantic

b) biogeographic regionalisation scheme (include reference citation):

Council Directive 92/43/EEC

14. Physical features of the site:

Describe, as appropriate, the geology, geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth, water permanence; fluctuations in water level; tidal variations; downstream area; general climate, etc.

Soil & geology	acidic, neutral, alluvium, peat, nutrient-poor, sandstone
Geomorphology and landscape	lowland, hilly, slope
Nutrient status	highly eutrophic
pH	circumneutral
Salinity	fresh
Soil	mainly mineral
Water permanence	usually permanent

Summary of main climatic features	Annual averages (Edinburgh, 1971–2000) (www.metoffice.com/climate/uk/averages/19712000/sites/edinburgh.html) Max. daily temperature: 12.2° C Min. daily temperature: 5.1° C Days of air frost: 54.5 Rainfall: 676.2 mm Hrs. of sunshine: 1405.8
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General description of the Physical Features:

Greenlaw Moor lies in the southern Lammermuir Hills. The site consists of heather moorland in the east and raised mire in the west. The heather *Calluna vulgaris* moorland is the largest remaining example of its type at mid-altitude in the Scottish Borders. There are two pools at Hule Moss.

15. Physical features of the catchment area:

Describe the surface area, general geology and geomorphological features, general soil types, general land use, and climate (including climate type).

Greenlaw Moor consists of heather moorland in the east and raised mire in the west. The heather *Calluna vulgaris* moorland is the largest remaining example of its type at mid-altitude in the Scottish Borders. There are two pools at Hule Moss.

16. Hydrological values:

Describe the functions and values of the wetland in groundwater recharge, flood control, sediment trapping, shoreline stabilization, etc.

No special values known

17. Wetland types

Inland wetland

Code	Name	% Area
O	Freshwater lakes: permanent	96.8
U	Peatlands (including peat bogs swamps, fens)	3.2

18. General ecological features:

Provide further description, as appropriate, of the main habitats, vegetation types, plant and animal communities present in the Ramsar site.

This site consists of two lochans set within an area of heather moorland showing sparse representation of other typical moorland species. The west loch is 'perched' and very exposed with a thin marginal surround of *Juncus effusus* tussocks which merges into a fringe of *Deschampsia* and *Eriophorum* and the heather moorland with acid grassland patches. Other shoreline species are very limited and include *Carex rostrata*, *C. nigra*, and *Rumex obtusifolius*. The lochan shoreline and substrate are entirely mineral, unlike the east loch, which is more varied and deeper with a peaty substrate. This loch supports marginal poor-fen with *Sphagnum recurvum* with scattered *Salix cinerea* ssp. *oleifolia* with fringing *Carex rostrata*, *C. nigra*, *Juncus effusus* and *Agrostis stolonifera*. At the outer edges of the basin other *Sphagnum* species occur with *Eriophorum vaginatum*, *Calliergonella cuspidata*, *Carex echinata* and *Juncus articulatus*. Flushes around the outflow of the east loch at the south-east corner support *Ranunculus repens*, *R. flammula*, *Trifolium repens* with *Agrostis* and *Rumex*. *Callitriche* species also occur here. Around this outlet further species of aquatic and terrestrial zone *Sphagna* occur. There are no significant invasive or introduced species. The hydrosereal development of particularly the east loch may be expected to proceed in the long term to more extensive poor-fen, limited only by the deeper water. There is no indication of rafting taking place.

19. Noteworthy flora:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 12. Justification for the application of the Criteria) indicating, e.g. which species/communities are unique, rare, endangered or biogeographically important, etc. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

None reported

20. Noteworthy fauna:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 12. Justification for the application of the Criteria) indicating, e.g. which species/communities are unique, rare, endangered or biogeographically important, etc., including count data. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

Birds**Species Information**

None reported

21. Social and cultural values:

e.g. fisheries production, forestry, religious importance, archaeological sites, social relations with the wetland, etc. Distinguish between historical/archaeological/religious significance and current socio-economic values.

Aesthetic
Environmental education/ interpretation
Non-consumptive recreation
Scientific research
Sport hunting

22. Land tenure/ownership:

Ownership category	On-site	Off-site
Private	+	+

23. Current land (including water) use:

Activity	On-site	Off-site
Nature conservation	+	+
Tourism		+
Recreation	+	+
Current scientific research	+	+
Collection of non-timber natural products: (unspecified)		+
Commercial forestry		+
Cutting of vegetation (small-scale/subsistence)	+	+
Arable agriculture (unspecified)		+
Permanent arable agriculture		+
Livestock watering hole/pond	+	
Grazing (unspecified)	+	+
Rough or shifting grazing	+	+
Hunting: commercial	+	+
Hunting: recreational/sport	+	+
Military activities		+

24. Factors adversely affecting the site's ecological character, including changes in land (including water) use and development projects:

Explanation of reporting category:

1. Those factors that are still operating, but it is unclear if they are under control, as there is a lag in showing the management or regulatory regime to be successful.
2. Those factors that are not currently being managed, or where the regulatory regime appears to have been ineffective so far.

NA = Not Applicable because no factors have been reported.

Adverse Factor Category	Reporting Category	Description of the problem (Newly reported Factors only)	On-Site	Off-Site	Major Impact?
No factors reported	NA				

For category 2 factors only.

What measures have been taken / are planned / regulatory processes invoked, to mitigate the effect of these factors?

Is the site subject to adverse ecological change? NO

25. Conservation measures taken:

List national category and legal status of protected areas, including boundary relationships with the Ramsar site; management practices; whether an officially approved management plan exists and whether it is being implemented.

Conservation measure	On-site	Off-site
Site/ Area of Special Scientific Interest (SSSI/ASSI)	+	
Special Protection Area (SPA)	+	
Management agreement		+
Site management statement/plan implemented	+	

26. Conservation measures proposed but not yet implemented:

e.g. management plan in preparation; official proposal as a legally protected area, etc.

No information available

27. Current scientific research and facilities:

e.g. details of current research projects, including biodiversity monitoring; existence of a field research station, etc.

Fauna.

Numbers of migratory and wintering wildfowl and waders are monitored annually as part of the national Wetland Birds Survey (WeBS) organised by the British Trust for Ornithology, Wildfowl & Wetlands Trust, the Royal Society for the Protection of Birds and the Joint Nature Conservation Committee.

PhD study involving site on 'Aspects of the ecology of the Lepidoptera associated with *Calluna vulgaris* on managed northern heath' (Haysom 1998; Haysom & Coulson 1998).

Miscellaneous.

Extensive bibliography available.

No other facilities.

28. Current conservation education:

e.g. visitor centre, observation hides and nature trails, information booklets, facilities for school visits, etc.

An informal moorland management demonstration. Local gamekeeping course is held on site.

A bird hide is situated on the site at Hule Moss.

29. Current recreation and tourism:

State if the wetland is used for recreation/tourism; indicate type(s) and their frequency/intensity.

Activities, Facilities provided and Seasonality.

Walking, riding and bird watching.

Bird hide on Hule Moss only.

Bird watching principally takes place in winter.

30. Jurisdiction:

Include territorial, e.g. state/region, and functional/sectoral, e.g. Dept. of Agriculture/Dept. of Environment, etc.

Scottish Executive, Environment and Rural Affairs Department

31. Management authority:

Provide the name and address of the local office(s) of the agency(ies) or organisation(s) directly responsible for managing the wetland. Wherever possible provide also the title and/or name of the person or persons in this office with responsibility for the wetland.

Scottish Natural Heritage, 2 Anderson Place, Edinburgh, EH6 5NP

32. Bibliographical references:

Scientific/technical references only. If biogeographic regionalisation scheme applied (see 13 above), list full reference citation for the scheme.

Site-relevant references

[See separate list]

Haysom, K (1998) *Aspects of the ecology of the Lepidoptera associated with Calluna vulgaris on managed northern heath*. Unpublished PhD thesis, University of Durham, Department of Biological Sciences

Haysom, KA & Coulson, JC (1998) The Lepidoptera fauna associated with *Calluna vulgaris*: effects of plant architecture on abundance and diversity. *Ecological Entomology*, **23**(4), 377-***

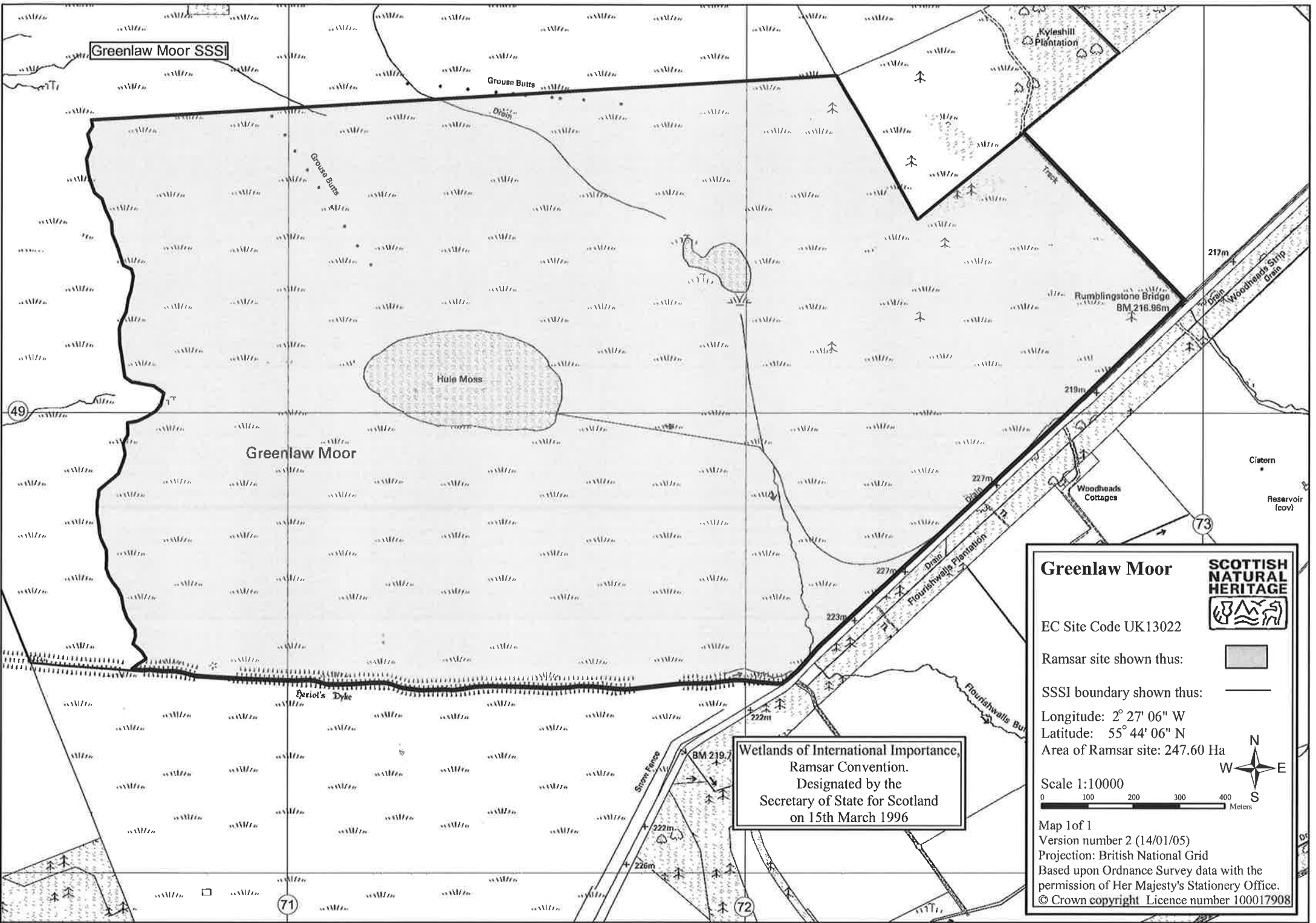
Musgrove, AJ, Pollitt, MS, Hall, C, Hearn, RD, Holloway, SJ, Marshall, PE, Robinson, JA & Cranswick, PA (2001) *The Wetland Bird Survey 1999–2000: wildfowl and wader counts*. British Trust for Ornithology, Wildfowl and Wetlands Trust, Royal Society for the Protection of Birds & Joint Nature Conservation Committee, Slimbridge. www.wwt.org.uk/publications/default.asp?PubID=14

Ratcliffe, DA (ed.) (1977) *A Nature Conservation Review. The selection of biological sites of national importance to nature conservation in Britain*. Cambridge University Press (for the Natural Environment Research Council and the Nature Conservancy Council), Cambridge (2 vols.)

Stroud, DA, Chambers, D, Cook, S, Buxton, N, Fraser, B, Clement, P, Lewis, P, McLean, I, Baker, H & Whitehead, S (eds.) (2001) *The UK SPA network: its scope and content*. Joint Nature Conservation Committee, Peterborough (3 vols.) www.jncc.gov.uk/UKSPA/default.htm

Please return to: **Ramsar Secretariat, Rue Mauverney 28, CH-1196 Gland, Switzerland**

Telephone: +41 22 999 0170 • Fax: +41 22 999 0169 • email: ramsar@ramsar.org



Greenlaw Moor SSSI

Grouse Butts

Kyleshill Plantation

Hain Moss

Greenlaw Moor

Rumblingstone Bridge
BM 216.96m

Woodheads Cottages

Clatern


Reservoir (cov)

Wetlands of International Importance,
Ramsar Convention.
Designated by the
Secretary of State for Scotland
on 15th March 1996

Greenlaw Moor

SCOTTISH NATURAL HERITAGE

EC Site Code UK 13022

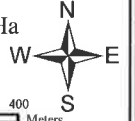
Ramsar site shown thus: 

SSSI boundary shown thus: 

Longitude: 2° 27' 06" W
Latitude: 55° 44' 06" N
Area of Ramsar site: 247.60 Ha

Scale 1:10000





Map 1 of 1
Version number 2 (14/01/05)
Projection: British National Grid
Based upon Ordnance Survey data with the permission of Her Majesty's Stationery Office.
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Making Sustainability Happen