Galileo 05 Limited

Lynemore Wind Farm

Environmental Impact Assessment Report (Volume 1)

Chapter 13 – Other Issues

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13 OTHER ISSUES

13.1 Introduction

13.1.1 This Chapter of Lynemore Wind Farm (hereafter the 'proposed Development') Environmental Impact Assessment (EIA) Report describes and assesses the potential effects of the construction and operation of the Proposed Development on the following issues:

- Infrastructure
- Forestry
- Shadow flicker
- Carbon balance
- Aviation
- Waste and environmental management

13.1.2 The following issues have been scoped out based on professional judgment and the response to scoping consultation:

- Telecommunications
- Television reception
- Air quality
- Population and human health
- Vulnerability of the development to risks of major accidents and disasters.

13.2 Issues Scoped Out

Telecommunications

13.2.1 Review of the Ofcom Spectrum Information Portal determined that there are no microwave fixed links within 1000m of any proposed turbine position in the Proposed Development. Consultations with the Joint Radio Company (JRC), Atkins and Arqiva confirmed that there are no UHF scanning telemetry or television re-broadcast links with the potential to be affected by the Proposed Development. Consequently, telecommunications have been scoped out of assessment.

Television Reception

13.2.2 Wind turbines have the potential to adversely affect analogue television reception through either physical blocking of the transmitted signal or, more commonly, by introducing multi-path interference where some of the signal is reflected through different routes. However, the proposed Development is located in an area now served by a digital transmitter. Therefore, television reception is unlikely to be affected by the proposed Development as digital signals are rarely affected. In the unlikely event that television signals are affected by the proposed Development, reasonable mitigation measures would be considered by the Applicant.

Air Quality

13.2.3 Given the rural location of the proposed Development, the main source of impact on air quality would be increased traffic flows on local roads during construction and emissions from construction activities, such as movement of vehicles on site, and exhaust fumes and dust generated by quarrying activities associated with borrow pits during dry spells. These activities, however, would be short termed, localised, and unlikely to have any significant effect on air quality taking into account average climate conditions and distance between construction and the nearest residential property. In addition to this, controls and best practice measures will form an integral part of the Construction Environmental Management Plan (CEMP), which would be agreed prior to the commencement of construction.

13.2.4 Wind farms do not produce carbon emissions during operation, the only source of emissions would be occasional vehicles accessing the Site for maintenance purposes having negligible effect on air quality.

13.2.5 Any relevant mitigation measures for air quality, dust and pollution control would be detailed within the CEMP.

Population and Human Health

13.2.6 As established under the EIA regulations, Population and Human Health is one of the factors that must be considered during the EIA process. There are no residential properties within the Site, which conveys limited interactions with human health are anticipated. The Site design and in-built buffers from sensitive receptors will minimise the risk to human health resulting from the operation of the turbines, and properly designed and maintained wind turbines are a safe technology.

13.2.7 Effects on Population and Human Health have been assessed under the respective technical studies in relation to:

- landscape and visual impacts (Chapter 5)
- noise and vibration (Chapter 11)
- shadow flicker (Chapter 13)
- traffic and transportation (Chapter 10)
- aviation and radar (Chapter 13)
- socio-economics, land Use, tourism and recreation (Chapter 12)

13.2.8 Any mitigation measures to ensure human safety derived from these assessments will be implemented through the CEMP.

13.2.9 Under this approach, it is considered that Population and Human Health as a factor has been sufficiently covered through the findings of several other assessments as part of the EIA process and not as a standalone EIA chapter.

Vulnerability of the Proposed Development to Risks of Major Accidents and Disasters (including Climate Change)

13.2.10 Given the nature of the proposed Development, and its location, the risk of a major accident or disaster is considered to be extremely low. A Design Risk Assessment process is followed during the design phase to mitigate risks to a level deemed as low as reasonably practicable as part of the requirements of the Construction (Design and Management) Regulations (2015). A Peat Landslide Hazard Risk Assessment (PLHRA) has been undertaken as part of the EIAR and is presented in **Technical Appendix 8.4** of **Chapter 8: Hydrology, Geology, Hydrogeology and Peat.**

13.2.11 During the operational phase of the proposed Development, routine maintenance inspections will be completed in order to ensure the safe and compliant operation of all built infrastructure. The main risk during the operational phase would be due to an increase in the frequency and intensity of bad weather. However, braking mechanisms installed on turbines allow them to be operated only under specific wind speeds and should severe windstorms be experienced, then the turbines would be shut down.

13.2.12 In addition, due to the topography of the Site, flooding will not pose a significant risk to the operation of the Wind Farm nor will the construction of the Proposed Development contribute to flooding elsewhere. For the reasons presented above an assessment of the risk of major accidents and/or disasters has been scoped out of the EIA.

13.3 Infrastructure

13.3.1 The entrance to the Site for vehicles delivering both construction materials and turbine components, such as tower sections and blades, would be from the A9. The access track would be approximately 2.8 km in length until reaching the first wind turbine. The proposed access route to the site from the A9 (inc. proposed junction design) is shown on Indicative Site access details are illustrated by **Figure 2.9** and is discussed further in **Chapter 9: Traffic and Transportation.**

13.3.2 There are no public rights of way or any paths that might meet the criteria but have yet to be catalogued within the application boundary that would be physically impacted by the infrastructure of the Proposed Development.

13.3.3 A desktop utility survey was undertaken prior to undertaking any peat probing and no utilities were identified on the Site.

13.4 Forestry

13.4.1 This Section presents the findings of the assessment of the likely significant environmental effects of the Proposed Development described in **Chapter 2: Proposed Development**. An assessment of the likely effects of tree felling on the landscape resource and visual amenity is covered separately in Chapter **5: Landscape and Visual Impact Assessment**. The effects on biodiversity are covered in **Chapter 6: Ecology and Biodiversity**, and effects on Hydrological receptors are considered in **Chapter 8: Hydrology, Geology, Hydrogeology and Peat.**

13.4.2 This Section is supported by the following figures and appendices, which provide further information, which are referenced throughout the text:

- **Figure 13.1** Study Area
- **Figure 13.2** Baseline Species
- **Figure 13.3** National Forest Inventory
- **Figure 13.4** Native Woodland

- **Figure 13.5** Proposed Felling
- **Figure 13.6** Restocking and Compensatory Planting
- **Appendix 13.1** Photographs and Felling Calculations

Statutory and Planning Context

13.4.3 The following policies and guidelines apply to any development involving the removal of woodland in Scotland.

UK Forestry Standard

13.4.4 The overarching document for forestry management is the UK Forestry Standard (revised 2017) (UKFS), by the Forestry Commission. It is the reference standard for sustainable forest management in the UK. The UKFS outlines the context for forestry management, sets out the approach of the UK government to forestry, defines standards and requirements and provides a basis for regulation and monitoring, including that of national and international reporting.

13.4.5 The UKFS's approach is based on applying criteria agreed at international and European levels, to forest management in the UK. It has been endorsed by the UK and Scottish Governments and applies to all UK forests and woodlands. In general, there is a strong presumption against woodland removal, and restocking of harvested forests is a normal condition of felling approval being granted.

13.4.6 The ability of woodlands to sequester carbon, and hence their role in possible mitigation of climate change is an important factor in shaping regulatory mechanisms.

Scottish Forestry Strategy (2019)

13.4.7 The Scottish Forestry Strategy (SFS), held by the Scottish Government is the Scottish Ministers' framework for taking forestry through the first half of this century and beyond. The SFS sets out the following commitments:

- To increase Scotland's woodland cover to 21% by 2032.
- 12,000 ha per year from 2020/21.
- 14,000 ha per year from 2022/23.
- 15,000 ha per year from 2024/25.
- Increase the contribution of forests and woodland to Scotland's sustainable and economic growth.
- Improve the resilience of Scotland's forests and woodlands and increase their contribution to a health and high-quality environment.
- Increase the use of Scotland's forest and woodland resources to enable more people to improve their health, well-being and life chances.

Scottish Land Use Strategy (2021)

13.4.8 The Scottish Land Use Strategy (SLUS) is a strategic framework by the Scottish Government for achieving the "best" use from Scotland's land resource. It aims to achieve a more integrated approach to land use, maintaining the future capacity of the land resource and is based on the three pillars of sustainability: economy, environment and communities.

13.4.9 Attaining multiple benefits from land is a key theme, and the focus on forestry is the identification of areas best for tree planting in an integrated land use system. To increase its role in addressing the challenge Scotland faces from climate change, a target of £150 million for woodland creation has been committed to. Regional Forestry and Woodland strategies developed by local authorities are identified as the delivery mechanism to promote good practice and multi-benefit land use.

National Planning Framework 4 (2023)

13.4.10 The National Planning Framework 4 (NPF4), by the Scottish Government acknowledges the economic value of woodlands and forestry in addition to their ecological value. Ancient woodland is land that has been maintained as continuous woodland habitat since at least 1750. Development proposals involving woodland removal will only be supported where they will achieve significant and clearly defined additional public benefits in accordance with relevant Scottish Government policy on woodland removal. Where woodland is removed, compensatory planting will most likely be expected to be delivered (p45, Scottish Government, 2023).

Forestry and Land Management (Scotland) Act (2018)

13.4.11 The felling of trees is regulated under the Forestry and Land Management (Scotland) Act 2018, except in cases when woodland removal is associated with wind farm development. In such cases, any significant environmental effects of woodland removal are assessed by the Scottish Government or the Local Authority depending on the capacity of the development. In this case it is the Scottish Government's Policy on the Control of Woodland Removal (2009)

13.4.12 The Scottish Government's 'Control of Woodland Removal' (CWR) Policy and accompanying Implementation Guidance (2019) (Appendix A) provides guidance for managing the application of the CWR Policy in respect of forestry removal on development sites. The principal aims of the CWR Policy are to provide a strategic framework for appropriate woodland removal and to support climate change mitigation and adaptation. The CWR Policy is built on the following principles:

- A strong presumption in favour of protecting Scotland's woodland resource;
- Woodland removal should be allowed only where significant and clearly defined additional public benefit can be demonstrated. A proposal for compensatory planting may add additional public benefit;
- Approval for woodland removal should be conditional on the undertaking of actions to ensure full delivery of the defined additional public benefits;
- Planning conditions and agreements are used to mitigate the environmental impacts arising from development and Scottish Forestry (SF) would also encourage their application to development related woodland removal; and

- Where felling is permitted but woodland removal is not supported, conditions conducive to woodland regeneration should be maintained through adherence to good forestry practices as defined in the UKFS.

The Right Tree in the Right Place – Planning for Forestry and Woodlands (2010)

13.4.13 This guidance allows for the Scottish Government to give advice to planning authorities on forestry and woodland planning. The guidance refers to the role of forestry and woodlands in the planned landscape in relation to development.

Climate Change (Scotland) Act (2009)

13.4.14 The Act is a statutory framework by the Scottish Government for greenhouse gas reductions in Scotland and sets an interim target reduction at 40% for 2020 and 80% for 2050. Part 5 of the Act includes provisions for forestry relating to climate change.

The Highland Council – Trees Woodland and Development (2013)

13.4.15 This guidance produced by The Highland Council outlines that developers should effectively consider tree planting proposals and aftercare when submitting planning applications. In relation to windfarm development it states that developers should seek:

- to mitigate against the loss of woodlands
- to provide mutual benefits such as local infrastructure improvements such as timber transport
- to investigate the potential for conversion of productive to native woodland planting;

The Highland Council - Highland Wide Local Development Plan (2012)

13.4.16 In relation to trees and development, the Plan held by The Highland Council outlines that the Council will support developments which protect existing hedgerows, trees and woodlands on and around development sites. This includes appropriate separation distances between existing trees and the development. The Council expect additional tree/hedge planting to compensate for tree removal in order to enhance the development.

13.4.17 The Plan details the Principle of Development in Woodland (PDW) and states that:

- there needs to be a strong presumption in favour of protecting existing woodland resources;
- and that the developer will need to demonstrate that the woodland site has the capacity to accommodate the development;
- development in woodland will be considered against socio-economic impact on the local forestry industry, the economic maturity of the woodland and the opportunity for co-existence with forestry operations; and
- compensatory planting will usually be required;

Highland Forest and Woodland Strategy (2018)

13.4.18 The Highland Forest and Woodland Strategy (HFWS), by The Highland Council sets the future vision, priorities and objectives for Highland forests and addresses the changes required to maintain a sustainable forest resource. The HFWS states that forestry represents one of the main land uses in the Highlands covering 13% of the area (310,000 ha). Although most of the forested area is pre 1980's productive planting, there has been a strong drive to enhance and restore native woodlands (5% of Highland land area). The strategy supports the expansion of native woodlands especially native pinewoods, upland birchwoods and wet woodlands.

13.4.19 Part of the HFWS objectives relating the Proposed Development are:

- encourage planting that contributes to integration with and expansion of native woodland and other woodland habitat networks; and
- encourage woodland expansion that delivers 'ecosystem services' relating to mitigation and adaptation to climate change, including flood plan management and protection of deep peat areas.

Consultation Undertaken

13.4.20 In undertaking this assessment, the formal scoping consultation responses have been fully considered in Table 13.1 below.

Table 13.1: Summary of consultation responses relevant to this chapter

Consultee	Issued Raised	Response/Action Taken
Scottish Forestry 23 April 2024	In line with Scottish Government's wider objective to protect and expand Scotland's woodland cover, applicants are expected to develop their proposal with minimal woodland removal. Woodland removal should be allowed only where it would achieve significant and clearly defined additional public benefits. The following criteria for determining the acceptability of woodland removal should be considered relevant to this application:	Woodland removal will be kept to a minimum. **Figure 13.5** illustrates that no large scale felling is required as part of the Proposed Development In addition, wind farms meet the criteria for delivering public benefit by way of climate change mitigation.
	• Woodlands with a strong presumption against removal - Only in exceptional circumstances should this be overridden. Proposals to remove these types of woodland should be judged on their individual merits and will require a high level of supporting evidence. Any Compensatory Planting (CP) area must exceed the area of woodland removed. • Woodland removal with a need for compensatory planting - Design approaches that reduce the scale of felling required and/or converting the type of woodland to another type must be considered from the earliest stages, rather than removing the woodland completely. The purpose of any required CP is to secure, through new woodland on site or off site, at least the equivalent woodland-related net public benefit embodied in the woodland to be removed.	Felling areas are indicated in **Figure 13.5**. Appropriate felling permissions would be obtained from Scottish Forestry in advance of works. Felling would only affect areas of commercial forestry and young trees. It would not affect any native woodland or other trees with a strong presumption against removal. As illustrated in **Figure 13.6**, compensatory planting would be located within the Lynemore Estate red line boundary and alongside the A9. Compensatory planting would consist of native trees species such as Scots pine, birch and common alder as supported in

Consultee	Issued Raised	Response/Action Taken
	Scottish Forestry welcomes the developers commitment within the Scoping Report to ensure that any proposed changes to woodland address the requirements of the Control of Woodland Removal Policy and other relevant guidance. National Planning Framework 4 - Policy 6 Forestry, Woodlands and trees identifies several themes that should be considered relevant to this application – b) Development proposals will not be supported where they will result in: i. Any loss of ancient woodlands, ancient and veteran trees, or adverse impact on their ecological condition; ii. Adverse impacts on native woodlands, hedgerows and individual trees of high biodiversity value, or identified for protection in the Forestry and Woodland Strategy; iii. Fragmenting or severing woodland habitats, unless appropriate mitigation measures are identified and implemented in line with the mitigation hierarchy; c) Development proposals involving woodland removal will only be supported where they will achieve significant and clearly defined additional public benefits in accordance with relevant Scottish Government policy on woodland removal. Where woodland is removed, compensatory planting will most likely be expected to be delivered. The scoping report describes impact on sensitive woodlands for which there is a presumption against removal or described in NPF4 as woodlands for which removal is not supported. An initial desk search indicates Ancient Woodland Inventory sites, Native woodland recorded on the Native Woodland Survey of Scotland and potential UK priority Biodiversity action plan habitats (UKBAP) specifically Upland Birch wood and Pine Wood. The development will also impact on commercial woodlands and a Woodland Grant Scheme funded plantation, namely Moy Birchwood WGS ref 30001771.	the Control of Woodland Removal Policy. This would deliver public benefit as an outcome of the proposal. The Study Area lies within the Scottish Government's Forestry Grant Scheme (FGS) Native Woodland Habitat Network which allows for the potential to plant native Scots Pine, native Upland Birch, native Broadleaves, native Low-density Broadleaves. CWR Policy and other relevant guidance is taken into consideration in Mitigation. Under the CWR, Scottish Forestry and the THC would require compensatory planting commensurate with the permanent loss of tree cover. Areas of forestry plantation removed back to windfirm edges, excluded from permanent infrastructure would be restocked as required by an approved felling license. By reference to Table 13.7 the residual level of effect would be considered negligible once embedded mitigation of compensatory planting and restocking has taken place. Restocking proposals under compensatory planting containing native species are indicated in **Figure 13.6** of this chapter. A woodland creation proposal would be prepared for compensatory planting. Refer to section "Compensatory Planting" . There is approximately 0.0613 net ha of mature native trees to be felled on the perimeter of compartments 1, 2 and 3. Therefore, no fragmentation of woodland habitats is foreseen. See comment above
The Highland Council 5 August 2024	It is recommended that the planting of native woodlands, particularly on the more visible edges of these uplands, should be undertaken by wind energy developers/landowners as a condition of consent with the aim of enhancing landscape character in the long term.	Felling areas are indicated in **Figure 13.5**. See comments above. The access track route will require the felling of a very

Consultee	Issued Raised	Response/Action Taken
	Whilst Highland Council's Forestry Officer has not had a chance to visit the site they have provided the following comments having compared the proposals with scaled aerial photography, Native Woodland Survey of Scotland (NWSS) and Ancient Woodland Inventory (AWI). The proposed development site is located in largely open ground where there does not appear to be much in the way of significant trees or areas of woodland.	small amount of native trees comprising approximately 0.0613 ha.
	There is an existing metalled access track from the A9 at Lynemore to Carn na h-Easgainn on the south-east side of the proposed development area. The track passes between blocks of woodland which are listed in the NWSS as mature upland birchwood, juniper scrub and dwarf shrub heath. Much of this woodland is also listed in the AWI as Ancient Semi-natural Origin (ASNO1860).	The updated route of the access track has been adapted to avoid the majority of this woodland.
	In the Scoping Report there is a section on Forestry, and it is noted that there is potential for effects on areas of woodland/forestry during the construction, operation, and decommissioning of the Proposed Development. It is not proposed to dedicate a specific chapter to Forestry in the EIAR, but to deal with it under other headings. Section 5.9.63 notes that Table 5.9.2 includes all of the areas of ancient woodland (AWI) within the site. These areas are shown on Figure 4.2.4a. However, the Forestry Officer is unable to locate that drawing in the Scoping Report. It is suggested in section 5.9.74 that potential direct impacts on AWI would be avoided by design and indirect impacts are unlikely. However, it goes on to note in section 5.9.75 that there is potential for permanent woodland loss associated with potential site access.	This Chapter provides all information regards effects on forestry.
	The EIAR should provide a baseline survey of the trees and plants (including fungi, lichens and bryophytes) present on the site to determine the presence of any rare or threatened species. The layout should be designed to ensure there is no/minimised adverse impact on native or ancient woodland. The EIAR should also indicate areas of woodland/forestry plantation which may need to be felled to accommodate new development (including the access) and any off site works/mitigation. Compensatory planting of new woodland is a clear expectation where there are any proposals for felling, and thereby such mitigation needs to be considered within any assessment. If trees are to be removed, compliance with the Scottish Governments Control of Woodland Removal Policy must be demonstrated.	Restocking and planting proposals under compensatory planting containing native species (such as Scots pine, silver and downy birch and common alder) are indicated in **Figure 13.6** and OHEMP in **Technical Appendix 6.5**.
SEPA 29 May 2024	If forestry is present on the site, the site layout should be designed to avoid large scale felling, as this can result in large amounts of waste	**Figure 13.5** illustrates that no large-scale felling is proposed. Brash would be kept clear of

Consultee	Issued Raised	Response/Action Taken
	material and a peak in release of nutrients which can affect local water quality. The submission must include drawings with the boundaries of where felling will take place and a description of what is proposed for this timber in accordance with Use of Trees Cleared to Facilitate Development on Afforested Land – Joint Guidance from SEPA, SNH and FCS.	watercourses and feeder flushes.

Approach to the Assessment

Scope of Assessment

13.4.21 .This examines the impact on the forestry resource from the felling that would be required for the access track plus 10 m buffer either side as well as that required for the temporary construction compound and a 10 m buffer. The trackside buffer will need to be 20m on curves to allow for oversail for delivery of turbine masts and blades.

Baseline Methodology

Desk Study

13.4.22 An initial study of web and paper based tools was carried out to gather all information on woodlands within the Proposed Development 'red line boundary'. Sources of information included:

- Forestry Commission (FC) National Forestry Inventory Scotland 2021
- Scottish Forestry Map Viewer
- Forestry Land Scotland Meall Mor, Moy and Farr Land Management Plan 2023 - 2033
- NatureScot Ancient Woodland Inventory
- FC Ecological Site Classification
- FC Forest Gales software
- Aerial mapping
- Ordnance Survey Maps.

Field Surveys

13.4.23 A walkover Site assessment was carried out on 4 June 2024. The survey covered the areas of woodland within the Proposed Development (Study Area).

Assessment Methodology

13.4.24 Commercial forestry is not considered a receptor when undertaking an EIA. Therefore, the desk study was used to research existing woodland designations and forest resource along the route of the proposed access track and construction compound. The results detail the classification of woodlands according to the National Forest Inventory and whether any of the woodlands are Plantations on Ancient Woodland Sites (PAWS) or

Ancient Semi-Natural Woodlands (ASNW). Forest Gales software was used to determine the risk of windblow to standing crops. The Ecological Site Classification was used to determine suitable species for restocking and other planting. Aerial mapping, Ordnance Survey maps and FLS maps illustrated the actual location and extent of the woodland coverage.

13.4.25 The field survey included random plot sampling to estimate timber size and visual assessment of timber quality. Standing timber volume was measured using a relascope and clinometer for top height. Estimates of timber volume per hectare were obtained by applying the field results to tables in the Forest Mensuration 'A handbook for practitioners' (2006). Timber quality was assessed using professional judgement based on experience of previous standing timber sales. This information would be used to assess the amount of timber transported from site. An estimate of crop age was made to determine Yield Class. Areas of windblown trees were noted during the survey. This information was combined with the Forest Gales output to assess the potential for future windblow.

Study Area

13.4.26 The study area extends to 346.56 ha and covers the wooded area boundary within the red line boundary of the Proposed Development (see **Figure 13.1**).

13.4.27 The woodlands would be impacted by felling to accommodate the route and width of the access track, and construction compound. It would be necessary fell a 26.6 m wide corridor (the width of the access track plus a 10 m buffer) where the track passes through the standing crop and trees. This would need to be wider (up to 20 m buffer) on bends to accommodate oversail. A 10 m external buffer of cleared trees around the construction compound would be created.

Guidance

13.4.28 As there are no published criteria, guidance or methodologies in relation to the assessment of effects on forestry. The assessment is therefore based on professional judgement informed by available forestry plans (and supporting information), field work, management experience and consultation.

13.4.29 The assessment has however taken account of statute, guidance and advice where applicable including:

- FC (FLS) Technical paper 16 Designing Forest Edges to improve wind stability (1996)
- FC Forest Yield: A handbook for forest growth and yield tables for British forestry (2016)
- Forest Research, Forest Gales 2.5 model for predicting risk of windthrow
- Scotland's Forestry Strategy 2019-2029
- UK Forestry Standard (2017)
- UK Woodland Assurance Standard (2018).

Cumulative Effects

13.4.30 Felling for dualling of the A9 may be required along the edge of the current carriageway but given the scale of felling would be minimal and the scale of felling for the proposed development would be minimal considering the size of the woodland onsite it is not considered that there is potential for significant cumulative effects on forestry.

Difficulties and Uncertainties

13.4.31 There are no forest plans covering the plantations on the Lynemore Estate. Therefore, age class and yield class have been estimated from visual assessment and mensuration data.

13.4.32 Professional judgement was used to assess crop age class on the Lynemore Estate. A woodland grant scheme active from 1999 to 2004 covered the planting of Scots pine on the Lynemore Estate. It is assumed that the planting was carried out within this period which would indicate a five year difference in estimated age of these trees. Aerial mapping from the year 2005 indicates that trees in compartments 4 to 8 were growing by this stage. The age of upland birch has been estimated at a maximum of 100 years as the species does not often surpass 80 years life expectancy.

Existing Environment

13.4.33 Lynemore Estate woodlands are centred on the north east facing slopes of Carn na h-Easgainn and Carn na Loinne between 300 m and 1.5 km west of the settlement of Moy within The Highland Council area.

13.4.34 The desk study and field study determined the current baseline condition of the plantations and woodlands within the Study Area is centred on Ordnance Survey grid reference of NH757337 (refer to section 13.5.6 and **Figure 13.1**). The compartment schedule detail the existing species, area, age class and yield class in the Study Area.

Long Term Forest Plans

13.4.35 Forestry Land Scotland (FLS) has produced the Meall Mor, Moy and Farr Land Management Plan (LMP) 2023 – 2033 for their woodlands within the Study Area. A LMP is not available for the Lynemore Estate woodlands.

Forest Structure

13.4.36 The following information has been taken from the National Forest Inventory (NFI) 2021, which is reasonably up to date and provides detail of the forestry and non-forestry categories throughout the Study Area as shown in **Figure 13.3**.

13.4.37 The total area of each land use category and what this represents in relation to the forestry features as a percentage of the NFI area within the Study Area is detailed in Table 13.2

Table 13.2 National Forest Inventory Land Classification within the Study Area

Land category	Area (ha)	Area (%)
Assumed woodland	106.05	46.16
Bare area	0.96	0.42
Broadleaved	53.78	23.41
Conifer	3.33	1.45
Felled	1.95	0.85
Low density	1.63	0.70
Mixed mainly broadleaved	0.53	0.23
Other vegetation	1.13	0.49
Young trees	60.40	26.29
Total	**229.76**	**100.00**

13.4.38 The NFI suggests woodland coverage of 225.72 ha with 1.95 ha felled (for the dualling of the A9) and 2.09 ha of other vegetation and bare ground. However, it should be noted that the area of assumed woodland shown in **Figure 13.3** is in fact open ground with occasional trees and sparse tree regeneration.

Forest species

13.4.39 The distribution of tree species has been derived from data supplied by Forestry Land Scotland (FLS); and data collected from the field survey in the case of Lynemore Estate. This is detailed in Table 13.3 and Table 13.4**,** and **Figure 13.2**. The forested areas for the Lynemore Estate have been calculated from Google Earth aerial map of 29 May 2023. It is assumed that the p1999 Scots pine on the Lynemore Estate is that planted under the Moy Birchwood WGS ref 30001771.

Table 13.3: Compartment schedule

Compartment number as shown in Figure 13.5	Area Gross (ha)	Species	Planting Year	Yield Class	Age
1	15.9075	BI/Juniper	1924	2	100
2	0.0183	BI/Juniper	1924	2	100
3	0.0419	BI/Juniper	1924	2	100
4	8.3965	SP	1999	10	25
5	0.9980	SP	1999	10	25
6	0.7491	SP	1999	10	25
7	4.0332	SP	1999	10	25
8	0.8356	SP/LP/SS	1999	10	25
2046 g	1.4000	SP	1956	10 (14)	68
2046 i	0.2210	MB/MC	1970	2	54

Compartment number as shown in Figure 13.5	Area Gross (ha)	Species	Planting Year	Yield Class	Age
2046 j	0.9000	NS	1979	10 (14)	45
2046 p	0.4000	SS/LP	1956	10/8 (16/12)	68
2046 o	0.3127	MB/MC	1970	2	54
Total	**34.2138**				

Species: BI – Birch, SP – Scots pine, LP – Lodgepole pine, NS – Norway spruce, SS – Sitka spruce, MB – Mixed broadleaves, MC – Mixed conifers. Measured YC in parenthesis where they differ from the FLS schedule.

Table 13.4: Species distribution

Species	Area (ha)	Area (%)
Scots pine*	33.23	24.15
Upland mixed broadleaves, silver birch with juniper*	86.29	62.72
Upland mixed broadleaves low density, silver birch*	12.24	8.90
Mixed conifers*	0.84	0.61
Scots pine**	1.18	0.86
Lodgepole pine**	0.70	0.51
Norway spruce**	0.90	0.65
Sitka spruce**	2.20	1.60
Total	**137.58**	**100.00**

* Lynemore Estate, **Forestry Land Scotland

Yield Class

13.4.40 Yield Class (YC) is defined as the cubic metres of growth per hectare area per year and is expressed m3/ha/yr. Measurements taken on-site estimated top height (m), and predicted planting year where this was not available. These measurements indicate that Site yield class for Scots pine is YC 14, lodgepole pine YC 12, Norway spruce YC 16, Sitka spruce YC 16, and for mixed broadleaves YC <4. This indicates moderate productivity for productive conifers such as Scots pine, Norway and Sitka spruce.

13.4.41 It should be noted that the measured and predicted yield class in the FLS compartment differed. FLS had not surveyed compartment 2046 at the time of writing.

Felling Phases

13.4.42 There is no information on felling phases. The FLS compartment 2046 is specified as long term retention in their LMP map.

Timber Size

13.4.43 The measurement data collected during the Site visit on 4 June 2024 is detailed in **Table 13.4** The mature stands of timber to the north of the settlement of Lynebeg and the A9 trunk road are of harvestable size, with some oversize material in compartments 2046 g and p. Top height within these compartments varies from 20 to 23m. The planted native Scots pine areas within the Lynemore Estate are at late pole stage with a mean top height of 8 m. The mixed broadleaves, dominated by downy and silver birch, are very mature and have a mean top height of 8m.

Timber Quality

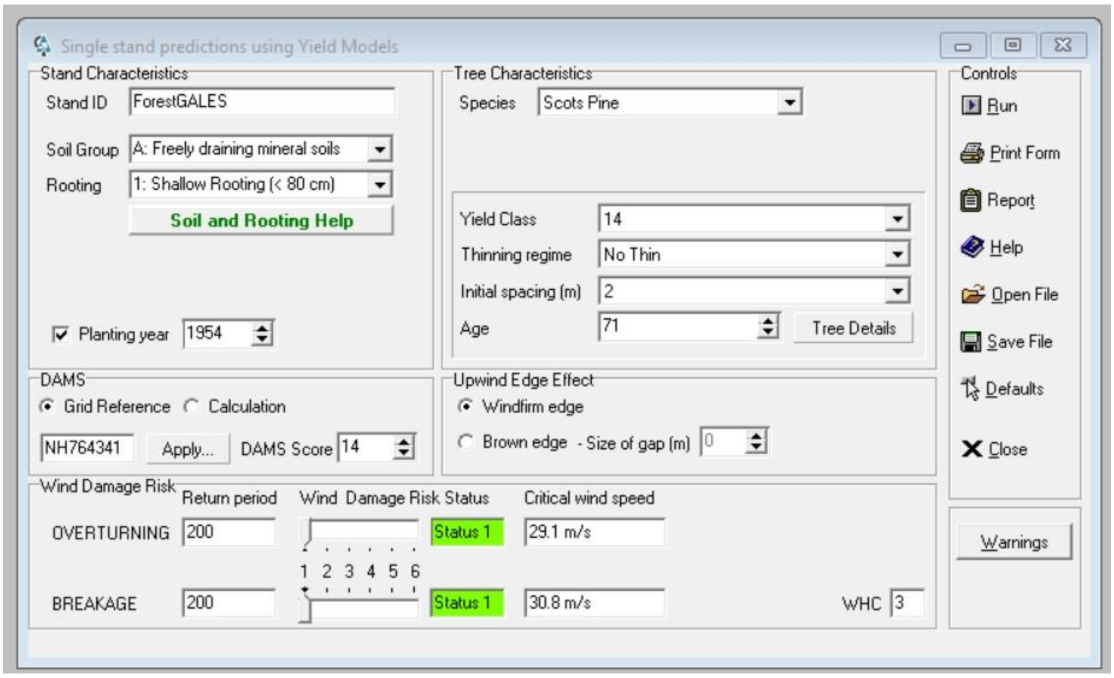
13.4.44 The photographs in **Figures 13.7** to **13.11** in **Appendix 13.1** illustrate the quality of the timber. The mature Norway spruce compartment 2046 j is of good marketable quality, which will produce a high quantity of sawlogs. The adjacent mature Scots pine, Sitka spruce and lodgepole pine stand of compartments 2046 g and p exhibit lower quality timber, but contains marketable sawlog material nonetheless. The younger native planted Scots pine is of rougher quality due to wider spacing when planted and will be suitable for firewood or biomass and small roundwood suitable for fencing. The native broadleaves are predominantly multi stemmed with twisted trunks suitable for firewood or biomass.

Windblow Risk

13.4.45 Wind Hazard Classification (WHC) classifies windthrow prediction risk with WHC 1 being the lowest risk and WHC 6 the greatest. The UK Forest Research 'Forest Gales' software[1] has been used to calculate WHC for the standing crops where possible. The existing Forest Gales output is illustrated in the diagram below. The WHC data for the forest resource affected by the Proposed Development is shown in Table 13.5, below

[1] Forestry Commission. (2015). Forest GALES, A wind risk decision support tool for forest management in Britain, User Manual - version 2.5.

FOREST GALES OUTPUT EXAMPLE FOR EXISTING SCOTS PINE IN COMPARTMENT 2046G



13.4.46 There is evidence of windblow in compartments 2046 g, p and 8 which would indicate that the creation of brown edges within the crop may lead to further windblow.

Table 13.5 Comparison between baseline and construction WHC

Compartment	Species	WHC
2046j	Norway spruce	2
2046g and p	Scots pine, Lodgepole pine, Sitka spruce	3
4 to 7	Scots pine	2
1 to 3	Birch	n/a
8	Scots pine, Sitka spruce, Lodgepole pine	2

Designated sites

13.4.47 The following information has been taken from the Scottish Forestry Map Viewer Native Woodland Survey of Scotland layer[2]. Table 13.6 categorises native and nearly native woodland into dominant habitat and dominant structure identified within the Study Area as shown in **Figure 13.4**. The Study Area is located within the Scottish Forestry Pinewood Zone.

[2] Scottish Forestry Map Viewer. Available at: https://forestry.gov.scot/support-regulations/scottish-forestry-map-viewer

Table 13.6 Native Woodland within the Study Area

Dominant Habitat	Dominant Structure	Area (ha)	Area (%)
Juniper scrub*	Shrub	14.26	16.45
Juniper scrub*	Visible regeneration	0.64	0.74
Native pinewood*	Established regeneration	0.72	0.83
Native pinewood*	Pole immature	2.90	3.35
Unidentifiable type*	Established regeneration	7.43	8.57
Upland birchwood*	Mature	39.75	45.84
Upland birchwood*	Shrub	2.25	2.60
Upland birchwood*	Visible regeneration	4.08	4.71
Native pinewood**	Established regeneration	0.07	0.08
Dwarf shrub heath***	No data	14.60	16.84
Total		**86.71**	**100.00**

Type = * Native woodland, ** Nearly-native woodland, *** Open land habitat.

13.4.48 The data shows that recognisable established trees cover 59.16 ha in the form of shrubs, and mature and immature pole stage growth trees. Regeneration and established seedlings are 12.95 ha and open land habitat of dwarf shrub heath is 14.60 ha.

13.4.49 The upland birch and juniper woodland within the Study Area is recorded on the Roy Map and Ancient Woodland Inventory. The extent of ancient woodland cover in the Study Area is illustrated in **Figure 13.4.** Although the FLS compartments 2046 g and p and Lynemore Estate compartment 8 are partially mapped as Native Woodland, they are Long Established Woodland of Plantation Origin (LEPO). These subcompartments are composed of Scots pine, Lodgepole pine and Sitka spruce planted in 1956 and 1999 (estimated) respectively. They are recorded as Long Term Retention in the FLS LMP with a potential felling year of beyond 2038.

13.4.50 The FLS LMP states that they have 132 ha of Long Term Retention woodland and that these are a stronghold of predatory birds and are also designated as a Red Squirrel stronghold. The area of FLS Long Term Retention Woodland within the Study Area is 2.80 ha and within compartment 2046

Embedded Mitigation

Design Considerations

13.4.51 In relation to forestry, the key objective has been to minimise the amount of tree felling. The area required to be cleared of trees to accommodate the construction of the access track and construction compound is illustrated in **Figure 13.5** and detailed in **Table 13.7 (Appendix 13.1)**. This details the minimum area that would need to be felled to accommodate the construction and operation of the Proposed Development.

Access Tracks

13.4.52 It has not been possible to use existing tracks due to archaeological and property constraints. The shortest possible route has been chosen subject to avoiding watercourses or other environmentally sensitive areas. The minimum track width of 6 m required for the transportation of the construction materials and a 10 m buffer on either side has been proposed. It would however be necessary to carry out some additional felling for passing places and on bends as required. A 20 m buffer has been applied for oversail on bends only when delivering turbine bases and blades.

Construction Compound

13.4.53 Trees in this area would be felled in this area plus a 10 m buffer from the outside edge of the compound.

Best Practice Measures

Forestry Operations

13.4.54 Forestry works would be conducted in line with the ‘Scottish Environment Protection Agency’s guidance note – Land Use Planning System’, as well as ‘SEPA’s Guidance Note LUPS-GU27 – Use of Trees Cleared to Facilitate Development on Afforested Land’.

13.4.55 The document states that the best practice for dealing with forest materials at development sites is as follows:

- Professional forester input to quantify the likely volume, markets, and economic uses of trees to be exported from the site.
- Developer commitment to employ a professional forester to implement and maximise the removal of timber and forest residue on site.
- Quantify the likely volumes of material for which no economic off-site use can be found.
- Identify if there are valid uses on site for material for which no economic off-site use can be found.

13.4.56 All forestry input in relation to the environmental appraisal of the Proposed Development is being provided by Wayne Scurrah, who is an Associate Member of the Institute of Chartered Foresters and has experience in providing forestry support for wind farms and other renewables developments.

13.4.57 However, the landowners’ forest agents would arrange and oversee the actual felling and utilisation of the timber.

Felling and Utilisation

13.4.58 The method of felling and utilisation would be based on whole tree utilisation. All the timber and branch wood would be removed from site so there would minimal arisings left on site. Felling areas and timber volume to be removed is detailed in **Table 13.7 (Appendix 13.1)**. The method would be as indicated below.

13.4.59 A conventional harvester and forwarder would be used to fell and extract the timber from all felled areas. A forwarder would then be used to gather the brash. It would then be taken to roadside and put through a chipper which would chip all the brash which is blown in walking floor type trailer on an articulated lorry.

13.4.60 The round timber is likely to be sent to local timber markets for onward processing with the wood chip element being sold for biomass.

Waste Materials

13.4.61 Given the negligible quantities of forestry waste likely to be produced from the proposed felling, these impacts have not been considered. However, all waste materials will be managed in accordance with SEPA's guidance notes – Land Use Planning System, SEPA Guidance Note LUPS-GU27 – Use of Trees Cleared to Facilitate Development on Afforested Land and the SEPA (2017) Guidance WST-G-027 version 3 Management of Forestry Waste.

Predicted Effects

13.4.62 This section assesses the effect of the long term loss of forestry resource as a result of the felling of the required access track corridor and construction compound.

13.4.63 It is common practice within the forestry sector to refer to net area of tree coverage. This is defined as eighty five percent of the gross area to allow for internal open space and rides. The net area of felling required as detailed in Table 13.7 and Figure 13.5 within the corridor and compound is 4.29 ha. Of this 2.46 ha will be permanently lost to infrastructure and 1.83 ha will be available for restocking.

13.4.64 The net area of permanent loss of FLS long term retention woodland in compartment 2046 is 0.75 ha. Similarly the loss of upland juniper woodland would be 0.06 ha.

13.4.65 There would be a very small loss of ancient woodland in the form of upland birch and juniper woodland amounting the removal of 0.0613 ha. This is not considered a significant loss in terms of the overall forest resource.

13.4.66 The minimum area of land required for compensatory planting under the Scottish Governments Policy on the Control of Woodland Removal will be 2.46 ha.

Mitigation

Restocking

13.4.67 The Applicant does not propose any restocking of those areas required to be felled and kept clear of trees for the operational phase of the Proposed Development.

13.4.68 There will be a requirement to restock felled areas that are felled back to windfirm edges and not part of the long term infrastructure requirement. Restocking species will be at the landowners preference but is likely to be a mixture of native species suitable to site conditions.

13.4.69 The following areas would require to be felled to accommodate the construction of the Proposed Development and amount to 1.83 ha, but potentially be available for restocking:

- Areas outside the above initially cleared of forestry to a compartment boundary or to create a windfirm edge, to facilitate the construction of the Proposed Development.
- Areas cleared of trees for widening around bends and junctions for component delivery.
- Location of temporary construction compound and buffer.

Compensatory Planting

13.4.70 As the proposed development involves the permanent removal of woodland for the purposes of conversion to another type of land use, the Scottish Government's Policy on the Control of Woodland Removal has been fully considered to establish whether Scottish Forestry would require an area of new woodland establishment to compensate for the area felled. In addition, The Council's Highland Wide Local Development Plan (2012) specifies the inclusion of Compensatory Planting as part of an application for development.

13.4.71 The need for compensatory planting to offset the permanent loss of woodland would be in the areas removed for the access track corridor and construction compound. Therefore, the area for compensatory planting would be 2.46 ha as shown in **Figure 13.6.**

13.4.72 The Scottish Forestry guidance to staff on implementing the Scottish Government's Policy on Control of Woodland Removal" states that:

"Options to avoid or reduce the need for Compensation Planting (CP) should always be fully considered as part of the decision making process. Compensation Planting should be seen as the final option once all other solutions have been exhausted".

13.4.73 The guidance also states the following in relation to windfarm developments:

"With regards to windfarm development, trees cleared for turbines bases, access roads and any other wind farm related infrastructure (infrastructure felling) should be considered as part of a planning application (under the Electricity Act 1989 or the Town and Country Planning Act 1997) and the felling should be consented with Compensation Planting requirements".

13.4.74 Throughout the design process, permanent felling has been avoided or minimised wherever practicable. This demonstrates compliance with the Scottish Government's Policy on Control of Woodland Removal.

13.4.75 In compliance with The Scottish Governments Policy on Control of Woodland Removal (2009) a change in land use would require compensatory planting. This is because the Proposed Development will not contribute significantly to any of the relevant criteria detailed in Appendix C of the policy.

13.4.76 However, the Proposed Development would meet the acceptability criteria for woodland removal as the change of land use with compensatory planting will contribute significantly to "helping Scotland to adapt to climate change" by providing facilities appropriate for the development of renewable energy projects and significantly reduce net greenhouse gas emissions.

13.4.77 As a result of the proposed felling of 4.29 net ha and 1.83 ha will be restocked. Therefore, the maximum area of land that will be needed as compensation (the Scottish Forestry default position) is an area equivalent to the area being kept clear of trees, which in this case is estimated to be 2.46 ha. Compensatory planting could take the form of native species with a high percentage of Scots pine, birch and common alder in the area shown on **Figure 13.6**. There is opportunity for expanding native woodland under the Scottish Governments Forest Grant Scheme Eligibility Native Woodland Habitat Network and Target Woodlands for Riparian Benefits.

13.4.78 In addition to the mitigation proposals detailed above, **Technical Appendix 6.5 Outline Habitat Enhancement and Management Plan** indicates 218 ha of peatland restoration and the removal of regenerating tree saplings and seedlings from sensitive peat areas. In the peat restoration area, regenerated broadleaves would be retained with pockets of lower value habitat. For example in acid or marshy grassland to provided wider biodiversity benefit.

Summary of Effects

13.4.79 With compensatory planting there would be no net loss of forestry resource. This would ensure that there would be no overall loss of woodland related public benefit.

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13.5 Shadow Flicker

Introduction

13.5.1 This assessment considers the potential effects of shadow flicker on receptors within 11 rotor diameters of the proposed 14 turbines of Lynemore Wind Farm (“the Proposed Development”).

13.5.2 Shadow flicker occurs when the sun passes behind the blades of a wind turbine and casts a moving shadow on nearby buildings. The effect can occur under certain combinations of geographical positioning, the time of day and time of year (i.e., when the sun is low on the horizon). Shadow flicker is caused when rotating wind turbine blades cause brightness levels to vary periodically, with the shadow created by the blades flickering on and off. The effect of shadow flicker is an issue inside buildings, where the flicker appears through windows, creating a nuisance for residents of the receptor. Shadow flicker can cause annoyance if it occurs for a significant time period.

Policy Context

13.5.3 This shadow flicker assessment was carried out in accordance with relevant policy in National Planning Framework 4 (NPF4) (2023a). Policy 11(e) of NPF4 requires that project design and mitigation demonstrates how impacts, including shadow flicker, on communities and residential receptors have been minimised.

13.5.4 Local guidance on shadow flicker is provided in Policy 67 of the Highland-wide Local Development Plan (HwLDP) (2012) and its Onshore Wind Energy Supplementary Guidance (2017). The HwLDP Policy 67 Renewable Energy Developments states that:

"The Council will support proposals where it is satisfied that they are located, sited and designed such that they will not be significantly detrimental overall, either individually or cumulatively with other developments … having regard in particular to any significant effects safety and amenity of any regularly occupied buildings, including from shadow flicker."

13.5.5 Furthermore, the Highland Council's (THC) supplementary guidance highlights the need for proposals to seek to avoid significant adverse effects on the safety of any residential or regular occupied property, including shadow flicker. It goes on to state that:

"Wind energy schemes should always be designed to avoid causing shadow flicker, blade glint, glare and light effects to any regularly occupied buildings not associated with the development. Where this cannot be achieved, the Council will expect wind energy developments to be located a minimum distance of 11 times the blade diameter of the turbine(s) from any regularly occupied buildings not associated with the development. Within a distance less than 11 times the blade diameter, a shadow flicker assessment will be required."

13.5.6 As per Section 24(3) of the Town and Country Planning (Scotland) Act (1997), where there is incompatibility between a provision of the National Planning Framework and a provision of a local development plan, whichever of them is later in date would prevail. Therefore, NPF4 (adopted in February 2023) holds primacy over the HwLDP and its supplementary guidance. This was further clarified by the Chief Planner's letter of 8th February 2023 (2023), which states:

"Provisions that are contradictory or in conflict would be likely to be considered incompatible."

13.5.7 In respect of shadow flicker, there is no incompatibility between NPF4 and HwLDP and its supplementary guidance. Both NPF4 and HwLDP outline expectations that developments should be designed to minimise the impacts of shadow flicker on communities and local residences. Therefore, while NPF4 takes precedence, this assessment has been undertaken in accordance with HwLDP and local planning policy, as these documents provide specific guidance on carrying out shadow flicker assessments and address mitigation.

Methodology

Consultation

13.5.1 Consultation was undertaken with the relevant regulatory bodies through the EIA scoping process. THC's response in regard to shadow flicker and the Applicant's response is provided in **Table 13.7**.

Table 13.7: Summary of Consultation Responses Relevant to Shadow Flicker

Consultee	Issued Raised	Response/Action Taken
The Highland Council (THC)	"Given that the final layout for the turbines and the candidate turbine is yet to be selected, a shadow flicker assessment should be undertaken as part of the EIAR. That said, if there are no properties within 11 rotor diameters the matter of shadow flicker will not require detailed assessment but should still be addressed in the EIAR."	Following a baseline review of all regularly occupied buildings as obtained from OS AddressBase Plus data, there are two properties (residential) within 11 rotor diameters of the nearest turbines. Therefore, a shadow flicker assessment has been prepared.

Study Area

13.5.2 It is generally accepted, as outlined in Onshore Wind Turbines: Planning Advice[3], that 10 rotor diameters from a wind turbine is the maximum limit within which significant shadow flicker effects can occur. THC's Onshore Wind Energy: Supplementary Guidance (2017) suggests that a shadow flicker assessment is required for all residential receptors within 11 rotor diameters of each turbine.

13.5.3 Although the Highland-wide Local Development Plan (HwLDP) and supplementary guidance are not the primary planning policies for the Proposed Development, this assessment followed THC's guidance by adopting an 11-rotor diameter threshold, equating to 1,782 m.

13.5.4 Furthermore, shadow flicker can only occur where turbine blades pass between the sun and a receptor. As such, since the sun in the UK crosses the southern sky, shadow flicker effects can only hypothetically occur at locations 130º either side of north (Parsons Brinckerhoff 2011; UK Government, 2015).

13.5.5 Based on these criteria, the zone of potential shadow flicker (ZPSF) for the Proposed Development was defined as a radius of 1,782 m from each turbine and limited to 130º either side of north (shown in **Figure 13.7**).

Assessment Methodology

13.5.6 The locations of receptors and the locations and maximum dimensions of turbines for the Proposed Development was inputted into a model run on industry standard ReSoft WindFarm® Release 5 software. For the receptors identified within the shadow flicker

[3] Scottish Government. (2014). 'Onshore wind turbines: planning advice'. Available at: https://www.gov.scot/publications/onshore-wind-turbines-planning-advice/ [Accessed 20/02/2025].

study area, a window centred at 2 m from ground level with 1 m x 1 m dimensions facing directly towards the proposed wind turbines was assumed for ‘worst-case’ scenario results. A minimum sun elevation of 2 degrees was considered. The model assumes that:

- The sun is shining from sunrise to sunset (cloudless sky).
- The turbine blades are turning 100 % of the time.
- The turbine rotor is orientated directly between the sun and the receptor.
- There is no screening between the turbine and the receptor (excluding topography).

13.5.7 The inclusion of the above factors results in a ‘worst-case’ scenario. As stated from the Update of UK Shadow Flicker Evidence Base Final Report (Parsons Brinckerhoff, 2011), for the ‘worst-case’ scenario to occur, all of the above listed conditions would have to be met at all times throughout the year. In real life conditions, the actual shadow flicker durations, if shadow flicker occurs at all, will be less than the modelled theoretical predicted levels. A more ‘realistic scenario’ of potential shadow flicker effects is estimated taking into account historical weather data typical of the Site of the Proposed Development.

13.5.8 Shadow flicker can only occur when the sun is shining. Historical weather data was therefore used to provide a more realistic prediction of potential annual shadow flicker duration when accounting for the frequency of clear skies, when shadows may be cast. This is reported in this assessment as the ‘realistic scenario’ for shadow flicker.

13.5.9 Average monthly sunshine data was obtained from the National Meteorological Service (Met) Office’s weather station nearest to the Proposed Development at Nairn Druim[4]. Data from 1994 to August 2024 was used to determine the average monthly sunshine hours for the location of the Proposed Development. Monthly daylight hours for 2024 were calculated from the National Oceanic and Atmospheric Administration’s (NOAA) solar calculator[5]. The values for average daylight and average sunshine are presented in **Table 13.8**.

13.5.10 The average monthly sunshine hours was divided by the corresponding monthly daylight hours to obtain an estimate of the percentage average sunshine hours each month. These were used to calculate an annual average sunshine hours percentage of 27.8 %, as shown in **Table 13.8**. Based on this, a correction factor of 0.28 was applied to the annual total theoretical ‘worst case’ predicted levels of shadow flicker to provide an estimate of the amount of time when the correct meteorological conditions would be present for shadow flicker to occur. These shadow flicker durations however are still likely to be conservative as no account is taken of the orientation of the turbine rotor, periods when turbine blades are not turning, and the presence of screening between the receptor and turbine.

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[4] Met Office Historic Station Data – Nairn Druim: https://www.metoffice.gov.uk/research/climate/maps-and-data/historic-station-data [Accessed 13/02/2025].

[5] NOAA Solar calculator: https://gml.noaa.gov/grad/solcalc/ [Accessed 13/02/2025].

Table 13.8 : Average Daylight and Sunshine Statistics for the Site (data analysed for baseline years 1994 – 2024)

Month	Mean Daylight (hours.mins)	Mean Daily Sunshine (hours.mins)	Percentage of sunshine (%)
January	7.28	1.49	20.47
February	9.10	2.47	27.14
March	11.53	4.26	36.95
April	14.22	5.57	39.17
May	16.37	5.44	33.23
June	17.52	4.41	25.17
July	17.12	4.09	23.89
August	15.09	4.11	27.24
September	12.44	3.39	27.25
October	10.17	3.09	30.38
November	8.01	2.02	25.22
December	6.45	1.12	17.36
Average	**12.11**	**3.46**	**27.79**

Significance Criteria

13.5.11 Within the UK, there is no formal guidance on the amount of shadow flicker that is considered the limit beyond which amenity effects are significant. European countries do have guidance on shadow flicker; however, these vary from one country to another. As outlined in Parsons Brinckerhoff (2011), guidance from Northern Ireland, Germany and Belgium suggests a shadow flicker limit not exceeding 30 hours per year or a maximum of 30 minutes on any given day as the thresholds for potential significant effects. For the purposes of this assessment, exceedance of these limits was considered to result in a significant effect on the amenity of the occupants of the receptor. If there are levels beyond the threshold limits at a receptor, mitigation may be required. These threshold limits have been used consistently in previous applications submitted to the Energy Consents Unit (ECU).

Baseline Conditions

13.5.12 As shown in **Figure 13.7**, the receptors listed in **Table 13.9** are within the Proposed Development's ZPSF and were identified for further review and assessment.

Table 13.9: Identified Residential Receptors

ID	Easting	Northing	Distance from nearest turbine (m)
1	276293	833947	1549
2	276368	834034	1650
3	276551	833979	1651

ID	Easting	Northing	Distance from nearest turbine (m)
4	276579	833974	1657
5	276615	833959	1656

Assessment of Effects

'Worst-case' Scenario Results

13.5.13 The results of the shadow flicker assessment are shown in **Table 13.10** and **Figure 13.8**.

13.5.14 In the 'worst-case' scenario model, Receptors 1 and 2 were the only residential receptors within the ZPSF were predicted to experience shadow flicker effects greater than 30 hours per year. However, as stated in **Paragraph 13.5.6**, this approach was indicative of the 'worst-case' scenario which does not factor in variables which have the potential to reduce the likelihood and/or duration of shadow flicker effects such as the amount of time the sun is shining, the orientation of the turbine rotor, periods when turbine blades are not turning, and the presence of screening between the receptor and turbine.

Table 13.10: 'Worst-case' Shadow Flicker Results

ID	Days per year	Maximum minutes per day	Mean minutes per day	Total hours per year	Turbines causing shadow flicker
1	141	27.6	20.4	48.6	T1, T10, T12
2	141	27.6	19.8	46.8	T1, T10, T12
3	83	25.8	19.8	27.1	T10, T12
4	83	25.8	19.2	26.2	T10, T12
5	78	25.8	19.2	25.0	T10, T12

'Realistic' Scenario' Results

13.5.15 For the 'realistic scenario', the statistics shown in **Table 13.8** are applied to the 'worst-case' scenario results for receptors 1 and 2 (shown in **Table 13.10)** to reflect more realistic environmental conditions. The shadow flicker effects were multiplied by a correction factor of 0.28 to reflect the proportion of total annual daylight hours at the Proposed Development which are considered 'sunny'. This adjustment provided a more realistic estimate of the shadow flicker effects for each residential receptor. The results are shown in Table 13.11.

13.5.16 In the 'realistic' scenario, no residential receptors within the ZPSF would exceed the shadow flicker thresholds of 30 hours per year or 30 minutes per day. Therefore, shadow flicker effects from the Proposed Development are **Not Significant** in EIA terms and do not require mitigation.

Table 13.11: 'Realistic' Shadow Flicker Results

ID	Mean minutes per day	Total hours per year	Turbines causing shadow flicker
1	5.7	13.6	T1, T10, T12
2	5.5	13.1	T1, T10, T12

Cumulative Effects

13.5.17 The cumulative shadow flicker effects with wind farms in the vicinity of the Proposed Development has also been considered. The closest turbines to the residential receptors are those at the constructed Moy Wind Farm. The nearest turbines are approximately 2.9 km away from the residential receptors identified for the Proposed Development, well beyond the area within which shadow flicker effects could occur. Therefore, it is expected that the Proposed Development will not cumulatively impact any of the residential receptors identified within the ZPSF.

13.5.18 Furthermore, as of the 12th of December 2024, no additional onshore wind developments were identified within **Chapter 5: Landscape and Visual** that would contribute to cumulative shadow flicker effects on the residential receptors identified. Consequently, in relation to operational, in-planning and scoping wind farms, there will be no cumulative shadow flicker effects.

Identification and Evaluation of Effects

Limitations to Assessment

13.5.19 For the shadow flicker assessment, the outputs of industry standard software such as ReSoft WindFarm® return 'worst-case' results based on assumptions of the number, dimensions and height of windows of the façade facing the turbines; the sun shining 100 % of the time during daylight hours; the turbine blades turning 100 % of the time; the turbine rotor orientated directly between the sun and the receptor; and there is no screening between the turbine and the receptor.

13.5.20 The 'realistic scenario' results are a modification of the 'worst-case scenario' results, that takes into consideration average daily sunshine hours over the previous 10 years, with all other assumptions noted applying.

Residual Effects and Mitigation

13.5.21 Based on the 'realistic scenario', shadow flicker effects from the turbines in the Proposed Development are assessed as **Not Significant**, no additional mitigation is required. As such it is expected that there will be no residual effects of Shadow Flicker.

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13.6 Climate and Carbon Balance

Introduction

13.6.1 Wind turbines and battery energy storage systems (BESS) provide an important mechanism for the reduction of carbon dioxide (CO_2), and other greenhouse gas (GHG) emissions into the atmosphere by reducing the consumption of fossil fuel generated mains electricity. However, during their manufacture, construction and decommissioning, wind farms can themselves result in GHG emissions, particularly in such instances as where natural carbon stores, such as peat, are present and potentially impacted by the development.

13.6.2 For this reason, this chapter provides an estimation of:

- the GHG emissions associated with the manufacture, construction, and decommissioning of the Proposed Development;
- the contribution which the Proposed Development would make towards the reduction of emissions, which would otherwise be produced by fossil fuel power generation.

13.6.3 Taken together, these two elements indicate the whole-life “carbon balance” of the Proposed Development, together with an understanding of the “emissions payback” period. Once emissions resulting from the manufacture, construction and decommissioning of the Proposed Development have been “paid back” (offset) by the wind farm, all subsequent wind-generated electricity would displace a similar amount of conventionally generated electricity, thereby contributing to an overall GHG reduction.

13.6.4 Although often colloquially termed “carbon balance”, the assessment includes all GHGs, not just carbon dioxide. The results are presented in tonnes of carbon dioxide equivalent (tCO_2e), where equivalence means having the same warming effect as CO_2 over 100 years.

Statutory and Planning Context

13.6.5 Planning and energy policy, including national and local policy objectives and requirements of legislation in relation to climate change, are summarised in **Chapter 3** of the EIA Report. Both national and local policy recognise that planning should consider the contributions a Proposed Development makes towards achieving the climate change targets. Guidance and legislation relating specifically to carbon and GHG emissions are listed below.

Legislation

13.6.6 Relevant legislation and guidance documents have been reviewed and taken into account as part of this assessment. Of particular relevance are:

- The 2015 Paris Agreement;
- The Electricity Works (Environmental Impact Assessment) (Scotland) (Regulations 2017 (as amended) (EIA Regulations); and
- The Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 and the legally binding net zero target for 2045 and interim targets for 2030 and 2040.

Planning policy

13.6.7 Planning Policy is addressed in **Chapter 3** of the EIA Report, and includes recent publications including:

National

- National Planning Framework 4 (NPF4);
- The Scottish Energy Strategy (December 2017);
- The Scottish Government's declaration of a Climate Emergency (April 2019);
- The Scottish Climate Change Plan Update (December 2020);
- The Scottish Government's 'Programme for Government' (September 2022);
- The Onshore Wind Policy Statement (December 2022); and
- The Draft Energy Strategy and Just Transition Plan (January 2023).
- The Future of Energy in Scotland: Energy Strategy (2017)
- Scottish Planning Policy (2014)

13.6.8 The Scottish Planning Policy (SPP, 2014) states that “where peat and other carbon-rich soils are present, applicants should assess the likely effects of development on carbon dioxide (CO_2) emissions. Where peatland is drained or otherwise disturbed, there is liable to be a release of CO_2 into the atmosphere. Developments should aim to minimise this release”.

Local

13.6.9 The Highland Council Net Zero Strategy (2023) is the only relevant local policy to this chapter. This outlines the Council’s approach to reaching net zero targets by 2045, and addressing the climate change emergency. This includes the “Future Highland” programme delivering ‘energy solutions’ including increasing wind renewable energy generation.

13.6.10 Furthermore, the Highland-Wide Local Development Plan (HwLDP) was adopted in April 2012 and is generally supportive of renewable energy development. Supplementary Guidance is also available in the form of The Onshore Wind Energy Supplementary Guidance (SG) which was adopted in November 2016. Together these set out the spatial framework and planning policies for the whole of the Highland Council area (out with National Parks).

Guidance

13.6.11 Recognisance has been taken of the following best practice guidelines / guidance etc:

- Institute of Environmental Management and Assessment (IEMA) Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance (2022).
- Good Practice During Wind Farm Construction, NatureScot et al. (2019)
- The Scottish Natural Heritage, now NatureScot, 'Good Practice During Wind Farm Construction' guidance recognises that one of the key aims of wind farm development is to reduce carbon emissions. However, wind farm developments, through the materials used, during the construction processes employed and the potential emissions from disturbed soils and habitats, do result in carbon emissions.
    - The guidance recognises that, in some circumstances, the carbon payback of wind farm developments could be significantly affected by the construction methods used and the degree of restoration of the site. The guidance, therefore, seeks to ensure that good practice is adopted to reduce the carbon emissions associated with wind farm development.

Consultation Undertaken

Table 13.12: Summary of consultation responses relevant to this Climate Change assessment

Consultee	Issued Raised	Response/Action Taken
Highland council	Water crossings must be designed to accommodate for climate change.	This matter falls under the purview of water specialists which can be found in **Chapter 8: Hydrology, Geology, Hydrogeology and Peat**.
	The development proposal should include plans to restore and/or enhance the site into a functioning peatland system capable of achieving carbon sequestration	The consideration of peat and sequestration of carbon are accounted for in this climate change chapter. Further details of inputs from the relevant disciplines, and outputs can be found in **Appendix 13.2**. More information about peat can be found in **Chapter 8: Hydrology, Geology, Hydrogeology and Peat**.
	Carbon balance calculations should be undertaken and included within the EIAR with a summary of the results provided focussing on the carbon payback period for the wind farm.	This climate chapter consists of a carbon balance assessment, with further results displayed in **Appendix 13.2**.
Scottish Environment Protection Agency (SEPA)	When addressing flood risk, crossings must be designed with an appropriate allowance for climate change.	This matter falls under the purview of water specialists which can be found in **Chapter 8: Hydrology, Geology, Hydrogeology and Peat**.

Approach to the Assessment

Scope of Assessment

13.6.12 The technical scope of this assessment has been established through an ongoing scoping process. As a result of this process, the technical scope of the assessment reported in this chapter comprises:

- GHG emissions

Matters Scoped In

Table 13.13: Receptor/matters scoped into further assessment

Receptor/ matter	Phase	Justification	Change since EIA Scoping?
GHG emissions	Construction	Embodied carbon of wind turbines and any ancillary developments can potentially be significant. It is important to include construction-related emissions when considering the overall lifecycle emissions of the proposed development, to determine an accurate ‘carbon-payback’ time of the scheme.	No.
GHG emissions	Operation	Aligned with IEMA guidance, a project that causes GHG emissions to be avoided has a beneficial effect that is significant.	No.
GHG emissions	Decommissioning	The decommissioning process is likely to result in GHG emissions, particularly from the removal or renewal of turbines. It is important to include all emissions when considering the overall lifecycle emissions of the proposed development, to determine an accurate ‘carbon-payback’ time of the scheme.	No.

Matters Scoped Out

13.6.13 The following matters are considered unlikely to result in likely significant effects, and therefore have been scoped out of the assessment, as agreed through the EIA scoping process:

- Climate change risk

Table 13.14: Receptor/matters scoped out of further assessment

Receptor/ matter	Phase	Justification	Change since EIA Scoping?
Climate Change Risk	Construction, Operation & Decommissioning	UKCP18 projections suggest that climate change would lead to hotter drier summers, warmer wetter winters, increased likelihood of extreme weather events (e.g., heat waves, high rainfall events) and sea-level rise. Due to the embedded resilience of wind turbines to high heat and wind speeds, and the distance of the Site from coastline; these factors are not expected to significantly impact on the construction, operation, or decommissioning of the proposed development. Flooding is not expected to have any significant impact on the project, due both to the embedded resilience of wind turbines and the lack of recorded historical flooding within the site boundary.	No. The Scoping Opinion agreed that this receptor/ matter should be scoped out of further assessment.

Baseline Methodology

Desk Study

13.6.14 The assessment has been based on the methodology stated below (paragraph 13.6.21 to 13.6.27), with data inputs provided by the relevant disciplines as referenced in **Technical Appendix 13.2**, and the outputs of the calculations also displayed within that same appendix. As this assessment relies on a specific methodological approach and internally derived data rather than external datasets or literature, confirmation of additional datasets is not applicable.

Field Surveys

13.6.15 All baseline surveys and data collection were carried out by the respective discipline teams, primarily the teams responsible for collecting data relating to peat disturbance and the felling of forestry. The data sources for the inputs for the carbon calculator would be shown in **Technical Appendix 13.2**.

Assessment Methodology

13.6.16 Whilst the Proposed Development is expected to deliver GHG savings over its lifetime, it could also cause GHG emissions through:

- disturbance of peatland;
- felling of forestry; and
- lifecycle emissions from turbines, BESS and other infrastructure.

13.6.17 The GHG assessment of the Proposed Development has been undertaken using version 2.14.1 of the Scottish Government's Carbon Calculator Tool, which is the standard way of assessing GHG emissions and savings from renewable energy developments comprising wind turbine technology and BESS. The latest online version of the Scottish

Government Carbon Calculator Tool (V1.8.1) was unavailable during the course of this assessment, owing to maintenance and a server upgrade. Version 2.14.1 of the Calculator was provided (as an Excel spreadsheet calculator) by a relevant case officer from the Energy Consents Unit as a suitable alternative. A detailed explanation of the Scottish Government's Carbon Assessment Tool methodology is found within **Appendix 13.2**. In brief, the calculator uses project-specific data from the construction of the Proposed Development (**Chapter 2: Proposed Development**) and the receiving environment (**Chapter 5 to Chapter 13**), particularly with regards to peat disturbance. This allows GHG emissions and avoidance to be quantified across the project lifecycle stages (construction, operation, and decommissioning/site restoration). Specific information concerning the embodied emissions of materials, which would account for turbine manufacture and delivery, is assumed directly through the Carbon Assessment Tool.

13.6.18 Calculations are provided for minimum, maximum and expected scenarios, whereby the minimum scenario assumes the lowest energy output and the lowest carbon losses from the Proposed Development, and the maximum assumes highest energy output and highest carbon losses.

13.6.19 A detailed explanation of the Scottish Government's Carbon Calculator Tool methodology is found within **Technical Appendix 13.2**. In brief, the calculator uses project-specific data from the construction of the Proposed Development (**Chapter 2: Proposed Development**) and the receiving environment (**Chapter 5** to **Chapter 13**), particularly with regards to peat disturbance and the felling of forestry. This allows GHG emissions and avoidance to be quantified across the project lifecycle stages (construction, operation, and decommissioning/site restoration). Specific information concerning the embodied emissions of materials, which would account for turbine manufacture and delivery, is assumed directly through the Carbon Calculator.

13.6.20 Calculations are provided for minimum, maximum and expected scenarios, whereby the minimum scenario assumes the lowest energy output and the lowest carbon losses from the Proposed Development, and the maximum assumes highest energy output and highest carbon losses. The expected scenario is based on 14 turbines with a maximum anticipated installed capacity of 100.8 MW and capacity factor of 24.6%, as per the technical specifications of the candidate turbine.

13.6.21 The Scottish Government's Carbon Calculator Tool includes embodied emissions from turbines and their foundations, but not for BESS. As such, a supplementary life cycle analysis of BESS has been conducted and integrated within the calculator outputs. Overall, LCA studies on BESS have found that the manufacturing stage has the greatest impact in terms of embodied GHG emissions. Lithium-ion batteries are the most common choice of battery technology, with several examples of Lithium-ion BESS supporting wind and solar farms in the UK. A study undertaken by Romare and Dahllöf (2017) indicates that the cradle to grave emissions of a lithium-ion battery is in the region of 150-200 kg CO_2e/kWh. Although this assessment was undertaken for batteries for light-duty vehicles, Lait and Walker (2022) suggest that there is a near-linear scale of GHG emissions when battery size increases. A BESS with 50 MWh energy storage capacity is proposed as part of the Proposed Development.

13.6.22 The GHG emissions and savings are combined to establish the overall (net) GHG effect of the Proposed Development, as well as its carbon payback period. Any inconsistencies in totals versus individual values are due to rounding and should not be viewed as erroneous.

13.6.23 Results from this assessment are reported below in accordance with IEMA's Environmental Impact Assessment Guide to Assessing Greenhouse Gas Emissions and Evaluating their Significance (2022).

Guidance

13.6.24 The following guidance documents have been used during the preparation of this chapter:

- Good Practice During Wind Farm Construction; and
- Institute of Environmental Management and Assessment (IEMA) Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance.

Study Areas

13.6.25 The sensitive receptor for GHG emissions is the global atmosphere, which is considered highly sensitive to GHG fluctuations. By proxy, the sensitive receptor can also be extended to the UK's commitments under the UK Climate Change Act 2008 (amended 2019), which aligned with the goals of the Paris Agreement, to avoid dangerous climate change by limiting global warming to well below 2°C and pursuing efforts to limit it to 1.5°C.

Value of Receptors

13.6.26 The sensitive receptor for GHG emissions is the global atmosphere, which is considered highly sensitive to GHG fluctuations.

Determination of Significance

13.6.27 Given the international urgency of climate change, the sensitivity of the receptor (i.e. global climate) to fluctuations in GHG emissions is considered 'Very High'. Thus, the level of the significance of effects is determined by the magnitude, and timing, of GHG emissions and the likelihood of avoiding severe climate change.

13.6.28 Aligned with IEMA's Guidance to Assessing GHG Significance (2022), any project that causes GHG to be avoided, or removed from the atmosphere, has a beneficial effect that is always significant. In such a scenario, the project substantially exceeds the national net zero requirements and is thus aligned with the goal of the Paris Agreement to limit temperature rise to well below 2°C, aiming for 1.5°C.Error! Reference source not found. presents the significance criteria used for the assessment.

Table 13.15: IEMA's Guidance to Assessing GHG Significance (2022) Framework for assessment of significant effects-

Significance	Level	Criteria
Significant	Major adverse	Project adopts a business-as-usual approach, not compatible with the national Net Zero trajectory, or aligned with the goals of the Paris Agreement (i.e., a science-based 1.5°C trajectory). GHG impacts are not mitigated or reduced in line with local or national policy for projects of this type.
	Moderate adverse	Project's GHG impacts are partially mitigated, and may partially meet up-to-date policy; however, emissions are still not compatible with the national Net Zero trajectory, or aligned with the goals of the Paris Agreement.
Not significant	Minor adverse	Project may have residual emissions, but the project is compatible with the goals of the Paris Agreement, complying with up-to-date policy and good practice.
	Negligible	Project has minimal residual emissions and goes substantially beyond the goals of the Paris Agreement, complying with up-to-date policy and best practice.
Significant	Beneficial	Project causes GHG emissions to be avoided or removed from the atmosphere, substantially exceeding the goals of the Paris Agreement with a positive climate impact.

Difficulties and Uncertainties

13.6.29 The accuracy of a GHG assessment depends on the quality of the data provided. Primary data should always be used where available. Where it has not been possible to collect this data, in view of the fact that this assessment represents a forecast of emissions and some information may not yet be known, secondary data (such as estimates, extrapolations, benchmarks and proxy data such as distance travelled) would be used. Assessments based largely on secondary data should only be viewed as an estimate of GHG emissions impact, and actual emissions may vary. Where secondary data has been used, it has been clearly set out in **Technical Appendix 13.2.**

13.6.30 The presence of BESS necessitated manual modification to the outputs of the Scottish Government Carbon Calculator Tool to account for the associated embodied emissions. These have been clearly marked within the technical appendix.

13.6.31 The inputs to the Scottish Government Carbon Calculator Tool were obtained from the relevant topic specialists. Any uncertainties concerning the data used within the calculations (**Technical Appendix 13.2**), would have been expanded upon in their respective chapter.

Existing Environment

13.6.32 The baseline conditions describe the conditions of a business-as-usual scenario whereby the proposed Development is not undertaken. The baseline comprises existing carbon stock and sources of GHG emissions within the Site boundary of the existing activities on-site.

13.6.33 The project is located on the hills approximately 2 km west of the A9 at Moy, within the Highland council area of Scotland. There is no pre-existing infrastructure within the site boundary that would be affected by the development.

13.6.34 The total perimeter of the Estate falls under Highland Council's jurisdiction, who set the opportunities that arise from renewable energy generation as a key area of focus in their 2045 Net Zero strategy (2023). The Highland Council also sets out interim targets to be aligned with the Scottish Government's corresponding strategy, such as reducing GHG emissions by at least 75% by 2030, and by least 90% by 2040.

Peat and Forestry

13.6.35 The Habitat Survey Area is mostly gently sloping hillside covered in peat of a heavily eroded nature some shallow summit heath, and on the lower slopes at the north of the Study Area some reasonably extensive downy birch dominated semi-natural woodland. There are also a few stream gullies and steeper slopes which contain dry heath and juniper dominated scrub. For further information on the peatland habitat within the site, consult **Chapter 8: Hydrogeology, Geology, Hydrology and Peat,** and **Chapter 13: Other Issues- Forestry.**

Embedded Mitigation

Design Considerations

13.6.36 This assessment has been based on the principle that measures have been 'embedded' into the design of the Proposed Development to remove potential significant effects as far as practicable, for example by the considered placement of infrastructure. **Chapter 2: Proposed Development**, identifies the project principles and design mitigation that has been embedded into the design of the Proposed Development.

13.6.37 Peat disturbance has been considered during the design process, which has sought to avoid areas of deep peat. The felling requirement has also been minimised by design. The site design process is described in **Chapter 2: Proposed Development** whilst specific details relating to peat depth (**Chapter 8: Hydrogeology, Geology, Hydrology and Peat**) and forestry (Forestry Section of this Chapter) are included elsewhere in the EIAR.

Predicted Effects

13.6.38 The results of the carbon balance assessment carried out for the Proposed Development are presented below for each project phase. The project-specific input and output data is contained within **Technical Appendix 13.2**, alongside the detailed methodology of the calculator.

Construction and Decommissioning

13.6.39 **Table 13.16** presents the results of the GHG balance assessment for the manufacture, construction, and decommissioning phases of the Proposed Development. Total projected emissions are 320,191 tCO_2e.

Table 13.16: Predicted GHG emissions from wind farm manufacture, construction, and decommissioning

Source of GHG Emissions/Savings	GHG Emissions (tCO_2e)	% of Total Emissions
Losses due to turbine manufacture, construction and decommissioning	94,007	29%
Losses due to back-up power generation	0	0%
Losses due to reduced carbon fixing potential	11,466	4%
Losses from soil organic matter	190,493	59%
Losses due to Dissolved Oxygen Content and Portable Oxygen Content	11,393	4%
Losses due to forestry felling	2,832	1%
Losses due to BESS manufacture, construction and decommissioning	10,000	3%
Total	**320,191**	**100%**

13.6.40 Any post-decommissioning site restoration and enhancement work, such as blocking drainage ditches to promote re-wetting, would be aligned with the outline Habitat Enhancement and Management Plan (see **Technical Appendix 6.5**). Such activities can incur GHG savings by promoting growth of peat or other natural carbon stores. Other management options may occur during the Habitat Management Planning stage.

13.6.41 **Table 13.17**Error! Reference source not found.Error! Reference source not found. shows the total CO_2 gains due to site improvement during post-decommissioning (tCO_2e).

Table 13.17: Total CO_2 savings due to Improvement of the Site (tCO_2e)

Improvement	GHG Emissions (tCO2e)	% of total
Change in emissions due to improvement of degraded bogs	-47,174	99%
Change in emissions due to improvement of felled forestry	-355	1%
Change in emissions due to restoration of peat from borrow pits	0	0%
Change in emissions due to removal of drainage from foundations and hardstanding	0	0%
Total change in emissions due to improvements	-47,528	100%

13.6.42 Taking into account the predicted GHG emissions from wind turbine manufacture, construction and decommissioning alongside those savings from the improvement of the Site, the total net GHG emissions from the Proposed Development are expected to be 272,663 tCO_2e (**Table 13.18**).

Table 13.18: Total net GHG emissions from the Proposed Development

	GHG emissions (tCO_2e)	GHG Savings (tCO_2e)
Predicted GHG emissions from wind turbine manufacture, construction, and decommissioning	320,191	0
Total CO_2 gains/savings due to improvement of the Site	0	-47,528
Total net GHG emissions from wind farm manufacture, construction, decommissioning and improvement of site	**272,663**	

Operation

13.6.43 The operational phase of the Proposed Development (50 years) has the greatest potential for GHG savings. At this phase, GHG emissions from construction activities would have ceased and operation of the turbines would generate zero-carbon electricity for the remainder of their lifespan

13.6.44 **Table 13.19**Error! Reference source not found. presents projected annual emissions savings as measured against the fossil fuel-mix (electricity that is sourced through the combustion of fossil fuels alone) and grid-mix (electricity from the National Grid; this could include be sourced from fossil fuels, renewable energy, nuclear, etc) of electricity.

Table 13.19: Annual Emissions Savings Against Fossil Fuel Electricity Generation Mix

GHG savings*	GHG savings (tCO_2e)		
	Expected value	Minimum value	Maximum value
Grid mix electricity generation			
GHG savings per year	55,083	49,574	60,591
Lifetime GHG savings*	2,481,469	2,096,568	2,895,272
Fossil fuel mix electricity generation			
GHG savings per year	97,749	87,974	107,524
Lifetime GHG savings*	4,614,787	4,016,554	5,241,921
***GHG savings based over a lifetime of 50 years, and taking into account those emissions caused by the Proposed Development**			

Emissions Payback Period

13.6.45 **Table 13.19**Error! Reference source not found. presents the emissions payback time. This iscalculated by dividing the total expected emissions caused by the Proposed Development for the manufacture, construction and decommissioning phases (272,663 tCO_2e**: Table 13.18**) by expected annual savings from operation (**Table 13.19**). This gives a predicted emissions payback of 5.0 years against a grid-mix, and 2.8 years against a fossil-fuel mix electricity generation.

Table 13.20: Carbon Payback Period of the Proposed Development for a Range of Capacity Factors

	Carbon payback time (years)		
	Expected value	Minimum value	Maximum value
Grid mix electricity generation	5.0	2.2	7.7
Fossil fuel mix electricity generation	2.8	1.2	4.3

Mitigation

13.6.46 It has been assumed that all activities during construction, operation and decommissioning would be conducted in accordance with good practice guidance.

13.6.47 Relevant guidance includes:

- Good Practice During Wind Farm Construction, NatureScot et al. (2019); and
- Life Extension and Decommissioning of Onshore Windfarms, SEPA (2016).

13.6.48 Further, it is assumed that mitigation outlined in the Schedule of Commitments (**Chapter 14** would be implemented to reduce environmental impacts, including GHG emissions, and improve effectiveness of restoration works.

13.6.49 As no adverse effects are predicted, no additional mitigation measures are proposed.

Residual Effects

13.6.50 Given the proposed development's projected operational life of 50 years, its total GHG savings are expected to be 4,614,787 tCO_2e against a fossil fuel mix of electricity, inclusive of construction, operation, and decommissioning, and 2,481,469 tCO_2e against a grid mix of electricity. This is assessed as **significant and beneficial.**

Cumulative Effects

13.6.51 GHG emissions are inherently cumulative, as all emissions have the same per-unit impact on the same ultimate receptor. The impact is climate change, or global warming, caused by the radiative forcing effects of GHGs in the atmosphere, and the affected receptor is the global climate and all the ecosystems and biomes that depend on it.

13.6.52 The Proposed Development would achieve emissions savings by reducing the consumption of fossil fuel generated mains electricity. These savings would outweigh the necessary GHG emissions resulting from manufacturing, constructing, and decommissioning of the Proposed Development. Once emissions from these sources are offset by the Development, then each subsequent unit of wind or solar generated electricity would displace a unit of conventionally generated electricity, thereby contributing to the overall reduction in emissions into the atmosphere.

13.6.53 In accordance with the IEMA Guidance (IEMA, 2022) *'All global cumulative GHG sources are relevant to the effect on climate change, and this should be taken into account in defining the receptor (the atmospheric concentration of GHGs) as being of 'high' sensitivity to further emissions. Effects of GHG emissions from specific cumulative projects therefore in general should not be individually assessed, as there is no basis for selecting any particular (or more than one) cumulative project that has GHG emissions for assessment over any other.'*

Summary of Effects

13.6.54 The following provides a summary of the conclusions of the impact assessment with respect to environmental features taking into consideration embedded and any additional mitigation measures.

Table 13.21: Summary of effects

Receptor	Potential Effects	Additional (Secondary and Tertiary) Mitigation	Residual Effects	Monitoring
Whole Lifecyle (Construction, Operation, and Decommissioning)				
Global Atmosphere	The Proposed Development is anticipated to result in GHG Savings of 2,481,469 tCO_2e against a grid-mix electricity generation over its 50-year lifespan, and 4,614,787 tCO_2e against a fossil fuel mix electricity generation.	It has been assumed that all activities during construction, operation and decommissioning would be conducted in accordance with good practice guidance.	**Beneficial (significant)**	N/A

13.6.55 The overall impact is considered to represent a **Significant and Positive effect,** and contribute to long-term climate change mitigation. Consequently, the Proposed Development contributes towards Scotland's emissions reduction targets as set out in the Climate Change (Emissions Reductions Targets) (Scotland) Act 2019, together with its renewable energy obligations as set out in the Scottish Climate Change Plan.

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13.7 Aviation and Radar

Introduction

13.7.1 This chapter provides an assessment of effects on aviation arising from the construction, operation and decommissioning of the Proposed Development.

13.7.2 Wind turbines have the potential to affect the performance of radars used for air traffic control, air defence and meteorological forecasting, and of aeronautical radio navigation aids. They can also present an obstacle hazard to aircraft flying at low altitude. They may affect the specified minimum altitudes for aircraft flying instrument flight procedures at airports; military aircraft carrying out low flying training; and emergency services helicopters operating at low altitude. Aviation obstruction lighting on wind turbines may generate adverse night time visual impacts on non-aviation receptors.

Legislation and Policy Context

13.7.3 The aviation assessment has been informed and guided by the following legislation and guidance:

- The Air Navigation Order (ANO) 2016;
- The Town and Country Planning (Safeguarded Aerodromes, Technical Sites and Military Explosives Storage Areas) (Scotland) Direction 2016;
- Civil Aviation Authority (CAA) Policy and Guidelines on Wind Turbines (CAP 764);
- CAA, Air Traffic Services Safety Requirements (CAP 670);

- CAA, Safeguarding of Aerodromes (CAP 738);
- CAA, Implementation and Safeguarding of Instrument Flight Procedures (IFPs) in the UK (CAP 785B); and
- CAA Policy Statement: Lighting of Onshore Wind Turbine Generators in the United Kingdom with a maximum blade tip height at or in excess of 150 m Above Ground Level (June 2017).

Consultation Undertaken

13.7.1 Responses from aviation consultees are set out in Table 13.22 below.

Table 13.22: Summary of consultation responses relevant to this chapter

Consultee	Issue Raised	Response/Action Taken
Highlands & Islands Airports Ltd (HIAL)	HIAL request that an Aviation Impact Feasibility Study of the proposed development is undertaken to understand any impact on the infrastructure and operation of Inverness Airport. The following are required to be assessed by the applicant: Air Traffic Control Surveillance Minimum Altitude Chart (ATCSMAC); Instrument Flight Procedures (IFPs); Primary Surveillance Radar (PSR); New Airspace and Instrument Flight Procedures; Lighting Requirement.	Potential effects on Inverness Airport are addressed in section “Predicted effects” of this chapter. An assessment of potential effects on Inverness Airport ATCSMAC and IFPs has been commissioned by the Applicant from HIAL’s Approved Procedure Design Organisation (APDO). A reduced lighting scheme was submitted to the CAA for approval and approved on 14 February 2025.
NATS (En Route) plc	The proposed development has been examined from a technical safeguarding aspect and does not conflict with our safeguarding criteria. Accordingly, NATS (En Route) Public Limited Company ("NERL") has no safeguarding objection to the proposal.	Noted. No further action required.

Consultee	Issue Raised	Response/Action Taken
Ministry of Defence (MoD)	The development falls within Low Flying Area 14 (LFA 14), an area within which fixed wing aircraft may operate as low as 250 feet or 76.2 metres above ground level to conduct low level flight training. The addition of turbines in this location has the potential to introduce a physical obstruction to low flying aircraft operating in the area. To address this impact, and given the location and scale of the development, the MOD require conditions are added to any consent issued requiring that the development is fitted with aviation safety lighting and that sufficient data is submitted to ensure that structures can be accurately charted to allow deconfliction. The development proposed specifies wind turbine generators that have a maximum height of 200m agl and which would be subject to the lighting requirements set out in the Air Navigation Order 2016. In addition to CAA requirements, the MOD will require the submission, approval, and implementation of an aviation safety lighting specification.	Potential effects on military low flying are addressed in section “Predicted effects” of this chapter. A reduced lighting scheme was approved by the CAA in February 2025 and issued to the MoD for confirmation.

Approach to the Assessment

Scope of Assessment

13.7.2 The aviation assessment has been conducted in accordance with the guidance in CAP 764: CAA Policy and Guidelines on Wind Turbines, adapted to ensure that all aviation assets with the potential to be affected by the Proposed Development are scoped into the assessment.

Baseline Methodology

Desk Study

13.7.3 The aviation baseline was determined by reviewing the UK Aeronautical Information Publication (AIP), the UK Military AIP and Civil Aviation Authority (CAA) Visual Flight Rules (VFR) aeronautical charts.

Assessment Methodology

13.7.4 Radar line of sight assessment has been carried out using proprietary software and digital terrain data with a resolution of 5m.

13.7.5 Assessment of the potential effects of the Proposed Development on current and future Inverness Airport ATCSMAC and IFPs has been carried out by HIAL’s APDO, commissioned by the Applicant.

13.7.6 The criteria for determining the significance of potential effects on aviation receptors have been based on international and national aviation regulations for safe obstacle avoidance and the ability to maintain radar separation from radar clutter, and on stakeholder responses.

Study Areas

13.7.7 The study areas applied for aviation were as follows:

- A 180 km radius from the Site boundary for en route and air defence PSRs.
- A 60 km radius from the Site boundary for airport PSRs and IFPs.
- A 30 km radius from the Site boundary for licensed and certificated aerodromes.
- A 10 km radius for military low flying areas and other aviation facilities.

Determination of Significance

13.7.8 Significance criteria for assessment of impacts on aviation, unlike those for environmental effects, are not based on the sensitivity of the receptor. Further, while magnitude of impact can be determined in some circumstances, the impact magnitude typically does not provide a standardised metric on which to measure the significance of any effects. In this context, the significance of effects on aviation has been determined in this chapter by application of professional judgement, underpinned by consideration of the magnitude of impact (where measurable), the regulations and procedures in place for ensuring that aviation infrastructure meets required performance standards, the safeguarding policies and practices in use by specific aviation stakeholders, and the consultation responses from those stakeholders.

13.7.9 Residual adverse effects of the Proposed Development on aviation are described as either nil, negligible, minor, moderate or major. Nil, negligible or minor impacts are categorised as not significant. Moderate or major effects are categorised as significant. The definitions of these criteria are shown in Table 13.23 below.

Table 13.23 Significance criteria

Significance term	Definition
Major	Regular, frequent or permanent effects which require changes to existing operational and/ or technical practice in order to mitigate adequately, or which are not capable of being mitigated adequately; and/or the owner of the affected aviation asset requires mitigation; and/or mitigation is required by law.
Moderate	Periodic effects experienced which may require alterations to existing operational practice; and/or the owner of the affected aviation asset requires mitigation; and/or mitigation is required by law.
Minor	Occasional effects experienced which do not require any alteration of existing operational and technical practice.

Significance term	Definition
Negligible	Normally no measurable change from baseline conditions; occasional, fleeting or very short term effects experienced which do not require any alteration of existing operational and technical practice.
Nil	No measurable change from baseline conditions.

Cumulative Effects

13.7.10 Cumulative impacts on the Inverness Airport PSR have been assessed by determining whether there are other wind farms within line of sight of that PSR that are within 10 nautical miles (nm) (18.5 km) of the Proposed Development.

13.7.11 Cumulative impacts on Inverness Airport IFPs have been assessed by reviewing the maximum tip heights of existing and consented wind farms within 30km radius of the Proposed Development.

Difficulties and Uncertainties

13.7.12 No limitations, uncertainties, or difficulties were encountered in carrying out the assessment for this chapter.

Existing Environment

13.7.13 The aviation baseline is as follows:

- the Site is located under the controlled airspace of air traffic service route N560 between Glasgow and Kirkwall;
- the Site is located 19 km from Inverness Airport and could have effects on that airport's PSRs and IFPs;
- the Site is located in a military low flying area.

Embedded Mitigation

13.7.14 The turbine layout has been designed to avoid all line of sight from the PSR at RAF Lossiemouth.

13.7.15 Article 222 of the Air Navigation Order requires all objects with a maximum height above ground level of 150m or more to be fitted with visible spectrum aviation warning lights. The Article also provides for the CAA to approve lighting schemes in which not all of a group of obstacles, such as turbines in a wind farm, are fitted with lighting. A reduced lighting scheme was submitted to the CAA for approval and approved on 14 February 2025.

13.7.16 Article 225A of the Air Navigation Order requires the owners of all objects exceeding 100m in height to submit details of the structures to the CAA at least eight weeks before the commencement of construction. This is to allow all such developments to be notified to airspace users. This requirement will be implemented through incorporation in the Construction Environmental Management Plan.

Predicted Effects

Construction

13.7.17 Air traffic control PSRs are designed to process out stationary objects. Since the wind turbine rotors will not be turning during the construction phase, the Proposed Development will have no effects on PSRs.

13.7.18 The IFP assessment commissioned by the Applicant from Inverness Airport's APDO concludes that the Proposed Development would have effects on the current and future ATCSMAC, on one element of the current IFPs and on two elements of the future IFPs. The Applicant is engaged in discussions with HIAL on the process for implementing mitigation measures for these effects. The mitigations will be delivered through a suspensive planning condition requiring approval and implementation of an IFP mitigation scheme prior to the construction of the Proposed Development.

13.7.19 The Proposed Development is located in daytime military Low Flying Area 14 and night low flying area Allocated Region 1C, where the minimum height authorised for fixed wing aircraft is 250 feet above ground level. This area is classified by the MoD as a "low priority military low flying area less likely to raise concerns" in relation to wind turbine developments. The MoD scoping response of 22 May 2024 states:

'The addition of turbines in this location has the potential to introduce a physical obstruction to low flying aircraft operating in the area. To address this impact, and given the location and scale of the development, the MOD require conditions are added to any consent issued requiring that the development is fitted with aviation safety lighting and that sufficient data is submitted to ensure that structures can be accurately charted to allow deconfliction.'

13.7.20 The Air Navigation Order requires that all structures 150m or more above ground level are fitted with aviation warning lighting and that information on all proposed structures 100m or more above ground level is submitted to the CAA prior to construction. Since these measures are required by law to be undertaken, the effect of the Proposed Development on military low flying is assessed as having minor significance.

Operation

13.7.21 Radar line of sight modelling has determined that all turbines in the Proposed Development will be within line of sight of the Inverness Airport Thales STAR 2000 and Terma Scanter 4002 PSRs. This has the potential to generate false plots on the radar display and to reduce the probability of detection of genuine aircraft targets in the airspace above the Proposed Development.

13.7.22 Effects on Inverness Airport IFPs and on military low flying will be the same as during the construction phase.

Decommissioning

13.7.23 The effects of the Proposed Development on aviation during the decommissioning phase will be similar to those during the construction phase.

Mitigation

13.7.24 Raising of the specified minimum altitudes in the Inverness Airport ATCSMAC and IFPs will require re-design and re-publication of the relevant published procedure charts. This may require the submission to and approval by the CAA of an Airspace Change Proposal (ACP). A planning condition will be agreed which requires approval and implementation of the required IFP changes prior to construction of the Proposed Development.

13.7.25 The Air Navigation Order requires that all structures 150m or more above ground level are fitted with aviation warning lighting and that information on all proposed structures 100m or more above ground level is submitted to the CAA prior to construction. These measures are required by law to be undertaken and will be implemented through inclusion in the CEMP agreed prior to construction.

13.7.26 HIAL has installed a Terma Scanter 4002 radar at Inverness Airport to mitigate the effects of wind farms on its Thales STAR 2000 PSR. It is expected that the Terma radar will mitigate the effects of the Proposed Development on the STAR 2000 PSR. A planning condition will be agreed which requires approval and implementation of the required radar mitigation measures prior to operation of the Proposed Development.

Summary of Effects

13.7.27 The following table provides a summary of the conclusions of the impact assessment with respect to each IEF taking into consideration embedded and any additional mitigation measures.

Table 13.24: Summary of effects

Potential impact	Pre-mitigation		Mitigation	Residual	
	Effect	Significance		Effect	Significance
Construction Phase					
Infringement of minimum altitudes in Inverness Airport IFPs		Major	Re-design of published procedures		Minor
Operational Phase					
Adverse effects on Inverness Airport PSR		Moderate	In-fill using Terma Scanter radar		Minor
Infringement of minimum altitudes in Inverness Airport IFPs		Major	Re-design of published procedures		Minor
Decommissioning Phase					
Infringement of minimum altitudes in Inverness Airport IFPs		Major	Re-design of published procedures		Minor
Cumulative effects					

Potential impact	Pre-mitigation		Mitigation	Residual	
	Effect	Significance		Effect	Significance
Adverse effects on Inverness Airport PSR		Moderate	In-fill using Terma Scanter radar		Minor
Infringement of minimum altitudes in Inverness Airport IFPs		Major	Re-design of published procedures		Minor

References

Article 222 of the Air Navigation Order (ANO): 2016

CAA Policy and Guidelines on Wind Turbines: CAP764 (6th Edition): 2016

CAA, CAP 393: Air Navigation Order 2016 and Regulations, March 2019

CAA, CAP 670: Air Traffic Services Safety Requirements, Part B, Section 4, June 2019

CAA, CAP 738: Safeguarding of Aerodromes, 2006;

CAA, Policy Statement: Lighting of Onshore Wind Turbine Generators in the United Kingdom with a maximum blade tip height

at or in excess of 150m Above Ground Level, 2017

Civil Aviation Authority (CAA), CAP 168: Licensing of Aerodromes, March 2019

nt (1989). Electricity Act 1989

13.8 Waste and Environmental Management

13.8.1 Chapters 5 to 13 of this EIA Report put forward suggestions on how to mitigate any negative impacts from the proposed Development with regards to waste and environmental management. These are summarised in Chapter 16: Schedule of Commitments.

13.8.2 A CEMP will be prepared prior to construction commencing which will outline how waste and other environmental issues would be managed during the construction phase. The Peat Management Plan (Technical Appendix 8.3) also details how excavated peat is controlled, stored, re-used and disposed of during the construction phase of the Proposed Development.

13.8.3 It is expected that a site-specific waste management plan for the control and disposal of waste generated onsite would be required by condition, should the Proposed Development receive consent.

13.9 Statement of Significance

13.9.1 This Chapter has assessed the potential effects of the construction and operation of the Proposed Development on the infrastructure, forestry, telecommunications, shadow flicker, carbon balance, aviation, and waste and environmental management. Predicted adverse effects on forestry, shadow flicker and waste and environmental management have been assessed as ‘Not Significant’ during both the construction and operational phases. Additionally, a ‘Significant’ beneficial effect has been predicted for carbon balance.

13.9.2 All effects and proposed mitigation measures are presented in Table 15.13. In addition, infrastructure, telecommunications and aviation assessments found that there would be no potential for impact and therefore effects on receptors.

Table 13.25 summary of effects

Description of effect	Significance of potential effects		Mitigation/enhancement measure	Significance of residual effect	
	Significance	Beneficial/Adverse		Significance	Beneficial/Adverse
Permanent Felling	Not Significant	Adverse	• all forestry plans and operations would fully comply with the UKFS; • use of keyhole felling for turbines to minimise the amount of felling required; and • compensatory planting equalling the same area as the area felled would be completed	Not Significant	Adverse
Shadow Flicker	Not Significant	Adverse	N/A	Not Significant	Adverse
Carbon Balance	Significant	Beneficial	• the design has minimised siting of infrastructure in areas of deep peat; • avoidance of construction activities within areas of deep peat where practicable; and • any excavated peat would be carefully handled and treated in accordance with best practice • measures to minimise drying and the loss of carbon into the atmosphere.	Significant	Beneficial
Waste and Environmental Management	Not Significant	Adverse	• adherence to the waste management plan, construction environmental management plan and	Not Significant	Adverse

Description of effect	Significance of potential effects		Mitigation/enhancement measure	Significance of residual effect	
	Significance	Beneficial/Adverse		Significance	Beneficial/Adverse
			• peat management plan, which would be agreed in advance with the relevant statutory consultees; • the extraction of the felled timber would be carried out after the access roads have been installed to minimise any damage to the soil caused by transporting felled timber over bare ground; • the felling method will be based on a short wood felling system utilisation and all timber would be removed from the Site; • site refuelling and maintenance areas would be sited outside the watercourse buffer areas and best practice measures would be taken to mitigate risks of spillages); • protection measures laid out in British Standard 5837 (2012), including measures such as forming a construction exclusion zone around retained trees/woodlands using specific barrier configurations, would be adopted to protect retained forestry during construction; and • Guidance in the UKFS regarding minimum buffers from watercourses would be followed in relation to the planned felling operations.		