# Cairnmore Hill Wind Farm

## Environmental Impact Assessment Report



## Volume 2 - Main Report

power for good

# Volume 2 Main Report: Table of Content

# 1 Introduction

## 1.1 Introduction

1.1.1 This Environmental Impact Assessment (EIA) Report has been prepared by RES UK & Ireland Limited (RES) in accordance with the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011 (as amended), in support of an application to The Highland Council (hereafter, the Council) for planning permission to construct a wind farm comprising 5 wind turbines at Cairnmore Hill, Caithness, Highland, as shown in Figure 1.1.

1.1.2 The EIAR comprises four volumes:

- Volume 1: Non-Technical Summary (NTS);
- Volume 2: Main Report;
- Volume 3a: Figures;
- Volume 3b: Visualisations; and
- Volume 4: Technical Appendices.

## 1.2 Purpose of the EIA Report

1.2.1 The Applicant is seeking detailed planning permission for the proposed development under the Town and Country Planning (Scotland) Act 1997, as amended.

1.2.2 The EIA Report has been prepared to accompany the planning application, in accordance with the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011 (the EIA Regulations). An EIA Report is required where a development is an EIA development, that is a development which is “likely to have significant effects on the environment by virtue of factors such as its nature, size or location”. The EIA Report demonstrates how the Applicant has taken these consenting requirements into account throughout the siting and design of the proposed development and has included reasonable mitigation measures.

1.2.3 The Applicant has considered the proposed development in light of the EIA Regulations and concluded that, due to the nature and scale of the proposed development and the potential for significant environmental effects, this is an EIA development.

1.2.4 Each of the technical chapters provides the specific criteria, including sources and justifications, for quantifying the different levels of effect. Where possible, this has been based upon quantitative and accepted criteria together with the use of value judgements and expert interpretations to establish to what extent an effect is environmentally significant. The threshold at which effects are likely to be "significant" is defined in each of the technical chapters.

## 1.3 Other Planning Documents

1.3.1 Additional documents that are submitted with this application include:

- Planning Application Form (including Ownership Notification Certificates);
- Planning Statement;
- Design and Access Statement;
- Pre-application Consultation Report;
- Cover Letter, confirming deposit locations for the EIA Report; and
- Proposed Processing Agreement between The Highland Council (THC) and the Applicant

## 1.4 EIA Process

1.4.1 EIA is a process that identifies the potential environmental effects (both positive and negative) of a proposed development and proposes mitigation to avoid, reduce and offset any adverse environmental effects. EIA is required where a proposed development is 'likely to have significant effects on the environment by virtue of factors such as its nature, size or location’. The key stages in the EIA process adopted for the proposed Cairnmore Hill Wind Farm are summarised below.

## 1.5 Screening

1.5.1 Screening is the term in the EIA regulations used to describe the process by which the need for EIA is considered. A request for a screening opinion can be submitted to the planning authority prior to submitting an application; however, there is no obligation to do so.

1.5.2 RES has volunteered to undertake an EIA rather than request a formal screening opinion to confirm whether likely significant effects may arise.

## 1.6 Scoping

1.6.1 The Applicant submitted a request for a Scoping Opinion to THC on 7 January 2022. This request was accompanied by a Scoping Report, prepared by the Applicant, which set out a summary of the proposal; identified the likely significant environmental effects, and summarised the proposed scope of the EIA. The Scoping Report was simultaneously issued to statutory and non-statutory consultees.

1.6.2 A Scoping Opinion was received from THC on 23 February 2022. The contents of this and other consultation responses received are summarised in Technical Appendix 1.1: Consultation Register, along with a list of all bodies consulted during the scoping exercise. Further detail on the key issues identified through the scoping and consultation process are described in **Chapter 3: Design Evolution and Alternatives.**

## 1.7 Consultation

1.7.1 In addition to seeking a Scoping Opinion, the Applicant conducted four public exhibitions, to seek the views of the local community. Exhibitions were held, as follows:

- 2nd February, 2022, Virtual event;
- 25th May, 2022, Forss Village Hall, Forss and the Pentland Hotel, Thurso;

1.7.2 The events in 2022 were advertised in advance in the John O'Groat Journal; Northern Times; and Caithness Courier on 26 February 2022. Newsletters were issued to Local MSPs, Councillors and Community Councils notifying them of the event and adverts were distributed to around 1,300 properties in the area in January 2022. A project website (http://www.cairnmorehill-windfarm.co.uk/) was also set up to allow access to further information on the proposal and to allow comments to be made online. This event were attended by 140 unique visits and applicant held calls with interested members of the community totalling almost 4 hours. Further update events were held in March 2022. These events were advertised in the Caithness Courier and Northern Times on 13 May 2022 and again information was distributed to the stakeholders aforementioned. The update events were attended by 36 people.

1.7.3 A summary of the representations received during the public exhibitions is provided in the Pre-Application Consultation Report.

1.7.4 Further detail on the key issues identified through the scoping and consultation process are described in Chapter 3: Design Evolution and Alternatives.

## 1.8 Baseline Characterisation

1.8.1 Baseline characterisation is the process by which the environmental conditions now, and in the future assuming no development on the site, are established. The process has included a combination of desk research, site survey and empirical study and projection.

1.8.2 The environmental baseline adopted for the purposes of the EIA is stated in each of the technical assessment chapters provided in the EIA Report. The baseline is normally taken as the current character and condition of the site and surrounds, and the likely significant environmental effects of the development are then assessed in the context of the current conditions.

## 1.9 EIA Methodology

### Mitigation by Design and Consideration of Alternative

1.9.1 Following the baseline characterisation, the information collected on environmental constraints was used to inform the consideration of design alternatives. An iterative process was followed, whereby the Applicant considered a range of turbine layout, height and access proposals. The aim of the design element of the EIA process was to develop an optimal solution which seeks to maximise potential renewable energy generation, within technical and environmental constraints. The main aim has been to avoid likely significant environmental effects through the design. Further details on the design process adopted for the proposed development are set out within Chapter 3: Design Evolution and Alternatives.

### Impact Assessment

1.9.2 The next stage in the EIA process was to complete an impact assessment to address the likely significant effects remaining following the implementation of mitigation by design. An assessment chapter has been provided for each issue where it is considered that there are likely significant effects associated with the construction, operation, decommissioning or restoration phases of the proposed development. Each assessment chapter considers primary, secondary, direct, indirect, short, medium, long, permanent, temporary, positive, negative and cumulative effects and defines the assessment methodology used and the criteria by which a significant effect is defined.

### Additional Mitigation

1.9.3 The impact assessment is used to identify where additional mitigation is required to address likely significant effects, where it has not been possible to avoid the effect through design of the turbine or infrastructure layout. Mitigation has been considered following a hierarchy of first seeking to avoid effects, followed by seeking a reduction in effects to level not considered significant, and finally where possible, offsetting or compensatory measures are considered.

## 1.10 Statement of Competency

1.10.1 The EIA Report has been compiled and approved by professional EIAR practitioners at LUC, holding relevant undergraduate and post-graduate degrees, membership of the Institute of Environmental Management and Assessment (IEMA) and Chartered Environmentalist status with the Society for the Environment. The EIAR meets the requirements of the IEMA EIA Quality Mark Scheme. This is voluntary scheme operated by IEMA that allows organisations to make a commitment to excellence in EIA and to have this commitment independently reviewed on an annual basis.

1.10.2 The project team comprises the specialist companies presented in Table 1.1 below.

**Table 1.1: Project Team**

| Team Member | Role & Responsibility |
|---|---|
| RES | Project Developer, Project Engineers, EIA Project Management, Noise, Aviation, Shadow Flicker, Transport and AIL Route Survey |
| LUC | Landscape and Visual Impact Assessment |
| David Bell | Planning |
| MacArthur Green | Hydrology, Peat, Ecology and Ornithology |
| CFA | Archaeology |

## 1.11 Environmental Impact Assessment Report

1.11.1 The process and outcomes of the assessment are presented in a single document, known as the EIA Report. This EIA Report has been prepared to provide clear and concise information on the likely significant environmental effects associated with the proposed development. The EIA Report is focussed on the residual effects that remain following the implementation of mitigation. The aim is to provide proportionate environmental information, as required in accordance with EIA regulations, to support the determination of the planning application.

1.11.2 In this case, the EIA Report is submitted to THC.

### Copies of the EIA Report

1.11.3 Further information is available on the project website (http://www.cairnmorehill-windfarm.co.uk/) and hard copies of the EIA Report and other documentation can be viewed at the following locations:

The Highland Council
Thurso, Strathy and Mey Service Point and Registration Office
Rotterdam Street
Thurso
KW14 8AB

1.11.4 An electronic version of the reports supporting the application, including the EIA Report, will be available to download from http://www.cairnmorehill-windfarm.co.uk/the-project/. This document is available at a cost of £400 in hard copy format (including postage and packaging) or on CD-ROM (price £15). A Non-Technical Summary of the EIA Report is available free of charge from the Applicant on request.

1.11.5 Copies of the EIA Report can be obtained from:

Renewable Energy Systems Limited
3rd Floor
STV
Pacific Quay
Glasgow
G51 1PQ

### Commenting of the EIA Report

1.11.6 Once the planning application for the proposed development is lodged with THC, THC will place a notice of the EIA Report and the application in a local newspaper and the Edinburgh Gazette, providing details of by when representations should be made and where the EIA Report may be inspected.

1.11.7 Any representations in relation to the application should be made by email to the Highland Council, Planning & Development Services mailbox at eplanning@highland.gov.uk or by post to The Highland Council, Planning & Development Services, Glenurquhart Road, Inverness, IV3 5NX identifying the proposal and specifying the grounds for representation. Written or emailed representations should be dated, clearly stating the name (in block capitals), full return email and postal address of those making representations.

# 2 Proposed Development

## 2.1 Introduction

2.1.1 This chapter provides a description of the Proposed Development for the purposes of identifying and assessing likely significant effects. Information is provided on:

- the location of the Proposed Development;
- the physical characteristics of the operational Proposed Development;
- typical activities associated with the construction and commissioning of the Proposed Development;
- typical activities associated with the operation of the Proposed Development; and
- typical activities associated with the decommissioning of the Proposed Development.

2.1.2 This chapter is supported by:

- Technical Appendix 2.1: Outline Construction Environmental Management Plan (CEMP);
- Technical Appendix 2.2: Draft Peat Management Plan;
- Technical Appendix 2.3: Peat Landslide Hazard and Risk Assessment (PLHRA);
- Technical Appendix 2.4: Phase 1 & 2 Peat Depth and Coring Survey Report;
- Technical Appendix 2.5: Hydrological Sensitivities;
- Technical Appendix 2.6: Carbon Balance Assessment;
- Technical Appendix 2.7: Outdoor Access Management Plan; and
- Technical Appendix 2.8: Shadow Flicker Assessment.

2.1.3 Planning permission is being sought for the proposed wind farm comprising the following:

- 5 three-bladed horizontal axis wind turbines of up to 138.5 m tip-height;
- turbine foundations;
- hardstanding areas at each turbine location for use by cranes erecting and maintaining the turbine;
- access tracks;
- a wind farm substation compound containing a control and substation buildings with battery energy storage ;
- an on-site electrical and control network of underground (buried) cables;
- a connection from the substation to the local grid network (not part of the wind farm planning application;
- a temporary construction compound;
- a temporary enabling works compound;
- communications mast;
- drainage works including a SuDs system;
- associated ancillary works;
- habitat management; and
- engineering operations.

## 2.2 Site layout and Flexibility

2.2.1 A plan of the proposed wind farm showing the proposed positions of the turbines, access tracks and control building/substation compound is shown in Figure 2.1.

2.2.2 Although the design process and evolution seeks to combine environmental and economic requirements, the Applicant would nevertheless wish some flexibility, where necessary, in micrositing the exact positions of the turbines and routes of on-site access tracks and associated infrastructure (50 m deviation in plan from the indicative design). This reflects possible variations in ground conditions across the site, which would only be confirmed once trial pits and boreholes for detailed site investigations are dug during the detailed infrastructure design, prior to the commencement of construction. Any repositioning would not encroach into environmentally constrained areas. Therefore, 50 m flexibility in turbine and infrastructure positioning would help mitigate any potential environmental effects e.g. avoidance of archaeological features not apparent from current records.

### Development Area

2.2.3 The turbines have a requirement to be spaced apart, so as not to interfere aerodynamically with one another (thus avoiding array losses). The actual land developed is limited to the substation, wind turbine plinths and paths, permanent crane hardstandings and the access tracks, which account collectively for approximately 1 % of the total area within the site boundary.

2.2.4 The turbine foundation is made up of a central excavation of approximately 20 m diameter and an approximate depth of 3 m – 5 m subject to prevailing ground conditions, but with sloping batters which would increase the excavated area to ground level to approximately 30 m diameter, possibly greater where poor ground conditions are encountered.

2.2.5 Each turbine requires a crane hardstanding to facilitate construction and maintenance. At each turbine there will be a 1,925 $m^2$ permanent hardstanding with an additional 630 $m^2$ temporary hardstanding during the construction phase.

The excavation area around each turbine is temporary. Ancillary excavation works and material storage around other parts of the development, such as those for cable trenching, would have a negligible impact on environmental receptors due to the very minor scale of the excavation or duration of the works and are not considered further in the Environmental Impact Assessment (EIA) Report.

2.2.6 Following completion of the turbine installation, the permanent hardstanding would be approximately 198 $m^2$ at each turbine site, which includes the concrete plinth to which the steel tower is attached and which includes a 5 m wide maintenance track/path around the base of the turbine (Figure 2.3). The completed foundation is covered with soil approximately 1.5 m deep, leaving only the concrete plinth exposed at ground level to which the steel tower is attached.

2.2.7 The proposed wind farm would result in the construction of approximately: 2,420 m of new track; 960 m of upgraded track; & 360 m of temporary track. The running width of the track would be 4 m on straight sections, with 0.25 m wide shoulders on each side. Tracks will be wider on bends. The total permanent hardstanding area for the new track would be approximately 10,890 $m^2$ (16,830 $m^2$ in total), plus hardstanding area for turning heads.

2.2.8 The control building & substation compound would take up an area of approximately 2,774 $m^2$. It is anticipated that there would be a transmission network operator's building within this footprint, though this is dependent of the final requirements of the network operator.

2.2.9 The temporary construction compound would require a hardstanding area of approximately 4,000 $m^2$ (80 m x 50 m). This area would be re-vegetated after construction is complete.

2.2.10 The Temporary Enabling Works Compound would require a hardstanding area of approximately 900 $m^2$ (30 m x 30 m). This area would be re-vegetated after construction is complete.

**Table 2.1 - Summary of Temporary and Permanent Hardstanding**

| Wind Farm Element | Temporary hardstanding[1] | Permanent Hardstanding [2] |
|---|---|---|
| Construction Compound | 4,000 m2 | N/A |
| Temporary Enabling Works Compound | 900 m2 | N/A |
| Turbines | N/A | 320m2 per turbine = 1,600m2 |
| Crane pads and laydown areas | 630m2 per turbine = 3,150m2 | 1,925m2 per turbine = 9,625m2 |
| Substation and Control Buildings | N/A | 2,774 m2 |
| On-site access tracks (New) | N/A | 2,420m x 4.5 m = 10,890m2 |
| On-site access tracks (Temporary) | N/A | 360 x 4.5 = 1,620$m^2$ |
| On-site access tracks (Upgrade) | N/A | 960 x 4.5 = 4,320$m^2$ |
| On-site access tracks (Turning Head) | N/A | 1,232m2 * 2 = 2,464m2 |
| On-site access tracks (Passing Place) | N/A | 3 x 260 m2 = 780m2 |
| Total Hardstanding in Square metres | 4,050 m2 | 34,073 m2 |
| Total Hardstanding in Hectares (ha) | 0.81 ha | 3.41 ha |
| Total Hardstanding as % of Total Area within the Wind Farm Site Boundary (358.55 ha). | 0.23 % | 0.95 % |

[1] Temporary hardstanding: this refers to ground which will be occupied by hardstanding / built structures during the construction of the proposed wind farm. However, once the proposed wind farm has been constructed this land will be reinstated and available for grazing.

[2] Permanent hardstanding: this refers to ground which will be occupied by hardstanding / built structures throughout the lifetime of the proposed wind farm.

2.2.11 Thus, in summary, the proposed wind farm would require approximately 3.41 ha of hardstanding during the life of the project. An estimated further 0.81 ha would be occupied by hardstanding on a temporary basis during the construction phase.

## 2.3 Project Description

### Wind Turbines

2.3.1 The wind turbine industry is constantly evolving. Designs continue to improve technically and economically. The most suitable turbine model for a particular location can change with time and therefore a final choice of machine for the proposed wind farm has not yet been made. The most suitable machine would be chosen before construction, with an overall height limit of up to 138.5 m blade tip as assessed in this EIA Report.

2.3.2 For visual and acoustic assessment purposes, the most suitable candidate turbine available in the marketplace (currently of 4.3 MW nominal capacity and with an overall height to blade tip of 138.5 m) has been assumed. Most of the dominant wind turbine manufacturers are now producing turbines that are classed as suitable for the wind regimes typical of Scotland and many are also producing turbines that match the 138.5 m tip height specification being suggested for the proposed wind farm. Exact tower and blade dimensions vary marginally between manufacturers, but suitable turbines are produced by Siemens, GE and Vestas amongst others. A diagram of a typical 138.5 m tip height turbine is given in Figure 2.2. The colour and finish of the wind turbine, blades, nacelles and towers would be agreed with the Council. A significant amount of research has been undertaken in relation to turbine

colour and finish. Siting and Designing wind farms in the Landscape (Version 1) SNH, December 2009 states:

*"Selecting the most appropriate colour for a turbine(s) is an important part of a detailed wind farm design and mitigation. It has previously been assumed that wind turbines could be painted a colour that would camouflage them against their background. However, experience has shown that no single colour of wind turbine would consistently blend with its background and it is more important to choose a colour that would relate positively to a range of backdrops seen within different views and in different weather conditions."*

2.3.3 The publication goes onto state that as a rule for most rural areas of Scotland:

- a single colour of turbine is generally preferable;
- a light grey colour generally achieves the best balance between minimising visibility and visual impacts when seen against the sky;
- the use of coloured turbines (such as green, browns or ochres) in an attempt to disguise wind turbines against a backcloth is usually unsuccessful; and
- paint reflection should be minimised.

2.3.4 Whilst often backclothed in views by topography, the turbines would be seen above the horizon at a number of key viewpoints both in close proximity to the site and from more distant views. In cognisance of the preceding guidance, a simple pale grey colour with a semi-matt finish is suggested for the turbines at the proposed wind farm.

2.3.5 Turbines normally rotate clockwise when viewed from the front, although this can vary between models. However, all the turbines would rotate in the same direction as those of the neighbouring Baillie Wind Farm. The computerised control system incorporated into each turbine continuously monitors the wind direction and instructs the turbine to turn (yaw) to face into the wind to maximise the amount of energy that is captured.

2.3.6 Turbines begin generating automatically at a wind speed of around 3 to 4 metres per second (m/s) and have a shut down wind speed of about 25 m/s. It is proposed to install infrared lighting on the turbines in a pattern that is acceptable to the Ministry of Defence (MoD) for aviation visibility purposes. Infrared lighting allows military aircraft with night vision capability to detect and avoid the proposed wind farm. Infrared lighting cannot be detected with the naked eye, thereby reducing visual impact.

2.3.7 Each turbine would have a transformer and switchgear. At Cairnmore Hill the transformer will be internally contained within the nacelle or tower base. The transformer's function is to raise the generation voltage from approximately 690 volts to the higher transmission level of 33 kV that is required to transport the electricity around the proposed wind farm and then onto the grid.

2.3.8 Every year, the Proposed Development is likely to generate electrical energy equivalent to the average annual demand of approximately 24,000 homes, approximately 22% of the homes in the Highlands area.

## Foundations and Hard Standing

2.3.9 The wind turbines would be erected on steel reinforced concrete foundations. It is anticipated that the foundations would be of gravity base design, but there may be the opportunity to use rock anchor foundations where ground conditions allow. Final base designs would be determined after a full geotechnical evaluation of each turbine location. Figure 2.3 provides an illustration of a typical gravity base wind turbine foundation construction. Figure 2.14 shows an illustration of a typical rock anchor foundation, which may be used when ground conditions allow.

2.3.10 During the erection of the turbines, crane hardstanding areas would be required at each turbine base. Typically, these consist of one main permanent area of 1,925 $m^2$ (Figure 2.4) adjacent to the turbine position where the main turbine erection crane would be located. The other areas, totalling 630 $m^2$, would be temporary and would be used to assist turbine erection. The hardstanding would be constructed using the same method as the excavated access tracks. This involves the topsoil being excavated and replaced with an engineered layer, typically crushed rock, to near the original ground level.

2.3.11 After construction operations are complete, the temporary crane pad areas, shown on Figure 2.4, would be reinstated. There would be a requirement to use cranes on occasion during the operational phase of the proposed wind farm, so the main crane hardstanding (1,925 $m^2$) would be retained to ease maintenance activities. This approach complies with current best practice guidance[3] which recommends crane hardstandings are left uncovered for the lifetime of the proposed wind farm.

## Site Tracks

2.3.12 The on-site access track layout has been designed to minimise environmental disturbance and land take by following the route through the shallower areas of peat where possible and keeping the length of track commensurate with the minimum required for operational safety. The track route also takes cognisance of the various

[3] SNH, Scottish Renewables, SEPA and the Forestry Commission Scotland (2013) "*Good Practice during Wind Farm Construction*"

identified environmental constraints. New tracks are proposed to access the various turbine locations totalling approximately 3.75 km in length.

2.3.13 Typical access track designs are shown in Figure 2.5. This Figure shows the use of floating and excavated tracks. Floating tracks would be constructed where practicable over areas of deep peat, however these areas have been avoided as much as possible and any impacts are expected to be minimal.

2.3.14 Three new watercourse crossings would be required as part of the track layout. These crossings would be designed to ensure that mammal movement is not restricted, and sized to ensure flood flows are not restricted. An example of the watercourse crossing design is shown in Figure 2.6. All water crossings will be in accordance with the CAR Regulations.

## Electrical Connection

2.3.15 Assuming the use of the currently available models, each wind turbine would generate electricity at 690 V and would have an ancillary transformer located within the nacelle or base of the tower to step up the voltage to the on-site distribution voltage of 33 kV. Each turbine would be connected to the substation by underground cable (Figure 2.8).

2.3.16 The substation is proposed to be located towards the south of the site, close to the site boundary, as shown in Figure 2.1. The substation and grid connection are described in greater detail below.

2.3.17 The grid connection route is not yet known. The precise route would be subject to a separate Section 37 application by the relevant network operator under the Electricity Act 1989 after further detailed surveys and assessments. A potential connection route to the potential grid connection point has been used for assessment purposes within this EIAR.

2.3.18 There is one potential grid option that it is anticipated National Grid could offer.

2.3.19 This option would be to construct a new grid connection to the Thurso substation to the east of the site.

## RES Control Building with Battery Energy Storage

2.3.20 The substation compound would contain electrical equipment, including auxiliary transformers. The control building required at the substation would accommodate metering equipment, switchgear, the central computer system and electrical control panels. A store room, toilet and wash basin along with a kitchenette would also be located in the control building. The buildings will be staffed by maintenance personnel on a regular basis. There is no requirement for any other permanent buildings within the Proposed Development.

2.3.21 There is a preference to source a ground water supply for the building subject to local availability. Alternatively water supply could be sourced from a rain water harvesting system. This would collect rain water from the roof of the control building via a modified drain pipe system and feed into a storage tank either within roof space of the building or an external buried tank. An overflow from the tank would drain to the outside of the building into a rainwater soakaway. The storage tank would supply untreated rainwater to the toilet and rainwater via a UV filter to the hand basin.

2.3.22 If an extended period of low rainfall occurs, water would be transported to the site in small tanks, as required.

2.3.23 Following an assessment of foul treatment options through a review of Pollution Prevention Guidelines 4, it was determined that both the toilet, wash hand basin and sink should drain to a small package treatment plant located adjacent to the control building, which would follow the Controlled Activities Regulations (CAR) guidelines and be constructed and located in accordance with the relevant Building Standards and agreed with the Council.

2.3.24 A permanent external environmental waste storage area will be provided with a minimum of 6 m clearance from the buildings. The area will consist of a concrete plinth typically 6 m x 3 m surrounded with a palisade fence and double gate.

2.3.25 In order to match on-site energy generation to energy demand, as well as facilitate options such as a reduction in any possible grid constraint requirements, the proposed development also provides for the provision of an energy storage device. Permanent containers, mounted on small concrete pad foundations would house an energy storage device, inverters and other ancillary equipment. The proposed design is a compact and low-key containerised scheme within the compound. For each container there would be a transformer located on the hardstanding.

## Grid Connection

2.3.26 Although a grid application has been made to National Grid (NG), the exact grid solution is not known at this point. The wind farm applicant applies for consent for the wind farm, whereas the grid connection consent will be sought by the network operator.

2.3.27 The grid solution will be offered by SHEP-D through NG and will require consent under Section 37 of the Electricity Act 1989.

2.3.28 This creates a logistical problem since the wind farm developer has no absolute control over the nature and location of the eventual grid connection. Equally, given that the optimum interconnection point depends upon power flows and available capacity in the wider network, and given that these are constantly changing, never more so than currently with the widespread development of renewable energy projects, then it is impossible to guarantee the detail of the grid connection until the time at which the connection is secured for construction.

2.3.29 There are different potential grid option routes that RES consider likely to be offered by SHEP-D. The most probable connection point is connection to Thurso South GSP, located east of the site. At the time that the application for the grid connection is brought forward, the grid connection will be the subject of a separate environmental assessment.

2.3.30 The network operator will require a building to be constructed adjacent to the RES Control Building. The plinth and indicative maximum dimensions are shown in Figure 2.7.

## 2.4 Description of Access

2.4.1 The guiding principle for access to the Proposed Development is to use existing infrastructure wherever possible.

2.4.2 It is anticipated that the port of entry for turbine delivery would be the Port of Scrabster. From the Port of Scrabster, turbine deliveries would proceed south on the A9 to the junction with the A836. Deliveries would then follow the A836 west, to the site entrance at near Brim of Burns. From the site entrance, deliveries would follow the existing access tracks, to the Proposed Development site boundary, where the new site tracks would be constructed.

2.4.3 Deliveries will be possible without the need for improvements to the public road network, as the proposed access route was upgraded to accommodate turbine deliveries for the construction of both Baillie and Limekiln wind farms.

## 2.5 Typical Construction Activities

### Access Tracks

2.5.1 In areas where the peat and topsoil are consistently less than 1 m thick, the vegetation and soil would typically be stripped to a suitable subsoil layer. This excavation would include a cut slope. The upper topsoil layer, together with turf, would be stored separately from the rest of the subsoil in piles adjacent to, or near to, the tracks, where appropriate, for later reinstatement.

2.5.2 Once the soil has been removed, as described above, to a suitable founding layer, the road and running surface would be constructed by tipping and compacting aggregate to the required shape and thickness. Cross sections of the final road shape following reinstatement of the roadside slopes by replacing the layers of excavated material in the correct order, are presented in Figure 2.5.

2.5.3 The site is predominantly flat with slopes generally in the range of 0% to 7% gradient, however there are areas where slopes exceed 15%, and short sections of track may cross these slopes. These sections would be similar to those shown in Figure 2.5.

### Construction of Compound

2.5.4 A temporary construction compound of approximately 4,000 $m^2$ (i.e. 80 m x 50 m) would be established. The compound would include:

- temporary portable buildings to be used as site offices, security monitoring and welfare facilities;
- toilet facilities;
- containerised storage areas for tools, small plant and parts;
- parking for construction vehicles;
- a receiving area for incoming vehicles;
- a generator; and
- a bunded area for storage of fuels and greases.

2.5.5 Figure 2.9 shows a typical layout for the construction compound, the exact layout may be different in practice.

2.5.6 It is proposed that a waterless wheel washing facilities would be established to ensure vehicles do not deposit material on public roads after leaving the site. As shown in Figure 2.1, these facilities would be located where the new access tracks join the A836, at the access point to the public road.

2.5.7 The compound area would be constructed by topsoil excavation in a similar manner to the access tracks. Aggregate would be laid over a geotextile membrane to avoid mixing of materials and enable the formation of a sound structural base. Following construction of the proposed wind farm, the temporary facilities would be removed and soil and vegetation reinstated over the construction compound area.

2.5.8 During construction, temporary fencing would be erected, as required, around the construction compound, areas under restoration and, if necessary, areas identified as ecologically or archaeologically sensitive.

## SuDs

2.5.9 A SuDs design in accordance with "*CIRIA C697 - The SuDS Manual*", will be agreed with SEPA prior to the commencement of construction.

2.5.10 The water crossings shown in Figure 2.1 will cross tributaries of the Burns of Brim. The design of the new watercourse crossings, would be agreed with SEPA prior to construction and would ensure the continued safe passage of mammals. These water crossings would require registration under The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR). The typical watercourse crossing used in upland sites on watercourses of this size is shown on Figure 2.6.

2.5.11 The access tracks would be designed to allow the efficient drainage of rainwater. The maintenance of the hydrological connectivity and water quality will be maintained through the appropriate design of the SuDS system around the tracks.

2.5.12 Where tracks cross contours, conveyance of surface flows would be maintained by diverting flow under the tracks through appropriately sized drainage pipes. Where appropriate, a lateral drainage swale would be cut along the uphill side of the track to intercept the natural runoff. This lateral swale would be drained under the track at regular intervals through correctly sized cross drains. In these cases, the cross drainage pipes would outfall into a drainage swale cut directly downhill at minimum slope until the bottom of the swale reaches ground level. Water would then flow out of the end of the swale onto the hillside, through a soakaway or settlement pond, thereby transferring the natural runoff through the track.

2.5.13 Where appropriate, a second lateral drainage swale on the other side of the road would catch runoff from the track itself. This swale would also outfall into the drainage swales cut directly downhill from the cross drains. Any material washed off the track surface would be removed through natural filtration or settlement pond before reaching any watercourse.

2.5.14 In cases where the tracks must run significantly downhill, transverse drains would be constructed, where appropriate, in the surface of the tracks to divert any runoff down the track into the drainage swale.

2.5.15 The SuDs design will specify measures to adequately control any runoff associated with borrow pit operations.

2.5.16 Mitigation measures to minimise the hydrological effect of constructing the access tracks have been proposed in **Chapter 3: Design Evolution and Alternatives** and Technical Appendices 2.2, 2.3, 2.4, and 2.5 of this EIA Report.

## Water Crossings

2.5.17 The design of the new watercourse crossings would be agreed with SEPA prior to construction and would be dealt with by registration under the CAR Regulations.

2.5.18 Guidance on the size, scale, design and construction of the crossings would be taken from the Construction Industry Research and Information Association (CIRIA) Culvert design and operation guide (C689). The crossings would be designed to ensure that they do not disconnect the watercourses at times of low flow and that they have appropriate flood capacity.

2.5.19 The crossings would be designed to ensure that fish and mammal movement is not restricted (specific mitigation for the safe passage of fish and mammals through culverts is considered within **Chapter 7: Ecology**).

## Crane Hardstanding Construction

2.5.20 During the erection of the turbines, crane hardstanding areas are required at each turbine base. Typically, these consist of one main area of 1,925 $m^2$ adjacent to the turbine position where the main turbine erection crane would be located. The other areas totalling 630 $m^2$ would be temporary and would be used during the assembly of the main crane jib. Figure 2.4 shows the hardstanding layout configuration in plan. The hardstanding would be constructed using the same method as the excavated access tracks. This involves the topsoil being replaced with stone to ground level. The final position of the hardstanding would be decided at the time of construction based on a number of considerations, including; size of crane required, depth of excavation required, hydrological/ecological features in the vicinity, local topography (it is preferable to position the crane hardstanding on the same level, or higher level to the turbine foundation level since this eases lifting operations).

2.5.21 After construction operations are complete, the temporary areas shown on Figure 2.4 would be reinstated. There would be a need to use cranes from time to time during the operational phase of the proposed wind farm. The '*Good Practice during Wind Farm Construction'*[4] guide recommends that crane hardstanding areas are not covered with peat or topsoil. Therefore, the crane pads would be left uncovered, which would ease maintenance activities and comply with best practice guidance.

[4] http://www.snh.gov.uk/planning-and-development/renewable-energy/onshore-wind/good-practice-during-windfarm-const/

## Turbine Foundation Construction

2.5.22 It is anticipated that the foundations for the turbine (Figure 2.3) would be of gravity base design. There may be the opportunity to use rock anchor foundations where ground conditions allow.

2.5.23 For a typical 4.3 MW machine the foundation would characteristically comprise around 400 $m^3$ of concrete reinforced by 50 tonnes of steel bars, in a tapered octagonal block of approximately 20-24 m diameter and from 3 m – 3.5 m depth, (see Figure 2.3 and 2.14). Each turbine base would require a in the region of 70 concrete deliveries (based on 6 $m^3$ of concrete in a truck). The final design of the turbine foundations will be subject to ground conditions on site.

2.5.24 The foundation surface lies approximately 2 m below the normal ground surface and is back filled with soil and reinstated. The foundation plinth would protrude from the ground by approximately 0.5 m. Approximately 2,000 $m^3$ of material would be excavated for each turbine base. Excavated material is placed back around the foundation and any required structural fill with any excess peat layered into the contours of the existing topography and re-seeded, if required.

2.5.25 The exact quantities of concrete, reinforcement, diameters and depths would vary depending on the actual make of the turbine used. Different turbine foundations may also be considered for different turbine locations depending on the local ground conditions. In the development of the foundation, geo-technical tests would be undertaken to determine the strength of the soil layers beneath the turbines and the soil behaviour under loading over time. This information is used to produce the foundation design into which are also incorporated factors of safety.

2.5.26 The code of practice for concrete design[5], gives specifications for the required resistance of concrete to sulphate attack. This ensures that when constructing in areas of acidic groundwater, the concrete mix is designed to withstand sulphate attack. It is therefore likely that the rate of alkaline leaching would be low and would not be expected to have significant effect on the local soil or groundwater conditions. The concrete used would be specified for Class 2 sulphate conditions[6], as this is appropriate for mildly acidic groundwater.

## Wind Turbine Erection

2.5.27 Wind turbine towers, nacelles and turbine blades would be transported to the site as abnormal loads. The tower sections and other turbine components would be stored at each turbine hardstanding until lifted into position.

2.5.28 The components would be lifted by adequately sized cranes and constructed in a modular fashion. Assembly, in general, requires only fixing of bolts, torquing of nuts and electrical and hydraulic connections.

2.5.29 Following erection of the turbines, there is a period of commissioning works prior to the commencement of generation.

## Cabling, Substation and Control Building

2.5.30 The location of the substation and control buildings is shown in Figure 2.1. Layout and elevation drawings for these buildings are presented in Figure 2.7 and 2.8. All cabling between the turbines and the substation on the site would be laid in underground trenches. Where excavated, the top layer of soil would be removed and used to reinstate the excavation following the installation of the cables. Where cables are being laid in areas of peat, the catotelmic and acrotelmic layers would be separated and replaced appropriately. Cabling would generally run parallel to the adjacent site tracks. Figure 2.11 presents a typical underground cable cross-section.

## Re-Instatement

2.5.31 A programme of reinstatement would be implemented upon completion of construction. This would relate to the construction compound, crane hardstandings, cable trenches and track shoulders where appropriate. After construction operations are complete the temporary hardstanding areas associated with the crane hardstanding would be reinstated. There would be a need to use cranes from time to time during the operational phase of the proposed wind farm, so the main crane hardstanding would be left uncovered to ease maintenance activities.

2.5.32 It is essential that the access track width is retained during the operation of the proposed wind farm to allow occasional crane access if required, hence no works to reduce the track width, post turbine erection, are proposed.

2.5.33 Cable trenches would be similarly reinstated. Where practicable, vegetation over the width of the cable trenches would be lifted as turves and replaced after trenching operations to reduce disturbance.

## Construction Programme

[5] BS EN206:1: 2000 Concrete Part 1: Specification, performance, production and conformity and BS 8500 – 1: 2006 Concrete – Complementary British Standard to BS EN 206 – 1 Part 1: Method of specifying and guidance for the specifier

[6] BS EN206:1: 2000 Concrete Part 1: Specification, performance, production and conformity and BS 8500 – 1: 2006 Concrete – Complementary British Standard to BS EN 206 – 1 Part 1: Method of specifying and guidance for the specifier

2.5.34 It is anticipated that the construction would take 12 months. The indicative construction programme shown in Plate 2.1 shows the anticipated scheduling of construction activities.

**Plate 2.1 – Indicative Construction Programme**

| Phase | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site Set-Up | ■ | ■ | | | | | | | | | | |
| Site tracks & hard standings | | ■ | ■ | ■ | ■ | ■ | | | | | | |
| Sub-Station and Control Building | | | | | ■ | ■ | ■ | ■ | | | | |
| Foundation construction | | | | ■ | ■ | ■ | ■ | ■ | | | | |
| Cable Installation | | | | | ■ | ■ | ■ | ■ | ■ | | | |
| Turbine erection, Comm & Test | | | | | | | | | ■ | ■ | ■ | ■ |
| Reinstatement | | | | | | | | ■ | ■ | ■ | ■ | ■ |
| Site Demobilisation | | | | | | | | | | | | ■ |
| Misc | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |

### Hours of Work

2.5.35 The normal hours of work for the construction phase would be restricted in time to Monday to Saturday from 7.00 am to 7.00 pm. There would be no working on a Sunday unless previously approved by the planning authority.

### Construction Traffic and Plant

2.5.36 In addition to staff transport movements, construction traffic would consist of heavy goods vehicles (HGVs) and abnormal load deliveries.

2.5.37 As outlined in **Chapter 10: Traffic and Transport**, taking into account forecast vehicle numbers from construction activities (13,320 trips) and forecast staff vehicle numbers (9,048 private car, mini bus or land rover trips). This equates to an average of circa 25 trips per day based on a 6 day week assuming a 12 month construction period.

2.5.38 Approximately 50 abnormal load deliveries would be generated for the turbine erection stage which would typically result in three deliveries per day. However, the actual number would be determined in the development of the Traffic Management Plan (TMP) which would be written in consultation with the Council, post-consent.

2.5.39 Turbine components would be supervised during their transportation and would use appropriate steerable hydraulic and modular trailer equipment where this is required. Axle loads would be appropriate to the roads and access tracks to be used. The transportation of turbine components would be conducted in agreement with the relevant roads authorities and local police. The Applicant would notify the police of the movement of abnormal length (e.g. turbine blade delivery) and abnormal weight (e.g. crane) vehicles and obtain authorisation from the Scottish Government prior to any abnormal vehicle movements.

2.5.40 Police escorts would be used where necessary and the appropriate permits obtained, for the transportation of abnormal loads to ensure that other traffic is aware of the presence of large, slow moving vehicles. Where long vehicles would have to use the wrong side of the carriageway, or need to swing into the path of oncoming vehicles, a lead warning vehicle would be used and escort vehicles would drive ahead and stop oncoming traffic. Vehicles would also be marked as long/abnormal loads. For return journeys, the extendible low loaders used for wind turbine delivery would be retracted to ensure they leave the site with a trailer length of no more than 16 m.

### Construction and Decommissioning Management Plan

2.5.41 A Construction and Decommissioning Management Plan (CDMP) will be agreed prior to construction commencing. This will be agreed with the Council and relevant statutory consultees. The CDMP will, as a minimum, include details of:

- schedule of mitigation;
- construction methodologies;
- pollution prevention measures;
- public liaison provision;
- peat slide, erosion and compaction management;
- control of contamination/pollution prevention;
- drainage management;
- water quality monitoring;
- management of construction traffic;
- control of noise and vibration; and
- control of dust and other emissions to air.

2.5.42 Technical Appendix 2.1 of this document provides a list of generic mitigation measures that will be included in the CDMP and implemented during the construction and decommissioning of the proposed wind farm.

2.5.43 In addition to the CDMP, details of an archaeology clerk of works/watching brief and details of ecology and protection of biodiversity will be agreed prior to the commencement of construction as required.

## 2.6 Operation, Management and Maintenance

2.6.1 Wind turbines and wind farms are designed to operate largely unattended. Each turbine at the Proposed Development would be fitted with an automatic system designed to supervise and control a number of parameters to ensure proper performance (e.g. start-up, shut-down, rotor direction, blade angles etc.) and to

monitor condition (e.g. generator temperature). The control system would automatically shut the turbine down should the need arise. Sometimes the turbines would re-start automatically (if the shut-down had been for high winds, or if the grid voltage had fluctuated out of range), but other shut-downs (e.g. generator over temperature) would require investigation and manual restart.

2.6.2 The proposed wind farm itself would have a sophisticated overall Supervisory Control and Data Acquisition system (SCADA) that would continually interrogate each of the turbines and the high voltage (HV) connection. If a fault were to develop which required an operator to intervene then the SCADA system would make contact with duty staff via a mobile messaging system. The supervisory control system can be interrogated remotely. The SCADA system would have a feature to allow a remote operator to shut down one or all of the wind turbines.

2.6.3 An operator would be employed to monitor the turbines, largely through remote routine interrogation of the SCADA system. The operator would also look after the day-to-day logistical supervision of the proposed wind farm and would be on-site intermittently.

2.6.4 Routine maintenance of the turbines would be undertaken approximately twice yearly. This would not involve any large vehicles or machinery.

2.6.5 If a fault should occur, the operator would diagnose the cause. If the repair warranted the proposed wind farm being disconnected from the grid then the operator would make contact with Scottish and Southern Energy. However, this is a highly unlikely occurrence as most fault repairs can be rectified without reference to the network utility. If the fault was in the electrical system then the faulty part or the entirety of the proposed wind farm would be automatically disconnected.

2.6.6 A sign would be placed on the proposed wind farm giving details of emergency contacts. This information would also be made available to the local police station and Scottish and Southern Energy.

## 2.7 Decommissioning

2.7.1 The expected operational life of the proposed wind farm is 35 years from the date of commissioning. Towards the end of this period a decision would be made as whether to refurbish, remove, or replace the turbines. If refurbishment or replacement were to be chosen, relevant planning applications would be made. If a decision was taken to decommission the proposed wind farm, this would require the removal of all the turbine components, transformers, the substation and associated buildings. Cables would be cut away below ground level and sealed. Some of the access tracks could be left on site to ensure the continued benefit of improved site access for the landowner, or they could be reinstated. It is not currently usual to remove the concrete foundations from the site as this would cause more damage to the environment. The exposed concrete plinth would be removed to a depth of 1 m below the ground surface and the entire foundation would be graded over with soil and would be replanted if appropriate. This follows SNH Report No. 591 Research and Guidance on Restoration and Decommissioning of Onshore Wind Farms and advice given in former Planning Advice Note: PAN 45 (Revised 2002) (which advised in paragraph 33 that "*Concrete foundations may be best left in place and covered over*") as and as reiterated in the Scottish Government's web-based renewable advice which has replaced PAN 45. Such advice is similarly contained in the '*Good Practice During Wind Farm Construction*'[7]. This approach also follows advice given in the recently published SNH Commissioned Report No. 591, which states that "*noise, ground disturbance, and cost (excavation/breaking/processing/transporting) along with associated carbon emissions, may create a larger environmental impact than leaving such concrete in situ.*"

2.7.2 If the Proposed Development obtains planning permission it is expected that an agreement would be put in place to allow for the establishment of a decommissioning bond or fund to be set aside for when the Proposed Development is decommissioned after its operational life. Prior to decommissioning of the Proposed Development, a method statement would be prepared and agreed with the Council.

2.7.3 Unlike most other forms of electricity production, wind farms are able to be decommissioned with comparative ease. Plant can readily be dismantled and removed from the site. Site restoration is relatively straight forward and after restoration there would be no significant visible trace of the wind farm's prior existence and no legacy of pollution.

## 2.8 Construction and Decommissioning Management

2.8.1 This section details the environmental management controls that would be implemented by RES and its contractors during the construction of the proposed wind farm to ensure that potential significant adverse effects on the environment are, wherever practicable, prevented, reduced and where possible offset.

[7] SNH, SEPA, Scottish Renewables & FCS (2010) Good Practice during Windfarm Construction

2.8.2 It would be a requirement that the appointed contractor complies with the CDMP that will be produced and agreed with the Council and relevant statutory consultees prior to construction commencing.

## Site Induction

2.8.3 The principal contractor would ensure that all employees, sub-contractors, suppliers and other visitors to the site are made aware of the content of the CDMP and its applicability to them. Accordingly, environmental specific induction training would be prepared and presented to all categories of personnel working on and visiting the site.

2.8.4 As a minimum, the following information would be provided to all inductees:

- Identification of specific environmental risks associated with the work to be undertaken on site by the inductee;
- Summary of the main environmental aspects of concern at the site as identified in the CDMP; and
- Environmental Incident and Emergency Response Procedures (including specific Environmental Communication Plan requirements).

2.8.5 A conveniently sized copy of an Environmental Risk Map or equivalent would be provided to all inductees showing all of the sensitive areas, exclusion zones and designated washout areas. The map would be updated and reissued as required. Any updates to the map would be communicated to all inductees through a tool box talk given by specialist environmental personnel. Regular tool box talks would be provided during construction to provide ongoing reinforcement and awareness of environmental issues.

## Pollution Prevention, Water Quality Monitoring and Emergency Response Plan

2.8.6 The CDMP will detail a number of measures to deal with pollution prevention, including RES' 'Environmental Requirements of Contractors', 'Water Quality Monitoring Procedure' and 'Procedure in the Event of a Contaminant Spill'.

2.8.7 SEPA has produced Pollution Preventions Guidelines (PPG) 5 for Works in, near or Liable to Affect Watercourses and PPG 6 for Working at Construction and Demolition Sites for civil engineering contractors. The Proposed Development would be constructed using best practice in conformance with these requirements.

2.8.8 Contractors and sub-contractors would be required to follow Pollution Prevention Guidance published by SEPA, and the following pollution control measures will be incorporated into the CDMP:

- equipment shall be provided to contain and clean up any spills in order to minimise the risk of pollutants entering watercourses, waterbodies or flush areas;
- trenching or excavation activities in open land shall be restricted during periods of intense rainfall and temporary landscaping shall be provided as required to reduce the risk of oil or chemical spills to the natural drainage system;
- sulphate-resistant concrete[8] shall be used for the construction of turbine bases to withstand sulphate attack and the resultant alkaline leaching into groundwater;
- all refuelling will be undertaken at designated refuelling points. There will be no refuelling within catchments contributing to water supply points;
- equipment, materials and chemicals shall not be stored within or near a watercourse. At storage sites, fuels, lubricants and chemicals shall be contained within an area bunded to 110%. All filling points shall be within the bund or have secondary containment. Associated pipework shall be located above ground and protected from accidental damage;
- drip trays shall be placed under machinery left standing for prolonged periods;
- all solid and liquid waste materials shall be properly disposed of at appropriate off site facilities;
- routine maintenance of vehicles shall be undertaken out with the site;
- there shall be no unapproved discharge of foul or contaminated drainage from the proposed wind farm either to groundwater or any surface waters, whether direct or via soakaway;
- sanitary facilities shall be provided and methods of disposal of all waste shall be approved by SEPA;
- a programme of surface water quality monitoring would be undertaken during the construction phase to provide assurances as to the absence of water quality impacts; and
- RES has a policy that no wind turbines, auxiliary and electrical equipment would contain askarels or Polychlorinated biphenyls (PCBs).

2.8.9 In the unlikely event of an environmental pollution incident, there will be an emergency response procedure to address any accidental pollution incident. For example, this requires the use of spill kits to contain the material and procedures to ensure that SEPA is notified immediately.

## General Drainage Design

2.8.10 Watercourses buffers have taken account of, and the proposed wind farm's infrastructure designed in accordance with, best practice guidance. Where localised encroachment into buffers has been unavoidable, specific mitigation measures will be implemented.

[8] BS EN206:1 : 2000 Concrete Part 1: Specification, performance, production and conformity and BS 8500 – 1 : 2006 Concrete – Complementary British Standard to BS EN 206 – 1 Part 1: Method of specifying and guidance for the specifier

2.8.11 The potential impact of preferential routing of drainage and associated erosion and sediment wash-off within the sub-catchments draining the site would be mitigated through measures to be incorporated into the SuDS Design. Standard mitigation measures to address these issues are included in Technical Appendix 2.1

## Runoff and Sediment Control Measures

2.8.12 The following measures would be used to mitigate any potential impacts on the water quality of the sub-catchments through peat erosion, stream acidification and metals leaching during construction. These are incorporated into the CDMP:

- appropriate sediment control measures (silt fences, attenuation ponds, etc.) would be used in the vicinity of watercourses, springs or drains where natural features (e.g. hollows) do not provide adequate protection;
- sediment control measures (e.g. checkdams, silt fences etc.) would be employed within the existing artificial drainage network during construction. These would be regularly checked and maintained during construction and for an appropriate period following completion. Consideration would be given to the permanent infilling of any major drains;
- watercourses would be monitored throughout the construction period by the ECoW to identify any enhanced scouring of the catchment surface. If sediment from disturbed peat is excessively mobilised through the minor channels network these would be mitigated by temporary sediment control measures (e.g. geotextiles/straw/bales/brash);
- the extent of all excavations would be kept to a minimum and during construction activities surface water flows shall be captured through a series of cut-off drains to prevent water entering excavations or eroding exposed surfaces. If dewatering of excavations is required, pumped discharges would be passed through attenuation ponds and silt fences to capture sediments before release to the surrounding land;
- where there is a permanent relocation of peat, the ground would be reinstated with vegetation as soon as practicable;
- where practicable, vegetation over the width of the cable trenches would be lifted as turfs and replaced after trenching operations to reduce disturbance;
- the movement of construction traffic would be controlled to minimise soil compaction and disturbance. Vehicle movements outside the defined tracks and hardstandings would be avoided;
- trenching or excavation activities in open land would be restricted during periods of intense rainfall and temporary landscaping would be provided, as required, to reduce the risk of sediment transport to the natural drainage system;
- construction of the track and cable crossings would take place only within dry weather conditions if reasonably practicable. If necessary, upstream of the crossing would be dammed and water pumped around the construction zone. The construction period would be minimised as far as practicable; and
- temporary peat stockpiles would be stored on a geotextile membrane and covered. Stored peat would be placed accordingly to minimise the potential for erosion. Peat would be stored in smaller stockpiles distributed in flat areas away from watercourses. These measures would be incorporated within the Draft Peat Management Plan (refer to Technical Appendix 8.6).

## Peat Slide, Erosion and Compaction Management

2.8.13 Management of the risk of peat slides is now recognised in literature, and a range of measures have now become standard engineering practice for construction of roads over peat. These measures would be adopted, as appropriate, on site, ensuring that:

- concentrated loads, such as those arising from stockpiling of material from turbine foundation excavations, would not be placed on marginally or potentially marginally stable ground;
- concentrated water flows arising from any aspect of construction or operation of the proposed wind farm would not be directed onto peat slopes and unstable excavations;
- construction would be supervised on a full time basis by engineers fully qualified and experienced in geotechnical matters;
- robust drainage plans would be developed;
- work practices would be reviewed, modified as necessary and adopted to ensure that existing stability is not compromised; and
- appropriate ground investigation and movement monitoring practices would be adopted.

2.8.14 The major contributory factor resulting in peat slide is heavy rain. Almost invariably, peat-slide events are preceded by unusual weather conditions typically characterised by a long dry summer that leads to desiccation cracking of the peat profile followed by a prolonged continuous rainfall including exceptionally heavy rainstorms.

2.8.15 The condition of the sliding surface at the base of the profile has a strong influence on potential mobility and depends on the regularity and smoothness or roughness of the underlying rock-head.

2.8.16 According to the ‘Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments’, peat slides tend to occur where the peat slab is less than 2 m deep and where the slope is steeper, between 5° and 15°.

2.8.17 A separate Peat Slide Risk Assessment is provided as Technical Appendix 2.3. This document would be updated during the detailed design stage and agreed with SEPA prior to construction.

### Peat Management Plan

2.8.18 A separate Draft Peat Management Plan is provided as Technical Appendix 2.2. This provides details of the predicted volumes of peat that would be excavated for the proposed wind farm, the characteristics of the peat that would be excavated, and how the excavated peat would be reused and managed. This document would be updated during the detailed design stage and agreed with SEPA prior to construction.

2.8.19 In line with best practice, the following order of preference would be used to relocate predominantly excess peat spoil:

- reinstatement locally around construction works – peat excavated for the construction compound and turbine foundations would be replaced on completion of the works as part of the reinstatement of the site to minimise movement of materials;
- along access tracks – floated tracks would incorporate stabilisation bunds to enhance stability. In addition, the peat would be stored in strips on one or both sides of the tracks as identified during detailed design. Design criteria would include consideration of peat thickness and strength, slope angle and effect of surcharge on stability and would include specification of maximum permitted mound heights;
- landscaping in and around the site infrastructure – any cut and/or fill sections of infrastructure would be landscaped using excess peat from excavations to reduce visual impact;
- any additional landscaping mounds would be identified based on similar criteria to track-side storage; and
- at locations where relocation of excess material is required, the vegetation would be stripped, stored and replaced to re-establish growth and provide erosion protection as soon as reasonably practicable. All stockpiles, temporary and permanent, would be designed with appropriate drainage systems and include a monitoring plan to provide early warning of potential peat slide events. A response plan would also be put in place to provide fast and effective action in the event of any peat movement.

### Traffic Management Plan

2.8.20 As detailed in Chapter 9: Traffic and Transport, a Transport Management Plan (TMP) would be developed to ensure road safety for all users during transit of development loads. The TMP would outline measures for managing the convoy and would set out procedures for liaising with the emergency services to ensure that police, fire and ambulance vehicles are not impeded by the loads. The TMP would be developed in consultation with the Council, the police, highways authorities and the local community and agreed before deliveries to the proposed wind farm commence.

### Ecological Management Plan

2.8.21 An Ecological Management Plan (EMP) would be prepared and implemented through the CDMP to set out the measures required to protect and enhance ecology and hydrology at the proposed wind farm during the construction phase, including pre-construction surveys, habitat management and biodiversity enhancement. The detail of the EMP would be prepared and agreed with NatureScot prior to commencement of construction.

2.8.22 An Ecological Clerk of Works (ECoW) would be present during the construction period to ensure that ecological impacts are appropriately mitigated in accordance with the EMP.

## Potential Construction and Decommissioning Phase Environmental Impacts

2.8.23 Construction is predominantly a civil engineering operation and would be phased over an approximate 12 month period. Construction of tracks and foundations would be progressive, minimising the number of simultaneously active locations and ensuring that traffic density is kept low. Erection would span approximately 10 weeks toward the end of the work programme.

2.8.24 A programme of site reinstatement would be put in place to minimise the visual and ecological impacts on the land.

2.8.25 The Proposed Development would operate for 35 years and would require only limited maintenance and inspection visits.

2.8.26 A restoration plan would be prepared and agreed with the relevant authorities towards the end of the Proposed Development's operational life.

# 3 Design Evolution Considerations and Alternatives

## 3.1 Introduction

3.1.1 In this chapter, a description is given of the site selection process and design strategies that were adopted in arriving at the proposed wind farm described in **Chapter 2: Proposed Development**. Firstly, the general design principles adopted by RES are outlined and the design objectives for the proposed wind farm are confirmed. Thereafter, an overview of the layout of the proposed wind farm is given, including references to identified / adopted design constraints that include details of the further refinements made to the turbine layout between conception and this application. Finally, the design considerations and decisions for the proposed wind farm's infrastructure are explained.

## 3.2 Site Selection Considerations

3.2.1 Cairnmore Hill Wind Farm is The site covers an area of approximately 3.58 km$^2$ and is located approximately 4.5 km west of the Thurso (Figure 1.1). The site was chosen for wind farm development for a number of reasons:

- the turbine array can be sited outwith designated areas (such as those designated for nature conservation, landscape or cultural heritage reasons) (Figure 3.1);
- the site is wholly located in Group 3 of Table 1 of Scottish Planning Policy 2014 ('SPP')[1] and of THC's Spatial Framework Plan. Group 3 areas are defined by SPP and THC as "Areas with potential for wind farm development"; and
- there is existing infrastructure in the area which can be utilised by the proposed development such as Thurso South Substation. Due to the presence of this existing infrastructure the proposed development can utilise existing tracks thereby reducing the need for new track.

3.2.2 RES utilise a Geographical Information System (GIS), to aid identification of potential wind farm sites. In the case of Cairnmore Hill Wind Farm, the GIS model was used to identify potential constraints that could restrict development, or would need to be addressed in the design process.

## 3.3 Current Land Use and Site Context

3.3.1 The site is gently undulating with the high points located at Hill of Forss. The site can be categorised as open moorland used for the purposes of grazing.

3.3.2 The A836 is located immediately north and runs in parallel to the site boundary (Figure 1.1).

3.3.3 The nearest residential properties are located to the south-east of the site, among a cluster of properties around the hamlet known as Janetstown and immediately north of the site running along the A836. Properties located within the site boundary are within the control of the Applicant.

3.3.4 There are a number of wind farms within 40 km of the proposed development (Figure 5.1.8). Operational and consented wind farms include Limekiln, Baillie, Forss, Strathy North and Strathy South, Achlachan 1 & 2, Halsary and Bad a Cheo.

## 3.4 Policy Considerations

3.4.1 The Scottish Planning Policy (SPP) is a key national level document considered. SPP requires planning authorities to define a spatial framework identifying those areas that are likely to be most appropriate for onshore wind farms. The spatial frameworks must be based on the following criteria:

- Group 1: Areas where wind farms will not be acceptable:
  - National Parks and National Scenic Areas.
- Group 2: Areas of significant protection:
  - Recognising the need for significant protection, in these areas wind farms may be appropriate in some circumstances. Further consideration will be required to demonstrate that any significant effects on the qualities of these areas can be substantially overcome by siting, design or other mitigation; and
  - Group 2 areas include World Heritage Sites; Natura 2000 and Ramsar sites; Sites of Special Scientific Interest; National Nature Reserves; Sites identified in the Inventory of Gardens and Designed Landscapes; Sites identified in the Inventory of Historic Battlefields; areas of wild land as shown on the 2014 SNH map of wild land areas; carbon rich soils, deep peat and priority peatland habitat; and an area not exceeding 2 km around cities, towns and villages identified on the local development plan.
- Group 3: Areas with potential for wind farm development:
  - Beyond groups 1 and 2, wind farms are likely to be acceptable, subject to detailed consideration against identified policy criteria.

3.4.2 The site does not lie within any 'Group 1' areas, or within any national and international designations for ecology, ornithology, cultural heritage or wild land

1 The Scottish Government (2014) Scottish Planning Policy, The Scottish Government, Edinburgh, June 2014 - URL: http://www.gov.scot/Publications/2014/06/5823/6, accessed 25/10/21

(Group 2 areas). All of the wind farm infrastructure is located within Group 3 as presented on Figure 3.1. The site boundary does extend into a Group 2 area in the southeastern area of the site boundary.

3.4.3 This Group 2 area relates to separation for community amenity in terms of consideration of visual impact. This is defined as an area not exceeding 2 km around cities, towns and villages identified on the local development plan with an identified settlement envelope and edge. As aforementioned, no infrastructure proposed as part of the development is located within this Group 2 area. However, the Applicant has undertaken a Residential Visual Amenity Assessment to assess impacts on the visual amenity of individual properties within 2 km of the proposed developments turbines (EIA Report Volume 4: Technical Appendix 5.2).

3.4.4 At a local level, the key policy is provided within the following documents:

- The statutory development plan for the site comprises the Highland-wide Local Development Plan (the HwLDP) (adopted April 2012)[2];
- Onshore Wind Energy Supplementary Guidance (adopted November 2016)[3]; and
- The Caithness and Sutherland Local Development Plan (adopted August 2018)[4].

3.4.5 This EIA Report does not make any judgements regarding the acceptability of the proposed development. A separate Planning Statement is provided which presents an appraisal of the proposed development with reference to the energy and planning policy framework and relevant material planning considerations.

## 3.5 Key Issues and Constraints

3.5.1 In addition to the policy considerations identified, key issues and constraints for consideration in the design process were established through a combination of desk-based research, extensive field survey and consultation (through the EIA scoping process). The design process considered the following issues:

- landscape character and visual amenity within a 40 km study area;
- cultural heritage, including mapping all known assets within the site, and designated assets within a 10 km study area to assess the potential for visibility and setting effects;
- sensitive fauna, with the mapping of the presence of European protected species;
- sensitive habitats, particularly peat forming habitats (supported by habitat and peat probing surveys) and habitats dependent on groundwater;
- ornithology, including surveys for bird flight activity and breeding bird activity on the site;
- cumulative operational noise levels and exposure at nearby properties; and
- hydrology and hydrogeology, including identifying all sensitive surface water features.

## 3.6 Alternatives

### Do-nothing Alternative

3.6.1 The "do nothing" scenario is a hypothetical alternative conventionally considered in the EIA Report as a basis for comparing the development proposal under consideration. This scenario is considered to represent the current baseline situation as described in the individual chapters of this EIA Report.

3.6.2 In the absence of the proposed development, it is anticipated that the site would continue to be managed as a combination of grazing livestock. These land uses would continue on the site whether or not the proposed development proceeds.

3.6.3 It is recognised that the baseline would not remain static for the lifetime of the proposed development. In particular, and apart from any changes arising from economic and agricultural policies and economic market considerations, it is predicted that biodiversity and landscape would undergo some level of change as a result of climate change. Two publications from the Landscape Institute[5] and NatureScot[6] consider the potential climate change effects on the landscape character. Due to the complexities and uncertainties inherent in attempting to predict the nature and extent of such changes to landscape and biodiversity during

2 Highland-wide Local Development Plan (2012), URL: https://www.highland.gov.uk/info/178/local_and_statutory_development_plans/199/highland-wide_local_development_plan, accessed 25/10/21

3 Onshore Wind Energy Supplementary Guidance (November, 2016), URL: (https://www.highland.gov.uk/downloads/file/18793/onshore_wind_energy_supplementary_guidance_november_2016, accessed 25/10/21

4 Caithness and Sutherland Local Development Plan (2018), URL: https://www.highland.gov.uk/info/178/local_and_statutory_development_plans/283/caithness_and_sutherland_local_development_plan, accessed 25/10/21

5 Landscape Institute (2008) Landscape architecture and the challenge of climate change, Position Statement, London, October 2008 – URL: https://www.landscapeinstitute.org/wp-content/uploads/2016/03/LIClimateChangePositionStatement.pdf, accessed 25/10/21

6 Land Use Consultants (2012) An assessment of the impacts of climate change on Scottish landscapes and their contribution to quality of life: Phase 1 – Final Report. Scottish Natural Heritage Commissioned Report 488 - URL: https://www.nature.scot/doc/naturescot-commissioned-report-488-assessment-impacts-climate-change-scottish-landscapes-and-their, access 25/10/21

the lifetime of the proposed development, it has been assumed that the current baseline would subsist. It is considered that this represents an appropriate approach for EIA Report preparation purposes.

## Design Evolution and Alternative Layouts

3.6.4 There have been five principal iterations, which have been developed at different stages in the project design process (Figure 3.2):

- Option A: Hill of Forss Layout;
- Option B: Scoping Layout;
- Option C: Design Freeze Layout (2020 submission);
- Option D: Design Freeze Layout (Amendment – 2020 submission); and
- Option E: Design Freeze Layout (2022 submission)

**Option A: Hill of Forss Layout (July 2013)**

3.6.5 The Hill of Forss Layout resulted in 5 turbines at a maximum tip height of 110 m. An initial baseline landscape and visual appraisal and analysis in respect of design priorities provided a number of locational and design priorities, including:

3.6.6 Preferential location of the proposed development outwith areas classified as Group 1 or Group 2 on landscape and visual grounds in the 2016 spatial framework for onshore wind energy.

3.6.7 Location of the proposed development outwith areas subject to landscape designations or classifications, and which is set back from settlements and principal concentrations of receptors.

3.6.8 Positioning of the proposed development in a landscape that is relatively settled and subject to existing wind farm developments and other large-scale structures, as opposed to one that has a higher degree of naturalness and consequently a higher sensitivity.

3.6.9 Selection of a location within a landscape of sufficient scale and simplicity to provide for the accommodation of the turbines.

3.6.10 Location of the proposed development away from distinctive landscape features, the scale and form of which could be compromised.

3.6.11 Positioning of turbines inland, away from key views of key landmark features and views including the distinctive cliffs and bays of the northern coastline of Caithness, and the land mass of Orkney.

3.6.12 Positioning of the proposed development to ensure sufficient separation from other nearby wind farm sites to ensure that the proposed development is seen as distinct and separate.

3.6.13 Preferential use of existing tracks on site to minimise effects associated with this aspect of the proposed development.

3.6.14 Minimisation of the amount of site infrastructure and ancillary elements, and their careful positioning and design, to ensure that such elements are screened from the majority of external receptor locations.

3.6.15 Siting of turbines and design of tracks and other infrastructure to avoid direct effects on archaeological remains.

3.6.16 Careful siting and design of ancillary elements such as the proposed substation and control room along with potential associated energy storage facility to minimise visibility from external receptor locations, especially the A836 corridor.

3.6.17 Creation of a balanced, coherent array that minimises 'stacking' of turbines in views from key neighbouring receptor locations.

3.6.18 The site is located within a low priority zone for military low flying exercises.

**Option B: Scoping Layout – 2020 submission (July 2016)**

3.6.19 The Scoping Layout resulted in a major design iteration to both the proposed turbine layout and maximum tip height (Figure 3.2). These changes were introduced as a result of an enlargement of the proposed developable area of the site. The layout increased from 5 turbines to 10 turbines and the tip height increased from 110 m to 125 m.

3.6.20 The key landscape and visual priorities in developing this preferred development were as follows:

3.6.21 Setting of turbines back from the most visibly prominent slopes of the Hill of Forss, and within the flatter part of the site where turbines would have a more consistent elevation.

3.6.22 Increasing the distance between the proposed development's turbines and the A836 corridor.

3.6.23 Maintenance of a maximum distance from individual dwellings and Janetstown properties to avoid overbearing or overwhelming visual effects.

**Option C: Design Freeze Layout (March 2019)**

3.6.24 Reductions in turbine numbers to 8 machines, with corresponding reductions in necessary infrastructure.

3.6.25 Due to change in the market conditions for onshore wind farms, a larger turbine typology was proposed with the tip height increasing from 125 m to 138.5 m. This change resulted in the need to submit another Proposal of Application Notice and further consultation on the proposed design was held in April 2019.

3.6.26 The reduced number of turbines provided benefits in respect of reduced infrastructure requirements, development footprint and a narrowing of the horizontal extent of the proposed development, with consequent benefits in respect of the visual amenity of the A836 and Janetstown properties.

3.6.27 The changes to the layout resulted in reduced operational noise levels at properties to the southwest of the proposed development. These properties lie between the proposed development and the existing Baillie wind farm such that reductions in operational noise levels from the proposed development lead to reductions in the cumulative operational noise levels at these locations. The changes to the layout also reduce the change in cumulative noise exposure due to the introduction of the proposed development by limiting the range of wind directions from which all properties that are downwind of turbines belong to the proposed development.

3.6.28 With further site investigatory data available by March 2019, the Principal Designer identified an opportunity to utilise and win stone within the site and thereby reducing the need for delivery of construction material to be used in establishment of the proposed development. As the borrow pits were in the south of the site, the most realistic method of construction was to propose to build an enabling compound and build from the south of the site towards T5 and complete the access tracks to the site opening where proposed AILs were to exit the road network and onto site.

**Option D: Design Freeze Layout (Amendment) (October 2019)**

3.6.29 From the period of the consultation held in April 2019 and October 2019 there was a requirement to make an amendment to the red line boundary which resulted in an overall reduction in the overall area of the proposed development. The layout remains at 8 turbines with a tip height of 138.5 m.

3.6.30 The amendment to the red line boundary also led to the removal of a borrow pit and secondary access to the south.

3.6.31 The hardstanding at T6 was relocated to avoid direct impacts on the watercourse directly east of this turbine.

3.6.32 This layout incorporates bat disturbance buffers from the buildings located at ‘Hopefield’ and ‘Blackheath’. These buildings were identified as having bat roost potential, the layout maintains a minimum 200 m, plus candidate turbine rotor radius, buffer from the buildings, in line with relevant guidance.

3.6.33 In response to consultation feedback, public access and heritage enhancement measures have been incorporated including the installation of noticeboards/information boards and signage, restoration of existing historic sheepfold, use of dry-stone walling and seating, and car parking close to site entrance[7].

**Option E: 2021 Design Chill Layout (February 2022)**

3.6.34 Reductions in turbine numbers to 5 machines, with corresponding reductions in necessary infrastructure. This -re-design has led to a design that incorporates all the turbines on a single row whilst the tip height of the turbines remains at 138.5 m.

3.6.35 The reduced number of turbines provided benefits in respect of lesser infrastructure requirements, development footprint, increasing the offset from all residential properties, increase the offset from the Broch at Thing’s VA and Scrabster Mains.

3.6.36 The substation and control buildings have been relocated from the Hill of Forss plateau to further south west down the Hill of Forss plateau, which will reduce the visual impact of these structures.

3.6.37 The changes to the layout resulted in reduced operational noise levels at properties to the southwest of the proposed development. These properties lie between the proposed development and the existing Baillie wind farm such that reductions in operational noise levels from the proposed development lead to reductions in the cumulative operational noise levels at these locations. The changes to the layout also reduce the change in cumulative noise exposure due to the introduction of the proposed development by limiting the range of wind directions from which all properties that are downwind of turbines belong to the Proposed Development.

**Option F: 2022 Design Freeze Layout (May 2022)**

3.6.38 Following consultation, T3 was moved approximately 60m southeast from its position at Design Chill to help improve the Residential Visual Amenity (RVA) for properties located to the north of the Proposed Development.

7 It is proposed that these measures are conditioned and a final design approved by THC following further consultation with the local community and THC

3.6.39 This turbine reposition also had a corresponding change to the infrastructure position.

**Preferred Option**

3.6.40 The preferred option which has been taken forward for assessment in this EIA Report is Option F which is presented in Chapter 2: Proposed Development and presented on Figure 2.1.

## 3.7 Mitigation by Design

3.7.1 The careful placement of the proposed turbines within the site boundary and the reduction in the number of turbines from 8 to 5 has facilitated effective mitigation, with potentially significant effects avoided or minimised as far as reasonably practicable through the design process. A summary of the potential effects addressed through the design process and the issues remaining following the selection of the final design is provided in Table 3.1 below.

**Table 3.1 – Summary of Mitigation by Design.**

| Topic/Issue | Environmental Constraint / Potential effect | Mitigation by Design | Issues Remaining |
|---|---|---|---|
| Hydrology | Potential pollution of watercourses. | A 50m buffer has been included within the design.<br>Watercourse crossings minimised through design process, and location of crossings selected to avoid damage. | Three number watercourse crossings are required.<br>Further detail on the proposed watercourse crossings. |
| | Increase in flood risk | The scheme has been designed so as to accommodate a SuDs system. | Confirmation that the SuDs system will provide adequate mitigation. |
| Landscape | Potential significant effects on landscape and visual receptors, including:<br>Landscape and seascape character;<br>Landscape designations and classifications (including Special Landscape Areas, Wild Land Areas and National Scenic Areas);<br>Visual receptors, including:<br>residents of settlements, road users; rail passengers<br>tourists; and<br>recreational receptors including cyclists, walkers and hill walkers.<br>Due to the emergent pattern of development, such potential effects were anticipated to include a high proportion of cumulative effects, both in combination and additional effects. | The number of turbines was changed from 5 to 10 and reduced to 5 through the design process and the layout of the remaining turbines was altered to provide the following mitigation:<br>Placement of turbines within landscape of sufficient scale and simplicity and away from distinctive landscape features the scale and form of which could be compromised;<br>Positioning of turbines inland, away from key views of key landmark features and views including the distinctive cliffs and bays of the northern coastline of Caithness, and the land mass of Orkney;<br>Positioning of turbines to ensure sufficient separation from other nearby wind farm sites;<br>Set-back from the most visible prominent slopes of the Hill of Forss;<br>Maintenance of a maximum distance from individual dwellings and Janetstown properties;<br>Minimisation of the amount of site infrastructure and ancillary elements;<br>Location of ancillary elements to minimise visibility from external receptor locations, especially the A836 corridor; and<br>Minimising ‘stacking’ of turbines in views from key neighbouring receptor locations. | EIA Report Volume 2: Chapter 5: Landscape and Visual Amenity provides an assessment of the residual effects of the Proposed Development on landscape and visual receptors. |
| Archaeology and Cultural Heritage | Potential direct effects on cultural heritage assets within the site boundary.<br>Potential effects on the settings of designated heritage assets in the wider landscape.<br>Cumulative effects on the settings of designated heritage assets in the wider landscape. | Siting of turbines and design of tracks and other infrastructure to avoid direct effects on archaeological remains | EIA Report Volume 2: Chapter 6: Archaeology and Cultural Heritage provides an assessment of the residual effects of the proposed development on archaeology and cultural heritage assets. |
| Ecology (non-avian) | Potential effects on sensitive habitats through habitat loss, fragmentation and degradation, including peat forming habitats; | With the exception of access track watercourse crossings, the design incorporates a minimum 50 m buffer distance around all major surface | EIA Report Volume 2: Chapter 7: Non-Avian Ecology assesses the residual effects on aquatic and terrestrial |

| Topic/Issue | Environmental Constraint / Potential effect | Mitigation by Design | Issues Remaining |
|---|---|---|---|
| | Potential effects on protected species e.g. mammals, fish, etc.;<br>Cumulative effects as arising from the addition of the proposed development in combination with other relevant projects; and<br>Potential effects on statutory sites within 5 km designated for ecological interests | watercourses and 25 m buffer off minor watercourses, avoiding direct effects on watercourses;<br>Direct effects on the minor modified watercourse by turbine 2 will be avoided via diversion of the watercourse and improvement of its hydromorphology;<br>A buffer of 200 m plus rotor diameter from turbines and 30 m from other infrastructure was maintained for potential bat roost features;<br>Areas of deep peat have been avoided;<br>The proposed development incorporates good practice drainage design during construction and operation using a multi-tiered sustainable drainage system (SuDS) approach to control the rate, volume and quality of runoff from the proposed development; and<br>Turbines and access tracks avoid or minimise effects on sensitive habitats, including peat forming habitats and potential Groundwater Dependent Terrestrial Ecosystems (GWDTEs), as far as possible based on both habitat mapping and peat probing surveys. | habitats and protected species.<br>EIA Report Volume 4: Technical Appendix 2.1: Outline CEMP presents the approach to protecting and managing surface water quality and quantity.<br>EIA Report Volume 4: Technical Appendix 2.2: Draft Peat Management Plan and Technical Appendix 2.3: Peat Landslide Hazard and Risk Assessment present the approaches to peat management and handling of peat.<br>The GWDTE assessment is presented in EIA Report Volume 4: Technical Appendix 5.1: National Vegetation Classification & Habitats Survey Report. |
| Ornithology | Short-term reduction in breeding or wintering bird populations due to construction disturbance (affecting breeding or foraging behaviour and potentially resulting in a reduction in productivity or survival);<br>Long-term reduction in breeding or wintering bird populations due to the loss/fragmentation of habitat critical for nesting or foraging;<br>Long-term reduction in breeding or wintering bird populations due to collision mortality;<br>Cumulative/In-combination effects with other projects or activities that are constructed during the same period, and/or with projects or activities which pose either a potential collision risk or loss of habitat by displacement; and<br>Potential effects on statutory sites within 20 km designated for ornithological interests. | As a result of the high volume of flight activity recorded below 20 m (mainly by waders and raptors/owls), turbine ground clearance was kept above 20 m (21.5 m, EIA Report Volume 4: Technical Appendix 6.1: Ornithology) to minimise the collision risk to these species; and<br>Areas of suitable goose foraging habitat to the south the proposed development were avoided. | EIA Report Volume 2: Chapter 8: Ornithology assesses the residual effects on birds, including presenting the results of collision risk analysis.<br>EIA Report Volume 2: Chapter 8: Ornithology also describes the appropriate steps to be taken to avoid/mitigate impacts on geese, swans and waders. These include the provision of a Breeding Bird Protection Plan (BBPP), |
| Traffic and Transport | Potential significant effects on traffic and transport receptors, including cumulative effects of committed development, in regard to:<br>▪ Severance;<br>▪ Driver Delay;<br>▪ Pedestrian Delay and Amenity;<br>▪ Accidents and Safety; and<br>▪ Dust and Dirt. | The implementation of a Construction Traffic Management Plan (CTMP) is recommended, though effects of total traffic on receptors are deemed as not significant in accordance with the Institute of Environmental Assessment. Guidelines for the Environmental Assessment of Road Traffic. 1993. | EIA Report Volume 2: Chapter 9: Traffic and Transport provides an assessment of the residual effects of the proposed development on Traffic and Transport. |
| Noise | Potential for significant effects at nearby residential properties due to operational and construction noise with potential for cumulative impact. | The number of turbines and their position was altered to provide the following mitigation:<br>▪ Reduce operational noise levels at nearby properties to minimise the amount of noise management required and improve project efficiency;<br>▪ Reduce cumulative operational noise impacts, particularly with the existing Baillie wind farm, in terms of both noise level and exposure;<br>▪ Maintain separation distances to nearby properties informed by baseline noise monitoring results whereby background noise levels at some locations are less than others; and<br>▪ The use of an enabling works compound allows the main construction compound to be located further from nearby properties, reducing construction noise levels. | See residual impact section of EIA Report Volume 2, Chapter 10: Noise |

| Topic/Issue | Environmental Constraint / Potential effect | Mitigation by Design | Issues Remaining |
|---|---|---|---|
| Hydrology and Hydrogeology | Potential effects on designated sites due to potential changes in surface and/or groundwater quality and quantity;<br>▪ Potential effects on the catchments due to changes in surface and/or groundwater quality and quantity;<br>▪ Potential localised increase in flood risk due to watercourse crossings;<br>▪ Potential effects on GWDTE through changes to site hydrogeology;<br>▪ Potential effects on Public or Private Water Supply (PWS) abstractions due to potential changes in surface and/or groundwater quality and quantity; and<br>▪ Potential for peat slide risk. | With the exception of access track watercourse crossings, the design incorporates a minimum 50 m buffer distance around all major surface watercourses and 25 m buffer off minor watercourses, avoiding direct effects on watercourses;<br>▪ Potential effects on the surrounding water environment have been minimised by utilising existing infrastructure where possible;<br>▪ All watercourse crossings would be designed to accommodate a 1 in 200-year return period peak flow;<br>▪ The number of watercourse crossings has been minimised through the design process, with the location of crossings selected to avoid damage;<br>▪ Direct effects on the minor modified watercourse by turbine 2 will be avoided via diversion of the watercourse and improvement of its hydromorphology;<br>▪ The proposed development incorporates good practice drainage design during construction and operation using a multi-tiered sustainable drainage system (SuDS) approach to control the rate, volume and quality of runoff from the proposed development;<br>▪ The proposed development is outwith any Scottish Water drinking water catchments or water abstraction sources designated as Drinking Water Protected under the Water Framework Directive;<br>▪ There is a single PWS registered within 2 km of the proposed development, however the property no longer uses the registered well and is connected to the public mains and supplied by Scottish Water;<br>▪ Peat depth probing was completed across the site. The design process involved avoiding the areas of greatest peat depths when siting the infrastructure, insofar as possible, taking account of other environmental constraints (e.g. sensitive habitats, ornithology, landscape and visual receptors etc.). Consequently, areas of deep peat have been avoided;<br>▪ Turbines and access tracks avoid or minimise effects on sensitive habitats, including peat forming habitats and potential Groundwater Dependent Terrestrial Ecosystems (GWDTEs), as far as possible based on both habitat mapping and peat probing surveys; and<br>▪ A Peat Landslide Hazard and Risk Assessment has been carried out to assess the potential for peat instability. This assessment concludes that there is a ‘low’ to ‘very low’ risk of peat landslide across at the site. Good practice measures are detailed, and these would be included as part of the CEMP. | Classification & Habitats Survey Report. Mitigation to be applied where GWDTE cannot be avoided to allow the flow of water across/through/under the infrastructure as appropriate. |
| Shadow Flicker | Potential effects of shadow flicker on residential receptors. | The proposed development includes a full Shadow Flicker Assessment to assess the impact. The assessment concludes that with the installation of a shadow flicker management system that all assessed properties would not experience significant residual effects. | EIA Report Volume 2: Technical Appendix 2.8: Shadow Flicker Assessment present the full assessment of Shadow Flicker upon identified properties. |

# 4 Approach to EIA

## 4.1 Introduction

4.1.1 Environmental Impact Assessment (EIA) is a process aimed to ensure that permissions for developments with potentially significant effects on the environment are granted only after assessment of the likely significant environmental effects has been undertaken. The assessment must be carried out following consultation with statutory consultees, other interested bodies and members of the public.

4.1.2 This chapter of the Environmental Impact Assessment(EIA) Report describes the EIA process for Cairnmore Hill Wind Farm (the Proposed Development) and is supported by the following Technical Appendix documents provided in Volume 4 Technical Appendices:

- Technical Appendix 4.1: Scoping Report (January 2022); and
- Technical Appendix 4.2: Scoping Opinion (received February 2022);

## 4.2 EIA Process

4.2.1 With a potential overall generating capacity of up to 21.5 MW, consent for the Development is being sought from the Highland Council (the Council) under the Town and Country Planning (Scotland) Act 1997[1] , as amended by the Planning etc. (Scotland) Act 2006[2] (the Planning Act). The requirement for EIA for wind farm generating stations with an electrical output capacity of up to 50 MW in Scotland is provided under Part 4 of the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017[3] (hereafter referred to as the EIA Regulations).

4.2.2 The EIA Regulations implement European Union (EU) Directive 2014/52/EU[4] which amended Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment.

4.2.3 The EIA Regulations outline the process of an EIA and the criteria that would determine if an EIA is necessary or not, the relevant environmental studies and statements, how the information is evaluated by the Council and consultative bodies, and how this is implemented through consent under the Planning Act.

4.2.4 Schedule 2 of the EIA Regulations lists developments where there are likely to be significant effects on the environment by virtue of factors such as the nature, size or locations of the Proposed Development. For these developments, an EIA is required.

4.2.5 The results of the EIA are presented in this EIA Report which, as prescribed in the EIA Regulations, is required to include a “description of the likely significant effects” of the Proposed Development; the effects which are not considered to be significant do not need to be described. It is therefore necessary for the scope of the EIA to be appropriately and clearly defined to ensure that any likely significant effects are defined, described and assessed.

4.2.6 The preparation and production of the EIA Report has been conducted in accordance with relevant regulations and good practice guidance. Relevant legislation, policy and guidance are referred to in each of the technical assessments within the EIA Report. Overarching regulation, policy and guidance documents have been used in preparing this EIA Report are:

- The Town and Country Planning (Scotland) Act 1997[5] ;
- The Planning etc. (Scotland) Act 2006[6] ;
- The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017[7] ;
- Planning Advice Note (PAN) 1/2013: Environmental Impact Assessment, 2013[8] ;
- Planning Advice Note (PAN) 1/2017: Environmental Impact Assessment, 2017[9] ; and
- Environmental Impact Assessment Handbook (2018)[10].

[1] Scottish Government (1997) Town and Country Planning (Scotland) Act 1997 [Online] Available at: https://www.legislation.gov.uk/ukpga/1997/8/contents (Accessed 27/04/2022)

[2] Scottish Government (2006) Planning etc. (Scotland) Act 2006 [Online] Available at: https://www.legislation.gov.uk/asp/2006/17/contents (Accessed 27/04/2022)

[3] Scottish Government (2017) Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 [Online] Available at: http://www.legislation.gov.uk/ssi/2017/102/contents/made (Accessed 27/04/2022)

[4] European Commission (2014) Directive 2014/52/EU [Online] Available at: https://eur-ex.europa.eu/legalcontent/EN/TXT/?uri=celex%3A32014L0052 (Accessed 27/04/2022)

[5] Scottish Government (1997) Town and Country Planning (Scotland) Act 1997 [Online] Available at: https://www.legislation.gov.uk/ukpga/1997/8/contents (Accessed 27/04/2022)

[6] Scottish Government (2006) Planning etc. (Scotland) Act 2006 [Online] Available at: https://www.legislation.gov.uk/asp/2006/17/contents (Accessed 27/04/2022)

[7] Town and Country Planning (2017) Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 [Online] Available at: http://www.legislation.gov.uk/ssi/2017/102/schedule/4/made (Accessed 27/04/2022)

[8] The Scottish Government (2013, Rev. 2017) Planning Advice Note 1/2013 Environmental Impact Assessment [Online] Available at: http://www.gov.scot/Publications/2013/08/6471 (Accessed 27/04/2022)

[9] Scottish Government (2017) Planning Advice Note 1/2017 Environmental Impact Assessment [Online] Available at: https://www.gov.scot/publications/planning-circular-1-2017-environmental-impact-assessment-regulations2017/ (Accessed 27/04/2020)

## 4.3 EIA Methodology

4.3.1 The EIA Report has been prepared following a systematic approach to EIA and project design. The process of distinguishing environmental effects is iterative and cyclical, running concurrently with the design process, whereby the design of the Proposed Development is refined in order to avoid or reduce potential adverse environmental effects using mitigation as necessary.

4.3.2 The EIA process follows a number of stages broadly in line with the following:

- Site selection and feasibility;
- Pre-application consultation with statutory and non-statutory consultees;
- Scoping to identify key issues on which the EIA should focus;
- Baseline studies to establish the current environmental conditions at the Site;
- Identification of potential environmental effects;
- Mitigation to avoid or reduce the effects through iterative design process;
- Assessment of residual effects;
- Preparation of an EIA Report;
- Submission of the EIA Report;
- Consideration of application and environmental information by the Highland Council (the Council) and other consultees;
- Determination of application (with or without conditions); and
- Implementation and monitoring.

4.3.3 The EIA Regulations require that an EIA Report should include a range of information including: a description of the development (Chapter 2: Proposed Development), a description of reasonable alternatives (Chapter 3: Design Evolution Considerations and Alternatives), baseline information, a description of the likely significant effects of the Proposed Development, and mitigation measures amongst other factors.

4.3.4 This EIA Report has been prepared in accordance with the EIA Regulations and includes the required information.

[10] SNH (2018) Environmental Impact Assessment Handbook [Online] Available at: https://www.nature.scot/handbook-environmental-impact-assessment-guidance-competent-authoritiesconsultees-and-others (Accessed 27/04/2022)

## 4.4 Consultation

4.4.1 Consultation forms an essential part of the EIA. The EIA team and RES (the Applicant) have engaged with a number of interested parties over the course of the project to determine their views on the Proposed Development, inform the design process, and to collect baseline information, principally within the following key stages:

- Scoping – Documentation and agreement on EIA scope and methodologies. Scoping Report issued in January 2022;
- Technical Assessments – Gathering baseline information from relevant organisations and confirming survey methodologies; and
- Informing Site Design including Public Information Days – Communication with local communities and consideration of baseline information; and

### Scoping

4.4.2 As per Section 17 (2) of Part 4 of the EIA Regulations, the Scoping Reports (Technical Appendices 4.1) sought to confirm the scope of the required assessment which is to be provided in the EIA Report (i.e. a Scoping Opinion – Technical Appendices 4.2). To aid this process, the scoping reports included the following:

- A description of the location of the Proposed Development including figures identifying the Site and the parameters of Development;
- Figures identifying the designated and sensitive environmental receptors surrounding the Site;
- A brief description of the nature and purpose of the Proposed Development and its potential resultant effects; and
- Proposed methodology for assessing potential environmental impacts of the Proposed Development.

4.4.3 The Scoping Reports (Technical Appendices 4.1) considered the different aspects of the environment likely to be significantly affected by the Proposed Development and identified those topics which require consideration as part of the EIA, with a view to inviting comments on the approach to the EIA and the content of the EIA Report from the Council and consultees.

4.4.4 The aim of the scoping process is to identify key environmental issues at an early stage, to determine which elements of the Proposed Development are likely to

cause significant environmental effects and identify issues that can be 'scoped out' of the assessment. This establishes the work and level of detail required for preparation of the EIA Report.

4.4.5 The initial request for a Scoping Report (Appendix 4.1) was submitted to the Council in January 2022. The Scoping Report described the Proposed Development, the proposed EIA methodology and the key issues to be addressed. The Scoping Report was sent to a range of consultees as agreed in advance with the Council. The Scoping Opinion were issued by the Council and received in 22nd February 2022; a copy of which are included as Appendices 4.2.

## Public Consultation

4.4.6 Public consultation is a key component of the EIA process. The Applicant has engaged with members of the local community through hosting two rounds of public consultation events in February 2022 and May 2022. Details of the attendance at the two rounds of public exhibitions is listed below:

- Round 1 – 2nd February 2022, virtual consultation event.
- Round 2 – 25th May 2022.

4.4.7 The Round 1 public consultation event provided members of the public the opportunity to speak with representatives of the Applicant and EIA team; learn more about the Proposed Development and preliminary findings of the EIA; and provide comment on the Proposed Development. The aim of the public consultation events was to provide information regarding the Proposed Development and invite comments from the local community to take into account in the iterative EIA process.

4.4.8 The first public consultation was a virtual event as since March 2020 the COVID-19 pandemic has prevented the regular method of face to face community engagement. As a result, the Applicant developed alternative ways to engage with the local community, namely the 'Virtual Exhibition'.

4.4.9 The second exhibition included a series of information boards which outlined details of the Proposed Development as the design evolved, including the proposed number of turbines, access to the Site and anticipated ancillary infrastructure. The latter exhibitions involved a range of visualisations from surrounding viewpoints.

4.4.10 Table 4.1 summarises the steps undertaken to ensure the local community were informed and involved with the process. Further detail of public consultation is provided in the Pre-Application Consultation (PAC) Report which accompanies the application.

**Table 4.1: Consultation Responses**

| Date | Exercise |
|---|---|
| February 2022 | Public notices in John O'Groat Journal and Northern Times as well as posted adverts for those living in the area.<br>Information leaflets with reply cards sent to over 1000 dwellings within 4 km to inform them of upcoming Virtual Exhibition.<br>Virtual Exhibition live from 2nd February and included:<br>• Images showing proposal from various viewpoints;<br>• Project manager video; and<br>• Live chat sessions on 2nd February (1pm-8pm) and<br>Website project page: http://www.cairnmorehill-windfarm.co.uk/ |
| May 2022 | Public exhibitions on 25 May 2022 held at:<br>• Forss Village Hall, Forss (10.00am – 1.00pm)<br>• Pentland Hotel, Thurso (5.00pm – 8.00pm)<br>Advertised through newspaper adverts in Northern Times and John O'Groat Journal.<br>Information leaflets sent to approximately 1000 dwellings within 4 km of the Proposed Development.<br>Exhibition boards were on display at the Public Information Day and brochures were available to take away. More than 50 residents and other interested parties attended the public exhibitions.<br>Website project page: http://www.cairnmorehill-windfarm.co.uk/ |

## Overview

4.4.11 Environmental Impact Assessment (EIA) is a systematic procedure that must be followed for certain categories of project (see Section 4.1.5 and 4.1.6) before they can be determined for planning permission. It aims to assess a project's likely significant environmental effects. This helps to ensure that the importance of the predicted effects and the scope for reducing effects are properly understood by the public and the relevant determining authority before it makes its decision.

4.4.12 The information on the development and its environmental effects are presented in an Environmental Impact Assessment Report (EIA Report). The EIA process that culminates in the submission of the EIA Report has a number of key characteristics:

- it should be systematic, comprising a sequence of tasks defined both by regulation and by practice;
- it should be analytical, requiring the application of specialist skills from the environmental sciences;

- it should be impartial, its objective being to inform decision-making rather than to promote the project;
- it should be consultative, with provision being made for obtaining information and feedback from interested parties including local authorities, members of the public and statutory and non-statutory agencies; and
- it should be iterative, allowing opportunities for environmental concerns to be addressed during the planning and design of a project.

4.4.13 Typically, a number of design iterations take place in response to environmental constraints identified during the EIA process (in effect, incorporating mitigation measures to avoid, reduce or compensate for identified adverse effects). Further details of such measures in this case are presented in the corresponding environmental topic chapters. A summary of design iterations is included at the end of Chapter 2: Proposed Development.

### EIA Regulations

4.4.14 The Town & Country Planning Act (Environmental Impact Assessment) (Scotland) Regulations 2017 will apply to the Proposed Development.

4.4.15 Schedule 1 of the EIA Regulations lists those developments for which an EIA will always be required. Schedule 2 of the EIA Regulations lists developments for which the need for an EIA is determined on a case-by-case basis (i.e. if significant environmental effects are likely), whilst Schedule 3 describes indicative thresholds to be used to determine if a Schedule 2 development is an "EIA development". Where an EIA is required, environmental information must be provided by the applicant in an EIA Report. Schedule 4 specifies the information that must be provided in the EIA Report.

4.4.16 Most wind energy developments fall within Schedule 2 and where the need for EIA is not certain the developer can apply to the determining authority for a screening opinion. It is clear that the potential size of the proposed development means that an EIA would be needed. It is recognised that the EIA process can play an important role in developing the design of proposals to minimise adverse environmental effects and to realise environmental benefits.

4.4.17 While it has been determined that the proposal has the potential for significant environmental effects, this does not mean that a significant effect is the ultimate conclusion of the EIA. The EIA process identifies the potential for adverse effects and then encourages environmental measures (mitigation) to be incorporated into the design of the development, or the method of construction and operation that may reduce or eliminate any negative effects or further enhance positive effects.

### Topics to be addressed

4.4.18 Schedule 4 of the Regulations specifies that the EIA Report should describe those "..aspects of the environment likely to be significantly affected by the development, including, in particular population, fauna, flora, soil, water, air, climatic factors, material assets, including the architectural and archaeological heritage, landscape and the inter relationship between the above factors."

4.4.19 Establishing which aspects of the environment and associated issues are relevant for a particular project is captured in an EIA scoping process.

### The Environmental Impact Assessment Scoping process

4.4.20 Scoping is the process of identifying those aspects of the environment and associated issues that need to be considered when assessing the potential effects of a particular development proposal. This recognises that there may be some environmental elements where there will be no significant issues or likely effects resulting from the Proposed Development and hence where there is no need for further investigation to be undertaken.

4.4.21 Scoping is undertaken through consulting organisations and individuals with an interest in and knowledge of the site, combined with the professional judgement and experience of an EIA team. Scoping takes account of published guidance, the effects of the kind of development under consideration and the nature and importance of the environmental resources that could be affected.

### Spatial scope

4.4.22 In its broadest sense, the spatial scope is the area over which changes to the environment would occur as a consequence of the development. In practice, an EIA should focus on those areas where these effects are likely to be significant.

## 4.5 Assessment Methodology

4.5.1 Following the identification of the scope of the EIA, individual environmental topics are subject to survey, investigation and assessment, and individual topic chapters are prepared for the EIA Report. The assessment methodologies are based on recognised good practice and guidelines specific to each topic area, and details are provided in the appropriate chapter.

4.5.2 In general terms, the technical studies undertaken for each topic area and chapter include:

- Collection and collation of existing baseline information about the receiving environment and original surveys to fill any gaps in knowledge or to update any historic information, along with identification of any relevant trends in, or evolution of, the baseline;
- Consultation with experts and relevant consultees to define the scope of the assessment and study area and subsequent consultation in response to emerging study findings;
- Consideration of the potential effects of the development on the baseline, followed by identification of design changes to seek to avoid or reduce any predicted adverse effects;
- Engagement with other technical topic specialists and engineers / designers in a design iteration process seeking to optimise the scheme for the differing environmental effects and identify any appropriate mitigation measures;
- Assessment of the final scheme design and evaluation of significant effects, together with an evaluation of any residual significant effects after mitigation measures have been implemented; and
- Compilation of the EIA Report chapter.

4.5.3 In reality, many of the effects are relevant to more than one environmental topic area, and careful attention has been paid to interrelationships to avoid overlap of duplication between topic chapters. For example, the assessment of effects on cultural heritage features will be aided by the assessment in the landscape and visual chapter. Similarly, secondary effects on ecological resources arising from hydrological change would be considered in the ecology chapter with a cross-reference to the relevant direct effect in the hydrology and hydrogeology chapter.

4.5.4 The following format has been adopted for the presentation of information within the EIA Report. In some cases, technical data and analysis has been moved to a Technical Appendix that is bound separately from the main EIA Report in Volume 3:

- Summary – A short summary of each technical chapter is included at the outset, this text also forms the basis of that included in the Non-Technical Summary that accompanies the EIA Report;
- Introduction and overview – setting the scene for the topic, the nature of the receptors to be considered, and how the proposals might cause change;
- Methodology – describing how receptors were identified through a scoping process, along with the specific methods used for data gathering, predicting levels of effects and evaluating significance of effects;
- Baseline information – describing the current state and circumstances of the receptors and changes that might be expected to arise in advance of the development being implemented as well as those that might arise regardless of the development;
- Topic specific design evolution – identifying where there was potential for an effect and how the scheme (in terms of the location of elements and their scale) has been developed to address that potential;
- Predicted effects of the scheme – the effects predicted to arise as a result of implementing the final design of the project;
- Mitigation and enhancement measures – identification of non-embedded 'design' measures which may be necessary to control or manage identified potentially significant effects or provide enhancements;
- Assessment of residual effects – an assessment of any effects remaining after non-embedded mitigation measures have been employed; and
- References

## 4.6 Defining significance of effects

4.6.1 Development proposals affect different environmental elements to differing degrees and not all of these are of sufficient concern to warrant detailed investigation or assessment within the EIA process. The EIA Regulations identify those that warrant investigation as those that are "likely to be significantly affected by the development". These are identified through a scoping process as described in Section 2.4.

4.6.2 Conclusions about significance are derived with reference to available information about the project description and the environmental receptors (or 'receiving environment'), and to predictions about the potential changes that the proposed development would cause to the affected receptors.

4.6.3 In each of the environmental topic chapters, professional judgement is used in combination with relevant guidance to assess the interaction of the receptor's sensitivity (this may be defined in terms of importance, value, rarity, quality) against the predicted magnitude of change to identify a level of effect. In general terms, and in order to assist consistent interpretation of the final results of the EIA, receptor sensitivity, magnitude of change and level of effect for each environmental topic.

4.6.4 The type of categorisation provides a guide only, and may be moderated by the professional that undertakes the assessment in accordance with judgement and experience. In particular, the divisions between categories of receptor sensitivity,

magnitude of change, and level of effect should not be interpreted as definitive (and indeed different definitions for each category may be applied by different professionals), and the lines that represent the boundaries between categories should in many cases be considered as 'blurred'. In some cases, the judgement can be guided by quantitative values, whilst in other cases qualitative descriptions are used. The significance of the effect may also need to be qualified with respect to the scale over which it may apply (e.g. local, regional, national, international).

4.6.5 Having defined a level of effect, professional judgement in combination with guidance and standards are then applied to identify which of those levels of effect are then considered to be equivalent to significant effects when discussed in terms of the EIA Regulations.

4.6.6 A definition of how the terms are derived for each topic is set out in the corresponding chapter along with the relevant explanation and descriptions of receptor sensitivity, magnitude of change and levels of effect that are considered significant in terms of the EIA Regulations.

### Type of Effect

4.6.7 The EIA Regulations (Schedule 4, Part 1) require consideration of a variety of types of effect, namely direct/indirect, secondary, cumulative, positive/negative, short/medium/long-term, and permanent/temporary. In this EIA Report, effects are considered in terms of how they arise, their valency (i.e. whether they are positive or negative) and duration. Each will have a source originating from the development, a pathway and a receptor.

4.6.8 Most predicted effects will be obviously positive or negative, and will be described as such. However, in some cases it is appropriate to identify that the interpretation of a change is a matter of personal opinion, and such effects will be described as 'subjective'.

4.6.9 The temporal scope of environmental effects is stated where known. Effects are typically described as:

- Temporary – these are likely to be related to a particular activity and will cease when the activity finishes. The terms 'short-term' and 'long-term' may also be used to provide a further indication of how long the effect will be experienced; and
- • Permanent – this typically means an unrecoverable change.

4.6.10 Effects are generally considered in relation to the following key stages of the development:

- Construction – effects may arise from the construction activities themselves, or from the temporary occupation of land. Effects are often of limited duration although there is potential for permanent effects. Where construction activities create permanent change, the effects will obviously continue into the operational period;
- Operation – effects may be permanent, or (as is typical with wind power developments) they may be temporary, intermittent, or limited to the life of the development until decommissioning; and
- Decommissioning - effects may arise from the decommissioning activities themselves, or from the temporary occupation of land. The effects would generally be temporary and of limited duration and additional permanent change would normally be unlikely unless associated with restoration.

## 4.7 The scope of the Environmental Impact Assessment for the Proposed Development

### Screening

4.7.1 Formal screening was not undertaken, as it was recognised at an early stage that due to the size of the Proposed Development an EIA would be required.

### The scoping request and scoping opinion

4.7.2 The content of the EIA Report and the identification of receptors requiring assessment for the proposed development were determined through the advice provided to the Applicant through a Scoping process. A Scoping Report (Technical Appendix 4.1) was submitted on 6th January 2022 to the Highland Council to define the information to be provided in the EIA Report. The environmental disciplines included in the Scoping Report are listed below:

- Ecology and Nature Conservation;
- Ornithology;
- Landscape and Visual Impact
- Hydrology, Hydrogeology Geology & Peat;
- The Historic Environment;
- Traffic and Transport;
- Noise;
- Climate Change;
- Air Quality;
- Infrastructure;
- Shadow Flicker & Safety; and
- Socio-Economic

4.7.3 Formal responses to the Scoping Report were issued by consultees, and the THC scoping response to the Proposed Development is presented in Technical Appendix 4.2.

## 4.8 Consultation with local residents

4.8.1 Community consultation is at the centre of RES' approach to development, not only in the pre-application stage, but also throughout the life of the project. This is delivered through an online consultation website (http://www.cairnmorehill-windfarm.co.uk), newsletters, virtual community liaison, virtual exhibitions and advertisements in local newspapers.

4.8.2 In February RES distributed newsletters to the local community, including businesses and local authority councillors. The newsletter provided an overview of the proposed Development and invited recipients to the community open day. The virtual exhibition was also advertised in the two local newspapers.

4.8.3 A new online consultation page was developed for the website which was live from Tuesday 2nd February until 16th February 2022. This gave stakeholders the flexibility to view the information presented and give feedback over a longer period than the standard public community open days.

4.8.4 Two public exhibition events were held on 25th May at 10am to 1pm and 5pm to 8pm. 36 people attended the sessions and were able to discuss issues relating to the proposal and wider climate emergency with the Development Project Manager at RES. The evening session attracted over 23 residents,

4.8.5 As well as being able to discuss the development alongside the wider issues of climate change, energy security, government support etc, members of the development team were able to demonstrate the difference in landscape impact between the consented tip height turbines and the proposed tip height turbines via photomontages.

4.8.6 Comments forms were completed by numerous attendees.

4.8.7 A Pre-Application Consultation Report has been provided to support the planning application for the Proposed Development.

# 5 Landscape and Visual Impact Assessment

## 5.1 Introduction

5.1.1 The Landscape and Visual Impact Assessment (LVIA) considers the potential effects of the Proposed Development on the landscape and visual resources of the site and the surrounding study area, during the construction, operational and decommissioning phases of the project.

5.1.2 Landscape character and resources are considered to be of importance in their own right and are valued regardless of whether they are seen by people. Effects on views and visual amenity as perceived by people are clearly distinguished from, although closely linked to, effects on landscape character and resources. Landscape and visual assessments are therefore separate, although linked, processes.

5.1.3 The assessment methodology for the LVIA has been developed in accordance with the Guidelines for Landscape and Visual Impact Assessment (Version 3, 2013) (GLVIA3), and is detailed in Technical Appendix 5.1. The assessment has been undertaken by chartered Landscape Architects at LUC.

5.1.4 This chapter should be read in conjunction with the following chapters:

- Chapter 2: Proposed Development;
- Chapter 6: Cultural Heritage;
- Chapter 7: Ecology; and
- Chapter 13: Socio-Economics

5.1.5 This chapter is supported by LVIA figures contained in this Volume, LVIA Visualisations in Volume 3b (to NatureScot and The Highland Council standards respectively) and the following Appendices:

- Technical Appendix 5.1: LVIA and Visualisation Methodology; and
- Technical Appendix 5.2: Residential Visual Amenity Assessment.

5.1.6 The study area for the assessment was defined as 40 km from the outermost turbines of the Proposed Development in all directions, as recommended in current guidance for turbines between 131-150 m to blade tip[1], and in agreement with statutory consultees NatureScot (formerly SNH) and The Highland Council (THC). The site is shown on Figure 5.1.1: Landscape and Visual Impact Assessment Study Area.

5.1.7 To consider cumulative effects of the Proposed Development in relation to other schemes in the wider area, wind farms within 40 km of the Proposed Development have been included. They are modelled within visualisations and examined in the detailed assessment, as agreed with NatureScot and THC. A review of patterns of development is also provided.

## 5.2 Scope of Assessment

### Effects Assessed in Full

5.2.1 The project was subject to a previous application, which considered 8 turbines at 138.5 m to tip height. The findings from the LVIA in the 2020 Environmental Statement[2] (2020 LVIA) which supported that application were reviewed, alongside undertaking further field work and assessment for this new project.

5.2.2 The following effects have been assessed in full:

- Direct effects on the physical landscape of the site, during construction, operation and decommissioning;
- Indirect effects on landscape character within the wider study area (within 15 km) during operation;
- Indirect effects on the key characteristics and special qualities of designated landscapes and areas of Wild Land Areas (within 15 km) during operation, including the overall integrity of the designated landscape as required by Scottish Planning Policy (SPP)[3];
- Effects on visual amenity relating to changes in views experienced by people from representative viewpoints within 40 km, during operation;
- Effects on visual amenity relating to changes in views experienced by people from nearby settlements (within 15 km) and routes (within 15 km), during operation; and
- Effects on landscape and visual receptors relating to the interaction between the Proposed Development and other existing or proposed wind farms (cumulative effects), during operation.

5.2.3 In accordance with the EIA Regulations, the key objective of the assessment is to identify, describe and assess the likely significant landscape and visual effects of the Proposed Development.

### Effects Scoped Out

1 SNH (February 2017) Visual Representation of Wind Farms Guidance. Version 2.2
2 RES (2020) Cairnmore Hill Wind Farm Environmental Statement.
3 The Scottish Government (2014) Scottish Planning Policy

5.2.4 On the basis of the desk based and field work undertaken, the professional judgement and experience of the LVIA team and policy guidance or standards, the following effects have been 'scoped out' (in agreement with statutory consultees):

- Effects on receptors beyond 40 km from the site, where it is judged that potential significant effects are unlikely to occur;
- Locations where receptors are unlikely to be affected by the Proposed Development, through having minimal or no predicted visibility, as predicted by the ZTV mapping (Figures 5.1.2a and b);
- Effects on landscape character beyond a 15 km radius from the outermost wind turbines of the Proposed Development and where the potential for significant effects on landscape character is limited, unless otherwise stated;
- Effects on designated landscapes and Wild Land Areas beyond a 15 km radius from the outermost wind turbines of the Proposed Development and from where it is judged that potential significant effects on special qualities or key attributes are unlikely to occur;
- Effects on views from routes and settlements beyond a 15 km radius from the outermost wind turbines of the Proposed Development and where the potential for significant visual and sequential effects is limited, unless otherwise stated;
- Cumulative effects in relation to turbines of less than 50 m to blade tip, single turbines beyond 5 km and wind farms at design/scoping stage (except where otherwise stated); and
- Given their transient nature, landscape effects on LCTs beyond the site boundary, visual effects and cumulative landscape and visual effects during the construction and decommissioning phases.

## 5.3 Assessment Methodology

### Overview

5.3.1 The LVIA methodology was prepared in accordance with the principles contained within GLVIA3 and is described in detail in Technical Appendix 5.1.

5.3.2 The key steps in the methodology for assessing both landscape and visual effects are as follows:

- The landscape of the study area was analysed and landscape receptors identified;
- The area in which the Proposed Development may be theoretically visible was established through creation of a ZTV map covering a distance of 40 km from the proposed turbines;
- The visual baseline was recorded in terms of the places where people will be affected by views of the Proposed Development, and the nature of views and visual amenity, seen by different groups of people;
- Viewpoints were selected (including representative viewpoints, specific viewpoints and illustrative viewpoints), in consultation with NatureScot and THC;
- Likely effects on landscape and visual resources were identified; and
- The significance of landscape and visual effects were judged with reference to the sensitivity of the resource/receptor (its susceptibility and value) and magnitude of change (taking cognisance of the scale of effect, geographical extent, duration and reversibility).

### Legislation and Guidance

#### Legislation

5.3.3 Information relating to relevant international and national legislation is provided in **Chapter 1: Introduction**.

#### Guidance

5.3.4 The LVIA has been carried out in accordance with, and with reference to the information and principles contained in:

**Assessment Guidance**

- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations (2017);
- Landscape Institute and the Institute of Environmental Management and Assessment (2013) Guidelines for Landscape and Visual Impact Assessment, 3rd Edition (GLVIA3);
- Landscape Institute (2019) Technical Guidance Note 06/19 Visual representation of development proposals;
- Landscape Institute (2019) Technical Guidance Note 02/19 Residential Visual Amenity Assessment;
- NatureScot(2021) Assessing the cumulative impact of onshore wind energy developments;
- SNH (2020) Assessing impacts on Wild Land Areas – technical guidance;
- SNH (2018) A Handbook on Environmental Impact Assessment, Appendix 2: Landscape and Visual Impact Assessment, Version 5;
- SNH (2017) Visual Representation of Wind Farms, Version 2.2; and
- THC (2016) Visualisation Standards for Wind Energy Developments.

**Design and Locational Guidance**

- SNH (2019) Good Practice During Windfarm Construction, Version 3;
- SNH (2017) Siting and Designing Wind Farms in the Landscape, Version 3a;
- SNH (2015) Spatial Planning for Onshore Wind Turbines – Natural Heritage Considerations;

- SNH (2015) Constructed Tracks in the Scottish Uplands, 2nd Edition;
- SNH (updated 2009) Policy Statement No 02/02: Strategic Locational Guidance for Onshore Windfarms in Respect of the National Heritage;
- Scottish Government (2021) Onshore Wind Policy Statement Refresh 2021;
- Scottish Government (2021) Our Fourth National Planning Framework (NPF4);
- Scottish Government (2017) Scottish Energy Strategy: The Future of Energy in Scotland;
- Scottish Government (2014) Scottish Planning Policy; and
- Scottish Government (2003) Planning Advice Note (PAN) 68: Design Statements.

### Landscape Character and Designated Landscapes

- Council of Europe (2000) European Landscape Convention;
- SNH (2019) National Landscape Character Assessment;
- SNH (2005) An Assessment of the Sensitivity and Capacity of Scottish Seascape in Relation to Windfarms;
- THC (2011) Assessment of Highland Special Landscape Areas; and
- Historic Environment Scotland Inventory of Gardens and Designed Landscapes4.

### Local Development Plans and Supplementary Planning Guidance

- THC (2017) Landscape Sensitivity Appraisal: Caithness and Black Isle, Surrounding Hills and Moray Firth Coast, Addendum Supplementary Guidance: 'Part 2b';
- THC (2016) Onshore Wind Energy Supplementary Guidance;
- THC (2012) Highland-wide Local Development Plan; and
- THC (2006) Highland Renewable Energy Strategy and Planning Guidelines.

## Consultation

5.3.5 In undertaking the assessment, consideration has been given to the scoping responses and other consultation undertaken as detailed in Table 7.1 below.

**Table 5.1: Consultation Responses**

| Consultee | Scoping/Other Consultation and Date | Issue Raised | Response/Action |
|---|---|---|---|
| THC | Scoping Opinion 22nd Feb 2022 (22/00234/SCOP) | Additional viewpoint requested to better represent views from the A836, near Reay.<br>Request inclusion of VP14 – A9 North of Mybster Substation, as forestry is the screening feature and this may change. | VP17 – A836 near Reay, included as an LVIA viewpoint.<br>VP14 included at request of THC. A photo/wireline has been prepared from this viewpoint. |
| | | Request assessment from Core Paths.<br>Request turbines below 50 m included in cumulative assessment.<br>Request an assessment from the Flow Country and Berriedale Coast SLA and Farr Bay, Strathy and Portskerra SLA.<br>Content that effects on Wild Land are scoped out. | Core Paths, within 5 km of proposed turbines, included in sequential assessment.<br>Turbines below 50 m to tip height, within 5 km of proposed turbines, included in CLVIA.<br>Effects on the Flow Country and Berriedale Coast SLA and Farr Bay, Strathy and Portskerra SLA are considered.<br>Effects on Wild Land scoped out. |
| NatureScot | Scoping Opinion 15th Feb 2022 (CEA165746) | No specific landscape comments raised. | - |
| THC | Post Scoping Consultation – Viewpoints and CLVIA | No response | - |

### Study Area

5.3.6 The study area for the assessment is defined as 40 km radius from the outermost turbines of the Proposed Development, as recommended in NatureScot guidance for turbines between 131-150 m to blade tip[5]. The study area is shown in Figure 5.1.1.

5.3.7 To consider cumulative effects of the Proposed Development in relation to other schemes in the wider area, wind farms within 40 km of the Proposed Development have been included. These inform the modelling and assessment, as agreed with NatureScot and THC. A review of patterns of wind farm development across the study area is also provided (see Figure 5.1.8).

5.3.8 A ZTV map was generated, illustrating areas from where the Proposed Development may be visible in the study area. The ZTV is based on bare earth topography and therefore does not take account of potential screening by vegetation or buildings. The ZTV is used as tool for understanding where significant visual effects may occur. Receptors which are outside the ZTV will not have visibility of the Proposed

4 Historic Environment Scotland, http://portal.historicenvironment.scot/

5 SNH (2017) Visual Representation of Wind Farms, Version 2.2

Development and are not considered further in this LVIA. The ZTV to blade tip height (138.5 m) is shown in Figure 5.1.2a and b, and the ZTV to hub height (80 m) is shown in Figure 5.1.3a and b.

### Desk Based Research and Data Sources

5.3.9 The following data sources have informed the assessment:

**Mapping**

- Ordnance Survey (OS) Maps at 1:50,000 Scale (Landranger) and 1:25,000 Scale (Explorer);
- Online map search engines; and
- British Geological Survey website, 2020.

**Modelling**

- OS Terrain 5 and 50 height data;
- Raster Data at 1:50,000 (to show surface details such as roads, forest and settlement detail equivalent to the 1:50,000 scale Landranger maps); and
- Raster Data at 1:250,000 (to provide a more general location map).

**Cumulative Assessment**

- Data from other wind farm applications; and
- THC and the ECU planning portals.

### Field Survey

5.3.10 Field survey work was carried out during several visits under differing weather conditions between February 2022 and May 2022, and records were made in the form of field notes and photographs. Field survey work included visits to the site, viewpoints, designated landscapes, Wild Land Areas and extensive travel around the study area to consider potential impacts on landscape character and on experiences of views seen from specific viewpoints, settlements and routes.

### Visualisation and Modelling

5.3.11 The methodology for producing the visualisations was based on current good practice guidance as set out by NatureScot[6] and THC[7]. Detailed information about the approach to viewpoint photography, ZTV and visualisation production is provided in Technical Appendix 5.1.

## Assessing Significance

### Sensitivity Criteria

5.3.12 Judgements regarding the sensitivity of landscape or visual receptors require consideration of both the susceptibility of the landscape or visual receptor to the type of development proposed and the value attached to the landscape or visual resource. Judgements are recorded as **high**, **medium** or **low**. Detailed information about the approach to assessment of sensitivity is provided in Technical Appendix 5.1.

### Magnitude of Change

5.3.13 Judgements regarding the magnitude of landscape or visual change are recorded as **high**, **medium** or **low** and combine an assessment of the scale and geographical extent of the landscape or visual effect, its duration and reversibility. Detailed information about the approach to assessment of magnitude is provided in Technical Appendix 5.1.

### Significance Criteria

5.3.14 The predicted significance of the effect is determined through a standard method of assessment based on professional judgement and guidance, considering both sensitivity and magnitude of change. **Major** and **moderate** effects are considered significant in the context of the EIA Regulations.

5.3.15 Judgements are made on a case by case basis. Technical Appendix 5.1 provides full details of the criteria considered in judging the identified aspects of sensitivity (susceptibility and value) and magnitude of change (scale, geographical extent, duration and reversibility), and the grades used to describe each. In terms of the direction of effects (beneficial or adverse) there is a wide spectrum of opinion with regard to wind energy development. Taking a precautionary stance, effects are assumed to be adverse unless stated otherwise.

### Cumulative LVIA (CLVIA)

5.3.16 The aim of a Cumulative Landscape and Visual Impact Assessment (CLVIA) is to *"describe, visually represent and assess the ways in which a proposed windfarm would have additional impacts when considered together with other existing, consented or proposed windfarms"* (Para. 55, SNH, 2012).

5.3.17 The cumulative assessment therefore focuses on the 'additional' cumulative change which may result from the introduction of a proposed wind farm. The cumulative assessment also makes reference to 'total' (also referred to as combined) cumulative effects, where these have the potential to be significant.

6 SNH (2017). Visual Representation of Wind Farms, Version 2.2.

7 THC (2016) Visualisation Standards for Wind Energy Developments

5.3.18 As with an LVIA, a CLVIA deals with cumulative landscape and visual effects separately.

5.3.19 Existing wind farms and those under construction have been assessed in the 'primary' LVIA, as part of the LVIA baseline (these are listed in Table 5.2). The CLVIA considers effects arising from the Proposed Development in a potential future landscape in which proposed wind farms are assumed to be present. The list of wind farms was derived using the following parameters and in consultation with NatureScot and THC:

- Turbines below 50 m to tip are omitted;
- Scoping/Design stage schemes are omitted (these have been mapped on Figure 5.1.8 for context); and
- Single turbines beyond 5 km are omitted.

5.3.20 The potential future baseline has been split into two possible scenarios:

- Scenario 1 – operational, under construction **and consented wind farms** (for which there is a higher level of certainty); and
- Scenario 2 - Scenario 1 **plus wind farms at appeal and scoping stage** (for which there is a lower level or certainty).

5.3.21 These developments are listed in Table 5.2 below and shown on Figure 5.1.8. All scoping stage schemes have been mapped on this figure. However, given the limited number of scoping stage schemes within the more immediate context (5 km) these have not been shown in the cumulative wirelines or considered in the CLVIA, given the level of uncertainty around these schemes.

**Table 5.2: Existing Wind Farm Developments**

| Distance (km)[8] | Wind Farm | Status | Blade Tip Height (m) | Number of Turbines |
|---|---|---|---|---|
| **Operational (included in primary LVIA baseline and Scenario 1 and 2 cumulative baseline)** | | | | |
| 29.44 | Achairn | Operational | 100 | 3 |
| 18.49 | Achlachan | Operational | 115 | 5 |
| 22.07 | Bad a Cheo | Operational | 112 | 13 |
| 4.55 | Baillie | Operational | 110 | 21 |
| 33.42 | Bettyhill | Operational | 120 | 2 |
| 26.69 | Bilbster | Operational | 100 | 3 |
| 33.95 | Buolfruich | Operational | 70 | 15 |
| 35.11 | Burn of Whilk | Operational | 116 | 9 |
| 28.5 | Camster | Operational | 100 | 25 |
| 20.41 | Causeymire - Phase 1 | Operational | 101 | 21 |
| 4.48 | Forss - Phase 1 | Operational | 76 | 2 |
| 4.63 | Forss - Phase 2 | Operational | 78 | 4 |
| 21.26 | Halsary | Operational | 120 | 15 |
| 21.55 | Lochend | Operational | 99.5 | 4 |
| 27.64 | Strathy North | Operational | 107 | 33 |
| 27.66 | Stroupster | Operational | 110 | 13 |
| 27.53 | Wathegar | Operational | 101 | 5 |
| 28.56 | Wathegar 2 | Operational | 110 | 9 |
| **Consented (included in Scenario 1 and 2 cumulative baseline)** | | | | |
| 19.1 | Achlachan 2 | Consented | 110 | 3 |
| 37.59 | Berriedale and Dunbeath Community | Consented | 74 | 3 |
| 34.21 | Binga Fea | Consented | 74 | 2 |
| 29.14 | Camster II | Consented | 126.5 | 11 |
| 24.43 | Cogle Moss | Consented | 99.5 | 12 |
| 15.37 | Dounreay Tri Demo | Consented | 201 | 2 |
| 31.94 | Golticlay | Consented | 130 | 19 |
| 4.04 | Hill of Lybster | Consented | 99.5 | 1 |
| 33.99 | Hoy | Consented | 149.9 | 6 |
| 9.66 | Limekiln Extension | Consented | 149.9 | 5 |
| 31.03 | Rumster Forest - Lybster | Consented | 75 | 3 |
| 31.71 | Strathy South | Consented | 200 | 35 |
| 27.27 | Strathy Wood | Consented | 180 | 13 |
| **Application stage (included in Scenario 2 cumulative baseline)** | | | | |
| 28.23 | Armadale (Cromsac Hill) | Application Submitted | 149.9 | 12 |
| 4.23 | Forss III (formerly Forss Extension) | Application Submitted | 100 | 2 |
| 11.12 | Limekiln | Application submitted (Note: consented post cumulative cut-off date) | 149.9 | 19 |
| 23.12 | Hollandmey | Application Submitted | 149.9 | 10 |
| 20.66 | Tormsdale | Application Submitted | 149.9 | 12 |

8 This is an approximate distance taken between the approximate centre point of each wind farm.

| Distance (km)[8] | Wind Farm | Status | Blade Tip Height (m) | Number of Turbines |
|---|---|---|---|---|
| Appeal/Public Inquiry (included in Scenario 2 cumulative baseline) | | | | |
| 25.83 | Slickly | Appeal/ Public Inquiry | 149.9 | 11 |

5.3.22 The cumulative cut-off date was set on 09/05/2022. Change to the cumulative baseline following this date include:

- Limekiln has been consented. The consented scheme includes the deletion of two turbines from the original 21 turbine application layout.

5.3.23 Although all of these wind farms are considered in the cumulative assessment, the assessment focused on the relationship of the Proposed Development with the closest wind farms or groups of wind farms, with which significant cumulative effects are most likely. For the cumulative assessment, these groupings include:

- The operational Baillie, which is located within 5 km to the south-east. This operational scheme has also been considered in the baseline. Refer to Figure 5.1.9 for comparative ZTV with the Proposed Development.
- The Forss Wind Farm group, which is located within 5 km to the north-west. This includes operational turbines which are considered in the baseline. Refer to Figure 5.1.10a and b for comparative ZTV with the Proposed Development.
- The south-east wind farm group, located beyond 15 km to the south-east and includes Halsary, Bad a Cheo, Causeymire, Achlachan, Achlachan 2 and Tormsdale. This includes operational turbines which are considered in the baseline. Refer to Figure 5.1.11a and b for comparative ZTV with the Proposed Development.
- The south-west wind farm group, located approximately 8 km to the south-west. This includes the consented Limekiln Extension and the proposed Limekiln (now consented). Refer to Figure 5.1.12a and b for comparative ZTV with the Proposed Development.
- The offshore consented Dounreay Tri Demo, which is beyond 15 km to the north-west. Refer to Figure 5.1.13 for comparative ZTV with the Proposed Development.

**Assessment Limitations**

5.3.24 No substantial information gaps have been identified during the preparation of baseline information or in undertaking the assessment, and it is considered that there is sufficient information to enable an informed decision to be taken in relation to the identification and assessment of likely significant effects on landscape, views and visual amenity. Wireframes and ZTVs are based on published digital terrain model data and reflect the resolution and any limitations of the source dataset.

## 5.4 Landscape Baseline Conditions

5.4.1 This section presents an overview of the landscape baseline covering current landscape character (including constituent landscape elements), landscape condition and any designations attached to the landscape. Where appropriate, baseline information from the 2020 LVIA has been included and verified.

### The Site and Study Area

5.4.2 The site lies approximately 4.5 km to the west of Thurso, within THC local authority area. The site is located across the ridge between Cairnmore Hillock (134 m Above Ordnance Datum (AOD)) and Scrabster Hill (144 m AOD), to the south of the A826 which links Thurso to Melvick. The study area, shown in Figure 5.1.1, extends to 40 km from the outermost turbines of the Proposed Development in all directions.

5.4.3 The Proposed Development would be located within an undulating lowland that varies in elevation between sea level and up to 144 m AOD, the highest points comprising low hills and ridges. The Proposed Development would be located on one such ridge which is orientated northeast to southwest. With the exception of a small number of bays such as Dunnet Bay and Sandside Bay, the coast is marked by steep cliff exposures that form an abrupt edge to the coast.

5.4.4 Further inland to the south-west and south, the landscape rises to form a series of sweeping moorlands at elevations of up to 180 m AOD, but with high summits and individual hills of up to 290 m OAD.

5.4.5 Land use in the study area is characterised by a distinct contract between the agricultural lowlands which also contain the principal areas of settlement, transportation corridors as well as power infrastructure, and the largely undeveloped uplands that play host to peatlands and moorland, interspersed with large scale coniferous forests.

### Landscape Character Types

5.4.6 This section provides a description of landscape character (including constituent landscape elements) – drawing on the NatureScot National Landscape Character Assessment (2019)**9**, and supplemented with project specific research and field work where relevant.

5.4.7 The site is located within Landscape Character Type (LCT) 143: Farmed Lowland Plain, as shown in Figure 5.1.4. The wider study area includes many different LCTs

9 SNH (2019) Scottish Landscape Character Types Map and Descriptions

from lowland, coastal and farmland areas to upland moorlands and mountainous areas.

5.4.8 The LCTs within 40 km of the Proposed Development are illustrated on Figure 5.1.4 and listed in Table 5.3 below. Figure 5.1.5 shows the ZTV at blade tip height (138.5 m) across LCTs within the study area.

5.4.9 The theoretical visibility of the Proposed Development (ZTV coverage) is used as a means of identifying which LCTs require further assessment, and which LCTs can be scoped out because they are unlikely to experience significant effects as a result of the Proposed Development.

5.4.10 Field work and assessment was undertaken to underpin decisions about scope for the current assessment, recognising that the Proposed Development will be different. The findings from the landscape assessment in the 2020 LVIA (refer to 2020 Technical Appendix 4) which considers a larger development, were also reviewed to help understand which LCT require detailed assessment.

5.4.11 LCTs with limited theoretical visibility/ distant LCTs/ LCT where the key characteristics are unlikely to be significantly altered by wind farm development at the site, are not considered further within the assessment.

**Table 5.3: Landscape Character Types**

| Landscape Character Type | Assessed in LVIA |
|---|---|
| Farmed Lowland Plain (143) | Yes - Proposed Development is located in this LCT. |
| High Cliffs and Sheltered Bays (141) | Yes – areas of widespread theoretical visibility within 15 km. |
| Sweeping Moorland and Flows (134) | Yes – areas of widespread theoretical visibility within 15 km. |
| Sandy Beaches and Dunes (140) | Yes – areas of theoretical visibility within 15 km. |
| Coastal Crofts and Small Farms (144) | No – very limited theoretical visibility to the south of this LCT, around 15 km distance. Significant effects on landscape character are considered unlikely. |
| Strath – Caithness and Sutherland (142) | No – very limited theoretical visibility. Significant effects on landscape character are considered unlikely. |
| Rocky Hills and Moorland (136) | No – intermittent pattern of visibility, beyond 20km. Significant effects on landscape character are considered unlikely. |
| Moorland Hills – Orkney (314) | No – beyond 25 km with a somewhat limited pattern of theoretical visibility. When visible, will be seen in longer distance views in which distant wind farms have already altered the context. Significant effects on landscape character are considered unlikely. |
| Cliffs – Orkney (307) | No – due to viewing distance (beyond 25 km), and context of outward views to the south-west, which have been altered by wind energy development, significant effects on landscape character are considered unlikely. |
| Inclined Coastal Pasture (302) | No – limited and distant theoretical visibility. Significant effects on landscape character are considered unlikely. |
| Whaleback Islands (296) | No – beyond 30 km with a somewhat limited pattern of theoretical visibility. When visible, will be seen in longer distance views in which distant wind farms have already altered the context. Significant effects on landscape character are considered unlikely. |
| Rounded Hills - Caithness & Sutherland (135) | No – beyond 30 km with a somewhat limited pattern of theoretical visibility. When visible, will be seen in longer distance views in which distant wind farms have already altered the context. Significant effects on landscape character are considered unlikely. |
| Enclosed Bays (305) | No – very limited theoretical visibility. Significant effects on landscape character are considered unlikely. |
| Rugged Hills (316) | No – beyond 30 km with a somewhat limited pattern of theoretical visibility. When visible, will be seen in longer distance views in which distant wind farms have already altered the context. Significant effects on landscape character are considered unlikely. |
| U-Shaped Valley (315) | No – limited and distant theoretical visibility. Significant effects on landscape character are considered unlikely. |
| Lone Mountains (138) | No – intermittent theoretical visibility from areas of site facing hill flanks and summits. Due to distance (beyond 30 km) and intervening context (with operational wind farms present) significant effects on landscape character considered unlikely. |
| Holms (295) | No - beyond 30 km. When visible, will be seen in longer distance views in which distant wind farms have already altered the context. Significant effects on landscape character are considered unlikely. |
| Low Moorland (311) | No – beyond 35 km with a somewhat limited pattern of theoretical visibility. When visible, will be seen in longer distance views in which distant wind farms have already altered the context. Significant effects on landscape character are considered unlikely. |
| Undulating Island Pasture (299) | No – beyond 35 km with a somewhat limited pattern of theoretical visibility. When visible, will be seen in longer distance views in which distant wind farms have already altered the context. Significant effects on landscape character are considered unlikely. |

| Landscape Character Type | Assessed in LVIA |
|---|---|
| Plateau Heath and Pasture (312) | No – limited and distant theoretical visibility. Significant effects on landscape character are considered unlikely. |
| Coastal Hills and Heath (306) | No - on edge of LVIA study area. When visible, will be seen in longer distance views in which distant wind farms have already altered the context. Significant effects on landscape character are considered unlikely. |
| North Caithness and Pentland Firth Seascape Character Unit (Seascape Unit 8) | Yes – widespread visibility within 15 km. |

## Designated Landscapes

5.4.12 The site is not within any designated landscapes but there are a number of designated landscapes within the study area as shown in Figure 5.1.6 and listed in Table 5.4 below. This includes two National Scenic Areas and the Dunnet Head Special Landscape Area (SLA), which covers the coastal edge and headland to the north of Castletown.

5.4.13 There are a small number of Gardens and Designed Landscapes (GDLs) within the study area some of which are open to members of the public. The closest is Castle of May (Barrogill Castle) which is located beyond 20 km from the Proposed Development. Effects on the setting of GDLs is considered in **Chapter 6: Cultural Heritage**.

5.4.14 The ZTV along with an understanding of the special qualities of each area is used as a means of identifying which designated landscapes require further assessment. Figure 5.1.7 shows the ZTV at blade tip height (138.5 m) across designated landscapes within the 40 km study area.

5.4.15 Field work and assessment was undertaken to underpin these decisions about scope for the current assessment, recognising that the Proposed Development will be different.

5.4.16 The findings from the landscape assessment in the 2020 LVIA (refer to 2020 Technical Appendix 4) which considers a larger development (more turbines), have also been reviewed to help inform the decision about which designated landscapes require detailed assessment.

**Table 5.4: Designated Landscapes**

| Designated Landscapes | Assessed in LVIA |
|---|---|
| **National Scenic Areas (NSA)** | |
| Hoy and West Mainland | No - beyond 30 km. Theoretical visibility focused to an intermittent pattern in the southern extents of the NSA. When visible, will be seen in longer distance views in which distant wind farms have already altered the context. Significant effects are considered unlikely. |
| Kyle of Tongue | No – very limited and distant visibility. Significant effects are considered unlikely. |
| **The Highland Council Special Landscape Areas (SLA)** | |
| Dunnet Head | Yes – widespread theoretical visibility within 15 km. |
| Farr Bay, Strathy and Portskerra | Yes – included at request of THC, through scoping opinion. |
| The Flow Country and Berriedale Coast | Yes – included at request of THC, through scoping opinion. |
| Duncansby Head | No – very limited and distant visibility. Significant effects are considered unlikely. |
| Bens Griam and Loch nan Clar | No – limited and distant (beyond 30km) visibility. Significant effects are considered unlikely. |

## Wild Land Areas

5.4.17 Wild Land Areas (WLA) are not designated but have been mapped**10** and described**11** by NatureScot, and are considered sensitive to development. They are classified as "*areas of significant protection*" within Scottish Planning Policy (SPP) (Table 1. Page 39, SPP) which states that development proposed within these areas should "*demonstrate that any significant effects on the qualities of these areas can be substantially overcome by siting, design or other mitigation*".

5.4.18 There are three WLAs within the study area, as shown on Figure 5.1.6.

5.4.19 The Causeymire-Knockfin Flows WLA (36) and Hoy WLA (41) are both located over 20 km from the Proposed Development. The pattern of ZTV coverage across both WLA is intermittent. When visible, the Proposed Development will be seen in long distance views outside the WLA's. These longer views, looking outside of the WLA, have largely been altered by wind farm development. Figure 5.1.9 highlights theoretical visibility of the operational Baillie Wind Farm (21 turbines at 110 m to tip height), which is located approximately 3 km to the south-west of the site. As such, no significant effects on the key attributes of either WLA are considered likely, and these WLA are not considered further.

10 https://www.nature.scot/wild-land-2014-maps

11 https://www.nature.scot/wild-land-area-descriptions

5.4.20 The East Halladale Flows WLA (39), is located approximately 11 km to the south-west of the Proposed Development. The key attributes12 of this WLA are as follows:

- "An awe-inspiring simplicity of landscape at the broad scale, with a strong horizontal emphasis, 'wide skies' and few foci.
- A remote, discrete interior, with limited access and a strong sense of solitude.
- A rugged and complex pattern of hidden burns, lochans and pools at the local level, despite the landscape's simple composition at the broad scale.
- A remarkably open landscape with extensive visibility, meaning tall or high features in the distance are clearly visible."

5.4.21 The ZTV (refer to Figure 5.1.2) highlights an intermittent and somewhat limited pattern of visibility, focused along the north-eastern edges and eastern parts of the WLA. There is operational wind farm development between this WLA and the site (Baillie Wind Farm), which has altered outward views to the north-east, from this WLA. This is noted in the description for the WLA, which states (page 4):

*"In some places, these views also include human artefacts and contemporary land uses that are tall or elevated, and thus appear prominent in contrast to the horizontal emphasis of the peatlands. These elements are mainly located at or beyond the edge of the WLA and include high voltage power lines, wind farms, telecom masts, fences and conifer trees."*

5.4.22 As such, no significant effects on the key attributes of this WLA are considered likely. This is not considered further.

## 5.5 Visual Baseline Conditions

5.5.1 This section identifies the extent of potential visibility of the Proposed Development and identifies visual receptors that are assessed as part of the LVIA. This section also introduces the viewpoints that are used to assess effects on receptors, including reasons for their selection.

### Analysis of Visibility of the Proposed Development

5.5.2 The ZTVs in Figures 5.1.2 and 5.1.3 show theoretical visibility of the Proposed Development to turbine blade tip height (138.5 m) and hub height (80 m) respectively, across the 40 km study area.

5.5.3 The ZTV indicates that across the 40 km study area, visibility of the Proposed Development is relatively widespread from onshore areas within 10 km of the site. This includes the larger settlement of Thurso and A roads which radiate out of this settlement. Beyond 10 km the pattern of ZTV coverage becomes more intermittent from onshore areas to the south.

5.5.4 Visibility is also widespread from offshore areas to the north, with notable areas of visual shadow created by cliffs along the northern mainland shoreline. Visibility from site facing coastal edges around Dunnet Head, approximately 12 km to the north-east of the site; Strathy Point, approximately 22 km to the west of the site; and the south-western coastline of Hoy (and smaller islands to the south-east), beyond 27 km to the north-east, is also notable.

### Key Visual Receptors

5.5.5 Potential visual receptors include:

- Residents, including views from settlements and scattered properties;
- Those engaged in recreational activity (e.g. hill walkers, runners and cyclists);
- Road users (including those travelling on recognised tourist routes); and
- People working in the area.

### Selection of Viewpoints for the Assessment

5.5.6 This section sets out the viewpoints that are used to represent and assess the visual effects of the Proposed Development. The viewpoint list is a representative selection of locations agreed with the statutory consultees; it is not an exhaustive list of locations from which the Proposed Development will be visible. 17 no. viewpoints were selected across the 40 km study area. These were informed by the viewpoints used in the 2020 LVIA, with some refinements to take account of comments made by statutory consultees, as well as if needed because of the change in layout.

5.5.7 The viewpoints are all in publicly accessible locations and include:

- Locations selected to represent the experience of different types of receptor;
- Locations which provide a representative range of viewing angles and distances (i.e. short, medium and long-distance views);
- Locations which represent a range of viewing experiences (i.e. static views and points along sequential routes);
- Locations which illustrate key cumulative interactions with other existing, consented and/or proposed wind farms (i.e. either in combination or succession);

12 https://www.nature.scot/sites/default/files/2021-06/Wild%20land%20Description%20East-Halladale-Flows-July-2016-39.pdf

- Specific viewpoints selected because they represent promoted views or viewpoints within the landscape; and
- Illustrative viewpoints chosen specifically to demonstrate a particular visual effect or specific issue.

5.5.8 The viewpoints are listed in Table 5.5 below and shown on Figures 5.1.2.

**Table 5.5: Viewpoint Locations**

| VP No. | Location | Grid Reference (NGR) | | Distance from nearest turbine (km)[13] | Reason for Selection |
|---|---|---|---|---|---|
| 1 | A836 | 305041 | 969065 | 1.4 km | Represents views for road users (and tourists) from the major route, which forms part of the North Coast 500 (NC500). This viewpoint has been relocated slightly further west from the 2020 viewpoint position, to a point where the landform offers more open views. |
| 2 | Thurso to Reay Road | 306661 | 964698 | 3.1 km | Represents views for recreational users of the road (which used to form part of NCR1). |
| 3 | A836, Thurso | 310889 | 968823 | 3.9 km | Represents views for road users (and tourists) from this major route, which forms part of the NC500. |
| 4 | St Mary's Chapel, Crosskirk | 302493 | 970121 | 4.1 km | Represents recreational views for visitors to the Chapel. |
| 5 | Kintail Cottage | - | - | - | This viewpoint has been scoped out of the LVIA for the re-designed scheme, due to the very limited visibility of the Proposed Development, seen behind operational turbines in Baillie. |
| 6 | A9 South of Thurso | 312435 | 965337 | 6.3 km | Represents views for road users (and tourists) from this major route, which forms part of the NC500. |
| 7 | Northlink Ferry (Scrabster to Stromness) | 312261 | 974766 | 8.1 km | Represents views for tourists and passengers on ferry, and recreational craft in the Pentland Firth. |
| 8 | Reay | 295743 | 965897 | 10.3 km | Represents views for tourists and recreational receptors of the coastal edge, north of Reay. |
| 9 | Beinn Ratha | 295427 | 961303 | 12.2 km | Represents recreational views experienced by hill walkers. |
| 10 | A9, Georgemas Station | 315564 | 959313 | 12.6 km | Represents views experienced by tourists and rail passengers. |
| 11 | Ben Dorrery | 306296 | 955049 | 12.6 km | Represents recreational views experienced by hill walkers. |
| 12 | Dunnet Bay Visitor Centre | 321897 | 970490 | 15 km | Represents views for tourists and recreational receptors of the coastal edge. |
| 13 | Easter Head Light House car park | 320533 | 976502 | 15.7 km | Represents views for tourists and recreational receptors of the coastal edge. |
| 14 | North of Mybster Substation | 316905 | 951838 | 19.3 km | This viewpoint has been included at the request of THC, through scoping opinion. |
| 15 | Loch Watten visitor car park | 324724 | 954932 | 22.4 km | Represents views for tourists and recreational receptors. |
| 16 | Strathy Point | 282908 | 969548 | 23.1 km | Represents views for tourists and visitors to nearby picnic site. Also, nearby residential receptors. |
| 17 | A836 near Reay | 296405 | 964826 | 9.9 km | Represents sequential views for road users travelling east, to the east of the settlement of Reay. Included at the request of THC. |
| 18 | Janetstown | 307777 | 967365 | 1.4 km | Included to represent views from scattered properties to the south-east of the site. |

## Settlements

5.5.9 Theoretical visibility of the Proposed Development from settlements across the study area is illustrated by Figures 5.1.2 and described in Table 5.6 below. The ZTV does not take account of any screening or filtering of views by built form or vegetation, which will substantially reduce visibility from the majority of settlements. In order to focus on potentially significant effects, settlements from which there is no theoretical visibility are not considered further in this assessment. Settlements with limited visibility over a longer distance i.e. beyond 15 km from the Proposed Development; or where views of the surrounding landscape (including the

13 Distance between viewpoint and the nearest turbine of the Proposed Development.

site) are not important to setting, and where it is unlikely that significant effects could occur, are also not considered further in the assessment.

5.5.10 The findings from the visual assessment in the 2020 LVIA, which considers a larger development, were also been reviewed to help understand which settlements required detailed assessment.

5.5.11 Whilst not a settlement as defined in the THC LDP, effects on local communities around the site, including Forss, Janetstown and Westfield have also been considered.

**Table 5.6: Settlements within 15 km**

| Settlement | Assessed in LVIA |
|---|---|
| Thurso | Yes – widespread visibility from eastern and western parts of the settlement. |
| Reay | No – this village is located just over 9 km to the south-west of the Proposed Development, on the A836.The ZTV indicates some visibility, from parts of the settlement. Actual visibility will be reduced by built form in the village. Where views east out the village are available, the operational Baillie Wind Farm has altered these views (refer to Viewpoint 17). |
| Castletown | No – this village is located just over 11 km to the east of the Proposed Development, on the southern end of Dunnet Bay, on the A836. Theoretical visibly across the settlement is very limited, as rising landform to the west (Hill of Clindrag) will largely screen views. |
| Dunnet | No – this village is located approximately 15 km north-east of the Proposed Development, on the A836. The ZTV indicates widespread visibility across this small settlement. Vegetation and buildings tend to foreshorten views in the main cluster or properties, to the east of the village. Views from scattered properties, strung out along the minor road to the west of Dunnet tend to be secondary (rear) views. Where long distance views to towards the site area available, these have been altered by operational wind farms (including Baillie and Forss). Given the viewing distance/ limited nature of visibility from the core of the village/ and secondary nature of views from properties to the west, significant effects, on the settlement as a whole, are not predicted. Occasional open views, where these exit, will be similar to those shown in Viewpoint 12. |
| Halkirk | No – very limited theoretical visibility from this settlement, located just over 10 km to the south-east. |

### Routes

5.5.12 Theoretical visibility of the Proposed Development from routes (roads, railways, ferries and recreational routes) is illustrated on Figures 5.1.2. Visibility from a route will vary as you move along it, depending on the surrounding topography, built form and vegetation pattern alongside the route.

5.5.13 Based on an analysis of theoretical visibility and potential views, Table 5.7 below provides information on which routes have been carried forward for detailed assessment.

5.5.14 Due to their lower receptor susceptibility, roads and railways beyond 10 km from the turbine area are scoped out. Due to the higher susceptibility of receptors using promoted long distance footpaths and cycle routes, these are included up to 15 km from the turbine area. Core Paths and rights of way within 5 km of the proposed turbines are mapped.

5.5.15 Where there is limited theoretical visibility, or where actual visibility from a route is likely to be limited due to localised screening, these routes are not considered further in this LVIA, as the likelihood for significant sequential effects is limited.

**Table 5.7: Routes**

| Route | Assessed in LVIA |
|---|---|
| **Major Roads** | |
| A836 (and NC500) | Yes – widespread theoretical visibility within 10 km |
| A9 (and Wick to Thurso Railway Line) | Yes – widespread theoretical visibility within 10 km. North of Georgemas Junction Station (within approximately 13 km of the site) the Wick to Thurso railway line follows a broadly similar route to the A9, along the broad valley of the River Thurso. |
| Stromness Ferry (both routes) | Yes – widespread theoretical visibility within 10 km |
| **Recreational Routes** | |
| NCR1 | This route was considered in the 2020 LVIA. The section, north of Tain, has been cut from the route following a review in 2018 by Sustrans. Not included. |
| Core Paths within 5 km (and representational viewpoint coverage) | Core Paths within 5 km are mapped on Figure 5.1.2. These include Core Paths radiating north, west and south of Thurso, as represented by Viewpoint 3 and 18; short sections of Core Paths to the east of Westfield, as represented by Viewpoint 2; and short sections of Core Paths around Crosskirk Bay, as represented by Viewpoint 4. |

## 5.6 Future Baseline

5.6.1 In the absence of the Proposed Development, it is likely that the land will continue under the same land use, and the character of the site is therefore unlikely to change notably. However, the surrounding landscape and visual amenity is likely to be influenced by a number of ‘forces for change’. Forces for change are those

factors affecting the evolution of the landscape and which may, consequently, affect the perception of the study area in the near or distant future. Although prediction of these is necessarily speculative, those of particular relevance are discussed briefly below.

5.6.2 The Landscape Institute's Position Statement on Climate Change**14** acknowledges that changes in average temperatures, precipitation and extreme weather events will have an effect on the landscape. However, whilst a change in rainfall and rising temperatures are anticipated, it is not considered that this will appreciably change the baseline landscape conditions.

5.6.3 Wind farm development is a clear force for change and is likely to continue. There are a number of proposals for further wind farms (refer to Figure 5.1.8). Given the wind resource in this area, there is likely to be ongoing interest in wind farm development in this part of the Highlands.

5.6.4 Agriculture within the study area, including land management practices, grazing and arable farming, and commercial forest plantations, are likely to remain important land uses, but may experience pressures from expansion of residential areas on the fringes of settlements.

## 5.7 Design Considerations

5.7.1 Landscape and visual considerations, including the appearance of the Proposed Development from key viewpoints, played a key role in the progression of the layout design. Consideration was given to the location of the turbines, as well as all ancillary infrastructure. Best practice guidance, including NatureScot's Siting and Designing Wind Farms in the Landscape (2017) was considered throughout the design process. The development of the proposed turbine layout is discussed in detail in **Chapter 3: Design Evolution and Alternatives**. This includes the embedded mitigation which has been achieved through the development of the layout and design of all aspects of the Proposed Development.

5.7.2 Further commitments which have been made to reduce landscape and visual effects, such as the protection of vegetation and restoration of disturbed areas after construction are detailed in the outline Construction and Environmental Management Plan (CEMP) contained in Technical Appendix 2.1

## 5.8 Micrositing

5.8.1 Micrositing of turbines (up to 50 m as specified in **Chapter 2: Proposed Development**) is considered unlikely to result in changes to predicted landscape or visual effects, and therefore will not materially affect the findings of this assessment.

## 5.9 Likely Significant Landscape Effects

5.9.1 The assessment of landscape effects follows the methodology presented in Technical Appendix 5.1 and is based upon the development description outlined in **Chapter 2: Proposed Development**. The LVIA reports on construction and operational effects separately.

### Construction Effects

**Sources of Effects During Construction**

5.9.2 During the proposed 12 month construction phase, there will be potential short-term landscape effects arising from the presence of partially constructed infrastructure and construction activities on the site (as described in **Chapter 2: Proposed Development**). Effects occurring during the construction phase are considered to be reversible unless otherwise stated.

5.9.3 The changes arising from the construction of the Proposed Development, as outlined in **Chapter 2: Proposed Development**, will include:

- The introduction of construction activity and vehicular/personnel movements around the site and on local roads;
- The disturbance of areas of land and surface vegetation at the locations of other ancillary elements, turbine bases and along the access track routes;
- Construction of a temporary construction compound and temporary enabling works compound;
- The creation of site access tracks, including passing places, turning heads, junctions and drainage;
- Construction of the new control building and substation compound which includes an area of permanent hardstanding;
- Construction of turbine foundations;
- Construction of crane hardstandings and laydown/storage adjacent to each turbine;

14 Landscape Institute (2008) Landscape architecture and the challenge of climate change: Position Statement

- Excavation of trenches and laying of electrical and control cables adjacent to the access tracks connecting the turbines to the control building;
- The introduction of tall vertical structures (turbines) and the use of cranes;
- Testing and commissioning of site equipment including wind turbines;
- The need for lighting during construction if work extends into hours of darkness; and
- Site restoration (including restoration of disturbed moorland vegetation/ rough grassland).

### Landscape Effects During Construction

5.9.4 Potential effects on the landscape character and resources of the site during construction are set out in Table 5.8 below.

### Table 5.8: Effects of Construction on The Site

| Effects of Construction on The Site | |
|---|---|
| Baseline Description | The site is located across the ridge between Cairnmore Hillock (134 m Above Ordnance Datum (AOD)) to the west and Scrabster Hill (144 m AOD) to the east. This west to east aligned ridge is located to the south of the A836, which links Thurso to Melvick. Landcover comprises mainly open moorland and heath on the higher ground, and a mix of rough grassland/ pasture and arable fields on the lower ground to the north and south of the site. There are a number of minor watercourses and small waterbodies across the site, which radiate out from the higher ground towards the lower surrounding farmed lowland plain.<br>The influence of human activity is apparent on and around the site, through field boundaries and farm tracks; the remains of farmsteads (Blackheath) and discussed quarries; the surrounding road network (including a major A road to the north) and residential properties; moto-cross tracks, electricity distribution overhead lines and small scale turbines. Due to the open character of the surrounding landscape and slightly elevated nature of the site, operational wind farms in the wider surrounding landscape also influence character.<br>The turbines are proposed within the Farmed Lowland Plain (143) LCT. Access to the site will be via the northern side from the A836, near Forss Holdings. |
| Sensitivity (susceptibility and value) | Given the open, simple landcover/ influence of human activity/ simple landform and larger-scale character of the site, the susceptibility of the site to development is judged to be medium.<br>The site is not designated, indicating a lower landscape value.<br>Judgements: Susceptibility - medium; Value – medium;<br>Sensitivity – medium. |
| Magnitude of change (size and scale, geographical extent, duration and reversibility) | Construction activities will result in direct landscape effects on the site. Changes primarily relate to excavations and track construction; disturbance to land cover; the presence of tall cranes and partially built towers whilst turbines are being erected; and construction activity including the movement of construction vehicles and plant and construction compounds and storage areas.<br>There will therefore be large scale changes to the site relating to construction activity including the removal/ clearance of features and disturbance to landcover (moorland, rough grassland and arable land cover); introduction of new features (turbines and infrastructure); additional movement and activity through construction vehicles and plant; as well as a perceived change from an area of moorland to an active construction site. Site access will be taken via the A836, to the north of the site, and there will be some localised disturbance associated with vegetation clearance and earthworks to provide access to the site. The size and scale of effect on the site is therefore judged to be large.<br>The geographic extent of these changes will be at the site level and is therefore judged to be small. The construction works are expected to last approximately 12 months, so will be temporary and short term. The level of reversibility will be varied, from fully reversible changes associated with ground disturbances (albeit that vegetation will take some time to recover) to irreversible infrastructure that forms part of the operational scheme.<br>Given the large size/scale of effect, small geographical extent, short-term and reversible to irreversible nature of effects, overall the magnitude of change is judged to be high.<br>Judgements: Scale - large; Geographical Extent - small; Duration - short term; Reversibility - fully reversible to irreversible;<br>Magnitude of Change: high |
| Effect and Significance | Overall, the effect of construction on the site is judged to be moderate (significant).<br>These effects will be temporary and largely contained within the geographical extent of the site. |

### Mitigation During Construction

5.9.5 Measures such as arrangements for vegetation and soil removal, storage and replacement and the restoration of disturbed areas after construction are detailed in the outline Construction and Environmental Management Plan (CEMP) contained in Technical Appendix 2.1, which includes reference to Construction Method Statements.

### Residual Construction Effects

5.9.6 Re-establishment of vegetation will take approximately three to five years, depending on the vegetation and soils, and levels of effect (in relation to disturbance to landcover experienced during the construction phase) will decline over this period.

## Operational Effects

### Sources of Effects During Operation

5.9.7 The main potential effects of the Proposed Development on the landscape once operational will be associated with the presence of the wind turbines, turbine transformers and related development including access tracks, onsite substation and main site access track as described in **Chapter 2: Proposed Development** and shown on Figures 2.1.

5.9.8 The key components of the Proposed Development of relevance to this assessment include:

- 5 three-bladed horizontal axis wind turbines of up to 138.5 m tip-height;
- turbine foundations;
- hardstanding areas at each turbine location for use by cranes erecting and maintaining the turbine;
- access tracks;
- a wind farm substation compound containing a control and substation buildings with battery energy storage ;
- an on-site electrical and control network of underground (buried) cables;
- a connection from the substation to the local grid network (not part of the wind farm planning application;
- a temporary construction compound;
- a temporary enabling works compound;
- communications mast;
- drainage works including a SuDs system;
- associated ancillary works;
- habitat management; and
- engineering operations.

### Landscape Effects During Operation

5.9.9 This section describes the operational effects resulting from the Proposed Development on the landscape fabric of the site and the LCTs which have been identified as requiring detailed consideration in Table 5.3. All operational effects are judged to be **long term** and **reversible**, unless specified otherwise.

**Effects on the Site**

### Table 5.9: Effects of Operation on The Site

| Effects of Operation on The Site | |
|---|---|
| Baseline Description | The site is described above in Table 5.8. |
| Sensitivity (susceptibility and value) | Judgements are explained above in Table 5.8: Susceptibility - medium; Value – medium;<br>Sensitivity - medium |
| Magnitude of change (size and scale, geographical extent, duration and reversibility) | The introduction of the Proposed Development will substantially alter the character of the site, through the change from open largely undisturbed moorland to a wind power generating site with turbines and infrastructure including tracks. The access track junction with the A836 will also be visible on the northern flank of the Hill of Forss/ Cairnmore Hillock. The margins of the tracks will in time grow over with vegetation, softening their appearance in the landscape. The substation, on the southern flank of Hill of Forss, will be visible from parts of the site. The size and scale of effect on the site is therefore judged to be large.<br>The geographical extent of these changes will be at the site level and is judged to be small.<br>Given the large size/scale of effect, small geographical extent, long-term and reversible nature of effects, overall the magnitude of change is judged to be high.<br>Judgements: Scale - large; Geographical Extent - small; Duration – long-term; Reversibility – reversible;<br>Magnitude of Change: high |
| Effect and Significance | Overall, the effects of the wind farm on the landscape of the site is judged to be major (significant). |

**Effects on Landscape Character Types**

5.9.10 The following tables provide a detailed assessment of effects on LCTs which have been carried forward for detailed assessment, as set out in Table 5.3. LCTs are illustrated on Figure 5.1.4, with theoretical visibility from those LCTs indicated by the ZTV shown on Figure 5.1.5.

5.9.11 The assessment describes the potential effects on landscape character resulting from the introduction of the Proposed Development during the operational phase. The LCTs have been assessed using NatureScot's (2019) National Landscape Character Assessment and the SNH (2005) report, 'An Assessment of the Sensitivity and Capacity of Scottish Seascape in Relation to Windfarms'. When determining sensitivity reference to the findings of the THC 'Black Isle, Surrounding Hills and Moray Firth Coast Caithness Landscape Sensitivity Appraisal' (2017) has also been made.

## Table 5.10: Farmed Lowland Plain (143) LCT (the host LCT)

| Farmed Lowland Plain (143) LCT | |
|---|---|
| Baseline Description | The key characteristics, as identified in the NatureScot LCT description[15], are as follows:<br>*"A generally open, low-lying plain, gently undulating to form shallow broad valleys, which are often filled with lochs and mosses, and subtle low ridges.*<br>*Occasional smooth hills rise above the more low-lying plain forming local landmarks.*<br>*The broad and shallow valley of the River Wick forming the largest of a series of valleys generally aligned south-east/north-west across the plain.*<br>*Agriculture the predominant land cover.*<br>*More intensively managed farmland near the coast around Thurso and Wick, and close to Loch Watten.*<br>*Distinctive Caithness flagstone fences in some parts, creating low, sharp edges to fields.*<br>*Sparse woodland, mainly comprising small angular coniferous plantations planted for shelter on farms.*<br>*Larger conifer woodlands located at the transition with the Sweeping Moorland and Flows standing out where they are planted on poorer wetter ground on low ridges.*<br>*Farm buildings and houses forming focal points within the landscape.*<br>*Occasional loose clusters of croft houses located on more marginal upper slopes and near the coast.*<br>*A number of historic environment features, including conspicuous castles, Baronial mansions and tall 'Lairds' houses, usually with broadleaf shelter woods planted around them.*<br>*Roads reinforce the settlement pattern, often following the field and property boundaries, running straight and then swinging around sharp corners.*<br>*A number of large settlements, including the towns of Thurso and Wick, situated on the coast, as well as several smaller settlements.*<br>*Many historic features, including brochs and cairns, dotted across farmland and situated on hills within, or adjacent to, this area.*<br>*Small groups of large wind turbines sited on some of the low ridges and hills and prominent visibility of larger wind farms in adjacent Landscape Character Types.*<br>*Extensive views due to the openness of the landscape, and the clarity of northern air and light.*<br>*Dramatic views from the northern part of this landscape to Dunnet Head and the distant Orkney islands, and views from the A9 on the western edge of this landscape of the Lone Mountains of Movern and Scaraben seen across the low-lying Sweeping Moorland and Flows."* |
| | This LCT contains Baillie and Forss (Phase 1 and 2) operational wind farms, both located within 5 km to the south-west and north-west of the site (refer to Figure 5.1.8). |
| Sensitivity (susceptibility and value) | Page 107 of the THC Landscape Sensitivity Appraisal states:<br>*"Whilst a broad, low lying landscape character, there are local undulations in topography which contribute to a local diversity of landscape scale and pattern. The widely settled character of farm buildings form small point features and coupled with small woodland copses, and a mosaic of fields provides scale indicators which are sensitive to larger scale development. This sensitivity is reinforced where the historic landscape is more prevalent in stone slab and dyke field boundaries. Between Spittal and Thurso, there is a greater prevalence of larger scale infrastructure with numerous pylon lines linking into the existing, extended and new substations at Spittal and South Thurso…"*<br>Overall, the susceptibility of this LCT to wind farm development is judged to be medium to high.<br>In terms of value, the LCT is not designated. Small parts of the Dunnet Head SLA fringe the LCT boundary to the north-east of the site. Overall, the LCT is therefore considered to be of medium value.<br>Judgements: Susceptibility – medium to high; Value – medium; Sensitivity – medium-high. |
| Magnitude of change (size and scale, geographical extent, duration and reversibility) | The turbines of the Proposed Development will be located within the area of LCT to the south of the A836 and west of Thurso. The Proposed Development will introduce turbines into the site area and will have direct effects on the landscape character of the site. This will include subtle changes to the terrain of Cairnmore Hill and the characteristic landcover of open moorland and heath. The site will change from a low lying moorland covered hill in the farmed lowland plain to a low lying moorland covered hill with turbines in the farmed lowland plain. The impacts on the site are considered in more detail in Table 5.9 above.<br>In terms of wider effects on landscape character, the ZTV indicates widespread theoretical visibility from this LCT (refer to Figure 5.1.5) and due to the open nature of this landscape, actual visibility will reflect this.<br>Potential effects on landscape character are anticipated from parts of this LCT including:<br>the A836 corridor between Thurso and Reay;<br>the A9 corridor on the approach to Thurso;<br>the coast at Scrabster and Crosskirk;<br>Janetstown; and<br>parts of the Thurso to Reay local road.<br>Such locations are generally within 7 km of the Proposed Development. In general, the Proposed Development would add to the existing context of prominent power lines, existing turbines and |

15 https://www.nature.scot/sites/default/files/LCA/LCT%20143%20-%20Farmed%20Lowland%20Plain%20-%20Final%20pdf.pdf

| Farmed Lowland Plain (143) LCT | |
|---|---|
| | large-scale built structures that are present within this LCT and which interrupt the gently undulating form and openness of this landscape.<br>As noted in the description for this LCT "*small groups of large wind turbines sited on some of the low ridges and hills and prominent visibility of larger wind farms in adjacent Landscape Character Types*" are characteristic of this LCT and the Proposed Development would follow this pattern. The operational Baillie Wind Farm occupies a similar hill top position as that proposed with a similar design response to landscape character.<br>Overall, the size and scale of effect is judged to be large for the site reducing to medium for areas within 5 km.<br>The overall geographical extent is judged to be large as visibility will be widespread from this LCT within 5 km. Beyond 5 km visibility becomes more intermittent.<br>Judgements: Scale – large (across site) and reducing to medium within 5 km; Geographical Extent –large; Duration – long-term; Reversibility – reversible; Magnitude of Change: high across site and reducing to medium within 5 km. |
| Effect and Significance | Major(significant) across site and reducing to Moderate (significant) within 5 km. Not significant beyond 5 km. |
| Additional Cumulative Effects with Proposed Wind Farms | Under scenario 1 the single consented turbine at Hill of Lybster will extend the influence of turbines in relation to Forss 1 and 2 Wind Farms. Under scenario 2 Forss III will also extend the influence of turbines in this cluster, within 5 km to the north-west of the site. Further changes, under scenario 1 and 2 will be limited and well offset from the site within the LCT, or in neighbouring LCT.<br>The key changes under scenario 1 and 2 will extend the influence of an existing scheme (Forss 1 and 2). Separation between this larger scheme and the Proposed Development (also located in this LCT) will remain intact. As such, landscape effects will be similar to those identified in the primary assessment. Significant additional cumulative landscape effects are not anticipated. |
| Cumulative Effect and Significance | Not significant |

## Table 5.11: High Cliffs and Sheltered Bays (141) LCT

| High Cliffs and Sheltered Bays (141) LCT | |
|---|---|
| Baseline Description | The key characteristics, as identified in the NatureScot LCT description16, are as follows:<br>*"Duncansby Head, with high, fissured and blocky cliffs, jagged asymmetric rock stacks, arches and geos.*<br>*Dunnet Head, with towering cliffs edged by low rocky reefs.*<br>*Occasional inlets and coves, often with very deep and sheltered waters, and sometimes containing tiny harbours tucked between* |

| High Cliffs and Sheltered Bays (141) LCT | |
|---|---|
| | *cliffs and not readily visible from the main coast road and settlement.*<br>*Harbours on the east Caithness coast which have a strong association with settlements which are perched above the cliff.*<br>*Moorland largely abutting this Landscape Character Type which is particularly open and sweeping to the east and north within Caithness.*<br>*The most prominent and exposed headlands marked by lighthouses.*<br>*Exhilarating experience of being precariously perched upon a high edge on the cliff tops, offering open elevated views and a perception of huge space.*<br>*Views of turbulent currents at the juncture of the Pentland Firth and North Sea, heightening the sense of wildness experienced from the headland.*<br>*The absence of development along the remote stretches of coast and a strong sense of naturalness creating a wild landscape character."*<br>There are no operational wind farms within this LCT (refer to Figure 5.1.8). From certain areas along the coastal edge, where inland views to the south and south-west area available, operational schemes including Baillie and Forss (Phase 1 and 2) are seen in combined and successive inland views. Forss (Phase 1 and 2) is located in close proximity to the coastal edge, to the north-west of the site. Baillie Wind farms occupies a slightly more inland position, on a subtle hill to the south-west of the site. |
| Sensitivity (susceptibility and value) | Page 106 of the THC Landscape Sensitivity Appraisal states<br>*"Narrow character type, featuring an intricate coastline of fissured cliffs, ravines, caves and stacks with small covers and narrow inlets regularly interrupting the cliffs. Key focus for scenic views and informal recreation, and imparts a strong sense of place to Caithness with views along the coast, of overlapping headlands. Immediate setting for several settlements. Character type has an elemental character influenced by the proximity of often turbulent seas and heightened by the dramatic rugged character. A strong sense of wildness is particularly associated with more remote stretches."*<br>Overall, the susceptibility of this LCT to wind farm development is judged to be high.<br>In terms of value, parts of the LCT are within the Dunnet Head SLA to the north-east of the site. Overall, the LCT is therefore considered to be of high value.<br>Judgements: Susceptibility – high; Value – high; Sensitivity – high. |
| Magnitude of change (size and scale, geographical extent, duration and reversibility) | The Proposed Development is not located in the LCT, so any landscape effects will be indirect. The ZTV (refer to Figure 5.1.5) indicates widespread visibility from this LCT where is occurs within 20 km, including from the coastal edge to the north of the site (coastal edge between Brims Ness and Holburn Head); west of Sandside Bay and to the north-west of Dunnet Bay. Actual visibility will be dependant on the complex terrain in the LCT. From the high ground along the southern edge of the LCT units to the north and |

16 https://www.nature.scot/sites/default/files/LCA/LCT%20141%20-%20High%20Cliffs%20and%20Sheltered%20Bays%20-%20Final%20pdf.pdf

| High Cliffs and Sheltered Bays (141) LCT | |
|---|---|
| | north-west of the site, and from the site facing coastal edge and high ground within the unit to the north-west of Dunnet Bay, views to site will be available.<br>The open and elevated seaward views, and the associated perception of 'huge space' would not be altered by further inland views of wind farms. Views from this LCT towards the site have been altered by operational wind farm development so effects on perceptual aspects such as 'naturalness' would not be notably further diminished across the full extents of the LCT.<br>Overall, the size and scale of effect is judged to be medium for LCT within 5 km (coastal edge between Brims Ness and Holburn Head) and small elsewhere.<br>The overall geographical extent is judged to be medium. Whilst theoretical visibility is relatively widespread, actual visibility is determined by the complex coastal terrain across the LCT.<br>Judgements: Scale – medium within 5 km reducing to small elsewhere; Geographical Extent – medium; Duration – long-term; Reversibility – reversible; Magnitude of Change: medium within 5 km reducing to low elsewhere. |
| Effect and Significance | Moderate (significant) from the high ground along the southern edge of the LCT between Brims Ness and Holburn Head. Minor (not significant) elsewhere. |
| Additional Cumulative Effects with Proposed Wind Farms | There are no consented or proposed wind farms in this LCT. Changes will relate to views of further consented and proposed wind farms, typically seen in inland views from these LCT units.<br>Under scenario 1 the single consented turbine at Hill of Lybster will extend the influence of turbines in relation to Forss 1 and 2 Wind Farms. Under scenario 2 Forss III will also extend the influence of turbines in this cluster. Further consented and proposed wind farms will increase the influence of turbines in inland views, more so from units of this LCT to the west of Sandside Bay.<br>The Proposed Development is located outside this LCT. When visible, the Proposed Development will be seen in inland views and read as a distinct cluster beyond the larger Forss Wind Farm (in views south from the LCT unit to the north of the site) or beyond the larger Forss and existing Baillie Wind Farm Wind Farm (in views south-east from the more westerly LCT units to the west of Sandside Bay). From the unit to the north of Dunnet Bay, the Proposed Development will be seen in front of these two wind farms clusters (including the slightly larger Forss cluster). In terms of effects on landscape character, these will be similar to those identified in the primary assessment. Significant additional cumulative landscape effects are not anticipated. |
| Cumulative Effect and Significance | Not significant |

## Table 5.12: Sweeping Moorland and Flows (134) LCT

| Sweeping Moorland and Flows (134) LCT | |
|---|---|
| Baseline Description | The key characteristics, as identified in the NatureScot LCT description17, are as follows:<br>*"Gently sloping or undulating landform which lies generally below 350 metres.*<br>*Occasional isolated hills of limited height form local landmark features.*<br>*Lochs and mature, meandering rivers.*<br>*Very distinct flora, dominated by sphagnum mosses, produced by the wetness and infertility of the flows.*<br>*Areas of peat cuttings and hagging.*<br>*Pockets of improved grazing, mainly within the outer fringes of sweeping moorland.*<br>*Coniferous forest forming a dominant characteristic within some parts of this landscape character type.*<br>*Ribbons of broadleaf woodland occasionally run along the water courses and loch edges.*<br>*Very sparsely settled with dispersed crofts, farms and estate buildings largely found on the outer edges of this landscape or near a strath.*<br>*Vehicular tracks within parts of the landscape.*<br>*Wind farms, transmission lines, the A9 and a network of minor roads are key features within the more modified outer fringes within Caithness.*<br>*Long, low and largely uninterrupted skylines offering extensive views across this landscape and result in a feeling of huge space.*<br>*Consistent views to the distant Lone Mountains and Rugged Mountain Massif – Caithness & Sutherland.*<br>*Great sense of exposure on areas of flat peatland on upland plateau.*<br>*A strong sense of remoteness is associated within the largely uninhabited, inaccessible core flows and moorlands of this landscape."*<br>This LCT contains a number of operational wind farms, focused along the north-eastern fringes of the LCT (refer to Figure 5.1.8) including Strathy North, Achlachan, Halsary, Bilbster, Achairn, Camster. |
| Sensitivity (susceptibility and value) | Page 100 of the THC Landscape Sensitivity Appraisal states<br>*"Gently sloping or undulating landform with strong horizontal composition, which whilst expansive and large in scale entails that any vertical features are highly prominent. Simplicity of composition comprising dominant land: sky horizon, which can be interrupted by vertical elements. Long, low and largely interrupted skylines offer extensive views. Lone Mountains* |

17 https://www.nature.scot/sites/default/files/LCA/LCT%20134%20-%20Sweeping%20Moorland%20and%20Flows%20-%20Caithness%20&%20Sutherland%20-%20Final%20pdf.pdf

| Sweeping Moorland and Flows (134) LCT | |
|---|---|
| | *punctuate the horizon and are important landmarks to the immediate south such as Scaraben, and further west at a greater distance are Ben Loyal and Ben Hope. There is a strong sense of remoteness and wildness within the core of the Flows and Moorlands as they are largely uninhabited and difficult to access and have an overriding natural character…"*<br>Overall, the susceptibility of this LCT to wind farm development is judged to be high reducing to medium on the more modified fringes of the LCT.<br>In terms of value, the LCT includes parts of the Flow Country and Berriedale Coast SLA and two area of Wild Land (refer to Figure 5.1.6. Overall, the LCT is therefore considered to be of high value.<br>Judgements: Susceptibility – medium to high; Value – high; Sensitivity – medium-high. |
| Magnitude of change (size and scale, geographical extent, duration and reversibility) | The Proposed Development is not located in the LCT, so any landscape effects will be indirect.<br>The ZTV (refer to Figure 5.1.7) indicates widespread visibility from this LCT within 5 km to 10 km and a more intermittent pattern beyond 10 km. Actual visibility, particularly within 5 km to 10 km to the south-west of the site, will be reduced by areas of coniferous forest cover. From this area, when visible, the Proposed Development will be seen beyond views of the operational Baillie Wind farm. As noted in the key characteristics "*wind farms, transmission lines, the A9 and a network of minor roads are key features within the more modified outer fringes within Caithness*". As such, further wind farm development, seen in views beyond operational schemes approximately 5 km north-east of this LCT, is unlikely to result in significant effects on landscape character.<br>From other units of this LCT, including to the north of Dunnet Bay, the increased viewing distance and views of horizons which have been altered by operational wind farms also reduces the potential for significant effects on landscape character.<br>Overall, the size and scale of effect is judged to be small.<br>The overall geographical extent is judged to be medium. Whilst theoretical visibility is relatively widespread, actual visibility is reduced by areas of coniferous forest cover, particularly within 5 km to 10 km.<br>Judgements: Scale – small; Geographical Extent – medium; Duration – long-term; Reversibility – reversible; Magnitude of Change: low. |
| Effect and Significance | Minor (not significant) |
| Additional Cumulative Effects with Proposed Wind Farms | The key changes, within the more immediate context of the Site, in this LCT relate to an emerging cluster of wind farms to the south-west (Limekiln and its extension) and consented and proposed schemes which will increase the influence of turbines around the larger south-eastern wind farm group.<br>Under both theoretical cumulative baselines wind farms have altered the landscape within (and views outside) this LCT. The Proposed Development is located outside this LCT. The Proposed Development will generally read as a distinct scheme seen beyond |

| Sweeping Moorland and Flows (134) LCT | |
|---|---|
| | the operational Baillie. As such, cumulative effects on landscape character are not judged to be significant. |
| Cumulative Effect and Significance | Not significant |

## Table 5.13: Sandy Beaches and Dunes (140) LCT

| Sandy Beaches and Dunes (140) LCT | |
|---|---|
| Baseline Description | Select key characteristics, as identified in the NatureScot LCT description18, are as follows:<br>*"Low shingle ridges backing many of these sandy beaches and forming the base for dune systems.*<br>*Wide plain covered with gorse, heather and rough grazing land at Cuthill Links in the Dornoch Firth,*<br>*Long gently curved sandy arcs of Sinclairs Bay and Dunnet Bay in Caithness.*<br>*Focus for recreation with camp sites, caravan parks and car parks located close to more accessible areas of coast with golf courses present where links and machair areas are more extensive.*<br>*Many small crofting communities located on the fringes of beaches, particularly in north and west Sutherland.*<br>*Castles with historic gardens and designed landscapes, as well as prehistoric brochs and cists, cairns, and hut circles.*<br>*Strong sense of space, light and exposure, and extensive visibility on the larger and more open stretches of sandy beach.*<br>*Contained smaller beaches on the north coast with views focused along the beach to rocky headlands and out to sea to near shore islands.*<br>*Strong contrast of the white/pale pink sands of the beaches in the north-west with surrounding darker cliffs and moorland.*<br>*Wildness character to of all these seascapes, more intensely experienced on the more remote beaches along the north and west coasts of Sutherland."*<br>There are no operational wind farms within this LCT (refer to Figure 5.1.8). From Dunnet Bay, where inland views to the south-west area available, the operational Baillie Wind Farm is visible on the horizon. |
| Sensitivity (susceptibility and value) | Page 105 of the THC Landscape Sensitivity Appraisal states:<br>*"Important focus for recreational and high scenic and landscape value. Small areas of this type within Caithness and as such are rare in this context. Whilst set within a well settled wider landscape, the natural qualities of sea, beach and dunes contribute to high qualities of wildness and seclusion."*<br>Overall, the susceptibility of this LCT to wind farm development is judged to be high. |

18 https://www.nature.scot/sites/default/files/LCA/LCT%20140%20-%20Sandy%20Beaches%20and%20Dunes%20-%20Final%20pdf.pdf

| Sandy Beaches and Dunes (140) LCT | |
|---|---|
| | In terms of value, Dunnet Bay is designated as an SLA (refer to Figure 5.1.6). Overall, the LCT is therefore considered to be of high value.<br>Judgements: Susceptibility – high; Value – high; Sensitivity – high |
| Magnitude of change (size and scale, geographical extent, duration and reversibility) | The Proposed Development is not located in the LCT, so any landscape effects will be indirect.<br>There are three units of this LCT, within 20 km, at Dunnet Bay (to the east) and Sandside Bay and Melvich Bay (both to the west).<br>The ZTV (refer to Figure 5.1.5) indicates that visibility from Sandside Bay and Melvich Bay, both located to the west and beyond 8 km from the site, is quite limited and focused to the western fringes of the LCT units. Key views, from both units, tend to be oriented to the north, out to sea, or along the coastal edge towards rocky headlines. Given the viewing distance, nature of key views and relatively limited visibility effects on landscape character are not judged to be significant.<br>From the Dunnet Bay unit, visibility will be more widespread. The Proposed Development will be visible on the horizon in views along the coastal edge to the west. However, given the viewing distance (beyond 13 km) and as horizon to the west have been altered by operational wind farms, this is not judged to translate into significant effects on landscape character, from this unit.<br>Overall, the size and scale of effect is judged to be small.<br>The overall geographical extent is judged to be small.<br>Judgements: Scale – small; Geographical Extent – small; Duration – long-term; Reversibility – reversible; Magnitude of Change: low. |
| Effect and Significance | Minor (not significant) |
| Additional Cumulative Effects with Proposed Wind Farms | There are no consented or proposed wind farms in this LCT. As noted above, visibility of the Proposed Development will be limited from Sandside Bay and Melvich Bay. From the Dunnet Bay unit of the LCT, and when visible, the Proposed Development will be seen in inland views over Dunnet Bay and read as a distinct cluster in front of the larger Forss Wind Farm (which will extend slightly under scenario 1 and 2) and existing Baillie Wind Farm Wind Farm. In terms of effects on landscape character, these will be similar to those identified in the primary assessment. Significant additional cumulative landscape effects are not anticipated. |
| Cumulative Effect and Significance | Not significant |

## Table 5.14: North Caithness and Pentland Firth Seascape Unit 8

| North Caithness and Pentland Firth Seascape Unit 8 | |
|---|---|
| Baseline Description | The key characteristics, as identified in the SNH (2005) report, 'An Assessment of the Sensitivity and Capacity of Scottish Seascape in Relation to Windfarms', are as follows: |

| North Caithness and Pentland Firth Seascape Unit 8 | |
|---|---|
| | *"Tall cliffs particularly on headlands, interspersed with short sections of low rocky coastal edge with occasional beaches eg Sinclair's Bay.*<br>*Views to Orkney Islands with Hoy especially visible in places.*<br>*Gently rolling hinterland with extensive Caithness peatlands inland and farmland and crofting communities along coastal edge.*<br>*Pentland Firth major shipping lane."*<br><br>The are no operational offshore wind farms in this Seascape Unit. Views of operational schemes on the mainland to the south, including Forss (Phase 1 and 2) which is located in closer proximity to the coastal edge, are available. |
| Sensitivity (susceptibility and value) | Page 62 of the SNH (2005) report 'An Assessment of the Sensitivity and Capacity of Scottish Seascape in Relation to Windfarms' states:<br>*"Turbines could relate to the expansiveness of the sea and simple coastal forms. Turbines would conflict with high cliffs where the coastal edge is distinct and where views of Hoy are a strong feature. Therefore to the west of this area there is a greater sensitivity… The perception of this area being remote is likely be affected by development."*<br>Overall, the susceptibility of this LCT to wind farm development is judged to be medium.<br>In terms of value, the Seascape Unit is not designated, but there are a number of landscape designations and areas of Wild Land along the coastal edge of the mainland and Orkney Isles. Overall, the LCT is therefore considered to be of medium value.<br>Judgements: Susceptibility – medium; Value – medium; Sensitivity – medium |
| Magnitude of change (size and scale, geographical extent, duration and reversibility) | The Proposed Development is not located in this Seascape Unit, so any landscape effects will be indirect.<br>The ZTV (refer to Figure 5.1.5) indicates widespread visibility from this Seascape Unit, with the exception of some areas of visual shadow where the cliffs along the north coastline provide screening. Given the open nature of sea views, actual visibility will closely reflect the ZTV.<br>The Proposed Development will be visible above the cliffs between Holburn Head and Brims Ness and affect their form and scale. The Proposed Development will, however, not significantly affect the sense of remoteness or degree of perceived exposure. The Proposed Development will be seen in the context of a coastal edge which has been altered by operational wind farms, including Forss and Baillie.<br>A medium scale of change is predicted from offshore areas, with visibility, within approximately 5 km. Beyond approximately 5 km the scale of change would reduce. This is due to the increased viewing distance and changing context in views to the mainland, where a greater extent of the northern coastline is visible; visibility of operational wind farms along the north coast of the mainland |

| North Caithness and Pentland Firth Seascape Unit 8 | |
|---|---|
| | increases; and the proposed turbines effects in relation to altering the form and scale of the coastal cliffs is reduced.<br>Overall, the size and scale of effect is judged to be medium, reducing with distance.<br>The overall geographical extent is judged to be large.<br>Judgements: Scale – medium; Geographical Extent – large; Duration – long-term; Reversibility – reversible; Magnitude of Change: medium reducing to low beyond 5 km. |
| Effect and Significance | Moderate (significant) within 5 km. Not significant beyond 5 km. |
| Additional Cumulative Effects with Proposed Wind Farms | Under both scenarios, and when visible, the Proposed Development will generally read as a distinct wind farm, seen in the context of a coastal edge which has been altered by operational, consented and proposed Wind Farms, notably Baillie to the south-west of the site. Forss Wind Farm, which will extend slightly under scenario 1 and 2, will remain the closest wind farm to the coastal edge. In terms of cumulative seascape effects, this is not judged to result in significant effects on seascape character. |
| Cumulative Effect and Significance | Not significant |

## Potential Implications for Designated Landscapes

5.9.12 This section describes the implications of the Proposed Development for designated landscapes in the study area, which have been taken forward for detailed assessment, as outlined in Table 5.4.

**Table 5.15: Dunnet Head SLA**

| Dunnet Head SLA | |
|---|---|
| **Receptor** | **Dunnet Head SLA** |
| Description and Sensitivity | THC report 'Assessment of Highland Special Landscape Areas (2011) sets out the special qualities of the Dunnet Head SLA, as follows:<br>*"Panoramic Views from Prominent Headland and Striking Cliffs*<br>*The prominent headland forms a striking large landmark at the northernmost point of the British mainland. High numbers of visitors travel along the single-track road to the viewpoint and lighthouse which occupies a commanding position and is itself a prominent feature in views from land and sea.*<br>*Views to the sheer cliffs of distinctive, horizontally layered Old Red Sandstone are enlivened by the changing light and weather conditions, the crashing waves of the Pentland Firth and the presence of many species of nesting sea birds.*<br>*Distinctive landform features also include ravines such as Red and Chapel Geos, crags and promontories such as The Neback and Easter Head, and by areas of rocky coast where the cliff have slumped and eroded.*<br>*In clear conditions expansive views are obtained, from the cliff tops and from elevated positions, extending across the sea to Orkney, Cape Wrath, Strathy Point, Duncansby Head, and inland to the peaks of Caithness including Morvern, Maiden Pap and Scaraben. These views looking across flat terrain or a low seaward horizon, are so expansive that they can prompt strong emotional responses, including evoking an "edge of world" feeling.*<br>*Isolated Moorland and Lochans*<br>*Inland from the sea cliffs the headland consist of an outlying area of moorland with scattered lochans, isolated from the landward moors by a farmed and settled coastal strip that extends across the neck of the peninsula.*<br>*The moorland seems extensive, even though it is actually quite small in extent, as its edges are typically not seen from its interior, and there is a lack of comparable size indicators.*<br>*Contrasting Bay and Cliff Landscapes*<br>*The sweeping curve of fine sandy beach and sheltered agricultural landscape at Dunnet Bay seems to form a secluded haven in sharp contrast to the elevated and dramatic headland which projects beyond."*<br>The are no operational wind farms in this SLA. Views of operational schemes on the mainland to the south-west, including Baillie and Forss (phase 1 and 2), are available from the SLA. |
| Changes | The ZTV indicates that theoretical visibility of the Proposed Development from within the SLA will be relatively widespread, to the north of Dunnet Bay and the coastal edge and western facing high ground on the headland to the north of the bay. Given the open nature of this landscape actual visibility will closely reflect theoretical.<br>There will be no direct effects on the Special Qualities of the SLA, yet there will be indirect effects on certain perceptual qualities including the *"expansive views" and "edge of the world feeling",* due to the introduction of further vertical features in the surrounding landscape. However, operational turbines visible from the SLA have already altered these perceptual qualities and the Proposed Development would be seen in outward views from the SLA at over 10 km, in a direction of view which has been altered by wind farms and other human influences (including the settlement of Thurso).<br>Given the viewing distance; as turbines have already altered views to the south-west from the SLA; and as there will be no direct effects on the Special Qualities, it is considered that the Proposed Development will not compromise the integrity of the SLA. |
| Additional Cumulative Effects with Proposed Wind Farms | There are no consented or proposed wind farms in this SLA. When visible, the Proposed Development will be seen in inland views over Dunnet Bay and read as a distinct cluster in front of the larger Forss Wind Farm (which will extend slightly under scenario 1 and 2) and existing Baillie Wind Farm Wind Farm. In terms of landscape effects, these will be similar to those identified in the primary assessment. Significant additional cumulative landscape effects are not anticipated. |
| Cumulative Effect and Significance | Not significant |

**Table 5.16: The Flow Country and Berriedale Coast SLA**

| The Flow Country and Berriedale Coast SLA | |
|---|---|
| **Receptor** | **The Flow Country and Berriedale Coast SLA** |
| Description and Sensitivity | THC report 'Assessment of Highland Special Landscape Areas (2011) sets out the special qualities of the Flow Country and Berriedale Coast SLA, as follows:<br>*"Distinctive Mountain and Moorland Skyline*<br>*The distinctive combination of expansive peatland and isolated mountains is unique within the UK. The isolated and tall mountains emphasise the simplicity, flatness and low relief of the surrounding Flow Country peatland and vice versa.*<br>*The conspicuous mountain profiles, from striking cones to rolling masses, are visible from most of Caithness and serve as distinctive landmarks. They are typically seen from a distance and it is difficult to perceive their size or distance due to the simplicity of the intervening peatland.*<br>*Morven forms a prominent conical landmark feature landmark which is visible from both the north coast and the Morayshire coast. It stands in strong contrast to its long-backed neighbour Scaraben but is echoed on a smaller scale by the rocky profile of the nearby Maiden Pap. The latter is an especially striking landscape feature and backdrop when viewed from the Braemore area.*<br>*Ben Alisky is a remote, isolated peak north of the main range of mountains. Whilst not particularly high (349 metres), it forms a distinctive landmark feature for a wide area of Caithness.*<br>*Exposed Peaks, Vast Openness and Intimate Glens*<br>*The mountain summits offer rare opportunity to view a panorama of wide ranging characteristics – extending over the Flow Country peatlands, out to sea and as far south as the Cairngorms in clear conditions.*<br>*The vast open sweep of the peatlands with the long, low horizon evokes strong feelings of isolation and wildness. The mountains on its southern edge and the isolated peak of Ben Alisky are welcome orientation features in a landscape otherwise lacking in landmarks.*<br>*Experience of the open peatlands area is strongly affected by big skies with rapidly changing light and weather conditions. Views from local roads are particularly important along the higher sections of the A9 around Achavanich and Berriedale and from the road into Braemore. Views from the railway which skirts the area's north western side, from the valley tracks, from the mountain peaks, or even from aircraft all give different perspectives. Views of the Flow Country from elevated viewpoints, including from air, best reveal the distinctive pattern of the pool systems.*<br>*In further contrast to the elevation and exposure of the mountain summits and the wide expanse of the peatland, the deep wooded sections of the Berriedale and Langwell glens provide an intimacy of scale and shelter and are dotted with buildings and other welcoming signs of human habitation.*<br>*Berriedale, at the wooded confluence of Langwell Water and Berriedale Water, is a dispersed settlement with buildings sandwiched between the Berriedale Water and the steep cliffs of the Berriedale Braes. Over these braes is a series of tortuous blind bends upon the A9 that are notoriously difficult to manoeuvre, particularly for long vehicles that occasionally get stuck on this section of the road.*<br>*Within the glens, there is a concentration of architecturally and historically important buildings including a pair of Telford bridges, the Berriedale post office on west side of the A9, mills, smithys and a row of terrace estate workers houses on the south side of Berriedale Water, with the contrasting redundant salmon bothy, ice house and terraced fisherman cottages on the opposite side of the Water.*<br>*The Historic Landscape*<br>*Recognising that the inland waterways were a vital method of transport and communication in prehistory monuments are predominantly located along Langwell and Berriedale Waters and their tributaries. The remains represent the full range of major prehistoric features and include chambered cairns, roundhouses, brochs, souterrains, burnt mounds etc; the density of monuments increases as one gets closer to the confluence of the two Waters and their eventual outlet at Berriedale."*<br><br>The are no operational wind farms in this SLA. Views of operational schemes, including closer proximity of operational schemes to the north-east (Halsary and Bad a Cheo Wind Farms) have altered outward views form the SLA. |
| Changes | The ZTV indicates that theoretical visibility of the Proposed Development from within the SLA is more widespread from its northern extents, between 20 and 30 km from the Proposed Development. Beyond this, visibility is more intermittent. Given the open nature of this landscape actual visibility will closely reflect theoretical.<br>There will be no direct effects on the Special Qualities of the SLA. The Proposed Development would be seen distantly and separate from this SLA and set within an existing settled landscape which contains a number of large-scale developments. Consequently, it is not considered likely to have a significant effect on the combination of expansive peatland and isolated mountains or the simplicity, flatness and low relief of the surrounding Flow Country peatland.<br>As the Proposed Development would only be visible to the north of the SLA it wouldn't be interposed in views towards the prominent and distinctive hills that form a key characteristic of this SLA and therefore would not adversely affect the pre-eminence or landmark profile of these features or affect their perceived scale.<br>Whilst visible from key mountain summits in the SLA, the Proposed Development would not adversely affect views across the Flow Country peatlands, or key views out to sea, and wouldn't affect the perception of remoteness and wildness experienced in this SLA.<br>As such, it is considered that the Proposed Development will not compromise the integrity of the SLA. |
| Additional Cumulative Effects with Proposed Wind Farms | Under both scenarios, and when visible, the Proposed Development will generally read as a distinct wind farm, seen in long distance views outside and to the north of this SLA. This will be in the context of views which have been altered by operational, consented and proposed wind farms. Changes, particularly under scenario 2, which will extend the influence of turbines in relation to the south-eastern wind farm group, are more likely to draw the eye in closer proximity views to the north-east and just outside the SLA. Significant additional cumulative landscape effects are not anticipated. |
| Cumulative Effect and Significance | Not significant |

### Table 5.17: Farr Bay, Strathy and Portskerra SLA

| Farr Bay, Strathy and Portskerra SLA | |
|---|---|
| **Receptor** | **Farr Bay, Strathy and Portskerra SLA** |
| Description and Sensitivity | THC report 'Assessment of Highland Special Landscape Areas (2011) sets out the special qualities of the Farr Bay, Strathy and Portskerra SLA:<br>*"Dramatically Intricate Coastline and Forceful Sea*<br>*This is a distinctive stretch of rocky coastline which is typically viewed from the cliff tops and enclosed sandy beaches or from the sea by passing vessels. It is deeply eroded by the sea to form a complex assemblage of headlands, cliffs, promontories, stacks, arches, caves and ravines which combine to form unique features along the coastal edge.*<br>*This coast can be an awe-inspiring, particularly during extreme weather or heavy oceanic swells. Access to the cliffs and coast line is readily available and allows opportunities to experience the sea's force and scale at close proximity.*<br>*By contrast the sandy bays which alternate with the harsher cliffs and headlands provide a more focussed and tranquil setting due to their low lying location and the shelter afforded by flanking cliffs.*<br>*The lighthouse at Strathy is a popular attraction to visitors and is approached via the minor road which serves the string of crofts and houses along the eastern side of the promontory.*<br>*Traditional netting stations now largely abandoned elsewhere in Highland are still notable around Strathy Point whilst the sheltered harbour at Portskerra is still well-used by local fishermen.*<br>*Moorland and Crofting Mosaic*<br>*Rolling landforms trending towards the coast and opening out over bays provide a distinctive contrast of sequential views and experience of the landscape - enclosed or exposed, framed or open, intimate or expansive.*<br>*There is a rich tapestry of moorland and crofting settlements with the pattern of buildings and various land cover creating a diverse mix of colour, texture, and form.*<br>*Big Skies and Extensive Views*<br>*There is a distinct perception and experience of immense space and dynamism, strongly influenced by the combination of big skies, and the distinctive coastal light, and the constantly changing influence of the weather. Fine conditions allow impressive and extensive views to Orkney and along the coast to Cape Wrath and Dunnet Head while in contrast poor weather restricts views and highlights the sense of remoteness of the landscape. The buildings and structures at Dounreay form prominent features in views from Strathy Point.*<br>*Historical Dimension*<br>*The remains of Borve Castle situated on a natural promontory with a defensive bank built across the neck and with some ramparts and some masonry from the keep walls still visible, is one of the few surviving medieval (c.16th-17th century) defended promontory forts in this part of the north coast."*<br><br>The are no operational wind farms in this SLA. Views of operational schemes on the mainland to the east, including Baillie and Forss (phase 1 and 2), are available from the SLA. |
| Changes | The ZTV indicates that theoretical visibility of the Proposed Development from within the SLA is intermittent. The terrain is quite complex along the coastal edge and through the SLA and theoretical visibility is limited to site facing higher ground. Given the open nature of this landscape actual visibility will closely reflect theoretical.<br>There will be no direct effects on the Special Qualities of the SLA including qualities relating to the intricate coastline and forceful sea. The Proposed Development would appear separate and distant from this SLA and would therefore be of insufficient prominence or scale to affect the scale of views from this SLA or the perception and experience of immense space that is strongly influenced by the combination of big skies, distinctive coastal light, and the constantly changing influence of the weather.<br>The Proposed Development would also, not be interposed in, or detract from the extensive views to Orkney and along the coast to Cape Wrath and Dunnet Head in views from Strathy Point. It would be located within a section of the coast subject to extensive large-scale developments including Dounreay Power Station, as well as the Baillie, Forss Wind Farms.<br>This will remain the case for the 5 turbine layout, considered in this re-assessment. As such, it is considered that the Proposed Development will not compromise the integrity of the SLA. |
| Additional Cumulative Effects with Proposed Wind Farms | There are no consented or proposed wind farms in this SLA. Changes will relate to views of further consented and proposed wind farms, typically seen in inland views south and east from the SLA.<br>The Proposed Development is located outside this LCT. When visible, the Proposed Development will be seen in inland views looking east along the coastal edge beyond the larger Forss (which will slightly extend under scenario 1 and 2) and existing Baillie Wind Farm Wind Farm. Consented and proposed schemes within the more immediate context to the south (including the proposed Armadale Wind Farm) are more likely to draw the eye in inland views. Significant additional cumulative landscape effects are not anticipated. |
| Cumulative Effect and Significance | Not significant |

## 5.10 Likely Significant Visual Effects

### Construction Effects

#### Predicted Visual Effects

5.10.1 In terms of visual effects during the construction phase, beyond those experienced at the site level where low level construction activity will be apparent in certain views, these will largely relate to views of tall cranes and turbine construction experienced from the wider study area. These effects will be transient and change throughout the construction phase as wind turbines are gradually constructed in sections. As such, visual effects during the construction phase are unlikely to exceed the level of effect associated with operational visual effects.

### Operational Effects

5.10.2 This section presents the assessment of effects of the Proposed Development on views and visual amenity for receptors identified across the study area.

**Effects on Visual Receptors at Viewpoints**

5.10.3 The assessment of visual effects from the 17 viewpoints selected to represent views of the Proposed Development are set out below. This assessment assumes that all effects are long-term, during the proposed 35-year operational lifespan of the Proposed Development, and reversible, unless stated otherwise.

5.10.4 Accompanying visualisations for each assessment viewpoint are contained in Volume 3b - NatureScot Visualisations and THC Visualisations and were prepared in accordance with the methodology set out in Technical Appendix 5.1 to both NatureScot and THC visualisation standards.

5.10.5 Existing wind farms are referred to within the 'primary' assessment, and the grades given take account of the effects which will occur from the Proposed Development in combination with these.

5.10.6 Additional effects arising from the relationship of the Proposed Development with other proposed wind farms are referred to separately at the end of each table in the cumulative assessment. In nearly all instances, the existing presence particularly of Baillie and Forss Wind Farms mean that the wide open views in this areas are already characterised by the presence of wind turbines.

**Table 5.18: Viewpoint 1 – A836**

| Viewpoint 1 – A836 | | | |
|---|---|---|---|
| **Grid Reference (NGR)** | 305041, 969065 | **Figure Number** | 5.2.1 |
| **LCT** | Farmed Lowland Plain | **Designated Landscape or Wild Land Area** | N/a |
| **Direction of View** | South-east | **Distance to Nearest Turbine (km)** | 1.4 km |

Location, description of existing view and potential receptors:

Represent views for road users (and tourists) from the major route, which forms part of the NC500.

The viewpoint for this reassessment has been located further west from the original assessment viewpoint, at a point where the landform allows more open views into the site. From this location oblique views south, from the road, look over gently rising pastoral farmland. Field boundaries are delineated by Caithness flag walls, gappy hedgerows and post and wire fences. Scattered properties, to the south of the A836, are visible. In the middle distance the horizon is formed by the gently undulating form of the Hill of Forss and Cairnmore Hillock. The landcover is open and characterised by heath moorland. Wood pole distribution lines cross the view and add small scale vertical components onto the horizon.

**Viewpoint 1 – A836**

In middle distance successive views to the south-west Baillie Wind Farm is visible on the horizon. Forss is also visible in sequential views from the road, to the north-west, where roadside hedgerows do not screen views.

Sensitivity:

The viewpoint is on a major road which forms part of a popular long distance tourist route. The view is therefore considered to be of high value.

Road users are considered to be of medium susceptibility to change.

Taking account of the judgements of susceptibility and value, overall sensitivity is judged to be medium-high.

Assessment of visual effects:

5 turbine hubs and 5 blades will be visible above the skyline, seen at a distance of 1.4 km, in sequential and typically oblique views as road users pass to the north of the site. The level of visibility will change as road users move along the road, with the landform playing more of a screen role as road users move east along this route. The turbines will be seen in the context of a horizon which has been altered by smaller scale vertical elements, including electricity distribution lines. Ancillary infrastructure and access tracks will be largely screened from view due to the landform of Cairnmore Hill and Hill of Forss. The access track which links the site to the A836 is visible across the northern hill flank of Hill of Forss/ Cairnmore Hillock, below turbine 4. The Proposed Development will be seen in successive views with Baillie and Forss Wind Farms, as road users move along this route.

The geographical extent of the change is judged to be medium, as this view represents sequential views from a section of the A836 (approximately 5 km in length), as it passes to the north of the site.

Judgements: Scale: large; Geographical Extent: medium; Magnitude of Change: large

Effect and Significance:

Major (significant)

Additional Cumulative Effects with Proposed Wind Farms:

Under scenario 1 the consented Limekiln will add further turbines onto longer distance horizons seen behind Baillie Wind Farm. Hill of Lybster will add further turbines seen in the context of Forss Wind Farm and Dounreay Tri Demo will add turbines into offshore views, where roadside hedgerows do not provide screening in views from the road.

Under scenario 2 longer distance views of the application stage Limekiln, Armadale and Forss will slightly increase the influence of turbines in successive views to south-west to north-west.

Under both scenarios the Proposed Development will read as a distinct scheme in closer proximity views to the south-east. Changes to the cumulative baseline will slightly increase the influence of existing wind farm clusters/ add longer distance successive views of further schemes to the south-west to north-west. As such, no significant additional cumulative visual effects are predicted.

Cumulative Effect Significance:

Not significant

## Table 5.19: Viewpoint 2 – Thurso to Reay Road

| Viewpoint 2 - Thurso to Reay Road | | | |
|---|---|---|---|
| **Grid Reference (NGR)** | 306661, 964698 | **Figure Number** | 5.2.2 |
| **LCT** | Farmed Lowland Plain | **Designated Landscape or Wild Land Area** | N/a |
| **Direction of View** | North | **Distance to Nearest Turbine (km)** | 3.1 km |

Location, description of existing view and potential receptors:

Represents views for recreational users of the Thurso to Reay Road, as it passes to the south of the site. This route is no longer part of NCR1.

Views from this location are medium scale and dominated by the open, gently undulating agricultural fields that adjoin the road and which are enclosed by post and wire fencing as well as Caithness stone. Scattered farmsteads are evident, in the landscape and are associated with wooded blocks.

Views to the north, towards the Proposed Development, are bounded by gently curving elevated topography. Whilst the form of the landscape is essentially horizontal, there are a number of vertical elements present, including low voltage power lines, small clumps of trees and occasional small-scale wind turbines which introduce localised movement to the skyline.

To the north-west of this viewpoint a series of pylons and the existing Forss turbines are discernible, whilst to the west, the existing Baillie array is evident.

Fieldwork in 2022 confirmed there have been no substantive changes in the view. The high voltage power line extends from east to west, to the south of the viewpoint. From this location the landform largely screen views to Forss Wind Farm, but views of the scheme open up to north-west of the viewpoint.

Sensitivity:

The viewpoint is on a local road which links Thurso to Reay. This viewpoint is not located within a designated landscape. The view is therefore considered to be of medium value.

Road users are considered to be of medium susceptibility to change.

Taking account of the judgements of susceptibility and value, overall sensitivity is judged to be medium.

Assessment of visual effects:

Three turbine hubs and five turbine blades will be visible above the skyline, seen at a distance of 3.1 km, in sequential and typically oblique views as road users pass to the south of the site. The turbines will be seen in the context of a horizon which has been altered by smaller scale vertical elements, including an electricity distribution line and a small turbine. The lower turbine towers, ancillary infrastructure and access tracks will be screened by the subtle ridge south of Cairnmore Hill, from this viewpoint. The Proposed Development will be seen in successive views with Baillie Wind Farm from this location.

The geographical extent of the change is judged to be medium, as this view represents sequential views from a section of the Thurso to Reay Road (approximately 5 km in length), as it passes to the south of the site.

Judgements: Scale: medium-large; Geographical Extent: medium; Magnitude of Change: medium-large

Effect and Significance:

Moderate (significant)

| Viewpoint 2 - Thurso to Reay Road |
|---|
| A similar level of effect will be experienced from short sections of the Core Path network, with open views towards the Proposed Development, to the east of Westfield. Refer to Figure 5.1.2 for Core Paths within 5 km. |
| Additional Cumulative Effects with Proposed Wind Farms:<br>Under scenario 1 and 2 the key change will be the consented and proposed Limekiln and its extension. Views of other consented and proposed wind farms will be very limited from this location (visibility of the larger Forss cluster is limited to upper turbine blades). Limekiln and its extension will add further turbines into longer distance, successive and sequential views to the south-west, seen beyond the operational Baillie Wind Farm. The Proposed Development will continue to read as a distinct scheme in successive views to the north. Gaps between the Proposed Development and existing wind farm clusters considered in the primary assessment will remain similar. As such, no significant additional cumulative visual effects are predicted. |
| Cumulative Effect and Significance:<br>Not significant |

## Table 5.20: Viewpoint 3 – A836, Thurso

| Viewpoint 3 - A836, Thurso | | | |
|---|---|---|---|
| **Grid Reference (NGR)** | 310889, 968823 | **Figure Number** | 5.2.3 |
| **LCT** | Farmed Lowland Plain | **Designated Landscape or Wild Land Area** | N/a |
| **Direction of View** | West | **Distance to Nearest Turbine (km)** | 3.9km |

Location, description of existing view and potential receptors:

Represent views for road users (and tourists) from this major route, which forms part of the NC500.

This viewpoint is located on a small open section of the A836 on the western edge of Thurso.

Views from this location are large scale and concentrated along the coastline to the west, north-west, and east, and across Thurso Bay, and out to the Orkney Islands, to the north.

Views inland, to the south-west, towards the Proposed Development, are medium scale and framed between properties in Pennyland and Burnside. The landscape in the foreground and middle-ground comprises fields of open semi-improved grassland enclosed by stone walls and post and wire fences. The views are characteristic of urban fringe with connecting views into the adjoining rural landscape that forms the background and consists of open moorland and a low, gently undulating skyline. The essentially horizontal form of which is interrupted by a small number of small-scale wind turbines.

Fieldwork in 2022 confirmed there have been no substantive changes in the view.

Sensitivity:

The viewpoint is on a major road which forms part of a popular long distance tourist route. The view is therefore considered to be of high value.

Road users are considered to be of medium susceptibility to change.

Taking account of the judgements of susceptibility and value, overall sensitivity is judged to be medium-high.

**Viewpoint 3 – A836, Thurso**

Assessment of visual effects:

Five turbine hubs and blades will be visible above the skyline, seen at a distance of 3.9 km, in sequential and direct views from a short open section of the A836 to the west of Thurso. The turbines will read as a well composed and coherent single group of turbines. The turbines will be seen in the context of a horizon which has been altered by smaller scale vertical elements, including small scale turbines and street lighting and built form in the foreground. Ancillary infrastructure and access tracks will be screened from view due to the undulating landform to the east of Scrabster Hill.

The geographical extent of the change is judged to be small, as this view represents sequential views from a short section of the A836 (approximately 5 km in length), with open views to the west of Thurso.

Judgements: Scale: medium-large; Geographical Extent: small; Magnitude of Change: medium

Effect and Significance:

Moderate (significant)

A similar level of effect will be experienced from sections of the Core Path network, with open views towards the Proposed Development, to the north, west and south of Thurso (refer to Figure 5.1.2 for Core Paths within 5 km). The level of sequential effect will increase from Core Paths in closer proximity to the proposed turbines, to the west of Thurso.

Additional Cumulative Effects with Proposed Wind Farms:

Under both scenario 1 and 2, changes to the cumulative baseline result in very small changes to wider successive views. This is focused to longer distance/ limited visibility of further wind turbines. As such, no significant additional cumulative visual effects are predicted.

Cumulative Effect and Significance:

Not significant

## Table 5.21: Viewpoint 4 – St Mary's Chapel, Crosskirk

| Viewpoint 4 – St Mary's Chapel, Crosskirk | | | |
|---|---|---|---|
| **Grid Reference (NGR)** | 302493, 970121 | **Figure Number** | 5.2.4 |
| **LCT** | Farmed Lowland Plain | **Designated Landscape or Wild Land Area** | N/a |
| **Direction of View** | South-east | **Distance to Nearest Turbine (km)** | 4.1 km |

Location, description of existing view and potential receptors:

Represents recreational views for visitors to the Chapel.

This viewpoint is located close to the cliff edge overlooking Crosskirk Bay.

Views from this location are large scale and largely concentrated along the coastline to the west/south-west (i.e. towards the Chapel) and east, and across Crosskirk Bay. The St Mary's Chapel is prominent in views to the west beyond which the existing Forss Wind Farm turbines are evident [on] the skyline. Views inland, to the south contain the existing Baillie turbines, whilst views to the south-east, towards the Proposed Development, are medium scale and devoid of wind farm development.

**Viewpoint 4 – St Mary's Chapel, Crosskirk**

The landscape in the foreground and middle-ground comprises fields of open semi-improved grassland enclosed by stone walls and post and wire fences, bisected by the incised course of Forss Water which is marked by an exposed rock face. Scattered dwellings and farmsteads are evident and coupled with numerous low voltage power lines, lend a settled character to this part of the view. In the background, the landscape resolves into what is a simpler large-scale open moorland and gently undulating skyline.

Fieldwork in 2022 confirmed there have been no substantive changes in the view.

Sensitivity:

This viewpoint is not located within a designated landscape. It is not a promoted viewpoint or on a promoted trail. It does not have any recognised scenic value. It is therefore considered to be of medium value.

This viewpoint represents the view experienced by tourist, walkers and visitors to the chapel, and is of medium-high susceptibility.

Taking account of the judgements of susceptibility and value, overall sensitivity is judged to be medium-high.

Assessment of visual effects:

Five turbine hubs and blades will be visible above the skyline, seen at a distance of 4.1 km. The turbines will read as a well composed and coherent single group of turbines. The turbines will be seen in the context of a gently undulating and simple inland horizon. From this location the eye is more likely to be drawn to open sea views to the north, and the closer proximity Forss turbines, seen in successive views to the west. The access track which links the site to the A836 is visible across the northern hill flank of Hill of Forss/ Cairnmore Hillock, below turbine 4.

The Proposed Development will be seen in successive views with the operational Baillie and Forss Wind Farms.

The geographical extent of the change is judged to be small, as this view represents views from the higher ground around Crosskirk Bay.

Judgements: Scale: medium-large; Geographical Extent: small; Magnitude of Change: medium.

Effect and Significance:

Moderate (significant)

A similar level of effect will be experienced from short sections of the Core Path network, with open views towards the Proposed Development, around Crosskirk Bay. Refer to Figure 5.1.2 for Core Paths within 5 km.

Additional Cumulative Effects with Proposed Wind Farms:

The key change under scenario 1 ands 2 will relate to the intensification of wind turbines around Forss Wind Farm, through Hill of Lybster and Forss III. This, along with longer distance views of Dounreay Tri Demo (consented), will increase the influence of wind farms in successive views to the south-west and north-west. The Proposed Development will continue to read as a distinct scheme, in views to the south-east. As such, no significant additional cumulative visual effects are predicted.

Cumulative Effect and Significance:

Not significant

## Table 5.22: Viewpoint 5 – Kintail Cottage

| Viewpoint 5 - Kintail Cottage |
|---|
| This viewpoint, from the 2020 LVIA, has been scoped out of the LVIA for the re-designed scheme. This is due to the very limited visibility of the Proposed Development, seen behind operational turbines in Baillie. |

## Table 5.23: Viewpoint 6 – A9 South of Thurso

| Viewpoint 6 - A9 South of Thurso | | | |
|---|---|---|---|
| **Grid Reference (NGR)** | 312435, 965337 | **Figure Number** | 5.2.6 |
| **LCT** | Farmed Lowland Plain | **Designated Landscape or Wild Land Area** | N/a |
| **Direction of View** | North-west | **Distance to Nearest Turbine (km)** | 6.3 km |

Location, description of existing view and potential receptors:

Represent views for road users (and tourists) from this major route.

This viewpoint is located on the A9 south of Thurso.

Views from this location are large scale, extending across much of the adjoining farmland landscape in all directions and connecting to adjacent moorland landscapes.

Views are generally bounded, in the background, by the low, gently undulating topography of the area, the form of which is interrupted by large scale vertical elements such as Baillie Wind Farm, pylons, woodlands and built structures such as the JGC Engineering building, which form prominent focal points and add to the complexity in the view.

Fieldwork in 2022 confirmed there have been no substantive changes in the view.

Sensitivity:

This viewpoint is not located within a designated landscape. It is not a promoted viewpoint or on a promoted trail. It does not have any recognised scenic value. It is therefore considered to be of medium value.

Road users are considered to be of medium susceptibility to change.

Taking account of the judgements of susceptibility and value, overall sensitivity is judged to be medium.

Assessment of visual effects:

Five turbine hubs and blades will be visible above the skyline, seen at a distance of 6.3 km, in sequential and direct views from the A9 on its southern approach to Thurso. From this location the turbines will read as a well composed and coherent single group of turbines. The turbines will be seen in the context of a wider horizon which has been altered by vertical elements, including steel tower electricity pylons in the foreground, operational turbines and a large shed structure (JGC Engineering building), in the distance. Ancillary infrastructure and access tracks will be screened from view due to the undulating landform.

The geographical extent of the change is judged to be large, as this view represents sequential views from a longer section of the A9 on its southern approach to Thurso (>5 km), where open views to the north and north-west can be experienced.

Judgements: Scale: medium-large; Geographical Extent: large; Magnitude of Change: medium

| Viewpoint 6 - A9 South of Thurso |
|---|
| Effect and Significance:<br>Moderate (significant) |
| Additional Cumulative Effects with Proposed Wind Farms:<br>Under both scenarios consented and proposed wind farms will extend and increase the influence of wind turbines in long distance successive views to the south-east (larger south-eastern wind farm cluster) and introduce a new cluster of wind farms in longer distance successive views to the south-west (Limekiln cluster). The Proposed Development will continue to read as a distinct scheme in successive views to the north-west. Gaps between the Proposed Development and the nearest existing wind farm clusters (Baillie Wind Farm) considered in the primary assessment will remain similar. As such, no significant additional cumulative visual effects are predicted. |
| Cumulative Effect and Significance:<br>Not significant |

## Table 5.24: Viewpoint 7 – Northlink Ferry (Scrabster to Stromness)

| Viewpoint 7 - Northlink Ferry (Scrabster to Stromness) | | | |
|---|---|---|---|
| **Grid Reference (NGR)** | 312261, 974766 | **Figure Number** | 5.2.7 |
| **LCT** | North Caithness and Pentland Firth SCU 8 | **Designated Landscape or Wild Land Area** | N/a |
| **Direction of View** | South-west | **Distance to Nearest Turbine (km)** | 8.1 km |

Location, description of existing view and potential receptors:

Represents views for tourists and passengers on ferry, and recreational craft in the Pentland Firth.

This viewpoint is located on the deck of the Orkney Ferry, north of Scrabster.

Apart from the enclosure provided by ferry structures, the view from this location is open and large scale.

Views to the south, in the direction of the Proposed Development are dominated by the open waters of the Pentland Firth and the mainland coastline. Of particular prominence are the cliffs between Spear Head and Holburn Head due to their distinctiveness and largely undeveloped simple character. In contrast, the more distant, less distinctive and more complex coastline between Thurso and Dunnet Head contains substantial urban and suburban forms. Similarly, the coastline between Brims Ness and Strathy Point contains the existing Forss turbines and commercial buildings at the Lybster Technology Park.

The photography used for the visualisation is based on photography captured in 2016. Fieldwork in 2022, including from Dunnet Head on the mainland to the east of this viewpoint, confirmed there have been no substantive changes in the view. It should be noted that the wireline view does not exactly relate to the stitched baseline view. This is due to the photography being captured whilst the ferry is in motion, which distorts the baseline view when photographs from the panorama are stitched together.

| Viewpoint 7 - Northlink Ferry (Scrabster to Stromness) |
|---|
| Sensitivity:<br>The viewpoint represents views experienced by tourists on a well used ferry route, likely to be taking in the view. Whilst not formally designated the view is therefore considered to be of medium-high value.<br>Tourist and passengers on the ferry are considered to be of medium-high susceptibility to change.<br>Taking account of the judgements of susceptibility and value, overall sensitivity is judged to be medium-high. |
| Assessment of visual effects:<br>Five turbine hubs and blades will be visible above the skyline, seen at a distance of 8.1 km, in sequential and direct views from the ferry as it approaches Scrabster. From this location the turbines will read as a well composed and coherent single group of turbines. The turbines will be seen in the context of the gently undulating horizon beyond the coastal cliffs to the north of Scrabster. This coastal edge and horizons have been altered by wind farm development further west, including Forss Wind Farm. Ancillary infrastructure and access tracks will be screened from view due to the undulating landform.<br>The geographical extent of the change is judged to be large, as this view represents open, sequential and direct views from the ferry, when travelling south to Scrabster. However, with distance from Scrabster the scale of change in the view will reduce.<br>Judgements: Scale: medium; Geographical Extent: large; Magnitude of Change: medium |
| Effect and Significance:<br>Moderate (significant) |
| Additional Cumulative Effects with Proposed Wind Farms:<br>Due to the open nature of sea based views, operational and consented schemes will be visible in long distance views to the north-east (on Orkney), south-west and south-east (on the mainland). Under both scenarios the key change in the view will be the intensification of turbines around the Forss group. This is a large scale view. Despite the increased number of wind farms visible, wind farms are not judged to be a defining feature of the view. The Proposed Development will continue to read as a distinct scheme on the coastal edge, in views to the south-west. |
| Cumulative Effect and Significance:<br>Not significant |

**Table 5.25: Viewpoint 8 – Reay**

| Viewpoint 8 - Reay | | | |
|---|---|---|---|
| **Grid Reference (NGR)** | 295743, 965897 | **Figure Number** | 5.2.8 |
| **LCT** | Farmed Lowland Plain | **Designated Landscape or Wild Land Area** | Eastern edge of Farr Bay, Strathy and Portskerra SLA |
| **Direction of View** | North-east | **Distance to Nearest Turbine (km)** | 10.3 km |

| Viewpoint 8 - Reay |
|---|
| Location, description of existing view and potential receptors:<br>Represents views for tourists and recreational receptors of the coastal edge, north of Reay.<br>This viewpoint is situated on the western side of Sandside Bay by a public car park.<br>Views from this location are concentrated towards the east and the interior of the bay. Key aspects of the view include the simple open expanse of sea within the bay, along with rocky foreshores of the foreground and eastern side of the bay, above which undulating farmland forms the backdrop to the view.<br>The essentially horizontal form of the landscape is compromised by a number of large-scale vertical elements, including Dounreay power station, numerous pylons, as well as the Baillie and Forss wind turbines.<br>Fieldwork in 2022 confirmed there have been no substantive changes in the view. |
| Sensitivity:<br>This viewpoint is not located within a designated landscape. It is not a promoted viewpoint or on a promoted trail. It does not have any recognised scenic value. It is therefore considered to be of medium value.<br>This viewpoint represents the view experienced by tourist and visitors to Sandside Bay, harbour and beach, and is of medium-high susceptibility. It is also located on the eastern edge of Farr Bay, Strathy and Portskerra SLA.<br>Taking account of the judgements of susceptibility and value, overall sensitivity is judged to be medium-high. |
| Assessment of visual effects:<br>Five turbine hubs and blades will be visible above the skyline, seen at a distance of 10.3 km. The turbines will read as a well composed and coherent single group of turbines. The turbines will be seen in the context of a gently undulating and simple inland horizon which has been altered by vertical infrastructure including wind turbines, steel tower electricity pylons and the power station at Dounraey. From this location the eye is more likely to be drawn to open sea views to the north. Ancillary infrastructure and access tracks will be screened from view due to the undulating landform. The Proposed Development is seen in combined views with Baillie and Forss Wind Farms.<br>The geographical extent of the change is judged to be small, as this view represents views from a localised area around Sandside Bay.<br>Judgements: Scale: medium-small; Geographical Extent: small; Magnitude of Change: low |
| Effect and Significance:<br>Minor (not significant) |
| Additional Cumulative Effects with Proposed Wind Farms:<br>Under scenario 1 and 2 consented and proposed turbines will slightly extend the influence of Forss Wind farm group, in views to the north-east. The operational Baillie Wind Farm is also visible in combined views to the north-east.<br>In wider successive views consented and proposed schemes in the Limekiln group are visible to the south. The Proposed Development will continue to read as a distinct scheme in views to the north-east. Gaps between the Proposed Development and the nearest existing wind farm clusters (Baillie |

| Viewpoint 8 - Reay |
|---|
| Wind Farm and the now slightly larger Forss group) considered in the primary assessment will remain similar. As such, no significant additional cumulative visual effects are predicted. |
| Cumulative Effect and Significance:<br>Not significant |

## Table 5.26: Viewpoint 9 – Beinn Ratha

| Viewpoint 9 - Beinn Ratha | | | |
|---|---|---|---|
| **Grid Reference (NGR)** | 295427, 961303 | **Figure Number** | 5.2.9 |
| **LCT** | Sweeping Moorland and Flows | **Designated Landscape or Wild Land Area** | East Halladale Flows WLA |
| **Direction of View** | North-east | **Distance to Nearest Turbine (km)** | 12.2 km |

Location, description of existing view and potential receptors:

Represents recreational views experienced by hill walkers.

This viewpoint is located at the summit of Beinn Ratha. The elevated and openness of this position mean that views from this viewpoint are large scale expansive and panoramic. However, the character of the landscape, as experienced from this location, varies considerably according to the direction of the view. To the south and west the outlook is more remote, comprising extensive moorland.

To the north, north-east and south-east the foreground comprises the open moorland and rock exposures of the hill summit. Beyond this the middle-ground is dominated by dense commercial forestry with occasional rocky outcrops. In the background to the north-east, in the direction of the Proposed Development, the landscape approaching the coast comprises a patchwork of agricultural bisected by a road network and grid infrastructure, the Dounreay power station and existing Forss turbines forming large scale prominent features on the coastal edge.

Fieldwork in 2022 confirmed there have been no substantive changes in the view. Baillie Wind Farm is visible in middle distance views, to the north-east.

Sensitivity:

This viewpoint is within the northern extents of the East Halladale Flows WLA, which indicates a higher value.

This viewpoint represents the view experienced by hill walkers and at the summit of a hill and likely to be taking in the view and is of high susceptibility.

Taking account of the judgements of susceptibility and value, overall sensitivity is judged to be high.

Assessment of visual effects:

Five turbine hubs and blades will be visible above the skyline, seen at a distance of 12.2 km. The turbines will read as a well compacted single cluster, with some overlapping of blades to the centre of the layout. The turbines will be seen on the skyline, in the context of a gently undulating, inland horizon and seen behind, and contained within the horizontal field occupied by, turbines in Baillie Wind Farm. The Proposed Development is likely to read as a smaller wind farm seen behind Baillie. Due to the elevated nature of the viewpoint ancillary infrastructure and access tracks may be visible, however difficult to perceive at this viewing distance.

| Viewpoint 9 - Beinn Ratha |
|---|
| The geographical extent of the change is judged to be small, as this view represents elevated views from higher ground on the approach and at the summit. The hill is generally accessed via the A836 from the north, so views from the ridge to the north of the hill will also be available.<br>Judgements: Scale: small; Geographical Extent: small; Magnitude of Change: low |
| Effect and Significance:<br>Minor (not significant) |
| Additional Cumulative Effects with Proposed Wind Farms:<br>Due to the elevated nature of the view, changes under scenario 1 and 2 will result in an increase in wind farms seen in combined views to the north-east, and wider successive views. The key change will be Limekiln and its extension, seen in closer proximity views to the north-east. The Proposed Development will continue to read as a smaller wind farm seen behind Baillie, and contained within the horizontal field occupied by turbines in Baillie Wind Farm. As such, no significant additional cumulative visual effects are predicted.<br>Due to the elevated and open nature of the viewpoint, with wind farms seen in multiple viewing directions and distances, the increased potential for significant total cumulative effects is acknowledged. However, the views is expansive and large scale enough that total effects are not considered to be significant. Beyond Limekilns and its extension, all the other wind farms are seen in medium to longer distance views. Large parts of the view also remain free of wind farms, even under scenario 2. |
| Cumulative Effect and Significance:<br>Not significant |

## Table 5.27: Viewpoint 10 – A9, Georgemas Station

| Viewpoint 10 - A9, Georgemas Station | | | |
|---|---|---|---|
| **Grid Reference (NGR)** | 315564, 959313 | **Figure Number** | 5.2.10 |
| **LCT** | Farmed Lowland Plain | **Designated Landscape or Wild Land Area** | N/a |
| **Direction of View** | North-west | **Distance to Nearest Turbine (km)** | 12.6 km |

Location, description of existing view and potential receptors:

Represents views experienced by tourists and rail passengers.

This viewpoint is not representative of views obtained by rail passengers here as the railway is located in a cutting nearby from where views are restricted.

Views from this location are large scale and expansive. In the immediate vicinity of this position the station and associated compound are prominent features. However, in views to the north and north-west the foreground comprises an area of deciduous woodland planting, beyond which the middle-ground contains an essentially agricultural landscape including scattered farmsteads and dwellings,

| Viewpoint 10 – A9, Georgemas Station |
|---|
| woodlands and grid infrastructure. The view in these directions is bounded, in the back-ground, by gently undulating topography that forms the horizon. |
| Fieldwork in 2022 confirmed there have been no substantive changes in the view. Views of operational wind farms are long distance and limited by the landform and intervening forest cover. |
| Sensitivity: |
| This viewpoint is not located within a designated landscape. It is not a promoted viewpoint or on a promoted trail. It does not have any recognised scenic value. It is therefore considered to be of medium value. |
| Road users are considered to be of medium susceptibility to change. |
| Taking account of the judgements of susceptibility and value, overall sensitivity is judged to be medium. |
| Assessment of visual effects: |
| Five turbine hubs and blades will be visible above the skyline, seen at a distance of 12.6 km, in sequential and direct views from the A9 as it bridges the railway. The turbines will read as a well composed and coherent single group of turbines. The turbines will be seen in the context of a gently undulating horizon, beyond steel tower electricity pylons and large agricultural buildings (contained below the horizon). Ancillary infrastructure and access tracks will be screened from view due to the undulating landform. |
| The geographical extent of the change is judged to be medium-small, as this view represents longer distance sequential views from a section of the A9 near Georgemas Station, where localised features contribute to more fleeting views. |
| Judgements: Scale: small; Geographical Extent: medium-small; Magnitude of Change: medium-low |
| Effect and Significance: |
| Minor (not significant) |
| Additional Cumulative Effects with Proposed Wind Farms: |
| Consented and proposed schemes will slightly increase the influence of wind farms, in longer distance successive and combined views. The key change will be the Limkilns grouping, which will be visible in longer distance combined views to the west. The Proposed Development will continue to read as a distinct scheme in views to the north-west. Due to this, and the viewing distances to other cumulative schemes in wider combined and successive views, no additional cumulative visual effects are predicted. |
| Cumulative Effect and Significance: |
| Not significant |

**Table 5.28: Viewpoint 11 – Ben Dorrery**

| Viewpoint 11 – Ben Dorrery | | | |
|---|---|---|---|
| **Grid Reference (NGR)** | 306296, 955049 | **Figure Number** | 5.2.11 |
| **LCT** | Sweeping Moorland and Flows | **Designated Landscape or Wild Land Area** | N/a |
| **Direction of View** | North | **Distance to Nearest Turbine (km)** | 12.6 km |

| |
|---|
| Location, description of existing view and potential receptors: |
| Represents recreational views experienced by hill walkers. |
| This viewpoint is located at the summit of Ben Dorrery. The elevated and openness of this position mean that views from this viewpoint are large scale expansive and panoramic. However, the character of the landscape, as experienced from this location, varies considerably according to the direction of the view. |
| To the north, north-east the foreground comprises the open moorland of the hill summit. Beyond this, the middle-ground is dominated by a mosaic of dense commercial forestry, open moorland and the open waters of Loch Calder. In the background the landscape approaching the coast comprises a patchwork of agricultural bisected by a road network and grid infrastructure, which gives way to areas of moorland and the waters of the Pentland Firth and the Orkney Islands beyond. Baillie and Forss wind farms form a prominent cluster of turbines in the background of the view. |
| Fieldwork in 2022 confirmed there have been no substantive changes in the view. |
| Sensitivity: |
| This viewpoint is not located within a designated landscape. It is not a promoted viewpoint or on a promoted trail. It does not have any recognised scenic value. It is therefore considered to be of medium value. |
| This viewpoint represents the view experienced by hill walkers and at the summit of a hill and likely to be taking in the view and is of high susceptibility. |
| Taking account of the judgements of susceptibility and value, overall sensitivity is judged to be medium-high. |
| Assessment of visual effects: |
| Five turbine hubs and blades will be visible above the skyline, seen at a distance of 12.6 km. The turbines will read as a single group of turbines, with a slight gap between turbine 3 and 4. The turbines will be seen in the context of the coastal edge, which has been altered by wind turbines further west due to Baillie and Forss Wind Farms. The communications mast on the summit of the hill, seen in the foreground to the south, is also likely to draw the eye. Due to the elevated nature of the viewpoint ancillary infrastructure and access tracks may be visible, however difficult to perceive at this viewing distance. |
| The geographical extent of the change is judged to be small, as this view represents elevated views from the summit of this minor hill. The hill is generally accessed via maintenance tracks on the southern flank, so views to the north open up around the summit. |
| Judgements: Scale: small; Geographical Extent: small; Magnitude of Change: low |
| Effect and Significance: |
| Minor (not significant) |

| Viewpoint 11 - Ben Dorrery |
|---|
| Additional Cumulative Effects with Proposed Wind Farms:<br>Due to the elevated nature of the view, changes under scenario 1 and 2 will result in an increase in wind farms seen in combined views to the north, and wider successive views. The Proposed Development will continue to read as a distinct wind farm seen in middle distance views to the north (and further east of operational turbines in Baillie and Forss). As such, no significant additional cumulative visual effects are predicted.<br>Due to the elevated and open nature of the viewpoint, with wind farms seen in multiple viewing directions and distances, the increased potential for significant total cumulative effects is acknowledged. However, the views is expansive and large scale enough that total effects are not considered to be significant. All wind farms are seen in medium to longer distance views. Large parts of the view also remain free of wind farms, even under scenario 2. |
| Cumulative Effect and Significance:<br>Not significant |

## Table 5.29: Viewpoint 12 – Dunnet Bay Visitor Centre

| Viewpoint 12 – Dunnet Bay Visitor Centre | | | |
|---|---|---|---|
| **Grid Reference (NGR)** | 321897, 970490 | **Figure Number** | 5.2.12 |
| **LCT** | Sandy Beaches and Dunes | **Designated Landscape or Wild Land Area** | Dunnet head SLA |
| **Direction of View** | West | **Distance to Nearest Turbine (km)** | 15 km |
| Location, description of existing view and potential receptors:<br>Represents views for tourists and recreational receptors of the coastal edge.<br>This viewpoint is situated on the eastern side of Dunnet Bay.<br>Views from this location are concentrated towards the western side and the interior of the bay. Key aspects of the view include a foreground comprising a flat and simple horizontal form of the open sea within the bay. The form and simplicity of these aspects of the view emphasizes the gently undulating form of the landmass and horizontal skyline west of the bay upon which the Baillie turbines and JGC Engineering building are positioned and form prominent foci.<br>Fieldwork in 2022 confirmed there have been no substantive changes in the view. | | | |
| Sensitivity:<br>The viewpoint is in an SLA indicating a higher value.<br>This viewpoint represents the view experienced by tourist and visitors to the centre, and is of medium-high susceptibility.<br>Taking account of the judgements of susceptibility and value, overall sensitivity is judged to be high. | | | |

| Viewpoint 12 - Dunnet Bay Visitor Centre |
|---|
| Assessment of visual effects:<br>Five turbine hubs and blades will be visible above the skyline, seen at a distance of 15 km. The turbines will read as a well composed and coherent single group of turbines. The turbines will be seen in the context of the inland horizon to the west of Dunnet Bay, which has been altered by vertical elements including Baillie Wind Farm. The focus of views from the bay is more likely to be seaward, to the north-west. Ancillary infrastructure and access tracks will be screened from view due to the undulating landform.<br>The geographical extent of the change is judged to be medium, as this view represents views south-west from the eastern side of Dunnet Bay.<br>Judgements: Scale: small; Geographical Extent: medium; Magnitude of Change: medium-low |
| Effect and Significance:<br>Minor (not significant) |
| Additional Cumulative Effects with Proposed Wind Farms:<br>Under scenario 1 the consented Dounreay Tri Demo will add turbines into the offshore view. Under scenario 1 and 2 the Limekilns group will be visible in views to the west, seen to the south of Baillie Wind Farm. The undulating landform will limit visibility of this scheme to turbine blades. Whilst these schemes will increase the influence of wind farms in longer distance views to the west, the Proposed Development will continue to read as a distinct scheme, in long distance views. There will continue to be clear separation between the Proposed Development and other wind farms in combined views in this direction. This is not judged to result in any additional significant cumulative visual effects. |
| Cumulative Effect and Significance:<br>Not significant |

## Table 5.30: Viewpoint 13 – Easter Head Light House car park

| Viewpoint 13 - Easter Head Light House car park | | | |
|---|---|---|---|
| **Grid Reference (NGR)** | 320533, 976502 | **Figure Number** | 5.2.13 |
| **LCT** | High Cliffs and Sheltered Bays | **Designated Landscape or Wild Land Area** | Dunnet Head SLA |
| **Direction of View** | South-west | **Distance to Nearest Turbine (km)** | 15.7 km |
| Location, description of existing view and potential receptors:<br>Represents views for tourists and recreational receptors of the coastal edge.<br>This viewpoint is located at vantage point at Dunnet Head, just south of the Dunnet Head lighthouse. Views from this location are large scale, panoramic views.<br>Views to the south comprise the Dunnet peninsula and Caithness hinterland beyond. To the north the lighthouse, coastal edge, open seas of the Pentland Firth and the Orkney Islands are key features. To the east, the coastline between Dunnet Head and John-o-Groats and the Isle of Stroma are principal features. In views to the west the coastline between Dunnet Head and Cape Wrath forms the main feature of interest, the simplicity of the open moorland in the foreground and middle-ground of the view contrasting with the complexity represented by the urban form of Thurso, the Baillie and Forss | | | |

| Viewpoint 13 - Easter Head Light House car park |
|---|
| turbines, and the assemblages of structures at Dounreay power station which are present in the background of the view. |
| Fieldwork in 2022 confirmed there have been no substantive changes in the view. |
| Sensitivity: |
| The viewpoint is in an SLA indicating a higher value. |
| This viewpoint represents the view experienced by tourist and visitors to the lighthouse, and is of medium-high susceptibility. |
| Taking account of the judgements of susceptibility and value, overall sensitivity is judged to be high. |
| Assessment of visual effects: |
| Five turbine hubs and blades will be visible above the skyline, seen at a distance of 15.7 km. The turbines will read as a compact single group of turbines, with some overlapping of turbine blades to the centre of the layout. The turbines will be seen in the context of the inland horizon to the south-west of Dunnet Bay, which has been altered by vertical elements including Baillie Wind Farm. The Proposed Development will be seen in front of this wind farm. The focus of views from the light house is more likely to be seaward, to the north. Any views of ancillary infrastructure and access tracks will be difficult to perceive at this viewing distance. |
| The geographical extent of the change is judged to be small, as this view represents views experienced by visitors to the light house. The undulating landform to the south of the lighthouse will provide a level of screening on approach to this feature. |
| Judgements: Scale: small; Geographical Extent: small; Magnitude of Change: low |
| Effect and Significance: |
| Minor (not significant) |
| Additional Cumulative Effects with Proposed Wind Farms: |
| Due to the elevated and open nature of the view, operational and consented schemes will be visible in long distance views to the north-east (on Orkney), south-west and south-east (on the mainland). Under both scenarios the Proposed Development will be seen in front of a larger group of wind turbines including Limekiln and its extension, Strathy South, Strathy Wood and the operational Strathy North and Baillie. Given that the Proposed Development will continue to be seen in long distance views to the south-west, in front of a (now larger) group of wind turbines seen in the distance, this is not judged to result in any significant additional cumulative visuals effects. This is a large scale and panoramic view. Despite the increased number of wind farms visible, wind farms are not judged to be a defining feature of the view. |
| Cumulative Effect and Significance: |
| Not significant |

## Table 5.31: Viewpoint 14 - North of Mybster Substation

| Viewpoint 14 - North of Mybster Substation | | | |
|---|---|---|---|
| **Grid Reference (NGR)** | 316905, 951838 | **Figure Number** | 5.2.14 |
| **LCT** | Sweeping Moorland and Flows | **Designated Landscape or Wild Land Area** | N/a |
| **Direction of View** | TBC | **Distance to Nearest Turbine (km)** | 19.3 km |

| |
|---|
| Location, description of existing view and potential receptors: |
| Represents views for tourists and road users. |
| The landscape context is one primarily a patchwork of agricultural fields and extensive commercial forestry and a gently undulating skyline that is interrupted by the extent of forestry as well as pylons and the Baillie turbines that form vertical elements in the middle-ground and background of the view. |
| Fieldwork in 2022 also confirmed that close proximity views of turbines in Halsary, Bad a Cheo and Causeymire Wind farms will also likely draw the eye, in views to the south. |
| Sensitivity: |
| This viewpoint is not located within a designated landscape. It is not a promoted viewpoint or on a promoted trail. It does not have any recognised scenic value. It is therefore considered to be of medium value. |
| Road users are considered to be of medium susceptibility to change. |
| Taking account of the judgements of susceptibility and value, overall sensitivity is judged to be medium. |
| Assessment of visual effects: |
| Intervening coniferous forestry will screen views of the Proposed Development, whilst this remains in place (a wireline only visualisation has been provided for this viewpoint). Should this forestry be removed, the Proposed Development will be partially screened by the landform (more so to the left and west of the view). This, combined with the viewing distance and foreground context with large scale steel tower pylons, is unlikely to result in significant visual effects. |
| The geographical extent of the change is judged to be medium-small, as this view represents longer distance sequential views from a section of the A9 near Mybster Station, where localised coniferous forestry plays a screening role. |
| Judgements: Scale: negligible; Geographical Extent: medium-small; Magnitude of Change: low |
| Effect and Significance: |
| Minor (not significant) |
| Additional Cumulative Effects with Proposed Wind Farms: |
| As visibility of the Proposed Development is limited by coniferous forest, the potential for any significant cumulative interactions is limited. |
| Cumulative Effect and Significance: |
| Not significant |

### Table 5.32: Viewpoint 15 – Loch Watten visitor car park

| Viewpoint 15 - Loch Watten visitor car park | | | |
|---|---|---|---|
| **Grid Reference (NGR)** | 324724, 954932 | **Figure Number** | 5.2.15 |
| **LCT** | Farmed Lowland Plain | **Designated Landscape or Wild Land Area** | N/a |
| **Direction of View** | North-west | **Distance to Nearest Turbine (km)** | 22.4 km |

Location, description of existing view and potential receptors:

Represents views for tourists and recreational receptors.

This viewpoint is located within a well-used public car park at the head of the loch. Views from this location are large scale, most especially to the north-west, along the line of the loch which is enclosed by low, gently undulating topography. The simplicity and openness of the loch emphasises the woodland and agricultural landscape of the loch sides and the horizontal horizon.

Fieldwork in 2022 confirmed there have been no substantive changes in the view.

Sensitivity:

This viewpoint is not located within a designated landscape. It is not a promoted viewpoint or on a promoted trail. It does not have any recognised scenic value. It is therefore considered to be of medium value.

This viewpoint represents the view experienced by tourist and visitors to the centre, and is of medium-high susceptibility.

Taking account of the judgements of susceptibility and value, overall sensitivity is judged to be high.

Assessment of visual effects:

Five turbine hubs (seen just above horizon) and blades will be visible above the skyline, seen at a distance of 22.4 km. The turbines will read as a well composed and coherent single group of turbines. The turbines will be seen in the context of a gently undulating horizon, in views across and beyond Loch Watten. Lower turbine towers, ancillary infrastructure and access tracks will be screened from view due to the undulating landform.

The geographical extent of the change is judged to be small, as this view represents longer distance views from the eastern extents of the loch.

Judgements: Scale: small; Geographical Extent: small; Magnitude of Change: low

Effect and Significance:

Minor (not significant)

Additional Cumulative Effects with Proposed Wind Farms:

Under scenario 1 and 2 consented and proposed schemes, seen in wider successive views, will largely be screened by local vegetation cover, from this location. The Proposed Development will continue to read as a distinct scheme in long distance views to the north-west. This is not judged to result in any significant additional cumulative visual effects.

Cumulative Effect and Significance:

Not significant

### Table 5.33: Viewpoint 16 – Strathy Point

| Viewpoint 16 - Strathy Point | | | |
|---|---|---|---|
| **Grid Reference (NGR)** | 282908, 969548 | **Figure Number** | 5.2.16 |
| **LCT** | Coastal Crofts and Small Farms | **Designated Landscape or Wild Land Area** | Farr Bay, Strathy and Portskerra |
| **Direction of View** | East | **Distance to Nearest Turbine (km)** | 23.1 km |

Location, description of existing view and potential receptors:

Represents views for tourists and visitors to nearby picnic site. Also, nearby residential receptors.

This viewpoint is located at vantage point at Strathy Point, just south of the Strathy Point lighthouse. Views from this location are large scale, panoramic.

Views to the south comprise the Strathy Point peninsula and Caithness hinterland beyond.

To the north the lighthouse, coastal edge, open seas of the Pentland Firth, and to the north-east, the Orkney Islands are key features.

To the east, the coastline between Strathy Point and Dunnet Head are principal features. The existing Baillie and Forss wind farms and Dounreay power station form distant foci in the view.

Fieldwork in 2022 confirmed there have been no substantive changes in the view.

Sensitivity:

The viewpoint is in an SLA indicating a higher value.

This viewpoint represents the view experienced by tourist and visitors to Strathy Point, and is of medium-high susceptibility.

Taking account of the judgements of susceptibility and value, overall sensitivity is judged to be high.

Assessment of visual effects:

Five turbine hubs and blades will be visible above the skyline, seen at a distance of 23.1 km. The turbines will read as a coherent single group of turbines, with some overlapping between turbine 3 and 4. The turbines will be seen in the context of a gently undulating and simple inland horizon which has been altered by vertical infrastructure including wind turbines (the Proposed Development will be seen in combined views with Baillie and Forss Wind Farms, between these two schemes). From this location the eye is more likely to be drawn to open sea views to the north. Ancillary infrastructure and access tracks will be screened from view due to the undulating landform.

The geographical extent of the change is judged to be small, as this view represents views from a localised area around Strathy Point.

Judgements: Scale: small; Geographical Extent: small; Magnitude of Change: low

Effect and Significance:

Minor (not significant)

Additional Cumulative Effects with Proposed Wind Farms:

Under scenario 1 Dounreay Tri Demo will add turbines into the offshore view. Hill of Lybster will slightly increase the influence of turbines at Forss and Limekiln Extension will add further turbines in inland views to the south-east.

Under scenario 2 Forss III will increase the influence of turbines around the Forss group. Limekiln (application stage) will extend the influence of this group.

Under both scenarios the Proposed Development will read as a distinct scheme between two wind farms (including the now larger Forss group and the operational Baillie Wind Farm) seen in long

| Viewpoint 16 - Strathy Point |
|---|
| distance views. Gaps between emerging groups and the Proposed Development will remain. This is a large scale and panoramic view. Despite the increased number of wind farms visible, wind farms are not judged to be a defining feature of the view. This is not judged to result in any significant additional cumulative visuals effects. |
| Cumulative Effect and Significance:<br>Not significant |

## Table 5.34: Viewpoint 17 – A836 east of Raey

| Viewpoint 17 - A836 east of Raey | | | |
|---|---|---|---|
| **Grid Reference (NGR)** | 296405, 964826 | **Figure Number** | 5.2.17 |
| **LCT** | Farmed Lowland Plain | **Designated Landscape or Wild Land Area** | N/a |
| **Direction of View** | North-east | **Distance to Nearest Turbine (km)** | 9.9 km |

Location, description of existing view and potential receptors:

Represent views for road users (and tourists) from the major route, which forms part of the NC500.

From this location direct views north-east, from the road, look over gently undulating farmland and the golf course at Reay. Street lights, buildings (including the club house and a church) and steel tower pylons contribute to vertical elements seen above the gently undulating horizon, in short to longer distance views. Turbines in Forss and Baillie Wind Farm are visible on the skyline to the north-east, in longer distance views.

Views towards the Pentland Firth are available to the north. In views to the south the more pronounced landform of Beinn Ratha is apparent.

Sensitivity:

This viewpoint is not located within a designated landscape. It is not a promoted viewpoint or on a promoted trail. It does not have any recognised scenic value. It is therefore considered to be of medium value.

Road users are considered to be of medium susceptibility to change.

Taking account of the judgements of susceptibility and value, overall sensitivity is judged to be medium.

Assessment of visual effects:

Five turbine hubs and blades will be visible above the skyline, seen at a distance of 9.9 km. The turbines will read as a coherent single group of turbines. The turbines will be seen in the context of a gently undulating and simple inland horizon which has been altered by vertical infrastructure including wind turbines (the Proposed Development will be seen in combined views with Baillie and Forss Wind Farms, between these two schemes) and vertical elements in the fore and middle ground. The proposed turbines will be seen behind steel tower pylons, which will be seen at a higher elevation above the horizon from this viewing angle. Ancillary infrastructure and access tracks will be screened from view due to the undulating landform.

The geographical extent of the change is judged to be small, as this view represents views from a localised area to the east of the settlement of Reay.

| Viewpoint 17 – A836 east of Raey |
|---|
| Judgements: Scale: small; Geographical Extent: small; Magnitude of Change: low |
| Effect and Significance:<br>Minor (not significant) |
| Additional Cumulative Effects with Proposed Wind Farms:<br>Under scenario 1 Dounreay Tri Demo will add turbines into the offshore view to the north. Hill of Lybster will slightly increase the influence of turbines at Forss and Limekiln Extension will add further turbines in inland views to the south. Under scenario 2 Forss III will increase the influence of turbines around the Forss group. Limekiln (application stage) will extend the influence of this group.<br>Under both scenarios the Proposed Development will read as a distinct scheme between two wind farms (including the now larger Forss group and operational Baillie Wind Farm) seen in long distance views. Gaps between emerging groups and the Proposed Development will remain. Vertical elements seen in short to medium distance views (street lights and steel tower pylons) will continue to read as the more prominent vertical features seen on the skyline, from this location. This is not judged to result in any significant additional cumulative visuals effects. |
| Cumulative Effect and Significance:<br>Not significant |

## Table 5.35: Viewpoint 18 - Janetstown

| Viewpoint 18 - Janetstown | | | |
|---|---|---|---|
| **Grid Reference (NGR)** | 307777, 967365 | **Figure Number** | 5.2.18 |
| **LCT** | Farmed Lowland Plain | **Designated Landscape or Wild Land Area** | N/a |
| **Direction of View** | North-west | **Distance to Nearest Turbine (km)** | 1.4 km |

Location, description of existing view and potential receptors:

Represents views for residents and users of the local road network through Janetstown, to the south-east of the site.

From this location the view looks over gently rising farmland. Field boundaries are delineated by post and wire fences and stone walls. Scattered properties to the north of Janetstown are visible, with the property at Hopefield visible on the horizon (along with the abandoned property at Blackheath). Ground disturbance through quarrying activity is also apparent. In the middle distance the horizon is formed by the gently undulating form of the Hill of Forss and Cairnmore Hillock. The landcover is open and characterised by farmland and heath moorland. Wood pole distribution lines cross the view and add small scale vertical components onto the horizon.

Long distance views to the south over the gently undulating terrain of Caithness are available. Views to the north-east include Dunnet bay and Orkney in the longer distance.

**Viewpoint 18 - Janetstown**

Sensitivity:

This viewpoint is not located within a designated landscape. It is not a promoted viewpoint or on a promoted trail. It does not have any recognised scenic value. It is therefore considered to be of medium value.

Residents are considered to be of high susceptibility to change.

Taking account of the judgements of susceptibility and value, overall sensitivity is judged to be medium-high.

Assessment of visual effects:

Five turbine hubs and blades will be visible above the skyline, seen at a distance of 1.4 km. The turbines will read as a coherent single group of turbines. The turbines will be seen in the context of a gently undulating and simple horizon. Access tracks across the site will largely be screened by the intervening terrain.

The geographical extent of the change is judged to be small, as this view represents views from a localised area, of slightly denser settlement, to the south of the Site.

Judgements: Scale: high; Geographical Extent: small; Magnitude of Change: high

Effect and Significance:

Major (significant)

A similar level of effect will be experienced from short sections of the Core Path network, with open views towards the Proposed Development, to the west of Thurso. Refer to Figure 5.1.2 for Core Paths within 5 km.

Additional Cumulative Effects with Proposed Wind Farms:

Under scenario 1 and 2 cumulative schemes will increase the influence of wind farms in longer distance successive views to the north-east and south. The Proposed Development will read as a distinct scheme in closer proximity views to the north-west. This is not judged to result in any significant additional cumulative visuals effects.

Cumulative Effect and Significance:

Not significant

## Effects on Views from Settlements

5.10.7 Theoretical visibility of the wind farm from settlements across the study area is illustrated by Figures 5.1.2a and b. Visual effects from settlements, which have been taken forward for detailed assessment, as outlined in Table 5.6, are discussed below. Where a settlement is represented by an assessment viewpoint reference is made to this.

### Table 5.36: Thurso

| Thurso | | | |
|---|---|---|---|
| **Representative viewpoints:** | VP3 - Thurso | **Approximate distance from settlement to nearest turbine (closest point):** | Within 5 km |

**Thurso**

Location, description of existing view and potential receptors:

This settlement is located on the coast on a north-eastern slope overlooking Thurso Bay and is centred in the line of the River Thurso. It is a relatively diverse settlement comprising a combination of an irregular street at its easternmost end, adjoining the bay, a grid iron street pattern in its oldest residential sections, and a series of post-war housing areas to the west at Pennylands, Ormlie, High Ormlie and Mount Pleasant which are characterised by suburban cul-de-sacs and estate roads. The satellite settlements of Burnside, to the north of the main settlement of Thurso is a relatively recent extension to the settlement and comprises a predominance of single storey dwellings oriented towards estate roads.

Views from within the more historic core of the settlement tend to be foreshortened by local built form. There are longer distance views to the north, from the northern edge of the settlement, over Thurso Bay and towards Orkney. Longer distance views to the west, towards the site, tend to be limited to properties on the western extents of the settlement.

The photography below, which is taken from the eastern flank of Hill of Forss, to the south-east of the site, highlights the nature of visibility, from the western settlement edge of Thurso.

Sensitivity:

Residents are assumed to have high susceptibility to changes in views from their properties.

Residents are assumed to value outward coastal and rural views from the settlement. The settlement is not located in a designated landscape indicating a lower value. Views from Thurso are therefore considered to be of medium value.

Taking account of the judgements of susceptibility and value, overall sensitivity is judged to be high.

**Thurso**

Assessment of visual effects:

The ZTV, refer to Figure 5.1.2, indicates widespread theoretical visibility from the eastern and western parts of this settlement. The lower ground along the course of the River Thurso, through the centre of the settlement, is in an area of visual screening. Actual visibility will be greatly reduced by the built up nature of the settlement, which would generally restrict views of the Proposed Development. The most open views of the Proposed Development would be available from the western fringes or Ormlie, Pennyland and Burnside and from open sections of the A836, where all five of the Proposed Developments turbines would be seen on the skyline, within a distance of 5 km. Viewpoint 3 is illustrative of these views, and from which a moderate and significant visual effects has been identified. However, within the core of the settlement and more widely, views towards the Proposed Development would typically be restricted by built form. Furthermore where long distance coastal views from the settlement can be experienced, these will not be altered by wind farm development at the site.

As such, and overall, the Proposed Development is not considered to result in significant effects on this settlement.

Effect and Significance:

Significant visual effects predicted from western extents of the settlement, from areas with open views west towards the site (as represented by Viewpoint 3). This is not predicated to translate into significant visual effects on the settlement overall. Key views towards the coast, where available, will not be altered by wind farm development at the site, in views to the west.

Additional Cumulative Effects with Proposed Wind Farms:

Cumulative visuals effects from the settlement of Thurso will be restricted by built form, which limits views out of the settlement from large parts of Thurso and the opportunity to view changes in the cumulative baseline in successive views outside the settlement.

Under Scenario 1, long distance views of Hoy and Binga Fea, on the isle of Orkney, may be apparent in certain coastal views from the settlement, to the north-east.

Longer distance views from the settlement edges of cumulative changes to the east will be limited by the rising landform including Duncan's Hill, to the east of Thurso.

Figure 5.1.11a and b highlights the potential for longer distance visibility of cumulative changes in the south-eastern wind farm group. However, when visible this is likely to be from a limited number of properties on the southern edge of Thurso. Changes will be seen in the context of an operational wind farm group, limiting the potential for significant additional cumulative interactions.

Viewpoint 3 is representative of the most open and worst case scenario views to the west, from Thurso. In views to the west there is no visibility of further consented or proposed wind farms. As such, no significant additional cumulative visual effects are predicted from the settlement of Thurso.

Cumulative Effect and Significance:

Not significant

## Table 5.37: Communities around Cairnmore Hillock/ Hill of Forss

| **Communities around Cairnmore Hillock/ Hill of Forss including Forss, Janetstown and Westfield** | | | |
|---|---|---|---|
| **Representative viewpoints:** | VP1 – A836<br>VP2 – Thurso to Reay Road<br>VP18 - Janetstown | **Approximate distance from settlement to nearest turbine (closest point):** | Within 5 km |

Location, description of existing view and potential receptors:

The following communities are located around Cairnmore Hillock and the Hill of Forss. This includes scattered properties along the A836, to the north of the site and to the north-west at Bridge of Forss. The terrain on the northern flank of these minor hills drops in elevation from south to north, and many of the properties are oriented to take advantage of coastal views to the north. Cairnmore Hillock and the Hill of Forss contribute to a simple moorland horizon in more open views from properties, to the south. Views from here are represented by Viewpoint 1.

There are also dispersed properties on the western flank of Cairnmore Hillock, along the minor road which runs south from the A836 at Bridge of Forss down to the community of Westfield. Many of these properties are oriented with views west over the Forss Water Valley, to the west (see photograph below). Baillie and Forss Wind Farms are apparent in views to the west and north-west. Cairnmore Hillock generally foreshortens views to the east and provides a moorland covered, gently rounded horizon. Views from near communities in Westfield are represented by Viewpoint 2.

The concentration of properties is higher to the south-east of the site, around Janetstown. The terrain here generally slopes from north-west down to the south-east. There is a more complex local network of minor roads and properties are oriented in various directions. Many properties are oriented/ or have windows focused towards Dunnet Bay, over Thurso, to the north-west. Longer distance views to the south, inland over Caithness, as also available from many properties. The Hill of Forss contributes to a simple moorland horizon in more open views from properties, to the north-east. Views from here are represented by Viewpoint 18.

| Communities around Cairnmore Hillock/ Hill of Forss including Forss, Janetstown and Westfield |
|---|
| Sensitivity:<br>Residents are assumed to have high susceptibility to changes in views from their properties.<br>Residents are assumed to value outward coastal and rural views where available. The communities around Cairnmore Hillock/ Hill of Forss are not located in a designated landscape, indicating a lower value. Views from these communities are considered to be of medium value.<br>Taking account of the judgements of susceptibility and value, overall sensitivity is judged to be high. |
| Assessment of visual effects:<br>The ZTV, refer to Figure 5.1.2, indicates widespread theoretical visibility for local communities around the Hill of Forss and Cairnmore Hillock. The landscape around the site is gently undulating and open in character, so actual visibility will closely reflect theoretical. Any local screening varies from property to property, and tends to be from vegetation and built form within the property curtilage, rather than landscape features in the surrounding area.<br>Viewpoint 1 (which represents views from properties along the A836 to the north of site) and 18 (which represents views from properties in Janetstown) both indicate a large scale change in views. A medium-large scale of change in the view is anticipated from properties in Forss Water Valley and Westfield, where the landform of Cairnmore Hillock will play more of a screening role for properties to the south-west of the site (see Viewpoint 2).<br>When visible, from properties around Cairnmore Hillock and Hill of Forss, the Proposed Development will result in significant visual effects. However, many properties have open and long distance views in one or more direction away from the site. The open and gently undulating nature of the landscape contributes to the sense of large scale views with expansive skies. The large scale and expansive nature of these views is better able to accommodate wind farm development of the scale proposed. This includes further views of wind farms with relevance to residents who currently experience views of Baillie and Hill of Forss Wind Farms, along the Forss water Valley. Where longer distance coastal views from communities around the site can be experienced (to the north for properties along the A836 and to the north-east, towards Dunnet Bay, for properties in Janetstown), these will typically not be altered by wind farm development at the site. |
| Effect and Significance:<br>Significant visual effects are predicted for communities around Cairnmore Hillock and the Hill of Forss.<br>The RVAA (refer to Technical Appendix 5.2) provides a more detailed assessment in relation to effects on residential visual amenity for the closest properties to the proposed turbines. |
| Additional Cumulative Effects with Proposed Wind Farms:<br>The key change, under scenario 1 and 2 will relate to a slight intensification of wind turbines in the Forss Wind Farm group, through Hill of Lybsyter and Forss 3. Limekiln and its extension will also result in further medium distance views of wind turbines, from properties with longer distance views to the south-west.<br>Within the more immediate context (5 km) changes to the cumulative context will not notably alter the baseline. As such, no significant additional cumulative visual effects are predicted, from communities around Cairnmore Hillock and Hill of Forss. |
| Cumulative Effect and Significance:<br>Not significant |

## Effects on Views from Routes

5.10.8 Visibility from a route is not uniform along its entire length. This is because views of the surrounding landscape change due to the landform, built form, and vegetation cover as the viewer moves along the route. Sequential effects from the key routes which have been taken forward for detailed assessment, as outlined from Table 5.7, are set out below.

**Table 5.38: A836**

| A836 | | | |
|---|---|---|---|
| **Representative viewpoints:** | Viewpoint 1: A836<br>Viewpoint 3: A836, Thurso<br>Viewpoint 12: Dunnet Bay Visitor Centre | **Approximate distance from route to nearest turbine (closest point):** | Approximately 1 km to proposed turbines, at closest point |
| Location, description of existing view and potential receptors:<br>This route runs roughly east-west through the study area starting from John O'Groats in the east and leaving the study area next to Bettyhill in the west. It follows the northern coast of Scotland and forms part of the North and West Highlands National Tourist Route. At its closest is situated approximately 1 km to the north of the Proposed Developments turbines. This route forms part of the promoted North Coast 500 Route.<br>Views to site include short distance oblique views from the open section of the route as it passes the site. Medium to longer distance more direct views will also be available, from shorter sections of the route, as road users travel east and west. | | | |
| Sensitivity:<br>Although road users on this route are fast moving, the highest susceptibility group of road users on this route are tourists, who are assumed to have medium-high susceptibility to changes in views from routes.<br>The route forms part of the NC500, with short sections passing through coastal SLA, which increases value.<br>Taking account of the judgements of susceptibility and value, overall sensitivity is judged to be medium-high. | | | |
| Assessment of visual effects:<br>When travelling east, visibility towards the Proposed Development opens up south of Armadale. Between here and just east of Melvich the pattern of visibility is very intermittent, due to the more complex terrain and winding nature of the route. Views, whilst more direct, will be very fleeting and longer distance resulting in a small scale of change. West of Melvich, within approximately 15 km of the Proposed Development, visibility becomes more widespread. Viewpoint 8 at Reay is broadly representative of medium distance views from this section of road. Close to medium distance views of operational wind farms at Baillie and Forss are available from this section of the road. From here a medium-small scale of change is predicted. East of Reay, the landscape is very open in character and the topography is more undulating. Direct to close proximity oblique views are available from much of the route. A medium to large scale of change is predicted.<br>When travelling west, longer distance and direct views are available from a section of the road (approximately 10 km in length) to the east of Dunnet Bay. Due to the viewing distance, beyond 15 km, a small scale of change is predicted. Oblique views to the south, towards the operational Lochend Wind Farm, are available from parts of this section of the route. Visibility towards the Proposed Development is then more widespread between Castletown and Thurso, between 5 and 12.5 km from the Proposed Development. From here the Proposed Development will be seen in direct views from open sections of the road. The operational Baillie Wind Farm will also be apparent in certain combined views, seen behind the Proposed Development. A medium small | | | |

**A836**

increasing to medium scale of change is predicted from here. As the route passes through Thurso built form and the valley landform around the River Thurso will largely screen views. Views will open up again on the western departure from Thurso, as represented by Viewpoint 3. Views will be direct changing to close proximity oblique views (represented by Viewpoint 1), as road users pass the site. A medium-large to large scale of change is predicted from this section of the route.

Effect and Significance:

Moderate and above (significant) sequential effects are predicted from open sections of the route, as road users travel east and west, within approximately 7.5 km of the site. The operational Baillie and Forss Wind Farms will also be visible in certain views through this section, particularly as road users travel east towards the site. Beyond this, sequential effects are judged to fall below the threshold of significance.

Additional Cumulative Effects with Proposed Wind Farms:

Figure 5.1.8 highlights changes to the cumulative baseline.

The key changes under scenario 1 will be Hill of Lybster, which will slightly intensify effects in relation to Forss Wind Farm in certain sequential views to the north of the route; and Limekiln Extension and Dounreay Tri Demo, which will add visibility of new wind farms, to the south and north of the route around Raey.

Under scenario 2 Forss Phase 3 will further intensify effects around Forss Wind Farm, and Limekiln will increase the influence of turbines in sequential views south from the route around Reay. The proposed Armadale and Hollandmey will increase the influence of wind farms in sequential views from wider sections of this route, beyond 20 km from the site.

Changes to the cumulative baseline will intensify the experience of wind farms being visible in sequential views from the route, particularly when travelling east towards the site through the introduction of the Limekilns group. Viewpoint 17 is representative of this section of the route and demonstrates this effect. However, and due to the fleeting and successive nature of views; gaps between new wind farms and the Proposed Development; and limited nature of cumulative changes in views to the east towards the Proposed Development, this is not judged to translate in significant additional cumulative visual effects. As road users enter the section of the road where significant sequential effects in relation to the Proposed Development are experienced, they will have passed the Limekilns group.

Consented and proposed wind farms will increase the influence of wind farms in sequential views from the A836. However, the gaps between these schemes and the Proposed Development are such that this is not judged to translate in significant additional cumulative sequential effects.

Cumulative Effect and Significance:

Not significant

## Table 5.39: A9

| A9 (and Wick to Thurso railway line) | | | |
|---|---|---|---|
| **Representative viewpoints:** | Viewpoint 6: A9 south of Thurso<br>Viewpoint 10: Georgemas Junction Station | **Approximate distance from route to nearest turbine (closest point):** | Within 5 km, at closest point |

Location, description of existing view and potential receptors:

**A9 (and Wick to Thurso railway line)**

This is a major route connecting Thurso to Inverness and the central belt of Scotland beyond. The route extends southwards from Scrabster on the coast, through Thurso to Latheron and the junction of The A99 just outside the study area to the south.

Short to longer distance views as available from various open sections of the route, as represented by Viewpoints 6 and 10. When visible the undulating landform around the site is visible in slightly oblique sequential views, when travelling north. The route passes through the operational Bad a Cheo and Halsary Wind Farm, approximately 20 km south of the site. At its closest, this route passes within 5 km east of the site. North of Georgemas Junction Station (within approximately 13 km of the site) the Wick to Thurso railway line follows a broadly similar route to the A9, along the broad valley of the River Thurso.

**Sensitivity:**

Road uses on this fast moving route are considered to be of medium sensitivity.

Through the LVIA study area the route does not pass through any designated landscapes or form part of any promoted long distance tourist routes, including a lower value.

Taking account of the judgements of susceptibility and value, overall sensitivity is judged to be **medium.**

**Assessment of visual effects:**

When travelling north, the ZTV indicates widespread theoretical visibility from this route, from approximately 3 km north of Latheron. Actual visibility will be dependant on local built form and vegetation, noting larger areas of coniferous forest cover around and south of Mybster as the route passes between operational wind farms including Halsary and Bad a Cheo.

Viewpoint 10 and 6 are representative of longer to medium distance views from this route, between 5 and 15 km, as road users travel north on the approach to Thurso. Through here there are open stretches of the road, with slightly oblique views towards the Proposed Development, which is seen in the context of a gently undulating horizon to the north-west, which is often altered by vertical structures including electricity infrastructure and wind turbines including the operational Baillie Wind Farm. A small increasing to medium-large scale of change is predicted.

Effect and Significance:

**Moderate (significant)** sequential effects are predicted from open sections of the route within approximately 6 km of the site, on the southern outskirts of Thurso. Beyond this sequential effects are judged to fall below the threshold of significance.

Additional Cumulative Effects with Proposed Wind Farms:

Figure 5.1.8 highlights changes to the cumulative baseline.

The key changes under scenario 1 will be Limekiln Extension, which will add visibility of new wind farms in medium to longer distance oblique views to the north-west/ west. Achalan 2 will slightly intensify the effects of wind farms as road users drive through the south-eastern wind farm group. Golticlay will add a further wind farm in successive views to the east of the route, approximately 30 km south of the site.

Under scenario 2 Limekiln, will intensify visibility of wind turbines in this now larger group, in medium to longer distance oblique views to the north-west/ west. Tormsdale will further slightly intensify the effects of wind farms as road users drive through the south-eastern wind farm group.

Changes to the cumulative baseline will intensify the experience of wind farms being visible in sequential views from the route. The changes will generally intensify existing groups (the south-eastern group) or add new closer proximity visibility of wind farms from sections of the route which are distant from the site. The Limekilns group will be potentially visible in combined sequential views with the Proposed Development, from a longer stretch of the road as indicated in Viewpoint 10 and 6. No significant additional cumulative sequential effects have been identified from either of these viewpoints. This is due to the viewing distance; gaps between wind farms; localised areas

| A9 (and Wick to Thurso railway line) |
|---|
| of screening offered by intervening forest cover (which will change as road users move along the route); and large scale panoramic nature of views from this road. |
| Cumulative Effect and Significance:<br>Not significant |

**Table 5.40: Stromness Ferry (both routes)**

| Stromness Ferry (both routes) | | | |
|---|---|---|---|
| **Representative viewpoints:** | Viewpoint 7: Northlink Ferry (Scrabster to Stromness) | **Approximate distance from route to nearest turbine (closest point):** | Within 5 km, at closest point |
| Location, description of existing view and potential receptors:<br>The Northlink ferry connects Stromness, in the Orkney Islands, to Scrabster on the mainland. It travels north to south through the northern extents of the study area, passing to the west of Hoy. Views to site are direct and long to short distance. | | | |
| Sensitivity:<br>Tourist on the ferry are assumed to have medium-high susceptibility to changes in views.<br>The ferry route passes through the western extents of the Hoy and West Mainland NSA, indicating a higher value.<br>Taking account of the judgements of susceptibility and value, overall sensitivity is judged to be **medium-high.** | | | |
| Assessment of visual effects:<br>When travelling south, and through the majority of the LVIA study area, the ZTV indicates widespread theoretical visibility from this ferry route. Due to the open nature of sea based views, actual visibility will reflect this. Viewpoint 7 is representative of medium distance views from the ferry, on the approach to Scrabster. Direct views from the passenger deck of the ferry, when travelling in both directions, will be available. The Proposed Development will be seen above the gently undulating horizon beyond the coastal cliff edges. Horizons on the mainland, to the south-west of view, have been altered by operational wind farms including Forss. A medium scale of change is predicted, which represents the scale of change in views within approximately 7.5 km. In longer distance views from the ferry, the scale of change will reduce. | | | |
| Effect and Significance:<br>**Moderate (significant)** sequential effects are predicted from the ferry route, within approximately 7.5 km of the site, on the approach to Scrabster. Beyond this, sequential effects are judged to fall below the threshold of significance. | | | |
| Additional Cumulative Effects with Proposed Wind Farms:<br>Viewpoint 7 is representative of sequential views from the ferry. Due to the open nature of sea based views, operational and consented schemes will be visible in long distance views to the north-east (on Orkney), south-west and south-east (on the mainland). Under both scenarios the key change in the view will be the intensification of turbines around the Forss group, seen along the coastal edge to the west of the site. The arrangement of turbines in wider views will change, as the ferry moves between the mainland and Orkney. Generally, the Proposed Development will read as a distinct scheme seen on the coastal edge, in medium to longer distance views to the south-west. As such, no significant additional cumulative visual effects are predicted. | | | |
| Cumulative Effect and Significance:<br>Not significant | | | |

## Proposed Mitigation

5.10.9 Measures to reduce effects upon the landscape resource and visual amenity were predominantly achieved through the design of the wind farm, as described in **Chapter 3: Design Evolution and Alternatives**.

### Residual Operational Effects

5.10.10 Measures to reduce landscape effects and visual effects have been embedded into the design of the wind farm and the site restoration proposals. All residual effects are therefore as predicted in the assessment section above.

### Residual Cumulative Effects during Operation

5.10.11 Measures to reduce cumulative landscape and visual effects have been embedded into the design of the wind farm and the site restoration proposals. All residual effects are therefore as predicted in the assessment sections above.

## 5.11 Further Survey Requirements and Monitoring

5.11.1 No monitoring is proposed for landscape and visual effects.

## 5.12 Summary of Significant Effects

5.12.1 Table 5.41 below summarises the predicted effects of the Proposed Development on the landscape and visual amenity of the study area. Where effects are significant this has been highlighted.

**Table 5.41: Summary Of Significant Landscape And Visual Effects**

| Receptor | Primary LVIA Assessment Findings (includes consideration of existing wind farms) | Scenario 1 Cumulative Assessment Findings | Scenario 2 Cumulative Assessment Findings |
|---|---|---|---|
| Effects of Construction on The Site | Moderate (significant) | Not applicable | Not applicable |

| Receptor | Primary LVIA Assessment Findings (includes consideration of existing wind farms) | Scenario 1 Cumulative Assessment Findings | Scenario 2 Cumulative Assessment Findings |
|---|---|---|---|
| **Operational effects on Landscape Receptors** | | | |
| The Site | Major (significant) | Not applicable | Not applicable |
| Farm Lowland Plain (143) LCT | Major(significant) across site and reducing to Moderate (significant) within 5 km. Not significant beyond 5 km. | Not significant | Not significant |
| High Cliffs and Sheltered Bays (141) LCT | Moderate (significant) from the high ground along the southern edge of the LCT between Brims Ness and Holburn Head. Minor (not significant) elsewhere. | Not significant | Not significant |
| Sweeping Moorland and Flows (134) LCT | Minor (not significant) | Not significant | Not significant |
| Sandy Beaches and Dunes (140) LCT | Minor (not significant) | Not significant | Not significant |
| North Caithness and Pentland Firth Seascape Unit 8 | Moderate (significant) within 5 km. Not significant beyond 5 km. | Not significant | Not significant |
| Dunnet Head SLA | The Proposed Development will not compromise the integrity of SLA | Not significant | Not significant |
| The Flow Country and Berriedale Coast SLA | The Proposed Development will not compromise the integrity of SLA | Not significant | Not significant |
| Farr Bay, Strathy and Portskerra SLA | The Proposed Development will not compromise the integrity of SLA | Not significant | Not significant |
| **Operational effects on visual receptors** | | | |
| Viewpoint 1 - A836 | Major (significant) | Not significant | Not significant |
| Viewpoint 2 - Thurso to Reay Road | Moderate (significant) | Not significant | Not significant |
| Viewpoint 3 - A836, Thurso | Moderate (significant) | Not significant | Not significant |
| Viewpoint 4 - St Mary's Chapel, Crosskirk | Moderate (significant) | Not significant | Not significant |
| Viewpoint 5 - Kintail Cottage | Scoped out of re-assessment | | |
| Viewpoint 6 - A9 South of Thurso | Moderate (significant) | Not significant | Not significant |
| Viewpoint 7 - Northlink Ferry (Scrabster to Stromness) | Moderate (significant) | Not significant | Not significant |
| Viewpoint 8 – Reay | Minor (not significant) | Not significant | Not significant |
| Viewpoint 9 - Beinn Ratha | Minor (not significant) | Not significant | Not significant |
| Viewpoint 10 - A9, Georgemas Station | Minor (not significant) | Not significant | Not significant |
| Viewpoint 11 - Ben Dorrery | Minor (not significant) | Not significant | Not significant |
| Viewpoint 12 - Dunnet Bay Visitor Centre | Minor (not significant) | Not significant | Not significant |
| Viewpoint 13 - Easter Head Light House car park | Minor (not significant) | Not significant | Not significant |
| Viewpoint 14 - North of Mybster Substation | Minor (not significant) | Not significant | Not significant |
| Viewpoint 15 - Loch Watten visitor car park | Minor (not significant) | Not significant | Not significant |
| Viewpoint 16 - Strathy Point | Minor (not significant) | Not significant | Not significant |
| Viewpoint 17 - A836 near Reay | Minor (not significant) | Not significant | Not significant |
| Viewpoint 18 – Janetstown | Major (significant) | Not significant | Not significant |
| Settlement of Thurso | Significant visual effects predicted from western extents of the settlement, | Not significant | Not significant |

| Receptor | Primary LVIA Assessment Findings (includes consideration of existing wind farms) | Scenario 1 Cumulative Assessment Findings | Scenario 2 Cumulative Assessment Findings |
|---|---|---|---|
| | from areas with open views west towards the site (as represented by Viewpoint 3). This is not predicated to translate into significant visual effects on the settlement overall. | | |
| Communities around Cairnmore Hillock/ Hill of Forss | Up to Major (significant) | Not significant | Not significant |
| A836 | Moderate and above (significant) sequential effects are predicted from open sections of the route, as road users travel east and west, within approximately 7.5 km of the site. Beyond this, sequential effects are judged to fall below the threshold of significance. | Not significant | Not significant |
| | | | |
| A9 (and Wick to Thurso Railway Line) | Moderate (significant) sequential effects are predicted from open sections of the route within approximately 6 km of the site, on the southern outskirts of Thurso. Beyond this, sequential effects are judged to fall below the threshold of significance. | Not significant | Not significant |
| Stromness Ferry (both routes) | Moderate (significant) sequential effects are predicted from the ferry route, within approximately 7.5 km of the site, on the approach to Scrabster. Beyond this, sequential effects are judged to fall below the threshold of significance. | Not significant | Not significant |

## 5.13 Appraisal of Proposed Development against THC SG Landscape and Visual Criteria

5.13.1 THC Onshore Wind Energy SG sets out ten landscape and visual criteria that the Council will use as a framework for assessing proposals. The criteria do not set absolute requirements but seek to ensure that developers are aware of key constraints to development, which should be taken account of when progressing assessment and design of wind energy proposals. An assessment of the Proposed Development against the ten criteria is set out below.

**Table 5.42: Appraisal of Proposed Development against THC SG L&V Criteria**

| Criterion | Measure | Evaluation |
|---|---|---|
| **Criterion 1** | | |
| Relationship between Settlements/Key locations and wider landscape respected | The extent to which the proposal contributes to perception of settlements or key locations being encircled by wind energy development. | There will be no significant visual effects on Settlements, as defined in the Highland LDP.<br>Visibility from the majority of the settlement of Thurso will be restricted by built form, although there will be views from the part of Thurso that lies to the north-west of the A836 and from the western edges of the settlement. The Proposed Development will not contribute to any effects of 'encirclement' on the Settlement.<br>There will be views from settled areas (but not defined as Settlements) around Cairnmore Hillock and Hill of Forss including the communities of Janetstown, Westfield and Forss. When visible, the Proposed Development will result in significant visual effects. However, many properties have open and long distance views in one or more direction away from the site. The open and gently undulating nature of the landscape contributes to the sense of large scale views with expansive skies. The large scale and expansive nature of these views is better able to accommodate wind farm development of the scale proposed (and further views of wind farms with relevance to residents who currently experience views of Baillie and Hill of Forss Wind Farms). Where long distance coastal views from communities around the site can be experienced, these will typically not be altered by wind farm development at the site.<br>Visibility from key routes into Thurso is discussed further below. |
| Development should seek to achieve a threshold where: | Turbines are not visually prominent in the majority of views within or from settlements/Key Locations or from the majority of its access routes. | |
| **Criterion 2** | | |
| Key Gateway locations and routes are respected | The extent to which the proposal reduces or detracts from the transitional experience of key Gateway Locations and routes. | There will be some localised significant sequential effects from the A836 (which also forms part of North Coast 500); A9 and Stromness Ferry, within 7.5 km of the site. All of these routes provide links, by road and sea, into Thurso.<br>However, all of these are long routes which extend beyond the LVIA study area. Effects are not predicted to result in significant sequential effects from these routes overall. Although there |
| Development should seek to | Wind Turbines or other infrastructure do not | |

| Criterion | Measure | Evaluation |
|---|---|---|
| achieve a threshold where: | overwhelm or otherwise detract from landscape characteristics which contribute the distinctive transitional experience found at key gateway locations and routes. | will be significant effects on some short sections of the routes in closer proximity to the Proposed Development, this is not considered to overwhelm or otherwise detract from landscape characteristics, given the small number of turbines proposed, as well as their scale. Furthermore, these will be from areas where existing wind farm development (including Forss and Baillie) and other human influences, such as electricity infrastructure and residential/ coastal industry development have altered the landscape.<br>No other key gateways and transport routes will be significantly affected. |
| **Criterion 3** | | |
| Valued natural and cultural landmarks are respected | The extent to which the proposal affects the fabric and setting of valued natural and cultural landmarks. | No significant visual effects are anticipated from valued natural and cultural landmarks including:<br>Beinn Ratha,<br>Ben Dorrery,<br>Dunnet Bay Visitor Centre,<br>Easter Head Light House,<br>Loch Watten Visitor Centre; or<br>Strathy Point.<br>Significant visual effects are predicted from St Mary's Chapel, Crosskirk. In views from here the operational Forss Wind Farm is located in closer proximity. The Proposed Development is seen in successive views in the context of panoramic views, with expansive skies. Key views towards the coast, from the chapel, will not be altered by wind farm development at the site. As such, the Proposed Development is not considered to, by its presence, diminish the prominence of this landmark or further disrupt its relationship to setting. |
| Development should seek to achieve a threshold where: | The development does not, by its presence, diminish the prominence of the landmark or disrupt its relationship to its setting. | |
| **Criterion 4** | | |
| The amenity of key recreational routes and ways is respected | The extent to which the proposal affects the amenity of key recreational routes and ways (e.g. Core Paths, Munros and Corbett's, Long Distance Routes etc.). | No long distance walking trails, Munros or Corbett's will be significantly affected by the Proposed Development.<br>Core Paths within 5 km are mapped on Figure 5.1.2. These include Core Paths radiating north, west and south of Thurso, as represented by Viewpoint 3 and 18; short sections of Core Paths to the east of Westfield, as represented by Viewpoint 2; and short sections of Core Paths around Crosskirk Bay, as represented by Viewpoint |
| Development should seek to | Wind Turbines or other infrastructure do not | |

| Criterion | Measure | Evaluation |
|---|---|---|
| achieve a threshold where: | overwhelm or otherwise significantly detract from the visual appeal of key routes and ways. | 4. Where open views towards the Proposed Development are available, from sections of the Core Path network within approximately 5 km, significant visual effects are predicted. However, these will generally be from areas where existing wind farm development (including Forss and Baillie) and other human influences, such as electricity infrastructure and residential/ coastal industry development have altered the landscape. Due to the gently undulating and open nature of the landscape, when visible the Proposed Development will generally be seen in open, larger scale views with expansive skies. From Core Paths along the coastal edge, key coastal views to the north will not be altered by wind farm development at the site. |
| **Criterion 5** | | |
| The amenity of transport routes is respected | The extent to which the proposal affects the amenity of transport routes (tourist routes as well as rail, ferry routes and local road access) | As noted previously, there will be some localised significant sequential effects from the A836; A9 and the Stromness Ferry, within 7.5 km of the site.<br>However, all of these are long routes which extend beyond the LVIA study. Effects are not predicted to result in significant sequential effects from these routes overall. Whilst there will be significant effects on some short sections of the routes in closer proximity to the Proposed Development, this is not considered to overwhelm or otherwise significantly detract from the visual appeal of transport routes, given the small number of turbines proposed, as well as their scale. Furthermore, these will be from an area where existing wind farm development (including Forss and Baillie) and other human influences, such as electricity infrastructure and residential/ coastal industry development have altered the landscape. Due to the gently undulating and open nature of the landscape, when visible the Proposed Development will generally be seen in open, larger scale views with expansive skies so the proposed wind turbines do not appear to overwhelm sequential views from the routes. From the A836, key coastal views to the north will not be altered by wind farm development at the site. |
| Development should seek to achieve a threshold where: | Wind Turbines or other infrastructure do not overwhelm or otherwise significantly detract from the visual appeal of transport routes | |
| **Criterion 6** | | |
| The existing pattern of Wind Energy | The degree to which the proposal fits with the existing pattern of nearby wind energy | The Proposed Development will be located in an area of potential for wind farm development, as identified in the Highland Onshore Wind Energy Supplementary Guidance (2016). |

| Criterion | Measure | Evaluation |
|---|---|---|
| Development is respected | development, considerations include:<br>Turbine height and proportions,<br>Density and spacing of turbines within developments,<br>Density and spacing of developments,<br>Typical relationship of development to the landscape.<br>Previously instituted mitigation measures<br>Planning Authority stated aims for development of area | Whilst the Proposed Development is not an extension to an existing scheme, it will follow the pattern of operational wind farm development, with schemes located outside of designated landscapes, in the Farm Lowland Plain and Sweeping Moorland Flows LCT. Both of these are larger scale and gently undulating landscape character types, with large scale views and expansive skies which are better able to accommodate wind farm development.<br>The Proposed Development will generally read as a distinct and well composed single cluster of turbines.<br>Due to the small number of turbines (the revised application has removed three turbines from the previous application) and with turbines at 138.5 m to tip, the layout and scale of turbines is comparable with wind farms in the more immediate context (Forss and Baillie Wind Farms). |
| Development should seek to achieve a threshold where: | The proposal contributes positively to existing pattern or objectives for development in the area. | |
| **Criterion 7** | | |
| The need for separation between developments and/ or clusters is respected | The extent to which the proposal maintains or affects the spaces between existing developments and/ or clusters. | Existing wind farm developments in the more immediate context includes Baillie and Forss Wind Farms. As recognised in the viewpoint assessment, there will be intervisibility between these schemes, which will be seen in combined medium to longer distance views towards the site and combined/ successive views for viewpoints in closer proximity to the site and between theses wind farms. The gaps between these schemes are such that the Proposed Development will generally read as a distinct and well composed single cluster of turbines, smaller than the existing wind farm at Baillie a few km to the south-west, but reflective of its position in the landscape – i.e. as a hilltop development.<br>Changes to the cumulative baseline, in the more immediate landscape context, will generally relate to a slight intensification of turbines in relation to the presence of Forss Wind Farm. The Proposed Development will continue to maintain a notable gap between the slighter larger group at Forss and itself, under a theoretical further cumulative baseline which includes consented and proposed schemes. It will also maintain a gap with the existing Baillie Wind Farm. |
| Development should seek to achieve a threshold where: | The proposal maintains appropriate and effective separation between developments and/ or clusters. | |

| Criterion | Measure | Evaluation |
|---|---|---|
| | | Beyond these relationships, changes to the wider cumulative baseline are beyond 8 km distant, which limits the potential for further additional and significant cumulative landscape and visual effects. |
| **Criterion 8** | | |
| The perception of landscape scale and distance is respected | The extent to which the proposal maintains or affects receptors' existing perception of landscape scale and distance. | Effects on landscape character will be localised, with significant effects focused to within 5 km from the Farmed Lowland Plain (143) LCT, High Cliffs and Sheltered Bays (141) LCT and North Caithness and Pentland Firth Seascape Unit 8. None of these LCT/ seascape units will be subject to widescale significant effects on landscape/ seascape character where the full or a large part of the LCT/ seascape unit would be significantly affected. There will be areas within the LCT/ seascape unit where the key characteristics can be experienced unaltered. Where significant effects on landscape character are experienced, this will typically be from places with large scale and open views and expansive skies, which are able to accommodate wind farm development without it overwhelming the experience of landscape character. This is particularly the case given the relatively small numbers of turbines proposed and their scale.<br>No wider significant effects on landscape character are predicted. |
| Development should seek to achieve a threshold where: | The proposal maintains the apparent landscape scale and/or distance in the receptors' perception. | |
| **Criterion 9** | | |
| Landscape setting of nearby wind energy developments is respected | The extent to which the landscape setting of nearby wind energy developments is affected by the proposal. | As noted previously, there is an offset between the Proposed Development and existing wind farms.<br>Given the relatively small numbers of turbines proposed and their scale, their effect on this large scale and expansive open landscape will be limited. They will relate well to the existing landscape setting and their visual prominence will not notably increase the influence of wind farms across the wider landscape. This is a large scale landscape, and in spite of there already being a number of wind farm developments across it, there remains a strong perception of open space, with the large scale of the landscape prevailing. The turbines will not alter the perception of scale and distance, but will become new features within it, which are already relatively familiar features of the wider landscape. |
| Development should seek to achieve a threshold where: | Proposal relates well to the existing landscape setting and does not increase the perceived visual prominence of surrounding wind turbines. | |
| **Criterion 10** | | |

| Criterion | Measure | Evaluation |
|---|---|---|
| Distinctiveness of Landscape character is respected | The extent to which a proposal affects the distinction between neighbouring landscape character types, in areas where the variety of character is important to the appreciation of the landscape. | Localised effects on landscape character are not unusual for commercial scale wind energy developments. Effects on landscape character associated with the Proposed Development will be localised, limited to within around 5 km, as experienced from open landscapes and areas of seascape around the site. The Proposed Development will be fully contained within the Farmed Lowland Plain (143) LCT and as such will not contribute to any 'blurring' of landscape character types.<br>No designated landscapes will be compromised by the Proposed Development. |

# 6 Archaeology and Cultural Heritage

## 6.1 Introduction

6.1.1 This chapter considers the likely effects on cultural heritage associated with the construction, operation and decommissioning of the Proposed Development. The specific objectives of the chapter are to:

- describe the cultural heritage baseline;
- describe the assessment methodology and significance criteria used in completing the impact assessment;
- describe the potential effects, including direct, indirect and cumulative effects; and
- describe the mitigation measures proposed to address likely significant effects; and assess the residual effects remaining following the implementation of mitigation.

6.1.2 This chapter is supported by the following figures and technical appendices:

- Figure 6.1: Cultural Heritage: Inner Study Area;
- Figure 6.2: Cultural Heritage: Outer Study Area;
- Figure 6.3: Cultural Heritage: Cumulative Schemes;
- Technical Appendix 6.1: Heritage Assets within the Inner Study Area;
- Technical Appendix 6.2: Heritage Assets within the Outer Study Area and within 5 km of the Proposed Development; and
- Technical Appendix 6.3: Heritage Assets within the Outer Study Area and between 5 km and 10 km of the Proposed Development.

6.1.3 Figures and technical appendices are referenced in the text where relevant.

## 6.2 Assessment Methodology and Significance Criteria

### Scope of Assessment

6.2.1 This chapter considers:

- Direct impacts on cultural heritage assets within the site;
- Impacts on the setting of heritage assets in the wider landscape; and
- Cumulative impacts on the settings of heritage assets in the wider landscape.

6.2.2 The assessment is based on the Proposed Development as described in Chapter 2: Proposed Development.

6.2.3 The scope of the assessment has been informed by consultation responses summarised in Table 6.1 and the following guidelines/policies:

- National Planning Framework (NPF 3) (SG, 2014a);
- Draft National Planning Framework for Scotland 4 (NPF 4);
- Scottish Planning Policy (SPP) (2014);
- Planning Advice Note (PAN) 2/2011 (2011);
- Historic Environment Policy for Scotland (HEPS) (2019);
- Highland-wide Local Development Plan (2012); Policy 28 (Sustainable Design) and Policy 57 (Natural, Built and Cultural Heritage);
- Highland Historic Environment Strategy: Supplementary Planning guidance (2013);
- Highland Council Standards for Archaeological Work (2012);
- Scottish Natural Heritage[1] and Historic Environment Scotland 'Environmental Impact Assessment Handbook'; (2018)
- Designation Policy and Selection Guidance (2019, updated 2020);
- Historic Environment Scotland (2016) 'Managing Change in the Historic Environment: Setting';
- Principles of Cultural Heritage Impact Assessment in the UK (2021); and
- Chartered Institute for Archaeologists (2014) 'Standard and Guidance for Historic Environment Desk-Based Assessment'.

### Consultation

6.2.4 Table 6.1 summaries the consultation responses received regarding archaeology and cultural heritage and provides information on where and/or how they have been addressed in this assessment. The following organisations made comment of archaeology and cultural heritage: The Highland Council (THC); Historic Environment Scotland (HES); THC Historic Environment Team (HET).

[1] Scottish Natural Heritage (SNH) has changed its name to NatureScot as of the 24th August 2020.

## Table 6.1: Consultation Responses

| Consultee and Date | Scoping / Other Consultation | Issue Raised | Response/Action Taken |
|---|---|---|---|
| HES 07/02/2022 | Scoping Response | Advise that there is potential for significant adverse impacts on the settings of the two Scheduled Monuments, from the Proposed Development:<br>▪ Thing's Va broch 1000m E of Blackheath Scrabster (SM 587); and<br>▪ Scrabster Mains, broch 1000m W of (SM 578).<br>Requested that photomontages demonstrating both the views out from the brochs, towards the Proposed Development, and also the views towards the brochs, with the Proposed Development in the background, be included in the EIA. | Noted<br>Assessment of the impact on the settings of Thing's Va, broch and Scrabster Mains, broch are set out in Section 6.4 and in Technical Appendix 6.2.<br>Photomontage visualisations are provided for Thing's Va, broch and Scabster Mains, broch from locations agreed within HES (Figures 6.2.1-6.2.4). These are referenced, where applicable in Technical Appendix 6.2 and in the assessment in Section 6.4. |
| | | Advised that potential significant adverse impacts on the settings of eleven Scheduled Monuments (see below) could arise from the Proposed Development:<br>▪ Brims Castle (SM 5510)<br>▪ Crosskirk, St Marys Chapel and broch S of Chapel Pool (SM 90086)<br>▪ Mill of Knockglass, long cairn 100m SSE of, Bridge of Westfield (SM 469)<br>▪ Mill of Knockglass, cairn 220m S of, Bridge of Westfield (SM 470)<br>▪ Mill of Knockglass, chambered cairn 320m SSE of, Bridge of Westfield (SM 471)<br>▪ Knockglass, broch 300m SSW of Mill of Knockglass (SM 562)<br>▪ Hill of Shebster, chambered cairn (SM 476)<br>▪ Cnoc Freiceadain, long cairns (SM 90078)<br>▪ Scrabster Castle, (SM 2630)<br>▪ Holborn Head, fort, Scrabster (SM 559)<br>▪ Green Tullochs, broch and cairn 640m NNW of Borrowstone Mains (SM 554) | Noted<br>Assessment of the impact of the Proposed Development on the setting of these heritage assets are set out in Section 6.4 and Technical Appendices 6.2 and 6.3.<br>A list of cultural heritage visualisations included in the assessment ins provided in Table 6.5. |
| | | Requested that the EIA should consider the potential for effects on the setting of these assets. | |
| | | Recommend that the potential cumulative impacts of the Proposed Development in combination with other developments in the vicinity be assessed as part of the EIA. | Noted<br>Assessment of the cumulative impact of the Proposed Development in combination with other developments on the setting of heritage assets in the study areas is set out in Section 6.4. |
| | | Recommend that an appropriately detailed ZTV should be used to identify potential setting impacts in the first instance and that consideration should be given to including assets even though the ZTV indicates that no direct intervisibility would be possible there is potential for turbines to appear in the background of key views towards these assets. | Noted<br>The methodology employed for the assessment is set out in Section 6.2.<br>The blade tip and hub height ZTVs generated for the Proposed Development were used to identify those heritage assets within the Outer Study Area whose settings maybe affected by the Proposed Development. |
| HES 21/03/2022 | Pre-App Advise | Confirm that they are broadly content with the list of proposed visualisations provided. | Noted<br>A list of cultural heritage visualisations included in the assessment ins provided in Table 6.5. |
| | | Welcome the inclusion of a viewpoint looking towards the Thing's Va, broch 1000m E of Blackheath, Scarbster (SM 587) and the Scrabster Mains, broch 1000m W of (SM 579) from further east with the assets in the foreground and showing the proposed turbines in the background. | Noted<br>Photomontages looking back towards the brochs with the Proposed Development in the background are provided in Figures 6.2.2 and 6.2.4. |
| | | Note that the visualisation from Thing's Va, broch 1000m E of Blackheath, Scarbster (SM 587) is proposed to be taken from the ESE with the broch in the centre of the frame. Advise that there is potential that this viewpoint may not show the full extent of the turbines given the angle of the view and the location of the proposed turbines. Suggests that a more accurate representation would be from a location of | Noted<br>A photomontage from a location at the field gate north-east of Hillburn House, east of the broch, and looking back towards the broch with the Proposed Development in the background, is provided in Figure 6.2.2. |

| Consultee and Date | Scoping / Other Consultation | Issue Raised | Response/Action Taken |
|---|---|---|---|
| | | the viewpoint further east along the road, at the field gate (at approx. 308906, 968309). | |
| | | Welcome sight of draft wireline visualisations provided as part of the consultation.<br>Note that the scale of the Proposed Development is reduced in comparison with the previous proposals and consider that these changes are likely to reduce impacts on the setting of designated heritage assets in the surrounding area. | Noted<br>Assessment of the impact of the Proposed Development on the setting of heritage assets is set out in Section 6.4 and Technical Appendices 6.2 and 6.3. |
| | | Advice that it appears that the effects on the setting of the Thing's Va, broch 1000m E of Blackheath, Scrabster (SM 587) and the Scarbster Mains, broch 1000m W of (SM 579) are still likely to be significant.<br>HES recommended that consideration be given to relocating T5 to reduce the level of effect on the setting of both of the scheduled brochs. | The revised scheme has been designed to take account of all environmental constraint issues including a significant reduction in the number of turbines within the Proposed Development. Therefore relocating T5 is not a viable proposal and HES did not object to the previous application. |
| THC 22/02/2022 | Scoping Response | It is requested that the EIA identifies all designated sites which may be affected by the Proposed Development either directly or indirectly.<br>Advise that any assessment should contain a full appreciation of the setting of these historic environment assets and the likely impact on their settings. | Noted<br>An assessment of the impacts of the Proposed Development, both direct (construction) impacts and impacts on the setting of heritage assets is set out in Section 6.4 and Technical Appendices 6.2 and 6.3. |
| | | It is recommended that where the assessment finds that significant impacts are likely, appropriate visualisations such as photomontage and wireframe views of the development in relation to these sites and their settings are provided. Visualisations illustrating views both from the asset towards the Proposed Development and views towards the asset with the Proposed Development in the background would be helpful. | Noted<br>A list of cultural heritage visualisations included in the assessment along with details on their locations and visualisation type (photomontage/wireline) is provided in Table 6.5. |
| | | Note that HES response to the Scoping does not recommend a specific radius to identify assets for inclusion or exclusion in impact assessments and includes a list of the heritage assets within its remit in the vicinity of the development that require to be assessed (see above for details). | Noted<br>Preliminary assessment of the 35 km blade tip ZTV did not identify any heritage assets beyond 10 km whose settings would be significantly affected by the Proposed Development. |
| | | Notes that HET advise that it is generally satisfied with the methodology presented in the Scoping Report. | Noted<br>The methodology employed for the assessment is set out in Section 6.2 |
| | | Notes that HET advise that the Proposed Development is within an important area with upstanding remains and potential for buried features and deposits and request that the EIA report proposed mitigation methods to mitigate impacts on archaeological and historical interests where impacts are unavoidable. | Noted<br>Assessment of the archaeological potential of the site is provided in Section 6.2<br>Proposed mitigation to avoid or reduce the predicted effects of the Proposed Development on heritage assets is provided in Section 6.5. |

## Potential Effects Scoped Out

6.2.5 On the basis of the desk-based and survey work undertaken, the professional judgement of the Environmental Impact Assessment (EIA) team, experience from other relevant projects and policy guidance or standards, the following topic areas have been 'scoped out':

- Disturbance from vibration, dewatering or changes in hydrology resulting in indirect effects on cultural heritage assets; and
- Effects on the settings of cultural heritage assets more than 10 km from the Proposed Development. No assets beyond 10 km were identified by statutory consultees as requiring assessment (see Table 6.1), and none whose settings would be significantly affected by the Proposed Development were identified during the study.

## Method of Baseline Characterisation

### Extent of Study Area

6.2.6 Two study areas are used for the assessment:

- The Inner Study Area (Figure 6.1): the Proposed Development red line boundary ("the site") forms the study area for the identification of heritage assets that could receive direct impacts arising from the construction of the Proposed

Development. The current land-use of this area is mostly rough grazing pastureland/moorland spread over three separate landholdings, with some areas of improved pasture grazing around former and existing farmsteads (Blackheath, Hopefield, Lythmore and Forss Holdings). Figure 6.1 shows the site boundary, the Proposed Development layout and the locations of heritage assets identified and described in Technical Appendix 6.1.

- An Outer Study Area (Figure 6.2): a 10 km study area, extending from the outermost turbines of the Proposed Development, was used for the identification of cultural heritage assets whose settings may be affected by the Proposed Development ("external receptors"). No assets beyond 10 km were identified, either by the consultees, or through preliminary assessment of the 35 km blade tip Zone of Theoretical Visibility (ZTV) as requiring inclusion in the assessment. Figure 6.2 shows the Proposed Development, together with the blade tip height ZTV and the location of heritage assets within the 5 km and 10 km study areas from which there would be a theoretical view of the turbines, and which are included in the assessment. Lists of these heritage assets is provided in Technical Appendices 6.2 and 6.3, which also provide tabulated summary assessments of the predicted impacts on their settings on a case-by-case basis.

6.2.7 The consideration of cumulative effects on the settings of heritage assets also uses the 10 km study area. Figure 6.3 shows the Proposed Development in its wider landscape context, together with the blade tip height ZTV. The locations of the heritage assets that have theoretical visibility of one or more turbines of the Proposed Development, and the locations of other wind energy developments in the wider area are also shown. The cumulative schemes included in the assessment reflect those listed in Chapter 5: Landscape and Visual Impact Assessment which have been agreed with THC.

**Desk Study**

6.2.8 The following sources were consulted as part of the desk-based assessment:

- THC Historic Environment Record (HER); provided a digital database extract in GIS for all assets within the site boundary;
- HES Spatial Data Warehouse[2]; provided up-to-date data on the locations and extents of Scheduled Monuments, Listed Buildings, Conservation Areas, Inventory status Garden and Designed Landscapes and Inventory status Historic Battlefields;
- The National Record of the Historic Environment (NHRE) database (Canmore[3]): for any information additional to that contained in the HER;
- National Library of Scotland Map Library; for Ordnance Survey maps and other historical map resources;
- National Collection of Aerial Photography (NCAP) archives for oblique and vertical aerial photographs;
- Modern aerial photography/satellite imagery (Google Earth, Bing Maps, ESRI World Imagery);
- Historic Land-use Assessment data for Scotland (HLAmap[4]); for information on the historic land use character of the site;
- The Scottish Palaeoecological Archive Database (SPAD) (Cole et al 1998[5]), consulted for information on sites within the Proposed Development area that may provide palaeoenvironmental and palaeoecological data; and
- Relevant bibliographic references were consulted to provide background and historic information.

**Field Survey**

6.2.9 An initial walk-over field survey of the northernmost part of the site was carried out in 2014. Subsequently, the site boundary was extended and a further walk-over field survey of the whole of the Proposed Development area within the Inner Study Area (shown outlined in blue on Figure 6.1) was undertaken between the 5th and 6th September 2016.

6.2.10 The aims of the field survey were to:

- Assess the present baseline condition of the heritage assets identified through the desk-based assessment;
- Identify any further features of cultural heritage interest not detected from the desk-based assessment; and
- Assess the Inner Study Area for its potential to contain currently unrecorded, buried archaeological remains.

6.2.11 Identified sites were recorded on pro-forma monument recording forms and by digital photography, and their positions (and where appropriate their extents) were

[2] HES Spatial Data Warehouse, available at: http://portal.historicenvironment.scot/spatialdownloads (Accessed May 2022)
[3] Canmore (PASTMAP), available at: http://pastmap.org.uk/ (Accessed May 2022)
[4] Historic Land-use Assessment data for Scotland (HLAMap) , available at: http://hlamap.org.uk (Accessed May 2022)
[5] Coles, G.M., Gittings, B.M., Milburn, P. and Newton, A.J. (1998) Scottish Palaeoecological Archive Database [online]. available at: http://www.geo.ed.ac.uk/spad/

logged using a Global Positioning System (GPS) with typical sub-metre accuracy. The survey data has been compiled in a GIS and will be provided to HET for inclusion in the Highland Council Historic HER.

6.2.12 The baseline character and assessed relative sensitivity of the heritage assets identified within the Inner Study Area through desk-based assessment and field survey is set out in Technical Appendix 6.1. Interpretative statements on the relative importance and sensitivity of heritage assets are included below in the Baseline Conditions section (Section 6.3).

6.2.13 Site visits were undertaken between the 5th and 6th September 2016 to assess the character and sensitivity of the settings of heritage assets in the Outer Study Area. Site visits included those assets specifically identified by consultees as requiring assessment and those identified through analysis of the blade tip height ZTV where it was considered, on the basis of professional judgement, that the impact on their settings could be significant. There has been no significant change to the cumulative developments in the area and the results of those site visits remains relevant to this application.

## Assessment of Effects

6.2.14 The effects of the Proposed Development on heritage assets have been assessed based on their type (direct impacts, impacts on setting and cumulative impacts) and nature (adverse or beneficial). The assessment takes into account the relative value/sensitivity of the heritage asset, and its setting, and the magnitude of the predicted impact.

- Adverse effects are those that detract from or reduce cultural significance or special interest of heritage assets.
- Beneficial effects are those that preserve, enhance, or better reveal the cultural significance or special interest of heritage assets.

### Criteria for Assessing the Sensitivity of Heritage Assets

6.2.15 Cultural heritage assets are given weight through the designation process. Designation ensures that sites and places are recognised by law through the planning system and other regulatory processes. The level of protection and how a site or place is managed varies depending on the type of designation and its laws and policies (HES, 2019, updated 2020[6]). Table 6.2 summarises the relative sensitivity of key heritage assets relevant to the Proposed Development drawing on the guidance provided in the 'Environmental Impact Assessment Handbook' (SNH/HES, 2018[7]).

**Table 6.2: Sensitivity of Heritage Assets**

| Sensitivity of Asset | Definition / Criteria |
|---|---|
| High | Assets valued at an international or national level, including:<br>Scheduled Monuments;<br>Category A Listed Buildings;<br>Inventory Garden and Designed Landscapes;<br>Inventory Historic Battlefields: and<br>Non-designated assets that meet the relevant criteria for designations |
| Medium | Assets valued at a regional level, including:<br>Archaeological sites and areas that have regional value (contributing to the aims of regional research frameworks);<br>Category B Listed Buildings; and<br>Conservation Areas |
| Low | Assets valued at a local level, including:<br>Archaeological sites that have local heritage value;<br>Category C Listed Buildings; and<br>Unlisted historic buildings and townscapes with local (vernacular) characteristics |
| Negligible | Assets of little or no intrinsic heritage value, including:<br>Artefact find-spots (where the artefacts are no longer in situ and where their provenance is uncertain); and<br>Poorly preserved examples of particular types of features (e.g. quarries and gravel pits, dilapidated sheepfolds, etc) |

### Assessing Magnitude of Impact

6.2.16 The magnitude of impact (adverse or beneficial) has been assessed in the categories, high, medium, low, and negligible as described in Table 6.3.

**Table 6.3: Magnitude of Impact**

[6] HES (2019, updated 2020) 'Designation Policy and Selection Guidance', Edinburgh.

[7] SNH/HES (2018) Environmental Impact Assessment Handbook: Guidance for competent authorities, consultation bodies, and others involved in the Environmental Impact Assessment process in Scotland.

| Magnitude of Impact | Criteria | |
|---|---|---|
| | Adverse | Beneficial |
| High | Changes to the fabric or setting of a heritage asset resulting in the complete or near complete loss of the asset's cultural significance.<br>Changes that substantially detract from how a heritage asset is understood, appreciated, and experienced. | Preservation of a heritage asset in situ where it would otherwise be completely or almost completely lost.<br>Changes to appreciably enhance the cultural significance of a heritage asset and how it is understood, appreciated, and experienced. |
| Medium | Changes to those elements of the fabric or setting of a heritage asset that contribute to its cultural significance such that this quality is altered appreciably.<br>Changes that appreciably detract from how a heritage asset is understood, appreciated, and experienced. | Changes to important elements of a heritage asset's fabric or setting, resulting in its cultural significance being preserved (where this would otherwise be lost) or restored.<br>Changes that improve the way in which the heritage asset is understood, appreciated, and experienced. |
| Low | Changes to those elements of the fabric or setting of a heritage asset that contribute to its cultural significance such that this quality is slightly altered.<br>Changes that slightly detract from how a heritage asset is understood, appreciated, and experienced. | Changes that result in elements f a heritage asset's fabric or setting detracting from its cultural significance being removed.<br>Changes that result in a slight improvement in the way the heritage asset is understood, appreciated, and experienced. |
| Negligible | Changes that result in elements of a heritage asset's fabric or setting detracting from its cultural significance being removed.<br>Changes that result in a slight improvement in the way the heritage asset is understood, appreciated, and experienced. | |

### Assessment of Setting Effect Significance

6.2.17 Historic Environment Scotland's guidance document, 'Managing Change in the Historic Environment: Setting' (HES, 2016[8]), notes that:

*"Setting can be important to the way in which historic structures or places are understood, appreciated and experienced. It can often be integral to a historic asset's cultural significance."*

*"Setting often extends beyond the property boundary or 'curtilage' of an individual historic asset into a broader landscape context".*

6.2.18 The guidance also advises that:

*"If proposed development is likely to affect the setting of a key historic asset, an objective written assessment should be prepared by the applicant to inform the decision-making process. The conclusions should take into account the significance of the asset and its setting and attempt to quantify the extent of any impact. The methodology and level of information should be tailored to the circumstances of each case".*

6.2.19 The guidance recommends that there are three stages in assessing the impact of a development on the setting of a historic asset or place:

- Stage 1: identify the historic assets that might be affected by the Proposed Development;
- Stage 2: define and analyse the setting by establishing how the surroundings contribute to the ways in which the historic asset or place is understood, appreciated and experienced; and
- Stage 3: evaluate the potential impact of the proposed changes on the setting, and the extent to which any negative impacts can be mitigated.

6.2.20 The turbine blade tip and hub height ZTVs for the Proposed Development have been used to identify those heritage assets from which there would be theoretical visibility of one or more of the proposed turbines and to assess the degree of potential visibility. Consideration was also given to designated heritage assets where there is no predicted visibility from the asset but where views of, or across, the asset are important factors contributing to its cultural significance. In such cases, consideration was given to whether the Proposed Development could appear in the background of those views.

6.2.21 Scheduled Monuments, Category A and B Listed Buildings, Conservation Areas, Inventory Gardens and Designed Landscapes, and Inventory Historic Battlefields, within 10 km of the outermost turbines, are included in the assessment. These assets are included in the tabulated assessments in Technical Appendices 6.2 and 6.3 and they are shown on Figure 6.2. There are no World Heritage Sites nearby that would be adversely affected by the Proposed Development.

6.2.22 Where it has been determined that the setting of an asset is such that there is no potential for it to be affected by the presence of the Proposed Development (including all assets of negligible sensitivity) the asset has not been considered further. For the remaining assets, the magnitude of impact on the setting was assessed according to the thresholds as set out in Table 6.3.

### Cumulative Assessment

6.2.23 The assessment of cumulative effects on heritage assets is based upon consideration of the effects of the Proposed Development on the settings of assets with statutory

8 HES (2016) Managing Change in the Historic Environment: Scotland.

designations and non-statutory designations within the Outer Study Area, in addition to the likely effects of other operational, under construction, consented and proposed (at the application stage) developments.

6.2.24 Operational and under construction developments are considered as part of the baseline and are taken to be such for the assessment of effects on the settings of heritage assets. Developments that are consented but not yet under construction and those that are the subject of valid planning applications are considered as being potential additions to the baseline and are considered in the cumulative impact assessment.

## Criteria for Assessing Significance

6.2.25 The sensitivity of the asset (Table 6.2) and the magnitude of the predicted impact (Table 6.3) are used to inform an assessment of the significance of the effect (direct effect or effect on setting), summarised using the formula set out in the matrix in Table 6.4. The matrix employs a gradated scale of significance (from negligible to major effects) and where two outcomes are possible through application of the matrix, professional judgment supported by reasoned justification, has been used to determine the level of significance.

**Table 6.4: Significance of Effect**

| Magnitude of Impact | Sensitivity of Asset | | | |
|---|---|---|---|---|
| | High | Medium | Low | Negligible |
| High | Major | Major / Moderate | Moderate / Minor | Minor / Negligible |
| Medium | Major / Moderate | Moderate | Moderate / Minor | Minor / Negligible |
| Low | Moderate / Minor | Moderate / Minor | Minor | Negligible |
| Negligible | Minor / Negligible | Minor / Negligible | Negligible | Negligible |

6.2.26 In the assessment that follows, major and moderate effects are considered significant for the purposes of the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (EIA Regulations). Minor and negligible effects are considered 'not significant'.

## Limitations and Assumptions

6.2.27 The desk-based assessment draws on the records in the HER, provided in a digital GIS dataset first acquired in September 2014 ahead of a field survey at that time and reacquired in March 2019 to complete the baseline assessment for the amended site boundary and it is assumed that those records were up to date at the time of the acquisition. There has been no change to the site boundary for this application and the data acquired in 2019 remains relevant for this assessment.

6.2.28 The field surveys carried out in 2014 and 2016 covered the whole of the site as it was defined at the time of the surveys. The site boundary has since been modified (Chapter 3: Design Evolution and Alternatives) and an additional element of desk-based assessment (2019) was carried out covering the extent of current site (as shown in Figure 2.1 and Figure 6.1, 6.2 and 6.3). As the previous field survey covered the whole of the proposed developable area (as shown on Figure 6.1), no further field survey has been carried out covering the amended area of the site, as this was included in the previous field survey. The baseline assessment draws on the results of the desk-based assessments and field surveys carried out, and sufficiently characterises the cultural heritage across the site. No development is proposed in the areas not covered by field survey, the extent of which is shown on Figure 6.1.

6.2.29 The desk-based assessment draws on the results of surveys carried out during a University of Edinburgh Field School Project in the 1980s (Mercer 1981[9]). That survey work recorded a number of features within the Inner Study Area, including mounds (possible cairns); other potential prehistoric remains (including a possible burial cist and a hut-circle); and later (post-medieval) settlement remains. However, it became apparent during the field survey undertaken in 2016 for this assessment that the grid coordinates recorded by that earlier survey work were inaccurate and that many of the features recorded were not present at the positions previously recorded. As the sites recorded by Mercer are listed in the HER they have been retained in Technical Appendix 6.1 and they are shown (at the locations recorded by Mercer) on Figure 6.1. Where it was established that the sites recorded by Mercer are at a different location this is explained below, in the baseline assessment.

6.2.30 Designated heritage assets within the Outer Study Area have been identified from the HES database downloaded from the HES website in May 2022. That data is assumed to have been current and up to date at the time of acquisition.

[9] Mercer, R.J. (1981) Archaeological Field Survey in Northern Scotland, Vol II, 1980-1981, Edinburgh: University of Edinburgh, Department of Archaeology

## 6.3 Baseline Conditions

### Current Baseline

**Heritage Assets within the Inner Study Area**

6.3.1 Fifty-six heritage assets (1-56) have been identified within the Inner Study Area. The locations and extents of these are shown on Figure 6.1 and Technical Appendix 6.1 provides detailed gazetteer information on their character and baseline condition. The heritage importance and relative sensitivity of these assets is summarised below.

6.3.2 There are no Scheduled Monuments or Listed Buildings within the Inner Study Area, and no part of the Inner Study Area lies within an Inventory Garden and Designed Landscape, Inventory Historic Battlefield or Conservation Area.

*Prehistoric Remains*

6.3.3 The HER and Canmore record that Mercer (1981[10]) recorded the presence of three mounds (2, 7 and 17) identified, at the time, as the remains of possible prehistoric burial cairns. No trace of two of these mounds (2 and 7) was identified during the field survey for this assessment. The area, in which the first mound (2) was recorded, is heather covered ground disturbed by farm vehicle tracks and cattle trampling and it is additionally noted that the cited grid reference is possibly incorrect; a mound (20), matching the description provided by Mercer, was found during the field survey in 2016 lying around 200m west. The recorded location for the second mound (7) lies under a field boundary, marked by a wide linear bank and fence, within an improved pasture field. The cited locations of both mounds are considered to be of no intrinsic heritage value and of negligible sensitivity.

6.3.4 The third mound (17), described as possibly being the remains of a prehistoric burial cairn, was recorded by Mercer (1981) at 306593, 968895. Field survey for this assessment did not identify any remains of a mound conforming to the description provided by Mercer at this location, although a slight, possible turf mound (4m by 0.2m) was found close to the cited location. The mound is poorly preserved and difficult to define and is unlikely to be the remains of a burial cairn; it is considered to be of no intrinsic heritage value and of negligible sensitivity.

6.3.5 The remains of a possible, partially robbed, burial cairn (42), corresponding to the description provided by Mercer for the site (17) described above, were found ca. 100m west of the location cited by Mercer: at 306491, 968875. The cairn survives as a circular grass-covered mound (5m in diameter and 0.8m high) positioned in a prominent location on a west-facing slope in an area of rough pasture. It is considered to be potentially of heritage value at the regional level and medium sensitivity.

6.3.6 The HER and Canmore note that (Mercer 1981) recorded the remains of a possible prehistoric hut circle (5a) and a nearby circular enclosure (5b), defined by a turf and stone bank. No trace of the hut circle (5a) was found during field survey for this assessment; however, the faint outline of the enclosure (5b) was identified, defined by a very poorly preserved bank (1m wide by 0.1m high) covered in high grass. Both the possible hut circle and the enclosure are considered to be of no more than of heritage value at the local level and of low sensitivity.

6.3.7 Remains of a probable burnt mound (49) of possible Bronze Age date, partly truncated by a farm track and damaged by ploughing, lie to the east side of the farm track north of Hopefield. The remains are considered to be of heritage value at the local level and of low sensitivity.

*Medieval or Later Settlement Farmstead*

6.3.8 The desk-based study and field survey have identified three farmsteads (4, 45 and 54); one of which, Hopefield (54), remains in occupation. One of the others, Taldale (4) survives as footings of a former building and turf banks of accompanying enclosures. Blackheath Farm (45) survives as ruined buildings. These farmsteads are all considered to be of heritage value at the local level and of low sensitivity.

*Other Farm Buildings/Crofts*

6.3.9 In addition to the farmsteads described above, the study has recorded a number of other unnamed buildings (1, 3, 12, 24, 27, 28, 33, 35, 36, 48, 52, 55 and 56) that are either former crofts or other farm buildings, distributed across the site.

6.3.10 Seven of the former buildings (1, 3, 24, 27, 28, 33 and 56) have surviving remains in the form of buildings footings and enclosure banks. These are assessed as being of heritage value at the local level and of low sensitivity.

6.3.11 Six of the former buildings (12, 35, 36, 48, 52 and 55) have no surviving remains and are assessed as being of no intrinsic heritage value and of negligible sensitivity.

[10] Mercer, R.J. (1981) Archaeological Field Survey in Northern Scotland, Vol II, 1980-1981, Edinburgh: University of Edinburgh, Department of Archaeology

6.3.12 One building (39), with an attached enclosure (40), recorded by Mercer (1981) was found by the field survey to have been incorrectly recorded; the features that are described by Mercer were found over 200m to the north-west of Mercer's cited location. These features (33a and 33b) are assessed as being of heritage value at the local level and of low sensitivity.

*Enclosures and Other Structure*

6.3.13 A circular sheepfold (8) with four radial arms roughly aligned to the cardinal points lies in open rough pasture south of and probably formerly associated with the former Taldale farmstead (4). It is reasonably well-preserved and is assessed as being of heritage value at the local level and of low sensitivity.

6.3.14 The denuded remains of second enclosure (16), also probably a former sheepfold, are assessed as being of little heritage value and of negligible sensitivity.

6.3.15 A horseshoe shaped turf bank enclosure (21) and small D-shaped enclosure (34) are the remains of structures likely to be associated with the former farming land-use. They are of unknown function or date but are assessed as being of heritage value at the local level and of low sensitivity.

6.3.16 No remains of two roughly circular structures (41), recorded by Mercer (1981), were identified during the field survey in 2016; although a section of wall, possibly that described by Mercer was found. The remains described appear to have been poorly preserved in 1981 and are assessed as being of little heritage value and of negligible sensitivity.

*Rig and Furrow Cultivation*

6.3.17 Two areas of former rig and furrow cultivation (37 and 38), recorded by Mercer (1981) and traces of which are still visible on modern aerial photography, were not detected by the field survey in 2016. The remnant rig and furrow are assessed as being of little heritage value and of negligible sensitivity.

*Water Management Features*

6.3.18 A mill lade (6), formerly drawing water from a number of watercourses within the site and leading northwards to Burn of Brims farm, survives in varying condition along its length: partly as an underground channel and partly as an open ditch. As a surviving feature associated with water management, possibly serving local grain mills, the lade is assessed as being of heritage value at the local level and of low sensitivity.

6.3.19 Two other former ponds and dams (14 and 51), of which nothing now survives, are of no intrinsic heritage value and of negligible sensitivity.

*Quarries*

6.3.20 Eight quarries (9, 10a-b, 25, 26, 30, 31 and 47) are depicted on the Ordnance Survey first edition map (1876/77), with three of these (10a-b, 30 and 31) continuing to be shown on the Ordnance Survey 2nd Edition map (1906). Field survey identified seven of these former quarries (9, 10a-b, 25, 26, 30 and 31), which survive in varying conditions cut into the slopes of Hill of Forss and Cairnmore Hillock. Large quantities of worked Caithness stone slabs and stone debris are present in and around the large, disused quarry (25) at Hopefield, which appears to still be in occasional use; while another quarry (26) appears to have been cut recently with a mechanical excavator suggesting that it too is in occasional use. One additional quarry (43) was identified during the field survey, in an area of rough pasture at Hill of Forss. This quarry is not shown on the early Ordnance Survey maps (1877-1949) and is likely to be modern in date. The quarries, which attest to historic exploitation of the Caithness sandstone during the 19th century, are of little heritage value and of negligible sensitivity.

6.3.21 A road (22) is shown on the Ordnance Survey first edition map (1877) leading from the A836, passing south-east of Blackheath Farm (45) and leading to the Hopefield Quarry (25). The former road survives as farm access tracks over much of its original length, although the westernmost part is now in a state of abandonment. The road is assessed as being of little heritage value and of negligible sensitivity.

6.3.22 The remains of an old windmill (50), of at least early 19th century date, survive at the east end of the old Hopefield Quarry workings (25). The windmill, which was used to drive a water pump to drain the quarries, is assessed as being of heritage value at the local level and of low sensitivity.

*Miscellaneous Features*

6.3.23 Seven wells (13, 15, 23, 29, 32, 46 and 53) are depicted on the Ordnance Survey first and second edition maps (1876-77 & 1906) around Hill of Forss. None of the wells were found during the field survey, although natural springs were noted at the locations of two of the wells (29 and 32) and it may be that such springs were once used as a source of water both for domestic purposes and for watering livestock. The former wells are of no intrinsic heritage value and of negligible sensitivity.

6.3.24 A long, linear mound (11), recorded by Mercer (1981) as being ca 30m long, was found during the field survey to be over 50m in length and of entirely modern construction. It is assessed as being of no intrinsic heritage value and of negligible sensitivity.

6.3.25 A sub-rectangular, grassy platform (18), identified during the field survey in 2016 and covered with a low pile of large boulders, may be the remains of a former building or may simply be a pile of field clearance stone. There are no traces of any possible structure at this location (and none shown on any historic maps) and the platform is assessed as being of little intrinsic heritage value and of negligible sensitivity.

6.3.26 A possible marker cairn (19) was recorded during the field survey in 2016, adjacent to an enclosure (16). The cairn is assessed as being of little intrinsic heritage value and of negligible sensitivity.

6.3.27 A low, oval turf-covered mound (20), recorded during the field survey in 2016 in an area of reedy vegetation, is unlikely to be the remains of a cairn or any other structure and is assessed as being of no intrinsic heritage value and of negligible sensitivity.

6.3.28 A grass and thistle covered boulder heap (44), on the edge of a rough pasture field, is a modern field clearance cairn and is assessed as being of no intrinsic heritage value and of negligible sensitivity.

**Assessment of Archaeological Potential**

6.3.29 The majority of the identified heritage assets across the site are related to historic, post-medieval farming land-use with some notable former industrial scale quarry workings around Hopefield Farm. Relict elements of that former farming activity survive in the form of the denuded remains of long abandoned crofts; largely limited to preserved footings of former buildings and turf and stone banks of old enclosures. HLAmap (HES 2020) records the site as a patchwork of 19th and 20th century holdings and smallholdings with some rectilinear fields and farming around Blackheath and Hopefield. An area on Lythmore Moss is shown as being traditional peat cutting and there are small areas of rough grazing, where there is no evidence of agricultural improvement.

6.3.30 There is some evidence of prehistoric activity within the site, in the form of a probable burial cairn, a possible cist, and remains of a probable burnt mound; each of which is potentially of Bronze Age date. A possible hut circle, potentially of either Bronze Age or Iron Age date, was also recorded in the 1980s; although no trace of that feature, or any other evidence of prehistoric settlement or activity, was found during the field surveys for this assessment (2014 and 2016). However, there is ample evidence in the wider landscape for prehistoric occupation and settlement in this part of Caithness. Chambered cairns, of Neolithic date, are recorded near Westfield, a short distance south-west of the site, and Iron Age brochs are recorded at Brimside, to the west of the site and Thing's Va broch lies to the east. Both chambered cairns and brochs are plentiful in the local landscape and the possibility that hitherto unidentified, buried remains of prehistoric activity survive within the site cannot be discounted.

6.3.31 The peat depth assessment (Technical Appendix 2.4: Phase 1 and 2 Peat Depth & Coring Survey) shows that there are limited areas of deep peat deposit within the site; with some notable peat accumulation being evident around the lochan on Hill of Forss, north of turbine locations T3 and T4, where peat depth up to 3.5 m has been identified. Over most of the site, the peat depth is less than 0.5 m.

6.3.32 Based on the available evidence, both from within the site and in the wider landscape, it is considered that there is a moderate probability of hitherto unidentified archaeological remains being present within the site, especially for remains of prehistoric date.

**Heritage Assets within the Outer Study Area**

6.3.33 Within the Outer Study Area, there are 53 Scheduled Monuments (two of which are Properties in Care (PIC)), 67 Listed Buildings (one of which is Category A Listed) and one Conservation Area from which there is some predicted theoretical visibility of the Proposed Development. There are no Inventory Garden and Designed Landscapes and no Inventory Historic Battlefield Sites within the Outer Study Area. However, not all of these assets are in locations from which there would be visibility of the Proposed Development and many of the Listed buildings lie within the urban environment at Thurso. The settings of these Listed Buildings are constrained to, and defined by, their locations within the built environment and their relationships with surrounding buildings and the local township, therefore it is considered that there would be little or no impacts on the settings of the Listed Buildings that lie within urban settings.

6.3.34 The blade tip height ZTV for the Proposed Development was used to identify those cultural heritage assets within the Outer Study Area from where there could be theoretical visibility of one or more of the proposed wind turbines. Those assets from which there is potential theoretical visibility of the Proposed Development are

shown on Figure 6.2 and are listed in Technical Appendices 6.2 and 6.3. Assets where there is no visibility are excluded.

### Future Baseline

6.3.35 If the Proposed Development was not to proceed, there would likely be no change to the baseline condition of the various heritage assets and features that presently survive within the site. The current land-use as rough pasture grazing would be likely to continue and those heritage assets that survive within the site would be subject only to natural decay and erosion processes.

6.3.36 Other wind farm developments in the area, both operational and consented or proposed, would have their own effects on the settings of heritage assets identified by this study. Those effects would be removed by the future decommissioning of those projects. For the purpose of this assessment, taking account of the inherent uncertainty about future wind farm development and decommissioning in the wider area, it has been assumed that the future baseline would remain the same as the current baseline.

## 6.4 Assessment of Likely Effects

### Potential Construction Effects

6.4.1 Any ground-breaking activities associated with the construction of the Proposed Development, (such as those required for turbine bases and crane hardstandings, access tracks, cable routes, compounds, etc.) have the potential to disturb or destroy features of cultural heritage interest within the site. Other construction activities, such as vehicle movements, materials storage, soil and overburden storage and landscaping also have the potential to cause permanent and irreversible effects on the cultural heritage within the site.

6.4.2 Two heritage assets have been identified that could, without mitigation, be affected by construction of the Proposed Development:

6.4.3 The proposed access from the A836 runs parallel with and directly alongside the alignment of a former mill lade (6) which survives as a linear ditch (ca 0.7m wide and ca 0.5m deep) running parallel with the current farm track. The lade is assessed as being of heritage value at the local level and of low sensitivity. The potential effect on the lade is likely to be of negligible magnitude, as the watercourse can easily be avoided; the resultant effect would be negligible and not significant.

6.4.4 The proposed access from the A836 passes a sub-rectangular grassy platform (18), 5m long by 4m wide, covered with a low pile of large boulders that may be either field clearance or possibly the remains of a demolished former small building or other structure. The platform is an asset of little intrinsic heritage value and of negligible sensitivity. The potential effect on the platform is likely to be of high magnitude, as track widening work could substantially alter its character; the resultant effect would be minor and not significant.

6.4.5 A mound (2), recorded by Mercer in 1980, is recorded in the HER as lying close to the access track route between T2 and T3. However, field survey for this assessment has established that this asset is incorrectly recorded by Mercer and the remains corresponding to Mercer's description (20) actually lies some distance to the west and well away from the proposed access track route.

6.4.6 Taking into account the limited footprint of the Proposed Development within the site and the moderate level of probability for hitherto unidentified archaeological remains to be present within the site, it is assessed that there is low potential for direct effects on buried archaeological remains that are likely to be significant in EIA terms.

### Potential Operational Effects

#### Direct Effects

6.4.7 There are no identified assets likely to receive a direct effect arising during operation of the Proposed Development. This is due to the approach adopted in formulating the design and layout of the Proposed Development, i.e. avoidance, and because any maintenance works on site would be managed to recognise the presence of heritage assets and to avoid them.

#### Setting Effects

6.4.8 The Proposed Development could result in adverse effects on the setting of cultural heritage assets in both the Inner Study Area and the Outer Study Area. Beyond 10 km, the Proposed Development would not be a dominant feature in the landscape and the effect on the settings of heritage assets would not be significant. No assets beyond 10 km have been identified by HES or HET as requiring consideration for potential effects on their settings. Technical Appendices 6.2 and 6.3 contain summary assessments of the predicted effects on designated heritage assets in the Outer Study Area.

6.4.9 The assessment of operational effects on the settings of heritage assets has been carried out with reference to the layout of the Proposed Development and locations of the cultural heritage assets shown on Figures 6.2. The criteria detailed in Tables 6.2 to 6.4 have been used to assess the nature and magnitude of the effects which are set out in summary in Technical Appendices 6.2 and 6.3.

6.4.10 The following discussion addresses those assets identified by HES or HET as requiring assessment even where the significance of the predicted effect is assessed as being not significant in EIA terms. The assessments are supported with visualisations (Figures 6.4 – 6.14) and by reference to the LVIA photomontages where relevant. The visualisations are reference in the tabulated assessment set out in Technical Appendices 6.2 and 6.3, where relevant, and are referenced where relevant in the assessment below. All the assets, including those identified by HES and HET as requiring detailed assessment, are included in the tabulated assessment in Technical Appendices 6.2 and 6.3.

**Table 6.5: Cultural Heritage (CH) Visualisation Viewpoints**

| Figure Ref | Figure Title - Asset Name (& Ref No) | Visualisation Type | Viewpoint Location |
|---|---|---|---|
| Figure 6.2.1 (CH1a) | Thing's Va broch, 1000m E of Blackheath, Scrabster (SM 587) | Photomontage | From location of broch |
| Figure 6.2.2 (CH1b) | Thing's Va broch, 1000m E of Blackheath, Scrabster (SM 587) | Photomontage | From location at field gate north-east of Hillburn House, east of broch |
| Figure 6.2.3 (CH2a) | Scrabster Mains broch 1000m W of (SM 579) | Photomontage | From location of broch. |
| Figure 6.2.4 (CH2b) | Scrabster Mains broch 1000m W of (SM 579) | Photomontage | From location on the playing field at Holburn Place, Scrabster, north-east of broch. |
| Figure 6.2.5 (CH3) | Cnoc Freiceadean, long cairns (SM 90078) | Photomontage | From location of northern most cairn. |
| Figure 6.2.6 (CH4) | Knockglass, broch 300m SSW of Mill of Knockglass (SM 562) | Photomontage | From location of broch. |
| Figure 6.2.7 (CH5) | Mill of Knockglass, long cairn 100m SSE of, Bridge of Westfield (SM 469) | Wireline | From location of cairn. |
| Figure 6.2.8 (CH6) | Brims Castle (SM 5510) | Wireline | From location of castle. |
| Figure 6.2.9 (CH7) | Scrabster Castle (SM 2630) | Wireline | From location of castle. |
| Figure 6.2.10 (CH8) | Hill of Shebster chambered cairn (SM 476) | Wireline | From location of cairn. |
| Figure 6.2.11 (CH9) | Green Tullochs, broch and cairn 640m NNW of Borrowstone Mains (SM 554) | Wireline | From location of broch. |

*Thing's Va Broch, 1000m E of Blackheath, Scrabster (SM 587) Figures 6.2.1 and 6.2.2*

6.4.11 The remains of this broch survive as a low grass covered mound in a rural farmland setting in rough pasture on an east facing slope, with the open aspect directing views towards Thurso and the coast. Rising ground to the west of the broch obscures visibility in that direction. The broch remains are visible as a low mound within a rough pasture field when viewed from the minor road that runs to the east, but it is not a prominent or widely visible monument in the landscape. There is no direct intervisibility with the Scrabster Mains broch (SM 579) to the north-east on the opposite side of the A836. The broch is a Scheduled Monument, of heritage value at the national level and high sensitivity.

6.4.12 Figure 6.2.1 shows that all five turbines (hubs and tips) would be visible in the view to the west from the broch, the remains of which are visible in the foreground in the photomontage. The closest turbine (T5) would be 1,100m from the broch. Figure 6.2.2, from a location at the field gate north-east of Hillburn House and east of the broch, shows that the Proposed Development would also be visible behind the broch when viewed from the minor road that runs to the east. The Proposed Development infrastructure (tracks, buildings, compounds, etc.) however would be screened from view from the broch and from the minor road, beyond the rising intervening ground.

6.4.13 Figure 6.2.1 shows that the ground visible from the broch in all directions, including that towards the Proposed Development, would preserve its current moorland/rough pasture quality. From the broch, the open aspect views towards the coast at Thurso Bay would be unaffected and it would remain possible for any visitor to appreciate and understand the landscape context of the siting of the broch overlooking the broad valley of the River Thurso to the east.

6.4.14 The introduction of the Proposed Development would result in a noticeable change in the surroundings of the broch, particularly in the view to the west, and in the view of the broch when approached from the east, resulting in a medium magnitude of change. However, the key visual links from the broch (towards the east and Thurso Bay and towards Scrabster broch to the north-east) and its relationship with its surroundings would be unaffected.

6.4.15 Overall, it is assessed that, as a result of the change in its surroundings, the Proposed Development would result in an impact of moderate significance on the setting of Thing's Va broch; significant in EIA terms. However, the effect would not appreciably diminish the cultural significance of the monument or its amenity value as a relic of the later prehistoric occupation of the landscape and it will remain possible to understand and appreciate the broch and its setting. Its contribution to the local landscape character would be retained.

*Scrabster Mains Broch 1000m W of (SM 579) Figures 6.2.3 and 6.2.4*

6.4.16 The remains of this broch survive as a low grass covered mound in a rural coastal farmland setting in rough pasture on a south-east facing slope, with open aspect directing views towards Thurso and the coast. Rising ground to north-west obscures visibility in that direction. The broch remains are visible as a low mound when viewed from A836, but it is not a prominent or widely visible monument in the landscape. There is no direct intervisibility with Thing's Va, broch (SM 587) to the south-west on the opposite side of the A836. The broch is a Scheduled Monument, of heritage value at the national level and of high sensitivity.

6.4.17 Figure 6.2.3 shows that five turbine tips (four hubs) would be visible from the broch, the remains of which are visible in the foreground in the photomontage. The closest turbine (T5) would be 2 km from the broch. Figure 6.2.4, from a location on the playing field at Holburn Place, north-east of the broch, shows that the Proposed Development would also be visible behind the broch when viewed from Scrabster. The Proposed Development would not be visible in combination with the broch when viewed from the A836 road that passes to the south of the broch and from where the remains can be readily seen and appreciated. Furthermore, the Proposed Development infrastructure (tracks, buildings, compounds, etc) would be screened from view from the broch, beyond the rising intervening ground.

6.4.18 Figure 6.2.3 shows that the ground visible from the broch including views towards the Proposed Development is open and over rough pasture. From the broch, the open aspect views towards the coast at Thurso Bay would be unaffected and it would remain possible for any visitor to appreciate and understand the landscape context of the siting of the broch, overlooking Thurso Bay and the mouth of the River Thurso. The introduction of the Proposed Development would result in a noticeable change in the surroundings of the broch, particularly in the view to the south-west, and in the view of the broch when approached from the north-east, resulting in a medium magnitude of change. However, the key visual links from the broch to the coast and across the Thurso valley and its relationship with its surroundings would be unaffected.

6.4.19 Overall, it is assessed that, as a result of the change in its surroundings, the Proposed Development would result in an impact of moderate significance on the setting of Scrabster Mains broch; significant in EIA terms. However, the effect would not appreciably diminish the cultural significance of the monument or its amenity value as a relic of the later prehistoric occupation of the landscape and it will remain possible to understand and appreciate the broch and its setting. Its contribution to the local landscape character would be retained.

*Cnoc Freiceadean, Long Cairns (SM 90078) Figure 6.2.5*

6.4.20 These two long cairns lie at right angles to each other in a prominent hilltop location from which there are extensive and wide-ranging views in all directions. Baillie Wind Farm lies close by to the south-east (600m to the nearest turbine) and is a prominent feature of the local landscape. The Dounreay Nuclear facility is visible on the coast 2.8 km to the north. The cairns each comprise a long, low mound and are visible features in the local landscape. The cairns are a Scheduled Monument, of heritage value at the national level and of high sensitivity.

6.4.21 Figure 6.2.5 shows that all five turbines (hubs and tips) would be visible in the view to the north-east from the cairns, the remains of which are visible in the foreground in the photomontage. The closest turbine (T1) would be 5 km from the cairns and the Proposed Development would be seen in the same view as, and in the background to, the intervening Baillie Wind Farm. Views from the cairns in all other directions would be unaffected and views of the cairns in their hilltop setting from the wider landscape would be unaffected.

6.4.22 The introduction of the Proposed Development would result in a noticeable change in the surroundings of the broch, particularly in the view to the north-east (being visible on the skyline behind and in the same context as Baillie Wind Farm) but it would have no impact on the views of the cairns when they are approached from the visitor car park which lies to the south-east of the cairns. The key visual links from the Cnoc Freiceadain long cairns and their relationship with their surroundings would be unaffected and the introduction of the Proposed Development would result in a low magnitude of change to the setting.

6.4.23 Overall, it is assessed that, as a result of the change in its surroundings, the Proposed Development would result in an impact of minor significance on the setting of Cnoc Freiceadain long cairns, not significant in EIA terms. The Proposed

Development would not result in any appreciable diminishment of the cultural significance of the monument, or its amenity value as funerary relict of the prehistoric landscape and it will remain possible to understand and appreciate the cairns and their setting. Their contribution to the local landscape character would be retained.

*Knockglass, Broch 300m SSW of Mill of Knockglass (SM 562) Figure 6.2.6*

6.4.24 The remains of this broch survive as a low grass covered mound in a rural farmland setting in rough pasture/heather moorland on the north bank of the Forss Water, and it is one of a group of monuments, together with a group of three burial cairns (SM 469, SM 470 & SM 471), in a riverside setting at Westfield village. The broch is not a visually prominent or widely visible monument in the landscape, and it is best appreciated at close quarters as part of a collective group of multi period monuments in its riverside setting. The broch is a Scheduled Monument, of heritage value at the national level and of high sensitivity.

6.4.25 Figure 6.2.6 shows that five turbines (hubs and tips) would be visible from the broch; the closest turbine (T1) being 4.1 km from the broch. However, the Proposed Development infrastructure (tracks, buildings, compounds, etc.) would be screened from view from the broch, by the rising intervening ground, and the Proposed Development would be seen behind, and in the same view as, a line of pylons in the middle distance, and modern settlement and overhead power lines in the foreground. The Proposed Development would not adversely affect the close relationship between the broch and the other prehistoric remains at Westfield and it would not affect the view of the broch from the road that passes through Westfield, from where the mound is plainly visible.

6.4.26 Figure 6.2.6 shows that, although there would be some change in its surroundings, the improved pasture character of the landscape surrounding the broch in all directions including in views towards the Proposed Development would be preserved. From the broch, the open aspect views eastwards along the Forss Water valley would be unaffected and it would remain possible for any visitor to appreciate and understand the landscape context of the siting of the broch and its association with the other prehistoric monuments that lie in close proximity. The introduction of the Proposed Development would result in a noticeable change in the surroundings of the broch, particularly in the view to the north-east but would result in only a low magnitude of change; the key visual links from the broch and its relationship with its surroundings would be unaffected.

6.4.27 Overall, it is assessed that, as a result of the change in its surroundings, the Proposed Development would result in an impact of minor significance on the setting of Knockglass, broch; not significant in EIA terms. The effect would not appreciably diminish the cultural significance of the monument or its amenity value as a relic of the later prehistoric occupation of the landscape and it will remain possible to understand and appreciate the broch and its setting. Its contribution to the local landscape character would be retained.

*Mill of Knockglass, Long Cairn 100m SSSE of, Bridge of Westfield (SM 469) Figure 6.2.7*

6.4.28 This long cairn lies in a rural farmland location in rough pasture/heather moorland on the north bank of the Forss Water. The cairn is aligned north-west to south-east, with its broad end at the south-east. It is one of a group of monuments, together with two other burial cairns (SM 470 & SM 471) and an Iron Age broch (SM 562), in a riverside setting at Westfield village. The long cairn is not a visually prominent or widely visible monument in the landscape, and it is best appreciated at close quarters as part of a collective group of multi period monuments in its riverside setting. The long cairn is a Scheduled Monument, of heritage value at the national level and of high sensitivity.

6.4.29 Figure 6.2.7 shows that five turbines (hubs and tips) would be visible from the cairn; the closest turbine (T1) being 3.8 km from the cairn. However, the Proposed Development infrastructure (tracks, buildings, compounds, etc.) would be screened from view from the cairn, beyond the rising intervening ground. The photomontage view from the broch at Westfield (Figure 6.2.6) also shows that the Proposed Development would be seen behind and in the same view as a line of pylons in the middle distance and modern settlement and overhead power lines in the foreground. The Proposed Development would not adversely affect the close group association between the cairn and the other prehistoric remains at Westfield.

6.4.30 From the cairn, the open aspect views south-east wards across the Forss Water valley would be unaffected and it would remain possible for any visitor to appreciate and understand the landscape context of the siting of the cairn and its association with the other prehistoric monuments that lie in close proximity. The introduction of the Proposed Development would result in a noticeable change in the surroundings of the cairn, particularly in the view to the north-east but would result in only a low magnitude of change; the key visual links from the cairn, especially that to the south-east, and its relationship with its surroundings would be unaffected.

6.4.31 Overall, it is assessed that, as a result of the change in its surroundings, the Proposed Development would result in an impact of minor significance on the setting of Mill of Knockglass, long cairn; not significant in EIA terms. The effect would not appreciably diminish the cultural significance of the monument or its amenity value as a relic of the prehistoric occupation of the landscape and it will remain possible to understand and appreciate the long cairn and its setting. Its contribution to the local landscape character would be retained.

*Mill of Knockglass, Cairn 220m S of, Bridge of Westfield (SM 470) & Mill of Knockglass, Chambered Cairn 320m SSE of, Bridge of Westfield (SM 471) Figures 6.2.6 & 6.2.7*

6.4.32 These two cairns, of probable Neolithic date, lie approximately 100m apart on the south bank of the Forss Water, south of Bridge of Westfield. Both are grass-covered round cairns approximately 11m in diameter and 1.5m high. They lie south of and close to the long cairn (SM 469), which lies on the north side of the watercourse. They are part of a group of monuments, together with the long cairn (SM 469) and an Iron Age broch (SM 562), in a riverside setting at Westfield village. The cairns are not visually prominent or widely visible monuments in the landscape, being set low down and close to the watercourse, and they are best appreciated at close quarters as part of a collective group of multi period monuments in a riverside setting. The cairns are both Scheduled Monuments, of heritage value at the national level and of high sensitivity.

6.4.33 Figures 6.2.6 and 6.2.7 provide visualisations (Photomontage in Figure 6.2.6 and wireline in 6.2.7) that show views from nearby to the two cairns and are typical, and representative, of the views from this low-lying local group on monuments. The ZTVs predict visibility of five turbines (hubs and tips) from each of the two cairns; the closest turbine (T1) being around 4 km distant in each case. The Proposed Development infrastructure (tracks, buildings, compounds, etc.) would be screened from view from the cairn, hidden beyond the rising intervening ground. The photomontage view from the broch at Westfield (Figure 6.2.6) also shows that the Proposed Development would be seen behind and in the same view as a line of pylons in the middle distance and modern settlement and overhead power lines in the foreground. The Proposed Development would not adversely affect the close group association between the cairns and the other prehistoric remains at Westfield.

6.4.34 From the cairns, the open aspect views south-eastwards across the Forss Water valley would be unaffected and it would remain possible for any visitor to appreciate and understand the landscape context of the siting of the cairns and their association with the other prehistoric monuments that lie in close proximity. The introduction of the Proposed Development would result in a noticeable change in the surroundings of the cairns, particularly in the view to the north-east but would result in only a low magnitude of change; the key visual links from the cairns, especially their relationships with the Forss Water and the other monuments nearby would be unaffected.

6.4.35 Overall, it is assessed that, as a result of the change in its surroundings, the Proposed Development would result in an impact of minor significance on the setting of the two cairns; not significant in EIA terms. The effect would not appreciably diminish the cultural significance of the monuments or their amenity value as relics of the prehistoric occupation of the landscape and it will remain possible to understand and appreciate the cairns and their setting. Their contribution to the local landscape character would be retained.

*Brims Castle (SM 5510) Figure 6.2.8*

6.4.36 The standing remains of this former tower house stand in a coastal location within the farmyard setting of a later, post-medieval farmstead, with more recent farm buildings immediately to the north-west. The castle now has a relatively localised setting dominated by the later farmstead; although it is still possible to see and appreciate its close association with the seascape to the north. The castle is a Scheduled Monument, of heritage value at the national level and of high sensitivity.

6.4.37 Figure 6.2.8 shows that five turbines (hubs and tips) would be visible from Brims Castle; the closest turbine (T3) being 3.2 km away. However, the Proposed Development infrastructure (tracks, buildings, compounds, etc) would be screened from view from the castle, beyond the distant rising intervening ground. The Proposed Development would not adversely affect the close group association between the castle and the present-day farm buildings, including the post-medieval farmstead, that lie immediately to the west or the coastal outlook from the castle.

6.4.38 The open, rural farmland setting would be unaffected, and it would remain possible for any visitor to appreciate and understand the landscape context of the siting of the castle; in particular, its association with the rural farmland and the coast. The introduction of the Proposed Development would result in a slight change in the wider surroundings of the Castle, but this would result in only a low magnitude of change to its current setting; the key visual links from the castle, especially that to

the coast to the north, and its relationship with its farmland surroundings would be unaffected.

6.4.39 Overall, it is assessed that, as a result of the change in its surroundings, the Proposed Development would result in an impact of minor significance on the setting of Brims Castle, not significant in EIA terms. The effect would not appreciably diminish the cultural significance of the monument or its amenity value as a relic of the historic occupation of the landscape and it will remain possible to understand and appreciate the remains of Brims Castle and its setting. Its contribution to the local landscape character would be retained.

*Scrabster Castle (SM 2630) Figure 6.2.9*

6.4.40 The rather poorly preserved earthwork remains of this castle lie at the edge of the shore to the east side of the A9 road to Scrabster harbour. Modern housing lies immediately adjacent to the south, and similar modern housing across the A9 to the west obscures inland views. The main views from the castle remains, which are difficult to make out, are focussed north-east over the sea view of Thurso Bay. The castle is a Scheduled Monument, of heritage value at the national level and of high sensitivity.

6.4.41 Figure 6.2.9 shows that five turbines (tips and hubs) would be visible from Scrabster Castle; the closest turbine (T5) being 3.7 km away. However, the Proposed Development infrastructure (tracks, buildings, compounds, etc.) would be screened from view from the castle remains, beyond the rising intervening ground and the modern housing beyond the A9. The Proposed Development would not adversely affect the castle's coastal outlook over Thurso Bay and the Proposed Development would not detract from the ability of any visitor to appreciate and understand the landscape context of the siting of the castle.

6.4.42 The introduction of the Proposed Development would result in a barely noticeable change in the surroundings of the castle, surrounded as it is by modern development, and would result in only a negligible magnitude of change; the key visual links from the castle, especially that over Thurso Bay to the north-east, would be unaffected.

6.4.43 Overall, it is assessed that, as a result of the change in its surroundings, the Proposed Development would result in an impact of minor significance on the setting of Scabster Castle, not significant in EIA terms. The effect would not appreciably diminish the cultural significance of the monument or its amenity value as relict of the historic occupation of the landscape and it will remain possible to understand and appreciate the remains of Scrabster Castle and its setting. Its contribution to the local landscape character would be retained.

*Holborn Head, Fort, Scrabster (SM 559) LVIA VP 7 (Figure 5.2.7)*

6.4.44 The low relief earthwork remains of this promontory fort lie at the north-eastern tip of Holborn Head at the north-west side of Thurso Bay. Reputedly the site of a Viking army occupation in the early 11th century, the fort occupies a defensible position commanding extensive views of the coastline and Thurso Bay. The fort is a Scheduled Monument, of heritage value at the national level and of high sensitivity.

6.4.45 The ZTV (Figure 6.2) and the wireline provided from the fort (Figure 6.13) show that there is no visibility of the Proposed Development from the headland, which lies 4.8 km from the nearest turbine (T5). However, LVIA VP 7 (Figure 5.2.7), taken from the sea approach to Scrabster Harbour, shows that from the sea off the headland the Proposed Development would be visible beyond the skyline and behind the site of the fort, which lies on the headland at the left of the photomontage. From the viewpoint, the photomontage shows five turbines (tips and hubs) visible; these being offset from the view of the fort at this point on the approach. No remains of the fort are visible in this view and so the Proposed Development would not be seen to be dominant in relationship to the scale of the fort. In the views of the fort from the sea, the Proposed Development would have a low magnitude impact on the fort's setting, being visible directly behind views of the fort for only a short section of the approach to Scrabster harbour, off Holborn Head. From the landward approach to the fort, the Proposed Development would have no impact on its setting.

6.4.46 Overall, it is assessed that, as a result of the change in its surroundings, the Proposed Development would result in an impact of minor significance on the setting of Holborn Head, fort; not significant in EIA terms, and the effect would not appreciably diminish the cultural significance of the monument or its amenity value as part of the historic landscape and it will remain possible to understand and appreciate the remains of the fort and its setting. Its contribution to the local landscape character would be retained.

*Hill Of Shebster Chambered Cairn (SM 476) Figure 6.2.10*

6.4.47 The remains of this cairn lie in a hilltop location on the north facing summit of Hill of Shebster. From the cairn, there are open aspect views to the north-west and to the sea. Slightly rising ground to the south-east of the cairn limits views in that direction, which is the direction of the Proposed Development; although Hill of Lieurary can be seen as a prominent feature beyond the near horizon of Hill of

Shebster. Baillie Wind Farm lies close by to the east (910m to the nearest turbine) and is a prominent feature of the local landscape, and the Dounreay Nuclear facility lies on the coast to the north. The chambered cairn is a Scheduled Monument, of heritage value at the national level and of high sensitivity.

6.4.48 Figure 6.2.10 shows that five turbines (hubs and tips) would be visible from the cairn; the closest turbine (T1) being 5.6 km away and seen beyond Baillie Wind Farm. The Proposed Development infrastructure (tracks, buildings, compounds, etc.) would be screened from view from the cairn, and the cairn's setting is dominated by the turbines at Baillie. The Proposed Development would not adversely affect the cairn's rural moorland/rough pasture setting on Shebster Hill and the view to the coastline to the north would be unaffected. The Proposed Development would not affect the ability of any visitor to appreciate and understand the landscape context of the siting of the cairn.

6.4.49 The introduction of the Proposed Development would result in a barely noticeable change in the surroundings of the chambered cairn and would result in only a negligible magnitude of change. It is therefore assessed that the Proposed Development would result in an impact of minor significance on the setting of Hill of Shebster chambered cairn; not significant in EIA terms, and the effect would not appreciably diminish the cultural significance of the monument or its amenity value as a relic of the historic occupation of the landscape. It will remain possible to understand and appreciate the cairn and its setting. Its contribution to the local landscape character would be retained.

*Green Tullochs, Broch and Cairn 640m NNW of Borrowstone Mains (SM 554) Figure 6.2.11*

6.4.50 These two monuments are prominent grassy mounds that stand on the low cliffs overlooking and visible from the coastal waters of the North Atlantic/Pentland Firth. They are set low down on the cliff edge and are not prominent features of the local landscape; being best appreciated at close quarters. They are not obviously visible from the A836 road, but they can be seen from places further afield, such as Cnoc Freiceadean to the south. Forss Wind Farm and the Forss Business and Technology Park lie directly to the east of the broch and cairn and dominate their setting. The broch is a Scheduled Monument, of heritage value at the national level and of high sensitivity.

6.4.51 Figure 6.2.11 shows that five turbine tips (three hubs) would be visible from the broch and cairn; the closest turbine (T1) being 4.9 km away. However, the Proposed Development infrastructure (tracks, buildings, compounds, etc.) would be screened from view from the Castle remains, beyond the rising intervening ground and Forss Wind Farm and the Business and Technology Park are prominent features in their immediate surroundings, 400m to the south-east. The Proposed Development would not adversely affect the coastal outlook from the broch and cairn, and it would not detract from the ability of any visitor to appreciate and understand the landscape context of the siting of these two monuments.

6.4.52 The introduction of the Proposed Development would result in a barely noticeable change in the surroundings of the broch and cairn and would result in only a negligible magnitude of change; the key visual links from the monuments, especially those over the seascape to the north, would be unaffected.

6.4.53 Overall, it is assessed that, as a result of the change in its surroundings, the Proposed Development would result in an impact of minor significance on the setting of Green Tullochs broch and cairn; not significant in EIA terms, and the effect would not appreciably diminish the cultural significance of the monument or its amenity value as a relic of the prehistoric occupation of the landscape and it will remain possible to understand and appreciate the broch and cairn and their setting. Their contribution to the local landscape character would be retained.

*Crosskirk, St Marys Chapel and Broch S of Chapel Pool (SM 90086) LVIA VP 4 (Figure 5.2.4)*

6.4.54 The remains of this 12th century Chapel stand in rough grassland on the cliff top at Crosskirk Bay overlooking and visible from the coastal waters of the North Atlantic and Pentland Firth. It is probable that this location was deliberately chosen so that the Chapel was visible from the sea, perhaps as a symbol of spiritual comfort to seafarers. The broch, which was an earlier settlement on the headland and which formerly lay close to the Chapel, was destroyed following excavation in 1972 and no trace of either it or of the small settlement that was also discovered to the east of the broch is now visible. The Chapel remains stand within an enclosed churchyard and are surrounded by a cemetery that is still occasionally used. The Chapel is a Scheduled Monument and Guardianship Monument (Property in Care) and is a visitor attraction, signposted and provided with a visitor display panel. The Chapel is of heritage value at the national level and of high sensitivity.

6.4.55 LVIA VP 4 (Figure 5.2.4) shows that the Proposed Development (five turbine hubs and tips) would be visible from the Chapel; the closest turbine (T3) being 4.1 km away. However, the Proposed Development infrastructure (tracks, buildings,

compounds, etc.) would be screened from view, beyond the rising intervening ground and Forss Wind Farm and the Business and Technology Park are prominent features in the immediate surroundings, directly to the south-west of, and 200m from, the Chapel. The Proposed Development would not adversely affect the coastal outlook from the Chapel and the Proposed Development would not detract from the ability for any visitor to appreciate and understand the landscape context of the siting of the Chapel and the broch.

6.4.56 The introduction of the Proposed Development would result in a noticeable change in the surroundings of the Chapel, particularly in the view to the south-east., and would result in a low magnitude of change to its current setting. The key visual links from the Chapel, to and from the sea, and its relationship with its coastal farmland surroundings would be unaffected.

6.4.57 Overall, it is assessed that, as a result of the change in its surroundings, the Proposed Development would result in an impact of minor significance on the setting of Crosskirk, St Marys Chapel and broch; not significant in EIA terms, and the effect would not appreciably diminish the cultural significance of the monument or its amenity value as a relic of the historic occupation of the landscape and it will remain possible to understand and appreciate the Chapel and its setting. Its contribution to the local landscape character would be retained.

### Potential Decommissioning Effects

6.4.58 Any ground-breaking activities, or other activities, such as vehicle movements, soil and overburden storage and landscaping, associated with the decommissioning of the Proposed Development have the potential to cause direct, permanent and irreversible effects on the cultural heritage assets within the site. The likelihood of direct effects is similar to or less than that expected during construction, presuming that the built infrastructure is used to facilitate decommissioning and removal of the components of the Proposed Development from the site.

6.4.59 There are no assets within the Inner Study Area likely to receive a direct effect arising from decommissioning of the Proposed Development. This is due to the approach adopted in formulating the design and layout of the Proposed Development, i.e. avoidance, and because decommissioning works on site would be managed to recognise the presence of heritage assets and to avoid them.

### Potential Cumulative Effects

6.4.60 The Proposed Development could, in combination with other wind farm developments in the area that are operational, consented but not yet built, or are the subject of valid planning applications, result in adverse cumulative effects on the setting of cultural heritage assets.

6.4.61 Based on the list of cumulative developments agreed with THC (Chapter 5: Landscape and Visual Impact Assessment), those other developments most likely to give rise to cumulative effects in combination with the Proposed Development on heritage assets are:

- Baillie Wind Farm (21 turbines, 115 m to tip) – operational and part of the baseline
- Forss Wind Farm 1 (two turbines 76 m to tip) – operational and part of the baseline
- Forss Wind Farm 2 (four turbines 78 m to tip) – operational and part of the baseline
- Limekiln (21 turbines (six at 126 m to tip and 15 at 139 m to tip) as varied in October 2017) – consented 21 June 2019
- Limekiln Extension (5 turbines, 149.9 m to tip) – Application
- Drum Hollistan 2 (7 turbines, 125 m to tip) – Application
- Lybster Road Forss (single turbine 79m to tip) – consented (in combination with Forss Wind Farm (1 and 2)
- Hill of Lybster (single turbine 99.5 m to tip) – consented (in combination with Forss Wind Farm (1 and 2)

6.4.62 Figure 6.3 shows the Proposed Development, along with the locations of other operational/under construction and consented wind farms, and those at the application/appeal stage, together with those cultural heritage assets within the Outer Study Area (within the Proposed Development ZTV and considered in the assessment).

6.4.63 Three of the cumulative schemes shown on Figure 6.3 (Baillie, Forss I and Forss II) are operational while three others (Limekiln, Hill of Lybster and Lybster Road Forss) are consented developments. Limekiln Extension and Drum Hollistan 2 are at the application stage. Both Lybster Road Forss and Hill of Lybster are single turbine developments.

6.4.64 Based on professional judgement, those schemes most likely, in combination with the Proposed Development, to have a cumulative effect on heritage assets are the larger schemes; in particular, Baillie and Limekiln (together with the proposed

Limekiln Extension). An additional cumulative impact would arise from Forss I and II in combination with the two single turbines at Lybster Road Forss and Hill of Lybster.

6.4.65 Cumulative wireline visualisations are provided to inform the assessment of impacts on the settings of heritage assets (Figures 6.2.1 to 6.2.11). These show the predicted theoretical visibility, assuming the absence of any screening provided by woodland or commercial forestry, of other wind farms in the wider landscape in combination with the Proposed Development. The wind farms shown on the wirelines include all of those agreed by consultees where they would be theoretically visible. One of the LVIA viewpoints (VP 4) shows cumulative impacts from Crosskirk Chapel (SM 90086).

6.4.66 Figure 6.3 shows that cumulative impacts from the Proposed Development in combination with the wind farms listed above are most likely to affect heritage assets to the west and south-west of the proposed development.

6.4.67 A group of Scheduled Monuments and Listed Buildings around Reay and Sandside Bay, to the west of the Proposed Development, would have visibility at varying distances of the operational developments at Baillie Wind Farm and Forss I and II (in combination with the Lybster Road Forss and Hill of Lybster single turbines) and the consented Limekiln Application (see Figure 6.3). The proposed Limekiln Extension and Drum Hollistan 2 would also be visible from these assets (e.g. Figures 6.2.5 and 6.10). From these assets, the Proposed Development would be seen cumulatively beyond and in the same context as the operational Baillie Wind Farm, with the group at Forss also visible but visually distinct and separate. Limekiln and Limekiln Extension would be seen, as a separate group of turbines, to the south-west, and Drum Hollistan 2 would be seen to the west, in the same context as Strathy North. The cumulative impact of the Proposed Development in combination with all of these other developments would be of low magnitude and minor significance; not significant in EIA terms, and the effect would not appreciably diminish the cultural significance of the monuments or their amenity value. It will remain possible to understand and appreciate these assets, and their settings, and their contribution to the local landscape character would be retained.

6.4.68 A group of Scheduled Monuments around Broubster, to the south-west of the Proposed Development would have visibility at varying distances of the operational developments at Baillie Wind Farm and Forss I and II (in combination with the Lybster Road Forss and Hill of Lybster single turbines) and with the consented Limekiln and the proposed Limekiln Extension development (see Figure 6.3). From these assets, the Proposed Development would be seen cumulatively beyond and offset from the operational Baillie Wind Farm with the group at Forss also theoretically visible beyond and through Baillie Wind Farm. The consented Limekiln Application (as amended) and the proposed Limekiln Extension developments would be visible to the north-west as a separate group of turbines (Figure 6.3). The cumulative impact of the Proposed Development in combination with these other developments would be of low magnitude and minor significance; not significant in EIA terms, and the effect would not appreciably diminish the cultural significance of the monuments, or their amenity value and it will remain possible to understand and appreciate these assets, and their settings, and their contribution to the local landscape character would be retained.

6.4.69 For the two Scheduled Monuments identified as having significant effects as a result of the introduction of the Proposed Development (Thing's Va, broch, 1000m E of Blackheath, Scrabster (SM 587) (Figure 6.2.1) and Scrabster Mains, broch 1000m W of (SM 579)) (Figure 6.2.3) no cumulative impact is predicted as a result of the Proposed Development in combination with other developments. From Thing's Va (Figure 6.2.1), the consented Limekiln scheme (together with the proposed Limekiln Extension) would be barely (if at all) visible, more than 10 km distant and beyond the operational Baillie Wind Farm. Forss I and II, together with Lybster Road Forss and Hill of Lybster single turbines would not be visible from Thing's Va. From Scrabster Mains, broch (Figure 6.2.3), none of the cumulative schemes to the west would be visible in combination with the Proposed Development and those to the east would, with the exception of the Weydale Farm single turbine, be more than 15 km distant. It will remain possible to understand and appreciate both Thing's Va, broch and Scrabster Mains, broch, and their settings, and their contribution to the local landscape character would be retained. Overall, there would be no additional adverse effect in combination with the other cumulative developments considered in the assessment.

6.4.70 Overall, the cumulative effect of the addition of the Proposed Development to a baseline including other operational, consented, or proposed wind farm developments would be not significant in EIA terms.

## 6.5 Mitigation

6.5.1 Planning Advice Note 1/2013: Environmental Impact Assessment (PAN1/2013) describes mitigation as a hierarchy of measures: prevention, reduction, compensatory (offset) measures. Prevention and reduction measures can be

achieved through design, whilst compensatory measures offset effects that have not been prevented or reduced.

6.5.2 The emphasis in Planning Advice Note (PAN) 2/2011: Planning and Archaeology (PAN2) is for the preservation of important remains in situ where practicable and by record where preservation is not possible. The mitigation measures presented below therefore take into account this planning guidance and provide various options for protection or recording and ensuring that, where practical, surviving assets are preserved intact to retain the present historic elements of the landscape.

6.5.3 Historic Environment Policy for Scotland 2019 (HEPS) also contains policies (notably HEP2 and HEP4) that are relevant for conservation and preservation of the historic environment. HEP requires that decisions affecting the historic environment should ensure that its understanding and enjoyment as well as its benefits are secured for present and future generations. HEP 4 requires that changes to specific assets and their context should be managed in a way that protects the historic environment. Opportunities for enhancement should be identified where appropriate. If detrimental impact on the historic environment is unavoidable, it should be minimised. Steps should be taken to demonstrate that alternatives have been explored, and mitigation measures should be put in place.

6.5.4 All mitigation works presented in the following paragraphs take note of the advice in PAN2 and HEPS. The mitigation proposed would take place prior to, or, where appropriate, during, the construction of the Proposed Development. All works would be conducted by a professional archaeological organisation, and the scope of works would be detailed in one or more Written Scheme(s) of Investigation (WSI) developed in consultation with (and subject to the agreement of) HET, acting on behalf of THC.

## Mitigation during Construction

### Preservation in Situ

6.5.5 Most of the known heritage assets within the site (Figure 6.1) have been avoided. The main access track from the A836 would pass alongside a former mill lade (6) of heritage value at the local level and of low sensitivity but would not directly affect it. The main access track would also pass by a possible building platform (18) of little intrinsic heritage value and of negligible sensitivity but may not directly affect it. There is no requirement for any measures to ensure preservation in situ in respect of either of these assets.

6.5.6 There are no requirements for any measures to ensure preservation in situ of any of the other identified heritage assets within the site.

### Watching Brief(s)

6.5.7 The applicant would seek to agree the scope of the archaeological watching brief(s) with HET in advance of development works commencing. The scope of the agreed works would be confirmed in a Written Scheme of Investigations (WSI) to be signed off prior to commencement of the development works.

6.5.8 Taking account of the avoidance through design, and the character of the identified cultural heritage baseline, it is proposed that a watching brief would be carried out at the following location:

- Platform (18): a watching brief would be carried out where the proposed access track passes the remains of this possible field clearance or remains of a demolished former building to identify and record any surviving associated remains that may be encountered.

6.5.9 Based on the results of the desk-based study and the field survey, there are no other particularly sensitive areas within the Inner Study Area where watching briefs would be expected to encounter any archaeological remains.

6.5.10 It has been assessed that there is a medium potential for hitherto undiscovered archaeological remains to be present prehistoric remains within the site. Therefore, if required under the terms of a condition of consent, the scope of any additional archaeological watching brief(s) would be agreed through consultation with West of Scotland Archaeology Service (WoSAS) in advance of development works commencing and will be set out in the WSI.

### Post-excavation

6.5.11 If significant discoveries are made during archaeological monitoring, and it is not possible to preserve the discovered remains in situ, provision would be made for the excavation where necessary, of any archaeological deposits encountered. The provision would include the consequent production of written reports, on the findings, with post-excavation analysis and publication of the results of the works, where appropriate.

### Construction Guidelines

6.5.12 Written guidelines would be issued for use by all construction contractors, outlining the need to avoid causing unnecessary damage to known heritage assets. The guidelines would set out arrangements for calling upon retained professional support

in the event that buried archaeological remains of potential archaeological interest (such as building remains, human remains, artefacts, etc.) should be discovered in areas not subject to archaeological monitoring.

6.5.13 The guidelines would make clear the legal responsibilities placed upon those who disturb artefacts or human remains.

**Heritage Enhancement**

6.5.14 The old sheepfold (8) close to the proposed temporary construction compound near turbine T3 will be restored using traditional drystone wall techniques and reused to provide a viewpoint and information point. Information panels will be provided offering general information on the cultural heritage of the local area and pointing out specific cultural heritage features that may be of interest to tourists and walkers, who may wish to further acquaint themselves with the wider cultural heritage of Caithness. Sites that could be promoted might include:

- Crosskirk, St Marys Chapel and broch S of Chapel Pool (SM 90086), a scheduled monument and Property in Care;
- Cnoc Freiceadain, long cairns (SM 90078), a scheduled monument and Property in Care;
- Thurso, St Peter's Church and Burial Ground (SM 618);
- Reay, burial ground, old church and cross slab 175 m E of Parish Church (SM 615) and Reay parish Church (LB14992);
- Holborn Head, fort, Scrabster (SM 559);
- Loch Calder (remains of long cairn, chambered cairns and prehistoric settlement in lochside setting);
- Further afield (Castle of Mey; Mey Battery, Battery 80 m NE of Braes of Harrow; St John's Point, Fort & Site of St John's Chapel; Camster Cairns; Loch of Yarrows; etc).

6.5.15 In addition to promoting the local cultural heritage, the site entrance bell-mouth will be dressed with traditional Caithness flagstone walling, where traditional stoneworkers and craftspeople will be encouraged to create a series of stone carving artwork panels portraying aspects of the local cultural heritage. Stone for this work could be taken from the former quarry at Hopefield (25), thereby re-using a traditionally exploited source of Caithness flagstone.

### Mitigation during Operation

6.5.16 There are no heritage assets that would be directly affected by decommissioning presuming that the Proposed Development infrastructure is used to facilitate decommissioning. All direct effects would arise during construction and addressed through good practice measures and mitigation

6.5.17 The layout of the Proposed Development has been designed to avoid or reduce as far as possible adverse effects on the settings of heritage assets, by retaining a stand-off from important heritage assets such as Thing's Va, broch and using the topography to provide a degree of visual screening of the on-site infrastructure.

### Mitigation during Decommissioning

6.5.18 There are no heritage assets that would be directly affected by decommissioning presuming that the Proposed Development infrastructure is used to facilitate decommissioning. All direct effects would arise during construction and addressed through good practice measures and mitigation

## 6.6 Assessment of Residual Effects

### Residual Construction Effects

6.6.1 Taking account of the mitigation proposals set out above, the following residual construction effects have been identified:

6.6.2 The former mill lade (6), which survives as a linear ditch (ca 0.7m wide and ca 0.5m deep) and which is an asset of heritage value at the local level and of low sensitivity would be avoided and preserved in situ. The residual effect on the lade would be negligible and not significant.

6.6.3 A sub-rectangular grassy platform (18), of no intrinsic heritage value and negligible sensitivity, may be affected by track widening work. No mitigation is required in relation to this feature and the residual effect would be minor and not significant.

6.6.4 Any adverse effects on buried archaeological remains that may be encountered during the construction of the Proposed Development would be offset through a programme of investigation and recording approved by THC and implemented under the terms of a WSI submitted to and approved by THC in response to any applied planning condition. The residual effect on the potential buried archaeological remains would be negligible and not significant.

### Residual Operational Effects

6.6.5 There would be no significant residual direct effects on any of the cultural heritage assets within the site.

6.6.6 The residual effect of the Proposed Development on the settings of designated heritage assets would be the same as the predicted operational effects described above. These effects would be removed following decommissioning.

### Residual Decommissioning Effects

6.6.7 There would be no residual decommissioning effects on cultural heritage.

### Residential Cumulative Effects

6.6.8 The assessment of potential cumulative effects has not identified any significant cumulative impact from the Proposed Development in combination with any other development that is either operational, consented or in planning. The residual effect of the addition of the Proposed Development to a baseline including other operational, consented or proposed wind farm developments would therefore be of no more than low magnitude and minor significance; not significant in EIA terms.

## 6.7 Summary

6.7.1 A desk-based assessment and walk-over field survey have been carried out to establish the archaeology and cultural heritage baseline within the site. The assessment has been informed by consultation with HES and THC.

6.7.2 56 heritage assets were identified within the Inner Study Area. The majority of these assets are related to post-medieval, pre-improvement period agricultural use of the landscape and include former crofts and farmsteads and other associated buildings and structures. There are also some probable prehistoric remains present within the site including a possible Bronze Age burial cairn assessed as being of regional importance and medium sensitivity. Seventeen of the assets identified are of low sensitivity and 36 are assessed as being of negligible sensitivity. Two of the recorded sites (which are both erroneously recorded locations for assets identified by Mercer that have been shown by field survey to lie at different locations) are assessed as being on no sensitivity.

6.7.3 An assessment of the known cultural heritage resource within and in the immediate vicinity of the Inner Study Area, and the current and past land-use, indicates that there is a moderate probability of hitherto unidentified archaeological remains being present within the site; especially for remains of prehistoric date.

6.7.4 The layout of the Proposed Development has been designed to avoid direct effects on the identified heritage assets within the site and to minimise the effect of the Proposed Development on the settings of designated heritage assets in the wider landscape (Outer Study Area).

6.7.5 Two heritage assets have been identified that could be affected by construction of the Proposed Development, the predicted effect would be no more than minor and not significant. The potential for significant direct effects on buried archaeological remains is considered to be low.

6.7.6 Moderately significant effects on the settings of two scheduled monuments are predicted. These predicted effects would arise as a result of the presence of the Proposed Development in the landscape surroundings of two brochs (Thing's Va, broch (SM 587) and Scrabster Mains, broch (SM 579)). The introduction of the Proposed Development would not however result in a change that would be so significant as to reduce the cultural significance or amenity value of the assets or to detract from the ability for any visitor to appreciate and understand the assets or their settings.

6.7.7 No significant cumulative impacts upon the settings of any designated cultural heritage assets are predicted.

**Table 6.5: Summary of Residual Effects**

| Likely Significant Effect | Mitigation | Means of Implementation | Residual Effect |
|---|---|---|---|
| **Construction** | | | |
| Potential impact on assets in close proximity to working areas (6 and 18) | Watching brief on any ground breaking where the proposed access track runs past Asset 18.<br>Asset 6 would be avoided and preserved in situ. | Planning condition; CEMP | Not Significant |
| Potential impact on any buried archaeological remains | Watching brief if required in sensitive areas; at the discretion of THC. | Planning condition; CEMP | Not significant |
| **Operation** | | | |
| Impact on the setting of Thing's Va, broch, 1000m E of Blacheath, Scrabster (SM 587) | None proposed | Not applicable | Significant |
| Impact on the setting of Scrabster Mains, broch, 1000m W of (SM 579) | None proposed | Not applicable | Significant |

# Glossary and Abbreviations

## Glossary

| Term | Definition |
|---|---|
| Broch | An Iron Age round defended house, found mainly in the north and west of Scotland. Brochs have a tapering profile and thick, usually hollow dry-stone walls which contain galleries, cells and a stairway, with guard cells at the entrance. |
| Burnt Mound | A mound of fire-cracked stone, often set beside a stream and including a trough or pit which may have been lined with clay, wood or stone. Assumed to be a location where heated stones were used to boil water for cooking purposes. |
| Chambered Carin | A Neolithic burial monument comprising a stone-built chamber within a mound of stones. |
| Cist | Generally rectangular structure normally used for burial purposes; formed from stone slabs set on edge and covered by one or more horizontal slabs or capstones. Cists may be built on the surface or sunk into the ground. |
| Croft | A small farm or holding. |
| Long Cairn | A rectangular or trapezoidal non-megalithic stony mound of Neolithic date, with human remains in cists rather than a large chamber. Mound construction and associated features vary considerably in type and complexity. |
| Marker Cairn | A cairn of no great antiquity, erected to mark a particular spot in the landscape, often used as a marker or directional aid in upland areas. |
| Mill Lade | An artificial channel carrying water from a stream or river to a water mill. |
| Promontory Fort | A defensive enclosure created by constructing one or more lines of ramparts across a neck of land, in order to defend, or restrict access to, a spur or promontory, either inland or on the coast. Use for prehistoric and early historic sites. |
| Property in Care (PIC) | Properties in Care (PICs) form a portfolio of sites cared for and managed by Historic Environment Scotland on behalf of Scottish Ministers. The PICs are legally defined and protected, and they are accessible to the public. |
| Rig and Furrow | A series of ridges (rigs), separated by furrows, created by ploughing. |

## Abbreviations

| Term | Definition |
|---|---|
| CIfA | Chartered Institute for Archaeologists |
| EIA | Environmental Impact Assessment |
| GIS | Geographical Information Systems |
| GPS | Global Positioning System |
| HER | Historic Environment Scotland |
| HES | Historic Environment Scotland |
| HET | Highland Council Historic Environment Team |
| HLAMap | Historic Land-Use Assessment Data for Scotland |
| HwLDP | Highland-wide Local Development Plan |
| NHRE | National Record of the Historic Environment |
| SNH | Scottish Natural Heritage |
| SPAD | Scottish Palaeoecological Archive Database |
| THC | The Highland Council |
| WSI | Written Scheme of Investigation |
| ZTV | Zone of Theoretical Visibility |

# 7 Ecology

## 7.1 Introduction

7.1.1 This chapter considers the potential effects on ecology associated with the construction, operation and decommissioning of the Proposed Development. The specific objectives of the chapter are to:

- describe the assessment methodology and significance criteria used in completing the impact assessment;
- describe the ecology baseline;
- describe the potential impacts, including direct, indirect and cumulative impacts;
- describe the mitigation measures proposed to address potential significant effects; and
- assess the significance of residual effects remaining following the implementation of mitigation.

7.1.2 Effects on birds are addressed separately in Chapter 8.

7.1.3 The assessment has been carried out by MacArthur Green and in accordance with NatureScot (formerly Scottish Natural Heritage (SNH)) and Scottish Environment Protection Agency (SEPA) guidelines.

7.1.4 This chapter is supported by the following figures and technical appendices:

- Figure 3.2: Layout Design Evolution;
- Figure 7.1: Ecological Designated Sites within 5 km;
- Figure 7.2: NVC Study Area and Survey Results;
- Figure 7.3: Potential Groundwater Dependent Terrestrial Ecosystems (GWDTEs) Study Area and Survey Results;
- Figure 7.4: Hydrological Sensitivity of Potential Groundwater Dependent Terrestrial Ecosystems (GWDTEs);
- Figure 7.5: Protected Species Survey Results;
- Figure 7.6: Bat Survey Results;
- Figure 2.4.1: Phase 1 and 2 Peat Sample Locations;
- Figure 2.4.2: Phase 1 and 2 Sampling Peat Depths;
- Figure 2.4.3: Phase 1 and 2 Interpolated Peat Depths;
- Technical Appendix 7.1: National Vegetation Classification & Habitats Survey Report;
- Technical Appendix 7.2: Protected Species Survey Report;
- Technical Appendix 7.3: Bat Survey Report;
- Technical Appendix 7.4: Caledonian Conservation Baseline Non-Avian Ecology Report 2014: Hill of Forss Wind Farm; and
- Technical Appendix 2.4: Phase 1 & 2 Peat Depth and Coring Survey Report.

7.1.5 Figures and technical appendices are referenced in the text where relevant.

## 7.2 Assessment Methodology and Significance Criteria

### Scope of Assessment

7.2.1 This assessment concentrates on the effects of construction, operation and decommissioning of the Proposed Development upon those ecological features identified during the review of desk-based information and field surveys (the extents of the study areas are set out in the Method of Baseline Characterisation section below). Effects upon the following features are assessed:

- Designated sites: including direct effects (i.e. derived from land-take or disturbance to habitats and/or protected species) and indirect effects (i.e. changes caused by effects to supporting systems such as groundwater or over land flow).
- Terrestrial habitats: including direct effects (i.e. derived from land-take) and indirect effects (i.e. changes caused by effects to supporting systems such as groundwater or over land flow).
- Aquatic habitats: effects are limited to the ecological impacts of changes in water conditions through potential pollution effects.
- Protected species: including direct effects (i.e. loss of life as a result of the Proposed Development; loss of key habitat; displacement from key habitat; barrier effects preventing movement to/from key habitats; and general disturbance) and indirect effects (i.e. loss/changes of/to food resources; population fragmentation; degradation of key habitat e.g. as a result of pollution).
- Groundwater Dependent Terrestrial Ecosystems (GWDTE): SEPA has classified a number of National Vegetation Classfication (NVC) communities as

potentially dependent on groundwater (SEPA, 2017[1]). Many of the NVC communities on the list are very common habitat types across Scotland and generally of low nature conservation value. Furthermore, some of the NVC communities may be considered GWDTE only in certain hydrogeological settings. Because designation as a potential GWDTE is related to groundwater dependency and not nature conservation value, GWDTE status has not been used as criteria to determine a habitat's nature conservation value. There is however a statutory requirement to consider GWDTEs and the data gathered during the NVC surveys has been used to inform this assessment. The GWDTE assessment is presented within Annex C of Technical Appendix 7.1: National Vegetation Classification and Habitats Survey Report.

7.2.2 The chapter assesses cumulative effects as arising from the addition of the Proposed Development in combination with other relevant projects. Operational, under construction and consented developments are considered as part of the baseline.

7.2.3 The assessment is based on the Proposed Development as described in Chapter 2.

7.2.4 The scope of the assessment has been informed by consultation responses summarised in Table 7.1 and the legislation, policy and guidance set out in the subsections below.

**Legislation**

7.2.5 This assessment is carried out in accordance with the principles contained within the following European legislation:

- Environmental Impact Assessment Directive 2014/52/EU[2]
- European Union Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora[3]; and
- European Union Council Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy ("Water Framework Directive")[4].

7.2.6 The following national legislation is considered as part of the assessment:

- The Conservation (Natural Habitats &c.) Regulations 1994 (as amended) (''The Habitats Regulations'')[5];
- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2011[6];
- The Nature Conservation (Scotland) Act 2004 (as amended)[7];
- The Protection of Badgers Act 1992 (as amended)[8];
- The Water Environment and Water Services (Scotland) Act 2003 (as amended) (WEWS)[9];
- The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended)[10];
- The Wildlife and Countryside Act 1981 (as amended)[11]; and
- The Wildlife and Natural Environment (Scotland) Act 2011[12].

7.2.7 This assessment considers the relevant aspects of Scottish Planning Policy, Planning Advice Notes and other relevant guidance. Of relevance to ecology are the following policies:

- 2020 Challenge for Scotland's Biodiversity[13];
- Climate Change Plan: Third Report on Policies and Proposals 2018-2032[14];

[1] SEPA (2017a). Land Use Planning System SEPA Guidance Note 31: Guidance on Assessing the Impacts of Windfarm Developments Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems. Version 3.
[2] European Parliament (2014). Environmental Impact Assessment Directive 2014/52/EU. Available at: https://www.legislation.gov.uk/eudr/2014/52/introduction [Accessed in April 2022]
[3] European Union (1992). European Union Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora. Available at: https://www.legislation.gov.uk/eudr/1992/43/contents. [Accessed in April 2022]
[4] European Union (2000). European Union Council Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy ("Water Framework Directive"). Available at: https://ec.europa.eu/environment/water/water-framework/index_en.html
https://www.legislation.gov.uk/asp/2003/3/contents [Accessed in April 2022]
[5] UK Government (1994). The Conservation (Natural Habitats, &c.) Regulations 1994. Available at: https://www.legislation.gov.uk/uksi/1994/2716/contents/made [Accessed in April 2022]
[6] Scottish Government (2017). The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017. Available at: https://www.legislation.gov.uk/ssi/2017/101/contents/made [Accessed in April 2022]
[7] Scottish Government (2004). Nature Conservation (Scotland) Act 2004. Available at: https://www.legislation.gov.uk/asp/2004/6/contents [Accessed in April 2022]
[8] UK Government (1992). Protection of Badgers Act 1992. Available at: https://www.legislation.gov.uk/ukpga/1981/69/contents [Accessed in April 2022]
[9] Scottish Government (2003). Water Environment and Water Services (Scotland) Act 2003. Available at: https://www.legislation.gov.uk/asp/2003/3/contents [Accessed in April 2022]
[10] Scottish Government (2011). The Water Environment (Controlled Activities) (Scotland) Regulations 2011. Available at: https://www.legislation.gov.uk/ssi/2011/209/contents/made [Accessed in April 2022]
[11] UK Government (1981). Wildlife and Countryside Act 1981. Available at: https://www.legislation.gov.uk/ukpga/1981/69/contents [Accessed in April 2022]
[12] Scottish Government (2011). Wildlife and Natural Environment (Scotland) Act 2011. Available at: https://www.legislation.gov.uk/asp/2011/6/contents/enacted [Accessed in April 2022]
[13] Scottish Government (2013). 2020 Challenge for Scotland's Biodiversity. Available at: https://www.gov.scot/publications/2020-challenge-scotlands-biodiversity-strategy-conservation-enhancement-biodiversity-scotland/ [Accessed in April 2022]
[14] Scottish Government (2018). Climate Change Plan: Third Report on Policies and Proposals 2018-2032

- Draft Peatland and Energy Policy Statement[15];
- Highland Nature Biodiversity Action Plan[16];
- Scottish Biodiversity Strategy: It's in Your Hands[17]; and
- UK Post-2010 Biodiversity Framework (2012)[18].

7.2.8 Guidance on the following topics has also been considered:

- Environmental impact assessment: CIEEM (2018) [19], European Commission (2011[20]), NatureScot (2019[21]), Scottish Government (2017[22]), SERAD (2000[23]), SNH (2018[24]);
- Designated sites: JNCC (2013[25]);
- Species-specific guidance: Collins (2016[26]), Hundt (2021[27]), NatureScot *et al.* (2021[28]), Rodrigues *et al.* (2014[29]), Scottish Government (2001[30]);
- Construction: Scottish Renewables *et al.* (2019[31]); and
- Habitats and peatlands: Scottish Government (2010[32], 2017[33]), SEPA (2017a[34], 2017b[35]), SNH (2015[36], 2016[37]).

## Consultation

7.2.9 In undertaking the assessment, full consideration has been given to consultation undertaken with relevant organisations. Table 7.1 below outlines the consultation responses where more detailed consideration was required, or additional consultation has been undertaken and provides information on where and/or how they have been addressed in the assessment.

**Table 7.1: Consultation Responses**

| Consultee and Date | Scoping / Other Consultation | Issue Raised | Response / Action Taken |
|---|---|---|---|
| The Highland Council (THC) 8th August 2016 | Scoping | The Environmental Statement (ES) should provide a baseline survey (species and location) of the animal (including European Protected Species) interests on site. | Protected Species Surveys were undertaken in 2014, 2018 and 2019. The results are outlined in Technical Appendices 7.2: Protected Species Survey Report and 7.4: Caledonian Conservation Baseline Non-Avian Ecology Report 2014: Hill of Forss Wind Farm. |
| Scottish Natural Heritage (SNH) 28th July 2016 | Scoping | Non-avian ecology surveys should be completed no more than 18 months prior to submission of the ES. | Three years of full protected species surveys were undertaken in 2014, 2018 and 2019. The results are outlined in Technical Appendix 7.2: Protected Species Survey Report. |
| Scottish Environment Protection Agency (SEPA) 19th July 2016 | Scoping | Map and assess impacts on GWDTE | The potential impacts on potential GWDTE have been assessed in Annex C of Technical Appendix 7.1: National Vegetation Classification & Habitats Survey Report and illustrated in Figures 7.3 and 7.4 (Volume 3a). |
| SNH 25th February 2019 | Post-scoping | A letter was issued to SNH by MacArthur Green to provide | Updated roost surveys were undertaken in 2019, with the results |

[15] Scottish Government (2016). Draft Peatland and Energy Policy Statement
[16] Highland Environment Forum (2021). Highland Nature Biodiversity Action Plan 2021-2026
[17] Scottish Government (2004) Scottish Biodiversity Strategy: It's in Your Hands. Available at: https://www.gov.scot/publications/scotlands-biodiversity---its-in-your-hands/ [Accessed April 2022]
[18] JNCC (2012). UK Post-2010 Biodiversity Framework. Available at: https://jncc.gov.uk/our-work/uk-post-2010-biodiversity-framework/ [Accessed in April 2022]
[19] CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (3rd Edition) (Version 1.1 Updated September 2019). CIEEM, Winchester.
[20] European Commission (2011). Natura 2000 Guidance Document 'Wind Energy Developments and Natura 2000'. European Commission, Brussels
[21] NatureScot (2021). Assessing the cumulative landscape and visual impact of onshore wind energy developments
[22] Scottish Government (2017). Planning Circular 1/2017: Guidance on The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011
[23] SERAD (Scottish Executive Rural Affairs Department) (2000). Habitats and Birds Directives, Nature Conservation: Implementation in Scotland of EC Directives on the Conservation of Natural Habitats and of Wild Flora and Fauna and the Conservation of Wild Birds ('The Habitats and Birds Directives'). Revised Guidance Updating Scottish Office Circular No 6/1995
[24] Scottish Natural Heritage (2018). Environmental Impact Assessment Handbook – Version 5: Guidance for competent authorities, consultation bodies, and others involved in the Environmental Impact Assessment process in Scotland
[25] Joint Nature Conservation Committee (2013a). Guidelines for selection of biological Sites of Special Scientific Interest (SSSI)
[26] Collins, J. (2016). Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edition). Bat Conservation Trust
[27] Hundt, L. (2012). Bat Surveys: Good Practice Guidelines (2nd edition). Bat Conservation Trust
[28] NatureScot, Natural England, Natural Resources Wales, RenewableUK, Scottish Power Renewables, Ecotricity Ltd, the University of Exeter & Bat Conservation Trust (BCT) (2021). Bats and Onshore Wind Turbines – Survey, Assessment and Mitigation
[29] Rodrigues L., Bach L., Dubourg-Savage M.J., Karapandza B., Kovac D., Kervyn T., Dekker J., Kepel A., Bach P., Collins J., Harbusch C., Park K., Micevski B., Minderman J. (2014). Guidelines for consideration of bats in windfarm projects. Revision 2014. EUROBATS Publication Series No. 6
[30] Scottish Government (2001). European Protected Species, Development Sites and the Planning Systems: Interim guidance for local authorities on licensing arrangements
[31] Scottish Renewables, SNH, SEPA, Forestry Commission (Scotland), Historic Environment Scotland, Marine Scotland Science, AEECOW (2019). Good Practice During Windfarm Construction (4th Edition)
[32] Scottish Government (2010). Management of Carbon-Rich Soils
[33] Scottish Government, SNH and SEPA (2017). Peatland Survey - Guidance on Developments on Peatland
[34] SEPA (2017). Land Use Planning System Guidance Note 31 - Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems
[35] SEPA (2017). Land Use Planning System Guidance Note 4 - Planning guidance on on-shore windfarm developments
[36] Scottish Natural Heritage (2015). Scotland's National Peatland Plan
[37] Scottish Natural Heritage (2016). Planning for Development: What to consider and include in Habitat Management Plans (Version 2)

| Consultee and Date | Scoping / Other Consultation | Issue Raised | Response / Action Taken |
|---|---|---|---|
| | | details of the assessment of the site for bats to date, proposed 2019 roost surveys and justification as to why updated activity surveys were not considered necessary for the Proposed Development.<br>SNH responded on 21st March 2019 to say they welcomed new roost surveys at the site in 2019. Updated bat activity surveys would be recommended, however, given the previous assessment of the site in 2014 (low risk for bats) and that no significant changes have occurred to the habitat since this time, SNH agree that the 2014 data is likely to be still relevant for the site and can be used for an EIA assessment.<br>SNH recommends that justifications for use of the 2014 data is included within the ES for completeness. | outlined in Technical Appendix 7.3: Bat Survey Report.<br>It has been noted that the EIA should contain the justification for the use of the 2014 bat data. This information is available in paragraphs 7.3.54 to 7.3.59. |
| SNH 11th April 2019 | Post-scoping | A letter was issued to SNH by MacArthur Green to provide details of the updated bat roost surveys, conducted on the 6th March 2019. 'Blackheath' and 'Hopefield' buildings were identified as having moderate potential for bats. Blackheath marginally fell within the 200m buffer, plus rotor radius of the layout at the time of consultation. The letter provided justification on unlikely negative impact from the turbine or wider development on the building, if a roost feature was present.<br>SNH responded on 30th April 2019 to state that it agrees with the proposed approach, given the level of detail and justification provided in the supporting information. SNH would encourage this information to be included within the ES for the Proposed Development. SNH also commented that, from the photographs of the Blackheath property and the location information, the building is unsuitable for breeding but use by a small number of bats (as a non-breeding roost) cannot be ruled out. SNH noted that what has been proposed in terms of mitigation in the event that bats are found (e.g. buffers etc) is proportionate. | The results of the updated bat roost surveys are provided in Technical Appendix 7.3: Bat Survey Report.<br>It has been noted that the EIA should contain the justification and proposals for the Blackheath property. This information is included within paragraph 7.3.78 of this EIA.<br>Since this consultation the bat activity data has been run through the Ecobat tool, as per current guidance, which has provided further context to bat activity on the site, providing evidence to support the conclusion that there are no roosts in the immediate area and that over bat activity is 'Low'. |
| SEPA 03rd April 2019 - 20th September 2019 | Post-scoping email correspondence | SEPA were consulted by MacArthur Green post-scoping and pre-application via ongoing email correspondence from 3rd April 2019 to 20th September 2019 in relation to the layout and design of the Proposed Development with regards to SEPAs remit on potential impacts to GWDTE, peatland, and hydrological sensitivities.<br>Correspondence included the provision of baseline NVC data, peat depth data, and locations of hydrological sensitivities (such as watercourses) overlain by proposed infrastructure layouts. During this ongoing correspondence and consultation, concerns raised by SEPA on the siting of some infrastructure elements were considered and the revised layout amended. The revised layout no longer requires the rerouting of water features. | Following the consultations with SEPA, the following actions and responses were undertaken, and commitments made, to inform and agree on the Proposed Development layout:<br>Existing infrastructure is utilised as far as practicable;<br>Undertake an assessment of areas of potential GWDTE (see Annex C of Technical Appendix 7.1: National Vegetation Classification & Habitats Survey Report);<br>Except where a minimum number of watercourse crossings are required, a 50m buffer from infrastructure has been applied off major watercourses, and a 25m buffer for infrastructure has been applied to minor watercourses (N.B. no major watercourses require new crossings).<br>Details and plans to be agreed upon further detailed survey post-consent and pre-construction - see Technical Appendix 2.5: Hydrological Sensitivities.<br>SEPA also acknowledge that the majority of the site is underlain by shallow peat. However, given design alterations since the Phase 2 peat depth probing was undertaken, there are some areas with comparatively fewer sample probes. Such areas should be subject to further depth probing to inform any micrositing requirements and peat management, however SEPA acknowledge this can be undertaken at the post-consent and pre-construction stage. |

| Consultee and Date | Scoping / Other Consultation | Issue Raised | Response / Action Taken |
|---|---|---|---|
| NatureScot 15th Feb 2022 | Scoping response | NatureScot were contacted on 24 January 2022 by the Highland Council requesting scoping advice for the updated proposal of a 5-turbine wind farm.<br>With regards to ecology, NatureScot's letter advised pre-application surveys should be repeated if the application is delayed beyond 2 years (for species that can be surveyed at any time of year, such as badger, otter etc.) or a 3rd survey period (for species with restricted survey periods, such as pine marten and water vole), and to ensure the previous surveys remain adequate in light of any substantive land use, guidance, habitat or population changes that may have occurred since the original surveys. | If this application were to become delayed beyond two years, repeat protected species surveys will be undertaken.<br>The previous surveys are considered to remain adequate for the assessment as the data is still likely to be representative of the site. There has been no significant change in land use or habitats and, due to the nature of the site, there are unlikely to have been significant changes in populations of species. In addition, mitigation during construction would ensure impacts on protected species and habitats are minimised and wildlife legislation is followed, such as by conducting pre-construction surveys, having an ECoW present, and complying with a Construction Environment Management Plan and Species Protection Plan. |

## Potential Effects Scoped Out

7.2.10 No construction or operational effects were scoped-out prior to commencement of desk-based and field surveys, and determination of the presence and distribution of ecological features in relation to the planned infrastructure and activities associated with the Proposed Development. On the basis of the results of the desk-based and survey work undertaken, the professional judgement of the EIA team, experience from other relevant projects and policy guidance or standards, the following species and habitats/habitat features have been 'scoped-out' of the assessment.

7.2.11 Generally, common or widely distributed habitats or species which do not fall within the following categories were scoped-out of the assessment:

- Annex I habitats of the Habitats Directive, and species on Annex II of the Habitats Directive;
- UK Biodiversity Action Plan (UKBAP) or Scottish Biodiversity List (SBL) Priority Habitats (Scottish Government, 2013); and
- Habitats or species protected by other legislation such as The Wildlife and Countryside Act 1981 (as amended), the Nature Conservation (Scotland) Act 2004 (as amended), or The Protection of Badgers Act 1992 (as amended).

## Method of Baseline Characterisation

### Extent of the Study Area

7.2.12 This ecological assessment focuses on the site and appropriate buffer areas (collectively the 'study areas') which have been applied. The area within which the desk-based research and field surveys were undertaken varies depending on the ecological feature and its search/survey requirements. Details of the extent of each study area are outlined below and are also detailed in associated Technical Appendices 7.1 to 7.4 and Figures 7.1 to 7.6 (EIA Volume 3a).

7.2.13 The specific field study areas are as follows:

- National Vegetation Classification (NVC) & Habitats: surveys within the majority of the site area and buffers appropriate to account for the presence of potential GWDTE (100m and 250m buffers as a minimum (SEPA, 2017a and b)). The NVC study area covers 501.76 hectares (ha). The study area extends beyond the site boundary which has a total area of 358.56 ha. Further information is provided within Technical Appendix 7.1: National Vegetation Classification and Habitats Survey Report and on Figure 7.2.
- Protected species (otter (*Lutra lutra*), water vole (*Arvicola amphibius*), badger (*Meles meles*), red squirrel (*Sciurus vulgaris*) and pine marten (*Martes martes*): surveys undertaken as part of the Extended Phase 1 survey in 2014 were conducted within the site boundary, as it was proposed at the time the surveys were undertaken (i.e. Option A Hill of Forss site boundary in Figure 3.2, which is within the finalised site boundary) (see Technical Appendix 7.4: Caledonian Conservation Baseline Non-Avian Ecology Report 2014: Hill of Forss Wind Farm for more information). Surveys undertaken in 2018 and 2019 were conducted around the most up to date proposed infrastructure locations at that time with survey buffers appropriate for each species, and also included a fisheries habitat survey (see Technical Appendix 7.2: Protected Species Survey Report and Figure 7.5). All infrastructure remains within the surveyed areas in the current Proposed Development layout.
- Bats: surveys undertaken in 2014 were conducted within the site boundary as proposed at the time the surveys were undertaken (i.e. Option A Hill of Forss site boundary in Figure 3.2; see Technical Appendix 7.4: Caledonian Conservation Baseline Non-Avian Ecology Report 2014: Hill of Forss Wind Farm). A preliminary bat roost assessment was conducted in 2019 (as agreed with SNH; see Table 7.1), around the most up to date proposed infrastructure

locations at that time (see Technical Appendix 7.3: Bat Survey Report and Figure 7.6).
- Peat depth & peat coring survey: the peat surveys conducted in 2016, 2018 and 2019, were all conducted within the site boundary, with Phase 2 surveys focussed around the proposed infrastructure as proposed at the time the surveys were conducted (i.e. Option C Layout in Figure 3.2) (see Technical Appendix 2.4: Phase 1 & 2 Peat Depth and Coring Survey and Figure 2.4.1).

**Desk Study**

7.2.14 A desk study was undertaken to collate available ecological information in relation to the Proposed Development and surrounding environment. The following data sources were considered as part of the determination of scope of baseline surveys and assessment:

- National Biodiversity Network (NBN) Atlas website for historical species records (NBN, 2022[38]);
- NatureScot SiteLink for designated site information (NatureScot, 2022[39]);
- Deer Distribution Survey 2016 results by the British Deer Society (British Deer Society, 2016[40]);
- Ancient Woodland sites within 5km of the Proposed Development (Scottish Government, 2015[41]); and
- Carbon and Peatland Map 2016 (SNH, 2016[42]).

**Field Survey**

7.2.15 Ecological fieldwork (including peat surveys) commenced in July 2014 and was completed in March 2019. The following field surveys were undertaken to establish the baseline ecological conditions and methods used standard best practice (see Technical Appendices 7.1 to 7.4 and Technical Appendix 2.4: Phase 1 and Phase 2 Peat Depth & Coring Survey Report (EIA Volume 4) for further details).

7.2.16 All field surveys outlined below were undertaken by MacArthur Green, unless otherwise specified.

***Extended Phase 1 Habitat Survey***

7.2.17 Surveys were undertaken as follows:

- Extended phase 1 survey (including protected species): 3rd to 4th July 2014 (undertaken by Caledonian Conservation).

7.2.18 Further information related to these surveys and their methods can be found in Technical Appendix 7.4: Caledonian Conservation Baseline Non-Avian Ecology Report 2014: Hill of Forss Wind Farm.

***National Vegetation Classification & Habitats Surveys***

7.2.19 Surveys were undertaken as follows:

- 2014: 3rd to 4th July (undertaken by Caledonian Conservation);
- 2018: 27th to 29th August 2018; and
- 2019: 5th and 6th March 2019.

7.2.20 The surveys in 2018 were conducted to verify the habitats and communities recorded during the 2014 baseline survey. This included adding further resolution to the mapping, where necessary, making updates to vegetation communities and classification, if required, and collecting further information on the habitats present, via additional target notes and photographs. Surveys in 2019 were undertaken to survey additional areas not covered in the original surveys.

7.2.21 Further information is provided in Technical Appendix 7.1: National Vegetation Classification and Habitats Survey Report and Technical Appendix 7.4: Caledonian Conservation Baseline Non-Avian Ecology Report 2014: Hill of Forss Wind Farm.

***Peat Depth and Coring Surveys***

7.2.22 Surveys were undertaken as follows:

- 2016: 7th to 9th September (peat depth surveys – 'phase 1 probing');
- 2018: 28th to 31st August (peat depth – 'phase 2 probing' and coring surveys);
- 2019: 4th to 7th March (peat depth surveys – 'additional phase 2 probing'); and
- 2022: 29th March 2022 (peat depth surveys – 'additional phase 2 probing').
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[38] NBN (2022). Available at: https://scotland.nbnatlas.org [Accessed in April 2022]
[39] NatureScot (2022). Scottish Natural Heritage. (n.d.) SiteLink. Available at: https://sitelink.nature.scot/home. [Accessed in April 2022].
[40] The British Deer Society (2016). Deer Distribution Survey Results 2016. Available at: https://www.bds.org.uk/index.php/research/deer-distribution-survey. [Accessed in April 2022]
[41] Scottish Government (2015). Ancient Woodland Inventory (Scotland). Available at: https://data.gov.uk/dataset/c2f57ed9-5601-4864-af5f-a6e73e977f54/ancient-woodland-inventory-scotland. [Accessed in April 2022]
[42] SNH (2016). Carbon and Peatland Map 2016. Available at: https://map.environment.gov.scot/Soil_maps/?layer=10# [Accessed in April 2022]

7.2.23 Further information related to the peat depth and coring surveys and their methods can be found in Technical Appendix 2.4: Phase 1 & 2 Peat Depth and Coring Survey.

***Protected Species Surveys***

7.2.24 Surveys were undertaken as follows:

- 2014: surveys undertaken as part of the Extended Phase 1 Habitat Survey on 3rd and 4th July (undertaken by Caledonian Conservation);
- 2018: 28th and 29th August; and
- 2019: 6th March 2019.

7.2.25 Further information related to the protected species surveys and their methods can be found in Technical Appendix 7.2: Protected Species Survey Report and Technical Appendix 7.4: Caledonian Conservation Baseline Non-Avian Ecology Report 2014: Hill of Forss Wind Farm.

***Bat Surveys***

7.2.26 The following surveys were undertaken in 2014 and 2016 by Caledonian Conservation:

- Walkover survey: conducted in May 2014;
- Bat habitat assessment survey: conducted in May 2014;
- Building roost survey: conducted in May 2014;
- Bat activity line transects: 21st May, 14th July and 24th September 2014; and
- Remote static bat survey: 18th to 23rd May, 10th to 15th July and 15th to 23rd September 2016.

7.2.27 Bat activity surveys were completed by Caledonian Conservation in 2016. These used static Anabat detectors at four areas during recording sessions in May, July/August and September 2016, for a minimum of five nights per recording session. Further information related to the 2014 bat surveys and their methods can be found in Technical Appendix 7.4: Caledonian Conservation Baseline Non-Avian Ecology Report 2014: Hill of Forss Wind Farm. Details of the analysis carried out on the 2016 data is included in Technical Appendix 7.3.

7.2.28 Surveys were also undertaken by MacArthur Green as follows:

- 2019: a preliminary bat roost assessment was carried out to update the baseline on 6th March 2019.

7.2.29 Further information related to the bat surveys undertaken in 2019 and the analysis of the 2016 bat activity data can be found in Technical Appendix 7.3: Bat Survey Report.

## Assessment of Effects

7.2.30 This section defines the methods used to assess the significance of effects on Important Ecological Features (IEFs) through the process of an evaluation of Nature Conservation Value, Conservation Status and Magnitude of Impact.

7.2.31 There can often be varying degrees of uncertainty over the sensitivity of receptors or magnitude of impacts as a result of limited information. A precautionary approach is therefore adopted where the response of a population to an impact is uncertain.

7.2.32 The evaluation for wider-countryside interests (interests unrelated to a Special Area of Conservation (SAC)) involves the following process:

- identification of the potential ecological impacts of the Proposed Development, including both beneficial and adverse;
- consideration of the likelihood of occurrence of potential impacts where appropriate;
- defining the Nature Conservation Value of the important ecological features present;
- establishing the feature's conservation status where appropriate;
- establishing the magnitude of the likely impact (both spatial and temporal);
- based on the above information, a professional judgement is made as to whether the identified effect is significant in the context of the EIA Regulations;
- if a potential effect is determined to be significant, measures to avoid, reduce, mitigate or compensate for the effect are suggested where required;
- opportunities for enhancement are considered; and
- residual effects after mitigation, compensation or enhancement are considered.

**Determining Nature Conservation Value of Ecological Features**

7.2.33 Nature Conservation Value is defined on the basis of the geographic context given in Table 7.2 (which follows standard CIEEM guidance[19]). Attributing a value to an ecological feature is generally straightforward in the case of designated sites, as the designations themselves are normally indicative of an importance level. For

example, a SAC, designated under the Habitats Directive, is implicitly of European (International) importance. In the case of species, assigning value is less straightforward as contextual information about distribution and abundance is fundamental, including trends based on historical records. This means that even though a species may be protected through legislation at a national or international level, the relative value of the population on site may be quite different (e.g. the site population may consist of a single transitory animal, which within the context of a thriving local/regional/national population of a species, is therefore of local or regional value rather than national or international).

7.2.34 Where possible, the valuation of habitat/populations within this assessment will make use of any relevant published evaluation criteria (e.g. The SBL[49] (Scottish Government, 2013), Joint Nature Conservancy Council (JNCC) on selection of biological SSSIs (JNCC, 2013a)). Furthermore, JNCC guidance (JNCC, 2014) has been consulted, where relevant, so that cross-referencing of classifications within different systems can be standardised (e.g. correctly matching NVC types with Annex I habitats where relevant etc.).

7.2.35 Where relevant, information regarding a feature's conservation status is also considered to fully define its importance. This enables an appreciation of current population or habitat trends to be incorporated into the assessment.

**Table 7.2: Approach to Valuing Ecological Features[43]**

| Value of Feature in Geographical Context | Description |
|---|---|
| International | An internationally designated site (e.g. SAC).<br>Site meeting criteria for international designations or qualifying species of a SAC where there is connectivity.<br>Species present in internationally important numbers (>1% of biogeographic populations). |
| National (UK) | A nationally designated site (SSSI, or a National Nature Reserve (NNR)), or sites meeting the criteria for national designation or qualifying species where there is connectivity.<br>Species present in nationally important numbers (>1% UK population). |
| Regional (National Heritage Zone or Local Authority Area) | Species present in regionally important numbers (>1% of Natural Heritage Zone population).<br>Areas of habitat falling below criteria for selection as a SSSI (e.g. areas of semi-natural ancient woodland larger than 0.25ha). |
| Local | Local Nature Reserves (LNR).<br>Areas of semi-natural ancient woodland smaller than 0.25ha. |
| | Areas of habitat or species considered to appreciably enrich the ecological resource within the local context, e.g. species-rich flushes or hedgerows. |
| Negligible | Usually widespread and common habitats and species. Features falling below local value are not normally considered in detail in the assessment process. |

7.2.36 IEFs to be assessed were taken to be those features of local, regional, national and international importance.

**Criteria for Assessing the Magnitude of Change**

7.2.37 Determining the magnitude of any likely impacts requires an understanding of how the ecological features are likely to respond to the Proposed Development. This change can occur during construction or operation of the Proposed Development.

7.2.38 Impact magnitude refers to changes in the extent and integrity of an ecological receptor. A suitable definition of ecological 'integrity' is found in Scottish Executive (2000) guidance which states that, "*The integrity of a site is the coherence of its ecological structure and function, across its whole area, which enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified*". Although this definition is used specifically regarding European level designated sites (SACs and SPAs), it is applied to wider countryside habitats and species for the purposes of this assessment.

7.2.39 Effects can be adverse, neutral or beneficial. Impacts are judged in terms of magnitude in space and time. There are five levels of spatial effects and five levels of temporal effects as described in Table 7.3 and Table 7.4 respectively.

**Table 7.3: Definition of Spatial Impact Magnitude upon IEFs**

| Spatial Magnitude | Description |
|---|---|
| Very High | Would cause the loss of the majority of a feature (>80%) or would be sufficient to damage a feature sufficient to immediately affect its viability. |
| High | Would have a major effect on the feature or its viability. For example, more than 20% habitat loss or damage. |
| Moderate | Would have a moderate effect on the feature or its viability. For example, between 10 - 20% habitat loss or damage. |
| Low | Would have a minor effect upon the feature or its viability. For example, less than 10% habitat loss or damage. |
| Negligible | Minimal change on a very small scale; effects not dissimilar to those expected within a 'do nothing' scenario. |

**Table 7.4: Definition of Temporal Impact Magnitude upon IEFs**

[43] Adapted from Hill *et al.* (2005)

| Temporal Magnitude | Description |
|---|---|
| Permanent | Effects continuing indefinitely beyond the span of one human generation (taken here as 30+ years), except where there is likely to be substantial improvement after this period in which case the category Long Term may be more appropriate. |
| Long term | Between 15 years up to (and including) 30 years. |
| Medium term | Between 5 years up to (but not including) 15 years. |
| Short term | Up to (but not including) 5 years. |
| Negligible | No effect. |

### Criteria for Assessing Cumulative Effects

7.2.40 NatureScot's cumulative assessment guidance (NatureScot, 2021) is used to inform the cumulative assessment in this chapter. Cumulative effects are not possible to evaluate through the study of one development in isolation but require the assessment of effects when considered in combination with other developments, projects or activities. However, in the interests of focusing on the potential for significant effects, this assessment considers the potential for cumulative effects with other EIA developments. The context in which these effects are considered is heavily dependent on the ecology of the feature assessed. For example, for water voles it may be appropriate to consider effects specific to individual catchments, should the distance between neighbouring catchments be sufficient to assume no movement of animals between them, whereas for blanket bog the region/Natural Heritage Zone may be the relevant spatial scale. Therefore, an assessment of cumulative impacts will be made for each scoped-in feature, appropriate to its ecology.

### Criteria for Assessing Significance

7.2.41 The potential significance of the effect was determined through a standard method of assessment based on professional judgement, considering the nature conservation value of the IEF and the magnitude of change.

7.2.42 Table 7.5 details the significance criteria that have been used in assessing the effects of the Proposed Development. 'Major' and 'Moderate' impacts are considered to be Significant in accordance with EIA Regulations. 'Minor' and 'Negligible' impacts are considered to be Not Significant in accordance with EIA Regulations.

**Table 7.5: Significance Criteria**

| Significance of Effect | Description |
|---|---|
| Major | **Significant effect**, as the effect is likely to result in a long term significant adverse effect on the integrity of the feature. |
| Moderate | **Significant effect**, as the effect is likely to result in a medium term or partially significant adverse effect on the integrity of the feature. |
| Minor | The effect is likely to adversely affect the feature at an insignificant level by virtue of its limited duration and/or extent, but there will probably be no effect on its integrity. The level of effect would be Minor and **Not Significant**. |
| Negligible | No material effects. The effect is assessed to be **Not Significant**. |

7.2.43 Using these definitions, it is decided whether there will be any predicted effects which will be sufficient to adversely affect the IEF to the extent that its conservation status deteriorates significantly above and beyond that which would be expected should baseline conditions remain (i.e. the 'do nothing' scenario).

### Limitations and Assumptions

7.2.44 Limitations exist regarding the knowledge base on how some species, and the populations to which they belong, react to effects. A precautionary approach is taken in these circumstances, and as such it is considered that these limitations do not affect the robustness of this assessment.

7.2.45 Ecological surveys are limited by factors which affect the presence of plants and animals such as the time of year and behaviour. The ecological surveys undertaken to support the Proposed Development have not therefore produced a complete list of plants and animals and the absence of evidence of any particular species should not be taken as conclusive proof that the species is not present or that it would not be present in the future. However, the results of these surveys are considered to be robust and sufficient to undertake this assessment.

7.2.46 Therefore, whilst some limitations have been identified, it is considered that there is sufficient information to enable an informed decision to be taken in relation to the identification and assessment of likely significant effects on important ecological features.

## 7.3 Baseline Conditions

### Current Baseline

7.3.1 This section details the results of the desk-study and field surveys, providing the baseline conditions for the site, and includes:

- statutory nature conservation designated sites within 5km of the site;
- desk-based study results;
- habitats and vegetation; and

- protected or notable species recorded during baseline surveys.

### Designated Sites

7.3.2 Information gathered from the desk-based study and consultation exercise revealed that the Proposed Development is within 5km of seven designated sites with qualifying interests related to ecology (EIA Volume 3a: Figure 7.1, and Table 7.6 below).

**Table 7.6: Designated Sites within 5km of the Proposed Site**

| Site Name | Distance from the Site (km) | Ecological Qualifying Features | Status |
|---|---|---|---|
| Newlands of Geise Mire SSSI | 1.46 | Valley fen | Favourable Maintained 08/08/2012 |
| Holborn Head SSSI | 1.85 | Maritime cliff | Favourable Maintained 05/09/2006 |
| Westfield Bridge SSSI | 3.08 | Fen meadow<br>Lowland calcareous grassland | Favourable Maintained 07/08/2003<br>Unfavourable Declining 20/06/2013 |
| Loch Lieurary SSSI | 2.53 | Basin fen | Favourable Maintained 16/08/2018 |
| Ushat Head SSSI | 2.15 | Maritime cliff | Favourable Maintained 14/08/2006 |
| River Thurso SAC | 3.48 | Atlantic salmon (*Salmo salar*) | Unfavourable Recovering 01/10/2011 |
| River Thurso SSSI | 3.42 | Floodplain fen<br>Vascular plant assemblage | Unfavourable No Change 29/05/2008<br>Favourable Maintained 02/07/2014 |

### Ancient Woodland

7.3.3 There are two small areas of woodland within 5 km of the site which are listed on the Ancient Woodland Inventory (AWI). These areas are located 860 m west of the site by Bridge of Forss and 4,582 m east of the site (EIA Volume 3a: Figure 7.1).

### NBN Atlas

7.3.4 A search on the NBN Atlas for species records within a 10km buffer of the site for the last 15 years (i.e. 2006 and onwards) contained records for the following relevant protected or notable species:

- Atlantic salmon;
- Badger (Meles meles);
- Brown hare (Lepus europaeus)
- Common pipistrelle (Pipistrellus pipistrellus);
- Daubenton's bat (*Myotis daubentonii*);
- Mountain hare (*Lepus timidus*);
- Otter;
- Palmate newt (Lissotriton helveticus);
- Pine marten;
- Adder (Vipera berus);
- Red deer (*Cervus elaphus*); and
- Roe deer (Capreolus capreolus);
- Slow worm (Anguis fragilis);
- Soprano pipistrelle (*Pipistrellus pygmaeus*);
- Water vole (Arvicola amphibious).

7.3.5 The invasive non-native species American mink (*Neovison vison*), Himalayan balsam (*Impatiens glandulifera*) and Japanese knotweed (*Fallopia japonica*) have also been recorded within the 10 km buffer of the site in the last 15 years.

### Deer Distribution Survey

7.3.6 The results of the 2016 Deer Distribution Survey (British Deer Society, 2016) indicate the following in the area where the site is located:

- Red deer were recorded in 2007 and/or 2011 but unconfirmed in 2016; and
- Roe deer were recorded in 2007 and/or 2011 and reconfirmed in 2016.

7.3.7 No other deer species have been recorded in the area of the site.

### Carbon and Peatland Map 2016

7.3.8 The Carbon and Peatland Map 2016[42] (SNH, 2016) was consulted to determine likely peatland classes present at the site. The map provides an indication of the likely presence of peat at a coarse scale and has been developed as "*a high-level planning tool to promote consistency and clarity in the preparation of spatial frameworks by*

*planning authorities*". It identifies areas of "*nationally important carbon-rich soils, deep peat and priority peatland habitat*" as Class 1 and Class 2 peatlands. Class 1 peatlands are also "*likely to be of high conservation value*" and Class 2 peatlands "*of potentially high conservation value and restoration potential*".

7.3.9 According to the Carbon and Peatland Map 2016, there is no peat present within the site. As the Carbon and Peatland Map is a high-level tool, detailed habitat and peat depth surveys have also been carried out across the peat study area to inform the detailed site assessment on peatland and associated habitats, which is required to identify actual effects of the proposal; including siting, design and mitigation. The results of the habitat surveys are discussed below and the results of the peat depth surveys are discussed in Technical Appendix 2.4: Phase 1 & 2 Peat Depth and Coring Survey Report.

**Field Surveys**

7.3.10 Details regarding field survey methodologies and results are included within Technical Appendices 7.1 – 7.4. The following section summarises the baseline conditions as identified during these surveys.

***Habitat Surveys***

7.3.11 The following paragraphs outline the baseline data for the habitat surveys. Where the text refers to the 'NVC study area', it is referring to the full area within which the NVC surveys were undertaken (see Technical Appendix 7.1: National Vegetation Classification and Habitats Survey Report and Figure 7.2). Where the term 'site' is used, this refers to the area within the site boundary.

7.3.12 Surveys followed the NVC scheme (Rodwell et al., 1991-2000[44]) using standard methods (Rodwell, 2006[45]). The NVC study area covered 501.76 hectares (ha) and in places is within or outwith the site boundary as a consequence of the requirement to ensure sufficient buffer areas were surveyed to account for the presence of potential GWDTEs, in line with SEPA guidance (SEPA, 2017a[34] and b[35]). The NVC study area also extends beyond the recommended buffers in some instances, as the surveys were completed in relation to previous design layouts that extended across a larger area than the Proposed Development. The site extends to an area of 358.49ha, however 26.77ha of this was not surveyed as it was distant from proposed infrastructure or outwith necessary survey buffers (see Figure 7.2; see also 'NSA' within Table 7.7 below). Baseline information is provided here on the entire NVC study area to allow characterisation of the Proposed Development in the context of the wider local setting.

7.3.13 The 2018 surveys were undertaken to verify and update the habitats and communities recorded during the 2014 baseline surveys, or to provide further resolution to the mapping, where any of this was required (as outlined in paragraph 5.2.20). The 2019 surveys were undertaken to survey additional areas not covered during the original surveys. As this walkover survey only resulted in minor updates to the 2014 vegetation classification of the site, those survey results remain valid. All data have been collated and are presented together within this Chapter.

***Phase 1 Habitats***

7.3.14 The NVC data was cross-referenced to the Phase 1 Habitat Survey Classification[46] (JNCC, 2010) to allow a broader characterisation of habitats. The extent of Phase 1 habitat types within the NVC study area and within the site boundary area was calculated using the correlation of specific NVC communities to their respective site-specific Phase 1 types (see Table 7.7 below), and their extents were determined within GIS; including within mosaic areas.

7.3.15 The results of the habitat surveys for the study area as well as the site boundary area and this analysis are summarised below in Table 7.7; which includes the data collated from the 2014, 2018 and 2019 habitat surveys. Figure 7.2 displays the Phase 1 and NVC survey results for the NVC study area extent (N.B. The Phase 1 shading in Figure 7.2 has been used to broadly characterise stands of vegetation based on the dominant NVC community within a particular area).

**Table 7.7: Phase 1 Habitat Types within the NVC Study Area and Site**

| Phase 1 Habitat Code | Phase 1 Habitat Description | Corresponding NVC & Other Habitat Types Recorded | NVC Study Area (ha) | Site boundary area (ha) | % of NVC Site boundary Area |
|---|---|---|---|---|---|
| A2.1 | Dense/Continuous Scrub (A2.1) | W23 | 5.19 | 4.31 | 1.20 |
| B1.1 | Unimproved Acid Grassland (B1.1) | U4, U5, U5c | 19.73 | 19.65 | 5.48 |

[44] Rodwell, J.S. (2006). NVC Users' Handbook. ISBN 978 1 86107 574 1.
[45] Rodwell, J.S. (Ed) et al. (1991 – 2000). British Plant Communities (5 volumes). Cambridge University Press, Cambridge.
[46] JNCC (2010, revised 2016) Handbook for Phase 1 Habitat Survey- a technique for environmental audit. Available at: https://data.jncc.gov.uk/data/9578d07b-e018-4c66-9c1b-47110f14df2a/Handbook-Phase1-HabitatSurvey-Revised-2016.pdf [Accessed in April 2022].

| Phase 1 Habitat Code | Phase 1 Habitat Description | Corresponding NVC & Other Habitat Types Recorded | NVC Study Area (ha) | Site boundary area (ha) | % of NVC Site boundary Area |
|---|---|---|---|---|---|
| B1.2 | Semi-Improved Acid Grassland (B1.2) | U4b | 35.90 | 28.56 | 7.97 |
| B2.1 | Unimproved Neutral Grassland (B2.1) | MG1 | 7.00 | 6.83 | 1.90 |
| B2.2 | Semi-Improved Neutral Grassland (B2.2) | MG10, MG10a, MG5 | 13.05 | 8.06 | 2.25 |
| B4 | Improved Grassland (B4) | MG6 | 96.42 | 57.54 | 16.05 |
| B5 | Marsh/Marshy Grassland (B5) | Cn, Je, M23, M23b, M25b, SSM | 50.85 | 28.60 | 7.96 |
| C3.1 | Tall Ruderal (C3.1) | OV25, OV27 | 0.32 | 0.32 | 0.08 |
| D1.1 | Acid Dry Dwarf Shrub Heath (D1.1) | H10, H9 | 10.64 | 10.44 | 2.91 |
| D2 | Wet Dwarf Shrub Heath (D2) | M15, M15a, M15b, M15c. M15d. Mvar | 192.45 | 123.61 | 34.47 |
| E1.7 | Wet Modified Bog (E1.7) | M17, M17b, M19 | 18.65 | 0.88 | 0.25 |
| E2.1 | Acid Neutral Flush (E2.1) | M4 | 3.13 | 0.48 | 0.13 |
| E2.2 | Basic Flush (E2.2) | M10 | 0.06 | 0.06 | 0.02 |
| F1 | Swamp (F1) | S10, S27, S9, Svar | 1.48 | 1.24 | 0.35 |
| G1.4 | Standing water - dystrophic | M1, M2, Mt, SW | 0.55 | 0.00 | 0.00 |
| J1.1 | Arable (J1.1) | AR | 38.84 | 37.04 | 10.33 |
| J1.2 | Amenity Grassland (J1.2) | PG | 0.19 | 0.19 | 0.05 |
| J3.6 | Building (J3.6) | BD | 0.33 | 0.33 | 0.09 |
| J4 | Bare Ground (J4) | BG | 6.87 | 4.01 | 1.12 |
| Area Not Surveyed | Area Not Surveyed (NSA) | NSA | N/A | 26.40 | 7.36 |

### *NVC Communities*

7.3.16 The NVC communities and non-NVC habitat types recorded within the NVC study area are detailed in Table 7.8 below and include the proportions of a particular community or habitat type that are found within the NVC study area, including proportions within mosaic habitats. Descriptions of the habitats, NVC communities and associated flora of the NVC study area are provided in Technical Appendix 7.1: National Vegetation Classification and Habitats Survey Report, Technical Appendix 7.4: Caledonian Conservation Baseline Non-Avian Ecology Report 2014: Hill of Forss Wind Farm and are displayed in Figure 7.2.

7.3.17 The NVC surveys recorded 25 recognised NVC communities within the NVC study area, with various associated sub-communities; however, only a small number of communities account for the majority of the NVC study area and site (Table 7.8). In addition, a number of non-NVC habitat types or features were also mapped, such as recently ploughed fields, non-NVC mires, *Juncus effusus* acid grassland community, buildings and bare ground. Semi-natural habitats within the NVC study area are mainly mire and grassland communities, with some scattered areas of scrub.

### *Annex 1 Habitats*

7.3.18 Certain NVC communities can also correlate to various Annex I habitat types listed under the Habitats Directive[47]. However, the fact that an NVC community can be attributed to an Annex I habitat type does not necessarily mean all instances of that NVC community constitute Annex I habitat. Its status can depend on various factors such as quality, extent, species assemblages, geographical setting, and substrates.

7.3.19 NVC survey data and field observations have been compared to JNCC Annex I habitat listings and descriptions (JNCC, 2016[48]). Those habitats within the site which could be considered Annex I habitats are also summarised in Table 7.8.

7.3.20 The extents and often relatively low quality and degraded nature of these potential Annex I habitats within the site means none are considered of more than local nature conservation value (Table 7.2). Full details and discussion of Annex I habitat types present with the NVC study area are provided within Technical Appendix 7.1.

### *Scottish Biodiversity List Priority Habitats*

7.3.21 The Scottish Biodiversity List (SBL) (Scottish Government, 2013[49]) is a list of animals, plants and habitats that Scottish Ministers consider to be of principal importance for

[47] As defined by the Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora – the 'Habitats Directive'.
[48] JNCC (2016). Annex I habitats and Annex II species occurring in the UK. URL: https://data.jncc.gov.uk/data/08ea8367-c479-4d68-9638-ce09fda79598/jncc-report-312-web.pdf [Accessed in April 2022].
[49] Scottish Government (2013). Scottish Biodiversity List. Available at: http://www.gov.scot/Topics/Environment/Wildlife-Habitats/16118/Biodiversitylist/SBL [Accessed: March 2022].

biodiversity conservation in Scotland. The SBL identifies habitats which are the highest priority for biodiversity conservation in Scotland. Some of these priority habitats are quite broad and can correlate to many NVC types.

7.3.22 Relevant SBL priority habitat types and corresponding associated NVC types recorded within the site are also summarised in Table 7.8 and are outlined for the full NVC study area in Technical Appendix 7.1. These SBL priority habitats also correlate with UK Biodiversity Action Plan (BAP) Priority Habitats (JNCC, 2016[50]).

***Groundwater Dependant Terrestrial Ecosystems***

7.3.23 The NVC results were referenced against SEPA guidance (SEPA, 2017a[34]), to identify those habitats which may be classified, depending on the hydrogeological setting, as being potentially groundwater dependent. Potential GWDTE NVC communities recorded within the NVC study area are summarised in Table 7.8 and are shown in Figure 7.3; all these communities (with the exception of CG10) are also present within the site.

7.3.24 The potential GWDTE sensitivity of each polygon containing a potential GWDTE community was classified on a four-tiered approach as follows:

- 'Highly – dominant' where potential high GWDTE(s) dominate the polygon;
- 'Highly – sub-dominant' where potential high GWDTE(s) make up a sub-dominant percentage cover of the polygon;
- 'Moderately – dominant' where potential moderate GWDTE(s) dominate the polygon and no potential high GWDTEs are present; and
- 'Moderately – sub-dominant' where potential moderate GWDTE(s) make up a sub-dominant percentage cover of the polygon and no high GWDTEs are present.

7.3.25 Where a potential high GWDTE exists in a polygon, it outranks any potential moderate GWDTE communities within that same polygon.

7.3.26 GWDTE sensitivity has been assigned here according to SEPA listings (SEPA, 2017a[34]). However, depending on several factors such as geology, superficial geology, presence of peat and topography, many of the potential GWDTE communities recorded may in fact be only partially groundwater fed or not dependent on groundwater. Further information on groundwater dependency is provided within Technical Appendix 7.1.

***Table 7.8: Summary of NVC Communities Recorded within the NVC Study Area & Site***

| NVC Community Code and Name | | Extent in Study Area (ha) | Extent in Site Area (ha) | % of Site Area | Potential Groundwater Dependency | Annex I Habitat Type | SBL Priority Habitat |
|---|---|---|---|---|---|---|---|
| Mires and Flushes | | | | | | | |
| M1 | Sphagnum denticulatum bog community | 0.09 | 0.00 | 0.00 | - | - | - |
| M2 | Sphagnum cuspidatum/fallax bog pool community | 0.13 | 0.00 | 0.00 | - | - | - |
| M4 | Carex rostrata - Sphagnum fallax mire | 0.74 | 0.48 | 0.13 | - | 7140 Transition mires and quaking bogs | Upland flushes, fens and swamps |
| M6 | Carex echinata – Sphagnum fallax/denticulatum mire | 2.39 | 0.00 | 0.00 | High | - | Upland flushes, fens and swamps |
| M10 | Carex dioica – Pinguicula vulgaris mire | 0.06 | 0.06 | 0.02 | High | 7230 Alkaline fens | Upland flushes, fens and swamps |
| M17, M17b | *Trichophorum germanicum - Eriophorum vaginatum* blanket mire | 18.35 | 0.88 | 0.25 | - | 7130 Blanket bogs | Blanket bog |
| M19 | *Calluna vulgaris - Eriophorum vaginatum* blanket mire | 0.30 | 0.00 | 0.00 | - | 7130 Blanket bogs | Blanket bog |
| M23, M23b | *Juncus effusus/acutiflorus - Galium palustre* rush pasture | 24.71 | 14.43 | 4.02 | High | - | - |
| M25b | *Molinia caerulea - Potentilla erecta* mire | 0.05 | 0.05 | 0.01 | Moderate | - | - |
| Wet Heath | | | | | | | |
| M15, M15a, M15b, M15c, M15d | *Trichophorum germanicum – Erica tetralix* wet heath | 181.37 | 120.06 | 33.48 | Moderate | 4010 Northern Atlantic | Upland heathland |

[50] JNCC (2016b). UK BAP priority habitats. URL: http://jncc.defra.gov.uk/page-5718 [April 2022].

| NVC Community Code and Name | | Extent in Study Area (ha) | Extent in Site Area (ha) | % of Site Area | Potential Groundwater Dependency | Annex I Habitat Type | SBL Priority Habitat |
|---|---|---|---|---|---|---|---|
| | | | | | | wet heaths with *Erica tetralix* | |
| Dry Heath | | | | | | | |
| H9 | *Calluna vulgaris - Deschampsia flexuosa* heath | 8.94 | 8.90 | 2.48 | - | 4030 European dry heaths | Upland heathland |
| H10 | *Calluna vulgaris - Erica cinerea* heath | 1.70 | 1.54 | 0.43 | - | 4030 European dry heaths | Upland heathland |
| Calcifugous Grasslands | | | | | | | |
| U4, U4b | *Festuca ovina - Agrostis capillaris - Galium saxatile* grassland | 36.01 | 28.68 | 8.00 | - | - | - |
| U5, U5c | *Nardus stricta - Galium saxatile* grassland | 19.62 | 19.54 | 5.45 | - | - | - |
| Mesotrophic Grasslands | | | | | | | |
| MG1 | *Arrhenatherum elatius* grassland | 7.00 | 6.83 | 1.90 | - | - | - |
| MG5 | *Cynosurus cristatus - Centaurea nigra* grassland | 3.68 | 1.21 | 0.34 | - | - | - |
| MG6 | *Lolium perenne - Cynosurus cristatus* grassland | 96.42 | 57.54 | 16.05 | - | - | - |
| MG10, MG10a | *Holcus lanatus - Juncus effusus* rush-pasture | 9.37 | 6.85 | 1.91 | Moderate | - | - |
| Calcicolous Grassland | | | | | | | |
| CG10 | *Festuca ovina - Agrostis capillaris - Thymus polytrichus* grassland | 0.09 | 0.00 | 0.00 | High | - | Upland calcareous grassland |
| Woodland and Scrub | | | | | | | |
| W23 | *Ulex europaeus - Rubus fruticosus* scrub | 5.19 | 4.31 | 1.20 | - | - | - |
| Swaps & Tall-Herb Fens | | | | | | | |
| S9 | *Carex rostrata* swamp | 0.19 | 0.05 | 0.01 | - | - | Upland flushes, fens and swamps |
| S10 | *Equisetum fluviatile* swamp | 0.02 | 0.02 | 0.01 | - | - | Upland flushes, fens and swamps |
| S27 | *Carex rostrata - Potentilla palustris* tall-herb fen | 1.21 | 1.11 | 0.31 | Moderate | - | Upland flushes, fens and swamps |
| Open Habitat Communities | | | | | | | |
| OV25 | *Urtica dioica - Cirsium arvense* community | 0.02 | 0.02 | 0.00 | - | - | - |
| OV27 | *Chamerion angustifolium* community | 0.30 | 0.30 | 0.08 | - | - | - |
| Non-NVC Community or Feature Types | | | | | | | |
| SSM | Small sedge mire | 24.98 | 13.82 | 3.85 | Moderate | 4010 Northern Atlantic wet heaths with *Erica tetralix* | Upland heathland |
| Mvar | *Eriophorum angustifolium - Schoenus nigricans* mire | 11.08 | 3.55 | 0.99 | Moderate | 4010 Northern Atlantic wet heaths with *Erica tetralix* | Upland heathland |
| Svar | *Potentilla palustris* swamp | 0.06 | 0.06 | 0.02 | - | - | Upland flushes, fens and swamps |
| Cn | Wet *Carex nigra* mire | 0.20 | 0.19 | 0.05 | - | - | Upland flushes, fens and swamps |
| Je | *Juncus effusus* acid grassland community | 0.91 | 0.11 | 0.03 | Moderate | - | - |

| NVC Community Code and Name | | Extent in Study Area (ha) | Extent in Site Area (ha) | % of Site Area | Potential Groundwater Dependency | Annex I Habitat Type | SBL Priority Habitat |
|---|---|---|---|---|---|---|---|
| Mt | *Menyanthes trifoliata* bog pool community | 0.29 | 0 | 0 | - | - | Upland flushes, fens and swamps |
| SW | Standing water | 0.04 | 0 | 0 | - | - | - |
| AR | Recently ploughed fields/arable | 38.84 | 37.04 | 10.33 | - | - | - |
| PG | Private gardens/amenity grassland | 0.19 | 0.19 | 0.05 | - | - | - |
| BD | Buildings and associated outbuildings | 0.33 | 0.33 | 0.09 | - | - | - |
| BG | Bare ground, rock, tracks, disused quarry etc. | 6.87 | 4.01 | 1.12 | - | - | - |
| NSA | Non-Surveyed Area | N/A | 26.40 | 7.36 | | | |
| TOTAL | | 501.76 | 358.56 | 100 | - | - | |

***Habitat Descriptions***

7.3.27 A brief description of the main Phase 1 habitats and associated NVC types recorded within the NVC study area and within the site area is presented below (full descriptions are provided in Technical Appendix 7.1 and 7.4, and shown in Figure 7.2). In the following paragraphs where reference is made to NVC community codes, the full community name and any respective sensitivity can be cross-referred to Table 7.8 above.

7.3.28 **Wet dwarf shrub heath** is made up of NVC communities and sub-communities M15, M15a, M15b, M15c and M15d and the non-NVC community 'Mvar' within the NVC study area. Wet heath covers around 120.06ha (33.48%) of the site area. M15 is the most common and extensive wet heath habitat within the NVC study area and site and it dominates the central plateau. The M15 present has a typical species assemblage which contains varying amounts of characteristic species such as heather *Calluna vulgaris*, cross-leaved heath *Erica tetralix*, common cottongrass *Eriophorum angustifolium*, deergrass *Trichophorum germanicum*, bog asphodel *Narthecium ossifragum*, heath rush *Juncus squarrosus* and sedges Carex spp. However, the M15 present is considered to be degraded and of poor quality due to overgrazing, trampling, drainage and burning; there are often patches of bare earth/peat and prostrate vegetation. The non-NVC Mvar mire community is a habitat dominated by large stands of common cottongrass with a blanket of *Sphagnum* species including *Sphagnum papillosum* and *S. subnitens*, fringed with tussocks of black bog-rush (*Schoenus nigricans*). This type of vegetation does not fit into any recognised NVC community description. The areas of Mvar within the NVC study area and site are heavily modified and are closest in nature to a wet heath community. The wet heath present is interspersed and mosaiced with several other similar upland mire, heathland and grassland NVC and non-NVC types.

7.3.29 **Improved grassland** used primarily for livestock grazing within the NVC study area is made up of NVC community MG6 and covers around 57.54 ha (16.05%) of the site area. Improved grasslands have been influenced by grazing and soil enrichment to the extent that most of the original plant species have been lost, resulting in a monotonous sward of low species diversity. This habitat is dominated by perennial rye-grass *Lolium perenne*. Other species found in these improved swards indicative of soil improvement included crested dogs-tail *Cynosurus cristatus*, Yorkshire fog *Holcus lanatus*, red fescue *Festuca rubra*, meadow grasses *Poa* spp., white clover *Trifolium repens* and buttercups *Ranunculus* spp. In wetter areas, the sward also contains soft rush Juncus effusus and marsh thistle *Cirsium palustre*.

7.3.30 **Acid grasslands** cover around 46.22ha (13.45%) of the site area; made up of the U4 and U5 NVC communities. These grasslands contain a characteristic mix of species including sheep's fescue *Festuca ovina*, red fescue, mat grass Nardus stricta, sweet vernal grass *Anthoxanthum odoratum,* tormentil *Potentilla erecta* and heath bedstraw *Galium saxatile*. In wetter areas tufted hair-grass *Deschampsia cespitosa* and marsh thistle become more prevalent. Many of these grasslands have also been influenced by grazing and enrichment.

7.3.31 **Marsh/marshy grassland** covers around 28.63 ha (7.96%) of the site area, and is made up of NVC communities and sub-communities M23, M23b, M25b and non-NVC communities small sedge mire (SSM), *Carex nigra* (common sedge) mire (Cn) and Juncus effusus (soft rush) acid grassland community (Je). The majority of this habitat consists of M23 rush mire, with a notable extent of SSM; see Table 7.8 for respective NVC study area and site coverages. The marshy grassland is generally present where the drainage channels from the higher slopes plateau and the soils become wetter. Soft rush is often the most dominant species in these areas, and it remains common in the heavily grazed stands. Other species commonly found along with the soft rush in these marshy grassland areas include purple moor-grass *Molinia caerulea*, marsh thistle and buttercups. The non-NVC SSM community type is most

common in the southwest of the NVC study area, where various water channels have eroded into the peat and where there have been ditches dug in to drain the surrounding land. These SSM areas lack rushes and sub-shrubs and are instead dominated by small sedge species in an assemblage that does not readily fit within the NVC classification, the most common species are carnation sedge *Carex panicea*, yellow sedge *C. viridula*, flea sedge *C. pulicaris* and common sedge. Non-NVC community 'Cn' is present in two patches to the east of the site and is dominated by common sedge.

7.3.32 **Wet modified bog** covers around 0.88 ha (0.25%) of the site and is made up of degraded, modified and grazed versions of NVC communities M17. The wet modified bog is primarily located to the south of the NVC study area and out-with the site boundary (Figure 7.2); it has been modified by grazing, drainage and burning.

7.3.33 **Neutral grasslands** (unimproved and semi-improved) cover around 14.89 ha (4.15%) of the site. Unimproved grassland is made up of coarse MG1 grassland which contains typical species such as cock's-foot grass *Dactylis glomerata*, Yorkshire fog and crested dogs-tail. The semi-improved neutral grasslands are made up of grazed MG5 and MG10 communities, MG5 being dominated by crested dogs-tail and MG10 by a mixture of soft rush and Yorkshire fog; extents and relative proportions of these communities can be found in Table 7.8.

7.3.34 **Dry dwarf shrub heath** covers around 10.44 ha (2.91%) of the site, mainly to the east of the site, and is made up the H9 and H10 NVC communities on gravelly well-drained soils. Both community types being dominated by common heather, with H10 also containing some bell heather *Erica cinerea*.

7.3.35 **Dense/continuous scrub** covers 4.31ha (1.20%) of the site and is dominated by gorse *Ulex europaeus* (NVC type W23).

7.3.36 All other habitat types (NVC and non-NVC) are either of negligible botanical or nature conservation value (e.g. arable/bare ground) or are limited in extent and often form small fragmented stands. Each of these habitat types or communities typically makes up less than 1% of the NVC study area or site (Tables 7.7 and 7.8) and none are of more than local nature conservation value at the site (Table 7.2). Given their limited extents, full details of these habitat types can be found within Technical Appendix 7.1 and Technical Appendix 7.4. With regards the Non-Surveyed Area (NSA) within the site boundary, upon review of aerial imagery in combination with existing data results and surveyor knowledge of the study area, these areas are likely to be comprised of a small number of habitat types extending from adjacent areas; namely, improved grasslands (MG6), wet dwarf shrub heath (M15) and arable land (AR) (see also Figure 7.2).

***Peatland***

7.3.37 EIA Volume 4: Figures 2.4.2 and 2.4.3 (Technical Appendix 2.4: Phase 1 and Phase 2 Peat Probing & Coring Survey) indicate that, according to this map, the site mostly contains no peat, or areas with a shallow depth of peat; generally under 50cm, and therefore more appropriately referred to as organo-mineral soils. Where peat or organo-mineral soils are present within the site, the depths are typically shallow. There is one isolated, deeper pocket of peat, located in the northeast of the site and this has been avoided in the design and layout of the Proposed Development (see EIA Volume 4: Figure 2.4.3).

7.3.38 The results of these surveys are discussed in EIA Volume 4: Technical Appendix 2.4: Phase 1 & 2 Peat Probing and Coring and their influence on the site's design are presented in EIA Volume 2: Chapter 2: Proposed Development and Chapter 3: Site selection, Design Evolution and Alternatives.

***Non-avian Fauna***

7.3.39 This section details the results from the protected species surveys. Full details of the results for each species are included in the following Technical Appendices and Figures (EIA Volume 4):

- Protected species (including otter, water vole, badger, pine marten and red squirrel): Technical Appendix 7.2, Figure 7.5;
- Bats: Technical Appendix 7.3, Figure 7.6; and
- Extended Phase 1 habitat surveys: Technical Appendix 7.4.

7.3.40 A summary of each species is provided below.

*Otter*

7.3.41 There were no field signs of otter recorded during the surveys in 2014, 2018 or 2019. There were no records of protected features (i.e. holts or couches).

7.3.42 There are a number of small watercourses present within the site and protected species study area, all of which were considered to have low suitability for otter. There are limited foraging opportunities offered due to the low suitability for the site supporting fish or amphibians. It is possible that otters could utilise the coastal habitats to the north of the site and could use the watercourses within the site as

commuting routes to other habitats, although no evidence of otter was recorded during any of the surveys.

Water vole

7.3.43 There was no evidence of water vole recorded during the 2014, 2018 or 2019 surveys.

7.3.44 The watercourses present within the protected species study area are considered to have low suitability for supporting water vole. Many of the watercourses have a relatively low bank profile which are often very rocky and therefore offer limited burrowing opportunities. There is also limited availability of riparian vegetation that is considered suitable for supporting water vole.

Badger

7.3.45 There was no evidence of badger recorded during the surveys in 2014, 2018 or 2019. Three mammal holes were recorded within close vicinity of each other in 2018 and these were considered to be of a size and structure suitable for supporting badger. However, no diagnostic fields signs of badger were recorded and their use could not be confirmed. A potential badger print was recorded to the east of the protected species study area in 2019.

7.3.46 There is limited habitat present for supporting badgers within the protected species study area. There is limited suitable substrate for supporting sett-building due to the nature of the site being typically either shallow and rocky substrates or peaty and waterlogged. There are some more suitable habitats present that offer more free draining soil for sett building and foraging opportunities within the outer fringes of the site and protected species study area, if badgers are present within the wider area of the site.

Pine Marten

7.3.47 There was no evidence of pine marten recorded during the surveys in 2014, 2018 or 2019.

7.3.48 There is limited availability of suitable habitat for pine marten, given the lack of woodland cover. There are therefore limited denning opportunities offered by the site.

Red Squirrel

7.3.49 There was no evidence of red squirrel recorded during any of the surveys.

7.3.50 There is an absence of woodland cover in the site and protected species study area, which limits the opportunities for red squirrels to utilise the study area for drey building, foraging or commuting.

Reptiles

7.3.51 There were a number of structures recorded within the study area in 2018 and 2019 which have the potential to act as potential reptile hibernacula. These structures include stone walls and the disused quarry areas with piles of quarry slabs, located to the southeast of the protected species study area near Hopefield House.

Amphibians

7.3.52 There were no amphibians recorded within the protected species study area during the surveys. A number of ponds were identified on Ordnance Survey (OS) maps in advance of the surveys. However, it was not deemed necessary to undertake surveys for great crested newts (*Triturus cristatus*) given that the site is located outwith the known species range (Oldham *et al.*, 2000).

Fish

7.3.53 Fish habitat surveys indicated that none of the watercourses within the protected species study area were suitable for containing fish.

Bats

7.3.54 Four species of bat and one bat genus classification were recorded during the surveys in 2014. Species recorded were common pipistrelle, soprano pipistrelle (*Pipistrellus pygmaeus*), Daubenton's and Natterer's bat (*Myotis nattereri*). Bat passes identified to genus level were Myotis spp.

7.3.55 Bat activity line transects recorded no bat passes in May or July 2014, and only one faint pass of a Natterer's bat in September 2014. This single pass equated to 0.11 bat passes for each hour of survey effort (see Technical Appendix 7.4).

7.3.56 The remote bat detector surveys conducted in 2014 recorded 36 nights of data. The most abundant species recorded during the surveys was common pipistrelle with a total of 98 bat passes, equating to an average of 2.72 bat passes per night (bppn). Six bat passes of soprano pipistrelle were recorded, equating to an average of 0.17 bppn. One bat pass was recorded for both Daubenton's and Natterer's bats, equating to 0.03 bppn for both species. Two unidentified Myotis sp. bats were recorded, with an average of 0.05 bppn. The highest number of bat passes (94 bat passes) was recorded at location 1, located towards the centre of the site adjacent

to a pond. Location 2 recorded the second highest number of bat passes (10 passes), followed by location 3 (2 bat passes) and location 2 (0 bat passes) (Figure 7.6).

7.3.57 Given the results of the 2014 bat surveys, bat activity for all species recorded on site was considered to be very low with the habitats determined to be sub-optimal for bats.

7.3.58 The 2014 bat data was reviewed in conjunction with the NVC and habitats data, collected by MacArthur Green in 2018. It was concluded that no significant habitat change had occurred at the site since the bat surveys were conducted in 2014. Accounting for the geographical location of the site, which is outwith the range of high collision risk species such as Nyctalus spp., it was determined that the likelihood of bat activity levels having significantly changed since 2014 was low to negligible. SNH was consulted (see Table 7.1) regarding the validity of using the 2014 data for the EIA, which they confirmed was still relevant for the site.

7.3.59 Temporal bat survey data was also recorded in 2016 by Caledonian Conservation and was assessed by MacArthur Green (see Technical Appendix 7.3). The data recorded 19 bat passes of common pipistrelle during a total of 105 recording nights. This equates to an average of 0.18 bppn for common pipistrelle. The bat activity results in 2016 show the site to have had low activity levels and with a limited number of species. The results of the 2016 surveys generally correspond to those conducted in 2014, which assessed the site as having low bat activity.

7.3.60 The remote bat detector data from 2016 was analysed using Ecobat[51] to gain estimates of relative bat activity recorded in the study area. The data was then evaluated in accordance with NatureScot *et al*. (2021[28]) guidance tables to determine the overall site risk level for each species. The guidance explains that: *"the tool compares data entered by the user with bat survey information collected from similar areas at the same time of year[…] Ecobat generates a percentile rank for each night of activity and provides and numerical way of interpreting the levels of bat activity recorded at a site across regions in Britain"*. Data from the study area were compared with data within a range of 100km of the Proposed Development and within 30 days of the survey date from all years. The full Ecobat report is provided in an annex to Appendix A7.3.

7.3.61 Table 7.9 presents the summary results of the Ecobat analysis for the site. The percentile rank is attributed to one of the following five bat activity categories as defined within relevant guidance (NatureScot *et al*. 2021[28]): Low (0-20%), Low-Moderate (20-40%), Moderate-High (60-80%) and High (80-100%). The median percentile represents the most frequent activity category and the 'typical' bat activity levels in the study area, the maximum percentile can be used to help interpret if there are unusually high levels or important peaks of bat activity. The reference range is the number of nights for each species that the data was compared to (a reference range of 200+ is recommended to be confident in the relative activity level).

**Table 7.9: Bat species recorded in 2016, Percentile Activity Level and associated activity level category**

| Bat Species | Median Percentile | Maximum Percentile |
|---|---|---|
| Common pipistrelle | 0 – Low activity | 55 – Moderate activity |

7.3.62 The site risk level is determined by project size and habitat risk. The Proposed Development consists of 5 turbines that are over 50 m in height, and so falls within the 'Medium' project size. Habitat features around the Proposed Development have low suitability for foraging and commuting bats, resulting in a habitat risk classification of 'Low'. Following NatureScot *et al*. (2021[28]) guidance, the overall site risk assessment was therefore calculated as 'Low'.

7.3.63 High collision risk species (as per NatureScot *et al*. (2021[28]) guidance) recorded within the study area in 2016 comprised common pipistrelle. No other bat species were recorded. Combining site risk level with the Ecobat activity output allows the determination of the overall site risk score for common pipistrelle, which resulted in a Risk Assessment Score of Low (2) based on Median Percentile and Low (3) based on Maximum Percentile.

7.3.64 An update to the roost surveys was conducted in 2019 by MacArthur Green, which assessed two buildings within the bat study area (Blackheath and Hopefield) to be of moderate potential for supporting roosting bats. However, the Proposed Development infrastructure layout is beyond all recommended bat disturbance buffers with the exception of Blackheath. Blackheath property sits 27.1 m within the calculated bat roost exclusion buffer for turbine 5. A stone ruin which is

[51] Mammal Society (2017). Ecobat. Available at: http://www.mammal.org.uk/science-research/ecostat [Accessed April 2022]

adjacent to the bat roost assessment study area was assessed as having negligible roost suitability.

## Future Baseline

7.3.65 In the absence of the Proposed Development, it is likely that the IEFs would generally remain as they are at present, although numbers and distribution of species may fluctuate naturally. Vegetation and habitat composition and extents in the study area may fluctuate in line with the management of the area, such as through drainage or grazing.

## Design Layout Considerations

7.3.66 As part of the iterative design process for the Proposed Development, ecological constraints identified through baseline survey results were considered in order to prevent or minimise adverse effects on ecological receptors within the site. This involved:

- a minimum 50 m buffer for any infrastructure or construction activity around major watercourses and 25 m buffer around minor watercourses, except where a minimum number of watercourse crossings are required and the diversion of two minor modified watercourses is required (as per Table 7.1 and Technical Appendix 2.5: Hydrological Sensitivities). The layout has sought to minimise the number of watercourse crossings. The application of respective buffers will minimise effects on associated habitats and species;
- avoidance of deeper peatland (>1m) and active blanket bog areas for the location of turbines and other infrastructure as far as practicable;
- avoidance of areas of potentially high GWDTE for the location of turbines and other infrastructure as far as practicable; and
- the track length and alignment has been designed to utilise existing tracks and reduce the extent of new track and number of watercourse crossings required, where feasible.

7.3.67 For a full description and history of the design layout considerations, please refer to Chapter 3: Site selection, Design Evolution and Alternatives (EIA Volume 2).

## Summary of Sensitive Receptors

### Scoped-out IEFs

7.3.68 With consideration of the desk-study and baseline data collected, and following the design mitigation and those measures described in the design layout considerations and project assumptions sections above, several potential effects on IEFs can be scoped out of further assessment based on the professional judgement of the EIA team and experience from other relevant projects and policy guidance or standards. The following paragraphs detail the ecological receptors and effects scoped out following the completion of surveys.

Designated Sites

7.3.69 There are no designated sites present within the site. Based on the qualifying interests and distance from the site, all designated sites within 5 km of the site have been scoped out of the assessment based on the lack of connectivity (see also Table 7.6). Similarly, effects on ancient woodland have been scoped out due to lack of connectivity (Figure 7.1).

Habitats

7.3.70 Certain habitats identified are IEFs of local importance at the site, some due to their intrinsic value as being listed as Annex I or SBL habitats (Table 7.8, Technical Appendix 7.1 and Technical Appendix 7.4). However, these habitats either; occupy such small areas within the NVC study area and site; are species-poor heavily degraded examples; or, any direct or indirect effects on the habitat are not predicted or are so minor that effects on them are scoped out of the assessment. These habitats comprise: calcareous grassland, marsh/marshy grassland, dry dwarf shrub heath, wet modified bog, flushes (acid/neutral and basic), swamp, and standing water (see Table 7.10).

7.3.71 Other habitats generally considered to be of low nature conservation value and unlikely to be affected by the Proposed Development are scoped out of the assessment. These include gorse scrub, acid grassland, neutral grassland, improved grassland, weed dominated ruderal tall-herb habitat, arable fields and bare ground.

7.3.72 Marsh/marshy grassland, which within the NVC study area is of the M23 or M25 NVC communities or the SSM, Cn or Je non-NVC communities, is scoped out of the assessment. M23 is a rush dominated habitat generally of low ecological value unless particularly species-rich examples are found. The M23 within the NVC study area is not species-rich, often consisting of little more than a dense sward of soft rush (see Technical Appendix 7.4). This is a very common habitat type locally, regionally and nationally and the small direct and indirect losses predicted at the site, as per Table 7.10, are of negligible significance. M23 is considered a potentially high GWDTE (SEPA, 2017a[47] and 2017b[49]) however designation as a GWDTE does not infer an intrinsic biodiversity value, and GWDTE status has not been

used as criteria to determine conservation value in the ecology assessment. There is however a statutory requirement to consider GWDTEs and the data gathered during the NVC surveys has been used to inform this assessment (Technical Appendix 7.1 and Figure 7.4 for further information on the GWDTE assessment).

Non-avian Fauna – Protected Species

7.3.73 Otter and water vole were not identified as IEFs and have been scoped out of the assessment. There were no field signs or protected features of either species recorded during the surveys in 2014, 2018 or 2019. There is limited habitat present within the protected species study area which has the potential to support otter and water vole. The watercourses offer limited foraging opportunities for otter, and although they could be used as a link to other habitats, their potential was considered to be low. There was also low suitability for supporting water vole given the relatively low, rocky banks and limited suitable bank-side vegetation. As a precautionary measure, it is recommended that the species are included within a Species Protection Plan (SPP) which will be prepared and implemented prior to construction. The SPP will ensure all reasonably practicable measures are taken so that the provisions of the relevant wildlife legislation are complied with in relation to otter and water vole. Furthermore, pollution prevention measures would be implemented as part of the CEMP during construction to ensure no unacceptable effects occur on watercourses. Thus, any potential direct or indirect effects on otter or water vole arising from the Proposed Development are considered to be negligible and are not considered further.

7.3.74 Badgers have been scoped out of the assessment. Several mammal holes were recorded in 2018 which were suitable in terms of size and structure for supporting badger, but no diagnostic field signs were recorded. A potential badger print was recorded in 2019, although could not be confirmed due to its poor quality. There was no confirmed evidence of badger recorded during the surveys. There is limited suitable habitat present within the study area for supporting badger for foraging, commuting and sett-building, although there is the potential for them to use the more suitable habitats present within the site and around its periphery. It is recommended that a pre-construction check is undertaken by a suitably trained ecologist or Ecological Clerks of Works (ECoW) within the vicinity of the proposed infrastructure to check the status of the mammal holes recorded during the baseline surveys, and to determine the presence of any new features. Should any of these structures, or any new structures, be located within 30 m of construction activities (or 100m of piling or blasting activities), all reasonably practicable measures should be taken to safeguard badgers associated with each feature so that the relevant wildlife legislation is complied with. As a precautionary measure, it is recommended that they are included as part of the SPP which will be prepared and implemented in advance of any construction works commencing. Given the lack of confirmed evidence of badger within the site, and the limited habitat available, the potential effect of the Proposed Development on badgers is considered to be negligible and they are not considered further within this assessment.

7.3.75 Pine marten, wildcat, red squirrel and great crested newt were not identified as IEFs and have been scoped out of the assessment. There is limited suitable habitat present within the study area for supporting pine marten, wildcat and red squirrel, given the general lack of woodland cover and open nature. There is also limited suitable habitat for amphibians, with the site being outwith the known range of great crested newt in Scotland.

7.3.76 Reptiles have not been identified as an IEF and have been scoped out of the assessment. Several features were recorded as potential hibernacula, such as stone walls and the disused quarry with piles of quarry slabs, however the Proposed Development lies outwith the recommended reptile disturbance buffers for these features. Many of these structures have low suitability for reptiles and the site is heavily grazed with poor vegetation coverage which is likely to have a high disturbance level. It is recommended that mitigation for these features is put in place to avoid any activities that may cause damage to the structure. Where possible, a suitable disturbance buffer should be put in place around the feature, which should be a minimum of 30 m (Catherine, 2018). Checks for basking reptiles should be undertaken within 30 m of any potential hibernaculum by a suitably trained ecologist or ECoW immediately prior to any works being undertaken. Where it is not possible to avoid features during works, these should be scheduled to avoid the hibernation season (October to March) (Catherine, 2018[52]). These measures will be included as part of the SPP for the site.

Non-avian Fauna – Bats

[52] Catherine, C. (2018). ARG UK Advice Note 10: Reptile Survey and Mitigation Guidance for Peatland Habitats. Amphibian and Reptile Groups of the United Kingdom.

7.3.77 Bats have not been identified as an IEF and have been scoped out of the assessment. The data collected in 2014 and 2016 concluded that bat activity was low for the site (see paragraph 7.3.57 and Technical Appendix 7.3) and is considered to remain low given no significant habitat change has occurred at the site since the bat surveys were conducted (see paragraph 7.3.58). The majority of the bat activity recorded on site in 2014 was from common pipistrelles, with some records of bat passes from soprano pipistrelles, Daubenton's and Natterer's bat. There were no records of high collision risk species, such as Nyctalus spp. The habitats present within the site were also noted as being sub-optimal for foraging bats. There was considered to be limited roosting habitat (e.g. trees, tunnels, caves or mines) present within the study area and its vicinity, other than those buildings described in the paragraphs below.

7.3.78 Blackheath property and Hopefield House were assessed as having moderate potential for supporting roosting bats (defined as a structure with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status (Collins, 2016[26]), with NatureScot in agreement with this classification (see Table 7.1). Both properties are at least 30 m from all infrastructure.

7.3.79 The 200 m buffer (feature height to nearest rotor tip) from Blackheath was calculated to be 244.13 m. In a previous revision of the proposed site layout, Turbine 8 fell 3.56 m within this bat roost exclusion buffer around Blackheath property, which prompted further consultation with SNH (Nature Scot) to address this as a potential constraint. In the current proposed layout, turbine 5 falls 22.39 m within the calculated potential roost buffer around Blackheath property. However, with the added context of bat activity in the area provided through the Ecobat tool and lack of direct evidence of roosting bats, it is considered unlikely that this potential roost feature is in use. The Overall Site Risk Assessment for bats was deemed to be Low at both the median and maximum percentile levels, and an analysis of the bat activity compared with known emergence times suggests that there are no roosts in the area

7.3.80 Therefore, the roost potential of Blackheath property and Hopefield House have not been identified as an IEF and have been scoped out of the assessment.

**Scoped-in IEFs**

7.3.81 A summary of the Nature Conservation Value of the remaining IEFs identified within the site, and therefore 'scoped in' to the assessment, is provided in Table 7.10, together with justification for inclusion.

**Table 7.10: Nature Conservation Value of Scoped-In IEFs**

| IEF | Nature Conservation Value | Justification |
|---|---|---|
| Wet dwarf shrub heath | Local | Wet heath is located across the site and NVC study area (see Figure 7.2), covering an area of 192.45 ha in the NVC study area and 123.61 ha (34.47%) of the site. Wet heath is indicated by NVC community M15 and sub-communities M15a, M15b, M15c, M15d and non-NVC type Mvar (Table 7.8). M15 is a very common wet heath type within the region and across the uplands of Scotland.<br>Despite wet heath being listed as an Annex I habitat in the Habitats Directive and part of the SBL upland heathland priority habitat, the habitat within the study area is degraded from a history of drainage, burning and over-grazing and is considered of no greater than Local Nature Conservation Value. This type of habitat is widespread throughout the local area. |

## 7.4 Assessment of Likely Effects

7.4.1 This section provides an assessment of the likely effects of the Proposed Development on the IEFs identified through baseline studies. The assessment of effects is based on the development description outlined in Chapter 2: Proposed Development, and is structured as follows:

- Construction effects;
- Operational effects; and
- Cumulative effects.

**Project Assumptions**

7.4.2 The following assumptions are included in the assessment of otherwise unmitigated effects on IEFs:

- A 12-month construction phase is proposed and would include construction of access tracks, hardstandings, turbines and other infrastructure, and site restoration.
- All electrical cabling between the turbines and the associated infrastructure would be underground in shallow trenches which would be reinstated during the construction phase and, in all cases, follow the access tracks.
- Any disturbance areas around permanent infrastructure during construction would be temporary and areas reinstated or restored before the construction

phase ends. The only excavation in these areas would be for cabling, as noted above, and otherwise would only be periodically used for side-casting of spoil until reinstatement.

- To ensure all reasonable precautions are taken to avoid adverse effects on habitats, protected species and aquatic interests, a suitably qualified ECoW would be appointed prior to the commencement of construction to advise the Applicant and the Contractor on ecological matters. The ECoW would be required to be present on the site during the construction phase and would carry out monitoring of works and briefings with regards to any ecological sensitivities on the site to the relevant staff working for the Contractor and subcontractors.
- A SPP will be implemented during the construction phase. The SPP will detail measures to safeguard protected species known to be in the area. Measures will include surveys in advance of construction activities and good practice methods during construction.
- Implementation of appropriate pollution prevention measures (particularly in relation to watercourses) and standard good practice construction environmental management would occur across the site and form part of a Construction Environmental Management Plan (CEMP). An Outline CEMP is included as Technical Appendix 2.1 (EIA Volume 4) and the final version would be submitted as a condition of consent.

## Potential Construction Effects

7.4.3 This section provides an assessment of the likely effects of construction of the Proposed Development upon the scoped-in IEFs.

7.4.4 Impacts on habitats may include direct loss of habitat, e.g. derived from permanent land-take for infrastructure or temporary land-take for the land required to accommodate construction site compounds etc. Impacts on habitats can also be indirect through increased habitat fragmentation, or changes caused by pollution, or effects to supporting systems such as groundwater or water-table levels.

7.4.5 The most tangible effect during the construction of the Proposed Development will be direct habitat loss due to the construction of new access tracks, turbines, hardstandings, laydown areas, compound and substation; much of this infrastructure will be permanent and maintained through the operational phase. Despite the planned restoration of any temporary infrastructure, and taking a precautionary approach, it is assumed for the assessment that the areas of land-take for these particular infrastructures also represent permanent losses of habitat due to the complexities in re-creating habitat types such as wet heath.

7.4.6 There may also be some indirect habitat losses to wetland habitats due to drainage effects. For the purposes of this assessment it is assumed that wetland habitat losses due to indirect drainage effects may extend out to 10m from infrastructure (i.e. in keeping with indirect expected drainage assumptions within the carbon calculator (see Technical Appendix 2.6: Carbon Balance Assessment). It is expected that any indirect drainage effects will only impact wetland habitats such as wet modified bog, marshy grassland, flushes, wet heath and swamp. No indirect drainage effects are expected to impact or alter the quality or composition of 'dry' habitats such as dry heath or acid grassland; as such only direct habitat loss applies to those habitats.

7.4.7 Table 7.11 below details the estimated direct and indirect losses predicted to occur, for all new infrastructure, by habitat type within the site boundary (habitat types not subject to any predicted direct or indirect losses are omitted from the table).

**Table 7.11: Estimated Loss of Habitat for Permanent Infrastructure**

| Phase 1 Habitat Type Lost[53] | Specific NVC Community or Habitat Type Lost | Total Extent of Phase 1 Type in Site (ha) | Direct Habitat Loss(ha) | Direct Habitat Loss as % of Phase 1 Extent in Site | Direct & Indirect Habitat Loss (ha) | Direct & Indirect Habitat Loss as % of Phase 1 Extent in Study Area |
|---|---|---|---|---|---|---|
| A2.1: Dense/ continuous scrub* | W23 | 4.31 | <0.01 | 0.093 | As per direct loss | |
| B1.1: Unimproved acid grassland* | U5 | 19.65 | 0.38 | 1.94 | As per direct loss | |

[53] Effects upon habitats with a '*' in Table 7.10 have been scoped-out of the assessment due to the minor nature of habitat loss involved or their low nature conservation value (i.e. not an IEF), as per the sections above.

| Phase 1 Habitat Type Lost[53] | Specific NVC Community or Habitat Type Lost | Total Extent of Phase 1 Type in Site (ha) | Direct Habitat Loss(ha) | Direct Habitat Loss as % of Phase 1 Extent in Site | Direct & Indirect Habitat Loss (ha) | Direct & Indirect Habitat Loss as % of Phase 1 Extent in Study Area |
|---|---|---|---|---|---|---|
| B1.2: Semi-improved acid grassland* | U4b | 28.56 | 0.29 | 1.03 | As per direct loss | |
| B2.2: Semi-improved neutral grassland* | MG10 | 8.06 | 0.25 | 3.05 | 0.71 | 11.69 |
| B4: Improved grassland* | MG6 | 57.54 | 0.70 | 1.22 | As per direct loss | |
| B5: Marsh/marshy grassland* | M23, SSM | 28.60 | 0.34 | 1.20 | 0.67 | 2.34 |
| C3.1: Tall Ruderal* | OV25 | 0.31 | <0.01 | 0.31 | As per direct loss | |
| D1.1: Acid dry dwarf shrub heath* | H10 | 10.44 | 0.04 | 0.37 | As per direct loss | |
| D2: Wet dwarf shrub heath | M15 | 123.61 | 2.63 | 2.13 | 6.86 | 5.55 |
| E1.7: Wet modified bog* | M17b | 0.88 | 0.00 | 0.00 | 0.01 | 1.14 |
| E2.2: Basic Flush* | M10 | 0.06 | 0.02 | 33.33 | 0.06 | 100.00 |
| J4: Bare ground* | BG | 4.01 | 0.07 | 1.80 | As per direct loss | |
| Site Area Totals | | | 4.73 | 1.65 | 8.31 | 2.91 |

7.4.8 The following sections assess the effect of these losses for wet dwarf shrub heath (the only scoped-in IEF).

**Wet Dwarf Shrub Heath**

7.4.9 Effect: Effects upon wet dwarf shrub heath during construction would be direct (through habitat loss occurring during construction of the Proposed Development) and indirect (through potential drying effects upon neighbouring wet heath habitats occurring from the construction phase into the operational phase). Direct loss would occur in areas where access tracks pass through this habitat type or where infrastructure such as turbine foundations, crane pads, hardstandings, compound, etc. are sited on these habitat types. In addition, there may be indirect losses as a result of drainage around infrastructure and disruption to hydrological flows.

7.4.10 Nature Conservation Value: As per Table 7.9 above, wet dwarf shrub heath is considered to be of Local Nature Conservation Value.

7.4.11 Conservation Status: Conservation Status of this habitat as assessed in the JNCC report on Northern Atlantic wet heaths with *Erica tetralix* (JNCC, 2019) is 'Bad and Deteriorating' at the UK level[54].

7.4.12 Magnitude: The UK has an estimated 508,817 ha[53] of this wet heath type. The majority, around 340,000 to 400,000 ha, is in Scotland[55]. Wet heath covers 123.61 ha (34.47%) of the site area and is indicated by NVC community M15 and sub-communities M15a, M15b, M15c, M15d and non-NVC type Mvar (Table 7.8).

7.4.13 Direct habitat loss is predicted to be 2.63 ha due to infrastructure (Table 7.10). This results in a potential total direct loss equivalent to 2.13% of wet heath within the surveyed site area. However as noted above, 26.40 ha of land within the site boundary was not surveyed (NSA; Tables 7.7 and 7.8) and much of this is wet heath, therefore the percentage loss of habitat stated here is an overestimate, and relative losses from the site are less.

7.4.14 In addition, there may be some indirect losses because of the zone of drainage around infrastructure (assumed to extend out to 10m from infrastructure as per paragraph 7.4.6). If indirect drainage effects are fully realised out to 10m in all wet heath areas then predicted losses increase to 9.48 ha for permanent infrastructure,

[54] JNCC (2019) Conservation status assessment for the habitat: H4010 – Northern Atlantic wet heaths with *Erica tetralix*. United Kingdom. Available: https://jncc.gov.uk/jncc-assets/Art17/H4010-UK-Habitats-Directive-Art17-2019.pdf [Accessed May 2022].

[55] JNCC (2019) Conservation status assessment for the habitat: H4010 – Northern Atlantic wet heaths with *Erica tetralix*. Scotland. Available: https://jncc.gov.uk/jncc-assets/Art17/H4010-UK-Habitats-Directive-Art17-2019.pdf [Accessed May 2022].

equating to 2.65% of the site (N.B. this is also an overestimate as per paragraph 7.4.13 above).

7.4.15 The maximum losses predicted equate to less than 0.002% loss at a national (Scottish) level[55]. These losses are however considered to be worst case as detailed below.

7.4.16 It is considered unlikely that indirect drainage effects would have a significant effect on the degraded wet heath present or result in large-scale vegetation shifts to a lower conservation value habitat type, such as acid grassland for example. If drainage effects materialise then this could, depending on the degree of drying, result in some subtle shifts of community or vegetation type, and this would likely be shifts to other sub-communities within the M15 NVC community. In response to more severe drying effects then M15 wet heath would be expected over time to transition towards a dry heath community, which are already present at the site (Table 7.8). Dry heath here is considered to be of the same nature conservation value, and therefore overall it is unlikely there would be a decline in locally important habitat types due to drainage effects on wet heath.

7.4.17 When considering the above habitat losses, and accounting for the abundance, distribution and quality of the habitat within the NVC study area and site as well as at the regional level, an effect magnitude of **low spatial** and **long-term temporal** is appropriate.

7.4.18 Significance of Effect: Given the above consideration of Nature Conservation Value, Conservation Status and Magnitude, the effect significance is considered to be **Minor Adverse** and **Not Significant** under the terms of the EIA Regulations

### Potential Operational Effects

7.4.19 All likely direct and indirect effects on wet dwarf shrub heath have been considered in the Potential Construction Effects section above. Indirect effects on habitats would largely occur during the operational phase as potential drying impacts take effect. However, for ease of assessing impacts on habitats these are considered together within the Potential Construction Effects section.

### Potential Decommissioning Effects

7.4.20 Due to the distant time frame until their occurrence (>35 years), decommissioning effects are difficult to predict with confidence. In general decommissioning effects are usually considered for the purposes of assessment to be similar to (or likely less than) those of construction effects in nature and are likely to be of shorter duration.

7.4.21 Wet heath is the only IEF assessed at the site. Decommissioning of the site would involve the removal of all infrastructure and restoration of the associated ground. Restoration of the site would seek to return areas to their pre-construction habitat type, or as similar as feasible depending on local substrates, topography, hydrology etc. As a result, decommissioning will not lead to any further direct or indirect habitat losses, rather, it is predicted that due to restoration of upland habitats such as wet heath in these areas, there would be a net beneficial effect.

### Potential Cumulative Effects

7.4.22 The primary concern regarding the assessment of cumulative impacts is to identify situations where impacts on habitats or species populations that may be acceptable from individual developments, are judged to be unacceptable when their impact is combined with nearby existing or proposed projects that are subject to an EIA process. The main projects likely to cause similar impacts to those associated with the Proposed Development are other operational wind farms, those under construction or those consented. Several other wind farms are present within the wider area, in planning, under construction and operational.

**Wet Dwarf Shrub Heath**

7.4.23 Wet dwarf shrub heath has been scoped-out of the cumulative assessment as it is considered unlikely that any significant ecological cumulative effect would arise as a consequence of the Proposed Development adding to habitat loss associated with other projects. This is due to the minor magnitude of loss of wet dwarf shrub heath due to the Proposed Development, as outlined above and the proposed wet heath enhancement measures noted below (paragraph 7.5.2). No significant cumulative effects are predicted for wet dwarf shrub heath (**Minor Adverse** and **Not Significant**).

## 7.5 Mitigation

### Mitigation during Construction

7.5.1 There is no mitigation required during construction in addition to the standard in-built mitigation and adoption of good practice as detailed in the project assumptions above (paragraph 7.4.2). For instance, application of good practice floating roads guidance (if any new access tracks subsequently require floating), the presence of an ECoW and implementation of appropriate pollution prevention and standard good practice construction environmental management as part of a CEMP and SPP. An

Outline CEMP is included as Technical Appendix 2.1 (EIA Volume 4) and the final version CEMP would be required to be agreed as a condition of consent. To ensure standard good practice measures are effective, pollution prevention proposals will be site specific and adapted to the local ground conditions.

### Mitigation during Operation

7.5.2 No IEFs were scoped-in to the assessment of potential operational effects. Potential indirect effects on habitats were considered as part of the construction effects, although any effect would likely span into the operational phase; no significant effects were predicted, and as such there is no additional mitigation is required during operation. Nonetheless, it is recommended that habitat improvement measures for wet heath enhancement are put in place during the operational phase (as per EIA Volume 2: Chapter 8: Ornithology). Measures should aim to enhance the quality of wet heath habitat, retain boggy ground and create new wet areas by measures such as blocking any active drains and ditches in selected areas. As detailed in paragraph 7.3.28, the wet heath on site is degraded as a consequence of overgrazing, trampling, drainage and burning and so management measures could be applied to reduce these impacts and improve the quality of this habitat further.

### Mitigation during Decommissioning

7.5.3 Mitigation measures are likely to be similar to those outlined for the construction phase (outlined in paragraph 7.5.1); they would be identified as part of a decommissioning management plan.

## 7.6 Assessment of Residential Effects

### Residual Construction Effects

7.6.1 No specific mitigation for wet heath is proposed over and above the embedded mitigation (paragraph 7.5.1) and project assumptions (paragraph 7.4.2) described above. Therefore, residual effects on wet heath remain **Minor Adverse** and **Not Significant**.

7.6.2 Although no significant effects are predicted, a habitat enhancement plan for wet heath is recommended as detailed in paragraph 7.5.2. Assuming the implementation of a habitat enhancement plan, residual effects on wet heath may reduce to **Negligible** and **Not Significant**.

### Residual Operational Effects

7.6.3 No IEFs were scoped-in to the assessment of potential operational effects. Potential indirect effects on habitats were considered as part of the construction effects, although any effect would likely span into the operational phase; no significant effects were predicted, and as such, no further residual effects during the operational phase are considered.

### Residual Decommissioning Effects

7.6.4 These would likely be the same as the residual construction effects.

### Residential Cumulative Effects

7.6.5 Wet dwarf shrub heath has been scoped-out of the residual cumulative construction assessment given that no significant cumulative effects are predicted for this feature (paragraph 7.4.23).

## 7.7 Summary

7.7.1 This chapter has considered the potential effects on the ecological features present at the site associated with the construction, operation and decommissioning of the Proposed Development. The assessment method followed the guidance detailed by CIEEM (2018).

7.7.2 It was possible to scope out most species and habitats recorded in the respective study areas from the assessment by virtue of their absence from the site, their low conservation value, the type and frequency of field signs present, the small extent of the sensitive habitat, or the negligible scale of potential impacts.

7.7.3 Potential construction and operational effects on wet dwarf shrub heath were assessed. The main effect being from direct and indirect habitat loss due to land take for infrastructure and associated hydrological disturbance. Habitat losses would be Minor Adverse and Not Significant. No significant effects are predicted.

7.7.4 Table 7.12 below summarises the potential effects of the Proposed Development.

**Table 7.12: Summary of Residual Effects**

| Likely Significant Effect | Mitigation | Means of Implementation | Residual Effect |
|---|---|---|---|
| **Construction** | | | |
| Wet dwarf shrub heath – direct habitat loss from infrastructure and | No specific mitigation proposed.<br>General mitigation proposed – pollution | Pollution prevention measures, best practice construction methods and a CEMP will be | Not Significant. |

| | | |
|---|---|---|
| indirect loss as a result of drainage. | prevention measures, best practice construction methods and CEMP.<br>Habitat enhancement recommended. | agreed with stakeholders prior to construction.<br>The provision of a CEMP would be required as condition of consent.<br>An ECoW would oversee the construction process and would be required as condition of consent.<br>Habitat enhancement should be agreed in advance of construction as part of a condition to the planning consent. |
| **Operation** | | |
| Operational effects considered within the Construction effects section above. | | |
| **Decommissioning** | | |
| Decommissioning effects considered within the Construction effects section above. | | |

## 7.8 Glossary and Abbreviations

| Abbreviation | Expanded term |
|---|---|
| AWI | Ancient Woodland Inventory |
| CEMP | Construction Environment Management Plan |
| CIEEM | Chartered Institute of Ecology and Environmental Management |
| EIA | Environmental Impact Assessment |
| ES | Environmental Statement |
| GWDTE | Groundwater Dependent Terrestrial Ecosystems |
| Ha | Hectares |
| IEF | Important Ecological Feature |
| JNCC | Joint Nature Conservancy Council |
| NBN | National Biodiversity Network |
| NVC | National Vegetation Classification |
| SAC | Special Area of Conservation |
| SBL | Scottish Biodiversity List |
| SEPA | Scottish Environment Protection Agency |
| SNH | Scottish Natural Heritage |
| SPA | Special Protection Area |
| SSSI | Site of Special Scientific Interest |
| UKBAP | UK Biodiversity Action Plan |

# 8 Ornithology

## 8.1 Introduction

8.1.1 This chapter considers the likely significant effects on ornithology associated with the construction, operation and decommissioning of Cairnmore Hill Wind Farm as described in Chapter 2 of this EIA Report ("the Proposed Development"). The specific objectives of the chapter are to:

- describe the ornithological baseline;
- describe the assessment methodology and significance criteria used in completing the impact assessment;
- describe the potential effects due to direct, indirect and cumulative impacts;
- describe the mitigation measures proposed to address any likely significant effects; and
- assess the residual effects remaining following the implementation of mitigation.

8.1.2 The assessment has been carried out by MacArthur Green and in accordance with NatureScot guidelines. All staff contributing to this chapter have undergraduate and/or postgraduate degrees in relevant subjects, have extensive professional ornithological impact assessment experience, hold professional membership of the Chartered Institute of Ecology and Environmental Management (CIEEM), and abide by the CIEEM Code of Conduct.

8.1.3 Effects on habitats and non-avian protected species are addressed separately in Chapter 7: Ecology.

8.1.4 This chapter is supported by the following figures and technical appendices:

- Figure 8.1 Site Boundary and Study Areas;
- Figure 8.2 Vantage Points and Viewsheds;
- Figure 8.3 Ornithological Designated Sites within 20km;
- Figure 8.4 Foraging Wildfowl: Barnacle Goose and Brent Goose;
- Figure 8.5 Foraging Wildfowl: Greenland White-fronted Goose;
- Figure 8.6 Foraging Wildfowl: Greylag Goose;
- Figure 8.7 Foraging Wildfowl: Pink-footed Goose;
- Figure 8.8 Foraging Wildfowl: Whooper Swan;
- Figure 8.9 Flight Activity: Greenland White-Fronted Goose;
- Figure 8.10a Flight Activity: Greylag Goose – 2012/2013 Non-breeding Season;
- Figure 8.10b Flight Activity: Greylag Goose – 2013/2014 Non-breeding Season;
- Figure 8.10c Flight Activity: Greylag Goose – 2015/2016 Non-breeding Season;
- Figure 8.10d Flight Activity: Greylag Goose – 2016/2017 Non-breeding Season;
- Figure 8.10e Flight Activity: Greylag Goose – 2013 and 2016 Breeding Season;
- Figure 8.11a Flight Activity: Pink-footed Goose – 2013/2014 Non-breeding Season;
- Figure 8.11b Flight Activity: Pink-footed Goose – 2015/2016 Non-breeding Season;
- Figure 8.11c Flight Activity: Pink-footed Goose – 2016/2017 Non-breeding Season;
- Figure 8.12 Flight Activity: Whooper Swan;
- Figure 8.13 Flight Activity: Barn Owl;
- Figure 8.14 Raptor Activity: 2014 and 2016;
- Figure 8.15 Non-breeding Season Target Species Activity: 2012/2013, 2015/2016, 2016/2017;
- Figure 8.16 Flight Activity: Hen Harrier;
- Figure 8.17 Flight Activity: Merlin;
- Figure 8.18 Flight Activity: Peregrine Falcon;
- Figure 8.19 Flight Activity: Short-Eared Owl;
- Figure 8.20 Breeding Wader Activity: 2013, 2014, 2016, 2017;
- Figure 8.21a Flight Activity: Curlew – Breeding Seasons;
- Figure 8.21b Flight Activity: Curlew – Non-breeding Seasons;
- Figure 8.22 Flight Activity: Dunlin
- Figure 8.23a Flight Activity: Golden Plover – Breeding Seasons;
- Figure 8.23b Flight Activity: Golden Plover – Non-breeding Seasons;
- Figure 8.24a-d Flight Activity: Lapwing – Breeding Seasons;
- Figure 8.24e-j Flight Activity: Lapwing – Non-breeding Seasons;
- Figure 8.25 Flight Activity: Ringed Plover;
- Figure 8.26 Flight Activity: Arctic Skua;
- Figure 8.27 Flight Activity: Herring Gull;
- Figure 8.28 Cumulative Impact Assessment, Natural Heritage Zone 2;
- Figure 8.29 In-combination Assessment, Caithness Lochs SPA; and
- Technical Appendix 8.1 Ornithology.

8.1.5 Figures and technical appendices are referenced in the text where relevant.

## 8.2 Assessment Methodology and Significance Criteria

### Scope of Assessment

8.2.1 This chapter considers any impacts of construction, operation and decommissioning of the Proposed Development upon those ornithological features identified during the review of desk-based information and field survey data (the extents of the study areas are set out in 8.3 Baseline Conditions below). The following identified impacts upon ornithological features are assessed:

- Direct temporary and permanent habitat loss for birds through construction of the Proposed Development;
- Displacement of birds through indirect loss of habitat where birds avoid the Proposed Development and its surrounding area due to construction and decommissioning, turbine operation, maintenance, and visitor disturbance. This also includes potential barriers to commuting or migrating birds due to the presence of the proposed development turbines and related infrastructure;
- Habitat modification due to change in land cover (e.g., forestry removal) or changes in hydrological regime, and consequent impacts on bird populations; and
- Death or injury of birds through collision with turbine blades, or fences (if any) associated with the Proposed Development.

8.2.2 The chapter also assesses the potential for additional cumulative/in-combination impacts when considered in addition to other consented or proposed developments which are subject to EIA/the Habitats Regulations Appraisal (HRA) process.

8.2.3 The assessment is based on the Proposed Development as described in Chapter 2: Proposed Development.

**Legislation**

8.2.4 Relevant European legislation has been reviewed and taken into account as part of this ornithological assessment. Of particular relevance is the following European legislation:

- EU Directive 2009/147/EC on the Conservation of Wild Birds[1] ('Birds Directive');
- EU Directive 92/43/EEC on Conservation of Natural Habitats and of Wild Fauna and Flora (as amended)[2] ('Habitats Directive'); and
- EU Environmental Impact Assessment Directive 2014/52/EU[3].

8.2.5 The following national legislation, which has recently been amended as a consequence of EU exit (Scottish Government 2019[4], 2020[5]), is also considered as part of the ornithology assessment:

- The Wildlife and Countryside Act 1981[6] (as amended);
- The Conservation (Natural Habitats &c.) Regulations 1994[7] (as amended) (The Habitats Regulations);
- The Nature Conservation (Scotland) Act 2004[8] (as amended); and
- The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017[9] (as amended).

**Policy**

8.2.6 This ornithological assessment considers the relevant aspects of Scottish Planning Policy, Planning Advice Notes and other relevant guidance. Of relevance to ornithology are the following policies:

- UK Post-2010 Biodiversity Framework (2012[10]);
- Scottish Biodiversity Strategy: It's in Your Hands (2004[11])/2020 Challenge for Scotland's Biodiversity (2013[12]);

[1] Directive 2009/147/EC of the European Parliament and of the Council. Available at: https://www.legislation.gov.uk/eudr/2009/147/contents (accessed April 2022)
[2] Scottish Government (1992). Council Directive 92/43/EEC. Available at: https://www.legislation.gov.uk/eudr/1992/43/contents (accessed April 2022)
[3] Scottish Government (2014). Directive 2014/52/EU of the European Parliament and of the Council. Available at: https://www.legislation.gov.uk/eudr/2014/52 (accessed April 2022)
[4] Scottish Government (2019). The Town and Country Planning and Electricity Works (EU Exit) (Scotland) (Miscellaneous Amendments) Regulations 2019. Available at: https://www.legislation.gov.uk/ssi/2019/80/introduction/made (accessed April 2022)
[5] Scottish Government (2020). EU Exit: The Habitats Regulations in Scotland. Available at: https://www.gov.scot/publications/eu-exit-habitats-regulations-scotland-2/ (accessed April 2022)
[6] Scottish Government (1981). Wildlife and Countryside Act 1981. Available at: https://www.legislation.gov.uk/ukpga/1981/69 (accessed April 2022)
[7] Scottish Government (1994) The Conservation (Natural Habitats, &c.) Regulations 1994. Available at: https://www.legislation.gov.uk/uksi/1994/2716/contents (accessed April 2022)
[8] Scottish Government (2004). Nature Conservation (Scotland) Act 2004. Available at: https://www.legislation.gov.uk/asp/2004/6/contents (accessed April 2022)
[9] Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017. https://www.legislation.gov.uk/ssi/2017/102/contents/made (accessed April 2022)
[10] JNCC and Defra (on behalf of the Four Countries' Biodiversity Group) (2012). UK Post-2010 Biodiversity Framework. JNCC, Peterborough.
[11] Scottish Executive (2004). Scottish Biodiversity: It's In Your Hands. Scottish Executive, Edinburgh.
[12] The Scottish Government (2013). 2020 Challenge for Scotland's Biodiversity. The Scottish Government, Edinburgh.

- Scottish Government (2000[13]). Planning Advice Note 60: Planning for Natural Heritage;
- Scottish Government (2017[14]). Planning Advice Note 1/2013-Environmental Impact Assessment, Revision 1.0;
- Scotland's Third National Planning Framework (2014[15]);
- Scotland 2045 – fourth National Planning Framework – draft consultation (November 2021[16]);
- The Highland Biodiversity Action Plan 2021 – 2026[17]; and
- The Scottish Biodiversity List[18].

**Guidance**

8.2.7 Guidance on the following topics has also been considered:

- Environmental impact assessment: NatureScot (2020[19]; SNH 2016a[20], 2018a[21], 2018b[22]), CIEEM (2018[23]), SERAD (2000[24]);
- Designated sites: SNH (2016b[25]), European Commission (2010[26]);
- Collision modelling: SNH (2000[27], 2018c[28]), Band *et al.* (2007[29]);
- Cumulative assessments: SNH (2018d[30]);
- Bird populations/species specific guidance: Stanbury *et al.* (2021[31]), SNH (2014[32], 2017[33]), Pearce-Higgins (2021[34]); and
- Construction and birds: SNH (2016c[35]).

## Consultation

8.2.8 Consultation for this EIA Report topic was undertaken with the organisations shown in Table 8.1.

**Table 8.1: Consultation Responses**

| Consultee and Date | Scoping/Other Consultation | Issue Raised | Response/Action Taken |
|---|---|---|---|
| Highland Council 22nd February 2022 | Scoping | The presence of Schedule 1 birds and qualifying interests of Special Protected Areas [SPAs] and other areas designated for avian interests must be included as part of the planning process; not as an issue that can be considered at a later stage. | Schedule 1 bird species and those listed as features on ornithological designations within 20km have been considered in this assessment. |
| | | An assessment of the impacts to birds through collision, disturbance and displacement from foraging / breeding / roosting habitat will be required for both the Proposed Development and cumulatively with other proposals. | A cumulative /in-combination assessment is included in Section 8.4. |
| | | NatureScot has provided advice in this respect and notes that the majority of bird data referred to in the Scoping Report was collected more than 5 years ago. As such, NatureScot advises that the EIAR should demonstrate that any bird survey data is sufficiently reliable to inform a robust assessment of likely impacts on birds. It suggests that, as a | Refer to paragraph 8.2.40. |

[13] https://www.gov.scot/publications/pan-60-natural-heritage/ (accessed April 2022)
[14] Scottish Government (2017). Planning Advice Note 1/2013 – Environmental Impact Assessment, Revision 1.0. Scottish Government, Edinburgh.
[15] https://www.gov.scot/publications/national-planning-framework-3/ (accessed April 2022)
[16] https://www.gov.scot/publications/scotland-2045-fourth-national-planning-framework-draft/
[17] https://www.highlandenvironmentforum.info/wp-content/uploads/2022/01/Highland-Nature-Biodiversity-Action-Plan-2021-2026-_compressed-.pdf (accessed April 2022)
[18] https://www.nature.scot/scotlands-biodiversity/scottish-biodiversity-strategy-and-cop15/scottish-biodiversity-list (accessed April 2022)
[19] NatureScot (2020). General pre-application and scoping advice for onshore wind farms.
[20] Scottish Natural Heritage (2016a). Environmental Statements and Annexes of Environmentally Sensitive Bird Information; Guidance for Developers, Consultants and Consultees. Version 2.
[21] Scottish Natural Heritage (2018a). Assessing significance of impacts from onshore windfarms on birds out with designated areas. Version 2.
[22] Scottish Natural Heritage (2018b). Environmental Impact Assessment Handbook – Version 5: Guidance for competent authorities, consultation bodies, and others involved in the Environmental Impact Assessment process in Scotland.
[23] CIEEM (2018). Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine version 1.1. Chartered Institute of Ecology and Environmental Management, Winchester.
[24] SERAD (Scottish Executive Rural Affairs Department) (2000). Habitats and Birds Directives, Nature Conservation; Implementation in Scotland of EC Directives on the Conservation of Natural Habitats and of Wild Flora and Fauna and the Conservation of Wild Birds ("the Habitats and Birds Directives"). Revised Guidance Updating Scottish Office Circular No 6/1995.
[25] Scottish Natural Heritage (2016b). Assessing connectivity with Special Protection Areas (SPAs). Version 3.
[26] European Commission (2010). Natura 2000 Guidance Document 'Wind Energy Developments and Natura 2000'. European Commission, Brussels.
[27] Scottish Natural Heritage (2000). Windfarms and birds: calculating a theoretical collision risk assuming no avoidance action.
[28] Scottish Natural Heritage (2018c). Avoidance Rates for the onshore SNH Wind Farm Collision Model. Version 2.
[29] Band, W., Madders, M., and Whitfield, D.P. (2007). Developing field and analytical methods to assess avian collision risk at wind farms. In: Janss, G., de Lucas, M. & Ferrer, M (eds.) Birds and Wind Farms. Quercus, Madrid. 259-275.
[30] Scottish Natural Heritage (2018d). Assessing the cumulative impacts of onshore wind farms on birds.
[31] Stanbury, A., Eaton, M., Aebischer, N., Balmer, D., Brown, A., Douse, A., Lindley, P., McCulloch, N., Noble, D., and Win, I. (2021). Birds of Conservation Concern 5: The population status of birds in the UK, Channel Islands and Isle of Man and second ICUN Red List assessment of extinction risk for Great Britain. British Birds 114: 723-747.
[32] Scottish Natural Heritage (2014). Assessing impacts to pink-footed and greylag geese from small-scale wind farms in Scotland.
[33] Scottish Natural Heritage (2017). Recommended Bird Survey Methods to inform impact assessment of Onshore Windfarms
[34] Pearce-Higgins, J.W. (2021). Climate Change and the UK's Birds. British Trust for Ornithology Report, Thetford, Norfolk.
[35] Scottish Natural Heritage (2016c). Dealing with construction and birds.

| Consultee and Date | Scoping/Other Consultation | Issue Raised | Response/Action Taken |
|---|---|---|---|
| | | minimum, a desk-based study of recent and currently available information is undertaken to assess the need for further survey work and inform the proposal. NatureScot also recommends you consult the RSPB, SOC, and the Greenland white-fronted Goose Sturdy Group for current information. | |
| | | The EIAR should be clear on the survey methods and any deviations from guidance on ornithology matters. | Survey methods are detailed in Technical Appendix 8.1 Annex C. |
| NatureScot 15th February 2022 | Scoping | The proposal has the potential to impact the qualifying interests of the Caithness Lochs Special Protection Area (SPA), protected for its wintering populations of Greenland white-fronted geese, greylag geese and whooper swan.<br>The developer should assess the direct and indirect impacts on these protected areas and their qualifying interests in the context of their conservation objectives. The assessment should also consider the impact of the proposal both as an individual development and cumulatively with other developments affecting these SPAs. | Information to inform an Appropriate Assessment has been included in Section 8.4. |
| | | Previous survey work has been completed within the last 5 years, however, we note the majority of survey data has been collected outside the last 5 years. We acknowledge the report states that no substantial habitat changes have occurred on site and, based on previous survey work, there appears to be little inter-variability in bird activity between years.<br>The Applicant will need to ensure the survey data remain reliable to inform a robust assessment of the likely impacts on birds from this proposal. As a minimum, we advise that a desk-based study of recent and currently available information is undertaken to assess the need for further survey work and, if appropriate, assessment of the revised proposal.<br>This will be particularly important in relation to assessment for the Caithness Lochs SPA, given the previously predicted collision risk to all 3 species and the proposal's location near known feeding areas for Greenland white-fronted geese. We recommend the Applicant consults others (e.g. RSPB, the SOC and the Greenland white-fronted Goose Study Group) for current information relating this this species (and others) in this area. | Refer to paragraph 8.2.40. |
| Royal Society for the Protection of Birds (RSPB) 18th February 2022 | Scoping | The Scoping Report states in section 7.4 that no further ornithology surveys are proposed to be undertaken as 'the current baseline data is considered representative to provide for a robust assessment to be undertaken,' despite the age of the data. NatureScot guidance states that survey data from previous EIAs can be used providing that 'the data are reliable and not too dated (collected within the last 5 years or within 3 years if the populations of key species are known to be changing rapidly).' In this case, the vast majority of data has been collected more than 5 years ago (4 years of bird surveys have been undertaken between 2012 and 2017).<br>We understand that there is extensive existing baseline data which shows consistency between years and that land management has not changed, however, we would strongly recommend that an additional year of surveys is undertaken due to the age of the data to inform a new impact assessment on birds. Any data collected prior to 2017 should now be considered out of date but could be used for contextual purposes.<br>We note that additional data requests to cover the intervening years will be sent to the Highland Raptor Study Group and RSPB Scotland, however, we are unlikely to have much data to provide post 2017 as no surveys have been undertaken in the area. This makes it even more important to undertake new surveys. | |
| | | RSPB Scotland had concerns that the 2020 EIAR submitted with application 20/03833/FUL underestimated impacts on some species and information was missing that meant that effects could not be fully assessed. The concerns which remain should be taken into account in the new EIAR. | The RSPB's response to the previous submission (dated 27th November 2020) and the response provided by MacArthur Green (dated 21st January 2021) is provided in Technical Appendix 8.1 Annex E. |

## Potential Effects Scoped Out

8.2.9 No identified potential effects have been scoped out.

8.2.10 On the basis of the findings of the survey work undertaken, the professional judgement of MacArthur Green, experience from other relevant projects and policy guidance/standards (e.g., SNH 2018a[21]), any species that are included in the categories detailed below have been scoped out of the assessment since significant effects are unlikely at a population level:

- Common and/or species of low nature conservation importance not recognised in statute as requiring special conservation measures, i.e., bird species not listed

on Annex I of the EU Birds Directive or Schedule 1 of the Wildlife and Countryside Act 1981 (as amended);
- Common and/or species of low nature conservation importance not included in non-statutory lists that indicate birds whose populations are at some risk either generally or in parts of their range (e.g., the Birds of Conservation Concern (BoCC) Red list, Stanbury *et al*. 2021[31]); and
- Passerine species (not generally considered to be at risk from wind farm developments, SNH 2017[33], 2018a[21]), unless being particularly rare or vulnerable at a national level.

## Method of Baseline Characterisation

### Extent of the Survey/Study Area

8.2.11 A range of surveys were employed to accurately record baseline ornithological conditions within the site and appropriate survey buffers. Terms referred to are as follows (and are detailed on Figure 8.1):

- 'survey area' is defined as the area covered by each survey type at the time of survey; and
- 'study area' is defined as the area of consideration of impacts on each species at the time of assessment and as the area used for any desk-based study.

8.2.12 Details of the spatial extent of each survey area are described in section 8.3 (Baseline Conditions) of this chapter and are detailed on Figure 8.1, Figure 8.2 and Technical Appendix 8.1: Ornithology.

8.2.13 Following the completion of flight activity surveys, a Collision Risk Analysis Area (CRAA) was defined for the purposes of estimating turbine collision rates. The CRAA was created using a 500m buffer from the proposed turbine locations (Figure 8.2). As recommended by NatureScot (SNH 2017[33]), using this buffer area around the turbines accounts for possible inaccuracies in the recording of flightlines by surveyors, and records any species' flight activity that was in proximity to, but not necessarily within the wind farm area at the time of surveys.

### Desk Study

8.2.14 The following data sources were considered as part of the assessment:

- NatureScot SiteLink[36] for designated site information;
- Highland Raptor Study Group (HRSG) and Royal Society for the Protection of Birds (RSPB) Scotland for historic raptor breeding data (and wildfowl from the RSPB);
- NatureScot's Caithness Lochs SPA whooper swan, greylag goose and Greenland white-fronted goose wind farm development survey dataset for cumulative assessment;
- Pink-footed goose and (Icelandic) greylag goose feeding distributions (Mitchell 2012[37]); and
- Various EIA reports and monitoring documents for wind farm projects within Natural Heritage Zone (NHZ) 2 North Caithness & Orkney.

### Field Survey

8.2.15 Ornithological surveys were undertaken to establish the baseline ornithological conditions at the site (plus appropriate buffers). Fieldwork commenced in September 2012 and was completed in August 2017. Within this period, surveys were undertaken between September 2012 and August 2014 and October 2015 and August 2017. These provided data covering four breeding seasons (2013, 2014, 2016 and 2017) and four non-breeding seasons (2012/2013, 2013/2014, 2015/2016 and 2016/2017).

8.2.16 The following surveys were undertaken (see Technical Appendix 8.1: Ornithology for details):

- Flight activity surveys – September 2012 to February 2013, May 2013 to August 2014, October 2015 to August 2017 (see Figure 8.2 for vantage point coverage);
- Scarce breeding bird surveys – spring/summer 2013, 2014 and 2016;
- Breeding bird surveys – spring/summer 2013, 2014, 2016 and 2017;
- Winter walkover surveys – December 2012 to February 2013 and December 2015 to February 2016; and
- Foraging goose surveys – September 2013 to May 2014, October 2015 to May 2016 and October 2016 to May 2017.

[36] https://sitelink.nature.scot/home (accessed April 2022)

[37] Mitchell, C. (2012). Mapping the distribution of feeding Pink-footed and Iceland Greylag Geese in Scotland. Wildfowl & Wetlands Trust / Scottish Natural Heritage Report, Slimbridge.

8.2.17 Field surveys were conducted following the relevant recommended NatureScot guidance (SNH 2010[38], 2013[39], 2014[40], 2017[33]) depending on survey date (refer to Technical Appendix 8.1: Ornithology for details of the survey methodologies and year specific survey areas).

## Assessment of Effects

### Assessing Wider-Countryside Ornithological Interests

8.2.18 The evaluation for wider-countryside interests (interests unrelated to SPAs but including Sites of Special Scientific Interest (SSSIs) and Ramsar sites) has been made using the following process:

- identifying the potential impacts associated with the Proposed Development;
- considering the likelihood of occurrence of potential impacts where appropriate;
- defining the sensitivity of a feature to impacts via the Nature Conservation Importance (NCI) of the species present and establishing each population's conservation status;
- establishing the magnitude of the impact (both spatial and temporal);
- based on the above criteria, making a judgement as to whether or not the identified effect is significant with respect to the EIA Regulations;
- if a potential effect if determined to be significant, suggesting measures to mitigate or compensate the effect where required; and
- considering residual effects after mitigation, compensation or enhancement.

### Assessing Likely Significant Effects on a Special Protection Area

8.2.19 The method for assessing the likely significant effects on an SPA is different from that employed for wider-countryside ornithological interests. The Habitats Directive is transposed into domestic legislation by the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended in Scotland). Regulation 48 includes a number of steps to be taken by the competent authority before granting consent (these are referred to here as an HRA). In order of application, the first four are:

- Step 1: consider whether the proposal is directly connected to or necessary for the management of the SPA (Regulation 48(1)(b)).
- If not, Step 2: consider whether the proposal (alone or in combination) is likely to have a significant effect on the SPA (Regulation 48(1)(a)).
- If so, Step 3: make an Appropriate Assessment of the implications for the SPA in view of that SPA's conservation objectives (Regulation 48(1)(a)).
- Step 4: consider whether it can be ascertained that the proposal will not adversely affect the integrity of the SPA ("Integrity Test") having regard to the manner in which it is proposed to be carried out or to any conditions or restrictions subject to which they propose that the consent, permission or other authorisation should be given (Regulation 48(5) and 48(6)).

8.2.20 It has already been established that the Proposed Development does not meet the criteria for Step 1. The results of baseline surveys and scientific conclusions presented in this chapter are therefore used to inform the HRA process, and potentially for the competent authority to conduct an Appropriate Assessment where likely significant effects have been identified.

### Assessing the Sensitivity of Features

8.2.21 The sensitivity of ornithological features on or near to the site is assessed in line with best practice guidance, legislation, statutory designations and/or professional judgement.

8.2.22 Determination of the level of sensitivity of an ornithological feature is based on a combination of the feature's NCI and conservation status. There are three levels of NCI as detailed in Table 8.2.

**Table 8.2: Determining Factors of a Feature's NCI**

| Importance | Description |
|---|---|
| High | Populations receiving protection by an SPA, proposed SPA, Ramsar Site, SSSI or which would otherwise qualify under selection guidelines.<br>Species present in nationally important numbers (>1% national breeding or wintering population). |
| Medium | The presence of species listed in Annex 1 of the Birds Directive (but population does not meet the designation criteria under selection guidelines).<br>The presence of breeding species listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended).<br>The presence of rare, Red-listed breeding species noted on the latest Birds of Conservation Concern (BoCC) Red list (Stanbury *et al.* 2020[31]).<br>Regularly occurring migratory species, which are either rare or vulnerable, or warrant special consideration on account of the proximity of migration routes, or breeding, moulting, wintering or staging areas in relation to the Proposed Development. |

[38] Scottish Natural Heritage (2005, revised 2010). Survey methods for use in assessing the impacts of onshore windfarms on bird communities.
[39] Scottish Natural Heritage (2013). Recommended bird survey methods to inform impact assessment of onshore windfarms.
[40] Scottish Natural Heritage (2014). Recommended bird survey methods to inform impact assessment of onshore windfarms.

| Importance | Description |
|---|---|
| | Species present in regionally important numbers (>1% regional breeding population). |
| Low | All other species' populations not covered by the above categories. |

8.2.23 Important Ornithological Features (IOFs, as per CIEEM 2018[23]) to be assessed for the purposes of the EIA Report, are taken to be those species of high or medium NCI.

8.2.24 As defined by NatureScot (SNH 2018a[21]), the conservation status of a species is "the sum of the influences acting on it which may affect its long-term distribution and abundance, within the geographical area of interest". Conservation status is considered by NatureScot (SNH 2018a[21]) to be 'favourable' under the following circumstances:

- "population dynamics indicate that the species is maintaining itself on a long-term basis as a viable component of its habitats;
- the natural range of the species is not being reduced, nor is likely to be reduced for the foreseeable future; and
- there is (and probably will continue to be) a sufficiently large habitat to maintain its population on a long-term basis".

8.2.25 NatureScot (SNH 2018a[21]) recommends that "the concept of favourable conservation status of a species should be applied at the level of its Scottish population, to determine whether an impact is sufficiently significant to be of concern. An adverse impact on a species at a regional scale (within Scotland) may adversely affect its national conservation status". Thus, "An impact should therefore be judged as of concern where it would adversely affect the existing favourable conservation status of a species or prevent a species from recovering to favourable conservation status, in Scotland."

8.2.26 In the case of non-designated sites in Scotland, the relevant regional scale for breeding species is considered to be the appropriate NHZ which the site falls within. The Proposed Development is within NHZ 2 (North Caithness & Orkney).

8.2.27 For wintering or migratory species, the national UK population or flyway population is considered to be the relevant scale for determining effects on the conservation status, and this approach is applied here.

### Assessing the Magnitude of Impact

8.2.28 An impact is defined as a change of a particular magnitude to the abundance and/or distribution of a population as a result of the Proposed Development. Impacts can be adverse, neutral or favourable.

8.2.29 In determining the magnitude of impacts, the resilience of a population to recover from temporary adverse conditions is considered in respect of each potentially affected population.

8.2.30 The sensitivity of individual species to anthropogenic activities is considered when determining spatial and temporal magnitude of impact and is assessed using guidance described by Bright *et al.* (2006[41]), Hill *et al.* (1997[42]) and Ruddock and Whitfield (2007[43]).

8.2.31 Impacts are judged in terms of magnitude in space and time. There are five levels of spatial and temporal effect magnitude as detailed in Table 8.3 and Table 8.4 respectively.

**Table 8.3: Spatial Magnitude of Impact**

| Spatial Magnitude | Description |
|---|---|
| Very high | Total/near total loss of a bird population due to mortality or displacement. Total/near total loss of productivity in a bird population due to disturbance.<br>Guide: >80% of population lost or increase in additive mortality. |
| High | Major reduction in the status or productivity of a bird population due to mortality or displacement or disturbance.<br>Guide: 21-80% of population lost or increase in additive mortality. |
| Medium | Partial reduction in the status or productivity of a bird population due to mortality or displacement or disturbance.<br>Guide: 6-20% of population lost or increase in additive mortality. |
| Low | Small but discernible reduction in the status or productivity of a bird population due to mortality or displacement or disturbance.<br>Guide: 1-5% of population lost or increase in additive mortality. |
| Negligible | Very slight (or no discernible) reduction in the status or productivity of a bird population due to mortality or displacement or disturbance. Reduction barely discernible, approximating to the "no change" situation.<br>Guide: <1% of population lost or increase in additive mortality. |

[41] Bright, J. A., Langston, R. H. W., Bullman, R., Evans, R. J., Gardner, S., Pearce-Higgins, J. & Wilson, E. (2006). Bird Sensitivity Map to provide locational guidance for onshore Windfarms in Scotland. Royal Society for the Protection of Birds.
[42] Hill, D.A., D. Hockin, D. Price, G. Tucker, R. Morris, and J. Treweek. (1997). Bird disturbance: improving the quality of disturbance research. Journal of Applied Ecology 34:275-288.
[43] Ruddock, M. & Whitfield, D. P. (2007). A Review of Disturbance Distances in Selected Bird Species, A report from Natural Research (Projects) Ltd to Scottish Natural Heritage.

**Table 8.4: Temporal Magnitude of Impact**

| Temporal Magnitude | Description |
|---|---|
| Permanent | Effects continuing indefinitely beyond the span of one human generation (taken as approximately 25-30 years), except where there is likely to be substantial improvement after this period. Where this is the case, long-term may be more appropriate. |
| Long-term | Approximately 15-25 years or longer (see above). |
| Medium-term | Approximately 5-15 years. |
| Short-term | Up to approximately 5 years. |
| Negligible | <12 months. |

### Assessing Cumulative Impacts

8.2.32 Cumulative and/or in-combination impacts are assessed in section 8.4 and present information about the potential cumulative impacts of the Proposed Development combined with other operational, consented or proposed wind farm projects.

8.2.33 NatureScot (SNH 2018d[30]) has provided guidance on assessing the cumulative effects on birds. This assessment follows the principles set out in that guidance.

8.2.34 Cumulative effects may include cumulative disturbance-displacement, collision mortality, habitat loss or barrier effects. Some cumulative effects, such as collision risk, may be summed quantitatively, but according to NatureScot (SNH 2018d[30]) "*In practice, however, some effects such as disturbance or barrier effects may need considerable additional research work to assess impacts quantitatively. A more qualitative process may have to be applied until quantitative information becomes available for developments in the area, e.g., from post-construction monitoring or research*".

8.2.35 The main projects likely to cause similar impacts on ornithological features are other operational developments, or those under construction, consented, or in the planning process, located within NHZ 2.

## Criteria for Assessing Significance

8.2.36 The potential significance of effect was determined through a standard method of assessment based on professional judgement, considering both sensitivity and magnitude of impact as detailed in Table 8.5. Major and moderate effects are considered 'significant' in the context of the EIA Regulations

**Table 8.5: Determining Significance of Effects**

| Significance of Effect | Definition |
|---|---|
| Major | The impact is likely to result in a long term significant adverse effect on the integrity of a feature. |
| Moderate | The impact is likely to result in a medium term or partially significant adverse effect on the integrity of a feature. |
| Minor | The impact is likely to adversely affect a feature at an insignificant level by virtue of its limitations in terms of duration or extent, but there will probably be no effect on its integrity. |
| Negligible | No impact. |

## Limitations and Assumptions

8.2.37 Limitations exist with regard to the knowledge base on how some species, and the populations to which they belong, react to impacts. A precautionary approach is taken in these circumstances, and as such it is considered that these limitations do not affect the robustness of this assessment.

8.2.38 In general, survey effort either met or exceeded the minimum requirements stipulated in NatureScot guidance (SNH 2017[33]) with weather conditions appropriate for the surveys. Surveys were suspended (or additional surveys were undertaken) where weather conditions deteriorated (refer to Technical Appendix 8.1).

8.2.39 It should be noted that whilst there have been various revisions to the design and site boundary across the development life history, surveys across all the various seasons covered the study areas detailed on Figure 8.1 as a minimum.

8.2.40 No further ornithology surveys were undertaken for the Proposed Development as there was considered to be an extensive baseline dataset available for the site with data covering four breeding seasons (2013, 2014, 2016 and 2017) and four non-breeding seasons (2012/2013, 2013/2014, 2015/2016 and 2016/2017) across a six-year period that provided a consistent and accurate representation of the distribution and abundance of the key species (waders and wintering wildfowl, as established by the previous submission). Furthermore land management on the site and surrounding area remains the same and as such the current baseline data is considered representative to provide for a robust assessment to be undertaken. An additional desk study has confirmed this (paragraph 8.2.14).

## 8.3 Baseline Conditions

### Current Baseline

8.3.1 The sections below provide information on statutory designations, a summary of target species recorded during flight activity surveys and a summary of results per target species (grouped into species groups) recorded. For each target species recorded it is also determined, based on baseline survey results and/or historic data, whether they can be reasonably scoped out if the assessment at this stage as a result of a lack of likely significant effects at a population level.

**Designated Sites**

8.3.2 There are no statutory nature conservation designations with an ornithological interest within the site, but the Proposed Development is within 20km of three SPAs (with their component SSSIs and Ramsar sites) and one SSSI (Figure 8.3):

- North Caithness Cliffs SPA (Table 8.6), underpinned by Dunnet Head SSSI and Red Point Coast SSSI – various distances to the north east, west and east, 2.4 km from the closest proposed turbine to closest part of the SPA;
- Caithness Lochs SPA (Table 8.7), underpinned by Caithness Lochs Ramsar site, Broubster Leans SSSI, Loch Calder SSSI, Loch Heilen SSSI, Loch Scarmclate SSSI and Loch Watten SSSI – various distances from east to south, 5.6 km from the closest proposed turbine to closest part of the SPA;
- Caithness and Sutherland Peatlands SPA (Table 8.8), underpinned by Caithness and Sutherland Peatlands Ramsar, East Halladale SSSI, Loch Caluim Flows SSSI, Strathmore Peatlands SSSI – 9.1 km to the south west from the closest proposed turbine to closest part of the SPA; and
- Lambsdale Leans SSSI (Table 8.9) – 12.4 km to the south from the closest proposed turbine to closest part of the SSSI.

**Table 8.6: Summary of the Qualifying Features of the North Caithness Cliffs SPA (and Dunnet Head SSSI[a] and Red Point Coast SSSI[b])**

| Feature | Qualifying Feature Category | Status | Description |
|---|---|---|---|
| Fulmar (breeding) | SPA | June 2016: favourable maintained | Breeding population of national importance: 14,700 pairs (1985-1987), 3% of the GB population. |
| Guillemot (breeding) | SPA, SSSI[a,b] | June 2016: favourable maintained | Breeding population of European importance: 38,300 birds (1985-1987), 1% of the north Atlantic biogeographic population and 4% of the GB population. |
| Kittiwake (breeding) | SPA | June 2016: unfavourable declining | Breeding population of national importance: 13,100 pairs (1985-1987), 3% of the GB population. |
| Peregrine falcon (breeding) | SPA | June 2014: unfavourable declining | Breeding population of European importance: 6 pairs, 0.5% of the GB population. |
| Puffin (breeding) | SPA | June 2016: favourable maintained | Breeding population of national importance: 2,080 pairs (1985-1987), 0.4% of the GB population. |
| Razorbill (breeding) | SPA | June 2016: favourable recovered | Breeding population of national importance: 4,000 pairs (1985-1987), 3% of the GB population. |
| Seabird colony (breeding) | SPA, $SSSI_a$ | June 2016: favourable maintained | In addition to those species listed as designated features, the following species breed on the cliffs: shag, herring gull and great black-backed gull. |

**Table 8.7: Summary of the Qualifying Features of the Caithness Lochs SPA/Ramsar (and Broubster Leans SSSI[c], Loch Calder SSSI[d], Loch Heilen SSSI[e], Loch Scarmclate SSSI[f] and Loch Watten SSSI[g])**

| Feature | Qualifying Feature Category | Status | Description |
|---|---|---|---|
| Greenland white-fronted goose (non-breeding) | SPA, Ramsar, SSSI[d,e] | April 2016: favourable declining | Wintering population of European importance: winter peak mean (1993/94 – 1997/98) of 440 representing 3% of the GB population and 1% of the Greenlandic population. |
| Greylag goose (non-breeding) | SPA, Ramsar, SSSI[d,e,f,g] | November 2015: favourable maintained | Wintering population of European importance: winter peak mean (1993/94 – 1997/98) of 7,190 representing 7% of the GB and Icelandic population. |
| Whooper swan (non-breeding) | SPA, Ramsar, SSSI[d,e] | March 2015: favourable maintained | Wintering population of European importance: winter peak mean (1993/94 – 1997/98) of 240 representing 4% of the GB population and 1% of the Icelandic population. |
| Breeding bird assemblage | SSSI[c] | June 2007: favourable maintained | Contains a range of breeding wildfowl and waders including: wigeon, teal, snipe, greenshank, dunlin, wood sandpiper and spotted crake. The SSSI is also an important foraging area for hen harrier and short-eared owl that breed outwith the SSSI. |

8.3.3 The Caithness Lochs SPA citation (and Loch Heilen SSSI citation) also states that "the site lies towards the northern limit of [the three goose] species' wintering distributions and is important to the maintenance of these species' wintering ranges".

**Table 8.8: Summary of the Qualifying Features of the Caithness and Sutherland Peatlands SPA/Ramsar (and East Halladale SSSI[h], Loch Caluim Flows SSSI[i] and Strathmore Peatlands SSSI[j])**

| Feature | Qualifying Feature Category | Status | Description |
|---|---|---|---|
| Black-throated diver (breeding) | SPA | June 2018: favourable maintained | Breeding population of European importance: 26 pairs in 1994, 15% of the GB population. |
| Common scoter (breeding) | SPA, SSSI[j] | June 2013: unfavourable declining | Breeding population of European importance: 21 pairs (2007) representing <0.1% of the western Siberia/western and north Europe/north western Africa biogeographic population and 40.4% of the GB population. |
| Dunlin (breeding) | SPA, Ramsar, SSSI[h,i,j] | June 2015: favourable maintained/recovered | Breeding population of European importance: 1,860 pairs (1993-1994) representing 20% of the GB population. |
| Golden eagle (breeding) | SPA, SSSI[h,i,j] | August 2016: favourable maintained | Breeding population of European importance: 5 pairs in 1992, 1% of the GB population. |
| Golden plover (breeding) | SPA, SSSI[h,i] | June 2015: favourable maintained/recovered | Breeding population of European importance: 1,064 pairs (1993-1994) representing 5% of the GB population. |
| Greenshank (breeding) | SPA, SSSI[i,j] | June 2015: favourable maintained/recovered | Breeding population of European importance: 653 pairs (2009) representing 0.9% of the Europe/western Africa biogeographic population and 59.4% of the GB population. |
| Greylag goose (breeding) | Ramsar | June 2018: favourable maintained | Internationally important population of north Scottish greylag goose. |
| Hen harrier (breeding) | SPA | June 2016: favourable maintained | Breeding population of European importance: 54 pairs (1993-1994) representing 4% of the GB population. |
| Merlin (breeding) | SPA | June 2004: favourable maintained | Breeding population of European importance: average of 14 pairs (1993-1997) representing 2.8% of the GB population. |
| Red-throated diver (breeding) | SPA | July 2006: favourable maintained | Breeding population of European importance: 46 pairs in 2006, 3.5% of the GB population. |
| Short-eared owl (breeding) | SPA | Condition not assessed | Breeding population of European importance: 30 pairs representing 2% of the GB population. |
| Wigeon (breeding) | SPA, SSSI[j] | June 2018: favourable maintained | Breeding population of European importance: 43 pairs (1993/94) representing <0.1% of the western Siberia/north western and north eastern Europe biogeographic population and 10.8% of the GB population. |
| Wood sandpiper (breeding) | SPA | June 2004: favourable maintained | Breeding population of European importance: up to 5 pairs representing 40% of the GB population. |
| Breeding bird assemblage | Ramsar, SSSI[h,i,j] | June 2015: favourable maintained | The Ramsar site and four SSSIs support a particularly rich range of breeding moorland birds and waterfowl. |

**Table 8.9: Summary of the Qualifying Features of the Lambsdale Leans SSSI**

| Feature | Qualifying Feature Category | Status | Description |
|---|---|---|---|
| Breeding bird assemblage | SSSI | June 2005: favourable recovered | Supports breeding/foraging wildfowl and wading bird's characteristic of upland wetlands including: grey heron, greylag goose, teal, wigeon, tufted duck, dunlin, snipe, curlew, redshank, greenshank and common sandpiper. |

### Flight Activity Summary

8.3.4 A summary of all target species recorded during flight activity surveys at the site is detailed in Table 8.10. This summarises all flights observed during the baseline period (September 2012 to February 2013, May 2013 to August 2014 and October 2015 to August 2017) regardless of the location of the flights in relation to the Proposed Development. For further details of the flight activity surveys, refer to Technical Appendix 8.1: Ornithology.

8.3.5 Band *et al.* (2007[29]) describe a method of quantifying potential bird collisions with onshore turbines, in which: (i) the activity rate per unit area per season is extrapolated; (ii) the likelihood of a collision with a blade for a bird passing through the rotor swept area is calculated; and (iii) an 'avoidance rate' is applied to account for behavioural adaptation of birds to the presence of turbines. The bird seconds[44] for target species identified to be 'at-risk'[45] were input into a collision risk model (using Band *et al.* 2007[29]) to calculate the predicted collision rates per season for each target species recorded during baseline flight activity surveys. A summary of the collision model results is detailed in Table 8.11 (refer to Annex B of Technical Appendix 8.1: Ornithology for detailed results). Two species (barn owl and short-eared owl) were recorded during flight activity surveys, but no flights were

[44] Bird seconds are calculated for each observation as the product of flight duration and number of individuals.

[45] 'At-risk' is defined as: a flight having at least part of its duration (i) at potential collision height; (ii) within the CRAA; and (iii) recorded within the 2km viewshed of the associated VP.

considered to be 'at-risk' (i.e., the flights were outside of the CRAA and associated viewshed and/or were only recorded flying below lower rotor tip height, 21.5 m) and are therefore not included in Table 8.11.

**Table 8.10: Target Species Recorded During Flight Activity Surveys, 2012 to 2017**

| Species | Number of Flights Recorded | Total Bird Seconds Recorded |
|---|---|---|
| Arctic skua | 5 | 375 |
| Barn owl | 2 | 60 |
| Curlew | 242 | 14,910 |
| Dunlin | 7 | 2,655 |
| Golden plover | 123 | 382,515 |
| Greenland white-fronted goose | 15 | 194,160 |
| Greylag goose | 368 | 1,709,985 |
| Hen harrier | 52 | 5,595 |
| Herring gull | 123 | 12,075 |
| Lapwing | 815 | 986,490 |
| Merlin | 4 | 165 |
| Peregrine falcon | 6 | 195 |
| Pink-footed goose | 183 | 1,831,245 |
| Ringed plover | 7 | 3,795 |
| Short-eared owl | 3 | 60 |
| Whooper swan | 30 | 22,905 |

**Table 8.11: Predicted Collision Rates**

| Species | Mean Breeding Season | Mean Non-Breeding Season | Mean Annual | Equivalent to One Bird Every X Years |
|---|---|---|---|---|
| Arctic skua | 0.0007 | 0.0008 | 0.0016 | 639 |
| Curlew | 0.1988 | 0.0346 | 0.2333 | 4.3 |
| Dunlin | 0.0000 | 0.0048 | 0.0048 | 211 |
| Golden plover | 0.9374 | 0.8472 | 1.7846 | 0.6 |
| Greenland white-fronted goose | 0.0000 | 0.0021 | 0.0021 | 485 |
| Greylag goose | 0.0000 | 0.3450 | 0.3450 | 2.9 |
| Hen harrier | 0.0000 | 0.0003 | 0.0003 | 3228 |
| Herring gull | 0.1541 | 0.0000 | 0.1541 | 6.5 |
| Lapwing | 0.6200 | 0.8082 | 1.4282 | 0.7 |
| Merlin | 0.0000 | 0.0002 | 0.0002 | 6461 |
| Peregrine falcon | 0.0005 | 0.0002 | 0.0007 | 1406 |
| Pink-footed goose | 0.0000 | 2.2399 | 2.2399 | 0.4 |
| Ringed plover | 0.0019 | 0.0685 | 0.0704 | 14.2 |
| Whooper swan | 0.0000 | 0.0152 | 0.0152 | 66 |

### Geese and Swans

8.3.6 Table 8.12 contains a summary of observations of foraging geese and swans recorded during the 2013/2014, 2015/2016 and 2016/2017 non-breeding seasons. These records are also detailed on Figure 8.4 (barnacle and brent geese), Figure 8.5 (Greenland white-fronted goose), Figure 8.6 (greylag goose), Figure 8.7 (pink-footed goose) and Figure 8.8 (whooper swan).

**Table 8.12: Foraging Wildfowl Survey Summary**

| | | Barnacle Goose | Brent Goose | Greenland-White Fronted Goose | Greylag Goose | Pink-Footed Goose | Whooper Swan |
|---|---|---|---|---|---|---|---|
| 2013/2014 Non-Breeding Season | No. of Records | - | 1 | 20 | 214 | 62 | 16 |
| | No. of Birds | - | 1 | 445 | 30,140 | 10,952 | 418 |
| | Flock Size (Range) | - | 2 | 1-70 | 1-1,600 | 1-2,500 | 2-115 |
| | Flock Size (Average) | - | 2 | 22 | 141 | 177 | 26 |
| 2015/2016 Non-Breeding Season | No. of Records | 1 | - | 7 | 79 | 19 | 16 |
| | No. of Birds | 3 | - | 227 | 14,690 | 3,746 | 293 |
| | Flock Size (Range) | 3 | - | 1-95 | 1-1,200 | 1-950 | 2-90 |
| | Flock Size (Average) | 3 | - | 32 | 186 | 197 | 18 |
| 2016/2017 Non-Breeding Season | No. of Records | 1 | - | 19 | 173 | 77 | 13 |
| | No. of Birds | 3 | - | 629 | 13,750 | 10,860 | 82 |
| | Flock Size (Range) | 3 | - | 1-86 | 1-700 | 1-835 | 1-20 |
| | Flock Size (Average) | 3 | - | 33 | 79 | 141 | 6 |

#### *Barnacle Goose*

8.3.7 Foraging goose surveys recorded two flocks of three barnacle geese within the survey area during April and October 2016 (Table 8.12, Figure 8.4). Barnacle geese were not recorded during any other surveys. The closest of these fields is 1.2km to the east of the site (Figure 8.4).

8.3.8 As the site does not appear to be used by the species, any disturbance to foraging barnacle goose as a result of the construction, operation and decommissioning of the Proposed Development is considered to be negligible/non-existent. Considering this

species' minimal activity within the wider study area, **barnacle goose is scoped out of the assessment**.

*Brent Goose*

8.3.9 Two brent geese were recorded on one occasion (over 1 km from the site) during surveys for foraging wildfowl during the 2013/2014 non-breeding season (Figure 8.4). Brent geese were not recorded during any other surveys.

8.3.10 Considering this species' minimal activity within the wider study area, **brent goose is scoped out of the assessment**.

*Greenland-White Fronted Goose*

8.3.11 Flight activity surveys recorded 15 flights (Table 8.10), of which three flights were identified to be 'at-risk' (Figure 8.9) which predicted a mean non-breeding season collision risk of 0.002, or one every 485 years (Table 8.11).

8.3.12 Surveys for foraging wildfowl recorded no feeding Greenland white-fronted goose within 500m of planned infrastructure, and within 1km of planned infrastructure on only one occasion (during the 2015/2016 non-breeding season, Figure 8.5). Table 8.12 contains a summary of all Greenland white-fronted goose foraging activity recorded within the 5 km survey area.

8.3.13 Considering the presence of foraging activity within 1km of the site and their inclusion on the Caithness Lochs SPA designation, **Greenland white-fronted goose is scoped in to the assessment**.

*Greylag Goose*

8.3.14 Flight activity surveys recorded 368 flights (Table 8.10), of which 116 flights were identified to be 'at-risk' (Figure 8.10a-e) which predicted a mean non-breeding season collision rate of 0.345 collisions per year, or one every 2.9 years (Table 8.11).

8.3.15 Surveys for foraging wildfowl recorded feeding greylag goose within 500 m of the site on nine occasions (on four occasions during the 2013/2014 non-breeding season, on three occasions during the 2015/2016 non-breeding season and on two occasions during the 2016/2017 non-breeding season) and within 1 km of the site on a further 17 occasions (on nine occasions during the 2013/2014 breeding season, three occasions during the 2015/2016 non-breeding season and on five occasions during the 2016/2017 non-breeding season) (Figure 8.6). As shown on Figure 8.6, greylag goose foraging activity within 1 km of the site was focussed to the north west of the site with the main concentrations in the fields north of the A836 to the north west of the site. Table 8.12 contains a summary of all greylag goose foraging activity recorded within the 5 km survey area. A comparison between the foraging data gathered during the baseline surveys and the Mitchell (2012[37]) greylag goose foraging data (Figure 8.6) shows a strong correlation between the 1 km grid squares identified for foraging greylag goose by Mitchell (2012[37]) and the baseline data although the surveys have identified additional 1 km grid squares used by greylag geese, adjacent to those identified by Mitchell (2012[37]) (Figure 8.6).

8.3.16 Considering the presence of foraging activity within 500 m of the site, the predicted risk of collision, and their inclusion on the Caithness Lochs SPA designation, **greylag goose is scoped in to the assessment**.

*Pink-Footed Goose*

8.3.17 Flight activity surveys recorded 183 flights (Table 8.10), of which 103 flights were identified to be 'at-risk' (Figure 8.11a-c) which predicted a mean non-breeding season collision rate of 2.24 collisions per year, or one every 0.4 years (Table 8.11). It should be noted that current NatureScot guidance[46] on potential wind farm impacts on pink-footed geese states: "*SNH will now no longer require CRM to be completed for pink-footed geese in support of wind farm applications in the wider countryside, although the process should be followed as usual for assessing impacts on designated site pink-footed goose populations*". Although the species is not a qualifying feature of any nearby designated site, to support the current assessment, the pink-footed goose data was entered into the collision model to check on the potential level of mortality which would be predicted.

8.3.18 Surveys for foraging wildfowl recorded feeding pink-footed goose within 500 m of proposed infrastructure on two occasions (during the 2013/2014 non-breeding season) and within 1 km of proposed infrastructure on a further eight occasions (on seven occasions during the 2013/2014 breeding season and on one occasion during the 2015/2016 non-breeding season) (Figure 8.7). As shown on Figure 8.7, pink-footed goose foraging activity within 1km of the site was focussed to the north west of the site with the main concentrations in the fields north of the A836 to the north west site (in a pattern similar to the greylag goose feeding distribution). Table 8.12 contains a summary of all pink-footed goose foraging activity recorded within the

[46] https://www.nature.scot/professional-advice/planning-and-development/planning-and-development-advice/renewable-energy/onshore-wind-energy/wind-farm-impacts-birds (accessed April 2022)

5km survey area. A comparison between the foraging data gathered during the baseline surveys and the Mitchell (2012[37]) pink-footed goose foraging data (Figure 8.7) indicates that pink-footed goose foraging is more widely distributed around the site than indicated by the 1 km grid squares identified for foraging pink-footed goose by Mitchell (2012[37]).

8.3.19 Considering the presence of foraging activity within 500 m of the site and the predicted risk of collision, **pink-footed goose is scoped in to the assessment.**

*Whooper Swan*

8.3.20 Flight activity surveys recorded 30 flights (Table 8.10), of which seven flights were identified to be 'at-risk' (Figure 8.12) which predicted a mean non-breeding season collision rate of 0.015 collisions per year, or one every 66 years (Table 8.11).

8.3.21 Whooper swan were recorded on the lochan at Hill of Forss (within the site) on one occasion during the 2013/2014 non-breeding season and on seven occasions during the 2015/2016 non-breeding season. All bar one of these records were of birds landing or taking off from the lochan and were recorded during flight activity surveys and consisted of between two and 13 birds. There was no evidence of whooper swan routinely using the lochan at Hill of Forss as a roosting site.

8.3.22 Surveys for foraging wildfowl recorded feeding whooper swan over 1km the north west, north east and south of the proposed infrastructure (Table 8.12, Figure 8.8) with the closest foraging record located just over 1 km to the north west of the nearest proposed infrastructure (near West Brims Farm).

8.3.23 Considering the presence of whooper swan on the lochan at Hill of Forss and their inclusion on the Caithness Lochs SPA designation, **whooper swan is scoped in to the assessment.**

**Raptors and Owls**

*Barn Owl*

8.3.24 Surveys for breeding raptors and owls during the 2013, 2014 and 2016 breeding seasons recorded no evidence of barn owl within 1km with the exception of one record of very old barn owl pellets over 500 m to the north of the site in February 2016. It was also noted by surveyors that the high densities of jackdaw nesting in any potential barn owl nesting sites was likely to have made these unsuitable for barn owl.

8.3.25 Flight activity surveys recorded two flights (Table 8.10, Figure 8.13), however neither were identified to be 'at-risk' and therefore no collision risk is predicted for barn owl.

8.3.26 Considering this species' low on-site activity, absence of breeding within 1 km and no predicted risk of collision, **barn owl is scoped out of the assessment.**

*Hen Harrier*

8.3.27 No evidence of breeding hen harrier within 2 km of the site was identified during the 2013, 2014 or 2017 breeding seasons with a ringtail hen harrier recorded on one occasion during April 2014 (Figure 8.14). There was noted to be little suitable breeding habitat available within the study area.

8.3.28 Hen harrier were recorded on seven occasions within the 2 km study area during the 2012/2013, 2015/2016 and 2016/2017 non-breeding seasons (Figure 8.15), however the records were widely distributed across the study area with no evidence of a roost site.

8.3.29 Flight activity surveys recorded 52 flights (Table 8.10), of which three flights were identified to be 'at-risk' (Figure 8.16) which predicted a mean rate of 0.0003 collisions per year (Table 8.11), or one every 3,228 years.

8.3.30 Considering this species' low on-site activity, no recorded breeding activity and negligible predicted risk of collision, **hen harrier is scoped out of the assessment.**

*Merlin*

8.3.31 No evidence of breeding merlin within 2 km of the site was identified during the 2013, 2014 or 2017 breeding bird seasons. A single bird was recorded flying over the site in both January and April 2016 (Figure 8.15 and Figure 8.14 respectively).

8.3.32 Flight activity surveys recorded four merlin flights (Table 8.10), of which one flight was identified to be 'at-risk' (Figure 8.17) which predicted a mean non-breeding season rate of 0.0002 collisions per year (Table 8.11), or one every 6,461 years.

8.3.33 Considering this species' low on-site activity, no recorded breeding activity and negligible predicted risk of collision, **merlin is scoped out of the assessment.**

*Peregrine Falcon*

8.3.34 No evidence of breeding peregrine falcon within 2 km of the site was identified during the 2013, 2014 or 2017 breeding bird seasons. A single bird was recorded flying over the site during winter walkover surveys in January 2016 (Figure 8.15).

8.3.35 Flight activity surveys recorded six flights (Table 8.10), of which two flights were identified to be 'at-risk' (Figure 8.18) which predicted a mean collision rate of 0.0007 collisions per year (Table 8.11), or one every 1,406 years.

8.3.36 Considering this species' low on-site activity, no recorded breeding activity and negligible predicted risk of collision, **peregrine falcon (the wider-countryside population) is scoped out of the assessment**.

8.3.37 For consideration of the North Caithness Cliffs SPA population, refer to Table 8.14 and paragraphs 8.3.66 to 8.3.72.

*Short-Eared Owl*

8.3.38 Flight activity surveys recorded three short-eared owl flights (Table 8.10, Figure 8.19), none of which were identified to be 'at-risk' and therefore no collision risk is predicted.

8.3.39 No evidence of breeding short-eared owl within 2km of the site was identified during the 2013, 2014 or 2017 scarce breeding bird surveys. A single bird was recorded flying over the site during winter walkover surveys in December 2015 (Figure 8.15).

8.3.40 Considering this species' low on-site activity, no recorded breeding activity and negligible risk of collision, **short-eared owl is scoped out of the assessment**.

**Waders**

8.3.41 Table 8.13 contains a summary of breeding wader activity located within 500 m of the site, with breeding activity also shown on Figure 8.20.

**Table 8.13: Breeding Wader Activity, 2013 to 2017 – Estimated Number of Territories**

| Species | 2013 | 2014 | 2016 | 2017 |
|---|---|---|---|---|
| Curlew | 3 | 2 | 3-5 | 2-3 |
| Dunlin | 0 | 0 | 0-1 | 0 |
| Lapwing | 3 | 2 | 4-7 | 3-5 |
| Ringed plover | 0 | 0 | 0-1 | 0 |

*Curlew*

8.3.42 Flight activity surveys recorded 242 flights (Table 8.10), of which 93 flights were identified to be 'at-risk' (Figure 8.21a-b) which predicted a mean annual collision risk of 0.233 (Table 8.11), or one every 4.3 years (Table 6.11). The majority of curlew activity was recorded during the breeding season (April to July), with a mean breeding season collision risk of 0.198 (Table 8.11), or one every five breeding seasons.

8.3.43 Breeding bird surveys recorded breeding curlew within the 500 m study area during each of the survey years with an estimated minimum of two and a maximum of five territories in any one year (Table 8.13, Figure 8.20).

8.3.44 Considering the presence of up to five breeding pairs within 500 m of the Proposed Development and the predicted collision rate, **curlew is scoped in to the assessment**.

*Dunlin*

8.3.45 Flight activity surveys recorded seven flights (Table 8.10), of which our flights were identified to be 'at-risk' (Figure 8.21) which predicted a mean non-breeding collision risk of 0.005 (Table 8.11), or one every 211 years (Table 6.11). All dunlin flight activity was recorded during the non-breeding season (September and October).

8.3.46 Breeding bird surveys recorded a potential breeding dunlin territory within the 500 m study area during the 2016 breeding season (Table 8.13, Figure 8.20).

8.3.47 Considering this species' low on-site activity and negligible predicted risk of collision, **dunlin is scoped out of the assessment**.

*Golden Plover*

8.3.48 Flight activity surveys recorded 123 flights (Table 8.10), of which 51 flights were identified to be 'at-risk' (Figure 8.23a-b) which predicted a mean collision rate of 1.78 per year (Table 8.11), or one every 0.6 years. The majority of golden plover activity was of wintering/non-breeding flocks recorded between August and April with only thirteen of the total 122 flights recorded during flight activity surveys recorded between May and July. Of the flights recorded between May and July, nine of these were of flocks between three and 34 birds and surveys across the four breeding seasons did not identify any breeding activity within the study area. Consequently, golden plover activity recorded at the site is all considered to be of non-breeding, migrating or wintering individuals.

8.3.49 Non-breeding golden plover were infrequently recorded utilising the site itself (i.e. for feeding/roosting) on seven occasions with the majority of golden plover activity recorded flying over the site (32 occasions during walkover surveys and 123 occasions during flight activity surveys) or foraging further afield in the surrounding area. The greater flight activity recorded during the non-breeding season was noted to relate to the large flocks noted gathering in the surrounding lowland fields during migration (autumn and spring).

8.3.50 Considering this species' predicted risk of collision (more than one bird a year), **golden plover (the wider countryside population) is scoped in to the assessment**.

8.3.51 For consideration of the Caithness and Sutherland Peatlands SPA population, refer to Table 8.14 and paragraphs 8.3.66 to 8.3.72.

*Lapwing*

8.3.52 Flight activity surveys recorded 815 flights (Table 8.10), of which 302 flights were identified to be 'at-risk' (Figure 8.24a-b) which predicted a mean collision rate of 1.43 per year (Table 8.11). Lapwing were recorded across all seasons, however as with curlew, the majority of flight activity was recorded between April and July (647 flights). Of the remaining flights, 122 flights were recorded in the migratory months of March and August and 46 flights between the months of September and February. Therefore, for lapwing, separate consideration of the mean breeding (0.62 per breeding season, Table 8.11) and mean non-breeding (0.81 per non-breeding season, Table 8.11) collision rates is considered to be appropriate.

8.3.53 Breeding bird surveys recorded breeding lapwing within the 500 m study area during each of the survey years with an estimated minimum of two and a maximum of seven territories in any one year (Table 8.13, Figure 8.20).

8.3.54 Considering the presence of up to seven breeding pairs within 500 m of the Proposed Development and the predicted collision rate, **lapwing is scoped in to the assessment**.

*Ringed Plover*

8.3.55 Flight activity surveys recorded seven flights (Table 8.10), of which four flights were identified to be 'at-risk' (Figure 8.25) which predicted a mean collision rate of 0.07 per year, or one every 14.2 years (Table 8.11). The majority of ringed plover flight activity (six out of seven records) was recorded between September and February, with a mean non-breeding season collision rate of 0.068, or one every 14.6 non-breeding seasons (with a resulting mean breeding season collision rate of 0.002, or one every 525 breeding seasons).

8.3.56 Breeding bird surveys recorded a single potential ringed plover territory within 500 m of the proposed infrastructure during 2016 surveys (Table 8.13, Figure 8.20). Ringed plover were not recorded during any other surveys.

8.3.57 Considering this species' low on-site activity, limited breeding activity and negligible predicted risk of collision, **ringed plover is scoped out of the assessment**.

*Woodcock*

8.3.58 Woodcock were recorded on two occasions during the 2015/2016 winter walkover surveys (Figure 8.15). Woodcock were not recorded during any other survey types.

8.3.59 Considering this species' very low on-site activity, no record of breeding and no predicted risk of collision, **woodcock is scoped out of the assessment**.

**Other Target Species**

*Arctic Skua*

8.3.60 Flight activity surveys recorded five flights (Table 8.10), of which three flights were identified to be 'at-risk' (Figure 8.26) which predicted a mean collision rate of 0.0016 per year, or one every 639 years (Table 8.11). Arctic skua was not recorded during any other surveys.

8.3.61 Considering this species' very low on-site activity and negligible predicted risk of collision, **arctic skua is scoped out of the assessment**.

*Herring Gull*

8.3.62 Flight activity surveys recorded 123 flights (Table 8.10), of which 48 flights were identified to be 'at-risk' (Figure 8.27) which predicted a mean breeding collision risk of 0.154, or one every 6.5 years (Table 8.11).

8.3.63 Herring gull were also recorded overflying the site during winter walkover surveys (Figure 8.15) and were noted to be foraging in the low-level fields at the northern end of the Proposed Development in small numbers (ten or less) on occasion. Much greater numbers of herring gulls were noted to be present in the fields to the north of the A836 (over 500 m to the north of the site).

8.3.64 Herring gull are included on the North Caithness Cliffs SPA seabird breeding colony species list (Table 8.6). Breeding herring gull can range both inland and offshore to forage, however considering the moorland/upland nature of the site, its value as a foraging resource for any herring gull breeding at the North Caithness Cliffs SPA is considered to be much lower than the surrounding agricultural fields, coastal and offshore foraging habitats. Considering this species' low on-site activity and negligible predicted risk of collision, **herring gull (the wider countryside and North Caithness Cliffs SPA populations) is scoped out of the assessment**.

## Future Baseline

8.3.65 In the absence of the Proposed Development, assuming the continuation of current land management practices, and allowing for changes in bird behaviour related to climate change (e.g., delayed, reduced or increased breeding attempts depending on the species range), the bird populations are likely to continue to be present in largely similar abundances and distributions to those described in the baseline, with any changes in numbers and diversity of species are likely to be a reflection of wider population trends and influences such as climate change rather than site-specific factors.

## Likely Significant Effects on SPAs

8.3.66 Table 8.14 details the qualifying features listed on the three SPAs within 20km of the site in relation to their recommended connectivity distances, based on territory and foraging ranges (SNH 2016b[25]). For the North Caithness Cliffs SPA, only peregrine falcon has been included in Table 8.14 as all the other species for which the SPA is designated (Table 8.6) are considered to be true seabirds and as such the site is unsuitable for these species (in addition, the site is located inland from the SPA and would not be located within any flyways for these species between the SPA and their offshore feeding areas). It should also be noted that herring gull is included in the seabird breeding assemblage (favourable maintained, June 2016; Table 8.6) which is listed as a designated feature of the North Caithness Cliffs SPA. Whilst herring gull was recorded during baseline surveys (paragraphs 8.3.62 to 8.3.64), the importance of the site for foraging herring gull is considered to be limited (the vast majority of herring gulls were observed foraging and commuting over the low-lying fields to the north of the site, Technical Appendix 8.1). As such connectivity with the SPA is considered to be limited at best, and therefore no Likely Significant Effect is predicted.

8.3.67 Foraging ranges are not provided by NatureScot (SNH 2016b[25]) for common scoter, wigeon or wood sandpiper and so approximate foraging ranges have been supplied on the basis of comparative species[47] for which foraging ranges are detailed in the NatureScot (SNH 2016b[25]) connectivity guidance.

**Table 8.14: SPA Qualifying Species and Likely Significant Effects on SPAs**

| SPA Species | Foraging Range (SNH 2016b[25]) | North Caithness Cliffs SPA - 2.4 km | Caithness Lochs SPA - 5.6 km | Caithness and Sutherland Peatlands SPA - 9.1 km |
|---|---|---|---|---|
| Black-throated diver | 10 km | N/A | N/A | Likely Significant Effect |
| Dunlin | 500 m | N/A | N/A | No Likely Significant Effect |
| Golden eagle | 6 km | N/A | N/A | No Likely Significant Effect |
| Golden plover | 3 km | N/A | N/A | No Likely Significant Effect |
| Greenland white-fronted goose | 8 km | N/A | Likely Significant Effect | N/A |
| Greenshank | 2 km | N/A | N/A | No Likely Significant Effect |
| Greylag goose | 15-20 km | N/A | Likely Significant Effect | N/A |
| Merlin | 5 km | N/A | N/A | No Likely Significant Effect |
| Peregrine falcon | 2 km | No Likely Significant Effect | N/A | No Likely Significant Effect |
| Red-throated diver | 8 km | N/A | N/A | N/A |
| Short-eared owl | 2 km | N/A | N/A | No Likely Significant Effect |
| Whooper swan | 5 km | N/A | Likely Significant Effect | No Likely Significant Effect |
| Common scoter | 1-8 km | N/A | N/A | N/A |
| Wigeon | 8 km | N/A | N/A | No Likely Significant Effect |
| Wood sandpiper | 500 m | N/A | N/A | No Likely Significant Effect |

8.3.68 Considering the information detailed in Table 8.14 and the information recorded during baseline surveys, there is potential for connectivity between the site and the Caithness Lochs SPA qualifying features (wintering Greenland white-fronted goose, greylag goose and whooper swan) and as such, with Likely Significant Effects concluded, **the Caithness Lochs SPA (and associated SSSIs/Ramsar) is scoped in to the assessment**.

8.3.69 The Caithness Lochs SPA conservation objectives are detailed below:

[47] Comparative species are: wood sandpiper = dunlin, common scoter = curlew, and wigeon = red-throated diver

- 1) To avoid deterioration of the habitats of the qualifying species (Greenland white-fronted goose, greylag goose and whooper swan) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and
- 2) To ensure for the qualifying species that the following are maintained in the long term:
  - (a) Population of the species as a viable component of the SPA;
  - (b) Distribution of species within the site;
  - (c) Distribution and extent of habitats supporting the species;
  - (d) Structure, function and supporting processes of habitats supporting the species; and
  - (e) No significant disturbance of the species.

8.3.70 Considering the information detailed in Table 8.14, there is theoretical potential for connectivity between the site and the Caithness and Sutherland Peatlands SPA, for breeding black-throated diver. However, black-throated diver were not recorded during any of the baseline surveys undertaken between 2013 and 2017 and no suitable waterbodies for breeding black-throated diver were identified within 2 km of the site. No Likely Significant Effects are therefore predicted and consequently, **the Caithness and Sutherland Peatlands SPA is scoped out of the assessment.** Greylag geese (qualifying species for Ramsar site and SSSI) were only recorded during baseline surveys for the Proposed Development during the migratory and wintering seasons, and therefore unlikely to be part of the Ramsar site/SSSI breeding population. Considering the results of baseline surveys, the Caithness and Sutherland Peatlands Ramsar site and SSSIs are also scoped out of the assessment,

8.3.71 Considering the information detailed in Table 8.14, there is some potential for connectivity between the site and the North Caithness Cliffs SPA breeding peregrine falcon population (the North Caithness Cliffs SPA is 2.4 km to the north of the site). However, peregrine falcon were infrequently recorded across the site, with no evidence of breeding within 2 km of the site and no suitable breeding habitat noted to be available within the site. There was also noted to be limited suitable breeding habitat in the surrounding area, with exception of the sea cliffs (including those of the North Caithness Cliffs SPA) which are over 2 km from the site. The site would therefore be unlikely to form an integral part of the territory of any breeding pair located on the sea cliffs (especially given the large prey resource also located around the sea cliffs). Consequently, **the North Caithness Cliffs SPA (and associated SSSIs) is scoped out of the assessment as no Likely Significant Effects are predicted.**

8.3.72 Lambsdale Leans SSSI includes a breeding bird assemblage as a qualifying feature (Table 8.9) and of the species named within the citation, only breeding greylag goose would be within potential foraging range (15-20 km) of the site (12.4 km from the SSSI). Greylag geese were only recorded during baseline surveys for the Proposed Development during the migratory and wintering seasons, and are therefore unlikely to be part of the SSSI breeding population. **Consequently, the Lambsdale Leans SSSI is scoped out of the assessment.**

## Summary of Scoped-In Important Ornithological Features

8.3.73 The assessment is applied to those scoped-in IOFs detailed in Table 8.15 of medium or high NCI (Table 8.2) that are known to be present within the site or surrounding area (as confirmed though survey results and consultations outlined above).

**Table 8.15: Scoped In IOFs**

| Feature | NCI | Reason for Inclusion |
|---|---|---|
| Greenland white-fronted goose | High | Caithness Lochs SPA connectivity, Annex 1, migratory species. |
| Greylag goose | High | Caithness Lochs SPA connectivity, migratory species. |
| Whooper swan | High | Caithness Lochs SPA connectivity, Annex 1/Schedule 1, migratory species. |
| Pink-footed goose | Medium | BoCC Amber listed, migratory species. |
| Curlew | Medium | BoCC Red listed, sensitive to wind farm developments. |
| Lapwing | Medium | BoCC Red listed, sensitive to wind farm developments. |
| Golden plover | Medium | Annex 1, BoCC Green listed. |

8.3.74 The conservation status of the scoped-in IOFs are detailed in Table 8.16.

**Table 8.16: Conservation Status of Scoped In IOFs**

| IOF | Conservation Status | Information |
|---|---|---|
| Greenland white-fronted goose | Annex 1, Red list (WDp[1/2]) | The UK wintering population is estimated to be 11,500 birds (Woodward *et al.* 2020[48]) with Wilson *et al.* (2015[49]) estimated a peak wintering abundance of 492 birds in NHZ 2 in 2005. |

[48] Woodward, I., Aebischer, N., Burnell, D., Eaton, M., Frost, T., Hall, C., Stroud, D.A. & Noble, D. (2020). Population estimates of birds in Great Britain and the United Kingdom. British Birds 113: 69–104.

[49] Wilson, M. W., Austin, G. E., Gillings, S. and Wernham, C. V. (2015). Natural Heritage Zone Bird Population Estimates. SWBSG Commissioned Report number SWBSG 1504.

| IOF | Conservation Status | Information |
|---|---|---|
| | | The British population's long-term trend (1993/94 to 2018/19) has shown a 34% decrease[50], with the ten-year trend (2008/09 to 2018/19) showing a 10% decrease[50] and is therefore in **unfavourable conservation status**. |
| Greylag goose | Schedule 1, Amber list (WL, WI) | The Scottish population is estimated to be at least 85,000 wintering birds (in addition to the resident breeding population) with over 95% of the Icelandic population wintering in Scotland (Forrester *et al*. 2012[51]). Mitchell *et al*. (2010[52]) estimates a north and west Scotland breeding (British) greylag goose population of 34,500 birds.<br>The breeding (British) greylag goose population is considered to be in **favourable conservation status** with a marked 21% increase between 2008/09 and 2018/19[53].<br>The wintering (Icelandic) greylag goose population is also considered to be in **favourable conservation status** (although there has been a slight decline noted in recent years[54]). |
| Whooper swan | Annex 1, Schedule 1, Amber list (BR, WL) | The Scottish wintering population is estimated to be 4,142 birds (Forrester *et al*. 2012[51]) with Wilson *et al*. (2015[49]) estimating an NHZ 2 peak wintering abundance of 706 birds in 2005 and Woodward *et al*. (2020[48]) estimating a GB population of 16,000. Wintering whooper swan in Scotland are almost exclusively from Iceland and population trends provided by the WWT[55] indicate that whooper swan are likely to be in **favourable conservation status**. |
| Pink-footed goose | Amber list (WL, WI) | The Scottish population is estimated to be 200,000 in October and 100,000-150,000 in winter/spring (Forrester *et al*. 2012[51]), with Wilson *et al*. (2015[49]) estimating a peak wintering abundance of 20,746 in NHZ 2 in 2005. Mitchell and Hearn (2004[56]) noted that pink-footed goose populations have increased greatly from the mid-1950s (20,000-30,000 birds) to mid-1990s (200,000-250,000 birds) and pink-footed goose has remained on the Amber list between the BoCC 3 (2009[57]) and BoCC 5 (2021[31]) reports. Overall, the wintering population is considered to be in **favourable conservation status**. |
| Curlew | Red List (BDp[2], BDMp[1], WDMp[1], BI) | The national curlew population was most recently estimated to be 58,500 pairs in 2016 (BTO BirdTrends 2020[58]) with the NHZ 2 population estimated by Wilson *et al*. (2015[49]) to be 3,233 (2,915-3,551) pairs in 2005. The inclusion of the species on the BoCC Red list since BoCC 4 (2015[59]) suggests that the national and regional populations are in **unfavourable conservation status**. |
| Lapwing | Red list (BDp[2], ERLOB, BDMp[1], WDMp[1]) | The national lapwing population was estimated to be 97,500 pairs in 2016 (BTO BirdTrends 2020[58]) and the Scottish population is estimated to be between 71,500 and 105,600 pairs (Forrester *et al*. 2012[51]).<br>BTO BirdTrends (2020)[58] has reported a decline in Scotland of 39% between 2008 and 2018 and an increase of 10% between 2013 and 2018 and notes that declines have been strongest in lowland regions/the south and that there may have been some increases in some upland/northern regions of Britain, with the Uists population of particular importance (long-term stable). The NHZ trend is unknown but the regional and national populations are on balance likely to be in **unfavourable conservation status**. |
| Golden plover | Annex 1, Green list | The British wintering population is estimated to be 400,000 (Woodward *et al*. 2020[48]) with the Scottish population estimated to be up to 60,000 in the autumn, 35,000 in mid-winter and 30,000 in the spring (Forrester *et al*. 2012[51]). The north east Scotland estuarine coastal estimates represent around 13% of the Scottish coastal total which would indicate a regional spring, autumn and winter population between 3,900 and 7,800 individuals. Given that in the region of 15,000 to 20,000 birds also winter inland and that rocky coasts are not included in the coastal estimates (Forrester *et al*. 2012[51]), the adjusted regional golden plover population for north east Scotland is estimated to lie between 5,850 and 10,400 birds. Golden plover continues to be included on the BoCC Green list (Stanbury *et al*. 2021[31]). Overall, the wintering population is considered to be in **favourable conservation status**. |

BoCC Red-list criteria (Stanbury *et al*. 2020[31])
BDp[1/2]: severe breeding population decline over 25 years/longer term.
WDp[1/2]: severe breeding population decline over 25 years/longer term.
BoCC Amber-list criteria (Stanbury *et al*. 2020[31])
ERLOB: threatened in Europe.
BDMp[1]: moderate breeding population decline over 25 years/longer term.
WDMp[1]: moderate non-breeding population decline over 25 years/longer term.
BI: breeding international importance.
BR: breeding rarity.
WL: non-breeding localisation.
WI: non-breeding international importance.

[50] https://monitoring.wwt.org.uk/our-work/goose-swan-monitoring-programme/species-accounts/greenland-white-fronted-goose/ (accessed April 2022)
[51] Forrester, R.W., Andrews, I.J., McInerny, C.J., Murray, R.D., McGowan, R.Y., Zonfrillo, B., Betts, M.W., Jardine, D.C. & Grundy, D.S. (eds) 2012. The Digital Birds of Scotland. The Scottish Ornithologists' Club, Aberlady.
[52] Mitchell, C., Griffin, L., Trinder, M. & Newth, J. (2010). The population size of breeding greylag geese *Anser anser* in Scotland in 2008/09. Scottish Natural Heritage Commissioned Report No. 371.
[53] https://monitoring.wwt.org.uk/our-work/goose-swan-monitoring-programme/species-accounts/british-greylag-goose/ (accessed April 2022)
[54] https://monitoring.wwt.org.uk/our-work/goose-swan-monitoring-programme/species-accounts/iceland-greylag-goose/ (accessed April 2022)
[55] https://monitoring.wwt.org.uk/our-work/goose-swan-monitoring-programme/species-accounts/whooper-swan/ (accessed April 2022)
[56] Mitchell, CR & RD Hearn. 2004. Pink-footed Goose Anser brachyrhynchus (Greenland/Iceland population) in Britain 1960/61 – 1999/2000. Waterbird Review Series, The Wildfowl & Wetlands Trust/Joint Nature Conservation Committee, Slimbridge.
[57] Eaton, M. A., Brown, A. F., Noble, D. G., Musgrove, A. J., Hearn, R. D., Aebischer, N. J., Gibbons, D. W., Evans, A., & Gregory, R. D. 2009. Birds of Conservation Concern 3: the population status of birds in the United Kingdom, Channel Islands and Isle of Man. British Birds 102: 296–341.
[58] https://www.bto.org/our-science/publications/birdtrends/birdtrends-2020-trends-numbers-breeding-success-and-survival-uk (accessed April 2022)
[59] Eaton, M. A., Aebischer, N., Brown, A., Hearn, R., Lock, L., Musgrove, A., Noble, D., Stroud, D., and Gregory, R. 2015. Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and Isle of Man. British Birds 108: 708–746.

## 8.4 Assessment of Likely Effects

8.4.1 This section provides an assessment of the likely effects of the Proposed Development on the IOFs identified through the baseline studies and scoping-in assessment. The assessment of effects is based on the project description outlined in Chapter 2: Proposed Development and is structured as follows:

- Construction effects – disturbance and habitat loss;
- Operational effects – collision risk;
- Operational effects – displacement;
- Decommissioning effects; and
- Cumulative/In Combination effects.

### Project Assumptions

8.4.2 The assessment below also makes the following assumptions:

- All electrical cabling between the proposed turbines and the associated infrastructure will be underground in shallow trenches which would be reinstated post-construction and, in most cases, follow the proposed access tracks.
- Any ground disturbance around permanent infrastructure during construction will be temporary and surface conditions will be reinstated or restored before the construction period ends. The only excavation in these areas will be for cabling as noted above and otherwise may only be periodically used for side-casting of spoil until reinstatement.
- To ensure all reasonable precautions are taken to avoid negative effects on ornithological interests during construction and decommissioning, the Applicant will appoint a suitably qualified Ecological Clerk of Works (ECoW) prior to the commencement of construction and decommissioning and they will advise the developer and the Principal Contractor on all ornithological matters (with the assistance of a suitably qualified/licenced ornithologist if required). The ECoW will be required to be present on the site during the construction and decommissioning periods and will carry out monitoring of works and briefings with regards to any ornithological sensitivities on the site to the relevant staff within the principal contractor and subcontractors.
- A Bird Disturbance Management Plan (BDMP) will be implemented during construction and decommissioning of the Proposed Development. The BDMP will detail measures to ensure legal compliance and safeguard birds known to be in the area. The BDMP shall include pre-construction surveys and good practice measures during construction. Pre-construction surveys will be undertaken to check for any new breeding/wintering bird activity in the vicinity of the construction/decommissioning works.
- Work on the Proposed Development, including vegetation clearance and construction of the site access tracks, turbine hard standings and site compound and erection of the turbines is predicted to last for approximately 12 months. The number of bird breeding seasons potentially disrupted would depend on the month in which construction commences and the breeding season of the potentially affected species. The main breeding season of most birds at the site would extend from April to July. For the purposes of this assessment, it is assumed that, for any given species of bird, construction activities would commence during the breeding season and would therefore potentially affect a maximum of up to two breeding seasons, assuming that construction will take approximately 12 months.

### Habitats Regulations Appraisal

8.4.3 Impacts relating to non-breeding Greenland white-fronted goose, whooper swan and greylag goose also require consideration within the context of the Caithness Lochs SPA via the HRA process, in addition to the wider countryside population. With regards to the HRA (as detailed above in paragraphs 8.2.19 to 8.2.20), and as previously stated, the Proposed Development is not directly connected to, or necessary for the management of, the SPA (Step 1) and it is considered likely to have a significant effect, either alone or in combination, on the SPA (Step 2). Step 3 therefore requires an Appropriate Assessment to be undertaken on the implications for the SPA's conservation objectives. This chapter provides information to inform the Appropriate Assessment.

### Potential Construction Effects

8.4.4 The main potential impacts of construction activities across the Proposed Development are the displacement and disruption of breeding, foraging and roosting birds as a result of noise and visual disturbance over a short-term period (either the duration of a particular construction activity within working hours, or the duration of the whole construction period).

8.4.5 Impacts on birds would be confined to areas in the locality of temporary construction compounds, turbines, tracks and other infrastructure. Few attempts have been made to quantify the impacts of disturbance of birds due to activities of this type, and much of the available information is inconsistent. However, as a broad generalisation, larger bird species such as raptors, or those that feed in flocks

in the open tend to be more susceptible to disturbance than small birds living in structurally complex habitats (such as woodland, scrub and hedgerow) (Hill *et al*. 1997[60]).

8.4.6 Direct habitat loss would also occur due to the Proposed Development's construction, which would be both temporary (e.g., construction compounds, laydown areas) or longer term (access tracks and turbines). This has the potential to impact on breeding, foraging or roosting individuals.

**Geese and Swans**

8.4.7 **Impact – foraging displacement:** in a recent review, Olsson (2018[61]) found that although there are large variations in responses among geese species, individual populations, seasons, sources and levels of disturbance, disturbance effects on geese have been observed at distances up to 500m (see for example, Vickery and Gill 1999[62], Jensen *et al*. 2017[63]).

8.4.8 Construction phase activities may therefore disturb birds from foraging areas located within 500 m[64] of the Proposed Development, mainly as a result of increased human activity.

8.4.9 **Impact – roosting:** wintering whooper swan may be disturbed from intermittently roosting/resting on the lochan at Hill of Forss (located within the site) during construction.

8.4.10 Sensitivity:

- Greenland white-fronted goose – high NCI (Table 8.15) and unfavourable conservation status (Table 8.16). High sensitivity;
- Greylag goose – high NCI (Table 8.15) and favourable conservation status (Table 8.16). Medium-high sensitivity;
- Whooper swan – high NCI (Table 8.15) and favourable conservation status (Table 8.16). Medium-high sensitivity; and
- Pink-footed goose – medium NCI (Table 8.15) and favourable conservation status (Table 8.16). Low-medium sensitivity.

8.4.11 **Magnitude of impact:** foraging geese and swans are widely distributed in the lowland areas (comprising of arable/semi-improved grassland fields) that surround the site (Figures 8.5 to 8.8) and birds have been recorded in one main area within 500 m of planned infrastructure relating to the Proposed Development. It is worth noting that no foraging geese or swans were recorded within 500 m of the turbine locations (in fact there are only four foraging records within 1 km of the turbines, all of greylag goose), but rather there are foraging records within 500 m of the track that heads north to the A836.

8.4.12 Madsen (1985[65]) monitored the impact of roads and landscape features on field utilization of pink-footed geese in autumn and spring. It was found that the disturbance distance of roads with traffic volume of more than 20 cars per day was around 500m in autumn, but less in spring. Lanes with 0–10 cars per day also had a depressing effect on utilization. Windbreaks, banks, and other features which hinder an open view, had disturbance distances of approximately 200–300 m. Larger, more heavily used roads have been reported to result in a smaller disturbance effect, as geese tend to get used to the constant disturbance, compared to smaller roads where traffic is more irregular (Giroux and Patterson 1995[66], Jensen *et al*. 2017[63]).

8.4.13 To the north, greylag goose and pink-footed goose have been recorded foraging in the fields surrounding Burn of Brims Farm (just to the north of the A836) and so construction activities relating to the building/upgrading of the main track that will connect the Proposed Development to the A836 may temporarily displace foraging birds. Approximately the northernmost 350 m of this track may be within 500 m of these foraging geese, however the presence of the A836 may have already habituated birds in these fields to vehicular activity. It is likely that any disturbed birds foraging within 500 m of the track will move further north west (towards West Brims Farm) to the other fields where foraging geese and swans were also recorded. The impact on foraging geese and swans foraging near Burn of Brims Farm is considered to be of **negligible** and **short-term** magnitude at a population level.

8.4.14 Whooper swan were infrequently recorded on the lochan at Hill of Forss (once during the 2013/2014 non-breeding season and on seven occasions during the 2015/2016

[60] Hill, D.A., D. Hockin, D. Price, G. Tucker, R. Morris, and J. Treweek. (1997). Bird disturbance: improving the quality of disturbance research. Journal of Applied Ecology 34:275-288.
[61] Olsson, C. (2018). Foraging and movement patterns by geese in agricultural landscapes. Swedish University of Agricultural Sciences, Uppsala.
[62] Vickery, J. A. & Gill, J. A. 1999. Managing grassland for wild geese in Britain: a review. Biological Conservation, 89, 93-106.
[63] Jensen, G. H., Pellissier, L., Tombre, I. M. & Madsen, J. (2017). Landscape selection by migratory geese: implications for hunting organisation. Wildlife Biology, 12.
[64] This precautionary buffer distance that has been previously applied in relation to foraging/roosting geese at other wind farm sites by MacArthur Green and NatureScot.
[65] Madsen, J. (1985) Impact of disturbance on field utilisation of Pink-footed Geese in West Jutland, Denmark. Biological Conservation, 33, 53-63.
[66] Giroux, J.-F. & Patterson, I. J. (1995). Daily movements and habitat use by radiotagged Pink-footed Geese Anser brachyrhynchus wintering in northeast Scotland. Wildfowl, 46, 31-44.

non-breeding season) with between two and 13 birds recorded. The 2015/2016 records were scattered across the season, with one record in November, four records in December and two records in January. No observations of foraging whooper swan were recorded within 1km of the Proposed Development and surveys during the 2012/2013 and 2016/2017 non-breeding seasons did not locate any evidence of whooper swan using the lochan at Hill of Forss. Considering the baseline results, it is considered that the use of the lochan by wintering whooper swan is sporadic and the lochan does not appear to be an established roosting location. The effect of construction-related disturbance on roosting/resting whooper swan is considered to be of **negligible** and **short-term** magnitude at a population level.

8.4.15 The habitat directly surrounding the Proposed Development is considered to be of limited suitability to foraging geese and swans, being mainly wet heath/wet modified bog/marshy grassland (which can be suitable for white-fronted geese, however there is a lack of records in this area to suggest that it is a core foraging area) and this is confirmed by the results of the foraging goose and swan surveys. Consequently, the loss of some of these habitats as a result of the Proposed Development is considered to be **negligible**.

8.4.16 **Significance of effect (EIA):** the unmitigated impact during construction on foraging geese and swans and roosting/resting whooper swan is considered to be no more than **minor adverse** at respective population levels, and is therefore **not significant** in the context of the EIA regulations.

8.4.17 **Effects on SPA (HRA):** in light of the potential connectivity (for Greenland white-fronted goose, greylag goose and whooper swan) between the Proposed Development and the Caithness Lochs SPA, the impact must also be considered within the context of the HRA process and the information provided here may also inform an appropriate assessment. Based on the above considerations, there are considered to be **no adverse effects on the integrity of the Caithness Lochs SPA** under the HRA process (paragraphs 8.2.19 to 8.2.20 and paragraph 8.3.69) due to construction-related disturbance-displacement impacts.

**Curlew and Lapwing**

8.4.18 **Impact**: breeding and/or foraging curlew and lapwing may be displaced from the site during construction, either by disturbance or direct habitat loss.

8.4.19 **Sensitivity**: medium NCI (Table 8.15) and unfavourable conservation status (Table 8.16). Medium-high sensitivity for both species.

8.4.20 **Magnitude of impact**: between two and five curlew and two and seven lapwing territories were identified within 500 m of the proposed infrastructure in any one year. The curlew NHZ 2 breeding population is estimated to be 3,233 pairs (Wilson *et al*. 2015[49]), and the potential (temporary) loss of between 2-5 curlew territories would result in a loss of up to 0.15% of the breeding population. It should however be noted that it is unlikely that all breeding curlew activity would be entirely lost from the population during construction as there is additional suitable breeding habitat surrounding the site and it is more likely that any curlew that may have bred near the site would be displaced to adjacent habitat. As a worst-case (where breeding would be lost rather than displaced), an impact of **low** and **short-term** magnitude is predicted.

8.4.21 The NHZ 2 lapwing population is unknown but based on the Scottish population of 71,500 to 105,600 pairs and considering the breeding distribution map presented in Forrester *et al*. (2012[51]), there is likely to be a minimum of 5,000 breeding pairs in Caithness. The potential (temporary) loss of 2-7 lapwing territories would result in a loss of up to 0.14% of the breeding population. It should however be noted that it is unlikely that all breeding lapwing activity would be entirely lost from the population during construction as there is additional suitable breeding habitat surrounding the site and it is more likely that any lapwing that may have bred near the site would be displaced to adjacent habitat. As a worst-case (where breeding would be lost rather than displaced), an impact of **low** and **short-term** magnitude is predicted.

8.4.22 **Significance of effect**: the unmitigated effect during construction for curlew and lapwing is considered to be **minor adverse** and is therefore **not significant** in the context of the EIA regulations.

**Golden Plover**

8.4.23 **Impact**: wintering golden plover may be displaced from the site during construction, either by disturbance or direct habitat loss.

8.4.24 **Sensitivity**: medium NCI (Table 8.15) and favourable conservation status (Table 8.16). Low-medium sensitivity.

8.4.25 **Magnitude of impact**: non-breeding golden plover were infrequently recorded on the site during baseline surveys with the vast majority of records of birds flying over the site. Of the birds recorded on the site, flock sizes were mainly between one and six birds with two records of flocks of 50 birds. A small number of foraging golden plover may therefore be displaced during construction however given the abundance

of similar suitable habitat within the wider area, any impact is considered to be of **negligible** and **short-term** magnitude.

8.4.26 **Significance of effect**: the unmitigated effect during construction for golden plover is considered to be **negligible** and is therefore **not significant** in the context of the EIA regulations.

### Potential Operational Effects – Collision Risk

8.4.27 Birds that utilise the airspace within the site at potential collision heights during the lifetime of the Proposed Development will be at risk of collision with turbines. The risk of collision with moving wind turbine blades may be related to various factors including the amount of flight activity over the site, the topography of the site, the species' behaviour, and the ability of birds to detect and manoeuvre around rotating turbine blades. Collision risk modelling was undertaken as part of the baseline survey analysis (refer to Table 8.11 and Technical Appendix 8.1) which results in a figure for the estimated collision rate at the wind farm which is then (for those species 'scoped in' to the assessment) assessed within the context of the species' relevant populations to determine the significance of any losses.

8.4.28 **Impact**: birds flying within the turbine area may be subject to a collision risk with turbines or other infrastructure, thereby potentially affecting annual mortality rates at a population level. For Greenland white-fronted goose, greylag goose and whooper swan, annual mortality rates at the Caithness Lochs SPA population level may also be affected and are considered below within an HRA context.

**Whooper Swan**

8.4.29 **Sensitivity**: medium-high.

8.4.30 **Magnitude of impact**: whooper swan were recorded in relatively low numbers across the four non-breeding seasons (2012/2013 – one record, 2013/2014 – eight records, 2015/2016 – 14 records, 2016/2017 – seven records) and a mean non-breeding collision rate of 0.015 (or one every 66 non-breeding seasons) is predicted for whooper swan (Table 8.11, Technical Appendix 8.1 Annex B).

8.4.31 The NHZ 2 wintering population is estimated to be 706 birds (Wilson *et al*. 2015[49]) and the additional mortality due to collisions would be an increase over the baseline mortality rate (0.199, BTO BirdFacts[67]) of 0.010%. This increase in baseline mortality is considered to be of **negligible** and **long-term** magnitude.

8.4.32 The Caithness Lochs SPA wintering population is estimated to be 240 birds (Table 8.7) and the additional mortality due to collision would be an increase over the baseline mortality rate of 0.031%.

8.4.33 **Significance of effect (EIA)**: the unmitigated effect on the NHZ 2 whooper swan population is considered to be minor adverse and is therefore not significant in the context of the EIA regulations.

8.4.34 **Effect on SPA (HRA)**: based on the above consideration, there are considered to be no adverse effects on the integrity of the Caithness Lochs SPA under the HRA process (paragraphs 8.2.19 to 8.2.20 and paragraph 8.3.69).

**Greenland White-Fronted Goose**

8.4.35 Sensitivity: high.

8.4.36 **Magnitude of impact**: Greenland white-fronted geese were recorded in relatively low numbers across two non-breeding seasons (2012/2013 and 2013/2014 – no records, 2015/2016 – one record, 2016/2017 – 14 records) and a mean non-breeding collision rate of 0.002 (or one every 485 non-breeding seasons) is predicted for Greenland white-fronted goose (Table 8.11, Technical Appendix 8.1 Annex B).

8.4.37 The NHZ 2 wintering population is estimated to be 492 birds (Wilson *et al*. 2015[49]) and the additional mortality due to collision would be an increase over the baseline mortality rate (0.276, BTO BirdFacts[68]) of 0.0014%. This increase in baseline mortality is considered to be of negligible and long-term magnitude.

8.4.38 The Caithness Lochs SPA wintering population is estimated to be 440 birds (Table 8.7) and the additional mortality due to collision would be an increase over the baseline mortality rate of 0.001%.

8.4.39 **Significance of effect (EIA)**: the unmitigated effect on the NHZ 2 Greenland white-fronted goose population is considered to be **minor adverse** and is therefore **not significant** in the context of the EIA regulations.

8.4.40 **Effect on SPA (HRA):** based on the above consideration, there are considered to be no adverse effects on the integrity of the Caithness Lochs SPA under the HRA process.

**Greylag Goose**

8.4.41 **Sensitivity**: medium-high.

[67] https://app.bto.org/birdfacts/results/bob1540.htm (accessed April 2022)

[68] https://app.bto.org/birdfacts/results/bob1590.htm (accessed April 2022)

8.4.42 **Magnitude of impact**: greylag geese were recorded frequently across the four non-breeding seasons (2012/2013 – 31 records, 2013/2014 – 86 records, 2015/2016 – 51 record, 2016/2017 – 198 records) and a mean non-breeding collision rate of 0.345 (or one every 2.9 non-breeding seasons) is predicted for greylag goose (Table 8.11, Technical Appendix 8.1 Annex B).

8.4.43 The Scottish wintering population (no NHZ 2 non-breeding population estimate provided) is estimated to be at least 85,000 birds (Table 8.16) and the additional mortality due to collision would be an increase over the baseline mortality rate (0.276, BTO BirdFacts[69]) of 0.001%. This increase in baseline mortality is considered to be of **negligible** and **long-term** magnitude.

8.4.44 The Caithness Lochs SPA wintering population is estimated to be 7,190 birds (Table 8.7) and the additional mortality due to collision would be an increase over the baseline mortality rate of 0.017%.

8.4.45 **Significance of effect (EIA)**: the unmitigated effect on the NHZ 2 greylag goose population is considered to be **minor adverse** and is therefore **not significant** in the context of the EIA regulations.

8.4.46 **Effect on SPA** (HRA): based on the above consideration, there are considered to be no adverse effects on the integrity of the Caithness Lochs SPA under the HRA process.

**Pink-Footed Goose**

8.4.47 **Sensitivity**: low-medium.

8.4.48 **Magnitude of impact**: pink-footed geese were recorded frequently across the four non-breeding seasons (2012/2013 – no records, 2013/2014 – 35 records, 2015/2016 – 30 records, 2016/2017 – 116 records) and a mean non-breeding collision rate of 2.24 (or one every 0.4 non-breeding seasons) is predicted for pink-footed goose (Table 8.11, Technical Appendix 8.1 Annex B).

8.4.49 The NHZ 2 wintering population is estimated to be at least 20,746 birds (Table 8.16) and the additional mortality due to collision would be an increase over the baseline mortality rate (0.171, BTO BirdFacts[70]) of 0.063%. This increase in baseline mortality is considered to be of **negligible** and **long-term** magnitude.

8.4.50 **Significance of effect**: the unmitigated effect on the NHZ 2 pink-footed goose population is considered to be **negligible** and is therefore **not significant** in the context of the EIA regulations.

**Curlew and Lapwing**

8.4.51 **Sensitivity**: medium-high.

8.4.52 **Magnitude of impact**: curlew were regularly recorded during the breeding seasons and tended to be absent from the site between August and February with only three of the total 242 flightlines recorded observed between these months and flight activity largely associated with breeding territories. A mean annual collision rate of 0.233 (one every 4.3 years) is predicted for curlew (Table 8.11, Technical Appendix 8.1 Annex B). The NHZ 2 breeding population is estimated to be 3,233 pairs (Wilson *et al*. 2015[49]) and the additional mortality due to collision would be an increase over the baseline mortality rate (0.264, BTO BirdFacts[71]) of 0.014%. The increase in baseline mortality for curlew is considered to be of **negligible** and **long-term** magnitude.

8.4.53 Lapwing showed a similar spatial and temporal distribution to curlew. A mean annual collision rate of 1.43 (one every 0.7 years) is predicted for lapwing at the Proposed Development (Table 8.11, Technical Appendix 8.1 Annex B). The Caithness breeding population is considered to be at least 5,000 pairs and the additional mortality due to collision would be an increase over the baseline mortality rate (0.295, BTO BirdFacts[72]) of 0.048%. The increase in baseline mortality for lapwing is considered to be of **negligible** and **long-term** magnitude.

8.4.54 **Significance of effect**: the unmitigated effect on the NHZ 2 curlew and regional lapwing populations is considered to be **minor adverse** and is therefore **not significant** in the context of the EIA regulations.

**Golden Plover**

8.4.55 **Sensitivity**: low-medium.

8.4.56 **Magnitude of impact**: considering their presence during the non-breeding season, the regional migrating and wintering populations are considered to be the appropriate reference populations of which the north east Scotland wintering population is considered to be between 5,850 and 10,400 birds (Table 8.16).

[69] https://app.bto.org/birdfacts/results/bob1610.htm (accessed April 2022)
[70] https://app.bto.org/birdfacts/results/bob1580.htm (accessed April 2022)
[71] https://app.bto.org/birdfacts/results/bob5410.htm (accessed April 2022)
[72] https://app.bto.org/birdfacts/results/bob4930.htm (accessed April 2022)

Considering an annual adult mortality of 0.27 (BTO Bird Facts[73]), this would equate to a background loss of 1,580 to 2,808 birds per year from the north east Scotland regional population. The additional predicted loss of 1.78 birds per year due to collisions would therefore equate to an additional mortality between 0.06 and 0.11%. The increase in baseline mortality for golden plover is considered to be of **negligible** and **long-term** magnitude.

8.4.57 **Significance of effect**: the unmitigated effect on the north east Scotland wintering golden plover population is considered to be **negligible** and is therefore **not significant** in the context of the EIA regulations.

## Potential Operational Effects – Displacement

8.4.58 The displacement of nesting and foraging birds from the site has the potential to extend beyond the construction phase, as described above, and to occur during the operational phase. It is recognised that disturbance may occur due to maintenance activities throughout the operational phase, although since these are likely to be of shorter duration and smaller extent than construction activities, effects will be lower than those predicted for construction effects (see previous section)

**Geese and Swans**

8.4.59 Rees (2012[74]) reviewed evidence for behavioural responses of geese to wind farms in literature published up to early 2012. She concluded that there was insufficient evidence at that time to determine whether landscape-scale displacement of foraging geese occurred as a result of wind farms. However, she concluded that geese tend to avoid foraging within 100 m of wind turbines, and that geese tended to alter flight direction when between 5 km and 1 km distant, to avoid entering wind farms and so may experience a barrier effect. This was confirmed by Plonczkier and Simms (2012[75]), who used radar to track flights of geese near to an operational offshore wind farm, and concluded that geese showed very high macro-avoidance, over 94% of flocks adjusting their flight direction to avoid entering the wind farm.

8.4.60 Rees (2012[74]) concluded that available evidence at that time was insufficient to assess the scale or extent of displacement of geese. Several detailed studies have however improved the evidence base. While Larsen and Madsen (2000[76]) found that pink-footed geese tended to avoid foraging within 100m of wind turbines, Madsen and Boertmann (2008[77]) showed that these birds demonstrated habituation to the presence of turbines, foraging in 50% smaller avoidance distances than they had initially shown when the wind farms first became operational. Habituation of foraging habitat use by geese and other birds to the presence of operational wind farms has also been shown by Farfan *et al.* (2017[78]).

8.4.61 Zehtindjiev *et al.* (2017[79]) concluded that wind farms in agricultural habitat did not cause any displacement at a landscape scale of red-breasted geese wintering in Bulgaria. Harrison *et al.* (2018[80]) did find local displacement by wind turbines of white-fronted geese wintering in Bulgaria, but considered that the displacement was very small scale, with densities reduced <100 m from turbines. The main determinant of foraging goose density in their study was distance from the roost site rather than presence of wind farms or other human structures such as roads and power lines which had only very local effects (Harrison *et al.* 2018[80]).

8.4.62 **Impact – foraging, roosting and flight path displacement**: the turbines and operational activities (e.g. turbine maintenance) may displace birds flying between established foraging and roosting areas or disturb birds from foraging areas located within 100 m of the proposed infrastructure.

8.4.63 Sensitivity:

- Greenland white-fronted goose – high;
- Greylag goose – medium-high;
- Whooper swan – medium-high; and
- Pink-footed goose – low-medium.

8.4.64 **Magnitude of impact**: foraging geese and swans are widely distributed in the lowland areas (comprising of arable/semi-improved grassland fields) that surround

[73] https://app.bto.org/birdfacts/results/bob4850.htm (accessed April 2022)
[74] Rees, E.C. (2012). Impacts of wind farms on swans and geese: a review. Wildfowl 62: 37-72.
[75] Plonczkier, P., and Simms, I.C. (2012). Radar monitoring of migrating pink-footed geese: behavioural responses to offshore wind farm development. Journal of Applied Ecology, 49, 1187-1194.
[76] Larsen J. K. and Madsen, J. (2000). Effects of wind turbines and other physical elements on field utilization by pink-footed geese (Anser brachyrhynchus): A landscape perspective. Landscape Ecology 15: 755–764.
[77] Madsen, J. and Boertmann, D. (2008). Animal behavioural adaptation to changing landscapes: spring-staging geese habituate to wind farms. Landscape Ecology 23: 1007-1011.
[78] Farfan, M.A., Duarte, J., Real, R., Munoz, A.R., Fa, J.E. and Vargas, J.M. (2017). Differential recovery of habitat use by birds after wind farm installation: A multi-year comparison. Environmental Impact Assessment Review 64: 8-15.
[79] Zehtindjiev, P., Vasilev, V., Marinov, M.P., Ilieva, M., Dimitrov, D., Peev, S., Raykov, I., Raykova, V., Ivanova, K., Bedev, K. and Yankov, Y. (2017). No evidence for displacement of wintering red-breasted geese Branta ruficollis (Pallas, 1769) (anseriformes) at a wind farms area in northern Bulgaria: Long-term monitoring results. Acta Zoologica Bulgarica 69: 215-228.
[80] Harrison, A.L., Petkov, N., Mitev, D., Popgeorgiev, G., Gove, B. and Hilton, G.M. (2018). Scale-dependent habitat selection by wintering geese: implications for landscape management. Biodiversity and Conservation 27: 167-188.

the site (Figures 8.5 to 8.8); however, no foraging geese or swans were recorded within 500 m of the turbine locations (in fact there are only four foraging records within 1 km of the turbine locations, all greylag goose), but only within 500m of the track that heads north to the A836. Considering that no geese or swans were recorded foraging within 500 m of the turbine locations, displacement as a result of turbine operation, or maintenance activities on the turbines themselves is considered unlikely and vehicular movements along the tracks extending to the north and south of the site are also not considered likely to disturb feeding geese. The impact on foraging geese and swans is considered to be an effect of **negligible** and **long-term** magnitude.

8.4.65 Whooper swan were infrequently recorded on the lochan at Hill of Forss (paragraph 8.4.14, 109m from T3), which does not appear to be an established roosting location. The potential loss of this lochan (due to displacement rather than the physical loss of the lochan) for migratory whooper swan is therefore considered to be an impact of **low** and **long-term** magnitude at a population level. The Hill of Forss lochan is 6.3 km to the north of the Caithness Lochs SPA and considering the foraging range of 5 km (SNH 2016b[25]) is considered unlikely to be a core roosting location for whooper swan from the Caithness Lochs SPA.

8.4.66 **Significance of effect (EIA):** the unmitigated effect during operation on foraging geese and swans and roosting/resting whooper swan is considered to be **minor adverse** and is therefore **not significant** in the context of the EIA regulations.

8.4.67 **Effect on SPA (HRA):** based on the above consideration, there are considered to be no adverse effects on the integrity of the Caithness Lochs SPA under the HRA process.

**Curlew and Lapwing**

8.4.68 **Impact**: breeding and/or foraging curlew and lapwing may be displaced from the site during operation, either by disturbance or direct habitat loss.

8.4.69 **Sensitivity**: medium-high.

8.4.70 **Magnitude of impact**: between two to five curlew and two to seven lapwing territories were identified within 500 m of the proposed infrastructure in any one year. The curlew NHZ 2 breeding population is estimated to be 3,233 pairs (Wilson *et al*. 2015[49]), and the potential loss of a maximum worst-case of five curlew territories would result in a loss of up to 0.15% of the NHZ 2 breeding population, an effect of **low** and **long-term** magnitude.

8.4.71 The NHZ 2 population is unknown for lapwing, however based on the Scottish population of 71,500 to 105,600 pairs and considering the breeding distribution map presented in Forrester *et al*. (2012[51]), there is likely to be a minimum of 5,000 breeding pairs in Caithness. The potential loss of a maximum worst-case of seven lapwing territories would result in a loss of up to 0.14% of the NHZ 2 breeding population, an effect of **low** and **short-term** magnitude.

8.4.72 It should be noted for both species that it is unlikely that the worst-case number of pairs of each species would be permanently lost from the breeding populations as there will continue to be suitable similar habitat outwith the Proposed Development that some pairs (if not all) may be displaced into. Furthermore, it should be noted that whilst it has been suggested that curlew nest densities may be reduced within 800m of turbines (Pearce-Higgins *et al*. 2009[81]), Whitfield *et al*. (2010[82]) offers little support to the hypothesis that breeding curlew are displaced by operational turbines (even at 200m). In addition, the authors suggested that there is no correlation between nesting success and turbine proximity (Whitfield *et al*. 2010[82]). There is direct evidence of this at the operational Tangy I and Tangy II wind farms where a curlew territory has been recorded within 50 m of a turbine during the 2012 (Tangy II baseline) and 2017 (Tangy IV baseline surveys, Tangy IV EIAR[83]), indicating that curlew at Tangy Wind Farm have continued to breed within the vicinity of operational turbines, further supporting the apparent tolerance to wind farms in this species, and possibly indicating habituation to the presence of turbines. Consequently, there is evidence to indicate that there is limited correlation between nesting success of waders and turbine proximity and that therefore birds may continue to nest successfully in proximity to turbines.

8.4.73 **Significance of effect**: the unmitigated effect during operation for curlew and lapwing is considered to be **minor adverse** and is therefore **not significant** in the context of the EIA regulations.

[81] Pearce-Higgins, J.W., Stephen, L., Langston, R.H.W., Bainbridge, I.P. and Bullman, R. (2009). Distribution of breeding birds around upland Windfarms. Journal of Applied Ecology 46: 1323-1331.
[82] Whitfield, D.P., Green, M. and Fielding, M.H. (2010). Are breeding curlew Numenius arquata displaced by wind energy developments? Natural Research Projects Ltd, Banchory.
[83] https://publicaccess.argyll-bute.gov.uk/online-applications/applicationDetails.do?keyVal=PEY7L8CH0GB00&activeTab=summary (accessed April 2022)

**Golden Plover**

8.4.74 **Impact**: wintering golden plover may be displaced from the site during operation, either by disturbance or direct habitat loss.

8.4.75 **Sensitivity**: low-medium.

8.4.76 **Magnitude of impact**: the results of a long-term study of golden plover breeding success within an active wind farm suggests minimal effects on the species' behaviour (Fielding & Howarth 2015[84]). Similarly, Pearce-Higgins *et al.* (2012[85]) reported no significant effect of wind farm construction or operation on golden plover densities. More recently Sansom *et al.* (2016[86]) have shown information to suggest that breeding golden plovers may be affected by operational turbines up to 400 m away. In addition, golden plover are known to have frequently overwintered at operational wind farms in central Scotland with operational monitoring not identifying any signs of disturbance/displacement. The impact is considered to be of **negligible** and **long-term** magnitude.

8.4.77 **Significance of effect**: the unmitigated effect during construction for golden plover is considered to be **minor adverse** and is therefore **not significant** in the context of the EIA regulations.

## Potential Decommissioning Effects

8.4.78 Decommissioning effects, because of the long timeframe until their occurrence (around 35 years), are difficult to predict with confidence. For the purpose of this chapter, they are considered to be similar to those of construction effects in nature, but of shorter duration, with the result being a restored habitat within an area where displaced birds will be able to return. However, on a precautionary basis, effects assessed during construction are considered to apply to decommissioning.

## Potential Cumulative and In-Combination Effects

8.4.79 This section presents information about the potential cumulative impact of the Proposed Development combined with other projects that are located within NHZ 2. Greenland white-fronted goose, greylag goose and whooper swan are also considered within an HRA context relating to the in-combination effects on the Caithness Lochs SPA.

8.4.80 NatureScot (SNH 2018d[30]) provides guidance on assessing the cumulative effects on birds and this assessment follows the principles set out in that guidance. NatureScot has also provided a dataset (issued on 9th June 2022) detailing information for projects in NHZ 2 or NHZ 5 that are within range of the Caithness Lochs SPA, to aid the in-combination assessment.

8.4.81 Cumulative impacts may include cumulative disturbance-displacement, collision mortality, habitat loss or barrier effects. Some cumulative impacts (such as collision risk) may be summed quantitatively, but according to SNH (2018d[30]) "*In practice, however, some effects such as disturbance or barrier effects may need considerable additional research work to assess impacts quantitatively. A more qualitative process may have to be applied until quantitative information becomes available for developments in the area, e.g. from post-construction monitoring or research*".

8.4.82 The main projects likely to cause similar effects to those associated with the Proposed Development are other operational wind farms, or those under construction, consented or in the planning process within NHZ 2 (Table 8.18, Figure 8.28) for the cumulative assessment (EIA) or those within foraging range (defined per species, as per SNH, 2016b[25]) of the Caithness Lochs SPA (Table 8.19, Figure 8.29) for the in-combination assessment (HRA). No other projects or activities subject to the EIA process have been identified for inclusion in the cumulative or in-combination assessments.

8.4.83 Wind farm projects at scoping stage have been scoped out of the cumulative assessment because they usually do not have sufficient information on potential effects to be included, as the baseline survey period is ongoing or results have not

[84] Fielding, A. H. and Haworth, P. F. (2015). Final report on the eleven-year monitoring programme (2005-2015) for the impact of the Farr wind farm on golden plover. http://www.alanfielding.co.uk/fielding/pdfs/Farr%20windfarm%20GP%20Final.pdf

[85] Pearce-Higgins, J.W., Stephen, L., Douse, A. and Langston, R.H.W. (2012). Greater impacts of wind farms on bird populations during construction than subsequent operation: results of a multi-site and multi-species analysis. Journal of Applied Ecology, 49: 386-394.

[86] Sansom, A., Pearce-Higgins, J.W. and Douglas, D.J.T. (2016). Negative impact of wind energy development on a breeding shorebird assessed with a BACI study design. Ibis 158: 541-555.

been published. Projects that have been refused (and are no longer capable of appeal) or withdrawn have also been scoped out of the cumulative assessment.

8.4.84 Small projects with three or fewer turbines have also been scoped out from the cumulative assessment as often these projects are not subject to the same level of detail of ornithological impact assessment and so there are no directly comparable data. Because of the small scale of such projects, effects are likely to negligible on the IOFs assessed here. Other small-scale renewable projects such as micro-hydro schemes have also been scoped out for similar reasons. Table 8.18 and Table 8.19 identify the wind farm projects that have been considered in the cumulative assessment and in-combination assessment respectively, and the relevant IOFs (Table 8.17) that were recorded during baseline assessments for these projects. The information relating to the in-combination assessment (Table 8.19) has been provided by NatureScot from their cumulative and in-combination database (issued on 9th June 2022).

8.4.85 It should also be noted that it is highly unlikely that all projects within NHZ 2/within foraging range of the Caithness Lochs SPA would be consented, and even less likely that all would become operational at the same time, and so the additive values represent a highly precautionary assessment of potential cumulative/in-combination effects.

8.4.86 Based on the conclusions of the predicted effects of the Proposed Development alone for the NHZ 2 populations of curlew and lapwing, the effects detailed in Table 8.17 have been taken forwards into the cumulative assessment below.

8.4.87 Following the Assessment of Likely Significant Effects on the Caithness Lochs SPA for Greenland white-fronted goose, whooper swan and greylag goose from the Proposed Development alone, in-combination effects on the SPA as listed in Table 8.17 have been considered below.

**Table 8.17: Impacts Scoped In to the Cumulative/In-Combination Assessment**

| Species | Construction/Decommissioning | Operation |
|---|---|---|
| Golden plover (NHZ 2) | - | - |
| Curlew (NHZ 2) | Breeding disturbance/displacement | Collision<br>Breeding disturbance/displacement |
| Lapwing (NHZ 2) | Breeding disturbance/displacement | Collision<br>Breeding disturbance/displacement |
| Pink-footed goose (NHZ 2) | - | - |
| Greenland white-fronted goose (NHZ 2) | - | - |
| Greenland white-fronted goose (SPA) | Foraging disturbance | Collision |
| Greylag goose (NHZ 2) | - | - |
| Greylag goose (SPA) | Foraging disturbance | Collision |
| Whooper swan (NHZ 2) | - | - |
| Whooper swan (SPA) | Foraging disturbance | Collision |

8.4.88 Cumulative collision assessments on the regional populations of golden plover, Greenland white-fronted goose, greylag goose, pink-footed goose and whooper swan have been scoped out of the cumulative assessment either due to the negligible effects of the addition of less than one collision across the 35-year lifespan of the Proposed Development (Greenland white-fronted goose and whooper swan) to the cumulative collision risk, or the negligible impacts of the additional mortality as a result of the predicted collisions associated with the Proposed Development upon the regional/national wintering populations (golden plover 0.06 to 0.11%, greylag goose 0.001%, pink-footed goose 0.063%). Additionally, in the case of pink-footed and greylag geese, the cumulative impacts resulting from wind farms are minor in comparison to the estimated shooting bag numbers (estimated to be 25,000 pink-footed geese annually in Britain by Frederiksen 2002[87] and 8,000 greylag geese annually in Scotland by Trinder *et al.* 2010[88]). Whilst these estimates are now 11-19 years old (and no accurate recording of shooting bags is undertaken in the UK), it is important to note that shooting bag numbers are likely to continue to be several orders of magnitude higher than any cumulative collision estimates. In-combination assessments for Greenland white-fronted goose, greylag goose and whooper swan are included due to the smaller SPA populations (i.e., in comparison to the Scottish/regional wintering populations).

[87] Frederiksen, M. 2002. Indirect estimation of the number of migratory Greylag and Pink-footed Geese shot in Britain. Wildfowl 53: 27–34.

[88] Trinder, M., Mitchell, C., Swann, B. and Urquhart, C. 2010. Status and population viability of Icelandic Greylag Geese Anser anser in Scotland. Wildfowl 60: 64-84.

**Table 8.18: Scoped In Wind Farm Projects Within NHZ 2 (Cumulative Assessment) – the '✓' Indicates that the Species Were Recorded in the Baseline Surveys Rather Than Scoped In to the Project Assessments**

| Project | Status | Number of Turbines | Information Available | Curlew | Lapwing |
|---|---|---|---|---|---|
| Baillie - Bardnaheigh Farm | Operational | 21 | No info available | - | - |
| Burgar Hill | Operational | 6 | No info available | - | - |
| Forss 2 (Extension) | Operational | 4 | No info available | - | - |
| Hammars Hill Wind Energy Project | Operational | 5 | Technical description and Environmental Studies | ✓ | ✓ |
| Lochend | Operational | 4 | Ornithology Chapter | ✓ | ✓ |
| Spurness | Operational | 5 | No info available | - | - |
| Stroupster | Operational | 13 | Ornithology Technical Appendix 5.1 | ✓ | ✓ |
| Wathegar | Operational | 5 | Ornithology Chapter | × | × |
| Wathegar 2 | Operational | 9 | Ornithology Chapter | ✓ | ✓ |
| Cogle Moss | Consented | 12 | Ornithology Chapter | ✓ | ✓ |
| Costa Head | Consented | 4 | No info available | - | - |
| Hesta Head | Consented | 5 | No info available | - | - |
| Slickly | Appeal | 11 | Ornithology Chapter | ✓ | ✓ |
| Hollandmey Energy Development | Application | 10 | Ornithology Chapter | ✓ | ✓ |

**Table 8.19: Scoped In Wind Farm Projects Within the Foraging Range (Species Specific) of the Caithness Lochs SPA (In-Combination Assessment) (Data Supplied by NatureScot) – the '✓' Indicates that the Species Were Recorded in the Baseline Surveys Rather Than Scoped In to the Project Assessments**

| Project | Status | Number of Turbines | Greenland White-Fronted Goose (8km) | Greylag Goose (20km) | Whooper Swan (8km) |
|---|---|---|---|---|---|
| Achairn | Operational | 3 | Not recorded | ✓ | Not recorded |
| Achlachan 1 and 2 (combined) | Operational + Consented | 5 + 3 | - | ✓ | - |
| Bad a Cheo | Operational | 13 | - | ✓ | ✓ |
| Baillie Hill | Operational | 21 | ✓ | ✓ | ✓ |
| Balmore single turbine | Operational | 1 | - | ✓ | - |
| Bower Quarry - micro (aka Netherside) | Operational | N/A | - | ✓ | - |
| Camster | Operational | 25 | Not recorded | ✓ | Not recorded |
| Flex Hill | Operational | 2 | Not recorded | ✓ | ✓ |
| Forss 2 | Operational | 4 | Not recorded | ✓ | Not recorded |
| Lochend | Operational | 4 | ✓ | ✓ | ✓ |
| Quoybrae single turbine | Operational | 1 | - | ✓ | ✓ |
| Rattar Mains | Operational | 1 | - | ✓ | ✓ |
| Thurso Waste Water Treatment Works | Operational | N/A | - | ✓ | - |
| Wathegar 2 | Operational | 9 | - | ✓ | - |
| Camster II | Consented | 11 | - | ✓ | - |
| Cogle Moss | Consented | 12 | - | ✓ | ✓ |
| Halsary | Consented | 15 | Not recorded | ✓ | ✓ |
| Hill of Lybster | Consented | 1 | - | ✓ | - |
| Limekiln | Consented | 21 | - | ✓ | - |
| Golticlay | Application | 19 | - | ✓ | - |
| Hollandmey | Application | 10 | - | ✓ | - |
| Slickly | Application | 11 | - | ✓ | ✓ |
| Tormsdale | Application | 12 | - | ✓ | - |

### Curlew and Lapwing (NHZ 2 Populations)

#### *Predicted Cumulative Impacts During Construction*

8.4.89 A total of seven wind farms (from those where information was publicly available) within NHZ 2 considered curlew and lapwing as part of their impact assessment (Table 8.18), of which four are already operational. Of the remaining three projects, Cogle Moss Wind Farm is already consented and it is therefore reasonably unlikely that the Proposed Development will be on a similar construction timescale to Cogle Moss Wind Farm. Slickly Wind Farm and Hollandmey Energy Development are at application stage and there is therefore the potential for the (temporary) loss of an additional two[89] breeding pairs of curlew and four[90] breeding pairs of lapwing which would equate to a cumulative loss of 4-7 pairs of curlew (up to 0.22% of the NHZ 2

[89] Slickly and Hollandmey EIAs both predicted the potential loss of one pair of curlew during construction.

[90] Slickly EIA predicted the potential loss of one pair of Lapwing during construction. Hollandmey EIA noted three pairs of lapwing within 500m of the turbines but did not scope lapwing into the assessment – as a worst case it has been assumed that all three pairs may be displaced.

population) and 6-11 pairs of lapwing (up to 0.22% of the estimated NHZ 2 population).

8.4.90 In addition, as detailed above in the assessment for the Proposed Development alone, it should be noted for both species that it is unlikely that all breeding pairs of each species would be permanently lost from the breeding populations as there will continue to be suitable similar habitat (nearby) in the Caithness region that some pairs (if not all) may be displaced into.

8.4.91 In summary, the potential worst-case (assuming that all pairs across both projects would be lost from the breeding population rather than displaced) cumulative loss of breeding curlew and lapwing in NHZ 2 due to construction disturbance is considered to be **low** and **short-term** magnitude (i.e. the same as for the Proposed Development alone). The cumulative construction effect is therefore considered to be minor adverse and is therefore **not significant** in the context of the EIA regulations.

*Predicted Cumulative Impacts During Operation – Collision Risk*

8.4.92 Of the wind farms within NHZ 2 (from those where information was publicly available) that considered curlew and lapwing as part of their impact assessment (Table 8.18), only Slickly Wind Farm and Hollandmey Energy Development undertook collision modelling for curlew (estimated annual collision rate of 0.08 and 0.18 respectively) and only Slickly Wind Farm for lapwing (estimated annual collision rate of 1.28). This would result in an estimated cumulative annual collision rate of 0.493 for curlew (0.028% additional mortality) and 2.71 for lapwing (0.09 % additional mortality).

8.4.93 Although there may be a low risk of collisions at the other sites where curlew and lapwing are present, the level of cumulative collision effect on the NHZ 2 populations of curlew and lapwing is considered to remain the same as for the Proposed Development alone and as such the cumulative collision effect is therefore considered to be **negligible** and is therefore **not significant** in the context of the EIA regulations.

*Predicted Cumulative Impacts During Operation – Displacement*

8.4.94 A total of seven wind farms within NHZ 2 considered curlew and lapwing as part of their impact assessment (Table 8.18), of which four are already operational. Information on the predicted effects on these species, and potential mitigation at these wind farms was limited. However, a total (from the information available and including the Proposed Development) of 29-46 curlew territories (0.89-1.42% of the NHZ 2 breeding population) and 24-32 lapwing territories (0.48-0.64% of the NHZ 2 breeding population) are potentially at risk of some level of disturbance or displacement at these wind farms (Table 8.20). As detailed above in the assessment for the Proposed Development alone, it should be noted for both species that it is unlikely that all breeding pairs of each species would be permanently lost from the breeding populations as:

- There will continue to be suitable similar habitat in the Caithness region that some pairs (if not all) may be displaced into;
- Some of the territories recorded at these projects may have been over 500 m from the turbines and were therefore not at risk of disturbance (it is often not clear in reports exactly where territories were recorded in relation to the final turbine design and ambiguity often exists over 'survey area' versus 'study area'); and
- There is evidence to indicate that there is limited correlation between nesting success and turbine proximity (as detailed in paragraph 8.4.72) and that therefore at least some pairs may continue to nest successfully in proximity to turbines.

8.4.95 It should also be noted that for the projects where breeding curlew and lapwing were detailed in the documents available, there is a good deal of uncertainty regarding how many breeding pairs may be truly affected by disturbance-displacement at each project, the magnitude of any potential effects and any mitigation/habitat management that may offset any potential effects. These values should therefore be seen as worst-case estimates (from the information available).

**Table 8.20: Cumulative Disturbance/Displacement Effects for NHZ 2 Projects: Predicted Loss of Breeding Pairs (Curlew and Lapwing)**

| | | Curlew | Lapwing |
|---|---|---|---|
| NHZ 2 Population (pairs) | | 3,233 | 5,000 |
| Possible Loss of Pairs | Operational | 19-26[91] | 15-18[92] |
| | Consented | 5-12[93] | 3 |
| | Application | 3 | 4 |
| | Proposed Development | 2-5 | 2-7 |
| Total | | 29-46 | 24-32 |
| % of NHZ 2 Population | | 0.89% - 1.42% | 0.48% - 0.64% |

8.4.96 Overall, considering the NHZ 2 breeding pair population estimates, the potential worst-case (assuming that all pairs would be lost from the breeding population rather than displaced) cumulative loss of breeding curlew and lapwing in NHZ 2 is considered to be **low** and of **long-term** magnitude. The cumulative operational effect is considered to be **minor adverse** and is therefore **not significant** in the context of the EIA regulations.

**Caithness Lochs SPA Species**

*Predicted Cumulative Impacts During Construction*

8.4.97 NatureScot provided a copy of their cumulative/in-combination spreadsheet (dated 9th June 2022) for Greenland white-fronted goose, greylag goose and whooper swan (Caithness Lochs SPA qualifying features) which included information on any potential for disturbance, displacement or foraging loss as a result of the construction of the wind farm project. Of the wind farm projects that identified a potential effect for any of the SPA species that are either consented or at application stage, two wind farm projects predicted potential foraging displacement greylag goose (Halsary, Tormsdale), one wind farm for whooper swan (Halsary) and no wind farms for Greenland white-fronted goose. Halsary and Tormsdale were both considered to have a negligible effect on foraging displacement post mitigation and were therefore considered to have no adverse effect on the integrity of the Caithness Lochs SPA. As such, the potential in-combination construction effects for Greenland white-fronted goose, greylag goose and whooper swan populations associated with the Caithness Lochs SPA, are considered to be the same as those for the Proposed Development alone.

8.4.98 Therefore, there are considered to be no adverse in-combination construction effects on the integrity of the Caithness Lochs SPA under the Habitats Regulations.

*Predicted Cumulative Impacts During Operation – Collision Risk*

8.4.99 From the cumulative/in-combination spreadsheet (dated 9th June 2022) provided by NatureScot, Table 8.21 provides a summary of the predicted collision rates associated with wind farm projects where the birds recorded have been identified to be connected to the Caithness Lochs SPA population.

**Table 8.21: In-Combination Collision Rates for the Caithness Lochs SPA Species[94]**

| Species | | Greenland White-Fronted Goose | Greylag Goose | Whooper Swan |
|---|---|---|---|---|
| SPA Population (Individuals) | | 440 | 7,190 | 240 |
| Annual Collision Rate | Operational | 0.30 | 7.39 | 0.33 |
| | Construction | 0.00 | 0.00 | 0.00 |
| | Consented | 0.00 | 12.53 | 0.38 |
| | Application | 0.00 | 3.79 | 0.04 |
| | Cairnmore Hill | 0.0021 | 0.345 | 0.0152 |
| | Total | 0.3021 | 24.06 | 0.7652 |
| Baseline Mortality Rate | | 0.279 | 0.17 | 0.199 |
| Baseline Mortality (Individuals) | | 122.76 | 1,222.3 | 47.76 |
| Additional In-Combination Mortality | | 0.25 % | 1.97 % | 1.60 % |

8.4.100 The mean annual/non-breeding season collision rate for Greenland white-fronted goose, greylag goose and whooper swan associated with the Proposed Development was predicted to be 0.0021, 0.345 and 0.0152 respectively (or one bird every 485, 2.9 and 66 years respectively). When also including the predicted collision rates from any installed, under construction, approved and application projects (Table 8.21), an in-combination annual collision rate of 0.3021, 24.06 and 0.0152 individuals respectively is predicted (one every 3.3, 0.04 and 1.3 years respectively). For Greenland white-fronted goose, this equates to an increase of less than 1 % in the baseline mortality of the SPA population. For greylag goose and whooper swan, whose SPA populations are considered to be in a favourable, maintained condition, this equates to an increase of less than 2 % in the baseline mortality on the SPA population (based on the precautionary assumption that all potential mortality would be related to SPA individuals).

[91] This range is due to Stroupster Wind Farm identifying 1-8 curlew territories.
[92] This range is due to Stroupster Wind Farm identifying 4-7 lapwing territories.
[93] This range is due to Cogle Moss Wind Farm identifying 5-12 curlew territories.

[94] Where required, any predicted collision rates have been updated to the current avoidance rates for these species: whooper swan 99.5 %, Greenland white-fronted goose and greylag goose 99.8 %.

8.4.101 Based on the above information, it can therefore be reasonably concluded that there would be no adverse in-combination collision effects on the integrity of the Caithness Lochs SPA under the Habitats Regulations.

*Predicted Cumulative Impacts During Operation – Displacement*

8.4.102 NatureScot provided a copy of their cumulative/in-combination spreadsheet (dated 9th June 2022) for Greenland white-fronted goose, greylag goose and whooper swan (Caithness Lochs SPA qualifying features) which included information on any potential for displacement as a result of the operation of the wind farm project. Of the wind farm projects that identified a potential effect for any of the SPA species, four projects (Baillie Hill, Lochend – operational, Halsary – consented, Tormsdale - application) indicated a potential for disturbance / displacement / foraging loss post mitigation for Greenland white-fronted goose, greylag goose and/or whooper swan.

8.4.103 Lochend Wind Farm (operational since May 2017) is located 1.8 km to the east of the of the SPA (Figure 6.29) and a disturbance / displacement / foraging loss for Greenland white-fronted goose, greylag goose and whooper swan was predicted for during the construction period only, which following a consent condition from NatureScot to mitigate this potential effect, there was considered to be no likely significant effect on the integrity of the Caithness Lochs SPA.

8.4.104 Baillie Wind Farm has been operational since August 2013 and is located approximately 2.6 km to the north of the SPA (Figure 6.29). Foraging wildfowl surveys undertaken for the baseline surveys for the Proposed Development included a 5 km survey area which encompassed Baillie Wind Farm. These surveys were undertaken during the 2013/2014, 2015/2016 and 2016/2017 non-breeding seasons and therefore consists of data from after Baillie Wind Farm became operational. A comparison of the three non-breeding seasons of foraging data (Figures 8.5, 8.6 and 8.8) indicates that birds are continuing to use the same foraging areas across the years including those locations within approximately 500 m of Baillie Wind Farm. This is particularly clear for greylag geese, which continue to show a strong correlation between the 1 km foraging grid squares identified by Mitchell (2012[37]), regardless of the more recent presence of Baillie Wind Farm.

8.4.105 Considering the limited foraging activity recorded within 500 m of the Proposed Development, the relatively low suitability of foraging habitat at the site itself, the continued evidence of foraging adjacent to Baillie Wind Farm and the evidence detailed in paragraphs 8.4.59 to 8.4.61 that foraging geese habituate to/are not displaced from foraging areas by wind turbines, any significant in-combination operational displacement due to the proposed development and Baillie Wind Farm is unlikely.

8.4.106 Halsary Wind Farm (consented) is located 5.3 km to the south of the SPA (Figure 6.29) and predicted a negligible disturbance / displacement / foraging loss for greylag goose and whooper swan with no likely significant effect on the integrity of the Caithness Lochs SPA.

8.4.107 Tormsdale Wind Farm (application) is located 8.1 km to the south east of the SPA (Figure 8.29) and predicted a negligible disturbance / displacement / foraging loss for greylag goose with no likely significant effect on the integrity of the Caithness Lochs SPA.

8.4.108 Considering all of the above, there are considered to be no adverse in-combination effects on the integrity of the Caithness Lochs SPA under the Habitats Regulations.

## 8.5 Mitigation

### Mitigation during Construction

8.5.1 With no unmitigated significant effects predicted, no specific mitigation is required. However as detailed in paragraph 8.4.2 a BDMP will be produced and will be approved by the planning authority in consultation with NatureScot prior to implementation. This would seek to ensure that any breeding birds, their nests, eggs or young are not directly affected by construction activities. In addition, as detailed in paragraph 8.4.2 an ECoW will be appointed prior to the commencement of construction to ensure all reasonable precautions are taken to avoid negative impacts on ornithological interests.

### Mitigation during Operation

8.5.2 With no unmitigated significant effects predicted, no specific mitigation is required. However, in order to maintain/improve habitat suitability for breeding/wintering waders within the site, it would be proposed to retain boggy ground and create new wet areas (including scrapes and small areas of shallow open water) within the site, but away from turbines, by measures such as blocking any active drains and ditches in selected areas. In addition, controlled grazing would be used to create a variable sward length to maintain areas of shorter vegetation for foraging whilst retaining taller vegetation for nesting.

### Mitigation during Decommissioning

8.5.3 An equivalent mitigation strategy to that described in paragraph 8.5.1 will ensure that any disturbance risk to breeding curlew and lapwing or to foraging golden plover, geese and swans is minimised.

## 8.6 Assessment of Residual Effects

8.6.1 Given that no specific mitigation is required, the residual effects relation to construction (disturbance/displacement), operation (disturbance/displacement and collision risk) and decommissioning (disturbance/displacement) remain as considered in Section 8.4 above, i.e. **not significant** within the context of the EIA Regulations, and **no adverse effect on the integrity of the Caithness Lochs SPA** under the Habitats Regulations.

## 8.7 Summary

8.7.1 In summary, this chapter reports on the baseline ornithological conditions recorded within and around the Proposed Development and presents an assessment of likely significant effects on populations of identified target species.

8.7.2 IOFs identified which are considered likely to experience significant effects as a result of the Proposed Development and that were taken forward into the assessment are: Greenland white-fronted goose, greylag goose, whooper swan, pink-footed goose, golden plover, curlew and lapwing. Due to the proximity of the Caithness Lochs SPA and the potential for connectivity with the Proposed Development, the SPA populations of Greenland white-fronted goose, greylag goose and whooper swan were also assessed under the Habitats Regulations.

8.7.3 Impacts related to direct and indirect habitat loss, construction disturbance and displacement, operational displacement, collision risk and cumulative impacts were all considered. The residual effects are considered to be **not significant** within the context of the EIA Regulations, and to have **no adverse effect on the integrity of the Caithness Lochs SPA** under the HRA process. Cumulative/in-combination effects for Greenland white-fronted goose, greylag goose, whooper swan, curlew and lapwing were assessed in relation to other relevant developments in NHZ 2/as detailed by the NatureScot Caithness Lochs SPA dataset and concluded to be **not significant/have no adverse effect on the integrity of the SPA**.

8.7.4 Table 8.22 summarises the residual effects following any proposed mitigation as detailed in Section 8.5.

**Table 8.22: Summary of Residual Effects**

| Likely Significant Effect | Mitigation | Means of Implementation | Residual Effect |
|---|---|---|---|
| Construction/Decommissioning | | | |
| Greenland white-fronted goose | None required | N/A | Not significant |
| Greylag goose | None required | N/A | Not significant |
| Whooper swan | None required | N/A | Not significant |
| Caithness Lochs SPA | None required | N/A | No Adverse Effect on the Integrity of the SPA |
| Pink-footed goose | None required | N/A | Not significant |
| Curlew | BDMP | To be agreed prior to commencement of construction and overseen by ECoW | Not significant |
| Lapwing | BDMP | To be agreed prior to commencement of construction and overseen by ECoW. | Not significant |
| Golden plover | None required | N/A | Not significant |
| Operation | | | |
| Greenland white-fronted goose | None required | N/A | Not significant |
| Greylag goose | None required | N/A | Not significant |
| Whooper swan | None required | N/A | Not Significant. |
| Caithness Lochs SPA | None required | N/A | No Adverse Effect on the Integrity of the SPA |
| Pink-footed goose | None required | N/A | Not significant |
| Curlew | Wader habitat improvement | To be agreed prior to commencement of construction. | Not significant |
| Lapwing | Wader habitat improvement | To be agreed prior to commencement of construction. | Not significant |
| Golden plover | Wader habitat improvement | To be agreed prior to commencement of construction. | Not significant |

## 8.8 Glossary and Abbreviations

| Term | Definition |
|---|---|
| Appropriate Assessment | An assessment required by the Habitats Directive where a project (or plan) would be likely to have a significant effect on a European Site, either alone or in combination with other plans or projects (part of the Habitats Regulations Assessment process in the UK and the Appropriate Assessment process in Ireland). |
| Barrier effects | Where a wind farm creates an obstacle to regular movements of birds to and from breeding colonies or migration. |

| Term | Definition |
|---|---|
| Collision Risk Analysis Area (CRAA) | The three-dimensional airspace within and surrounding the proposed turbine area where birds in flight are theoretically at risk of a collision with operational turbines. This forms the basis of calculations used in collision risk modelling. |
| Conservation objective | Objective for the conservation of biodiversity (e.g., specific objective within a management plan or broad objectives of policy). |
| Conservation status | The sum of the influences acting on a species which may affect its long-term distribution and abundance, within a geographical area of interest. |
| Cumulative effect | Additional changes caused by a Proposed Development in conjunction with other developments or the combined effect of a set of developments taken together. |
| Habitats Regulations Appraisal | An assessment of projects (or plans) potentially affecting European Sites in the UK, required under the Habitats Directive and Regulations. |
| Important Ornithological Features | Ornithological features requiring specific assessment within an EIA. Ornithological features can be important for a variety of reasons (e.g., quality and extent of designated sites, species rarity). |
| Integrity (of a designated site) | The coherence of its ecological structure and function across its whole area which enables it to sustain the habitats, complex of habitats and/or population levels of the species for which it was classified (or designated). |
| Nature Conservation Importance | A level of importance attributed to a species population or habitat which may relate for example, to the quality or extent of designated sites or habitats, to habitat/species rarity, to the extent to which they are threatened throughout their range, or to their rate of decline. |

| Abbreviation | Expanded Term |
|---|---|
| BDMP | Bird Disturbance Management Plan |
| BoCC | Birds of Conservation Concern |
| BTO | British Trust for Ornithology |
| CRAA | Collision Risk Analysis Area |
| CRM | Collision Risk Modelling |
| ECoW | Ecological Clerk of Works |
| EIA | Environmental Impact Assessment |
| ES | Environmental Statement |
| HRA | Habitats Regulations Appraisal |
| HRSG | Highland Raptor Study Group |
| IOF | Important Ornithological Feature |
| NCI | Nature Conservation Importance |
| NHZ | Natural Heritage Zone |
| RSPB | Royal Society for the Protection of Birds |
| SNH | Scottish Natural Heritage |
| SPA | Special Protection Area |
| SSSI | Site of Special Scientific Interest |
| VP | Vantage Point |

# 9 Traffic and Transport

## 9.1 Introduction

9.1.1 This Chapter assesses transport and traffic impacts and effects resulting from the construction, operation and decommissioning of the proposed Cairnmore Hill Wind Farm as described in Chapter 2 of this EIA Report ('the proposed development'). This Chapter primarily focuses on the traffic impact associated with the construction phase of the Proposed Development as it will generate the highest volume of traffic and therefore result in the greatest impact. The operational and decommissioning phases of the Proposed Development are also considered; however, the traffic impact during these phases would be limited in comparison to the construction phase.

9.1.2 The Proposed Development comprises five wind turbines and associated infrastructure including a series of on-site access tracks, turning points and a temporary construction compound. The Proposed Development site ('the site') is located approximately 4.5 km west of Thurso, situated within the administrative boundary of the Highland Council ('THC'). Access to the site is proposed via a new priority junction with the A836 at a location approximately 5 km west of the A9 trunk road ('T'). A full description of the proposed development is included in Chapter 2: Development Description.

9.1.3 The traffic and transport receptors have been identified within a defined assessment area (the 'Study Area') which have the potential to be adversely or positively impacted by the construction, operation and decommissioning of the Proposed Development. These receptors have been assessed based on their determined sensitivity and the anticipated magnitude of change of traffic flows as a result of the Proposed Development. This chapter also identifies and details the various mitigation measures that will be implemented to prevent, reduce or offset potential adverse impacts or enhance potential beneficial effects; where possible.

9.1.4 The objectives of this Chapter are as follows:

- Outline the scope of the traffic impact assessment;
- Describe the overarching methodology and significance criteria used in the assessment;
- Identify relevant policies and guidance for consideration;
- Describe the baseline characteristics of the surrounding area;
- Describe the anticipated construction, operational and decommissioning characteristics of the Proposal and their likely effects;
- Describe the mitigation measures proposed to address any likely significant effects; and
- Assess any remaining residual effects.

9.1.5 This transport and traffic assessment has been carried out by RES and is supported by the following:

- Technical Appendix 9.1: Abnormal Indivisible Loads (AIL) Route Assessment;
- Technical Appendix 9.2: Anticipated Proposed Construction Traffic by Month;
- Figure 9.1: Study Area;
- Figure 9.2: Traffic Counter Locations; and
- Figure 9.3: Accident Statistics and Locations.

## 9.2 Assessment Methodology and Significance Criteria

### National, Regional and Local Transport Planning Policy

**Scottish Planning Policy**

9.2.1 Scottish Planning Policy (SPP)1 produced in 2014 sets out Scottish Ministers' priorities in terms of development planning and other important matters.

9.2.2 It is proposed that all major wind turbine components (i.e. Blades, Tower Sections and Nacelle) associated with the Proposed Development would be transported by sea arriving at Scrabster Harbour, approximately 4.5 km northeast of the site.

9.2.3 Paragraph 290 of SPP (2014) states that:

> *"Development proposals that have the potential to affect the performance of safety of the strategic transport network need to be fully assessed to determine their impact. Where existing infrastructure has the capacity to accommodate a development without adverse impacts on safety or unacceptable impacts on operational performance, further investment in the network is not likely to be required. Where such investment is required, the cost of the mitigation measures required to ensure the continued safe and effective operation of the network will have to be met by the developer".*

9.2.4 Technical Appendix 9.1 includes an assessment of abnormal indivisible loads ('AIL') from Scrabster Harbour to the site identifying where mitigation would be necessary to facilitate access to the site.

9.2.5 Notwithstanding these transport specific aspects, policies concerning the delivery of renewable energy related developments are detailed within the 'A Low Carbon Place' section of SPP (2014). Paragraph 169 of this section identifies that proposed wind farm developments should consider a variety of multidisciplinary environmental

1 Scottish Government, Planning Advice Note 75 – Planning for Transport, 2005

aspects that are relative to the scale and location of the potential site. Amongst these considerations is the requirement to consider "*impacts on road traffic*" and "*impacts on adjacent trunk roads*". This Chapter assess the transport and traffic impacts on local and trunk roads within the Study Area.

### PLANNING ADVICE NOTE 75 – PLANNING FOR TRANSPORT

9.2.6 SPP (2014) is supported by the document Planning Advice Note 75 (PAN 75) – Planning for Transport2 produced by the Scottish Government in 2005.

9.2.7 PAN 75 (2005) states that:

> *"the early involvement of interested parties will positively inform transport planning by building consensus and minimising potential future areas of objection".*

9.2.8 Engagement with THC and other stakeholders has been undertaken at an early stage by the Applicant through a scoping exercise. Relating to transport and traffic, cognisance will be taken of comments related by THC Transport Planning Team and Transport Scotland (TS) within this Chapter, where applicable.

### Regional and Local Transport Planning Policy

9.2.9 The Highland-wide Local Development Plan (HwLDP)3, which was adopted by THC in 2012, provides an overview of the spatial planning policy for the local authority region.

9.2.10 Policy 36 states that:

> *"renewable energy development proposals will be assessed against the renewable Energy Policies, the non-statutory Highland Renewable Energy Strategy and where appropriate, Onshore Wind Energy: Supplementary Guidance".*

9.2.11 In relation to transport, Policy 57 states that:

> *"Development proposals that involve travel generation must include sufficient information with the application to enable the Council to consider any likely on- and off-site transport implications of the Development".*

9.2.12 Policy 67 states that THC will have regard to "proposals able to demonstrate significant benefits including by making effective use of existing and proposed infrastructure facilities".

9.2.13 This Chapter takes cognisance of the HwLDP by quantifying and assessing the anticipated impacts of the Proposed Development related traffic on the local and trunk road network.

## Assessment Guidance

### Onshore Wind Energy Interim Supplementary Guidance

9.2.14 This Guidance identifies the planning approval process for wind farm developments. Chapter 11 of the Guidance document identifies the requirements for traffic and transportation considerations.

9.2.15 Paragraph 2.62 specifies that:

> *"any proposal for a wind energy development must demonstrate that the development including its associated infrastructure will not have a significant adverse effect individually or cumulatively (with other built, permitted or lodged wind energy proposals) on the public road network."*

9.2.16 Paragraph 2.64 goes on to state that:

> *"Developers should consider measures to reduce the impact of construction traffic on the road network such as the use of on-site borrow pits and on-site concrete batching."*

9.2.17 This Chapter assesses cumulative transport and traffic impacts. The chapter and Technical Appendix 9.1 also illustrate measures proposed by the Applicant to mitigate transport and traffic impacts.

### Guidelines for Traffic Impact Assessment

9.2.18 The Institution of Highways and Transportation (IHT), now the Chartered IHT (CIHT), publication Guidelines for Traffic Impact Assessment 19944 recommends that traffic and transport effects should be assessed in accordance with the Institute for Environmental Management & Assessment (IEMA) Guidelines (1993)5.

### Guidelines for the Environmental Assessment of Road Traffic

9.2.19 The IEMA Guidelines (1993) recommends that the following rules be considered when assessing the increase in traffic flow, associated with a proposal, on highway links and when identifying the area of influence for assessment purposes:

2 Scottish Government, Scottish Planning Policy, 2014
3 The Highland Council, The Highland-wide Local Development Plan, 2012
4 Institution of Highways & Transportation. Guidelines for Traffic Impact Assessment. 1994.
5 Institute of Environmental Assessment. Guidelines for the Environmental Assessment of Road Traffic. 1993.

9.2.20 Rule 1: Include highway links where traffic flows would increase by more than 30% (or the number of Heavy Goods Vehicles (HGVs) would increase by more than 30%); and

9.2.21 Rule 2: Include any specifically sensitive areas where traffic flows would increase by 10% or more.

9.2.22 The IEMA Guidelines (1993) acknowledge that day-to-day variations of traffic on a road can frequently be at least + or – 10%. At a basic level, it should therefore be assumed that projected changes in traffic of less than 10% create no discernible environmental impact. Absolute changes (number of vehicles) are equally relevant since percentages alone could be misleading.

9.2.23 It is considered that the 30% threshold from the IEMA Guidelines (1993) is the appropriate rule to apply when assessing the impact of the Proposed Development on the local and trunk road network. This rule has been used to determine the extent of the Study Area and to identify the road links within the Study Area where a full assessment of environmental effects may be warranted.

## Scope of Assessment

9.2.24 This traffic and transport chapter of the EIA Report includes the following steps to ensure that the effects on road users due to traffic associated with the construction, operation and decommissioning of the Proposed Development establish:

9.2.25 An assessment of the existing baseline conditions based on Department for Transport (DfT) traffic data;

9.2.26 An assessment of the surrounding road network to determine its suitability to accommodate the anticipated volume of construction traffic e.g. HGVs; and

9.2.27 An assessment of the increase in traffic compared to baseline traffic flows for the opening year of construction for the roads included in the Study Area.

9.2.28 For the construction, operation and decommissioning phases of the Proposed Development it considers the following potential impacts as listed within the IEMA (1993) Guidelines:

- Severance (for motorists or pedestrians);
- Increased journey times for non-construction traffic;
- Pedestrian delay, intimidation, loss of amenity;
- Road accidents and safety; and
- Dust and dirt.

## Consultation

9.2.29 Table 9.1 summarises the consultation responses received regarding traffic and transport as relates to the Proposed Development and provides information on where and/or how they have been addressed in this assessment. The following organisations made comment on the Proposed Development:

- The Highland Council ('THC'); and
- Transport Scotland ('TS').

**Table 9.1 Consultation Summary**

| Consultee and Date | Summary of Consultation | Comment/Action Taken |
|---|---|---|
| The Highland Council (preapplication meeting - 8th June 2016) | The Traffic, Transport and Access chapter of the EIA should include:<br>▫ A list of the public roads affected by construction traffic and their baseline traffic flows;<br>▫ Detail the number of LGVs, HGVs and AILs that are expected;<br>▫ Assess the impact of construction traffic on the carriageway, road users and nearby communities;<br>▫ Provide swept path analysis of AILs at the problem areas;<br>▫ Assess the cumulative impact of other developments that are under construction and are committed;<br>▫ Provide mitigation measures; and<br>▫ Include a framework Construction Traffic Management Plan (CTMP). | ▫ Correspondence list of possible construction traffic routes was identified and agreed with THC.<br>▫ Anticipated Proposal Construction Traffic has been calculated and assigned to proposed routes (in terms of both LGV and HGV, disaggregated by month of construction programme).<br>▫ Assessment of the construction traffic on the roads, its users and nearby communities has been undertaken following IEMA and DMRB guidelines.<br>▫ Swept path analysis has been undertaken for turbine components, and specifically blades along the route from port to site (included in Technical Appendix 8.1).<br>▫ Cumulative effects of other wind farm developments have been considered and assessed. Details of selection criteria has been provided.<br>▫ Mitigation measures have been proposed and discussed where necessary within Chapter 8 of the ES.<br>▫ An outline of a Framework Construction Traffic Management Plan (CTMP) has been prepared and included within this chapter. |

| | | |
|---|---|---|
| The Highland Council (Rescoping) | THC informed of the intention to use a temporary southern access route using the U2144 at Viewfield to permit early enablement works and access to potential borrow pits. | Scoping letter issued by AECOM on the 6th March 2019. Agreement in Principle (subject to the route being assessed and appropriate mitigation being put in place where required) response received from THC on 19th March 2019.<br>Subsequently the use of U2144 for site access from the south has been ruled out for use. Original Scoping agreement still applies. |
| Transport Scotland | Although not a statutory consultee a scoping letter was issued as traffic associated with the Proposed Development would route to and from the site via the trunk road network (A9 (T)). | AECOM issued a scoping letter to TS on 26th August 2016 – correspondence has been considered in this chapter where applicable. |

## Potential Effects Scoped Out

9.2.30 On the basis of the desktop and video survey work, the following has been scoped out of this transport and traffic chapter:

- The effect of vehicles associated with the Proposed Development on the road network, in respect of traffic flows, both in isolation and cumulatively, is considered unlikely to be significant in terms of congestion. Therefore, full detailed junction capacity assessments have not been undertaken and thus no Transport Assessment / Traffic Impact Assessment has been prepared to support the Proposed Development.

## Method of Baseline Characterisation

### Extent of the Study Area

9.2.31 The Study Area for the assessment of transport and traffic impacts and effects extends from the site to include:

- A836 between the proposed site access junction and the A9 (T);
- A9 (T) north between the A836 and Scrabster Harbour; and
- A9 (T) south from the A836 junction to Thurso town centre.

9.2.32 The extent of the Study Area has been agreed with THC Transport Planning Team and is shown in Figure 9.1 Study Area. More detail on the characteristics of the Study Area is included in the Baseline Characterisation section of this Chapter.

### Desk Study

9.2.33 The Study Area has been identified using Institute of Environmental Assessment (IEA) now the Institute of Environmental Management and Assessment (IEMA) Guidelines6 considering the anticipated routing of vehicles associated with the Proposed Development. More detail on the IEMA Guidelines (1993) and anticipated vehicle routing is included in this Chapter.

### Field Study

9.2.34 RES completed multiple Study Area site visit in August 2016 which included a video survey of the anticipated route of construction vehicles, particularly AILs from Scrabster harbour to the site. In addition to the video survey a desktop survey of the Study Area has also been undertaken.

### Criteria for Assessing the Sensitivity of Receptors

9.2.35 In the case of the Proposed Development the receptors of sensitivity are defined as roads, communities and businesses within the Study Area, detailed further in the following section. Table 9.2: Receptor Sensitivity details the criteria used to determine receptor sensitivity.

**Table 9.2: Receptor Sensitivity7**

| Sensitivity | Description |
|---|---|
| **Very high** | Roads which have not been constructed for regular use by road traffic and are limited in width and capacity e.g. private access roads or recreational routes. |
| **High** | Roads that have limited width and have not been constructed to accommodate a high volume of traffic or frequent use by HGVs e.g. single-track rural roads.<br>Roads with traffic control signals, width and loading restrictions and traffic calming measures that restrict the flow of traffic. |
| **Medium** | Local roads that are capable of accommodating regular use by HGVs e.g. A or B class roads.<br>Roads which pass through urban areas that have some form of traffic management measures. |
| **Low** | Trunk roads or A class road links that can accommodate a significant volume of HGVs per hour.<br>Roads with limited or no traffic management measures. |
| **Negligible** | Modern strategic links such as trunk roads that have sufficient capacity to accommodate an increase in traffic with little perceivable impact.<br>Roads with no frontage developments or adjacent settlements. |

6 Institute of Environmental Management & Assessment, Guidelines for the Environmental Assessment of Road Traffic, 1993
7 Institute of Environmental Management & Assessment, Guidelines for the Environmental Assessment of Road Traffic, 1993

### Criteria for Assessing the Magnitude of Change

9.2.36 In terms of the magnitude of change, the IEMA Guidelines (1993) point to changes in traffic in excess of 30%, 60% and 90% as being representative of "slight", "moderate" and "substantial" impacts respectively. Table 9.3: Magnitude of Traffic Change reflects the IEMA Guidelines (1993) and has been used to quantify the magnitude of change associated with traffic associated with the Proposed Development. As indicated previously, the IEMA Guidelines (1993) relate to the operational impacts of development only. Application of the IEMA Guidelines (1993) to temporary construction traffic is therefore considered a robust and conservative approach.

**Table 9.3: Magnitude of Change**

| Magnitude | Description |
|---|---|
| **High** | Substantial or total loss of capability for movement along and across transport corridors, loss of access to key facilities, loss of safety and severe delays to road users.<br>(+ 90% increase in traffic) |
| **Medium** | Moderate loss of capability for movement along and across transport corridors, some measurable loss of access to key facilities, loss of safety and severe delays to road users.<br>(60 -90% increase in traffic). |
| **Low** | Moderate loss of capability for movement along and across transport corridors, some measurable loss of access to key facilities, loss of safety and severe delays to road users.<br>(30 -60% increase in traffic). |
| **Negligible** | Moderate loss of capability for movement along and across transport corridors, some measurable loss of access to key facilities, loss of safety and severe delays to road users.<br>(10 -30% increase in traffic). |
| **No change** | No loss or alteration of characteristics, features or elements. No observable impact in either direction.<br>(0 – 10% increase in traffic) |

9.2.37 Where the predicted increase in traffic volume (general traffic or HGV only) is lower than IEMA Guidance (1993) Rule 1 (30%), the significance of the effects can be stated to be Not Significant meaning that further detailed assessments are not warranted.

9.2.38 In order to determine the magnitude of change associated with traffic impacts, table 9.3: Magnitude of Change has been utilised in tandem with due professional judgement.

9.2.39 The magnitude of change is a function of the existing traffic volumes, the percentage increase and change due to a Proposed Development, the changes in type of traffic, and the temporal distribution of traffic (day of week, time of day). The determination of magnitude has been undertaken by reviewing the characteristics of the Proposed Development, establishing the parameters of roads within the Study Area that may be affected and quantifying impacts.

9.2.40 Consideration has been given to the composition of the traffic on the road network, under both existing and proposed conditions. For example; Light Goods vehicles (LGV's) have less impact on traffic and the road system than HGVs. Similarly, HGV's can have less impact than AIL vehicles, depending on the frequency of deliveries.

### Criteria for Assessing Cumulative Effects

9.2.41 The cumulative assessment of traffic, transport and access effects only considers wind farms that are approved, approved but not yet under construction, submitted but pending decision or at appeal as only these schemes may be under construction concurrently with the Proposed Development and therefore have potential for significant cumulative construction effects. The timescale for delivery of proposals currently in scoping to successfully securing planning consent is considered to be of a duration by which it is unlikely that cumulative construction would occur. There is no potential for significant cumulative effects to occur from those wind farms which are operational due to the minimal vehicle trips attributed to the operational phase of a development.

9.2.42 Secondly, cumulative effects are only considered for wind farm proposals which meet the former criteria, and where they use any of the road network utilised by traffic associated with the construction, operation and decommissioning phases of the Proposed Development.

## Criteria for Assessing Significance

### Assessment of Significance

9.2.43 As per IEMA Guidance (1993) the magnitude is defined as the "level of change" and whether the effect is significant or not will largely depend on the number of people affected. With regards to significance the IEMA Guidelines (1993) state that:

*"for many effects there are no simple rules or formulae which define the thresholds of significance and there is, therefore, a need for interpretation and judgement on the part of the assessor, backed-up by data or quantified information wherever possible. Such judgements will include the assessment of the numbers of people experiencing a change in environmental impact as well as the assessment of the damage to various natural resources."*

9.2.44 As a guide to inform the assessment, but not as a substitute for professional judgement, criteria for determining the significance of traffic and transport related effects are set out in *Table 9.4*: Significance of Effects. This is based on combining the magnitude of the effect with the receptor sensitivity.

**Table 9.4: Significance of Effects**

| Magnitude of Change | Receptor Sensitivity | | | | |
|---|---|---|---|---|---|
| | Very High | High | Medium | Low | Negligible |
| **High** | Major | Major | Moderate | Moderate | Minor |
| **Medium** | Major | Moderate | Moderate | Minor | Negligible |
| **Low** | Moderate | Moderate | Minor | Negligible | Negligible |
| **Negligible** | Minor | Minor | Negligible | Negligible | Negligible |
| **No change** | Negligible | Negligible | Negligible | Negligible | Negligible |

9.2.45 Significance is categorised as major, moderate, minor or negligible. Effects judged to be of major or moderate significance are considered to be Significant in accordance with the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011 ('EIA Regulations (2011)'). Effects judged to be of minor or negligible significance are considered Not Significant.

**Limitations and Assumptions**

9.2.46 Large road networks provide the opportunity for route choice for vehicles using them, and consequently the impact of additional traffic on the road network can become diluted. In this instance in order to provide a robust assessment of the environmental impact of a Proposed Development in terms of traffic and transport, the methodology used would assume that 100% of the construction traffic predicted to be generated would be loaded onto each road link in turn. This methodology automatically applies in the case of the Proposed Development, as route choice for construction vehicles associated with the Proposed Development is limited to the A9(T) and A836 as noted previously in this chapter.

## 9.3 Baseline Conditions

### Current Baseline

9.3.1 In order to determine the baseline characteristics of the Study Area the following sources have been utilised:

- Desktop review of the Study Area;
- Video survey of the road network between Scrabster Harbour and the site;
- Scotland's Census 2011;
- National Road Traffic Forecast '97 (NRTF) annual traffic growth factors;
- Publically available accidents statistics form www.crashmap.co.uk;
- Publically available traffic flow data from the Department for Transport (DfT) (www.dft.gov.uk/traffic-counts) for roads within the Study Area;
- Supplementary Automatic Traffic Count (ATC) survey carried out in March 2019 in order to inform the existing DfT data with Average and Percentile Speeds recorded; and
- Theoretical carrying capacities of road links as identified in the DMRB (2002).

### Road Network

**AIL Routing**

9.3.2 It is anticipated that St Ola pier at Scrabster Harbour will be used for the delivery of blades and the St Ola or Jubilee Quay will be used for the delivery of the Nacelle and tower sections.

9.3.3 All options utilise the existing road network, firstly joining the A9 out of the harbour and connecting onto the A836 via the Pennylands Junction.

9.3.4 8.3.4 After travelling approximately 5.6 km along the A836 to Forss, the AILs will access and enter the site via a new construction access junction and internal site track(s).

**A836**

9.3.5 Within the Study Area (Figure 9.1), the A836 connects Scrabster to the site. The A836, although not a trunk road, provides a strategic connection for communities in the Highlands.

9.3.6 Within the vicinity of the site the A836 is a two-way single carriageway and is approximately 7 m wide and subject to the National Speed Limit. There are no footways or street lighting along this section of the A836 and the road has an undulating carriageway in keeping with the rural characteristics of the area. A

number of residential and business holdings (farms) have direct frontage access or are accessed form the A836 via minor roads / tracks within the Study Area.

9.3.7 As the A836 passes through the boundary of Thurso town at Burnside, the characteristics of the road change. Footways are provided as is street lighting and the speed limit is 40 mph. the approximate carriageway width remains 7 m. Along this section of the A836 there are no direct frontage accesses to residential properties instead access via Upper Burnside Drive. There are however two direct frontage accesses at the A836 / A9 (T) junction for access to a former car garage which is now used for car parking and for access to the Weigh Inn Hotel. Within the Study Area, a bus stop is provided at the A836 for westbound travel only. This bus stop takes the form of a shelter with seating.

9.3.8 At the junction of the A836 / A9 (T) the A836 is subject to road name change to the A9 (T).

9.3.9 Businesses and residential properties which have frontage to or are accessed from the A836, within the Study Area, are considered to be 'medium' sensitivity receptors. The A836 within the Study Area is also considered to be a 'medium' sensitivity receptor.

9.3.10 During the video survey no traffic congestion was noted along the A836.

9.3.11 A836 forms a part of the North Coast 500 (NC500) route that runs 516 miles to and from Inverness, forming a loop around the northern Highlands. Specially commissioned traffic surveys conducted for this assessment as well as count data gathered by Transport Scotland (publically disseminated by the DfT) at their automated counter sites includes both local vehicle movements and longer distance using the NC 500.

**A836 / A9 (T) Junction**

9.3.12 At the priority junction of the A836 / A9 (T) localised improvements have been provided to facilitate turning movements associated with AIL vehicles. These improvements take the form of a hardstanding run-off area and a lay-by to facilitate a right turn movement from the A9 (T) north (Scrabster Harbour) to the A836 for westbound travel towards the site.

**A9(T)**

9.3.13 The A9 (T) is a strategic trunk road and connects Scrabster Harbour to Perth via Inverness. Within the Study Area the A9 (T) links the site to Scrabster Harbour and Thurso town centre and is also a bus route. The Study Area video survey illustrates that localised peak period congestion is noted along the A9 (T) particularly within Thurso town centre.

9.3.14 The A9 (T) within the study area is a two-way single carriageway.

9.3.15 Within the village of Scrabster the A9 (T) is subject to a 30 mph speed limit, is approximately 7.5 m wide and is well lit. There are intermittent footways provided. A number of residential properties and businesses have direct frontage to the A9 (T) within Scrabster village. The population of Scrabster village is 191 individuals per Census (2011) data.

9.3.16 Scrabster Harbour is a strategic facility and caters for the renewable energy industries. The Harbour has previously facilitated AIL deliveries, more detail on the route to the site is included in Technical Appendix 9.1. Additionally, it is an established gateway to the North of Scotland, a recognised cruise port with a modern ferry terminal designed to handle both domestic and international traffic.

9.3.17 Heading south of Scrabster the A9 (T) is subject to a 40 mph speed limit and is approximately 7.5 m wide. A continuous footway is provided as is street lighting. A number of residential and business properties front or are accessed from the A9 (T) south of Scrabster.

9.3.18 Bus stops along the A9 (T) north take form of a bus shelter or bus flag poles.

9.3.19 The A9 (T) south (from A836 to Thurso town centre) is a two-way single carriageway (approximately 7.5 m wide) subject to a 30 mph speed limit. Footways and street lighting is provided as are bus shelters / bus flag poles.

9.3.20 A number of residential properties, businesses, recreational and leisure land uses front or are accessed from the A9 (T) south within the Study Area. The population of Thurso is 7,933 individuals (Census, 2011).

9.3.21 Within the Study Area a short section of the A9 (T) forms a part of National Cycle Route (NCR) 1. NCR 1 within Thurso is an on-road route with wayfinding.

9.3.22 Businesses and residential properties which have frontage to or are accessed from the A9 (T), within the Study Area, are considered to be 'low' sensitivity receptors due to current and historic volume of traffic that uses the A9 (T) each day. The A9 (T) is also considered to have a 'low' sensitivity.

**Traffic Flows**

9.3.23 Table 9.5: 2017 and 2019 Study Area Traffic Flows illustrates the most recent Average Annual Daily Flows (AADF) for roads within the Study Area based on the

recently undertaken traffic surveys as well as AADF for roads within the Study Area based on publicly available traffic flow data when taking into consideration the impacts of the Coronavirus Pandemic in March 2020. The traffic counter locations are presented in Figure 9.2: Counter Locations.

**Table 9.5: 2017 and 2019 Study Area Traffic Flows**

| Counter Number / Location | Road | 2017 DfT AADF two-way and 2019 Survey based AADF | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Pedals / Cycles | Motorcycles | Cars / Taxis | Buses / Coaches | LGV's | HGV's | Total Two way Motor Vehicl |
| 10934 | A836 | 7 | 41 | 1,904 | 88 | 360 | 67 | 2,460 |
| 20801 | A9 (T) | 18 | 10 | 2,734 | 24 | 394 | 95 | 3,256 |
| 40800 | A9 (T) | 11 | 6 | 2,527 | 70 | 526 | 148 | 3,227 |
| 40956 | A9 (T) | 55 | 94 | 11,954 | 128 | 1,783 | 272 | 14,230 |
| Survey 1 | A836 | 1 | 2 | 720 | 10 | 1,290 | 91 | 2,111 |

9.3.24 As illustrated in Table 9.5 the DfT data shows AADF by vehicle type, as percentage of total vehicles, HGV traffic accounts for between 2% - 5%.

### Accidents

9.3.25 Within the Study Area there have been 11 recorded road accidents between 2014 and 2018 (www.crashmap.com). The approximate location of recorded accidents is shown in Figure 9.3: Accident Statistics and Locations. Of the recorded accidents, 1 was reported as Fatal (involved 2 vehicles), 1 Serious (involved 2 vehicles) and all other accidents were reported as 'Slight'.

## Future Baseline

9.3.26 As the most recent data available is from 2018 and 2019 it is necessary to factor this data to anticipated 2020 levels using the NRTF annual growth factors. Low Growth has been utilised as this represents the most robust test when considering the impact of the Proposed Development in respect of a percentage increase in traffic and lack of consistent observed growth. The NRTF Low Growth factor is 1.024 (for 2018 obtained data) and 1.008 (for the 2019 obtained data).

**Table 9.6: 2020 Traffic Flows**

| Counter Number / Location | Road | 2018 DfT AADF two-way and 2019 Survey based AADF | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Pedals / Cycles | Motorcycles | Cars / Taxis | Buses / Coaches | LGV's | HGV's No. / HGVs % of Total Traffic | Total Two way Motor Vehicl |
| 10934 | A836 | 6 | 40 | 1,954 | 96 | 353 | 67/3% | 2,510 |
| 20801 | A9 (T) | 15 | 9 | 2,707 | 26 | 376 | 94/3% | 3,212 |
| 40800 | A9 (T) | 9 | 6 | 2,511 | 74 | 515 | 150/5% | 3,255 |
| 40956 | A9 (T) | 48 | 92 | 11,878 | 135 | 1,747 | 272/2% | 14,125 |
| Survey 1 | A836 | 1 | 2 | 726 | 10 | 1,300 | 92/4% | 2,130 |

### Theoretical Road Carrying Capacity

9.3.27 The DMRB (2002) identifies the typical theoretical carrying capacity of roads based on their characteristics, under favourable road and traffic conditions. Within the DMRB (2002) the capacity is defined as the maximum sustainable flow of traffic passing in one hour.

9.3.28 Utilising the DMRB Volume 5, Section 1 (Part 3) (1997)8 and Volume 15, Section 1 (Part 5) (2013)9 it is considered that for the A9 (T) and A836 within the Study Area the theoretical traffic carrying capacity is 1,200 vehicles per hour in one direction or 2,400 vehicles per hour in both directions.

9.3.29 The traffic flows included in Table 9.6 demonstrate that the flows are in keeping with the theoretical carrying capacity of the road network and that it is noted that in terms of DMRB, road links within the Study Area have residual capacity. It is however recognised that capacities can vary depending on local conditions.

### Summary of Sensitive Receptors

9.3.30 Based on a review of the Study Area characteristics, Table 9.7: Summary of Receptor Sensitivity has been created.

8 Department for Transport, Design Manual for Roads and Bridges, Volume 5, Section 1, Part 3, 1997
9 Department for transport, Design Manual for Roads and Bridges, Volume 15, Section 1, Part 5 (2013)

**Table 9.7: Summary of Receptor Sensitivity**

| Receptor | Sensitivity | Justification |
|---|---|---|
| Private Residential dwellings with direct frontage to or accessed from the A836. | Medium | Current and historic volume of traffic that uses the A836 each day is less than that relative to the A9(T). |
| Businesses including farms with direct frontage to or accessed from the A836. | Medium | Current and historic volume of traffic that uses the A836 each day is less than that relative to the A9(T). |
| Businesses including farms with direct frontage to or accessed from the A836. | Low | Current and historic volume of traffic that uses the A9 (T) each day are already relatively high. |
| A9(T) | Low | Strategic Route designed and maintained to appropriate standard. |
| A836 | Low | Strategic Route designed and maintained to appropriate standard. |

## 9.4 Assessment of Likely Affects

### Potential Construction Effects

9.4.1 The construction traffic associated with the Proposed Development would comprise of HGVs and LGVs carrying construction materials and plant. There would also be AIL vehicles carrying the main wind turbine components and private cars / vans associated with construction workers and general deliveries. Details of each construction process, construction plant equipment utilised, and the associated traffic movements are included in Technical Appendix 9.1.

9.4.2 There is expected to be an average of 33 construction personnel working on-site at any one time. It is important to note that the number of personnel on-site would vary during the construction process.

9.4.3 Construction work hours are expected to be between 7am to 7pm on Mondays to Saturdays (although it may occasionally be necessary to extend beyond this, for example due to incremental weather). This means that staff would generally arrive and depart outside the peak hours associated with the surrounding road network (typically 8am to 9am and 5pm to 6pm).

9.4.4 The construction period is anticipated to last for 12 months.

9.4.5 Estimates of traffic generation associated with the construction phase of the Proposed Development have been calculated and include, but are not limited to, the following activities:

- Delivery and removal of plant / materials in relation to site mobilisation and set up of site compound;
- Delivery of aggregates and geotextile materials to construct site access roads;
- Delivery of roadstone wearing course for access roads and hardstanding areas at the site;
- Delivery of steel reinforcement;
- Delivery of base rings for turbines;
- Delivery of transformers and switchroom equipment;
- Delivery of sand bedding for cabling;
- Delivery of cabling for turbines;
- Delivery of turbine components (including AILs);
- Delivery and removal of cranes for turbine erection;
- Miscellaneous deliveries; and
- Construction worker trips.

9.4.6 Table 9.8: Anticipated Proposal Construction Traffic details vehicle movements by type.

**Table 9.8: Anticipated Proposed Development Construction Traffic**

| Vehicle Type | Anticipated Number of Vehicles during Proposal Construction |
|---|---|
| Low Loaders | 77 |
| Tippers | 3,675 |
| Mixer truck | 303 |
| Flat bed | 30 |
| Backhoe loader | 4 |
| Clamp lift trailer | 15 |
| Extendible trailer | 15 |
| 30t-50t crane | 1 |
| 150t-200t crane | 2 |

| | |
|---|---|
| 1000t-1200t crane | 2 |
| Tele Handler | 2 |
| Skip lorry | 104 |
| Small Tanker | 104 |
| TOTAL HGV | 4,315 |
| TOTAL TWO-WAY HGVs | 8,630 |
| Cars, Vans and LGVs | 9,048 |
| TOTAL VEHICLES | 13,364 |
| TOTAL TWO-WAY VEHICLE MOVEMENTS | 26,728 |

9.4.7 Table 9.8 demonstrates that the Proposed Development is anticipated to generate a total of 26,728 two-way vehicle movements over the 12-month construction period. It is important to note that traffic movements associated with construction are temporary in nature. Of the 26,728 two-way movements, 8,630 are HGVs.

9.4.8 In addition to the vehicles detailed in Table 9.8 there are anticipated to be 30 one-way AIL vehicle movements associated with the Proposed Development. AIL vehicles can retract once components have been off-loaded and thus the outbound movement is akin to a HGV. The impacts of AIL vehicles are detailed in Technical Appendix 9.1.

**Table 9.9: Anticipated Proposal Construction Traffic by Month, provides a breakdown of deliveries by vehicle type by month.**

| | Month | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Vehicle** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
| **Low loader** | 13 | 4 | 2 | | 4 | 2 | | | 40 | | | 11 |
| **Tippers** | 582 | 582 | 581 | 581 | 587 | 97 | 4 | 4 | 5 | 5 | 315 | 315 |
| **Mixer truck** | | | 87 | 87 | 87 | 40 | 1 | 1 | | | | |
| **Flat bed** | | | 4 | 5 | 10 | 6 | | 6 | | | | |
| **Backhoe loader** | | | 2 | | | | | | | | | 2 |
| **Clamp lift trailer** | | | | | | | | | 24 | | | |
| **Extendible trailer** | | | | | | | | | 15 | | | |
| **30t-50t crane** | | | | | 1 | | | | | | | |
| **150t-200t** | | | | | | | | | 15 | | | |
| **crane** | | | | | | | | | | | | |
| **1000t-1200t crane** | | | | | | | | | 2 | | | |
| **Tele Handler** | | | | | | 2 | | | | | | |
| **Skip lorry** | 9 | 9 | 9 | 8 | 8 | 8 | 8 | 9 | 9 | 9 | 9 | 9 |
| **Small Tanker** | 9 | 9 | 9 | 8 | 8 | 8 | 8 | 9 | 9 | 9 | 9 | 9 |
| **Delivery Vans** | 361 | 361 | 361 | 361 | 357 | 357 | 357 | 357 | 361 | 361 | 361 | 361 |
| **Staff Vehicles** | 180 | 180 | 180 | 180 | 180 | 180 | 180 | 180 | 180 | 180 | 180 | 180 |
| **Total** | **1,154** | **1,145** | **1,235** | **1,230** | **1,241** | **697** | **557** | **565** | **660** | **564** | **874** | **887** |

9.4.9 Construction vehicles would generally be arriving and departing the site at regular intervals during expected site working hours.

9.4.10 Table 9.9 illustrates that Month 5 of the construction period is anticipated to be the busiest month in terms of the number of construction vehicle movements, with 3,076 two-way movements anticipated (1,241 deliveries). Hence, Month 5 is used to determine the impact and any resultant effects of the Proposed Development by determining the anticipated average number of daily vehicle movements which would be added to the baseline AADF illustrated in Table 9.6.

9.4.11 For the purposes of this assessment the following assumptions have been used to determine average daily two-way vehicle movements during Month 5:

- Robust case monthly two-way vehicle movements 2,482 (based on 1,241 deliveries);
- Weekly two-way vehicle movements 620 (assume 4 weeks per month);
- Daily two-way vehicle movements 124 (assume 5 day working week); and
- Hourly two-way vehicle movements 10 (assume 12-hour working day).

9.4.12 Thus, as a robust case, it is anticipated that the peak average number of construction vehicle movements on a daily basis would amount to 124 two-way movements. This equates to approximately 10 two-way vehicle movements per hour.

### Vehicle Routing and Access

9.4.13 Technical Appendix 9.1 contains the route assessment of AIL vehicles from Scrabster Harbour to the site including detailed Swept Path Analysis ('SPA'). The single access point for the AIL vehicles is outlined in the SPA and detailed in Technical Appendix 8.1.

9.4.14 The AIL vehicle route can be summarised as follows:

- from Scrabster Harbour heading south along the A9 (T);
- right turn from the A9 (T) to the A836; and
- westbound travel along the A836 for approximately 5 km prior to taking a left turn into the site.

9.4.15 All other construction traffic is anticipated to access the site via the A9 (T) from Thurso. This has been agreed with THC Transport Planning Team. Thus, for the purposes of the traffic and transport assessment it is assumed that 100% of construction traffic (as shown in Table 9.9) would pass counter locations: 10934, 40800 and 40956 as shown in Figure 9.2. A review of quarries in the area has been used to confirm the assumptions relating to vehicle routing. To represent a robust case, it is also assumed that 100% of construction traffic would pass counter 20801 when in reality only AIL vehicles are likely to utilise the A9 (T) north.

9.4.16 Within the site, existing tracks would be utilised where practicable. New and upgraded access tracks would be provided, typically 5.5 m in width with passing places as required.

### Impact of Construction Vehicles

9.4.17 Table 9.10: Impact of Construction Vehicles details the anticipated impact of proposed construction vehicles within the Study Area based on robust assumptions relating to: the use of Month 5 traffic movements and the assumption that all construction traffic would use each link in the Study Area.

9.4.18 The full table of Proposed Development flows is included in the Technical Appendix 9.2: Anticipated Proposed Construction Traffic by Month.

**Table 9.10: Impact of Construction Vehicles**

| Counter Number / Location | Road | 2020 Baseline AADF | | Proposed development Vehicles Peak Daily Flow | | % Impact of Proposed development Vehicles | |
|---|---|---|---|---|---|---|---|
| | | HGVs Two-Way Vehicles | Total Two - Way Vehicles | HGVs Two-Way Vehicles | Total Two - Way Vehicles | HGVs | Total Vehicles |
| 10934 | A836 | 67 | 2,510 | 62 | 124 | 93% | 5% |
| 20801 | A9 (T) | 94 | 3,212 | 62 | 124 | 66% | 4% |
| 40800 | A9 (T) | 150 | 3,255 | 62 | 124 | 41% | 5% |
| 40956 | A9 (T) | 272 | 14,125 | 62 | 124 | 23% | <1% |
| A836 | A836 | 92 | 2,130 | 62 | 124 | 67% | 6% |

9.4.19 Table 9.10 demonstrates that in respect of total vehicle movements, the maximum daily percentage increase in traffic is 6% at the surveyed location on the A836. As per the IEMA Guidelines (1993), the increase in traffic does not exceed the threshold whereby an assessment of effects is warranted.

9.4.20 It is however recognised that the impact of construction vehicles exceeds the 30% threshold when considering HGVs only at several points in the Study Area, thus an assessment of environmental effects has been undertaken, detailed in the following section.

9.4.21 The daily percentage increase in HGV traffic is anticipated to be between 23% and 93%. It is important to recognise the existing low baseline level of HGVs when assessing any environmental effects and the robust nature of the volume of construction traffic anticipated.

9.4.22 Construction traffic volumes are anticipated to equate to an average of 10 two-way vehicles per hour assuming a 12-hour working day. Considering that the theoretical carrying capacity of roads within the Study Area is in the region of 2,400 two-way vehicles, an additional 10 two-way vehicles per hour is not anticipated to affect the carrying capacity of road links. As demonstrated in Table 9.6 and in respect of DMRB theoretical carrying capacities, it is recognised that road links within the Study Area have residual capacity.

### Study Area Traffic Impact Assessment

9.4.23 The following paragraphs detail the magnitude of impact and effects associated with construction traffic on the road network within the Study Area.

#### A836

9.4.24 The Proposed Development is expected to increase the total daily traffic flow on the A836 by a maximum of 6%. The carrying capacity of the A836, as identified by DMRB (2002) is 1,200 vehicles per hour in either direction. It is anticipated that an additional 10 vehicles per hour is not expected to significantly affect the operation of the A836.

9.4.25 As per Table 9.3, the magnitude of the change of the construction vehicles associated with the Proposed Development on the A836 is classed as ‘no change’, with a maximum increase of 6%.

9.4.26 The daily increase in HGVs is a maximum of 93%. Whilst this equates to a ‘High’ Magnitude of Change, it is important to note that the existing HGV traffic flows are

low (67 two-way vehicle movements) and any increase in traffic has a more pronounced percentage impact. Table 9.3 stipulates in the description for a 'High' Magnitude of Change that the result would be a substantial or total loss of capability for movement along and across transport corridors, loss of access to key facilities, loss of safety and severe delays to road users. It is not considered that this would be the case on the A836 in relation to HGV impact of the Proposed Development. Table 9.3 details the Magnitude of Change descriptors associated with percentage traffic impacts. It is important to note that the impact on the A836 would not match the descriptor for a High Magnitude of Change. The approach used is considered fully robust given the temporary nature of construction traffic.

9.4.27 The sensitivity of the A836 has been determined to be 'low' in terms of the criteria set out within Table 9.2. When the magnitude is combined with the sensitivity of the receptor (Table 9.4), the overall significance of effect is considered to be **Negligible** and is **Not Significant**.

**A9 (T)**

9.4.28 The Proposed Development is expected to increase the daily traffic flow on the A9 (T) by between 1% and 5%. The carrying capacity of the A9 (T), as identified by DMRB is approximately 1,200 vehicles per hour in each direction. It is anticipated that an additional 10 vehicles per hour is not expected to noticeably affect the operation of the A9 (T).

9.4.29 The magnitude of change can be classed as 'no change' when compared with the criteria set out in Table 9.3. The sensitivity of the receptors can be defined as 'low' in terms of the criteria set out within Table 9.2. When the magnitude is combined with the sensitivity of the receptor, the overall significance of effect is considered to be **Minor** and is **Not Significant**.

9.4.30 The daily increase in HGVs is between 23% and 66%. This results in a 'Medium' Magnitude of Change. However, due to the low baseline of HGV traffic, it is not considered that the traffic impact of HGV delivery for the Proposed Development would match the descriptor of a 'High' Magnitude of Change as shown in Table 9.3.

**Severance**

9.4.31 The IEMA Guidelines (1993) advise that "severance is the perceived division that can occur within a community when it becomes separated by a major traffic artery".

9.4.32 The potential for traffic associated with the Proposed Development to cause severance is assessed on a case-by-case basis using professional judgement. As detailed in this Chapter communities exist within the Study Area, principally the settlements of Thurso and Scrabster. There are also a small number of isolated residential and business properties located along the A9 (T) and the A836. On the A9(T) these are identified as being of low sensitivity in Table 9.7. On the A836 businesses and private residential properties are identified as medium sensitivity.

9.4.33 The greatest anticipated traffic volume increase as a result of the construction of the Proposed Development is on A836 with a 6% overall increase in traffic and 93% increase in HGVs. However, as discussed, the percentage increases do not reflect the overall increase in vehicles due the low baseline traffic volume. With an increase of 10 vehicles per hour in each direction, there is not expected to be any perceivable level of severance.

9.4.34 On the A9 (T), it is expected that only residents of Thurso and Burnside would be likely to experience any severance as these settlements are bisected by the A9 (T). However as discussed, the increase in traffic relating to construction vehicles is not expected to result in any perceivable severance occurring.

9.4.35 Combining the low to medium sensitivity of the receptors with the small magnitude of the effect, it is considered that in respect of severance, the Proposed Development would have a **Negligible to Minor** effect and is therefore **Not Significant** on all links in the Study Area.

**Driver Delay**

9.4.36 Some driver delay may be experienced when construction traffic is accessing the site. The IEMA Guidelines (1993) advise "delays are only likely to be significant when the traffic on the network surrounding the development is already at, or close to, the capacity of the system".

9.4.37 It is noted that existing traffic flows on local routes within the vicinity of the Proposed Development are low and there are no locations of significant congestion. Whilst the existing flows are higher on the A9 (T), there are also no significant periods of prolonged congestion. This is demonstrated by existing traffic flows being substantially lower than the theoretical capacity of links in the Study Area. The sensitivity of these routes is considered to be medium when compared with the criteria set out in Table 9.2.

9.4.38 It is noted that construction traffic associated with the Proposed Development amounts to 124 two-way vehicles per day in the robust traffic impact assessment. This volume would only occur during Month 5 of the construction programme and

equates to 10 two-way trips per hour. This volume of traffic is considered to be negligible in magnitude when compared to the baseline traffic volume of each link.

9.4.39 When this 'low' magnitude of the change is combined with the 'medium' sensitivity of the receptors, it is considered that the expected volume of construction traffic would have a **Minor** effect on the Study Area in terms of driver delay and consequently the effect is deemed to be **Not Significant** for all links.

9.4.40 It is noted that the transportation of AILs is likely to cause minor delays to road users due to the need to travel at low speeds and under escort. However, the transportation of AILs to site would be infrequent and is expected to only occur in month 9 of construction therefore the magnitude of any change would be small. When combined with the medium sensitivity of the receptors, the significance of any driver delay is considered to be **Minor** and therefore **Not Significant**.

**Pedestrian Delay and Loss of Amenity**

9.4.41 An increase in construction traffic can make it more difficult for pedestrians to cross a road. Pedestrians can also experience intimidation and the degree to which this is true is affected by the volume of traffic, the proportion of HGV traffic and its proximity to pedestrians and cyclists.

9.4.42 Construction traffic will travel to site through rural areas where there is limited existing pedestrian and cycle infrastructure and therefore activity is expected to be low throughout the Study Area. Given the nature of Scrabster and Thurso, there is anticipated to be a volume of pedestrians akin to the scale and size of these settlements. Along the A836, pedestrian movements are likely to be nominal.

9.4.43 As shown in Table 9.6, there is a negligible volume of cyclists on the Study Area on a daily basis. In 2020, there is expected to be 48 cyclists per day on the A9 (T) through Thurso, 15 on the A9 (T) near Burnside and 6 on the A836. It is noted that a short section of the A9 (T) in Thurso forms part of National Cycle Route (NCR) 1; however, there are segregated footways and signalised crossings in this area which would prevent any loss of amenity for cyclists of pedestrians following the route.

9.4.44 The number of pedestrians or cyclists that are likely to be impacted by construction traffic is negligible and the magnitude of the effect is considered to low; therefore, the effect is considered **Negligible** and **Not Significant**.

**Accidents and Safety**

9.4.45 It is estimated that 10,810 vehicles would access the site during the construction phase (12-month period). An approximate calculation has been undertaken to quantify the level of accident risk that could be expected due to construction traffic.

9.4.46 Receptors of accidents are considered to be of high sensitivity, and any accident directly attributable to the Proposed Development is considered to be significant in terms of EIA Regulations (2011).

9.4.47 The likelihood of an accident occurring is commonly expressed in accidents per million vehicle-km. Accidents that are appraised in relation to transport are predominantly those in which Personal Injury Accidents (PIAs) occur.

9.4.48 Whilst it is acknowledged that there are varying road characteristics along the length of the links within the Study Area, for the purpose of this calculation it has been assumed that the length of road is approximately 7.1 km (from the site access point on the A836 to Thurso town centre) and can be classified as rural good single carriageway.

9.4.49 Accident rates for this category (rural good single carriageway) of road are:

- 0.190 PIAs per million veh-km.

9.4.50 Assuming a two-way trip on the 7.1 km route for each of the 10,810 vehicles, a total distance travelled of 153,502 km is obtained. Based on the rate above this suggests that 0.029 PIAs would occur during the construction phase.

9.4.51 It is considered that the magnitude of this effect is negligible and when combined with the 'low' sensitivity of the receptors (existing users of the roads within the Study Area) the overall effect is classed as **Negligible** and therefore **Not Significant** for all links in the Study Area.

**Dust and Dirt**

9.4.52 IEMA Guidelines (1993) acknowledge that it is not practical to quantify the level of dust and dirt that can be expected from construction traffic associated with a development. Therefore, a quantitative description of the effect on dust and dirt from construction traffic is not provided here.

9.4.53 It is acknowledged that HGVs would have the potential to collect debris on their tyres when accessing the site. This could be transferred to the road surface when vehicles travel away from the site and can be deposited on the road in the form of either dust or dirt depending on weather conditions.

9.4.54 Under the current site access arrangements, it is expected that the A836 would be the most affected by any accumulation of dust or dirt as construction traffic will be

entering and exiting the site from this road. As the A836 is a strategically important road for the north of Scotland and is expected to carry approximately 2,500 vehicles in total (two-way) each day in 2020, its sensitivity with respect to dust and dirt has been determined to be 'low.

9.4.55 As discussed, the volume of construction traffic included in the robust traffic impact assessment amounts to an average of 10 two-way vehicles movements each hour. The magnitude of the effect of dust and dirt is considered to be 'low'.

9.4.56 When the 'low' magnitude of the effect is combined with the 'low' sensitivity of the link, and in the absence of mitigation, it is considered that the effect of dust and dirt study is **Negligible** and therefore **Not Significant**.

## Potential Operational Effects

9.4.57 Once the Proposed Development is operational, the volume of traffic associated with the operations would be minimal, relating to maintenance of wind turbines only. Vehicles used for maintenance are likely to be road-going 4x4s. There may, on rare occasions, be the need for HGV access to the wind turbines. The effect of operational traffic on the road network is therefore considered to be **Minor** and therefore **Not Significant**

9.4.58 The effect of operational traffic impacts in respect of: severance, driver delay, pedestrian delay and amenity, accidents and safety and dust and dirt is considered to be **Not Significant** given that the volume of traffic associated with operational phase is likely to be significantly less than during construction.

## Potential Decommissioning Effects

9.4.59 Planning permission for the Proposed Development is sought for a 35-year period, after which the Proposed Development may be decommissioned, or a further application submitted to repower the site. Traffic associated with the decommissioning of the Proposed Development would include HGVs, LGVs, AILs and private cars. The number of vehicle trips associated with decommissioning is be anticipated to be significantly less than those associated with construction as it is likely that elements of infrastructure such as access tracks and electrical connections would be left in place and components could be broken up on-site to allow transport by reduced numbers of vehicles. As decommissioning traffic volumes are less than construction volumes, assuming the baseline has not substantially changed, the significance of any effects would not be greater, with the effect on the road network considered to be **Not Significant**. It can therefore be assumed that the assessment of the construction phase covers the worst-case scenario.

9.4.60 The effect of decommissioning traffic impacts in respect of: severance, driver delay, pedestrian delay and amenity, accidents and safety and dust and dirt is considered to be **Not Significant** given that the anticipated volume of traffic is significantly less than during construction.

## Potential Cumulative Effects

### Traffic Impact

9.4.61 The cumulative developments that have been reviewed and their relative characteristics are as follows:

- Achlan – Access Route from Wick – Not Considered;
- Achlan 2 - Access Route from Wick – Not Considered;
- Berriedale and Dunbeath - Access Route from Wick – Not Considered;
- Cogle Moss - Access Route from Wick – Not Considered;
- Golticlay - Access Route from Wick – Not Considered;
- Halsary - Access Route from Wick – Not Considered;
- Hill of Lybster – 1 Turbine – Not Considered;
- Rumster Community - Access Route from Wick – Not Considered;
- Limekiln Resubmission (Planning Reference 16/02752/S36) located to the west of the site and is anticipated to generate an average of 61 two-way HGV movements per day and 111 total vehicle two-way movements;
- Strathy Wood Wind Farm (Planning Reference 13/04469/S36) located to the west of the site is anticipated to generate an average of 8 two-way HGV movements per day and 20 total vehicle two-way movements;
- Strathy South Wind Farm (Planning Reference 07/00263/S36SU) also located to the west of the site is anticipated to generate an average of 11 two-way HGV movements per day and 33 total vehicle two-way movements per day; and
- Drum Hollistan Wind Farm (Planning Reference 16/04987/S36) – Refused – Not Included.

9.4.62 Thus, the combined average per day associated with cumulative developments is 80 two-way HGV movements and 164 total vehicle two-way movements.

9.4.63 8.4.64 For the purposes of this transport and traffic assessment, as per the main assessment methodology, 100% of the HGV movements associated with the cumulative developments has been applied to each link in the Study Area in order to

provide a robust assessment. Furthermore, it should be recognised that the cumulative impacts represent a robust case as the Strathy Wood Wind Farm has not been granted planning consent and are at present, still in the planning process.

9.4.64 The resultant cumulative impact of the Proposed Development and potential cumulative developments is included in Table 9.11: Cumulative Traffic Impact.

**Table 9.11: Cumulative Traffic Impact**

| Counter Number / Location | Road | 2020 Baseline AADF | | Proposed development Vehicles Peak Daily Flow | | % Impact of Proposed development Vehicles | |
|---|---|---|---|---|---|---|---|
| | | HGVs Two-Way Vehicles | Total Two - Way Vehicles | HGVs Two-Way Vehicles | Total Two - Way Vehicles | HGVs | Total Vehicles |
| 10934 | A836 | 67 | 2,510 | 172 | 318 | 257% | 13% |
| 20801 | A9 (T) | 94 | 3,212 | 172 | 318 | 183% | 10% |
| 40800 | A9 (T) | 150 | 3,255 | 172 | 318 | 115% | 10% |
| 40956 | A9 (T) | 272 | 14,125 | 172 | 318 | 63% | 2% |
| A836 | A836 | 92 | 2,130 | 172 | 318 | 187% | 15% |

9.4.65 The cumulative impact equates to 318 two-way vehicles per day or 27 two-way vehicles per hour assuming a 12-hour working day.

### Likely Cumulative Effects and their Significance

#### Road Network

9.4.66 The magnitude of change associated with the Proposed Development and cumulative traffic (combined total of 318 two-way vehicles) is considered to be low. The sensitivity of receptors is considered to be medium on all roads within the study area. The significance is classed as **Minor** and thus **Not Significant**.

9.4.67 Whilst the percentage increase in HGV's seems high, this is due to the very low level of existing HGV traffic and the fact that the A836 and A9(T) have been shown to have substantial residual capacity to cope with an increase.

#### Severance

9.4.68 The sensitivity of the receptors is considered to be low. It is considered that the volume of cumulative traffic (318 two-way vehicles per day) would have a small effect on the local road network in terms of severance and consequently the effect is deemed to be **Negligible** and thus **Not Significant**.

#### Driver Delay

9.4.69 When the magnitude of the effect (small) is combined with the sensitivity of the receptors (medium), it is considered that in respect of driver delay the effect is of **Minor** significance and thus deemed **Not Significant** for all the routes within the study area.

#### Pedestrian Delay and Amenity

9.4.70 It is considered that the receptor sensitivity to this effect is low while magnitude of this effect is considered to be **negligible** thus the effect can be considered as **Not Significant** on all routes within the study area.

#### Accidents and Safety

9.4.71 An estimated 76,320 vehicles are associated with the cumulative developments over the 12 month construction programme, based on a robust calculation of assuming the total proposed two-way vehicle trips vehicles (318) would be subject to the same working patterns as the Proposed Development i.e a 5 day week for calculation purposes (318 x 5 days x 4 weeks x 12 months = 76,320). Using the same study route length of 7.1 km and an accident rate of 0.190 PIAs per million vehicle-kilometres, the likelihood of an accident is 0.103. Given that the increased traffic levels are temporary the magnitude of the accidents and safety effects has been determined as being low and **Not Significant**.

#### Dust and Dirt

9.4.72 When the magnitude of the change is combined with the receptor sensitivity, it is considered that the effect of dust and dirt on all routes within the study area is **Not Significant**.

## 9.5 Mitigation

9.5.1 The assessment does not predict any significant effects. As a result, no mitigation is required to address predicted effects associated with traffic and transport. Notwithstanding this, the following measures are proposed as 'good practice' to ensure the any effects are minimised as far as possible within the Study Area and it is assumed will be a condition to any consent for the Proposed Development. The Applicant proposes to offer mitigation by way of CTMP. The purpose of the CTMP is to reduce the traffic impacts and effects associated with the Proposed Development. The CTMP would include (where applicable) the following indicative measures:

- Minimise the volume of imported and exported material;
- Delivery control;
- Implementation of sustainability policies;
- Designated construction route to the site (preferred routes have already been identified);
- Implementation of contractor' speed limit;
- Use of warning and information signs;
- Restriction on construction site operating hours;
- Management of construction vehicle routing;
- Wheel washing at site accesses;
- Use of road sweeper to keep A836 clear of dust and dirt;
- Workforce parking arrangements; and
- Staff induction to educate site staff on traffic management arrangements.

### Mitigation during Construction

9.5.2 A Liaison Officer would be appointed by the Applicant with responsibility for the CTMP. The Liaison Officer would be responsible for the implementation of the mitigation measures and would be a key point of contact with the local community and other stakeholders. The Liaison Officer would be responsible for ensuring the Principal Contractor for the Proposed Development adheres to the CTMP.

9.5.3 With regards to the movement of AIL, the following mitigation measures would be put in place:

- All AIL vehicles would be restricted out-with the peak hours when existing traffic flows along the route would be lower;
- Information on the movement of AIL would be provided to the local press to help inform the public and those directly affected by the Proposed Development;
- An escort would accompany all AIL vehicles; and
- Appropriate warning and information signs would be provided along the AIL delivery route.

9.5.4 The Liaison Officer appointed by the Applicant would as part of the CTMP consult and work with other developers of wind farm proposals to mitigate impacts and effects through the appropriate scheduling and control vehicle access, where appropriate. It is important to recognise that the peak periods associated with wind farm developments are not likely to overlap due to the output capacities of quarries. Scheduling of AIL deliveries would also be discussed with the Scrabster Harbour Master to mitigate impacts, where appropriate.

### Mitigation during Operation

9.5.5 There are no relevant mitigation measures.

### Mitigation during Decommissioning

9.5.6 There are no relevant mitigation measures.

## 9.6 Assessment of Residual Effects

9.6.1 There would be no significant Residual Effects.

## 9.7 Summary

9.7.1 Table 9.12: Summary of Potential Significant Effects of the Proposed Development, summarises the significance of transport and traffic effects during the construction, operation and decommissioning of the Proposed Development. There would be no Residual Effects.

**Table 9.12: Summary of Potential Significant Effects of the Proposed Development**

| Likely Significant Effect | Mitigation Proposed | Means of Implementation | Outcome/Residual Effect |
|---|---|---|---|
| **Construction** | | | |
| Severance | ▫ Use of warning and information sign.<br>▫ Delivery control. | CTMP | Not significant |
| Driver Delay | Designated construction Route.<br>▫ Restriction on construction site operating hours. | CTMP | Not significant |
| Pedestrian Delay and Amenity | ▫ Use of contractor's speed limits.<br>▫ Management of construction vehicle routing. | CTMP | Not significant |
| Accidents and Safety | ▫ Use of warning and information signs.<br>▫ Use of contractor's speed limits. | CTMP | Not significant |
| Dust and Dirt | ▫ Wheel Washing at site access.<br>▫ Use of Road Sweeper. | CTMP | Not significant |
| **Cumulative** | | | |
| Severance | ▫ Use of warning and information signs.<br>▫ Delivery control. | CTMP | Not significant |
| Driver Delay | ▫ Designated construction Route. | CTMP | Not significant |

| Likely Significant Effect | Mitigation Proposed | Means of Implementation | Outcome/Residual Effect |
|---|---|---|---|
| | ▫ Restriction on construction site operating hours. | | |
| Pedestrian Delay and Amenity | ▫ Use of contractor's speed limits.<br>▫ Management of construction vehicle routing. | CTMP | Not significant |
| Accidents and Safety | ▫ Use of warning and information signs.<br>▫ Use of contractor's speed limits. | CTMP | Not significant |
| Dust and Dirt | ▫ Wheel Washing at site access.<br>▫ Use of Road Sweeper. | CTMP | Not significant |
| **Operation** | | | |
| Severance | Not applicable | Not applicable | Not significant |
| Driver Delay | Not applicable | Not applicable | Not significant |
| Pedestrian Delay and Amenity | Not applicable | Not applicable | Not significant |
| Accidents and Safety | Not applicable | Not applicable | Not significant |
| Dust and Dirt | Not applicable | Not applicable | Not significant |
| **Decommissioning** | | | |
| Severance | Not applicable | Not applicable | Not significant |
| Driver Delay | Not applicable | Not applicable | Not significant |
| Pedestrian Delay and Amenity | Not applicable | Not applicable | Not significant |
| Accidents and Safety | Not applicable | Not applicable | Not significant |
| Dust and Dirt | Not applicable | Not applicable | Not significant |

9.7.2 The Applicant proposes to mitigate the transport and traffic impact and effects of the Proposed Development during construction through CTMP.

## 9.8 Glossary and Abbreviations

9.8.1 Table below shows the list of terms used within this chapter with brief definition.

| Term | Definition |
|---|---|
| Study Area | Defined Assessment Area |
| Proposed Development | Cairnmore Hill Wind Farm |
| The site | The project site, the site, development area, red line boundary. |

9.8.2 Table below shows the list of abbreviations used within the chapter and its expansion. All the abbreviations were fully expanded on first reference within the chapter with the abbreviation in brackets immediately after.

| Abbreviation | Expanded Term |
|---|---|
| AADF | Average Annual Daily Flows |
| AIL | Abnormal Indivisible Loads |
| ATC | Automatic Traffic Counter |
| CIHT | Chartered Institution of Highways and Transportation |
| CTMP | Construction Traffic Management Plan |
| DfT | Department for Transport |
| DMRB | The Design Manual for Roads and Bridges |
| EIA | Environmental Impact Assessment |
| HGV | Heavy Goods Vehicle |
| HwLDP | Highland wide Local Development Plan |
| IEA | Institute of Environmental Assessment |
| IEMA | Institute of Environmental Management and Assessment – formerly the IEA |
| IHT | The Institution of Highways and Transportation |
| LGV | Light Goods Vehicle |
| NRTF | National Road Traffic Forecasts |
| PAN 75 | Planning Advice Note 75 |
| SPP | Scottish Planning Policy |
| THC | The Highland Council |
| TS | Transport Scotland |

# 10 Noise

## 10.1 Introduction

10.1.1 This chapter considers the likely significant effects of noise associated with the construction, operation and decommissioning of the Proposed Development. The specific objectives of the chapter are to:

- describe the noise baseline;
- describe the assessment methodology and significance criteria used in completing the impact assessment;
- describe the potential effects, including direct, indirect and cumulative effects;
- describe the mitigation measures proposed to address likely significant effects; and
- assess the residual effects remaining following the implementation of mitigation.

10.1.2 The assessment has been carried out by Andrew Birchby of RES, a Member of the Institute of Acoustics with over ten years of experience in wind farm noise assessment. Further detail of RES' experience is provided in Technical Appendix 10.1.

10.1.3 This chapter is supported by the following figures and technical appendices:

- Figure 10.1 – Noise footprint for Proposed Development;
- Figure 10.2 – Cumulative noise footprint;
- Technical Appendix 10.1 – Statement of Authority;
- Technical Appendix 10.2 - Assessment of Energy Storage Facility;
- Technical Appendix 10.3 – Scope of Assessment;
- Technical Appendix 10.4 – Calculating Standardised Wind Speed;
- Technical Appendix 10.5 – Propagation Height & Valley Effect;
- Technical Appendix 10.6 – Background Noise Survey Photos;
- Technical Appendix 10.7 – Instrumentation Records;
- Technical Appendix 10.8 – Charts;
- Technical Appendix 10.9 – Directional Cumulative Noise Levels without Proposed Development;
- Technical Appendix 10.10 – Suggested Planning Conditions;
- Technical Appendix 10.11 – Directional Predicted Noise Levels for Proposed Development;
- Technical Appendix 10.12 – Directional Margins for Proposed Development;
- Technical Appendix 10.13 – Noise Management Strategy;
- Technical Appendix 10.14 – Mitigated Directional Noise Levels for Proposed Development; and
- Technical Appendix 10.15 - Directional Margins for Proposed Development with Mitigation.

10.1.4 Figures and technical appendices are referenced in the text where relevant.

## 10.2 Assessment Methodology and Significance Criteria

### Scope of Assessment

10.2.1 Noise can have an effect on the environment and on the quality of life enjoyed by individuals and communities. The effect of noise, both in the construction and operational phase, is therefore a material consideration in the determination of planning applications.

**Construction Noise**

10.2.2 The sources of construction noise, which are temporary, would vary both in location and duration as the different elements of the wind farm are constructed and would arise primarily through the operation of large items of plant.

10.2.3 Noise would also arise due to the temporary increase in construction traffic near the site. This level would also depend on the particular construction phase of the Proposed Development.

10.2.4 The acoustic impact assessment of construction noise from the Proposed Development presented in this chapter is based on RES's experience of constructing wind farms and calculated for the operation of the primary large items of construction equipment. Additionally, consideration is given to the increased noise levels due to increased traffic flows during the construction phase to and from the site.

10.2.5 Noise would also arise during decommissioning of the Proposed Development (through turbine deconstruction and breaking of the exposed part of the concrete bases) although resultant noise levels are expected to be lower than those associated with construction activity.

**Operational Noise**

10.2.6 In the context of other sources of environmental noise, the noise levels produced by wind turbines are generally low and have greater dependence upon wind speed. The

combination of these two factors implies that a degree of masking would often be provided by background noise.

10.2.7 As described by Scottish Government Planning Advice for Onshore Wind Turbines[1]:

*"Technically, there are two quite distinct types of noise sources within a wind turbine - the mechanical noise produced by the gearbox, generator and other parts of the drive train; and the aerodynamic noise produced by the passage of the blades through the air. There has been significant reduction in the mechanical noise generated by wind turbines through improved turbine design".*

10.2.8 The main focus of the assessment of operational noise presented in this chapter is based on the most relevant type of noise emission for modern wind turbines: aerodynamic noise, which is broadband in nature. Mechanical noise, which can be tonal in nature, is also considered albeit less relevant to modern wind turbines. Implicitly incorporated within this assessment is the normal character of the noise associated with wind turbines (commonly referred to as 'blade swish') and consideration of a range of noise frequencies, including low frequencies.

10.2.9 An acoustic assessment considering the operation of the proposed energy storage facility can be found in Technical Appendix 10.2.

## Consultation

10.2.10 Details of the consultation undertaken are outlined in Table 10.1.

**Table 10.1 Consultation Responses**

| Consultee | Date of Consultation | Issue Raised | Response/Action |
|---|---|---|---|
| The Highland Council | 29/08/2014 | Report "Planned Acoustic Assessment at the Proposed Hill of Forss Wind Farm" (ref. 03022-000409) sent to Environmental Health Officer (EHO). | Response from EHO received 29/08/2014 detailed below |
| The Highland Council | 29/08/2014 | Email from EHO following receipt of planned acoustic assessment details confirming that ETSU-R-97 and the Institute of Acoustics Good Practice Guide should be used.<br>EHO proposes visiting site to get a better idea of the proposed survey locations.<br>EHO notes that noise from existing wind farms will need to be excluded from the measurements, consented levels rather than predicted levels should be used and that there are other projects other than Forss and Baillie in the vicinity.<br>The EHO also raises the issue of respite/exposure. | ETSU-R-97 and the Institute of Acoustics Good Practice Guide have been used.<br>Measures to exclude the influence of existing wind farms have been taken.<br>Conditioned levels have been used for any consented/existing projects in the cumulative assessment.<br>Eight single turbine sites are included in the cumulative assessment alongside Forss & Baillie.<br>An assessment of respite/exposure is included. |
| The Highland Council | 29/09/2014 | Phone call made to EHO to confirm receipt of "Planned Acoustic Assessment at the Proposed Hill of Forss Wind Farm" report. EHO was invited to attend the initial setup and confirmed their attendance on 6th October 2014. EHO to confirm his acceptance of the survey locations by 3rd October 2014. | Response from EHO received 03/10/2014 detailed below |
| The Highland Council | 03/10/2014 | Email from EHO saying they hadn't been able to visit site and attaching a map with the five broad areas for monitoring and advising that survey locations within these areas should be conservative e.g. sheltered, set back from the road and away from agricultural activity. | The four survey locations are within the four areas identified by the EHO that are closest to the Proposed Development.<br>The selected monitoring locations were chosen to be conservative as far as possible with the EHO present at the installation. |
| The Highland Council | 28/10/2014 | Report "Noise Survey Locations for the Acoustic Assessment at the Proposed Hill of Forss Wind Farm" (ref. 03022-000436), containing details of installed survey locations, sent to EHO via email. | Response from EHO received 18/11/2014 detailed below |
| The Highland Council | 18/11/2014 | Email response received from EHO providing planning officer contact details regarding obtaining a copy of the Baillie Environmental Impact Assessment. | Baillie Environmental Impact Assessment obtained. |
| The Highland Council | 25/08/2017 | Email to EHO informing of name change to Cairnmore Hill and request to discuss assessment in advance of submission. | Response from EHO received 29/08/2017 detailed below |
| The Highland Council | 29/08/2017 | Response from EHO requesting summary and mapping in advance to inform any discussion. | Information requested provided 15/03/19 as detailed below |
| The Highland Council | 15/03/2019 | Email to EHO outlining points for discussion and providing requested background information. | Response from EHO received 02/04/2019 detailed below |
| The Highland Council | 02/04/2019 | On determining background noise level from existing wind farms EHO notes that old data can be used, directional filtering might be appropriate in this case and that the properties to the east are probably far enough away from Baillie and Forss.<br>Where significant headroom exists between the predicted noise levels and | Directional filtering is used to account for the presence of existing wind farms at the two survey locations to the west. The resulting background noise levels are compared to old data for reference.<br>3dB is added to the predicted |

1 Onshore wind turbines', The Scottish Government, 2013, www.scotland.gov.uk

| Consultee | Date of Consultation | Issue Raised | Response/Action |
|---|---|---|---|
| | | consented limits adding 3dB to the predictions is generally appropriate. | noise levels where significant headroom exists. |
| The Highland Council | 08/04/2019 | Email to EHO requesting further opinion on methods for excluding influence of existing sites, sites for inclusion in cumulative assessment, cumulative exposure assessment method, significant headroom definition and appropriate lower limits. | Response from EHO received 11/04/2019 detailed below |
| The Highland Council | 11/04/2019 | EHO looking for evidence that background figures are representative.<br>Suggested cumulative exposure assessment methods, e.g. calculating % time a property would be downwind, ok.<br>Night time lower limit of 38dB(A) advised although Baillie consented to 43dB(A). | The background noise levels are compared to old data for reference.<br>Exposure assessed using one of the suggested methods (% time downwind).<br>Night time lower limit of 38dB(A) adopted. |
| The Highland Council | 23/12/2020 | Taldale may not be a suitable proxy location.<br>Description of noise sources at measurement locations not provided.<br>Amount of noise management, and need for turbines to be paused, suggests scale of development not appropriate.<br>Concerns about increased noise exposure. | Background noise levels from Taldale not inferred to other locations.<br>Description of noise sources observed during site visits provided.<br>Revised scheme with fewer turbines proposed with less noise management.<br>Updated information provided on noise exposure. |
| The Highland Council | 18/01/2022 | Scoping report submitted for 5 turbine site. | Response from EHO received 02/02/2022 detailed below |
| The Highland Council | 02/02/2022 | 35 dB(A) daytime and 38 dB(A) night-time lower limits should be used.<br>A cumulative assessment is required with consented and existing schemes scaled to their conditioned limits.<br>Consideration should be given to noise exposure. | The requested day and night-time lower limits have been maintained.<br>A cumulative assessment has been included with scaling of consented/existing sites.<br>Noise exposure considered. |

## Potential Effects Scoped Out

10.2.11 Low frequency content of the noise from wind farms is considered through the use of octave band specific noise emission and propagation modelling; however, it is considered that a specific and targeted assessment on low frequency noise from the Proposed Development is unjustified.

10.2.12 Detailed reasoning for scoping out low frequency noise, infrasound, sleep disturbance, vibration, amplitude modulation and wind turbine syndrome is presented in Technical Appendix 10.3. A summary of the findings of a comprehensive study into wind turbine noise and health effects can also be found in this appendix.

## Method of Baseline Characterisation

10.2.13 The baseline is determined following the methodology described in the Department of Trade and Industry's 'The Assessment and Rating of Noise from Wind Farms' (ETSU-R-97)[2] and the Institute of Acoustics' Good Practice Guide to the application of ETSU-R-97 for the assessment and rating of wind turbine noise (IoA GPG)[3] .

10.2.14 Similar to other assessments of noise impacts (most notably BS 4142[4] which ETSU-R-97 identifies as forming the basis of its recommendations), the ETSU-R-97 methodology requires the comparison of predicted noise levels due to turbine emissions (which vary with hub height wind speed) with noise limits based upon the noise levels already existing under those same conditions (i.e. the baseline conditions).

10.2.15 Since background noise levels depend upon wind speed, as indeed do wind turbine noise emissions, it is important when making reference measurements to put them in that context. Thus, the assessment of background noise levels at potentially sensitive residential properties requires the measurement of not only noise levels, but concurrent wind conditions, covering a representative range of wind speeds. These wind measurements are made at the wind turbine site rather than at the residential properties, since it is this wind speed that would subsequently govern the wind farm's noise generation. Often the residential properties themselves will be sheltered from the wind and may consequently have relatively low background noise levels.

10.2.16 To establish the baseline conditions, sound level meters and associated apparatus are set-up to record the required acoustic information at a selection of the most noise sensitive residential properties geographically spread around the proposed wind farm site and which are likely to be representative of other residential properties in the locale.

10.2.17 Wind speed and direction are recorded as 10 minute averages for the same period as for the noise measurements, and are synchronised with the acoustic data to allow

2 'The Assessment and Rating of Noise from Wind Farms', The Working Group on Noise from Wind Turbines, ETSU Report for the DTI, ETSU-R-97

3 'A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise', Institute of Acoustics, May 2013

4 'Method for Rating Industrial Noise affecting Mixed Residential and Industrial Areas', British Standards Institution, 1997

correlations to be established. The wind speed that is adopted for use is the same wind speed as that which drives the turbine noise levels.

10.2.18 The adoption of this wind speed was recommended by the IoA GPG. The methodology used to calculate standardised 10 m wind speed is described in Technical Appendix 10.4.

10.2.19 Prior to establishing the baseline conditions the acoustic data is filtered as follows:

- For each background noise measurement location, the measured noise data is divided into two sets, as specified by ETSU-R-97 and shown in Table 10.2:

**Table 10.2 Definition of Time of Day Periods**

| Time of Day | Definition |
|---|---|
| Quiet daytime | 18:00 - 23:00 every day<br>13:00 - 18:00 Saturday<br>07:00 - 18:00 Sunday |
| Night-time | 23:00 - 07:00 every day |

- Rainfall affected data is systematically removed from the acoustic data set. To facilitate this, a rain gauge is deployed at the site to record 10 minute rainfall data and identify potentially affected noise data. Both the 10 minute period containing the bucket tip and the preceding 10 minute period are removed from the dataset as recommended by the IoA GPG to account for the time it takes for the rain gauge tipping bucket to fill;
- Periods of measured background noise data thought to be affected by extraneous, i.e. non-typical, noise sources are identified and removed from the data set. Whilst some 'extraneous' data may actually be real, it tends to bias any trend lines upwards so its removal is adopted as a conservative measure.
- In practice this means close inspection of the measured background noise levels, comparison with concurrent data measured at nearby locations and consideration of both directional and temporal variation.

## Criteria for the Assessment of Effects

### Construction Noise

10.2.20 In the web based Scottish Government technical advice on construction noise assessment in 'Appendix 1: Legislative Background, Technical Standards and Codes of Practice'[5] it is stated that:

*"However, under Environmental Impact Assessments and for planning purposes i.e. not in regard to the Control of Pollution Act 1974, the 2009 version of BS 5228 is applicable."*

10.2.21 Given that BS 5228-1:2009 'Code of practice for noise and vibration control on construction and open sites - Part 1: Noise'[6] is identified as being the appropriate source of guidance on methods for minimising noise from construction activities, it is adopted herein.

10.2.22 The Control of Pollution Act 1974 provides information on the need for ensuring that the best practicable means are employed to minimise noise[7].

10.2.23 To ensure adequate assessment of the potential impacts of the construction noise from the Proposed Development the following steps have been taken:

10.2.24 Baseline noise criteria are established from the appropriate guidance BS 5228-1:2009;

10.2.25 Noise levels due to on-site construction activities are predicted at the most sensitive residential properties in accordance with the BS 5228-1:2009 standard;

- Predicted noise levels due to construction traffic at the same residential properties are made using the BS 5228-1:2009 standard; and
- The combined effect of on-site construction activities with construction traffic is compared with the target level specified by BS 5228-1:2009.

### Operational Noise

10.2.26 Within Scotland, noise is defined within the planning context by 'Planning Advice Note 1/2011: Planning and Noise'[8]. This Planning Advice Note provides advice on the role of the planning system in helping to prevent and limit the adverse effects of noise. The Planning Advice Note 1/2011 states that:

*"Good acoustical design and siting of turbines is essential to minimise the potential to generate noise."*

10.2.27 Planning Advice Note 1/2011 refers to the use of the Department of Trade and Industry's 'The Assessment and Rating of Noise from Wind Farms' (ETSU-R-97), noting that further guidance is provided in the web-based planning advice on renewable technologies for onshore wind turbines1. In relation to noise from wind farms the web-based renewables advice states:

5 'Appendix 1: Legislative Background, Technical Standards and Codes of Practice', Scottish Government, 2011, www.scotland.gov.uk

6 'Code of Practice for Noise and vibration control on construction and open sites - Part 1: Noise', British Standards Institution, BS 5228-1:2009

7 'Control of Pollution Act', Control of Pollution Act, published by Her Majesty's Stationary Office, 1974

8 'Planning Advice Note 1/2011: Planning and Noise', Scottish Government policy, March 2011

*"The Report, 'The Assessment and Rating of Noise from Wind Farms' describes a framework for the measurement of wind farm noise, which should be followed by applicants and consultees, and used by planning authorities to assess and rate noise from wind energy developments, until such time as an update is available."*

10.2.28 It is therefore considered that the use of ETSU-R-97, as criteria for assessment of wind farm noise, fulfils the requirements of Planning Advice Note 1/2011.

10.2.29 The methodology described in ETSU-R-97 was developed by a working group comprising a cross-section of interested persons including, amongst others, environmental health officers, wind farm operators and independent acoustic experts.

10.2.30 The guidance makes it clear from the outset that any noise restrictions placed on a wind farm must balance the environmental impact of the wind farm against the national and global benefits that arise through the development of renewable energy resources. The principle of balancing development needs against protection of amenity may be considered common to any type of noise control guidance.

10.2.31 The basic aim of ETSU-R-97, in arriving at the recommendations contained within the report, is the intention to provide:

*"Indicative noise levels thought to offer a reasonable degree of protection to wind farm neighbours, without placing unreasonable restrictions on wind farm development or adding unduly to the costs and administrative burdens on wind farm developers or local authorities."*

10.2.32 An article published in the Institute of Acoustics Bulletin (IoA Bulletin) Vol. 34 No. 2, March/April 2009[9], recommends a methodology for addressing issues not made explicit by, or outside the scope of, ETSU-R-97, such as in relation to wind shear or noise propagation modelling. Whilst this article does not represent formal legislation or guidance it was authored by a group of independent acousticians experienced in wind farm noise issues who have undertaken work on behalf of wind farm developers, local planning authorities and third parties and as such is a good indicator of best practice techniques. The assessment presented herein adopts the recommendations made within this article.

10.2.33 The IoA GPG, issued by the Institute of Acoustics in May 2013 and endorsed by the Department of Energy and Climate Change (DECC), Northern Ireland Executive, Scottish Government and the Welsh Assembly, provides guidance on all aspects of the use of ETSU R 97 and reaffirms the recommendations of the IoA Bulletin with regard to propagation modelling and wind shear. The assessment presented herein adopts the recommendations of the IoA GPG.

10.2.34 Supplementary guidance notes were published by the Institute of Acoustics in July and September 2014, and these provide further details on specific areas of the IoA GPG[10]. The assessment presented in this chapter adopts the recommendations made within these supplementary guidance notes.

10.2.35 ETSU-R-97 has been applied at the vast majority of wind farms currently operating in the UK and provides a robust basis for assessing the noise impact of a wind farm when used in accordance with the IoA GPG. It is the only relevant guidance referenced in Scottish planning policy for rating and assessing operational wind farm noise. Based on planning policy and guidance, as outlined above, a wind farm which can operate within noise limits derived according to ETSU-R-97 shall be considered acceptable. This approach has been agreed with the Highland Council (THC) (see Table 10.1)

10.2.36 To ensure adequate assessment of the potential impacts of the operational noise from the Proposed Development the following steps have been taken, in accordance with relevant guidance detailed above:

10.2.37 The baseline noise conditions at a representative sample of the nearest residential properties are established by a background noise survey;

- The noise levels at the nearest residential properties, from the operation of the Proposed Development, are predicted using a sound propagation model considering:
- the locations of the wind turbines;
- the locations of the properties;
- the intervening terrain; and
- the likely noise emission characteristics of the wind turbines;
- With due regard to relevant guidance or regulations the acoustic assessment criteria are derived; and
- The evaluation of the acoustic impact is undertaken by comparing the predicted noise levels with the assessment criteria.

9 'Prediction and Assessment of Wind Turbine Noise', Bowdler et al, Acoustics Bulletin Vol 34 No 2 March/April 2009

10 'A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise - Supplementary Guidance Notes', Institute of Acoustics, July & September 2014

### MODELLING NOISE PROPAGATION

10.2.38 Whilst there are several sound propagation models available, the ISO 9613 Part 2 model has been used[11], this being identified as the most appropriate for use in such rural sites[12]. The specific interpretation of the ISO 9613 Part 2 propagation methodology recommended in the aforementioned IoA Bulletin and the subsequent IoA GPG has been employed.

10.2.39 To make noise predictions it is assumed that:

- the turbines radiate noise at the power specified in this report;
- each turbine can be modelled as a point source at hub-height; and
- each residential property is assigned a reference height to simulate the presence of an observer.

10.2.40 The sound propagation model takes account of attenuation due to geometric spreading and atmospheric absorption. The assumed temperature and relative humidity are 10˚C and 70% respectively, as recommended in the IoA Bulletin and IoA GPG. Ground effects are also taken into account by the propagation model with a ground factor of 0.5 and a receiver height of 4 m used, as recommended in the IoA Bulletin and IoA GPG.

10.2.41 The barrier attenuations predicted by ISO 9613 Part 2 have been shown to be significantly greater than those measured in practice under downwind conditions. Therefore, barrier attenuation according to the ISO 9613 Part 2 method has been discounted. In lieu of this, where there is no direct line of sight between the residential property in question and any part of the wind turbine, 2 dB attenuation has been assumed, as recommended in the IoA Bulletin and the IoA GPG.

10.2.42 Additionally, verification studies have also shown that ISO 9613 Part 2 tends to slightly underestimate noise levels at nearby dwellings in certain exceptional cases, notably in a valley type environment where the ground drops off between source and receiver. In these instances, an addition of 3 dB(A) has been applied to the resulting overall A-weighted noise level, as recommended by the IoA GPG. Further detail is provided in Technical Appendix 10.5.

10.2.43 To generate the ground cross sections between each turbine and each dwelling necessary for reliable propagation modelling, ground contours at 5 m intervals for the area of interest have been generated from 50 m grid resolution digital terrain data.

10.2.44 The predicted noise levels are calculated as LAeq noise levels and changed to the LA90 descriptor (to allow comparisons to be made) by subtraction of -2 dB, as specified by ETSU-R-97.

10.2.45 It has been shown, by measurement-based verification studies, that the ISO 9613 Part 2 model tends to slightly overestimate noise levels at nearby dwellings[12]. Examples of additional conservative assumptions modelled are:

- properties are assumed to be downwind of all noise sources simultaneously and at all times. In reality, this is not the case and additional attenuation would be expected when a property is upwind or crosswind of the proposed wind turbines;
- although, in reality, the ground is predominantly porous (acoustically absorptive) it has been modelled as ‘mixed’, i.e. a combination of hard and porous, corresponding to a ground absorption coefficient of 0.5 as recommended by the IoA Bulletin and IoA GPG;
- receiver heights are modelled at 4 m above local ground level, which equates roughly to first floor window level, as recommended by the IoA Bulletin and IoA GPG. This results in a predicted noise level anything up to 2 dB(A) higher than at the typical human ear height of 1.2 - 1.8 m;
- trees and other non-terrain shielding effects have not been considered;
- an allowance for measurement uncertainty has been included in the sound power levels for the presented turbine.

## CRITERIA FOR ASSESSING SIGNIFICANCE

10.2.46 Noise is measured in decibels (dB) which is a measure of the sound pressure level, i.e. the magnitude of the pressure variations in the air. Measurements of environmental noise are usually made in dB(A) which includes a correction for the sensitivity of the human ear.

10.2.47 ETSU-R-97 seeks to protect the internal and external amenity of wind farm neighbours by defining acceptable limits for operational noise from wind turbines. The test applied to operational noise is whether or not the noise levels produced by the combined operation of the wind turbines lie below noise limits derived in accordance with ETSU-R-97 at nearby residential properties.

10.2.48 Whilst ETSU-R-97 presents a comprehensive and detailed assessment methodology for wind farm noise, it also provides a simplified methodology:

11 ‘Acoustics - Attenuation of Sound During Propagation Outdoors, Part 2: General Method of Calculation’, International Organisation for Standardisation, ISO 9613-2:1996

12 ‘A Critical Appraisal of Wind Farm Noise Propagation’, ETSU Report W/13/00385/REP, 2000

*"if the noise is limited to an LA90,10min of 35dB(A) up to wind speeds of 10 m/s at 10 m height, then these conditions alone would offer sufficient protection of amenity, and background noise surveys would be unnecessary".*

10.2.49 In the detailed methodology, ETSU-R-97 states that different limits should be applied during daytime and night-time periods. The daytime limits, derived from the background noise levels measured during quiet daytime periods, are intended to preserve outdoor amenity, while the night-time limits are intended to prevent sleep disturbance. The general principle is that the noise limits should be based on existing background noise levels, except for very low background noise levels, in which case a fixed limit may be applied. The suggested limits are given in Table 10.3 below, where LB is the background noise level in LA90,10min and is a function of wind speed. During daytime periods and at low background noise levels, a lower fixed limit of 35–40 dB(A) is applicable. The exact value is dependent upon a number of factors: the number of nearby dwellings, the effect of the noise limits on energy produced, and the duration and level of exposure.

**Table 10.3: Permissible Noise Level Criteria**

| Time of Day | Permissible Noise Level |
|---|---|
| Day | 35-40B(A) for $L_B$ less than 30-35 dB(A)<br>$L_B$ + 5 dB, for $L_B$ greater than 30-35 dB(A) |
| Night | 43 dB(A) for $L_B$ less than 38 dB(A)<br>$L_B$ + 5 dB, for $L_B$ greater than 38 dB(A) |

10.2.50 Note that a higher noise level is permissible during the night than during the day as it is assumed that residents would be indoors. The night-time criterion is derived from sleep disturbance criterion referred to in ETSU-R-97, with an allowance of 10 dB for attenuation through an open window.

10.2.51 The wind speeds at which the acoustic impact is considered are less than or equal to 12 ms-1 at a height of 10 m and are likely to be the acoustically critical wind speeds. Above these wind speeds, as stated in ETSU-R-97, reliable measurements of background and turbine noise are difficult to make. However, if a wind farm meets the noise criteria at the wind speeds presented, it is most unlikely that it would cause any greater loss of amenity at higher wind speeds due to increasing background noise levels masking wind farm generated noise.

10.2.52 It is important to note that, since reactions to noise are subjective, it is not possible to guarantee that a given development would not result in any adverse comment with regard to noise as the response to any given noise will vary from person to person. Consequently, standards and guidance that relate to environmental noise are typically presented in terms of criteria that would be expected to be considered acceptable by the majority of the population.

## 10.3 Baseline Conditions

### Current Baseline

#### Construction Noise

10.3.1 For the on-site construction noise assessment, Annex E of BS 5228-1:2009 provides guidance on setting environmental noise targets. Several methods of assessing the significance of noise levels are presented in Annex E and the most applicable to the construction of the proposed wind farm development is the ABC method. The ABC method sets threshold noise levels for specific periods based on the ambient noise levels.

#### Operational Noise

10.3.2 The Proposed Development is located approximately 4.5 km west of Thurso. The surrounding area is predominantly rural in nature although an A-class road runs to the north of the site and the sea is approximately 2 km to the north. The general noise character is typical of a rural environment with some traffic noise from the A road.

10.3.3 Background noise measurements were undertaken at four residential property locations in accordance with ETSU-R-97 as detailed in Table 10.4.

**Table 10.4: Background Noise Survey Details**

| House Name | Start | End | Duration (days) | Observed Noise Sources |
|---|---|---|---|---|
| Braighmor | 08/10/2014 | 24/11/2014 | 48 | Wind in the trees & birds |
| Dunhobby | 08/10/2014 | 24/11/2014 | 48 | Road traffic |
| Hopefield | 08/10/2014 | 24/11/2014 | 48 | Birds |
| Taldale | 08/10/2014 | 24/11/2014 | 48 | Road traffic, birds & dogs |

10.3.4 The background noise monitoring equipment was housed in weather-proof enclosures and powered by lead-acid batteries. The microphones were placed at a height of approximately 1.2 m above ground and equipped with all-weather wind shields which also provide an element of water resistance.

10.3.5 The proprietary wind shields used are designed to reduce the effects of wind-generated noise at the microphone and accord with the recommendations of the IoA GPG in that they are the appropriate size and, in combination with the microphone, are certified by the manufacturer as meeting Type 1 / Class 1 precision standards.

10.3.6 Noise levels are monitored continuously, and summary statistics stored every 10 minutes in the internal memory of each meter. The relevant statistic measured is the LA90,10min (The A-weighted sound pressure level exceeded for 90 % of the 10 minute interval).

10.3.7 The sound level meters were placed away from reflecting walls and vegetation. Photos of the equipment, in situ, may be seen in Technical Appendix 10.6. The apparatus were calibrated before and after the survey period and the maximum drift detected was 0.5 dB, which is within the required range outlined in the IoA GPG. All instrumentation has been subject to laboratory calibration traceable to national standards within the last 24 months, as recommended in the IoA GPG. Detailed instrumentation records are provided in Technical Appendix 10.7.

10.3.8 Chart 1 (**see Technical Appendix 10.8 for all charts**) shows the measured wind rose recorded over the background noise survey period, as measured by a SoDAR located on site.

10.3.9 A SODAR instrument is a remote sensing device that measures conditions in the atmosphere by using sound waves to detect the movement of air in the atmospheric boundary layer to measure wind speed and direction. For a SoDAR remote sensing device, sound pulses are reflected by temperature gradients in the atmosphere. SODAR provides measurements at several heights, and this enables wind speed data to be obtained that describe the wind profile across a range of heights.

10.3.10 The Triton SODAR employed has been successfully tested, by independent third parties using suitable test sites, against conventional anemometry[1314]. From the technical reports, these tests have demonstrated that, over a range of relevant heights, the accuracy of the Triton SODAR is comparable to that of the conventional anemometry. The results of these validation campaigns provide confidence that the Triton SODAR can reproduce traditional wind speed measurements within the approximate uncertainty limits expected for cup anemometer measurements

13Verhoef, H Van der Werff, A Oostrum, H (2009), 'Comparative Measurements Between a Triton SODAR and Meteo Measurements at the EWTW, The Netherlands', ECN report ECN-X--09-104 (rev.b), dated September 2009

14 Scott, G Elliott, D Schwartz, M (2010), 'Comparison of Second Wind TritonTM Data with Meteorological Tower Measurements', National Renewable Energy Laboratory Technical Report NREL/ TP-550-47429, dated January 2010.

10.3.11 For illustrative purposes, Chart 2 shows the measured wind rose over an extended period (16/02/05 – 01/03/06) at a meteorological mast located 5 km from the proposed site. As previously discussed, the noise prediction model employed is likely to overestimate the real noise immission levels for locations not downwind of the turbines. Chart 2 therefore may aid the reader as to the likelihood of over-estimation due to this factor.

10.3.12 The noise data has been cross-referenced with rainfall data measured at the SoDAR using a rain gauge. Any noise data identified as having been affected by rainfall has been removed from the analysis as shown in Charts 3 to 10.

10.3.13 Short-term periods of increased noise levels considered to be atypical have been removed from the dataset. The excluded data is shown in Charts 3 to 10.

10.3.14 An analysis of the impact of noise from existing wind turbines on the datasets has also been performed. Predicted noise levels due to the existing wind turbines were calculated at each of the survey locations so that they could be subtracted from the measured noise levels to calculate the background noise level. The noise levels were calculated by direction and weighted by the survey wind rose to account for the reductions in noise that would occur when the measurement location is not downwind of the turbines.

10.3.15 The predicted noise levels due to the existing turbines are greater than the measured noise levels at three of the four measurement locations demonstrating that the prediction methodology is conservative. This remains true when noise levels from the existing wind turbines are not scaled to their conditioned limits, indicating that conservatism exists in either the acoustic emission data adopted or the propagation model itself.

10.3.16 Given the conservatism of the predicted noise levels the influence of the existing turbines was instead accounted for by directional filtering. Data recorded when the measurement location was downwind of either the existing Baillie or Forss wind farms has been filtered out as the noise levels from these sites would be expected to be greatest from these wind directions. In order to further focus the assessment, additional filtering was performed so that only data for the wind directions when properties are downwind of the Proposed Development was included.

10.3.17 For Taldale data recorded between wind directions of 210-90 degrees has not been considered in the assessment. At Braighmor data recorded for wind directions of 135-360 degrees has not been considered. No directional filtering was done at Dunhobby

or Hopefield as these locations are to the east of the Proposed Development and further from the existing Baillie and Forss wind farms.

10.3.18 Charts 3 to 6 show LA90,10min correlated against wind speed for quiet daytime periods at each survey location. In each case, a 'best fit' line has been fitted to the data and the derived daytime noise limits added. The equation of the regression polynomial has been provided in the charts.

10.3.19 Charts 7 to 10 show LA90,10min correlated against the wind speed for night-time periods at each survey location. In each case, a 'best fit' line has been fitted to the data and the derived night-time noise limits added. The equation of the regression polynomial has been provided in the charts.

10.3.20 Tables 10.5 and 10.6 detail the LA90,10min background noise levels calculated from the derived 'best fit' lines, as described above.

**Table 10.5 – Quiet Daytime Background Noise Levels (dB(A) re 20 µPa)**

| House Name | Standardised 10 m Wind Speed (ms-1) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Braighmor | 24.2 | 24.2 | 24.2 | 24.2 | 24.3 | 25.4 | 27.4 | 30.0 | 32.8 | 35.7 | 38.3 | 40.4 |
| Dunhobby | 25.5 | 25.5 | 25.5 | 26.0 | 27.0 | 28.6 | 30.7 | 33.3 | 36.3 | 39.7 | 43.4 | 47.5 |
| Hopefield | 22.2 | 22.2 | 22.3 | 22.7 | 23.6 | 24.9 | 26.6 | 28.8 | 31.6 | 34.9 | 38.7 | 43.2 |
| Taldale | 30.3 | 30.5 | 30.7 | 31.0 | 31.5 | 32.1 | 33.0 | 34.1 | 35.5 | 37.3 | 39.4 | 41.9 |

**Table 10.6 – Night-time Background Noise Levels (dB(A) re 20 µPa)**

| House Name | Standardised 10 m Wind Speed ($ms^{-1}$) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Braighmor | 25.4 | 25.4 | 25.4 | 25.4 | 25.4 | 25.6 | 26.6 | 28.2 | 30.4 | 33.2 | 36.5 | 40.3 |
| Dunhobby | 23.8 | 23.8 | 24.0 | 24.6 | 25.6 | 27.1 | 29.2 | 31.7 | 34.7 | 38.3 | 42.5 | 47.2 |
| Hopefield | 21.3 | 21.5 | 21.7 | 22.0 | 22.5 | 23.3 | 24.5 | 26.3 | 28.8 | 32.0 | 36.2 | 41.3 |
| Taldale | 29.4 | 29.4 | 29.4 | 29.4 | 29.4 | 29.5 | 30.2 | 31.4 | 33.1 | 35.4 | 38.3 | 41.8 |

10.3.21 A comparison of the background noise levels detailed in Tables 10.5 and 10.6 with the background noise levels recorded in noise surveys carried out to inform the acoustic assessments of other sites in the vicinity has been made, the results of which can be viewed in Charts 11 and 12.

10.3.22 The charts show that the background noise levels for use in the assessment of the Proposed Development are lower than almost all of the comparison locations:

- Borrowston Mains which was surveyed as part of the Forss assessment;
- Achiebraeskiall, Bardnaheigh, Hillcrest, Skiall and Stemster which were surveyed as part of the Baillie assessment; and
- Achins, Borlum House, Milton and Loanscorribest which were surveyed as part of the Limekiln[15] assessment.

10.3.23 The assessment in this Chapter is therefore more conservative than if background noise data from previous surveys had been used as lower background noise levels result in lower noise limits which the Proposed Development is required to meet.

### Future Baseline

10.3.24 The baseline conditions would not be expected to change under the "do nothing" scenario i.e. in the event that the Proposed Development does not go ahead.

## 10.4 Assessment of Likely Effects

### Potential Construction Effects

#### Construction Noise Assessment

10.4.1 Primary activities creating noise during the construction period include the construction of the turbine bases; the erection of the turbines; the excavation of trenches for cables; and the construction of associated hard standings, access tracks and construction compound. Noise from vehicles on local roads and access tracks would also arise due to the delivery of turbine components and construction materials, notably aggregates, concrete and steel reinforcement.

10.4.2 It should be noted that the exact methodology and timing of construction activities cannot be predicted at this time, this assessment is therefore based on assumptions representing a worst-case approach.

#### Construction Noise Predictions

10.4.3 The plant assumed for each construction activity is shown in Table 10.7. The number of items indicates how many of each plant are required for the specified activity, and the duration of activity is a percentage of a given 12 hour day period needed for that plant to operate. Overall sound power levels are based upon the data in Annex C of BS 5228-1:2009.

**Table 10.7: Construction Phases and Sound Power Levels**

15 The Scottish Government, Energy and Climate Change Directorate, Decision Notice for Limekiln wind farm, dated June 2019, Highland Council planning reference 16/02752/S36

| Activities | Plant | Sound Power ($L_{WA}$) | No. Items | Activity Duration (%) | Effective Sound Power ($L_{WA}$) |
|---|---|---|---|---|---|
| Construct Temporary site compounds | Tracked excavator | 113 | 2 | 100 | 119 |
| | Dump truck | 113 | 2 | 100 | |
| | Tipper lorry | 107 | 2 | 50 | |
| | Vibratory roller | 102 | 1 | 75 | |
| | Lorry | 108 | 1 | 75 | |
| Construct/Upgrade Site Tracks | Tracked excavator | 113 | 3 | 100 | 122 |
| | Dump truck | 113 | 2 | 75 | |
| | Tipper lorry | 107 | 4 | 50 | |
| | Dozer | 109 | 1 | 100 | |
| | Vibratory roller | 102 | 1 | 75 | |
| | Excavator mounted rock breaker | 121 | 1 | 33 | |
| Construct Substations | Tracked excavator | 113 | 1 | 100 | 115 |
| | Concrete mixer truck | 108 | 2 | 50 | |
| | Lorry | 108 | 1 | 50 | |
| | Telescopic Handler | 99 | 1 | 100 | |
| Construct Crane Hardstandings | Tracked excavator | 113 | 3 | 100 | 120 |
| | Dump truck | 113 | 2 | 100 | |
| | Tipper lorry | 107 | 4 | 50 | |
| | Vibratory roller | 102 | 1 | 50 | |
| Construct Turbine Foundations | Tracked excavator | 113 | 2 | 75 | 122 |
| | Dump truck | 113 | 2 | 75 | |
| | Concrete mixer truck | 108 | 4 | 50 | |
| | Mobile telescopic crane | 110 | 1 | 50 | |
| | Concrete pump | 106 | 2 | 50 | |
| | Water pump | 93 | 1 | 100 | |
| | Hand-held pneumatic breaker | 111 | 1 | 75 | |
| | Compressor | 103 | 3 | 50 | |
| | Poker vibrator | 106 | 3 | 50 | |
| | Excavator mounted rock breaker | 121 | 1 | 50 | |
| Excavate and Lay Site Cables | Tracked excavator | 113 | 2 | 100 | 122 |
| | Dump truck | 113 | 2 | 75 | |
| | Tractor (towing equipment) | 108 | 1 | 75 | |
| | Tractor (towing trailer) | 107 | 1 | 75 | |
| | Vibratory plate | 108 | 1 | 50 | |
| | Excavator mounted rock breaker | 121 | 1 | 50 | |
| Erect Turbine | Mobile telescopic crane | 110 | 2 | 75 | 119 |
| | Lorry | 108 | 1 | 75 | |
| | Diesel generator | 102 | 1 | 100 | |
| | Torque guns | 111 | 4 | 100 | |
| Reinstate Crane Bases | Tracked excavator | 113 | 1 | 75 | 115 |
| | Dump truck | 113 | 1 | 75 | |
| Lay Cable to Substations | Wheeled loader | 108 | 1 | 100 | 117 |
| | Saw | 114 | 1 | 50 | |
| | Hand-held pneumatic breaker | 111 | 1 | 50 | |
| | Dump truck | 113 | 1 | 75 | |
| | Tipper lorry | 107 | 1 | 50 | |
| | Vibratory plate | 108 | 1 | 75 | |
| | Tandem roller | 102 | 1 | 75 | |
| | Tractor (towing trailer) | 107 | 1 | 50 | |
| | Lorry | 108 | 1 | 75 | |
| Construct New Water Crossing | Tracked Excavator | 113 | 1 | 100 | 116 |
| | Dump Truck | 113 | 1 | 100 | |
| | Telescopic Handler | 99 | 1 | 100 | |
| | Water pump | 93 | 2 | 100 | |
| Construct Enabling Works Compound | Tracked excavator | 113 | 2 | 100 | 119 |
| | Dump truck | 113 | 2 | 100 | |
| | Tipper lorry | 107 | 2 | 50 | |
| | Vibratory roller | 102 | 1 | 75 | |
| | Lorry | 108 | 1 | 75 | |

10.4.4 Predictions of construction noise levels have been carried out using the methods prescribed in Annex F of BS 5228-1:2009[16]. The worst-case scenario, where each construction activity takes place at the nearest proposed location to the residential property being assessed, is considered. The locations of the construction activities are taken from the site layout drawing (Figure 2.1). The results of these predictions, made at four representative residential properties, are shown in Table 10.8 (see

16 A 50% mixed ground attenuation has been used throughout to conservatively account for the nature of ground conditions at the site.

Table 10.12 for further detail of receptor locations). The significance of these predicted noise levels is discussed in paragraphs 10.4.12 to 10.4.16.

10.4.5 In all cases, average noise levels over the construction period would be lower as the worst case is presented for when the activities are closest to the residential property.

**Table 10.8 - Predicted Sound Pressure Level due to Construction Noise (dB LAeq)**

| Activity | H34 | H39 | H69 | H75 |
|---|---|---|---|---|
| Construct Site Compounds | 46.9 | 43.7 | 45.0 | 42.4 |
| Construct/Upgrade Site Tracks | 52.3 | 50.0 | 73.2 | 50.3 |
| Construct Substations | 43.0 | 39.5 | 39.4 | 36.9 |
| Construct Crane Hard-standings | 49.1 | 48.8 | 48.0 | 48.8 |
| Construct Turbine Foundations | 50.9 | 50.6 | 49.8 | 50.6 |
| Excavate and Lay Site Cables | 50.3 | 50.0 | 49.2 | 50.0 |
| Erect Turbine | 47.4 | 47.1 | 46.3 | 47.1 |
| Reinstate Crane Bases | 43.4 | 43.1 | 42.3 | 43.1 |
| Lay Cable to Substations | 46.2 | 45.9 | 45.1 | 45.9 |
| Construct New Water Crossing | 45.1 | 41.0 | 65.5 | 43.3 |
| Construct Enabling Works Compound | 39.3 | 43.1 | 68.7 | 41.5 |

### Construction Traffic

10.4.6 Due to the delivery of construction material and wind farm components, vehicle movements either into or away from the site would increase levels of traffic flow on public roads in the area. It is estimated that a maximum of 200 vehicle movements per day, or 30 per hour (modelled as 10 dump trucks, 10 concrete mixer trucks and 10 lorries) would be required during the most intense period of construction activity as explained in Chapter 9: Traffic and Transport.

10.4.7 Construction traffic noise has been quantified using the method described in BS 5228-1:2009. Using the distances from the considered residential properties to the centre of the relevant carriageway where site traffic would be the noise levels predicted are presented in Table 10.9. The maximum sound pressure level due to traffic flows during the most intensive period of activity at the properties considered is predicted to be 62.9 dB LAeq at H75 which is adjacent to the proposed delivery route and thus corresponds to the worst case.

**Table 10.9: Traffic Noise Predictions (dB LAeq)**

| House ID | Dump Truck | Lorry | Concrete Mixer | Total |
|---|---|---|---|---|
| H34 | 44.7 | 40.1 | 40.1 | 47.0 |
| H39 | 43.8 | 39.1 | 39.1 | 46.0 |
| H69 | 54.1 | 49.4 | 49.4 | 56.3 |
| H75 | 60.6 | 56.0 | 56.0 | 62.9 |

10.4.8 The increase in noise level due to the presence of construction traffic on nearby roads has been quantified using the methodology set out in CRTN[17]. The maximum predicted increase in daytime average traffic noise level, during the most intense period of construction, is 2.3 dB(A) on the A836. Given that a 3 dB(A) change is commonly regarded as the smallest subjectively perceptible difference in noise level, the predicted short-term change in traffic noise levels is not considered to be significant.

### General Construction Noise in Conjunction with Traffic Noise

10.4.9 Worst case construction noise levels may arise when the following simultaneous activities occur:

- the construction of the substation;
- the excavation and laying of cables;
- the construction of turbine foundations and associated hard standings; and
- construction of site tracks.

10.4.10 Cumulative predicted noise levels due to these construction activities and the additional contribution from construction traffic have been calculated and are shown in Table 10.10.

10.4.11 It should be noted that the predictions exclude the screening effects of local topography therefore actual levels of noise experienced at nearby residential properties could be lower.

**Table 10.10: Predicted Noise due to Combined Traffic Noise and Turbine Construction (dB LAeq)**

| House ID | Construction Plant Noise | Traffic Noise | Combined Noise |
|---|---|---|---|
| H34 | 55.0 | 47.0 | 55.6 |
| H39 | 53.5 | 46.0 | 54.2 |
| H69 | 73.2 | 56.3 | 73.3 |
| H75 | 53.6 | 62.9 | 63.4 |

17 HMSO Department of Transport (1988) Calculation of Road Traffic Noise (CRTN)

### Assessment of Construction Noise

10.4.12 In accordance with the ABC method of Annex E of BS 5228-1:2009, due to the relatively low levels of ambient noise at the site, a Category A assessment is appropriate. This category sets threshold LAeq criteria of: 65 dB(A) during weekdays (0700-1900) and Saturdays (0700-1300); below 55 dB(A) at evenings and weekends; and below 45 dB(A) for night-time (2300-0700) periods.

10.4.13 Table 10.10 shows that predicted noise levels from the combined effect of increased traffic flows and activities associated with the peak of construction activities are below the 65 dB(A) daytime target level specified by BS 5228-1:2009 at three of the assessed residential properties. At H69, which is adjacent to the site entrance, the 65 dB(A) criteria is predicted to be exceeded during the construction/upgrade of site tracks, construction of the nearest water crossing and construction of the enabling works compound.

10.4.14 Peak construction noise levels are predicted to exceed the 55 dB(A) target level for evenings and weekends at three of the four assessed properties.

10.4.15 An assessment against the night-time target level has not been undertaken as construction work is not scheduled to take place during the night.

10.4.16 The predictions made represent the worst-case combination of most intensive traffic activity with simultaneous construction activity at the nearest possible location to each residential property.

## Potential Operational Effects

### Noise Propagation Modelling

10.4.17 The locations of the proposed turbines are provided in Table 10.11 and shown in Figure 10.1.

**Table 10.11: Location of Proposed Turbines**

| Turbine | Co-ordinates | |
|---|---|---|
| | X (m) | Y (m) |
| T1 | 305882 | 967652 |
| T2 | 306060 | 968009 |
| T3 | 306209 | 968343 |
| T4 | 306676 | 968310 |
| T5 | 306997 | 968574 |

10.4.18 The locations of the nearest residential properties to the turbines have been determined by inspection of relevant maps and through site visits. More residential properties may have been identified but have not been considered in this acoustic assessment e.g. due to their distance from the Proposed Development, them being adequately represented by another location or them being unoccupied for the lifetime of the wind farm. The locations considered are listed in Table 10.12 and are also shown in Figure 10.1.

10.4.19 The distances from each residential property to the nearest turbine are given in Table 10.12. It can be seen that the minimum house-to-turbine separation is 922 m to Hopefield (H34) which is occupied by a financial beneficiary of the scheme. The nearest property without financial involvement is Dunhobby (H75) at 950 m.

**Table 10.12: Location of Residential Properties and Distances to Nearest Proposed Turbine**

| House Name | House ID | Co-ordinates | | Distance (m) | Nearest Turbine |
|---|---|---|---|---|---|
| | | X (m) | Y (m) | | |
| 1 Oust Farm | H1 | 306329 | 965584 | 2116 | T1 |
| Oust Farm | H2 | 306354 | 965589 | 2116 | T1 |
| 2 Oust Farm Cottages | H3 | 306297 | 965606 | 2088 | T1 |
| 3 Oust Farm Cottages | H4 | 306290 | 965609 | 2083 | T1 |
| New House | H5 | 306258 | 965628 | 2059 | T1 |
| Bardnaclavan | H6 | 307682 | 965855 | 2543 | T1 |
| Srathbofey | H7 | 305580 | 965936 | 1742 | T1 |
| 5 Stempster Holding | H8 | 304485 | 966012 | 2154 | T1 |
| Tobarvale | H9 | 304599 | 966170 | 1960 | T1 |
| 1 Lythmore Farm Cottage | H10 | 305393 | 966229 | 1505 | T1 |
| 3 Lythmore Farm Cottage | H11 | 305387 | 966245 | 1492 | T1 |
| Lythmore Farm House | H12 | 305315 | 966421 | 1355 | T1 |
| South Waass | H13 | 307770 | 966440 | 2167 | T4 |
| 6 Stempster Holding | H14 | 304479 | 966472 | 1833 | T1 |
| River Cottage | H15 | 304453 | 966608 | 1770 | T1 |
| Waas Farm | H16 | 308147 | 966850 | 2072 | T5 |
| Achnamara | H17 | 307554 | 967104 | 1492 | T4 |
| Fairview | H18 | 307420 | 967153 | 1376 | T4 |
| Smith House | H19 | 307617 | 967158 | 1487 | T4 |
| Viewfield | H20 | 307395 | 967182 | 1338 | T4 |
| Langlands House | H21 | 307678 | 967183 | 1508 | T4 |

| | | | | | |
|---|---|---|---|---|---|
| Eibihlin | H22 | 307610 | 967219 | 1436 | T4 |
| Daibhidh | H23 | 307596 | 967243 | 1409 | T4 |
| Strathmore House | H24 | 304958 | 967245 | 1010 | T1 |
| Glenburnie | H25 | 307371 | 967293 | 1232 | T4 |
| Quarry View | H26 | 307733 | 967310 | 1455 | T4 |
| Bramwyn | H27 | 307522 | 967372 | 1263 | T4 |
| Oaklands | H28 | 307609 | 967390 | 1310 | T4 |
| Amberbanks | H29 | 307973 | 967408 | 1521 | T5 |
| Murrayfield | H30 | 307802 | 967424 | 1404 | T5 |
| Carron | H31 | 307964 | 967444 | 1487 | T5 |
| Kidagach | H32 | 307969 | 967501 | 1448 | T5 |
| Burnside | H33 | 308653 | 967531 | 1957 | T5 |
| Hopefield | H34 | 307200 | 967551 | 922 | T4 |
| Sharone | H35 | 307909 | 967574 | 1353 | T5 |
| Eriador | H36 | 308232 | 967589 | 1580 | T5 |
| Caol Argaibh | H37 | 308596 | 967610 | 1867 | T5 |
| Briga View | H38 | 307892 | 967614 | 1312 | T5 |
| Braighmor | H39 | 304931 | 967630 | 951 | T1 |
| Ornum Cottage | H40 | 307892 | 967669 | 1273 | T5 |
| Seaview | H41 | 308456 | 967677 | 1713 | T5 |
| Hill Of Forss | H42 | 308323 | 967685 | 1596 | T5 |
| Seaview Cottage | H43 | 308610 | 967687 | 1841 | T5 |
| Bernessie | H44 | 308040 | 967706 | 1357 | T5 |
| Caiplie | H45 | 308409 | 967770 | 1625 | T5 |
| The Shiean | H46 | 308529 | 967790 | 1721 | T5 |
| Fullerton | H47 | 308566 | 967878 | 1716 | T5 |
| 8 Holding | H48 | 304671 | 968045 | 1273 | T1 |
| 7 Holding | H49 | 304371 | 968318 | 1651 | T1 |
| Lochroy | H50 | 304302 | 968336 | 1722 | T1 |
| 6 Holding | H52 | 304403 | 968499 | 1704 | T1 |
| Beechwood | H53 | 304381 | 968522 | 1735 | T1 |
| 9 Holding | H54 | 304318 | 968629 | 1844 | T1 |
| 10 Holding | H55 | 304474 | 968886 | 1812 | T2 |
| Cairnmore | H56 | 304638 | 968940 | 1681 | T3 |
| Rosedean | H57 | 304674 | 968949 | 1650 | T3 |
| 1 School Place | H58 | 304612 | 968970 | 1716 | T3 |
| 2 School Place | H59 | 304614 | 968973 | 1715 | T3 |
| 3 School Place | H60 | 304622 | 968975 | 1708 | T3 |
| 4 School Place | H61 | 304633 | 968977 | 1699 | T3 |
| Schoolhouse | H62 | 304655 | 968980 | 1679 | T3 |
| 5 School Place | H63 | 304633 | 968996 | 1706 | T3 |
| 6 School Place | H64 | 304638 | 968998 | 1702 | T3 |
| 7 School Place | H65 | 304643 | 969000 | 1698 | T3 |
| 8 School Place | H66 | 304649 | 969003 | 1694 | T3 |
| "Fairview, Roadside" | H67 | 304716 | 969008 | 1634 | T3 |
| Atlantic View | H68 | 305422 | 969089 | 1084 | T3 |
| Taldale | H69 | 305576 | 969163 | 1036 | T3 |
| Burn Of Brims | H70 | 305283 | 969188 | 1254 | T3 |
| Torigill | H71 | 304573 | 969218 | 1855 | T3 |
| Scrabster Lodge | H72 | 308827 | 969313 | 1974 | T5 |
| Brims House | H73 | 305644 | 969424 | 1220 | T3 |
| Annfield | H74 | 305696 | 969446 | 1216 | T3 |
| Dunhobby | H75 | 307282 | 969480 | 950 | T5 |
| 2 Brims Cottages | H76 | 305677 | 969515 | 1287 | T3 |
| 1 Brims Cottages | H77 | 305684 | 969516 | 1285 | T3 |
| Thorvik Brims | H78 | 307012 | 969550 | 976 | T5 |
| Windrift | H79 | 306607 | 969561 | 1061 | T5 |
| Thusater Farm | H80 | 306899 | 969729 | 1159 | T5 |
| Brimmisa House | H81 | 306286 | 969729 | 1356 | T5 |
| Thusater Cottage | H82 | 306875 | 969794 | 1226 | T5 |
| Thusater | H83 | 306875 | 969794 | 1226 | T5 |
| Middleton Of Brims | H84 | 305919 | 969903 | 1587 | T3 |
| Fuaran | H85 | 305367 | 970009 | 1867 | T3 |
| East Brims | H86 | 305308 | 970030 | 1913 | T3 |
| Melgedwynell | H87 | 305416 | 970067 | 1898 | T3 |
| Ornum Farm House 2 | H88 | 307898 | 967773 | 1206 | T5 |
| Ornum Farm House 1 | H89 | 307865 | 967917 | 1089 | T5 |

10.4.20 Although not finalised, the candidate turbine type for the noise assessment is the Vestas V117 4.3 MW turbine. This report uses the acoustic data from the manufacturer's performance specification for all analysis[18]. The manufacturer has identified these values as warranted although no independent test reports are available to indicate whether any margin has been incorporated; therefore, 2 dB has been added to the warranted levels as a conservative measure as recommended by the IoA GPG. Details used in this analysis are as follows:

- a hub height of 80 m;
- a rotor diameter of 117 m;

18 'Performance Specification V117 - 4.0/4.2 MW, Vestas Document ID: 0067 7063 V03, 2017-11-29

- sound power levels, LWA, for standardised 10 m height wind speeds (v10) as shown in Table 10.13;
- octave band sound power level data, at the wind speeds where it is available, as shown in Table 10.14; and
- tonal emission characteristics such that no clearly audible tones are present at any wind speed.

**Table 10.13 – A-Weighted Sound Power Levels (dB(A) re 1 pW) for the Vestas V117 4.3 MW Wind Turbine**

| Standardised 10 m Height Wind Speed, $v_{10}$ ($ms^{-1}$) | Warranted | Plus Uncertainty |
|---|---|---|
| 1 | 93.1 | 95.1 |
| 2 | 93.1 | 95.1 |
| 3 | 93.1 | 95.1 |
| 4 | 95.8 | 97.8 |
| 5 | 99.8 | 101.8 |
| 6 | 103.6 | 105.6 |
| 7 | 105.7 | 107.7 |
| 8 | 106.0 | 108.0 |
| 9 | 106.0 | 108.0 |
| 10 | 106.0 | 108.0 |
| 11 | 106.0 | 108.0 |
| 12 | 106.0 | 108.0 |

**Table 10.14 - Octave Band A-Weighted Sound Power Levels (dB(A) re 1 pW) at 8 ms-1 for the Wind Turbine**

| Octave Band (Hz) | Sound Power Level, dB(A) |
|---|---|
| 63 | 88.3 |
| 125 | 95.5 |
| 250 | 100.3 |
| 500 | 102.6 |
| 1000 | 102.4 |
| 2000 | 99.7 |
| 4000 | 94.6 |
| 8000 | 87.0 |
| OVERALL | 108.0 |

## Predictions of Noise Levels at Residential Properties

10.4.21 Table 10.15 shows the predicted noise immission levels at the nearest residential properties, at each wind speed considered, due to the operation of the Proposed Development. The properties with the highest predicted noise immission levels of 38.9 dB(A) and 37.2 dB(A) are Hopefield (H34) and Taldale (H69) although these are occupied by financial beneficiaries of the scheme. The highest predicted noise level at an un-associated property is 37.1 dB(A) at Braighmor (H39).

10.4.22 Figure 10.1 shows an isobel (i.e. noise contour) plot for the site at a 10 m height wind speed of 8 ms-1. Such plots are useful for evaluating the noise 'footprint' of a given development.

**Table 10.15: Predicted Noise Levels at nearby Residential Properties, dB(A)**

| House ID | Reference Wind Speed, Standardised $v_{10}$ ($ms^{-1}$) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| H1 | 15.6 | 15.6 | 15.6 | 18.3 | 22.3 | 26.1 | 28.1 | 28.5 | 28.5 | 28.5 | 28.5 | 28.5 |
| H2 | 15.6 | 15.6 | 15.6 | 18.3 | 22.3 | 26.1 | 28.1 | 28.5 | 28.5 | 28.5 | 28.5 | 28.5 |
| H3 | 15.7 | 15.7 | 15.7 | 18.4 | 22.4 | 26.2 | 28.3 | 28.6 | 28.6 | 28.6 | 28.6 | 28.6 |
| H4 | 15.7 | 15.7 | 15.7 | 18.4 | 22.4 | 26.2 | 28.3 | 28.6 | 28.6 | 28.6 | 28.6 | 28.6 |
| H5 | 15.8 | 15.8 | 15.8 | 18.5 | 22.6 | 26.3 | 28.4 | 28.7 | 28.7 | 28.7 | 28.7 | 28.7 |
| H6 | 15.6 | 15.6 | 15.6 | 18.3 | 22.3 | 26.1 | 28.1 | 28.5 | 28.5 | 28.5 | 28.5 | 28.5 |
| H7 | 17.9 | 17.9 | 17.9 | 20.6 | 24.6 | 28.4 | 30.5 | 30.8 | 30.8 | 30.8 | 30.8 | 30.8 |
| H8 | 15.6 | 15.6 | 15.6 | 18.3 | 22.3 | 26.1 | 28.2 | 28.5 | 28.5 | 28.5 | 28.5 | 28.5 |
| H9 | 16.6 | 16.6 | 16.6 | 19.2 | 23.3 | 27.0 | 29.1 | 29.4 | 29.5 | 29.5 | 29.5 | 29.5 |
| H10 | 19.3 | 19.3 | 19.3 | 22.0 | 26.0 | 29.8 | 31.8 | 32.1 | 32.2 | 32.2 | 32.2 | 32.2 |
| H11 | 19.3 | 19.3 | 19.3 | 22.0 | 26.1 | 29.8 | 31.9 | 32.2 | 32.2 | 32.2 | 32.2 | 32.2 |
| H12 | 20.2 | 20.2 | 20.2 | 22.9 | 27.0 | 30.7 | 32.8 | 33.1 | 33.1 | 33.1 | 33.1 | 33.1 |
| H13 | 17.6 | 17.6 | 17.6 | 20.3 | 24.4 | 28.1 | 30.2 | 30.5 | 30.5 | 30.5 | 30.5 | 30.5 |
| H14 | 17.3 | 17.3 | 17.3 | 20.0 | 24.0 | 27.8 | 29.8 | 30.2 | 30.2 | 30.2 | 30.2 | 30.2 |
| H15 | 17.5 | 17.5 | 17.5 | 20.2 | 24.2 | 28.0 | 30.1 | 30.4 | 30.4 | 30.4 | 30.4 | 30.4 |
| H16 | 17.8 | 17.8 | 17.8 | 20.5 | 24.5 | 28.3 | 30.4 | 30.7 | 30.7 | 30.7 | 30.7 | 30.7 |
| H17 | 21.5 | 21.5 | 21.5 | 24.2 | 28.2 | 32.0 | 34.1 | 34.4 | 34.4 | 34.4 | 34.4 | 34.4 |
| H18 | 22.4 | 22.4 | 22.4 | 25.1 | 29.1 | 32.9 | 35.0 | 35.3 | 35.3 | 35.3 | 35.3 | 35.3 |
| H19 | 21.5 | 21.5 | 21.5 | 24.2 | 28.2 | 32.0 | 34.0 | 34.4 | 34.4 | 34.4 | 34.4 | 34.4 |
| H20 | 22.7 | 22.7 | 22.7 | 25.4 | 29.4 | 33.2 | 35.3 | 35.6 | 35.6 | 35.6 | 35.6 | 35.6 |
| H21 | 21.3 | 21.3 | 21.3 | 24.0 | 28.0 | 31.8 | 33.9 | 34.2 | 34.2 | 34.2 | 34.2 | 34.2 |
| H22 | 21.8 | 21.8 | 21.8 | 24.5 | 28.5 | 32.3 | 34.4 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 |
| H23 | 22.0 | 22.0 | 22.0 | 24.7 | 28.7 | 32.5 | 34.6 | 34.9 | 34.9 | 34.9 | 34.9 | 34.9 |
| H24 | 22.7 | 22.7 | 22.7 | 25.4 | 29.5 | 33.2 | 35.3 | 35.6 | 35.6 | 35.6 | 35.6 | 35.6 |

| House ID | Reference Wind Speed, Standardised $v_{10}$ ($ms^{-1}$) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| H25 | 23.4 | 23.4 | 23.4 | 26.1 | 30.2 | 33.9 | 36.0 | 36.3 | 36.3 | 36.3 | 36.3 | 36.3 |
| H26 | 21.6 | 21.6 | 21.6 | 24.3 | 28.3 | 32.1 | 34.2 | 34.5 | 34.5 | 34.5 | 34.5 | 34.5 |
| H27 | 23.1 | 23.1 | 23.1 | 25.7 | 29.8 | 33.5 | 35.6 | 35.9 | 36.0 | 36.0 | 36.0 | 36.0 |
| H28 | 22.7 | 22.7 | 22.7 | 25.3 | 29.4 | 33.1 | 35.2 | 35.5 | 35.6 | 35.6 | 35.6 | 35.6 |
| H29 | 20.7 | 20.7 | 20.7 | 23.4 | 27.4 | 31.2 | 33.2 | 33.6 | 33.6 | 33.6 | 33.6 | 33.6 |
| H30 | 21.7 | 21.7 | 21.7 | 24.4 | 28.4 | 32.2 | 34.3 | 34.6 | 34.6 | 34.6 | 34.6 | 34.6 |
| H31 | 20.9 | 20.9 | 20.9 | 23.6 | 27.6 | 31.4 | 33.4 | 33.8 | 33.8 | 33.8 | 33.8 | 33.8 |
| H32 | 21.1 | 21.1 | 21.1 | 23.7 | 27.8 | 31.5 | 33.6 | 33.9 | 34.0 | 34.0 | 34.0 | 34.0 |
| H33 | 17.4 | 17.4 | 17.4 | 20.1 | 24.1 | 27.9 | 30.0 | 30.3 | 30.3 | 30.3 | 30.3 | 30.3 |
| H34 | 26.0 | 26.0 | 26.0 | 28.7 | 32.8 | 36.5 | 38.6 | 38.9 | 38.9 | 38.9 | 38.9 | 38.9 |
| H35 | 21.7 | 21.7 | 21.7 | 24.4 | 28.4 | 32.2 | 34.3 | 34.6 | 34.6 | 34.6 | 34.6 | 34.6 |
| H36 | 19.8 | 19.8 | 19.8 | 22.5 | 26.5 | 30.3 | 32.4 | 32.7 | 32.7 | 32.7 | 32.7 | 32.7 |
| H37 | 17.9 | 17.9 | 17.9 | 20.5 | 24.6 | 28.3 | 30.4 | 30.7 | 30.8 | 30.8 | 30.8 | 30.8 |
| H38 | 21.9 | 21.9 | 21.9 | 24.6 | 28.7 | 32.4 | 34.5 | 34.8 | 34.8 | 34.8 | 34.8 | 34.8 |
| H39 | 24.2 | 24.2 | 24.2 | 26.8 | 30.9 | 34.6 | 36.7 | 37.0 | 37.1 | 37.1 | 37.1 | 37.1 |
| H40 | 22.2 | 22.2 | 22.2 | 24.9 | 28.9 | 32.7 | 34.7 | 35.0 | 35.1 | 35.1 | 35.1 | 35.1 |
| H41 | 18.7 | 18.7 | 18.7 | 21.4 | 25.5 | 29.2 | 31.3 | 31.6 | 31.6 | 31.6 | 31.6 | 31.6 |
| H42 | 19.5 | 19.5 | 19.5 | 22.2 | 26.2 | 30.0 | 32.1 | 32.4 | 32.4 | 32.4 | 32.4 | 32.4 |
| H43 | 17.9 | 17.9 | 17.9 | 20.6 | 24.7 | 28.4 | 30.5 | 30.8 | 30.8 | 30.8 | 30.8 | 30.8 |
| H44 | 21.3 | 21.3 | 21.3 | 24.0 | 28.1 | 31.8 | 33.9 | 34.2 | 34.2 | 34.2 | 34.2 | 34.2 |
| H45 | 19.2 | 19.2 | 19.2 | 21.9 | 25.9 | 29.7 | 31.8 | 32.1 | 32.1 | 32.1 | 32.1 | 32.1 |
| H46 | 18.6 | 18.6 | 18.6 | 21.2 | 25.3 | 29.0 | 31.1 | 31.4 | 31.5 | 31.5 | 31.5 | 31.5 |
| H47 | 18.5 | 18.5 | 18.5 | 21.2 | 25.2 | 29.0 | 31.1 | 31.4 | 31.4 | 31.4 | 31.4 | 31.4 |
| H48 | 22.1 | 22.1 | 22.1 | 24.8 | 28.8 | 32.6 | 34.7 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 |
| H49 | 19.8 | 19.8 | 19.8 | 22.5 | 26.5 | 30.3 | 32.3 | 32.7 | 32.7 | 32.7 | 32.7 | 32.7 |
| H50 | 19.3 | 19.3 | 19.3 | 22.0 | 26.0 | 29.8 | 31.9 | 32.2 | 32.2 | 32.2 | 32.2 | 32.2 |
| H52 | 19.7 | 19.7 | 19.7 | 22.4 | 26.4 | 30.2 | 32.3 | 32.6 | 32.6 | 32.6 | 32.6 | 32.6 |
| H53 | 19.5 | 19.5 | 19.5 | 22.2 | 26.3 | 30.0 | 32.1 | 32.4 | 32.4 | 32.4 | 32.4 | 32.4 |
| H54 | 19.0 | 19.0 | 19.0 | 21.7 | 25.7 | 29.5 | 31.5 | 31.9 | 31.9 | 31.9 | 31.9 | 31.9 |
| H55 | 19.3 | 19.3 | 19.3 | 22.0 | 26.0 | 29.8 | 31.8 | 32.2 | 32.2 | 32.2 | 32.2 | 32.2 |
| H56 | 20.0 | 20.0 | 20.0 | 22.7 | 26.8 | 30.5 | 32.6 | 32.9 | 32.9 | 32.9 | 32.9 | 32.9 |
| H57 | 20.2 | 20.2 | 20.2 | 22.9 | 26.9 | 30.7 | 32.8 | 33.1 | 33.1 | 33.1 | 33.1 | 33.1 |
| H58 | 19.8 | 19.8 | 19.8 | 22.5 | 26.5 | 30.3 | 32.4 | 32.7 | 32.7 | 32.7 | 32.7 | 32.7 |
| H59 | 19.8 | 19.8 | 19.8 | 22.5 | 26.5 | 30.3 | 32.4 | 32.7 | 32.7 | 32.7 | 32.7 | 32.7 |
| H60 | 19.8 | 19.8 | 19.8 | 22.5 | 26.6 | 30.3 | 32.4 | 32.7 | 32.7 | 32.7 | 32.7 | 32.7 |

| House ID | Reference Wind Speed, Standardised $v_{10}$ ($ms^{-1}$) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| H61 | 19.9 | 19.9 | 19.9 | 22.6 | 26.6 | 30.4 | 32.5 | 32.8 | 32.8 | 32.8 | 32.8 | 32.8 |
| H62 | 20.0 | 20.0 | 20.0 | 22.7 | 26.7 | 30.5 | 32.6 | 32.9 | 32.9 | 32.9 | 32.9 | 32.9 |
| H63 | 19.8 | 19.8 | 19.8 | 22.5 | 26.6 | 30.3 | 32.4 | 32.7 | 32.7 | 32.7 | 32.7 | 32.7 |
| H64 | 19.9 | 19.9 | 19.9 | 22.6 | 26.6 | 30.4 | 32.4 | 32.8 | 32.8 | 32.8 | 32.8 | 32.8 |
| H65 | 19.9 | 19.9 | 19.9 | 22.6 | 26.6 | 30.4 | 32.4 | 32.8 | 32.8 | 32.8 | 32.8 | 32.8 |
| H66 | 19.9 | 19.9 | 19.9 | 22.6 | 26.6 | 30.4 | 32.5 | 32.8 | 32.8 | 32.8 | 32.8 | 32.8 |
| H67 | 20.3 | 20.3 | 20.3 | 23.0 | 27.0 | 30.8 | 32.8 | 33.2 | 33.2 | 33.2 | 33.2 | 33.2 |
| H68 | 24.0 | 24.0 | 24.0 | 26.7 | 30.7 | 34.5 | 36.5 | 36.9 | 36.9 | 36.9 | 36.9 | 36.9 |
| H69 | 24.3 | 24.3 | 24.3 | 27.0 | 31.1 | 34.8 | 36.9 | 37.2 | 37.2 | 37.2 | 37.2 | 37.2 |
| H70 | 22.6 | 22.6 | 22.6 | 25.3 | 29.3 | 33.1 | 35.2 | 35.5 | 35.5 | 35.5 | 35.5 | 35.5 |
| H71 | 18.8 | 18.8 | 18.8 | 21.5 | 25.5 | 29.3 | 31.4 | 31.7 | 31.7 | 31.7 | 31.7 | 31.7 |
| H72 | 16.4 | 16.4 | 16.4 | 19.1 | 23.1 | 26.9 | 29.0 | 29.3 | 29.3 | 29.3 | 29.3 | 29.3 |
| H73 | 22.9 | 22.9 | 22.9 | 25.6 | 29.6 | 33.4 | 35.4 | 35.8 | 35.8 | 35.8 | 35.8 | 35.8 |
| H74 | 22.9 | 22.9 | 22.9 | 25.6 | 29.6 | 33.4 | 35.5 | 35.8 | 35.8 | 35.8 | 35.8 | 35.8 |
| H75 | 23.8 | 23.8 | 23.8 | 26.5 | 30.5 | 34.3 | 36.3 | 36.7 | 36.7 | 36.7 | 36.7 | 36.7 |
| H76 | 22.4 | 22.4 | 22.4 | 25.1 | 29.1 | 32.9 | 35.0 | 35.3 | 35.3 | 35.3 | 35.3 | 35.3 |
| H77 | 22.4 | 22.4 | 22.4 | 25.1 | 29.1 | 32.9 | 35.0 | 35.3 | 35.3 | 35.3 | 35.3 | 35.3 |
| H78 | 23.9 | 23.9 | 23.9 | 26.6 | 30.6 | 34.4 | 36.5 | 36.8 | 36.8 | 36.8 | 36.8 | 36.8 |
| H79 | 24.0 | 24.0 | 24.0 | 26.7 | 30.8 | 34.5 | 36.6 | 36.9 | 36.9 | 36.9 | 36.9 | 36.9 |
| H80 | 22.6 | 22.6 | 22.6 | 25.2 | 29.3 | 33.0 | 35.1 | 35.4 | 35.5 | 35.5 | 35.5 | 35.5 |
| H81 | 22.4 | 22.4 | 22.4 | 25.1 | 29.1 | 32.9 | 34.9 | 35.3 | 35.3 | 35.3 | 35.3 | 35.3 |
| H82 | 22.1 | 22.1 | 22.1 | 24.8 | 28.8 | 32.6 | 34.6 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 |
| H83 | 22.1 | 22.1 | 22.1 | 24.8 | 28.8 | 32.6 | 34.6 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 |
| H84 | 20.6 | 20.6 | 20.6 | 23.3 | 27.3 | 31.0 | 33.1 | 33.4 | 33.5 | 33.5 | 33.5 | 33.5 |
| H85 | 18.6 | 18.6 | 18.6 | 21.3 | 25.3 | 29.1 | 31.1 | 31.5 | 31.5 | 31.5 | 31.5 | 31.5 |
| H86 | 18.3 | 18.3 | 18.3 | 21.0 | 25.0 | 28.8 | 30.9 | 31.2 | 31.2 | 31.2 | 31.2 | 31.2 |
| H87 | 18.4 | 18.4 | 18.4 | 21.1 | 25.1 | 28.9 | 31.0 | 31.3 | 31.3 | 31.3 | 31.3 | 31.3 |
| H88 | 22.5 | 22.5 | 22.5 | 25.2 | 29.2 | 33.0 | 35.1 | 35.4 | 35.4 | 35.4 | 35.4 | 35.4 |
| H89 | 23.3 | 23.3 | 23.3 | 26.0 | 30.0 | 33.8 | 35.8 | 36.1 | 36.2 | 36.2 | 36.2 | 36.2 |

10.4.23 Noise levels at 64 of the 88 nearest residential properties are below 35 dB(A) level, indicating that the noise immission levels would be regarded as acceptable and the residents amenity as receiving ‘sufficient protection’ without further assessment requiring to be undertaken.

### Acoustic Acceptance Criteria

10.4.24 As stated previously, during daytime periods and at low background noise levels, a lower fixed limit of 35-40 dB(A) is applicable with the exact value dependent upon a number of factors: the number of noise affected residential properties; the potential impact on the power output of the wind farm and the likely duration and level of exposure.

10.4.25 Considering each of the factors recommended by ETSU-R-97 and the guidance provided by the IoA GPG in more detail:

- Number of noise affected residential properties: There are 24 residential properties with maximum predicted noise levels of greater than 35 dB(A) although not all of these are predominantly downwind of the Proposed Development and this should be considered in the context of the significant social, economic and environmental benefits generated by the Proposed Development;
- Potential impact on the power output of the wind farm: The Proposed Development can be considered a medium scale development as it has a rated power output of 21.5 MW should the turbine type considered in the acoustic assessment be installed. A daytime lower limit at the lower end of the range would reduce the amount of energy that could be generated by such a scheme;
- The likely duration and level of exposure: The amount of the time that noise levels of greater than 35 dB(A) are predicted is limited to periods of sufficiently high wind speed. Noise levels would also be reduced when properties are not located downwind of the Proposed Development.

10.4.26 Despite the explanations presented above indicating that a daytime lower limit towards the middle of the range would potentially be justifiable, RES has adopted a daytime lower limit of 35 dB(A) for the assessment of the Proposed Development as a conservative measure in consultation with the EHO.

10.4.27 Despite ETSU-R-97 recommending a night-time lower limit of 43 dB(A), a 38 dB(A) lower limit has been adopted for the purposes of this assessment in consultation with the EHO. The resulting criteria are shown in Table 10.16.

**Table 10.16: Permissible Noise Level Criteria for Assessment**

| Time of Day | Permissible Noise Level |
|---|---|
| Day | 35 dB(A) for $L_B$ less than 30 dB(A)<br>$L_B$ + 5 dB, for $L_B$ greater than 30 dB(A) |
| Night | 38 dB(A) for $L_B$ less than 33 dB(A)<br>$L_B$ + 5 dB, for $L_B$ greater than 33 dB(A) |

10.4.28 The 'best-fit' lines of Charts 3-10 have been used to calculate the acceptable noise limits at the background noise measurement locations. Table 10.17 shows the daytime noise limits and Table 10.18 the night time noise limits.

**Table 10.17 – Daytime Noise Limits (dB(A) re 20 µPa)**

| House Name | Standardised 10 m Wind Speed ($ms^{-1}$) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Braighmor | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 37.8 | 40.7 | 43.3 | 45.4 |
| Dunhobby | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.7 | 38.3 | 41.3 | 44.7 | 48.4 | 52.5 |
| Hopefield | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 35.0 | 36.6 | 39.9 | 43.7 | 48.2 |
| Taldale | 35.3 | 35.5 | 35.7 | 36.0 | 36.5 | 37.1 | 38.0 | 39.1 | 40.5 | 42.3 | 44.4 | 46.9 |

**Table 10.18 – Night-time Noise Limits (dB(A) re 20 µPa)**

| House Name | Standardised 10 m Wind Speed ($ms^{-1}$) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Braighmor | 38.0 | 38.0 | 38.0 | 38.0 | 38.0 | 38.0 | 38.0 | 38.0 | 38.0 | 38.2 | 41.5 | 45.3 |
| Dunhobby | 38.0 | 38.0 | 38.0 | 38.0 | 38.0 | 38.0 | 38.0 | 38.0 | 39.7 | 43.3 | 47.5 | 52.2 |
| Hopefield | 38.0 | 38.0 | 38.0 | 38.0 | 38.0 | 38.0 | 38.0 | 38.0 | 38.0 | 38.0 | 41.2 | 46.3 |
| Taldale | 38.0 | 38.0 | 38.0 | 38.0 | 38.0 | 38.0 | 38.0 | 38.0 | 38.1 | 40.4 | 43.3 | 46.8 |

10.4.29 The recommendations of ETSU-R-97 state that where there are groups of properties that are likely to have a similar background noise environment, it is appropriate to use data from one representative location as the basis for assessment at the other properties. The survey results inferred to be representative for each property are shown in Table 10.19. The specific choice of noise survey chosen has been made considering the distance to the nearest survey location and the likelihood of experiencing a broadly similar exposure as the survey. Baseline data for Taldale has not been inferred to other locations as raised noise levels at low wind speeds could indicate the presence of a noise source that is specific to this location.

**Table 10.19 – Assumed Representative Background Noise Survey Locations**

| House ID | House Name | Survey Location |
|---|---|---|
| H1 | 1 Oust Farm | Hopefield |
| H2 | Oust Farm | Hopefield |

| House ID | House Name | Survey Location |
|---|---|---|
| H3 | 2 Oust Farm Cottages | Hopefield |
| H4 | 3 Oust Farm Cottages | Hopefield |
| H5 | New House | Hopefield |
| H6 | Bardnaclavan | Hopefield |
| H7 | Srathbofey | Braighmor |
| H8 | 5 Stempster Holding | Braighmor |
| H9 | Tobarvale | Braighmor |
| H10 | 1 Lythmore Farm Cottage | Braighmor |
| H11 | 3 Lythmore Farm Cottage | Braighmor |
| H12 | Lythmore Farm House | Braighmor |
| H13 | South Waass | Hopefield |
| H14 | 6 Stempster Holding | Braighmor |
| H15 | River Cottage | Braighmor |
| H16 | Waas Farm | Hopefield |
| H17 | Achnamara | Hopefield |
| H18 | Fairview | Hopefield |
| H19 | Smith House | Hopefield |
| H20 | Viewfield | Hopefield |
| H21 | Langlands House | Hopefield |
| H22 | Eibihlin | Hopefield |
| H23 | Daibhidh | Hopefield |
| H24 | Strathmore House | Braighmor |
| H25 | Glenburnie | Hopefield |
| H26 | Quarry View | Hopefield |
| H27 | Bramwyn | Hopefield |
| H28 | Oaklands | Hopefield |
| H29 | Amberbanks | Hopefield |
| H30 | Murrayfield | Hopefield |
| H31 | Carron | Hopefield |
| H32 | Kidagach | Hopefield |
| H33 | Burnside | Hopefield |
| H34 | Hopefield | Hopefield |
| H35 | Sharone | Hopefield |
| H36 | Eriador | Hopefield |
| H37 | Caol Argaibh | Hopefield |
| H38 | Briga View | Hopefield |
| H39 | Braighmor | Braighmor |
| H40 | Ornum Cottage | Hopefield |
| H41 | Seaview | Hopefield |
| H42 | Hill Of Forss | Hopefield |
| H43 | Seaview Cottage | Hopefield |
| H44 | Bernessie | Hopefield |
| H45 | Caiplie | Hopefield |
| H46 | The Shiean | Hopefield |
| H47 | Fullerton | Hopefield |
| H48 | 8 Holding | Braighmor |
| H49 | 7 Holding | Braighmor |
| H50 | Lochroy | Braighmor |
| H52 | 6 Holding | Braighmor |
| H53 | Beechwood | Braighmor |
| H54 | 9 Holding | Braighmor |
| H55 | 10 Holding | Dunhobby |
| H56 | Cairnmore | Dunhobby |
| H57 | Rosedean | Dunhobby |
| H58 | 1 School Place | Dunhobby |
| H59 | 2 School Place | Dunhobby |
| H60 | 3 School Place | Dunhobby |
| H61 | 4 School Place | Dunhobby |
| H62 | Schoolhouse | Dunhobby |
| H63 | 5 School Place | Dunhobby |
| H64 | 6 School Place | Dunhobby |
| H65 | 7 School Place | Dunhobby |
| H66 | 8 School Place | Dunhobby |
| H67 | "Fairview, Roadside" | Dunhobby |
| H68 | Atlantic View | Dunhobby |
| H69 | Taldale | Taldale |
| H70 | Burn Of Brims | Dunhobby |
| H71 | Torigill | Dunhobby |
| H72 | Scrabster Lodge | Dunhobby |
| H73 | Brims House | Dunhobby |
| H74 | Annfield | Dunhobby |
| H75 | Dunhobby | Dunhobby |
| H76 | 2 Brims Cottages | Dunhobby |
| H77 | 1 Brims Cottages | Dunhobby |
| H78 | Thorvik Brims | Dunhobby |
| H79 | Windrift | Dunhobby |
| H80 | Thusater Farm | Dunhobby |
| H81 | Brimmisa House | Dunhobby |
| H82 | Thusater Cottage | Dunhobby |
| H83 | Thusater | Dunhobby |
| H84 | Middleton Of Brims | Dunhobby |
| H85 | Fuaran | Dunhobby |

| House ID | House Name | Survey Location |
|---|---|---|
| H86 | East Brims | Dunhobby |
| H87 | Melgedwynell | Dunhobby |
| H88 | Ornum Farm House 2 | Hopefield |
| H89 | Ornum Farm House 1 | Hopefield |

10.4.30 As recommended in ETSU-R-97, the absolute lower noise limits may be increased up to 45 dB(A) if the occupant of a property has a financial involvement in the wind farm. As such, at H34 and H69 the absolute lower limit has been increased to 45 dB(A).

### Acoustic Assessment

10.4.31 An assessment of the Proposed Development alone has not been undertaken as there are other wind turbines in the vicinity that are already in existence and it is necessary for the criteria to be met cumulatively. An acoustic assessment considering the Proposed Development along with nearby consented and existing sites is provided in the Potential Cumulative Effects section of this Chapter.

## Potential Decommissioning Effects

10.4.32 The noise levels associated with decommissioning are not expected to exceed those predicted due to construction and the same criteria would apply such that no significant effects are anticipated.

## Potential Cumulative Effects

### Cumulative Construction Noise

10.4.33 Any noise due to the construction of the other sites considered in the cumulative operational noise assessment, the majority of which have already been built, is unlikely to be ongoing at the same time as the construction of the Proposed Development. In the event that this scenario did occur, the activities associated with single turbine sites would be relatively limited and far enough away so as not to have a cumulative impact.

### Cumulative Operational Noise

10.4.34 An assessment of the cumulative acoustic impact of the Proposed Development in conjunction with the existing Baillie and Forss Wind Farms, along with eight single turbine schemes, has been undertaken in accordance with the guidance on wind farm noise assessment; ETSU R 97 and the IoA GPG.

10.4.35 ETSU-R-97 states:

*"It is clearly unreasonable to suggest that, because a wind farm has been constructed in the vicinity in the past which resulted in increased noise levels at some properties, the residents of those properties are now able to tolerate higher noise levels still. The existing wind farm should not be considered as part of the prevailing background noise."*

10.4.36 The locations of the turbines that make up the Proposed Development, along with the other turbines considered in the cumulative assessment, are shown in Figure 10.2. The planning references for the single turbine schemes are as detailed in Table 10.20.

**Table 10.20: Single Turbine Planning Details**

| Turbine ID | Planning Reference | Status |
|---|---|---|
| L1 | 17/04934/FUL | Consented |
| A1 | 17/01450/FUL | Consented |
| C1 | 12/01053/FUL | Existing |
| D1 | 12/00224/FUL | Existing |
| E1 | 11/04131/FUL | Existing |
| G1 | 11/03913/FUL | Existing |
| H1 | 10/03869/FUL | Existing |
| I1 | 10/00012/FULCA | Existing |

10.4.37 The residential properties considered in the cumulative assessment are as per those detailed in Table 10.12. The distances to the nearest turbine included in the cumulative assessment are given in Table 10.21.

**Table 10.21: Distances from Residential Properties to Nearest Cumulative Turbine**

| House ID | Distance to nearest Turbine (m) | Nearest Turbine |
|---|---|---|
| H1 | 2116 | T1 |
| H2 | 2116 | T1 |
| H3 | 2088 | T1 |
| H4 | 2083 | T1 |
| H5 | 2059 | T1 |
| H6 | 2543 | T1 |
| H7 | 1742 | T1 |
| H8 | 1270 | B21 |
| H9 | 1401 | B15 |
| H10 | 1505 | T1 |
| H11 | 1492 | T1 |

| House ID | Distance to nearest Turbine (m) | Nearest Turbine |
|---|---|---|
| H12 | 1355 | T1 |
| H13 | 2167 | T4 |
| H14 | 1137 | D1 |
| H15 | 1049 | D1 |
| H16 | 2072 | T5 |
| H17 | 1492 | T4 |
| H18 | 1376 | T4 |
| H19 | 1487 | T4 |
| H20 | 1338 | T4 |
| H21 | 1508 | T4 |
| H22 | 1436 | T4 |
| H23 | 1409 | T4 |
| H24 | 1010 | T1 |
| H25 | 1232 | T4 |
| H26 | 1455 | T4 |
| H27 | 1263 | T4 |
| H28 | 1310 | T4 |
| H29 | 1521 | T5 |
| H30 | 1404 | T5 |
| H31 | 1487 | T5 |
| H32 | 1448 | T5 |
| H33 | 1947 | E1 |
| H34 | 922 | T4 |
| H35 | 1353 | T5 |
| H36 | 1580 | T5 |
| H37 | 1853 | E1 |
| H38 | 1312 | T5 |
| H39 | 951 | T1 |
| H40 | 1273 | T5 |
| H41 | 1713 | T5 |
| H42 | 1596 | T5 |
| H43 | 1785 | E1 |
| H44 | 1357 | T5 |
| H45 | 1625 | T5 |
| H46 | 1661 | E1 |
| H47 | 1591 | E1 |
| H48 | 1273 | T1 |
| H49 | 1354 | C1 |
| H50 | 1314 | C1 |
| H52 | 1500 | C1 |
| H53 | 1501 | C1 |
| H54 | 1539 | C1 |
| H55 | 1411 | H1 |
| H56 | 1240 | H1 |
| H57 | 1202 | H1 |
| H58 | 1259 | H1 |
| H59 | 1257 | H1 |
| H60 | 1248 | H1 |
| H61 | 1237 | H1 |
| H62 | 1215 | H1 |
| H63 | 1234 | H1 |
| H64 | 1229 | H1 |
| H65 | 1223 | H1 |
| H66 | 1217 | H1 |
| H67 | 1150 | H1 |
| H68 | 442 | H1 |
| H69 | 276 | H1 |
| H70 | 567 | H1 |
| H71 | 1277 | H1 |
| H72 | 852 | E1 |
| H73 | 304 | H1 |
| H74 | 290 | H1 |
| H75 | 555 | A1 |
| H76 | 359 | H1 |
| H77 | 357 | H1 |
| H78 | 416 | A1 |
| H79 | 574 | A1 |
| H80 | 263 | A1 |
| H81 | 481 | I1 |
| H82 | 221 | A1 |
| H83 | 221 | A1 |
| H84 | 83 | I1 |

| House ID | Distance to nearest Turbine (m) | Nearest Turbine |
|---|---|---|
| H85 | 505 | I1 |
| H86 | 565 | I1 |
| H87 | 464 | I1 |
| H88 | 1206 | T5 |
| H89 | 1089 | T5 |

*Turbines prefixed 'T' are part of the Proposed Development, those prefixed 'B' belong to Baillie, those prefixed 'F' belong to Forss. All other prefixes denote single turbine schemes whose associated planning references can be found in Table 10.20.*

### CUMULATIVE ASSESSMENT METHODOLOGY

10.4.38 ETSU-R-97 recommends that the derived noise limits applicable at nearby residential properties shall relate to the cumulative effects of noise from all wind turbines that may affect a particular location.

10.4.39 The methodology is therefore to:

- Identify appropriate overall ETSU-R-97 noise limits for each noise-sensitive receptor;
- Predict the level of noise resulting from the operation of the turbines being considered in the cumulative assessment without the Proposed Development;
- Subtract the predicted noise levels calculated in step 2 from the ETSU-R-97 limits identified in step 1. Such a calculation shall provide the limit remaining at each property which the Proposed Development should not exceed; and
- Compare the predicted noise levels due to the Proposed Development to the limit calculated in step 3 to determine whether the Proposed Development complies with ETSU R-97.

10.4.40 The methodology outlined above is in accordance with the appropriate guidance on cumulative wind farm noise assessment as described in ETSU-R-97 and the IoA GPG.

### PREDICTIONS OF NOISE LEVELS AT RESIDENTIAL PROPERTIES

10.4.41 The existing Baillie Wind Farm consists of Nordex N90/2500 machines. Warranted acoustic data for these turbines is taken from the manufacturer's performance specification and an uncertainty of 2 dB has been included. Details used in this analysis are as follows:

- hub height of 65 m;
- rotor diameter of 90 m;
- sound power levels, LWA, for standardised 10 m height wind speeds (v10) as shown in Table 10.22; and
- octave band sound power level data, at the wind speeds where it is available, as shown in Table 10.23.

**Table 10.22: A-Weighted Sound Power Levels (dB(A) re 1 pW) for the Nordex N90/2500**

| Standardised 10 m Height Wind Speed, $v_{10}$ ($ms^{-1}$) | Warranted | Warranted Plus Uncertainty |
|---|---|---|
| 1 | 93.5 | 95.5 |
| 2 | 93.5 | 95.5 |
| 3 | 93.5 | 95.5 |
| 4 | 97.0 | 99.0 |
| 5 | 100.5 | 102.5 |
| 6 | 103.5 | 105.5 |
| 7 | 104.8 | 106.8 |
| 8 | 105.4 | 107.4 |
| 9 | 105.5 | 107.5 |
| 10 | 105.5 | 107.5 |
| 11 | 105.5 | 107.5 |
| 12 | 105.5 | 107.5 |

**Table 10.23: Octave Band A-Weighted Sound Power Levels (dB(A) re 1 pW) at 8 ms-1 for the Nordex N90/2500**

| Octave Band (Hz) | Sound Power Level, dB(A) |
|---|---|
| 63 | 92.6 |
| 125 | 96.7 |
| 250 | 101.1 |
| 500 | 101.5 |
| 1000 | 100.0 |
| 2000 | 98.9 |
| 4000 | 94.9 |
| 8000 | 87.3 |
| OVERALL | 107.4 |

10.4.42 The existing Baillie Wind Farm is conditioned to the noise limits specified in its Decision Notice[19]. These noise limits are used to calculate the worst case predicted noise levels using the 'Controlling Property' method outlined in the IoA GPG as follows:

- Predictions are made using appropriate acoustic emission data, as specified above;
- Comparison is made between the predictions and the limits from the planning conditions in order to identify the controlling property; and
- The predictions are scaled by the minimum margin between the predictions and the conditioned noise limits at the controlling property. This yields predicted noise levels which do not exceed the conditioned noise limits at any property and are equal to the conditioned noise limit at the controlling property.

10.4.43 The existing Forss Wind Farm was developed in two phases and consists of Siemens SWT 1.3 62 machines. Warranted acoustic data for these turbines is provided by the manufacturer and includes an allowance for uncertainty. Details used in this analysis are as follows:

- hub height of 47 m;
- rotor diameter of 62 m;
- sound power levels, LWA, for standardised 10 m height wind speeds (v10) as shown in Table 10.24; and
- octave band sound power level data, at the wind speeds where it is available, as shown in Table 10.25.

**Table 10.24: A-Weighted Sound Power Levels (dB(A) re 1 pW) for the Siemens SWT-1.3-62**

| Standardised 10 m Height Wind Speed, $v_{10}$ ($ms^{-1}$) | Phase 1 | Phase 2 |
|---|---|---|
| 1 | 100.0 | 102.0 |
| 2 | 100.0 | 102.0 |
| 3 | 100.0 | 102.0 |
| 4 | 100.0 | 102.0 |
| 5 | 100.0 | 102.0 |
| 6 | 100.0 | 102.0 |
| 7 | 100.9 | 102.5 |
| 8 | 101.0 | 103.0 |
| 9 | 102.6 | 104.3 |
| 10 | 103.5 | 105.5 |
| 11 | 103.5 | 105.5 |
| 12 | 103.5 | 105.5 |

**Table 10.25: Octave Band A-Weighted Sound Power Levels (dB(A) re 1 pW) at 8 ms-1 for the Siemens SWT-1.3-62**

| Octave Band (Hz) | Phase 1 | Phase 2 |
|---|---|---|
| 63 | 85.1 | 87.1 |
| 125 | 91.7 | 93.7 |
| 250 | 94.6 | 96.6 |
| 500 | 93.7 | 95.7 |
| 1000 | 93.6 | 95.6 |
| 2000 | 93.9 | 95.9 |
| 4000 | 88.3 | 90.3 |
| 8000 | 80.1 | 82.1 |
| OVERALL | 101.0 | 103.0 |

10.4.44 The existing Forss Wind Farm is conditioned to the noise limits specified in its Decision Notice[20]. These noise limits are used to calculate the worst case predicted noise levels using the 'Controlling Property' method outlined in the IoA GPG and described above.

10.4.45 Details of the existing and consented single turbine schemes are as follows:

10.4.46 Turbine types and hub heights as detailed in Table 10.26;

10.4.47 sound power levels, LWA, for standardised 10 m height wind speeds (v10) as shown in Table 10.27; and

10.4.48 octave band sound power level data, at the wind speeds where it is available, as shown in Table 10.28.

19 The Scottish Government, Enterprise, Energy and Tourism Directorate, Renewable Energy Division, Consent for Baillie Wind Farm, January 2010, Highland Council Application Reference 04/00342/S36CA

20 The Highland Council, Consent for Forss Wind Farm, October 2006, Application Reference 01/00380/FULCA

**Table 10.26: Single Turbine Types and Dimensions**

| Turbine ID | Turbine Type | Hub Height (m) |
|---|---|---|
| L1 | Enercon E70 E4 2.3MW | 64.5 |
| A1 | Harbon HWT60 | 23.4 |
| C1 | Xzeres 442SR 10kW | 15.9 |
| D1 | Xzeres 442SR 10kW | 15.9 |
| E1 | Harbon HWT60 | 18.0 |
| G1 | Harbon HWT60 | 18.0 |
| H1 | Proven P35 | 15.0 |
| I1 | Xzeres 442SR 10kW | 9.0 |

**Table 10.27: A-Weighted Sound Power Levels (dB(A) re 1 pW) for Single Turbines**

| Standardised 10 m Height Wind Speed, $v_{10}$ ($ms^{-1}$) | L1 | A1 | C1 | D1 | E1 | G1 | H1 | I1 |
|---|---|---|---|---|---|---|---|---|
| 1 | 89.4 | 83.8 | 88.0 | 88.0 | 83.8 | 83.8 | 89.2 | 88.0 |
| 2 | 89.4 | 83.8 | 88.0 | 88.0 | 83.8 | 83.8 | 89.2 | 88.0 |
| 3 | 89.4 | 83.8 | 88.0 | 88.0 | 83.8 | 83.8 | 89.2 | 88.0 |
| 4 | 89.4 | 84.0 | 88.0 | 88.0 | 83.8 | 83.8 | 89.2 | 88.0 |
| 5 | 91.9 | 85.6 | 88.2 | 88.2 | 85.3 | 85.3 | 91.2 | 88.1 |
| 6 | 96.7 | 87.1 | 88.3 | 88.3 | 86.7 | 86.7 | 93.1 | 88.2 |
| 7 | 101.1 | 88.7 | 88.5 | 88.5 | 88.2 | 88.2 | 95.1 | 88.4 |
| 8 | 104.2 | 90.2 | 88.7 | 88.7 | 89.7 | 89.7 | 97.0 | 88.6 |
| 9 | 106.0 | 91.8 | 88.9 | 88.9 | 91.2 | 91.2 | 98.9 | 88.7 |
| 10 | 106.0 | 93.3 | 89.1 | 89.1 | 92.7 | 92.7 | 100.9 | 88.9 |
| 11 | 106.0 | 94.9 | 89.2 | 89.2 | 94.1 | 94.1 | 102.8 | 89.0 |
| 12 | 106.0 | 95.6 | 89.4 | 89.4 | 95.6 | 95.6 | 104.8 | 89.2 |

**Table 10.28: Octave Band A-Weighted Sound Power Levels (dB(A) re 1 pW) at 8 ms-1 for Single Turbines**

| Octave Band (Hz) | L1 | A1 | C1 | D1 | E1 | G1 | H1 | I1 |
|---|---|---|---|---|---|---|---|---|
| 63 | 88.1 | 87.2 | 65.3 | 65.3 | 86.7 | 86.7 | 73.8 | 65.2 |
| 125 | 96.7 | 84.0 | 76.5 | 76.5 | 83.5 | 83.5 | 79.6 | 76.4 |
| 250 | 99.2 | 80.2 | 82.1 | 82.1 | 79.7 | 79.7 | 85.6 | 82.0 |
| 500 | 97.8 | 77.6 | 82.3 | 82.3 | 77.1 | 77.1 | 90.8 | 82.2 |
| 1000 | 96.3 | 75.7 | 83.2 | 83.2 | 75.2 | 75.2 | 92.4 | 83.1 |
| 2000 | 93.0 | 73.7 | 80.6 | 80.6 | 73.2 | 73.2 | 89.3 | 80.5 |
| 4000 | 86.1 | 76.4 | 74.6 | 74.6 | 75.9 | 75.9 | 88.6 | 74.5 |
| 8000 | 78.5 | 70.1 | 69.7 | 69.7 | 69.6 | 69.6 | 74.4 | 69.6 |
| OVERALL | 104.2 | 90.2 | 88.7 | 88.7 | 89.7 | 89.7 | 97.0 | 88.6 |

10.4.49 The existing and consented single turbine schemes are conditioned to the noise limits specified in their Decision Notices[21]. These noise limits are used to calculate the worst case predicted noise levels using the 'Controlling Property' method outlined in the IoA GPG and described above. Where no noise limits are specified, or no Decision Notice is available, the predicted noise levels calculated using the turbine specified in any information available on the Highland Council planning portal are used without scaling.

10.4.50 A check on whether significant headroom (defined as 5 – 10 dB by the IoA GPG) exists between the predicted noise levels and the conditioned limits has been carried out for the consented and existing sites considered in the cumulative assessment. Rather than assuming that the site could be operating right up to its consented limit, which would be unrealistic where significant headroom exists, an additional 3 dB buffer has been added to the predicted noise levels for use in the cumulative

21 The Highland Council, Decision Notice for Application Reference 17/04934/FUL, dated June 2019
The Highland Council, Decision Notice for Application Reference 17/01450/FUL, dated January 2018
The Highland Council, Decision Notice for Application Reference 12/01053/FUL, dated July 2012
The Highland Council, Decision Notice for Application Reference 12/00224/FUL, dated July 2012
The Highland Council, Decision Notice for Application Reference 11/04131/FUL, dated December 2011
The Highland Council, Decision Notice for Application Reference 11/03913/FUL, dated February 2012
The Highland Council, Decision Notice for Application Reference 10/03869/FUL, dated November 2010

assessment in these circumstances. This approach has been agreed in consultation with the EHO (Table 10.1).

10.4.51 The predicted noise levels at the nearest residential properties due to the operation of the sites considered in the cumulative assessment, excluding the Proposed Development, are detailed in Tables 9.29 and 9.30 for day and night-time periods respectively. The cumulative predicted noise levels are different for day and night as some of the sites considered are conditioned to different limits for the two periods and the predicted noise levels have been scaled to these limits. The maximum cumulative noise level is predicted to be 42.9 dB(A) at H84 during both day and night-time periods.

10.4.52 The methodology used to calculate the cumulative predicted noise levels makes the assumption that the properties in question are downwind of all of the considered sites simultaneously, which is not the case in practice. These downwind cumulative predicted noise levels are conservative due to the reductions in noise that would be expected when a property is situated crosswind or upwind of a noise source.

**Table 10.29: Cumulative Downwind Predicted Noise Levels exc. Proposed Development Day, dB(A)**

| House ID | Reference Wind Speed, Standardised $v_{10}$ ($ms^{-1}$) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| H1 | 23.9 | 23.9 | 24.1 | 23.9 | 25.0 | 26.2 | 27.9 | 29.7 | 30.4 | 30.6 | 31.9 | 32.4 |
| H2 | 23.8 | 23.8 | 24.0 | 23.8 | 24.9 | 26.2 | 27.8 | 29.7 | 30.4 | 30.5 | 31.8 | 32.3 |
| H3 | 24.0 | 24.0 | 24.2 | 24.0 | 25.1 | 26.3 | 28.0 | 29.8 | 30.5 | 30.7 | 32.0 | 32.5 |
| H4 | 24.0 | 24.0 | 24.2 | 24.0 | 25.1 | 26.3 | 28.0 | 29.8 | 30.6 | 30.7 | 32.0 | 32.5 |
| H5 | 24.1 | 24.1 | 24.3 | 24.1 | 25.2 | 26.4 | 28.1 | 29.9 | 30.7 | 30.8 | 32.1 | 32.6 |
| H6 | 19.3 | 19.3 | 19.7 | 19.9 | 21.1 | 22.1 | 23.5 | 25.2 | 26.0 | 26.4 | 27.5 | 28.1 |
| H7 | 26.4 | 26.4 | 26.6 | 26.5 | 27.6 | 28.8 | 30.4 | 32.3 | 33.0 | 33.2 | 34.4 | 34.9 |
| H8 | 28.6 | 28.6 | 28.7 | 28.5 | 29.5 | 30.8 | 32.5 | 34.4 | 35.1 | 35.2 | 36.6 | 37.0 |
| H9 | 27.6 | 27.6 | 27.7 | 27.5 | 28.5 | 29.8 | 31.5 | 33.4 | 34.1 | 34.2 | 35.6 | 36.0 |
| H10 | 27.0 | 27.0 | 27.3 | 27.3 | 28.4 | 29.5 | 31.1 | 32.9 | 33.6 | 33.8 | 35.0 | 35.5 |
| H11 | 27.0 | 27.0 | 27.3 | 27.3 | 28.4 | 29.5 | 31.1 | 32.9 | 33.6 | 33.8 | 35.0 | 35.5 |
| H12 | 27.2 | 27.2 | 27.5 | 27.5 | 28.7 | 29.8 | 31.3 | 33.0 | 33.8 | 34.0 | 35.2 | 35.6 |
| H13 | 19.6 | 19.7 | 20.0 | 20.2 | 21.4 | 22.4 | 23.9 | 25.5 | 26.3 | 26.7 | 27.8 | 28.4 |
| H14 | 27.7 | 27.7 | 27.9 | 27.7 | 28.8 | 30.0 | 31.6 | 33.5 | 34.2 | 34.3 | 35.6 | 36.1 |
| H15 | 27.5 | 27.5 | 27.7 | 27.6 | 28.7 | 29.9 | 31.5 | 33.3 | 34.0 | 34.2 | 35.4 | 35.9 |
| H16 | 16.7 | 16.8 | 17.3 | 17.7 | 19.1 | 19.9 | 21.2 | 22.7 | 23.6 | 24.2 | 25.2 | 25.8 |
| H17 | 19.6 | 19.7 | 20.1 | 20.4 | 21.7 | 22.6 | 24.0 | 25.6 | 26.5 | 26.9 | 27.9 | 28.5 |
| H18 | 20.4 | 20.4 | 20.8 | 21.1 | 22.4 | 23.4 | 24.8 | 26.3 | 27.2 | 27.6 | 28.7 | 29.2 |
| H19 | 19.0 | 19.1 | 19.6 | 20.1 | 21.5 | 22.3 | 23.6 | 25.0 | 26.0 | 26.5 | 27.5 | 28.0 |
| H20 | 20.4 | 20.4 | 20.8 | 21.2 | 22.5 | 23.4 | 24.8 | 26.3 | 27.2 | 27.6 | 28.7 | 29.2 |
| H21 | 18.7 | 18.8 | 19.3 | 19.9 | 21.2 | 22.0 | 23.3 | 24.7 | 25.7 | 26.3 | 27.2 | 27.8 |
| H22 | 18.8 | 18.9 | 19.4 | 20.0 | 21.3 | 22.1 | 23.4 | 24.8 | 25.8 | 26.4 | 27.3 | 27.9 |
| H23 | 18.8 | 18.9 | 19.5 | 20.0 | 21.4 | 22.2 | 23.5 | 24.8 | 25.8 | 26.4 | 27.3 | 27.9 |
| H24 | 27.5 | 27.5 | 28.0 | 28.3 | 29.5 | 30.4 | 31.8 | 33.3 | 34.2 | 34.5 | 35.5 | 35.9 |
| H25 | 20.2 | 20.3 | 20.7 | 21.1 | 22.4 | 23.3 | 24.7 | 26.2 | 27.1 | 27.6 | 28.6 | 29.1 |
| H26 | 18.5 | 18.5 | 19.1 | 19.7 | 21.1 | 21.9 | 23.1 | 24.5 | 25.5 | 26.1 | 27.0 | 27.6 |
| H27 | 19.3 | 19.4 | 19.9 | 20.4 | 21.8 | 22.6 | 23.9 | 25.3 | 26.2 | 26.8 | 27.7 | 28.4 |
| H28 | 19.0 | 19.1 | 19.6 | 20.2 | 21.5 | 22.3 | 23.6 | 25.0 | 26.0 | 26.6 | 27.5 | 28.1 |
| H29 | 18.3 | 18.4 | 18.9 | 19.5 | 20.9 | 21.7 | 23.0 | 24.3 | 25.3 | 26.0 | 26.9 | 27.5 |
| H30 | 18.5 | 18.6 | 19.1 | 19.7 | 21.1 | 21.9 | 23.1 | 24.5 | 25.5 | 26.1 | 27.0 | 27.7 |
| H31 | 18.3 | 18.4 | 18.9 | 19.5 | 20.9 | 21.7 | 23.0 | 24.3 | 25.3 | 25.9 | 26.9 | 27.5 |
| H32 | 18.2 | 18.2 | 18.8 | 19.4 | 20.8 | 21.6 | 22.8 | 24.2 | 25.2 | 25.9 | 26.7 | 27.4 |
| H33 | 17.4 | 17.5 | 18.0 | 18.6 | 20.0 | 20.8 | 22.1 | 23.4 | 24.5 | 25.3 | 26.3 | 27.1 |
| H34 | 20.7 | 20.7 | 21.2 | 21.6 | 22.9 | 23.8 | 25.1 | 26.6 | 27.5 | 28.0 | 29.0 | 29.6 |
| H35 | 18.3 | 18.4 | 19.0 | 19.6 | 21.0 | 21.8 | 23.0 | 24.3 | 25.3 | 26.0 | 26.9 | 27.6 |
| H36 | 17.6 | 17.6 | 18.2 | 18.9 | 20.3 | 21.0 | 22.2 | 23.5 | 24.6 | 25.3 | 26.2 | 26.9 |
| H37 | 17.5 | 17.5 | 18.0 | 18.6 | 20.1 | 20.9 | 22.1 | 23.4 | 24.5 | 25.4 | 26.3 | 27.2 |
| H38 | 18.3 | 18.4 | 19.0 | 19.6 | 21.0 | 21.8 | 23.0 | 24.3 | 25.3 | 26.0 | 26.9 | 27.6 |
| H39 | 27.1 | 27.2 | 27.8 | 28.3 | 29.6 | 30.3 | 31.6 | 33.0 | 33.9 | 34.4 | 35.3 | 35.6 |
| H40 | 18.4 | 18.5 | 19.1 | 19.7 | 21.1 | 21.9 | 23.1 | 24.4 | 25.5 | 26.2 | 27.0 | 27.7 |
| H41 | 17.8 | 17.9 | 18.4 | 19.0 | 20.4 | 21.2 | 22.5 | 23.8 | 24.9 | 25.7 | 26.7 | 27.6 |
| H42 | 17.5 | 17.5 | 18.1 | 18.8 | 20.2 | 21.0 | 22.2 | 23.5 | 24.6 | 25.3 | 26.2 | 26.9 |
| H43 | 17.5 | 17.6 | 18.1 | 18.7 | 20.1 | 21.0 | 22.2 | 23.5 | 24.6 | 25.5 | 26.4 | 27.3 |
| H44 | 18.2 | 18.2 | 18.8 | 19.4 | 20.8 | 21.6 | 22.9 | 24.2 | 25.2 | 25.9 | 26.8 | 27.5 |
| H45 | 17.4 | 17.5 | 18.0 | 18.7 | 20.1 | 20.9 | 22.1 | 23.4 | 24.4 | 25.2 | 26.1 | 26.8 |
| H46 | 17.6 | 17.7 | 18.2 | 18.8 | 20.3 | 21.1 | 22.3 | 23.6 | 24.7 | 25.6 | 26.6 | 27.5 |
| H47 | 17.7 | 17.7 | 18.2 | 18.9 | 20.3 | 21.1 | 22.4 | 23.6 | 24.8 | 25.7 | 26.7 | 27.6 |
| H48 | 27.1 | 27.2 | 27.8 | 28.5 | 29.9 | 30.6 | 31.8 | 33.1 | 34.1 | 34.6 | 35.4 | 35.7 |
| H49 | 27.2 | 27.3 | 28.0 | 28.8 | 30.2 | 30.9 | 32.1 | 33.2 | 34.3 | 34.9 | 35.6 | 35.9 |
| H50 | 27.2 | 27.3 | 28.1 | 28.9 | 30.3 | 30.9 | 32.1 | 33.2 | 34.3 | 34.9 | 35.5 | 35.8 |
| H52 | 27.4 | 27.5 | 28.2 | 29.1 | 30.6 | 31.2 | 32.4 | 33.5 | 34.5 | 35.2 | 35.8 | 36.2 |

| House ID | Reference Wind Speed, Standardised $v_{10}$ ($ms^{-1}$) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| H53 | 27.3 | 27.4 | 28.1 | 29.0 | 30.4 | 31.1 | 32.2 | 33.4 | 34.4 | 35.1 | 35.7 | 36.1 |
| H54 | 27.3 | 27.4 | 28.3 | 29.2 | 30.7 | 31.2 | 32.4 | 33.5 | 34.6 | 35.2 | 35.8 | 36.2 |
| H55 | 27.1 | 27.2 | 28.1 | 29.1 | 30.6 | 31.2 | 32.3 | 33.3 | 34.4 | 35.1 | 35.7 | 36.0 |
| H56 | 27.0 | 27.1 | 27.9 | 28.8 | 30.3 | 30.9 | 32.0 | 33.0 | 34.1 | 34.8 | 35.4 | 35.8 |
| H57 | 27.0 | 27.1 | 27.8 | 28.8 | 30.3 | 30.8 | 31.9 | 32.9 | 34.0 | 34.7 | 35.3 | 35.7 |
| H58 | 27.0 | 27.1 | 27.9 | 28.9 | 30.4 | 30.9 | 32.0 | 33.0 | 34.1 | 34.8 | 35.4 | 35.8 |
| H59 | 27.0 | 27.1 | 27.9 | 28.9 | 30.4 | 30.9 | 32.0 | 33.0 | 34.1 | 34.8 | 35.4 | 35.8 |
| H60 | 27.0 | 27.1 | 27.9 | 28.9 | 30.4 | 30.9 | 32.0 | 33.0 | 34.1 | 34.8 | 35.4 | 35.8 |
| H61 | 27.0 | 27.1 | 27.9 | 28.8 | 30.4 | 30.9 | 32.0 | 33.0 | 34.1 | 34.8 | 35.4 | 35.8 |
| H62 | 27.0 | 27.1 | 27.9 | 28.8 | 30.3 | 30.8 | 31.9 | 32.9 | 34.0 | 34.8 | 35.3 | 35.7 |
| H63 | 27.0 | 27.1 | 27.9 | 28.9 | 30.4 | 30.9 | 32.0 | 33.0 | 34.1 | 34.8 | 35.4 | 35.8 |
| H64 | 27.0 | 27.1 | 27.9 | 28.8 | 30.4 | 30.9 | 32.0 | 32.9 | 34.1 | 34.8 | 35.4 | 35.8 |
| H65 | 27.0 | 27.1 | 27.9 | 28.8 | 30.4 | 30.9 | 32.0 | 32.9 | 34.1 | 34.8 | 35.4 | 35.8 |
| H66 | 26.9 | 27.1 | 27.9 | 28.8 | 30.3 | 30.9 | 32.0 | 32.9 | 34.1 | 34.8 | 35.3 | 35.8 |
| H67 | 26.9 | 27.1 | 27.8 | 28.7 | 30.2 | 30.8 | 31.9 | 32.8 | 34.0 | 34.7 | 35.3 | 35.7 |
| H68 | 30.3 | 30.3 | 30.6 | 31.0 | 32.7 | 33.0 | 33.6 | 34.2 | 34.9 | 35.5 | 36.0 | 36.5 |
| H69 | 34.0 | 34.0 | 34.1 | 34.3 | 36.0 | 36.2 | 36.5 | 36.9 | 37.4 | 37.8 | 38.3 | 38.8 |
| H70 | 28.6 | 28.6 | 29.0 | 29.5 | 31.2 | 31.5 | 32.3 | 33.0 | 33.9 | 34.5 | 35.1 | 35.6 |
| H71 | 27.0 | 27.1 | 28.0 | 29.0 | 30.6 | 31.1 | 32.1 | 33.0 | 34.2 | 34.9 | 35.5 | 35.8 |
| H72 | 17.7 | 17.7 | 18.1 | 18.6 | 20.1 | 21.1 | 22.4 | 23.7 | 24.9 | 25.9 | 27.0 | 28.2 |
| H73 | 34.0 | 34.0 | 34.1 | 34.3 | 36.0 | 36.3 | 36.9 | 37.5 | 38.2 | 39.0 | 39.8 | 40.7 |
| H74 | 34.6 | 34.6 | 34.7 | 34.8 | 36.5 | 36.9 | 37.4 | 38.1 | 38.8 | 39.6 | 40.4 | 41.4 |
| H75 | 24.4 | 24.5 | 24.8 | 25.4 | 26.9 | 27.9 | 29.1 | 30.4 | 31.3 | 32.0 | 32.6 | 33.9 |
| H76 | 33.1 | 33.2 | 33.3 | 33.5 | 35.1 | 35.5 | 36.1 | 36.9 | 37.7 | 38.5 | 39.4 | 40.3 |
| H77 | 33.2 | 33.2 | 33.4 | 33.6 | 35.1 | 35.6 | 36.2 | 36.9 | 37.8 | 38.6 | 39.4 | 40.4 |
| H78 | 25.9 | 26.0 | 26.3 | 26.8 | 28.3 | 29.3 | 30.6 | 31.9 | 32.7 | 33.2 | 33.7 | 35.0 |
| H79 | 27.5 | 27.5 | 27.8 | 28.2 | 29.7 | 30.6 | 31.7 | 32.9 | 33.7 | 34.3 | 34.9 | 36.1 |
| H80 | 28.6 | 28.6 | 28.8 | 29.2 | 30.7 | 31.9 | 33.3 | 34.7 | 35.3 | 35.6 | 35.9 | 37.4 |
| H81 | 29.6 | 29.7 | 29.9 | 30.2 | 31.4 | 32.2 | 33.3 | 34.3 | 35.4 | 36.3 | 37.2 | 38.4 |
| H82 | 29.7 | 29.7 | 29.9 | 30.3 | 31.8 | 33.1 | 34.5 | 35.9 | 36.5 | 36.7 | 36.9 | 38.6 |
| H83 | 29.7 | 29.7 | 29.9 | 30.3 | 31.8 | 33.1 | 34.5 | 35.9 | 36.5 | 36.7 | 36.9 | 38.6 |
| H84 | 40.7 | 40.7 | 40.7 | 40.7 | 40.9 | 41.1 | 41.3 | 41.6 | 41.9 | 42.2 | 42.5 | 42.9 |
| H85 | 28.3 | 28.3 | 28.7 | 29.3 | 30.5 | 31.0 | 31.8 | 32.7 | 33.6 | 34.4 | 35.0 | 35.7 |
| H86 | 27.7 | 27.8 | 28.2 | 28.8 | 30.1 | 30.6 | 31.5 | 32.3 | 33.3 | 34.0 | 34.7 | 35.3 |
| H87 | 28.5 | 28.5 | 28.9 | 29.4 | 30.6 | 31.0 | 31.8 | 32.7 | 33.6 | 34.3 | 34.9 | 35.6 |

| House ID | Reference Wind Speed, Standardised $v_{10}$ ($ms^{-1}$) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| H88 | 18.6 | 18.7 | 19.2 | 19.8 | 21.2 | 22.0 | 23.3 | 24.6 | 25.6 | 26.3 | 27.2 | 28.0 |
| H89 | 19.3 | 19.4 | 19.8 | 20.4 | 21.7 | 22.6 | 23.9 | 25.3 | 26.2 | 26.9 | 27.9 | 28.6 |

**Table 10.30: Cumulative Downwind Predicted Noise Levels exc. Proposed Development Night, dB(A)**

| House ID | Reference Wind Speed, Standardised $v_{10}$ ($ms^{-1}$) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| H1 | 24.2 | 24.2 | 24.2 | 27.3 | 29.5 | 29.7 | 30.0 | 30.2 | 30.4 | 31.4 | 31.9 | 31.9 |
| H2 | 24.1 | 24.1 | 24.1 | 27.2 | 29.4 | 29.6 | 29.9 | 30.1 | 30.4 | 31.4 | 31.8 | 31.9 |
| H3 | 24.3 | 24.3 | 24.3 | 27.4 | 29.6 | 29.8 | 30.1 | 30.3 | 30.5 | 31.5 | 32.0 | 32.0 |
| H4 | 24.3 | 24.3 | 24.3 | 27.4 | 29.6 | 29.8 | 30.1 | 30.3 | 30.6 | 31.6 | 32.0 | 32.1 |
| H5 | 24.4 | 24.4 | 24.4 | 27.5 | 29.7 | 29.9 | 30.2 | 30.4 | 30.7 | 31.7 | 32.1 | 32.2 |
| H6 | 19.9 | 19.9 | 19.9 | 22.5 | 24.6 | 24.9 | 25.3 | 25.5 | 26.0 | 27.1 | 27.5 | 27.7 |
| H7 | 26.8 | 26.8 | 26.8 | 29.8 | 32.1 | 32.2 | 32.6 | 32.7 | 33.0 | 34.0 | 34.4 | 34.5 |
| H8 | 28.8 | 28.8 | 28.8 | 32.1 | 34.3 | 34.4 | 34.8 | 34.9 | 35.1 | 36.1 | 36.6 | 36.6 |
| H9 | 27.8 | 27.8 | 27.8 | 31.0 | 33.3 | 33.4 | 33.7 | 33.9 | 34.1 | 35.1 | 35.6 | 35.6 |
| H10 | 27.5 | 27.5 | 27.5 | 30.4 | 32.6 | 32.8 | 33.1 | 33.3 | 33.6 | 34.6 | 35.0 | 35.1 |
| H11 | 27.5 | 27.5 | 27.5 | 30.4 | 32.6 | 32.8 | 33.1 | 33.3 | 33.6 | 34.6 | 35.0 | 35.1 |
| H12 | 27.7 | 27.7 | 27.7 | 30.5 | 32.7 | 32.9 | 33.3 | 33.5 | 33.8 | 34.8 | 35.2 | 35.2 |
| H13 | 20.2 | 20.2 | 20.2 | 22.8 | 24.9 | 25.2 | 25.7 | 25.9 | 26.3 | 27.4 | 27.8 | 28.0 |
| H14 | 28.0 | 28.0 | 28.0 | 31.1 | 33.3 | 33.4 | 33.8 | 33.9 | 34.2 | 35.2 | 35.6 | 35.7 |
| H15 | 27.9 | 27.9 | 27.9 | 30.8 | 33.0 | 33.2 | 33.6 | 33.7 | 34.0 | 35.0 | 35.4 | 35.5 |
| H16 | 17.6 | 17.6 | 17.6 | 19.5 | 21.4 | 22.0 | 22.5 | 22.9 | 23.6 | 24.6 | 25.2 | 25.6 |
| H17 | 20.3 | 20.3 | 20.3 | 22.6 | 24.6 | 25.1 | 25.6 | 25.9 | 26.5 | 27.5 | 27.9 | 28.3 |
| H18 | 21.1 | 21.1 | 21.1 | 23.4 | 25.4 | 25.8 | 26.3 | 26.6 | 27.2 | 28.2 | 28.7 | 28.9 |
| H19 | 19.9 | 19.9 | 19.9 | 21.9 | 23.9 | 24.4 | 24.9 | 25.3 | 26.0 | 27.0 | 27.5 | 27.8 |
| H20 | 21.1 | 21.1 | 21.1 | 23.4 | 25.4 | 25.8 | 26.3 | 26.6 | 27.2 | 28.2 | 28.7 | 29.0 |
| H21 | 19.6 | 19.6 | 19.6 | 21.6 | 23.5 | 24.0 | 24.6 | 25.0 | 25.7 | 26.7 | 27.2 | 27.6 |
| H22 | 19.7 | 19.7 | 19.7 | 21.6 | 23.5 | 24.1 | 24.7 | 25.1 | 25.8 | 26.8 | 27.3 | 27.7 |
| H23 | 19.8 | 19.8 | 19.8 | 21.7 | 23.5 | 24.1 | 24.7 | 25.1 | 25.8 | 26.8 | 27.3 | 27.7 |
| H24 | 28.2 | 28.2 | 28.2 | 30.7 | 32.7 | 33.1 | 33.5 | 33.7 | 34.2 | 35.2 | 35.5 | 35.6 |
| H25 | 21.0 | 21.0 | 21.0 | 23.2 | 25.2 | 25.6 | 26.2 | 26.5 | 27.1 | 28.1 | 28.6 | 28.9 |
| H26 | 19.4 | 19.4 | 19.4 | 21.2 | 23.0 | 23.7 | 24.3 | 24.7 | 25.5 | 26.5 | 27.0 | 27.4 |
| H27 | 20.2 | 20.2 | 20.2 | 22.1 | 24.0 | 24.6 | 25.2 | 25.5 | 26.2 | 27.3 | 27.7 | 28.1 |
| H28 | 19.9 | 19.9 | 19.9 | 21.8 | 23.7 | 24.3 | 24.8 | 25.3 | 26.0 | 27.0 | 27.5 | 27.9 |
| H29 | 19.3 | 19.3 | 19.3 | 21.1 | 22.9 | 23.6 | 24.2 | 24.6 | 25.3 | 26.4 | 26.9 | 27.3 |

| House ID | Reference Wind Speed, Standardised $v_{10}$ ($ms^{-1}$) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| H30 | 19.4 | 19.4 | 19.4 | 21.2 | 23.0 | 23.7 | 24.3 | 24.7 | 25.5 | 26.5 | 27.0 | 27.5 |
| H31 | 19.3 | 19.3 | 19.3 | 21.0 | 22.9 | 23.5 | 24.1 | 24.6 | 25.3 | 26.3 | 26.9 | 27.3 |
| H32 | 19.1 | 19.1 | 19.1 | 20.8 | 22.6 | 23.3 | 23.9 | 24.4 | 25.2 | 26.2 | 26.7 | 27.2 |
| H33 | 18.3 | 18.3 | 18.3 | 19.8 | 21.6 | 22.4 | 23.0 | 23.6 | 24.5 | 25.6 | 26.3 | 27.0 |
| H34 | 21.5 | 21.5 | 21.5 | 23.6 | 25.5 | 26.0 | 26.5 | 26.9 | 27.5 | 28.5 | 29.0 | 29.4 |
| H35 | 19.3 | 19.3 | 19.3 | 20.9 | 22.7 | 23.4 | 24.1 | 24.5 | 25.3 | 26.4 | 26.9 | 27.4 |
| H36 | 18.6 | 18.6 | 18.6 | 20.1 | 21.9 | 22.6 | 23.2 | 23.8 | 24.6 | 25.6 | 26.2 | 26.7 |
| H37 | 18.4 | 18.4 | 18.4 | 19.8 | 21.5 | 22.3 | 23.0 | 23.6 | 24.5 | 25.6 | 26.3 | 27.1 |
| H38 | 19.3 | 19.3 | 19.3 | 20.9 | 22.7 | 23.4 | 24.0 | 24.5 | 25.3 | 26.4 | 26.9 | 27.4 |
| H39 | 28.1 | 28.1 | 28.1 | 30.2 | 32.2 | 32.7 | 33.1 | 33.3 | 33.9 | 34.9 | 35.3 | 35.3 |
| H40 | 19.4 | 19.4 | 19.4 | 21.0 | 22.8 | 23.5 | 24.1 | 24.6 | 25.5 | 26.5 | 27.0 | 27.6 |
| H41 | 18.7 | 18.7 | 18.7 | 20.1 | 21.8 | 22.6 | 23.4 | 24.0 | 24.9 | 26.0 | 26.7 | 27.5 |
| H42 | 18.5 | 18.5 | 18.5 | 19.9 | 21.7 | 22.5 | 23.2 | 23.7 | 24.6 | 25.6 | 26.2 | 26.8 |
| H43 | 18.4 | 18.4 | 18.4 | 19.8 | 21.5 | 22.3 | 23.1 | 23.7 | 24.6 | 25.7 | 26.4 | 27.2 |
| H44 | 19.1 | 19.1 | 19.1 | 20.7 | 22.4 | 23.2 | 23.9 | 24.4 | 25.2 | 26.2 | 26.8 | 27.4 |
| H45 | 18.4 | 18.4 | 18.4 | 19.8 | 21.5 | 22.3 | 23.0 | 23.6 | 24.4 | 25.5 | 26.1 | 26.7 |
| H46 | 18.5 | 18.5 | 18.5 | 19.7 | 21.4 | 22.3 | 23.1 | 23.8 | 24.7 | 25.9 | 26.6 | 27.4 |
| H47 | 18.6 | 18.6 | 18.6 | 19.7 | 21.4 | 22.3 | 23.1 | 23.8 | 24.8 | 25.9 | 26.7 | 27.5 |
| H48 | 28.2 | 28.2 | 28.2 | 30.1 | 32.0 | 32.6 | 33.1 | 33.4 | 34.1 | 35.0 | 35.4 | 35.5 |
| H49 | 28.4 | 28.4 | 28.4 | 30.1 | 31.8 | 32.5 | 33.1 | 33.5 | 34.3 | 35.3 | 35.6 | 35.7 |
| H50 | 28.5 | 28.5 | 28.5 | 30.1 | 31.8 | 32.6 | 33.2 | 33.5 | 34.3 | 35.3 | 35.5 | 35.6 |
| H52 | 28.7 | 28.7 | 28.7 | 30.2 | 31.9 | 32.7 | 33.3 | 33.7 | 34.5 | 35.5 | 35.8 | 36.0 |
| H53 | 28.6 | 28.6 | 28.6 | 30.1 | 31.8 | 32.6 | 33.2 | 33.6 | 34.4 | 35.4 | 35.7 | 35.9 |
| H54 | 28.7 | 28.7 | 28.7 | 30.1 | 31.8 | 32.7 | 33.3 | 33.7 | 34.6 | 35.6 | 35.8 | 36.0 |
| H55 | 28.6 | 28.6 | 28.6 | 29.8 | 31.4 | 32.4 | 33.1 | 33.4 | 34.4 | 35.4 | 35.7 | 35.9 |
| H56 | 28.4 | 28.4 | 28.4 | 29.5 | 31.1 | 32.1 | 32.7 | 33.1 | 34.1 | 35.0 | 35.4 | 35.6 |
| H57 | 28.3 | 28.3 | 28.3 | 29.5 | 31.1 | 32.0 | 32.7 | 33.1 | 34.0 | 35.0 | 35.3 | 35.6 |
| H58 | 28.4 | 28.4 | 28.4 | 29.5 | 31.2 | 32.1 | 32.8 | 33.2 | 34.1 | 35.1 | 35.4 | 35.7 |
| H59 | 28.4 | 28.4 | 28.4 | 29.5 | 31.1 | 32.1 | 32.8 | 33.2 | 34.1 | 35.1 | 35.4 | 35.7 |
| H60 | 28.4 | 28.4 | 28.4 | 29.5 | 31.1 | 32.1 | 32.7 | 33.1 | 34.1 | 35.1 | 35.4 | 35.6 |
| H61 | 28.4 | 28.4 | 28.4 | 29.5 | 31.1 | 32.1 | 32.7 | 33.1 | 34.1 | 35.1 | 35.4 | 35.6 |
| H62 | 28.3 | 28.3 | 28.3 | 29.5 | 31.1 | 32.0 | 32.7 | 33.1 | 34.0 | 35.0 | 35.3 | 35.6 |
| H63 | 28.4 | 28.4 | 28.4 | 29.5 | 31.1 | 32.1 | 32.7 | 33.1 | 34.1 | 35.1 | 35.4 | 35.6 |
| H64 | 28.4 | 28.4 | 28.4 | 29.5 | 31.1 | 32.0 | 32.7 | 33.1 | 34.1 | 35.0 | 35.4 | 35.6 |
| H65 | 28.4 | 28.4 | 28.4 | 29.5 | 31.1 | 32.0 | 32.7 | 33.1 | 34.1 | 35.0 | 35.4 | 35.6 |

| House ID | Reference Wind Speed, Standardised $v_{10}$ ($ms^{-1}$) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| H66 | 28.4 | 28.4 | 28.4 | 29.5 | 31.1 | 32.0 | 32.7 | 33.1 | 34.1 | 35.0 | 35.3 | 35.6 |
| H67 | 28.3 | 28.3 | 28.3 | 29.4 | 31.0 | 31.9 | 32.6 | 33.0 | 34.0 | 34.9 | 35.3 | 35.6 |
| H68 | 30.8 | 30.8 | 30.8 | 31.3 | 33.0 | 33.6 | 33.9 | 34.3 | 34.9 | 35.7 | 36.0 | 36.4 |
| H69 | 34.2 | 34.2 | 34.2 | 34.4 | 36.2 | 36.5 | 36.7 | 37.0 | 37.4 | 37.9 | 38.3 | 38.7 |
| H70 | 29.3 | 29.3 | 29.3 | 30.0 | 31.7 | 32.3 | 32.8 | 33.2 | 33.9 | 34.7 | 35.1 | 35.5 |
| H71 | 28.5 | 28.5 | 28.5 | 29.5 | 31.0 | 32.1 | 32.8 | 33.2 | 34.2 | 35.2 | 35.5 | 35.7 |
| H72 | 18.3 | 18.3 | 18.3 | 19.1 | 20.7 | 21.8 | 22.8 | 23.8 | 24.9 | 26.0 | 27.0 | 28.1 |
| H73 | 34.2 | 34.2 | 34.2 | 34.4 | 36.1 | 36.6 | 37.0 | 37.5 | 38.2 | 39.0 | 39.8 | 40.6 |
| H74 | 34.7 | 34.7 | 34.7 | 34.9 | 36.6 | 37.0 | 37.5 | 38.1 | 38.8 | 39.7 | 40.4 | 41.4 |
| H75 | 25.1 | 25.1 | 25.1 | 25.6 | 27.1 | 28.3 | 29.4 | 30.5 | 31.3 | 32.1 | 32.6 | 33.8 |
| H76 | 33.4 | 33.4 | 33.4 | 33.6 | 35.2 | 35.7 | 36.3 | 36.9 | 37.7 | 38.6 | 39.4 | 40.3 |
| H77 | 33.5 | 33.5 | 33.5 | 33.7 | 35.2 | 35.8 | 36.4 | 37.0 | 37.8 | 38.6 | 39.4 | 40.4 |
| H78 | 26.5 | 26.5 | 26.5 | 27.0 | 28.4 | 29.7 | 30.8 | 31.9 | 32.7 | 33.3 | 33.7 | 35.0 |
| H79 | 28.0 | 28.0 | 28.0 | 28.4 | 29.8 | 30.9 | 31.9 | 32.9 | 33.7 | 34.4 | 34.9 | 36.1 |
| H80 | 28.9 | 28.9 | 28.9 | 29.3 | 30.8 | 32.1 | 33.4 | 34.7 | 35.3 | 35.6 | 35.9 | 37.4 |
| H81 | 30.0 | 30.0 | 30.0 | 30.3 | 31.6 | 32.6 | 33.5 | 34.4 | 35.4 | 36.3 | 37.2 | 38.4 |
| H82 | 30.0 | 30.0 | 30.0 | 30.3 | 31.8 | 33.2 | 34.5 | 35.9 | 36.5 | 36.7 | 36.9 | 38.6 |
| H83 | 30.0 | 30.0 | 30.0 | 30.3 | 31.8 | 33.2 | 34.5 | 35.9 | 36.5 | 36.7 | 36.9 | 38.6 |
| H84 | 40.7 | 40.7 | 40.7 | 40.7 | 40.9 | 41.1 | 41.4 | 41.6 | 41.9 | 42.2 | 42.5 | 42.9 |
| H85 | 29.0 | 29.0 | 29.0 | 29.5 | 30.7 | 31.6 | 32.2 | 32.8 | 33.6 | 34.5 | 35.0 | 35.6 |
| H86 | 28.5 | 28.5 | 28.5 | 29.1 | 30.4 | 31.2 | 31.9 | 32.4 | 33.3 | 34.2 | 34.7 | 35.3 |
| H87 | 29.1 | 29.1 | 29.1 | 29.6 | 30.8 | 31.6 | 32.2 | 32.7 | 33.6 | 34.5 | 34.9 | 35.6 |
| H88 | 19.6 | 19.6 | 19.6 | 21.1 | 22.9 | 23.7 | 24.3 | 24.8 | 25.6 | 26.7 | 27.2 | 27.8 |
| H89 | 20.1 | 20.1 | 20.1 | 21.9 | 23.7 | 24.4 | 25.0 | 25.5 | 26.2 | 27.3 | 27.9 | 28.4 |

10.4.53 As downwind cumulative predicted noise levels are known to be conservative, directional attenuation factors can be accounted for in order to calculate more realistic cumulative noise levels. This results in different cumulative noise levels for each direction sector.

10.4.54 The directional attenuation factors adopted are detailed in Table 10.31. These are consistent with the recommendations of the IoA GPG, with reductions in noise of 2 dB(A) when a receiver is crosswind, and 10 dB(A) when a receiver is upwind of a noise source respectively and a polynomial interpolation in the intermediate directions. The IoA GPG goes on to state that such reductions would only come into play gradually at distances of between five and ten tip heights. As such, the

attenuation factors applied have been adjusted by the separation distance between the source and receiver accordingly.

**Table 10.31: Directional Attenuation Factors**

| Directional Offset from Directly Downwind (°) | Directional Attenuation Factor (dB) |
|---|---|
| 0 | 0 |
| 30 | 0 |
| 60 | 0 |
| 90 | -2 |
| 120 | -6.7 |
| 150 | -9.3 |
| 180 | -10 |
| 210 | -9.3 |
| 240 | -6.7 |
| 270 | -2 |
| 300 | 0 |
| 330 | 0 |

10.4.55 The predicted cumulative noise levels for each direction sector are shown in Technical Appendix 10.9. The results differ for day and night-time periods as the predicted noise levels are scaled to the consented noise limits which also differ by time of day.

### DERIVED ACOUSTIC ACCEPTANCE CRITERIA

10.4.56 The assessment criteria are determined by subtracting the directional cumulative predicted noise levels (without the Proposed Development) from the total noise limit to calculate the limit remaining for the Proposed Development. The results of this calculation for day and night time periods are shown in Technical Appendix 10.10.

10.4.57 Where the directional cumulative predicted noise levels are greater than the total noise limit minus 3 dB(A) the limit remaining for the Proposed Development is set to the total limit minus 3 dB(A). This is to avoid the resulting noise limits being set so low, e.g. below the background noise level in some instances, that they become unenforceable due to it being impractical to monitor and hard to prove a breach. The introduction of this measure should also be judged in light of the conservatism of the prediction methodology which was shown by the noise levels measured during the background noise monitoring campaign being less than those predicted due to the existing wind turbines. A conservative prediction methodology would result in the cumulative predicted noise levels being higher and the remaining limit being lower than in reality.

### CUMULATIVE ACOUSTIC ASSESSMENT

10.4.58 The directional predicted noise levels for the Proposed Development are shown in Technical Appendix 10.11. A comparison of these predicted noise levels with the noise limits is shown in Technical Appendix 10.12. A negative margin indicates that the limit is met and a positive margin that the limit is predicted to be exceeded. The daytime limit is predicted to be exceeded at 34 properties by a maximum of 4.2 dB(A). The night limit is predicted to be exceeded at six properties by a maximum of 0.8 dB(A).

10.4.59 A noise management strategy can be implemented to reduce the predicted noise levels to below the limit remaining for the Proposed Development. This involves operating certain turbines within the Proposed Development in reduced noise mode in certain conditions. The Vestas V117 4.3 MW machine has three reduced noise modes whereby the pitch of the turbine blades can be altered, sacrificing power production, to decrease the amount of noise produced. Acoustic emission data for the available noise modes, with the inclusion of a 2 dB(A) allowance for measurement uncertainty, is shown in Table 10.32.

**Table 10.32: A-Weighted Sound Power Levels (dB(A) re 1 pW) for Vestas V117 4.3 MW Reduced Noise Modes**

| Standardised 10 m Height Wind Speed, $v_{10}$ ($ms^{-1}$) | Mode 1 | Mode 2 | Mode 3 |
|---|---|---|---|
| 1 | 95.1 | 95.1 | 95.1 |
| 2 | 95.1 | 95.1 | 95.1 |
| 3 | 95.1 | 95.1 | 95.1 |
| 4 | 97.8 | 97.8 | 97.8 |
| 5 | 101.8 | 101.7 | 101.6 |
| 6 | 105.1 | 103.8 | 102.8 |
| 7 | 106.7 | 104.3 | 103.0 |
| 8 | 107.0 | 104.5 | 103.0 |

| Standardised 10 m Height Wind Speed, $v_{10}$ ($ms^{-1}$) | Mode 1 | Mode 2 | Mode 3 |
|---|---|---|---|
| 9 | 107.0 | 104.8 | 103.0 |
| 10 | 107.0 | 105.0 | 103.0 |
| 11 | 107.0 | 105.0 | 103.0 |
| 12 | 107.0 | 105.0 | 103.0 |

10.4.60 An example of a noise management strategy which would allow the noise limit to be met is provided in Technical Appendix 10.13. 'M0' indicates that the turbine is operating unconstrained with 'M1', 'M2' and 'M3' corresponding to Modes 1-3 as described above. There are many different combinations of turbines operating in different modes which would result in the limit being met and this is just one example to demonstrate the principle. It may be possible to further optimise the strategy to maximise the amount of energy generation.

10.4.61 The predicted noise levels during day and night-time periods with the above noise management strategy in place are provided in Technical Appendix 10.14. The resulting margins to the limit remaining for the Proposed Development are shown in Technical Appendix 10.15 and there are no longer any exceedances.

10.4.62 This is achieved without the need to pause any turbines whereas under the strategy shown in the previous application for an eight turbine scheme a turbine was paused for approximately 19% of the time. The strategy presented for the eight turbine scheme didn't account for wind direction and the number of pauses would have been less had this been considered but some would still have been required. Similarly, the turbines need to operate in noise reduced mode less frequently for the revised five turbine scheme compared to the previous, eight turbine, scheme.

10.4.63 Figure 10.2 shows a cumulative noise contour plot calculated using the ISO 9613 Part 2 propagation model. The plot is provided to illustrate the cumulative noise 'footprint' and should be considered indicative only. Where properties are located such that they cannot be downwind of all turbines simultaneously, the predictions made using a downwind propagation model such as ISO 9613-2 are conservative given that reductions in noise would be expected when a property is crosswind or upwind of a noise source. The footprint shows the Proposed Development without noise management and with no scaling applied to the predicted noise levels for consented or existing sites.

### EXPOSURE ASSESSMENT

10.4.64 In addition to the assessment of predicted noise levels against noise limits, an assessment of the amount of the time that properties would be downwind of any turbine with and without the Proposed Development has also been made at the request of the EHO. The expected long-term wind rose, showing the proportion of the time that the wind is predicted to blow from each direction sector is shown in Table 10.33.

**Table 10.33: Long-Term Wind Rose**

| Directional Sector (°) | Frequency (%) |
|---|---|
| 0 | 7 |
| 30 | 4 |
| 60 | 4 |
| 90 | 4 |
| 120 | 9 |
| 150 | 11 |
| 180 | 9 |
| 210 | 8 |
| 240 | 12 |
| 270 | 13 |
| 300 | 11 |
| 330 | 8 |

10.4.65 The results of this assessment, shown in Table 10.34, allow the reader to gauge the increase in exposure due to the introduction of the Proposed Development. The table shows the percentage of the time that the four background noise survey locations are downwind of the turbines for a given site or combination of sites.

**Table 10.34: Cumulative Exposure Assessment**

| Sites Considered | H34 | H39 | H69 | H75 |
|---|---|---|---|---|
| Cairnmore Hill | 32% | 21% | 32% | 53% |
| Baillie | 52% | 42% | 53% | 52% |
| Forss | 51% | 51% | 52% | 52% |
| Baillie & Forss | 68% | 68% | 72% | 61% |

| Sites Considered | H34 | H39 | H69 | H75 |
|---|---|---|---|---|
| Cairnmore Hill, Baillie & Forss | 68% | 89% | 84% | 72% |
| Change due to introduction of Cairnmore Hill | 0% | 21% | 13% | 11% |

10.4.66 For the purposes of this assessment a property is defined as being downwind of a given site in the direction sectors where the maximum noise levels are predicted when noise levels due to the site are calculated by direction using the directional attenuation factors detailed in Table 10.31. The long-term wind rose shown in Table 10.33 is then used to determine the percentage of the time that the wind is expected to come from the identified sectors. It can be seen that the change in exposure level due to the introduction of the Proposed Development varies by location within the range of 0% to 21%. The results are shown in graphical form in Charts 13-16.

## 10.5 Mitigation

### Mitigation during Construction

10.5.1 For all activities, measures would be taken to reduce noise levels with due regard to practicality and cost as per the concept of 'best practicable means' as defined in Section 72 of the Control of Pollution Act 1974.

10.5.2 BS 5228-1:2009 states that the 'attitude of the contractor' is important in minimising the likelihood of complaints and therefore consultation with the local authority along with letter drops are advised to inform residents of intended activity. Non-acoustic factors, which influence the overall level of complaints such as mud on roads and dust generation, would also be controlled through construction practices adopted on the site.

10.5.3 Furthermore, the following noise mitigation options could be implemented where appropriate:

- Consideration would be given to noise emissions when selecting plant and equipment to be used on site;
- All equipment should be maintained in good working order and fitted with the appropriate silencers, mufflers or acoustic covers where applicable;
- Stationary noise sources would be sited as far away as reasonably possible from residential properties and where necessary and appropriate, acoustic barriers could be used to screen them; and
- The movement of vehicles to and from the site would be controlled and employees instructed to ensure compliance with the noise control measures adopted.

10.5.4 Site operations would be limited to 0700-1900 Monday to Saturday except during turbine erection and commissioning or periods of emergency work. The number of activities occurring simultaneously, the location of activities or the amount of construction traffic could be controlled on Saturdays between 1300 and 1900, if necessary, to ensure that the relevant criterion of 55 dB(A) is met.

10.5.5 The increase of construction noise above the 65 dB(A) daytime target level would be temporary and could be mitigated by the installation of acoustic barriers if required. Noise levels would be expected to drop below 65 dB(A) after six days based on typical rates of track construction/upgrade. Work on the water crossing closest to the site entrance would be expected to take three days. Work on the enabling works compound is anticipated to take five days.

10.5.6 The mitigation measures that would be adopted during the construction phase would be agreed with the relevant parties as part of the Construction and Environmental Management Plan (CEMP).

### Mitigation during Operation

10.5.7 One of the key constraints and considerations in designing the layout of the turbines was the minimisation of potential noise impacts at the nearest residential receptors. As such the turbine layout was designed with separation distances between the proposed turbines and nearby residential properties in mind.

10.5.8 Other than the noise management strategy identified in the Potential Cumulative Effects section of this Chapter, no further mitigation measures would be required for the operation of the proposed turbines as the Proposed Development would comply with noise criteria with this noise management strategy in place.

10.5.9 The noise management strategy takes advantage of the fact that the operation of modern wind turbines can be altered by changing the pitch of the wind turbine blades resulting in a trade-off between power production and noise reduction. This provides a potential mechanism for further reducing the level of noise experienced at nearby residential properties although the acoustic assessment demonstrates that this is not required.

10.5.10 If planning permission is granted for the Proposed Development, planning conditions can be proposed to provide protection to nearby residents in the form of limits

relating to noise level and tonality. Technical Appendix 10.9 contains a set of noise conditions that RES considers appropriate.

### Mitigation during Decommissioning

10.5.11 No specific mitigation measures are anticipated to be necessary during the decommissioning phase although general best practice methods of reducing noise, as employed during the construction phase, should be adopted as a precaution.

## 10.6 Assessment of Residual Effects

### Residual Construction Effects

10.6.1 There could be a temporary increase in construction noise above the 65 dB(A) criteria level at properties close to the site entrance although this could be mitigated if necessary. There could also be construction noise levels of greater than the 55 dB(A) criteria level for 1300-1900 on Saturdays although again this could be mitigated if necessary. At all other times and locations, predicted noise levels from the worst-case combination of increased traffic and site operations would not exceed relevant criteria.

### Residual Operational Effects

10.6.2 The acoustic assessment demonstrates that predicted noise levels at all residential properties would not exceed the derived noise limits with a noise management strategy in place. This should not be interpreted to mean that wind farm operational noise would be inaudible (or masked by background noise) under all conditions, but that the levels of noise would be acceptable under ETSU-R-97 and associated guidance.

### Residual Decommissioning Effects

10.6.3 No significant effects are predicted as any noise levels due to decommissioning are expected to be less than during construction.

### Residual Cumulative Effects

10.6.4 No significant additional residual effects would be anticipated due to construction in the cumulative scenario.

10.6.5 The predicted operational noise levels are within the limits at all nearby properties such that the impact would be deemed acceptable and no significant residual effects would be anticipated.

## 10.7 Summary

10.7.1 The acoustic impact for the operation of the Proposed Development on nearby residential properties has been assessed in accordance with the guidance on wind farm noise as issued in the DTI publication "The Assessment and Rating of Noise from Wind Farms", otherwise known as ETSU-R-97, and Institute of Acoustics Good Practice Guide (IoA GPG), as recommended for use by relevant planning policy.

10.7.2 To establish baseline conditions, background noise surveys were carried out at four nearby properties and the measured background noise levels used to determine appropriate noise limits, as specified by ETSU-R-97 and the IoA GPG.

10.7.3 Operational noise levels were predicted using the recommended noise propagation model. The limit remaining for the Proposed Development was determined by subtracting the predicted noise levels due to nearby consented and existing sites from the total noise limit. The predicted noise levels for the Proposed Development are within the derived noise limits at all considered wind speeds with an appropriate noise management strategy in place. The Proposed Development therefore complies with the relevant guidance on wind farm noise and the impact on the amenity of all nearby residential properties would be regarded as acceptable.

10.7.4 A construction noise assessment has been carried out in accordance with BS 5228-1:2009 "Noise control on construction and open sites Part 1 - Noise", and with due regard to mitigation outlined, indicates that predicted noise levels likely to be experienced at representative critical residential properties would be below relevant criteria.

10.7.5 The potential impact of the Proposed Development, along with the mitigation proposed and any residual impact, is summarised in Table 10.35.

**Table 10.35: Summary of Potential Significant Effects of the Proposed Development**

| Potential Effect | Mitigation Proposed | Means of Implementation |
|---|---|---|
| | **Construction** | |
| General Construction Noise: potential for noise to be created during general construction activities | Due regard for 'best practicable means' (defined by Section 72 of the Control of Pollution Act 1974)<br>A range of noise mitigation measures are proposed for the construction phase in accordance with measures outlined in BS 5228- | Noise mitigation measures would be implemented as part of the CEMP which would be required to be agreed as a condition of |

| Potential Effect | Mitigation Proposed | Means of Implementation |
|---|---|---|
| | 1:2009<br>Site operations to be limited to 0700-1900 Monday to Saturday (except during turbine erection and commissioning/periods of emergency work) | consent. |
| Construction Traffic Noise: potential for noise to be created due to construction traffic | Construction traffic to be controlled on Saturdays between 1300-1900, if necessary, to ensure relevant noise criteria are met | Provision of a Construction Traffic Management Plan to be incorporated into the CEMP and delivered as a condition of consent |
| Cumulative Construction Noise | No additional measures required | Not applicable |
| Cumulative Construction Traffic Noise | No additional measures required | Not applicable |
| **Operation** | | |
| Operational Noise: potential impact on residential amenity | Impact is deemed to be acceptable as wind farm meets noise limits specified by relevant guidance with a noise management strategy in place<br><br>No additional mitigation measures are required due to absence of identified significant effect | Not applicable |
| Cumulative Operational Noise | No additional measures required | Not applicable |
| **Decommissioning** | | |
| Potential noise from site decommissioning activities | General best practice measures of reducing noise, employed during the construction phase, would be adopted as precaution | A Decommissioning and Restoration Plan would be submitted to and approved in writing by The Highland Council in consultation with SNH and SEPA no later than twelve months prior to the final decommissioning of the wind farm. |

# Glossary and Abbreviations

| Term | Definition |
|---|---|
| A-weighting | A frequency-response function providing good correlation with the sensitivity of the human ear. |
| Broadband Noise | Noise which covers a wide range of frequencies (see Frequency). |
| Decibel dB(A) | The decibel (dB) is a logarithmic unit used in acoustics to quantify sound levels relative to a 0 dB reference (e.g. a sound pressure level of $2*10^{-5}$ Pa). The 'A' signifies A-weighting. |
| Equivalent Continuous Sound Level ($L_{eq}$) | The equivalent continuous sound level is a notional steady noise level, which over a given time would provide the same energy as the intermittent noise. |
| Frequency | Refers to how quickly the air vibrates, or how close the sound waves are to each other and is measured in cycles per second, or Hertz (Hz). The lowest frequency audible to humans is 20 Hz and the highest is 20,000 Hz. The human ear is most sensitive to the 1 kHz, 2 kHz and 4 kHz octave bands and much less sensitive at lower audible frequencies. |
| Frequency Spectrum | Description of the sound pressure level of a source as a function of frequency. |
| Percentile Sound Level ($L_{90}$) | Sound pressure level exceeded for 90% of the time for any given time interval. For example, $L_{(A)90,10min}$ means the A-weighted level that is exceeded for 90% of a ten minute interval. This indicates the noise levels during quieter periods, or the background noise level. It represents the lower estimate of the prevailing noise level and is useful for excluding such effects as aircraft or dogs barking on background noise levels. |
| Noise Emission | The noise energy emitted by a source (e.g. a wind turbine). |
| Noise Immission | The sound pressure level detected at a given location (e.g. nearest dwelling). |
| Octave Band | Range of frequencies between one frequency ($f_0*2^{-1/2}$) and a second frequency ($f_0*2^{+1/2}$). The quoted centre frequency of the octave band is $f_0$. |
| Sound Power Level | Sound power level is the acoustic power radiated from a sound source and is independent of the surroundings. It is a logarithmic measure in comparison to a reference level ($10^{-12}$ watts). |
| Sound Pressure Level | A logarithmic measure of the effective sound pressure of a sound relative to a reference value which is for minimum audible field conditions ($20*10^{-6}$ Pa). |
| Third Octave Band | The range of frequencies between one frequency ($f_0*2^{-1/6}$) and a second frequency equal to ($f_0*2^{+1/6}$). The quoted centre frequency of the third octave band is $f_0$. |
| Tonal Noise | A noise that contains a noticeable or discrete, continuous note and includes noises such as hums, hisses, screeches. |

| Abbreviation | Expanded Term |
|---|---|
| BS | British Standard |
| CEMP | Construction and Environmental Management Plan |
| CTRN | Calculation of Road Traffic Noise |
| dB | Decibel |
| Hz | Hertz |
| $L_B$ | Background Noise Level |
| $L_{WA}$ | A-weighted Sound Power Level |
| $ms^{-1}$ | Metres per Second |
| MW | Megawatt |
| Pa | Pascal |
| pW | Picowatt |
| SEPA | Scottish Environment Protection Agency |
| SNH | Scottish Natural Heritage |
| $V_{10}$ | Standardised 10m Wind Speed |

# 10 Safety and Other Issues

## 10.1 Introduction

10.1.1 This Chapter of the Environmental Impact Report (EIA Report) evaluates the effects of the Cairnmore Hill Wind Farm (Proposed Development) on any remaining topics that are within the scope of the Environmental Impact Assessment (EIA).

10.1.2 This Chapter is supported by Technical Appendix 2.8: Shadow Flicker Assessment.

## 10.2 Human Health & Safety, including Major Accidents & Disaster

### Introduction

10.2.1 The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017[1] (hereafter referred to as the 'EIA Regulations') state than an EIA must identify, describe and assess in an appropriate manner, the expected effects deriving from the vulnerability of the Proposed Development to Major Accidents and Disasters (MADS) that are relevant to the Proposed Development, as well as upon human health and safety.

### Assessment Methodology

10.2.2 In identifying relevant major accidents or disasters, the following definitions are used to guide this assessment which are informed by Institute of Environmental Management and Assessment (IEMA) EIA Quality Mark Article:

- Major Accident – uncontrolled occurrence in the course of the construction or operation of the Proposed Development, leading to serious danger to the environment, which may be either immediate or delayed;
- Disaster - An event not directly caused by the Proposed Development, leading to serious danger to the environment, which may be either immediate or delayed. It may result from natural sources, such as flooding, adverse weather, ground movement, or from man-made sources (e.g. escalation of a fire from an adjacent facility); and
- Relevance – a relevant major accident or disaster is defined as follows: ▪ Caused by the Proposed Development;
    - Having the potential to impact upon the Proposed Development; and
    - Would be exacerbated or mitigated by the Proposed Development.

### Vulnerability of the Proposed Development to Disasters

10.2.3 The land upon which the Proposed Development is proposed within the application boundary (the Site) is not located within an area known for natural disasters such as floods, hurricanes, tornadoes, volcanic eruptions, earthquakes or tsunamis.

10.2.4 As stated in Chapter 14: Climate Change of this EIA Report, none of the identified climate change trends listed will affect the Proposed Development with the exception of increased high wind speed conditions. Due to the exposed nature of wind farm sites, wind turbines are designed to withstand extreme weather conditions. Brake mechanisms installed on turbines allow them to be operated only under specific wind speeds and, should severe wind speeds be experienced, then the turbines would be shut down. Although an unlikely event for Scotland, the brake mechanism could also apply to a hurricane scenario.

10.2.5 Flooding and ground saturation/landslips on slopes are the most probable natural disaster that could affect the Proposed Development. The Proposed Development has been designed to minimise the impact of flooding by incorporating a buffer zone between watercourses and turbine bases of 50 m. Measures, including SuDS, to attenuate run-off and intercept sediment prior to run-off entering watercourses are described in the CEMP in Technical Appendix 2.1 and are embedded as part of the Proposed Development design. Although no turbines, construction compounds, substations or meteorological masts are located within areas described as having a 0.5 % or greater annual risk of flooding, emergency response plans appropriate for the individual phases of the Proposed Development would be in place and implemented to deal with any occurrences. These would ensure the health and safety of employees and the protection of critical infrastructure.

10.2.6 No other natural or man-made disasters are considered to have the realistic potential to occur and therefore are not considered further within this Chapter.

10.2.7 Where the Proposed Development has the potential to exacerbate or mitigate effects of disasters this is assessed in other chapters within the EIA Report as relevant, particularly within the hydrological assessment in Technical Appendix 2.5: Hydrological Sensitives and Hydrogeology of this EIA Report (in relation to flooding), geological assessment within Technical Appendix 2.3 and 2.4 and in relation to offsetting of greenhouse gas emissions and related climate change impacts in Chapter 14: Climate Change.

[1] The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 [Online] Available at: https://www.legislation.gov.uk/ssi/2017/102/schedule/4/paragraph/8/made?view=plain (Accessed 20/04/2022)

## Potential for the Proposed Development to Cause Major Accidents

10.2.8 The risk of environmental accidents is covered, where relevant, in individual technical chapters. For example, the potential for accidents, like spillages, are considered in Technical Appendix 2.5: Hydrological Sensitives. Other general construction health and safety measures would be implemented by the principal development contractor in line with best practice prior to the commencement of construction, as discussed in Section 11.1.8.

10.2.9 No other major accidents are considered likely to occur. On-site accidents during construction and operation are assessed in the following subsections of this Chapter.

### Construction Phase

10.2.10 Effects upon health and safety are managed through risk assessments, pursuant to legislation of the European Union such as Directive 2012/18/EU of the European Parliament[2] on the control of major-accident hazards. The Directive lays down rules for the prevention of major accidents which might result from certain industrial activities and the limitation of their consequences for human health and the environment. Directive 2012/18/EU requires the preparation of emergency plans and response measures which will be covered under equivalent documents relevant to the nature of the Proposed Development

10.2.11 The Construction (Design and Management) Regulations 2015[3] (CDM Regulations) are intended to ensure that health and safety issues are properly considered during development to reduce the risk of harm. In accordance with the CDM Regulations, a Principal Designer and Principal Contractor would be appointed.

10.2.12 The Principal Designer would have responsibility for coordination of health and safety during the pre-construction phase. Guidance published by the Health and Safety Executive in January 2015, defines principal designers as "…designers appointed by the client in projects involving more than one contractor. They can be an organisation or an individual with sufficient knowledge, experience and ability to carry out the role.

"Principal contractors are defined in the 2015 CDM Regulations as "contractors appointed by the client to coordinate the construction phase of a project where it involves more than one contractor …They … must possess the skills, knowledge, and experience, and (if an organisation) the organisational capability necessary to carry out their role effectively given the scale and complexity of the project and the nature of the health and safety risks involved."

10.2.13 Throughout all phases of the Proposed Development, cognisance would be made of the following guidance documents produced by RenewableUK, and updated by SafetyOn:

- Wind Turbine Safety Rules Third Edition[4]; and
- Guidance & Supporting Procedures on the Application of Wind Turbine Safety Rules Third Edition[5].

10.2.14 The remoteness and the type of the Proposed Development will reduce the severity of accidents occurring and major accidents occurring as a result of construction are highly unlikely. In the unlikely event that such an event was to occur during construction, emergency response plans would be available and implemented to deal with any occurrences.

10.2.15 The risk of construction accidents as they relate to human health and safety would be covered in the Construction Method Statements (CMS) and Construction Environmental Management Pan (CEMP) and specific risk assessment method statements, prepared in response to conditions attached to any consent. These would include identifying site specific risks and preparing assessments to minimise and manage the risk such as equipment safe handling, personal protection equipment, amongst others. As a result, construction accidents are not considered further within this Chapter.

### Operational Phase

10.2.16 Electrical infrastructure will be located across the Proposed Development in the form of an electrical substation and battery storage facility which will be subject to routine maintenance such that it is not considered to pose a significant risk of creating an accident. Additionally, effects upon population and human health are unlikely due to the remoteness of the Proposed Development, the low population density, and adherence to required safety clearances around turbines.

10.2.17 A possible but rare source of danger to human or animal life from a wind turbine would be the loss of a piece of the blade or, in the most exceptional circumstances,

[2] European Parliament (2012) Directive 2012/18/EU [Online] Available at: https://eurlex.europa.eu/eli/dir/2012/18/oj (Accessed on 22/04/2022)

[3] Scottish Government (2015) The Construction (Design and Management) Regulations 2015 [Online] Available at: http://www.legislation.gov.uk/uksi/2015/51/contents/made (Accessed on 22/04/2022)

[4] SafetyOn (2019) Wind Turbine Safety Rules, Third Edition - Issue 2 [Online] Available at: https://safetyon.com/__data/assets/pdf_file/0005/662729/Wind-Turbine-Safety-Rules-Edition-3-2015-Issue-2- December-2019.pdf (Accessed on 22/04/2022)

[5] SafetyOn (2019) Guidance on the Application of Wind Turbine Safety Rules, Third Edition – Issue 3 [Online] Available at: https://safetyon.com/__data/assets/pdf_file/0006/662730/Wind-Turbine-Safety-Rules-Guidance-Edition-3-2015-Issue-3-Dec-2019.pdf (Accessed on 22/04/2022)

of the whole blade from an operational turbine. Many blades are composite structures with no bolts or other separate components. Even for blades with separate control surfaces on or comprising the tips of the blade, separation is highly unlikely. Wind turbines have an exemplary safety record with no recorded instances of fatalities to any member of the public anywhere in the world. The turbines are also designed to shut down automatically during high wind speed conditions, typically in excess of 60 mph.

10.2.18 There is a risk of ice accumulation on turbine blades, nacelles and towers under certain conditions such as periods of very cold weather with high humidity. In those instances where icing of blades occurs, fragments of ice might be released from blades, particularly when the machine is started. The wind turbines would be fitted with vibration sensors to detect any imbalance which might be caused by icing of the blades. This enables the operation of machines with iced blades to be inhibited to eliminate the risk of ice throw.

10.2.19 The possibility of attracting lightning strikes applies to all tall structures, and wind turbines are no different. Appropriate lightning protection measures are incorporated in wind turbines to ensure that lightning is conducted harmlessly past the sensitive parts of the nacelle and down into the ground.

10.2.20 The Scottish Government Online Advice (2014) states

*"although wind turbines erected in accordance with best engineering practice should be stable structures, it may be advisable to achieve a set-back from roads and railways of at least the height of the turbine proposed, to assure safety".*

10.2.21 The distance between the nearest proposed turbines and public roads/footpaths is well in excess of tip height, with the nearest receptor over 1 km from the closest turbine.

### Statement of Significance

10.2.22 Due to its location, the Site is not prone to natural disasters. Whilst adverse weather conditions, most notably high wind speed events, ice producing conditions and lightning strikes, do occur within Scotland, wind turbines are designed to withstand extreme weather conditions. Brake mechanisms, vibration sensors and lightning protection measures are installed on turbines allowing them to be operated under optimal conditions and inhibited during extreme weather events.

10.2.23 The risk of construction accidents as they relate to human health and safety are detailed and managed through the CDM Regulations and in the CEMP through specific construction risk assessment method statements, which will be prepared in accordance with conditions attached to any consent of the Proposed Development.

10.2.24 Therefore, the overall risk of health and safety including major accidents and disasters is considered negligible and **not significant** in terms of the EIA Regulations.

## 10.3 Waste

10.3.1 Exact quantities and types of waste are unknown at this stage of the Proposed Development. It is expected that they could include:

- Excavated material;
- Woodland Residues;
- Welfare facility waste;
- Packaging;
- Waste chemicals, fuels and oils;
- Waste metals;
- Waste water from dewatering;
- Waste water from cleaning activities; and
- General construction waste (paper, wood, etc.).

10.3.2 A Site Waste Management Plan (SWMP) will detail how waste streams are to be managed, following the Waste Hierarchy[6] of prevention, reuse, recycle, recover and as a last resort, disposal to landfill. The SWMP will be agreed and implemented prior to construction commencing on Site via a planning condition.

10.3.3 Therefore, the effects of any waste generated would be negligible and not significance in terms of the EIA Regulations.

[6] The Waste Management Licencing (Scotland) Regulations 2011 places a duty on all persons who produce, keep or manage waste to apply the 'Waste Hierarchy' in order to minimise waste production at all stages of a development.

# 12 Potential Grid Connections

## 12.1 Introduction

### The Consenting Context

12.1.1 Although a grid connection is an integral, requisite part of any wind farm project, it is typically subject to a separate consenting process. Depending upon size (installed capacity), consent for a wind farm is sought either from the relevant local authority under the Town and Country Planning (Scotland) Act 1997 (the 1997 Act) or from the Scottish Ministers under Section 36 of the Electricity Act 1989. In contrast, in relation to overhead lines (OHL), the grid connection may require consent from the Scottish Ministers under Section 37 of the Electricity Act 1989; or, alternatively for underground sections (i.e. underground electricity cables), either planning permission may be required from the local authority; or permitted development rights may apply, subject to specific circumstances.

12.1.2 Normally the wind farm applicant will be the developer, whereas the grid connection consent will be sought by the relevant owner of the local distribution or transmission network, in this case Scottish and Southern Electricity Networks (SSEN).

12.1.3 In this case, the Applicant's interpretation of the application requirements is that the Environmental Impact Assessment process for the Proposed Development should additionally assess the secondary and indirect environmental effects associated with the grid connection, insofar as is possible.

12.1.4 The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011 ('the EIA Regs')1 states that the EIA Report should provide an indication of any difficulties encountered by the applicant in compiling the required information. The main technical difficulty in relation to predicting the likely significant environmental effects of the grid connection is that the applicant for the Proposed Development has no absolute control over the nature and routeing of the eventual grid connection. Equally, given that the optimum interconnection point depends upon power flows and available capacity in the wider network, and given that these are constantly changing, then it is impossible to guarantee the final form of the grid connection until the time at which the connection is secured for construction.

12.1.5 As such, the Applicant has made an assessment of the predicted environmental effects of the grid connection based upon its best understanding of a potentially suitable route corridor. It should be noted that, when the consent application for the grid connection is brought forward, the grid connection will be the subject of a separate environmental assessment process.

## 12.2 Scope

12.2.1 Given the above qualifications and context, the purpose of this section is:

- to describe the existing local grid infrastructure;
- to describe a potential grid connection corridor and its environmental sensitivities; and
- based upon the identified grid corridor, demonstrate that a connection solution is possible that would be unlikely to have significant environmental impacts.

12.2.2 If the final objective can be achieved, then for the purpose of consenting the proposed development, there would be no reason to withhold consent on grounds of likely significant environmental impact of necessary related development.

12.2.3 This chapter contains the following:

- Figure 12.1: Potential Grid Connection Corridor.

## 12.3 Potential Grid Connection Corridor

12.3.1 RES has submitted an application for a grid connection for the Proposed Development to SSEN. A connection agreement is in place between the Applicant and SSEN.

12.3.2 The Applicant's initial assessment of the site was that it was physically capable of hosting a development of between 20 MW and 50 MW.

12.3.3 the grid network local to the site contains existing 132 kV infrastructure and a newly constructed 275 kV infrastructure. The 132 kV circuit south of the site runs from Dounreay to Thurso, with another 132 kV circuit southeast of the site from Thurso to Mybster. The newly constructed 275 kV circuit passes through Thurso South substation and will replace the two 132 kV circuits from Dounreay to Mybster.

12.3.4 The Proposed Development would most likely be connected to the Thurso South substation via sections of both OHL and underground cable. The potential grid connection corridor would begin at the on-site substation within the proposed development, travel initially southeastwards and thereafter would follow the public

1 As stated in Chapter 1: Introduction, the EIA has been prepared in accordance with the Town and Country Planning (EIA Regulations) (Scotland) 2011 since the request for an EIA Scoping Opinion was submitted in July 2016.

road corridor to Thurso South substation as shown in Figure 12.1: Potential Grid Connection Corridor. The only overhead section is anticipated to be where the corridor crosses B874 northeast into Thurso South substation.

## 12.4 Construction

12.4.1 For an underground cable connection, the trench would be similar to those used for the Proposed Development(i.e. underground cabling as described in Chapter 2: Proposed Development), as shown in Figure 2.11. The trench could run in the road side verges adjoining the carriageway, or within footways adjoining the carriageway, although it is also possible that the cable would be laid within the carriageway itself. At 33 kV, underground cables are normally laid to a depth of 0.9 m. To lay this cable a trench is dug, bedding material, normally sand, is placed along the trench-base, the cable laid and then covered with more sand. The cables are then protected by a layer of protective plastic covers and then backfilled with subsoil and original topsoil and turfs.

12.4.2 For bridge crossings along the road, the cable could be laid within the bridge, if there is sufficient excavation depth, or otherwise via either trenching or directional drilling under the watercourse.

12.4.3 Generally, when OHL are constructed over open ground, single pole supports are used with a typical height of 13 m to 15 m, a typical spacing of 50 m and a minimum ground to cable clearance of 5.2 m (5.8 m over roads). Where the line changes direction, a stayed, double-pole arrangement is adopted. Double poles are also used at line terminations, for instance when the cable goes underground, or on rising ground, where the spacing between supports would generally decrease. It is anticipated that only a very short section of OHL will be required.

12.4.4 In terms of construction, single poles are buried to a depth of approximately 2 m, dependent on the pole height. The pole is stabilised by underground cross arms which run in the line direction. Excavations can generally be carried out by a mini crawler digger. Additional site plant will typically include a powered lifting and handling machine.

12.4.5 The construction activities would include the following:

- clearance of land (including vegetation strip as appropriate);
- digging of trenches;
- backfilling of trenches and remediation;
- micrositing of proposed locations for wooden poles;
- construction of contractor compounds for materials/plant/worker accommodation;
- establishment of the working width;
- excavations for wood pole foundations and removal of bedrock if necessary;
- erection of wooden poles; and
- stringing of conductors.

12.4.6 The land should be reinstated as near as reasonably practicable to its original condition.

12.4.7 It is anticipated that the works would be implemented by SSEN.

## 12.5 Potential Impact

12.5.1 A preliminary assessment of the precited environmental effects of the potential grid connection corridor has been undertaken to verify that there are unlikely to be any unacceptable environmental effects.

12.5.2 The main receptors considered to have the potential for likely significant effects are:

- Landscape and Visual;
- Non-Avian Ecology;
- Ornithology;
- Archaeology and Cultural Heritage;
- Hydrology
- Traffic and Transport; and
- Noise.

12.5.3 These are described in turn in the following sections.

### Landscape and Visual

12.5.4 Currently there is no detailed route for the potential grid connection, therefore only a high-level assessment of landscape and visual impacts of likely significant effects has been carried out. However, for the purpose of this assessment it has been assumed that the majority of the potential grid connection would, as described above, be undergrounded and that construction locations would be restored to existing condition, and any landscape elements, such as stone dykes, would be reinstated to their original specification.

**Baseline Characteristics**

### Landscape Fabric/Topography and Landuse

12.5.5 The grid connection corridor is located within a landscape that comprises:

- an essentially flat or gently undulating landform between 39 and 138 m AOD, the highest elevation occurring at the Hill of Forss, and the lowest at Geisse;
- occasional wet ditches and minor watercourses;
- a predominance of open, semi-improved grasslands, including grass verges;
- small scale minor local roads and small farm tracks;
- occasional stone dykes;
- farmsteads and scattered residential properties with associated boundary vegetation and garden vegetation; and
- small quarries and borrow pits.

### Landscape Character

12.5.6 The potential grid connection corridor is located within the Farmed Lowland Plain landscape type, which is an extensive landscape, extending across the north east of Caithness between Wick to the east, and from Tang Head to Melvich along the north coast. This landscape as described in The Highland Council's Onshore Wind Energy Supplementary Guidance (SG)2 as *"a broad and relatively low-lying plain and basin bounded by the sea and inland by the expansive Sweeping Moorland and Flows. The landscape is predominantly farmed and well settled with a range of field scales relative to local topography. Given the geographical extent of the area there is considerable local variety in the extent to which different characteristics are displayed. Of note between the east and west, the scale of field patterns and types of boundaries, presence of woodland, presence of infrastructure and prominent built development all vary."*

### Visual Amenity

12.5.7 The potential grid connection corridor and adjoining area contain a number of key visual receptors, including:

- local road users;
- residential receptors in scattered properties and farmsteads; and
- local walkers and cyclists.

12.5.8 No gateways or key routes, as described in the SG are present within or in the immediate vicinity of the potential grid connection corridor.

### Construction Impacts

### Effects on Landscape Receptors

12.5.9 Construction activities associated with the potential grid connection are likely to result in temporary impacts on the landcover, landscape elements (e.g. stone dykes), and disturbance to the condition of the landscape along the route. The principal impacts on landscape fabric would arise from site preparations (including stripping of turf/existing vegetation), excavation of cable trenches and pole foundations, and subsequent backfilling and reinstatement of trenches/excavations. Impacts would, however, be of relatively short duration, of limited geographical extent and reversible, and are therefore not considered likely to be significant.

12.5.10 Construction operations would introduce disturbance, additional vehicle movements and temporary compounds to the settled rural landscape of the Farmed Lowland Plain landscape character type (LCA CT9). However, the landscape already contains a number of borrow pits and excavations, and so the proposals would not represent a wholly new element in the landscape. Construction activities would also be of short duration, of limited extent and reversible, and are therefore considered unlikely to constitute a significant effect on the character of the site and adjoining landscape.

12.5.11 Whilst there is potential for indirect effects on nearby landscape designations such as the Dunnet Head SLA and the East Halladale Flows Wild Land Area (WLA 39), these areas are located over 10 km from the potential grid connection corridor. This distance, coupled with the temporary and reversible nature of construction impacts, suggest that these landscapes would not be subject to significant construction effects.

### Effects on Visual Receptors

12.5.12 The majority of visual receptors, including main settlements and communication corridors would be located distantly from the potential grid connection corridor. However, the potential grid connection would bisect a settled landscape where a large number of residential properties are located (i.e. in and around Janetstown) and where National Cycleway 1, and a network of locally important roads and footpaths are present. Thus, construction works would have potential effects on the amenity of visual receptors nearby, principally in respect of temporary visual disturbance. However, such effects would be geographically localised, short term and reversible, and are therefore not considered significant.

2 Adopted Onshore Wind Energy Supplementary Guidance, November 2016 (with addendum, December 2017)

### Operational Impacts

#### Effects on Landscape and Visual Receptors

12.5.13 As much of the potential grid connection corridor would be undergrounded, and measures are to be adopted to reinstate any disturbed land and /or loss of characteristic elements such as stone dykes, it is unlikely that there would be any effects on landscape fabric, landscape character or visual amenity. The only place where this would not be the case is where the line is over grounded on wooden poles, south-west of the Thurso South substation where, as it approaches the substation, it could be seen in conjunction with the existing 132 kV and 275 kV OHLs, adding to the existing wirescape converging on the substation. It is unlikely, however, that the modest scale and extent of this section of the grid connection would contribute to a significant cumulative or individual effect.

#### Mitigation

12.5.14 On the basis of the preceding assessment of potential construction and operational effects, the focus of mitigation would comprise:

- the careful selection of the detailed grid connection alignment and sites for compounds and material storage to avoid sensitive landscapes and visual receptors;
- the adoptions of a phased programme of construction that would minimise the extent of disturbance at any one time, and allow for rapid reinstatement of disturbed ground associated with trenching and foundations;
- undergrounding of the majority of connection;
- selection of the grid connection alignment to minimise its length and to avoid key features and landscape and visual receptors; and
- early restoration of disturbed ground to a condition consistent with the current baseline; and reinstatement of any landscape elements that might be lost or damaged during construction works.

#### Residual Impacts

12.5.15 Taking account of the embedded and additional mitigation measures outlined previously no significant effects are anticipated during either the construction or operational phase of the grid connection.

12.5.16 Effects on landscape fabric would be confined to the construction phase when undergrounding would take place and would entail disturbance or temporary and highly localised loss of ground cover. However, this would be reversed in the short term.

12.5.17 Similarly, whilst construction of the grid connection would introduce disturbance and additional vehicle and plant movements to the landscape, these would be highly localised, of a relatively small scale and temporary, the underlying character of the local landscape returning to its baseline condition in the short term.

12.5.18 The visual amenity of the area would also only be subject to small scale and temporary impacts associated with construction activities. The undergrounding of the majority of the grid connection would ensure that views are generally not affected following cessation of construction activities.

## Ecology

### Baseline Characteristics

12.5.19 Baseline surveys undertaken for the Proposed Development did not extend to include the potential grid connection corridor. A summary of the likely ecological sensitivities of the potential grid connection corridor (based on the findings of the baseline surveys for the Proposed Development (Chapter 7) and professional judgement) is provided below:

12.5.20 Protected mammalian species: Otter, badger, water vole, bats, pine marten, and red squirrel may also be present depending on the availability of suitable habitat and resource, as their known ranges encompass the potential grid connection corridor;

12.5.21 Protected reptilian species: The ranges of adder, common lizard, and slow worm also encompass the potential grid connection corridor, and consequently these species may also be present depending on the availability of suitable habitat and resource;

12.5.22 Fish: The ranges of Atlantic salmon, brown trout, European eel and lamprey spp. all encompass the potential grid connection corridor and consequently these species may also be present depending on the availability of suitable habitat and resource in local watercourses; and

12.5.23 Habitats/botany: Sensitive habitats and plant species may be present within the potential grid connection corridor.

### Potential Effects

12.5.24 The potential effects during both construction and operation on ecological sensitivities are variable depending on the receptor and the proposed construction methods/design. Below is a summary of potential effects that a given development may have on ecological receptors:

- Direct and indirect habitat loss;
- Disturbance to / loss of breeding sites, resting places, etc.;
- Direct / indirect loss of foraging resource;
- Displacement / disruption to movement of animals;
- Direct effects upon protected fauna, i.e. road traffic accidents, etc.;
- Environmental effects, i.e. pollution of watercourses, etc.; and
- Changes to habitat composition through land-use change, increased human presence, etc.

**Approach to Mitigation**

12.5.25 Proposed mitigation will vary depending on the assessment of any ecological constraints identified from baseline surveys. The following points are provided as examples of the standard measures that may be utilised to mitigate any construction and/or operational impacts on ecological constraints:

- Appropriate buffers from ecological constraints to inform the route design (e.g. 30 m badger sett, 200 m breeding otter feature, 10 m water vole burrow, 30 m bat roost);
- Appropriate buffers from sensitive botanical and hydrological features to inform route design;
- Standard pollution prevention mitigation will be employed throughout the construction phase of the Proposed Development;
- Timing of works to avoid peak activity periods/seasons for protected species;
- Enhancement and creation of habitat to offset any habitat loss associated with the development (e.g. hibernacula, bat roosts, setts); and
- Where fish population are known to be present, pre-construction fish rescues prior to any instream construction works.

**Residual Impacts**

12.5.26 On the assumption that the final grid connection route and design is informed by any ecological sensitivities identified, and that mitigation measures and good practice methods are adopted, no significant residual impacts are anticipated to occur.

## Ornithology

**Existing Conditions**

12.5.27 As detailed in Chapter 8 (Ornithology) the North Caithness Cliffs Special Protection Area (SPA), Caithness Lochs SPA and Caithness and Sutherland Peatlands SPA are within 20 km of the Proposed Development and are also within 20 km of the potential grid connection corridor. Consequently, as identified in Chapter 8 (Ornithology) there is potential for connectivity between the potential grid connection corridor and the Caithness Lochs SPA, whose qualifying features are listed as Greenland white-fronted geese, greylag geese and whooper swans.

12.5.28 Baseline surveys undertaken for the Proposed Development did not extend to include the potential grid connection corridor. (As explained baseline surveys would be carried out as part of a separate environmental assessment process once the consent application for the grid application is brought forward). A summary of the likely ornithological sensitivities of the potential grid connection corridor (based on the findings of the baseline surveys for the Proposed Development (Chapter 8: Ornithology) and professional judgement) is provided below.

12.5.29 Foraging wildfowl and waders (September to April). Wintering Greenland white-fronted goose, greylag goose, pink-footed goose, whooper swan and golden plover were all identified to be foraging in lowland fields surrounding the site and are likely to also be foraging in similar habitat in proximity to the potential grid connection corridor.

12.5.30 Breeding waders (April to July). Curlew and lapwing were both identified to be regularly breeding at the site and are likely to be breeding in other areas along the potential grid connection corridor (although densities are likely to vary depending on the prevailing habitat).

12.5.31 Breeding raptors (March to August). Hen harrier, merlin, peregrine falcon and short-eared owl were all occasionally recorded at the site and, whilst there is no evidence of these species nesting within 2 km of the proposed development, they are likely to be breeding further afield (which may be in proximity to the potential grid connection corridor). Some evidence of roosting barn owl was also recorded within 2 km of the site and barn owl may be using other structures along the potential grid connection corridor for roosting or breeding. Shawyer (2011[3]) provides recommended buffer distances for breeding barn owl (depending on the activity) for construction activities with a maximum buffer of 175 m recommended for

3 Shawyer, C. R. 2011. Barn Owl Tyto alba Survey Methodology and Techniques for use in Ecological Assessment: Developing Best Practice in Survey and Reporting. IEEM, Winchester.

continuous heavy construction works. Consequently, should any section of the grid connection (and associated construction areas) be within 175 m of any structures with barn owl potential, checks will be undertaken by a suitably licensed ornithologist and an appropriate buffer distance3 applied.

**Species Scoped Out of Assessment**

12.5.32 On the basis of experience from other relevant projects and policy guidance or standards (e.g. SNH 2018[4]), the following species are likely to be 'scoped out' since significant effects are unlikely:

- Common and/or low conservation species not recognised in statute as requiring special conservation measures, i.e. bird species not listed on Annex 1 of the EU Birds Directive5 or Schedule 1 to the Wildlife & Countryside Act 1981 (as amended);
- Common and/or species of low nature conservation importance not included in non-statutory lists that indicate birds whose populations are at some risk either generally or in parts of their range (e.g. the Birds of Conservation Concern (BoCC) Red list, Eaton et al. 2015[6]); and
- Passerine species (not generally considered to be at risk from wind farm developments, SNH 2017[7], 2018[4]), unless being particularly rare or vulnerable at a national level.

**Potential Construction/Decommissioning Effects**

12.5.33 Based on the available information to date from baseline surveys for the adjacent Proposed Development (Chapter 8) and the preliminary results from the desk-based study for the grid connection corridor, the following construction/decommissioning effects are likely to require consideration:

- Disturbance/displacement to target species (breeding raptors, owls and waders, and foraging geese and swans) associated with construction/decommissioning activities.

**Potential Operational Effects**

12.5.34 Based on the available information to date from baseline surveys for the adjacent Proposed Development and the preliminary results from the desk-based study for the potential grid connection corridor, the following operational effects are likely to require consideration:

- Displacement of target species (breeding raptors, owls and waders, and foraging geese and swans) around any sections of the grid connection that are overhead; and
- Potential collision risks associated with any sections of the grid connection that are overhead for target species (most likely to be wildfowl).

**Approach to Mitigation**

12.5.35 Significant effects upon birds will be avoided/minimised where possible within the design process. Good practice during construction and operation of the grid connection will also be implemented. Subject to detailed studies, there may be a need to minimise the risk of line strike by geese and swans moving between foraging areas e.g. through the use of bird deflectors are used on any sections of the grid connection that are overhead.

12.5.36 Where potential likely significant effects on Important Ornithological Features (IOFs) are identified, measures to prevent, reduce and where possible to offset these adverse effects will be proposed.

12.5.37 Standard good practice (SNH 2015[8]) measures[9] will be applied to minimise any potential effects on any wintering foraging/roosting wildfowl and breeding waders within up to 500 m and/or breeding Schedule 1/Annex 1 raptors and owls within up to 800 m of the grid connection.

12.5.38 If required, a Breeding Bird Protection Plan (BBPP), will be produced for construction and decommissioning to ensure that all reasonable precautions are taken to ensure the relevant wildlife legislation is adhered to.

**Residual Impacts**

12.5.39 On the assumption that the final grid connection route and design is informed by any ornithological sensitivities identified, and that mitigation measures and good practice methods are adopted, no significant residual impacts are anticipated to occur.

4 Scottish Natural Heritage (2018). Assessing Significance of Impacts from Onshore Windfarms on Birds Outwith Designated Areas. Scottish Natural Heritage, Edinburgh.

5 Council Directive 2009/147/EC on the conservation of wild birds (the Birds Directive).

6 Eaton, M., Aebischer, N., Brown, A., Hearn, R., Lock, L., Musgrove, A., Noble, D., Stroud, D. and Gregory, R. (2015). Birds of Conservation Concern 4: The population status of birds in the UK, Channel Islands and Isle of Man. British Birds 108: 708-746.

7 Scottish Natural Heritage (2014, revised March 2017). Recommended Bird Survey Methods to Inform Impact Assessment of Onshore Wind Farms. Scottish Natural Heritage, Edinburgh.

8 SNH joint publication (2015) Good Practice during Wind Farm Construction. Version 3 http://www.snh.gov.uk/docs/A1168678.pdf

9 Including appropriate mitigation/monitoring and license application/consultation with SNH.

## Archaeology and Cultural Heritage

### Baseline Characteristics

12.5.40 There are no heritage assets with statutory or non-statutory designations within the potential grid connection corridor. The closest scheduled monuments are Thing's Va, Broch 1000m E of Blackheath, Scrabster (SM587), 700 m to the northeast of the potential grid connection corridor through Janetstown, and Tulloch Of Shalmstry, Broch 275m SE of Shalmstry (SM594), which lies 1 km to the southeast of the Thurso South Substation. The nearest listed buildings are a category B listed farmhouse (LB14920) and a category C listed row of farm dwellings (LB14921) at Aimster, around 1.4 km from the potential grid connection corridor and south of the Thurso South Substation.

12.5.41 There are 48 non-designated heritage assets recorded in the HER within the potential grid connection corridor. These include five assets of prehistoric date, 41 of post-medieval date and two of unknown date.

12.5.42 The prehistoric assets include: a burnt mound (MHG1200); a broch (MHG1770) and a possible broch (MHG1465); and two burial cists (MHG1475 & MHG2536).

12.5.43 The post-medieval assets include: farmsteads and farmhouses, cottages and other residential buildings; windmills and a watermill; stone quarries; rig and furrow; a chapel; and an old distillery.

12.5.44 Five of the assets are assessed as being of medium sensitivity, 38 are probably of no more than low sensitivity, while two are of unknown sensitivity and one find-spot is of negligible sensitivity.

### Construction Impacts

12.5.45 Installation of underground sections of the grid connection would have potential to directly affect any identified heritage asset that lies along its route. Installation of poles to support an overhead line can usually easily be microsited to avoid identified assets along the route.

12.5.46 In addition to potential impacts from construction activities, the establishment of compounds for materials and plant storage, offices and workers welfare accommodation can also have direct impacts on identified heritage assets.

12.5.47 It is also possible that buried archaeological remains that have not been identified by the desk-based baseline study could be directly affected either as a result of construction activities or the establishment of working compounds.

12.5.48 Where works are proposed within road carriageways, the potential for direct impact on archaeology and cultural heritage assets is normally low or negligible as road construction work is likely to have had a detrimental impact on any buried remains that may have been present. Where cable trenches or pole erection is proposed in roadside verges or footpaths, the potential for direct impacts on archaeology and cultural heritage is likely to be low; although the possibility of buried archaeological remains surviving in undisturbed ground cannot be ruled out.

12.5.49 Only one asset along the potential grid connection corridor is likely to be directly affected: a burnt mound (MHG1200), which lies alongside, and is partly truncated by, the farm access track to the north of Hopefield, which would be crossed by the potential grid connection. Excavation of the trench for the installation of underground cable could reveal buried remains of the burnt mound that may survive either along the verge or below the track surface.

### Operational Impacts

12.5.50 If the proposal to install underground cables is adopted, there would be a negligible potential for adverse impact on the settings of cultural heritage assets along the route.

12.5.51 If the section of overhead line crossing the B874 to connect to the Thurso South Substation were to be installed, there is a low potential for any adverse impact on the setting of cultural heritage assets. The closest scheduled monument to the proposed overhead line section is Tulloch of Shalmstry, Broch 275m SE of Shalmstry (SM594), which lies 1 km to the southeast of the Thurso South Substation and alongside the A9. The proposed overhead line would, if installed, have an impact on its setting of only negligible magnitude; an effect that would be minor and not significant.

### Mitigation

12.5.52 Most of the identified heritage assets within the potential grid connection corridor can be avoided by design of the route alignment and the selection of the sites of construction compounds; thereby ensuring their preservation in situ.

12.5.53 Where the potential grid connection corridor passes the location of a burnt mound (MHG1200) a watching brief would be carried out to ensure that any buried remains are identified and recorded to an appropriate standard.

12.5.54 If required under the terms of a planning condition, the scope of any other required archaeological watching brief(s) would be agreed through consultation with HET in

advance of development works commencing and would be set out in the Written Scheme of Investigation (WSI).

12.5.55 If significant discoveries are made during any archaeological monitoring works that are carried out, and it is not possible to preserve the discovered remains in situ, provision would be made for the excavation where necessary, of any archaeological deposits encountered. The provision would include the consequent production of written reports, on the findings, with post-excavation analysis and publication of the results of the works, where appropriate.

12.5.56 Written guidelines would be issued for use by all construction contractors, outlining the need to avoid causing unnecessary damage to known heritage assets. The guidelines would set out arrangements for calling upon retained professional support in the event that buried archaeological remains of potential archaeological interest (such as building remains, human remains, artefacts, etc.) should be discovered in areas not subject to archaeological monitoring. The guidelines would make clear the legal responsibilities placed upon those who disturb artefacts or human remains.

## Hydrology

### Baseline Characteristics

12.5.57 As noted previously, the grid connection corridor would begin at the on-site substation. It would then travel south-eastwards initially and thereafter follow the public road corridor to Thurso South substation as shown in Figure 12.1: Potential Grid Connection Corridor. The only overhead section is anticipated to be where the corridor crosses B874 northeast into Thurso South substation.

12.5.58 As noted previously, the grid connection corridor would begin at the on-site substation. It would then travel south-eastwards initially and thereafter follow the public road corridor to Thurso South substation as shown in Figure 12.1. The only overhead section is anticipated to be where the corridor crosses B874 northeast into Thurso South substation.

12.5.59 Where the grid connection comprises an overhead line, the potential for hydrological effects can be scoped out. Whilst a small area of ground disturbance would be required for the foundations this is not considered to be significant, assuming an access track is not required alongside the overhead line.

12.5.60 As the potential grid connection would comprise an overhead line from northeast of the B874, this would remove the need to drill under the River Thurso or its tributary, Burn of Geise. Assuming that the underground cable would also follow the line of the public road from the site boundary to the B874, it would not require any watercourse crossings, subject to excavation depth explained below.

12.5.61 The wider area is farmed and contains a high-density drainage network that the public road and potential grid connection would cross. For bridge crossings along the road, the cable could be laid within the bridge, if there is sufficient excavation depth, and would become part of the crossing; otherwise it would be buried under the watercourse by either trenching or directional drilling. With this approach no work within the water environment is envisaged.

12.5.62 Baseline conditions with regards to wider hydrological sensitivities including GWDTE and public or private water supplies are not known and can only be established following a baseline survey. The following section outlines the wider hydrological sensitivities that would be considered when the grid connection application is brought forward.

### Potential Hydrological Effects

12.5.63 The underground cable route would be assessed for the following potential effects:

- construction runoff and potential pollution events;
- potential effects on GWDTE; and
- potential effects on public or private water supplies.

12.5.64 The potential effects from construction runoff and potential pollution events would be controlled through adherence to best practice guidance as detailed in the Construction Environmental Management Plan (CEMP) for the proposed development.

12.5.65 If the final length of the underground cable route is greater than 5 km it would require a Simple Licence under the Controlled Activities (Scotland) Regulations (CAR) 2011, authorised by SEPA. This would include details of the drainage plans proposed to manage surface runoff from the cable route.

12.5.66 The potential effects of the cable route on GWDTE and any public and private water supplies would be assessed once baseline data has been obtained and any associated constraints identified.

### Approach to Mitigation

12.5.67 The following section identifies potential mitigation measures that would need to be considered to reduce the likely significant effects.

12.5.68 If high or moderate GWDTE are identified within the survey corridor a 100 m buffer would need to be applied to the habitat in accordance with SEPA Land Use Planning System Guidance Note 3110, in order to ensure no significant effect on GWDTE.

12.5.69 If the cable route does cross through habitat comprising high or moderate GWDTE further assessment would be needed, to ascertain whether the route passed through the preferential flow path and would consequently have a significant effect on the habitat.

12.5.70 The design of the cable route would aim to result in minimal disturbance to the ground. Any disturbance would be temporary. Backfilling of material around the cable without significant compaction should allow shallow movement of water to reoccur once construction has been completed. This would be reviewed against the survey data once complete.

12.5.71 A 100 m buffer would also be required around groundwater abstractions for private water supplies. Where the supply may be influenced by surface water interactions, the wider hydrological connectivity of the working area to the supply source would need to be considered. The potential effect would be reviewed against the details of each individual supply including usage and rate of abstraction. Should the assessment identify a potential effect, mitigation measures would need to be submitted to SEPA and THC. Mitigation measures would be dependent on the assessed risk, for instance whether the effect would be a temporary reduction in water quality, or effect on water quantity, and the magnitude of this effect.

**Residual Impacts**

12.5.72 On the assumption that the final grid connection route is informed by identified hydrological sensitivities, and that mitigation measures are adopted. No significant residual impacts are anticipated to occur.

## Traffic and Transport

**Baseline Characteristics**

12.5.73 Baseline surveys undertaken for the Proposed Development did not extend to include the potential grid connection corridor. As such the review of the grid connection corridor in terms of traffic and transport has been informed through desk top study and professional judgement alone.

12.5.74 From the south of the site boundary a potential grid connection corridor could follow the local road network at Viewfield/Langland Quarry. At this location the U2144 Langland – Newlands of Geise road travels north-east towards its junction with the A836. The grid connection corridor would follow this road for approximately 0.5 km before heading southbound towards Janetstown. At Janetstown the U2144 meets the C1001 Isauld – Glengolly Road, which the grid connection corridor would follow north-east towards Thurso, for approximately 1.2km. The corridor then turns southbound once more, following the B874 towards Glengolly for approximately 2km before turning east across land where the grid connection corridor would connect to the Thurso South Substation, crossing the Far North Railway line and the River Thurso. The potential grid connection corridor is presented in Figure 13.1.

12.5.75 As noted above, outwith the site boundary the potential grid connection corridor follows the local road network with the exception of a short section where it leaves the B874 to connect to the Thurso South Sub Station. The local road network is predominantly made up of narrow, single lane, tracks with passing places allowing two-way travel. The B874 is wide enough to accommodate two vehicles traveling in each direction and also has a pedestrian walkway alongside one carriageway for a section.

12.5.76 Although no traffic counts are publicly available for the potential grid connection corridor (with the exception of the U2144 which was initially being considered as a temporary access but later discounted), it is considered that all roads would be lightly trafficked with the majority of Thurso traffic using the A9(T) and A836.

**Construction Impacts**

12.5.77 It is anticipated that construction vehicles for the potential grid connection will travel to site using the A9(T) and the A836 rather than following the potential grid connection corridor. As such there is an increase in traffic anticipated on these roads in addition to roads on the potential grid connection corridor (B874 and U2144 roads at Viewfield and Janetstown).

12.5.78 Construction traffic associated with the potential grid connection corridor would likely involve a small number of construction vehicles each day to deliver equipment and materials for the connection cable routing to site and carry excavated material. Staff are anticipated to travel to site via the A9(T) or A836 and would be of a limited number each day. Whilst no quantative traffic appraisal has been undertaken as part of this study into the potential grid connection corridor, it is envisaged that there would be sufficient capacity on the road network to accommodate traffic associated

10 Land Use Planning System Guidance Note 31, Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems, Version 3, SEPA, September 2017.

with construction; on the considered basis that the local road network (U2144, C1001 and B874) is currently lightly trafficked, there is spare capacity on the A9(T) and A836 and that the level of construction traffic required for grid connection would be negligible in comparison to that required to construct the proposed development.

12.5.79 It is possible that some road closures may be required particularly on sections of the potential grid connection corridor where underground cabling is to be utilised, or where construction vehicles require to occupy the road and there is insufficient spare width for vehicles to pass. If required, whilst roads are fully closed (except for local access), diversionary routes would be implemented. Road closures to facilitate laying of underground cables are likely to be required for short periods at a time based upon the assumption that an average of 30 m of underground cabling can be laid within normal working hours.

**Operational Impacts**

12.5.80 Operational impacts in terms of traffic and transport would be limited to occasional trips associated with maintenance and repair. This would generally be restricted to one LGV trip per day as repairs and maintenance occur. As such the operational impact in terms of Traffic and Transport can be classed as negligible.

**Mitigation**

12.5.81 A construction traffic management plan will likely be required as part of any future planning application for the grid connection. This would likely include mitigation measures such as plans for temporary traffic management during construction periods, acceptable hours of work during the construction period and good practice measures for construction such as wheel cleaning stations when leaving site to join the local road network.

**Residual Impacts**

12.5.82 It is considered that with the adoption of the proposed mitigation, no significant residual impacts are anticipated to occur.

## Noise

**Baseline Characteristics**

12.5.83 The noise character of the area is typical of a rural environment with some traffic noise from nearby roads and is described in more detail in EIA Report Chapter 10: Noise.

**Construction Impacts**

12.5.84 Noise would arise during construction of the grid connection due to the operation of plant and any associated traffic. Construction noise levels at residential properties would depend on their distance from the final grid connection route but would be temporary in nature and could be mitigated if necessary.

**Operational Impacts**

12.5.85 Corona noise can be emitted from overhead lines in certain conditions and has two components: a low frequency hum and broadband noise. They type of sound emitted can be characterised as a ‘crackling’ or ‘buzzing’ that is at its maximum in wet weather conditions such as fog or rain. Corona noise is more associated with higher voltage transmission lines and would only be expected to be audible infrequently at short distances from the overhead line sections of the grid connection. No significant impacts due to operational noise are therefore expected due to the potential grid connection corridor.

**Mitigation**

12.5.86 Any noise emitted during the construction period would be temporary. ‘Best practicable means’ would be used to reduce noise levels with due regard to practicality and cost in line with the Control of Pollution Act (COPA)[11].

12.5.87 The guidance provided by BS 5228-1: 2009[12] would also be utilised to identify appropriate mitigation. The final mitigation measures to be adopted would be agreed as part of the CEMP.

12.5.88 The levels of corona noise due to the operation of the overhead line sections of the grid connection are not predicted to be great enough to require mitigation due to the voltages involved, the separation from nearby properties and the masking provided by background noise. The use of underground cabling along some of the route mitigates corona noise from these sections.

**Residual Impacts**

12.5.89 No significant residual impacts are anticipated due to either the construction or operation of the grid connection.

11 Control of Pollution Act, published by Her Majesty’s Stationary Office, 1974.
12 ’Code of Practice for Noise and vibration control on construction and open sites – Part 1: Noise’, British Standards Institution, 2009

## 12.6 Summary

**Table 13.1 Likely Secondary and Indirect Impacts of the Proposed Developmentresulting from the Potential Grid Connection**

| Impact Type | Construction Impacts | Operational Impacts | Mitigation | Residual Effects | Means by which Mitigation would be delivered |
|---|---|---|---|---|---|
| Landscape and Visual | Indirect impacts on Landscape Character arising from presence of site clearance and excavation activities, movement of people and machinery/ plant, removal of vegetation to facilitate construction<br>Impacts on views and visual amenity arising from presence of site clearance and excavation activities, movement of people and machinery/ plant, removal of vegetation to facilitate construction. | Potential for indirect operational impacts would only exist where the grid connection comprises overhead line.<br>These would include presence of new above ground infrastructure impacting upon the character of the landscape and on the views and visual amenity of receptors in proximity to the proposed OHL.<br>Indirect impacts on Landscape Character and on views and visual amenity arising from the proposed cable route would only arise should maintenance activities be required. | Embedded mitigation, including suitable construction methods/controls, and rapid reinstatement/restoration of the affected landscape. | Minor/Not significant. | Design, construction management and monitoring. |
| Archaeology and Cultural Heritage | Potential direct impact on burnt mound (MHG1200).<br>Potential direct impact on buried archaeological remains. | Potential impact on setting of Tulloch of Shalmstry, Broch 275m SE of Shalmstry (SM594). | None. | Negligible | Planning condition; CEMP |
| Ecology | Disturbance/displacement of protected species (otter, water vole, badger, bats).<br>Direct and indirect habitat loss of any potential sensitive habitats identified. | Disturbance/displacement of protected species (otter, water vole, badger, bats).<br>Indirect habitat loss of any potential sensitive habitats identified. | Appropriate good practice guidance will be applied.<br>Should any likely significant effects on ecological features be identified, measures to prevent, reduce and/or offset these effects would be proposed. | With avoidance and appropriate mitigation there would be no significant effects.<br>The design and proposed mitigation would aim to reduce the significance of effect on any ecological features, though the final significance would be based on the sensitivity of the feature and magnitude of effect. | Design and construction management/monitoring. |
| Ornithology | Disturbance/displacement of breeding waders, raptors and/or owls.<br>Disturbance/displacement of foraging geese and swans.<br>Collision risk for migratory geese and swans. | Potential for operational effects would only exist where the grid connection comprises overhead line and are likely to consist of:<br>Disturbance/displacement of breeding waders, raptors and/or owls.<br>Disturbance/displacement of foraging geese and swans.<br>Collision risk to wildfowl moving between foraging and roosting areas. | SNH (2015[8]) good practice guidance will be applied.<br>Should any likely significant effects on IOFs be identified, measures to prevent, reduce and/or offset these effects would be proposed. For example: a BBPP for construction and decommissioning, bird deflectors attached to any overhead section of the route. | With avoidance and appropriate mitigation there would be no significant effects.<br>The design and proposed mitigation would aim to reduce the significance of effect on any IOFs, though the final significance would be based on the sensitivity of the feature and magnitude of effect. | Design and construction management/monitoring. |
| Hydrology | Surface water runoff and pollution events.<br>Effects on GWDTE. | No further effects. | Surface water runoff and pollution prevention would be managed through adherence to the CEMP and | With avoidance there would be no significant affect.<br>The design and proposed mitigation | CEMP and (if required) CAR licensing. |

| Impact Type | Construction Impacts | Operational Impacts | Mitigation | Residual Effects | Means by which Mitigation would be delivered |
|---|---|---|---|---|---|
| | Effects on public or private water supplies. | | any CAR requirements.<br>Avoidance of GWDTE and water supplies would be applied as the first principle of the detailed alignment selection.<br>The design of the cable alignment should allow shallow subsurface flows to reach GWDTE as per baseline conditions.<br>Any mitigation required to prevent deterioration of a private water supply would need to be agreed with SEPA and THC, and the landowner dependent on the assessed risk. | will aim to reduce the significance of effect on any hydrological receptors, though the final significance would be based on the sensitivity of the receptor and magnitude of effect. | |
| Traffic and Transport | Impact confined to A9(T), A836, B874 and U2144 and C1001 on the local road network. Levels of construction traffic is likely to be lower than that associated with construction of the Proposed Developmentand therefore no capacity issues are anticipated. | Operational trips to site would include maintenance and repairs only. The impact of these are considered to be negligible. | A construction traffic management plan would likely be required to be put in place. This would include plans for Temporary Traffic Management and any diversionary routes required during construction. | Negligible assuming mitigation is carried out. | Construction Traffic Management Plan. |
| Noise | Some temporary construction noise impact at properties close to the connection route. | No significant operational noise impact due to low voltages, separation distances and masking. | Construction noise mitigation measures in accordance with the CoPA and BS 5228-1. | Minor/Not significant. | CEMP |

# 13 Socio-Economic Assessment

## 13.1 Introduction

13.1.1 This chapter considers the potential socio-economic effects of the Proposed Development. The objectives of this chapter are to:

- describe the socio-economic baseline;
- describe the assessment methodology and significance criteria used for completing the assessment;
- describe the potential effects, including direct, indirect and cumulative effects;
- describe the mitigation measures proposed to address likely significant effects; and
- assess the residual effects remaining following the implementation of mitigation.

13.1.2 The socio-economic assessment has been undertaken by experienced EIA practitioners at LUC who have undertaken such assessments for a number of wind farm developments in Scotland.

13.1.3 This chapter is supported by the following appendices and figures:

- **Technical Appendix 2.7: Outdoor Access Management Plan.**
- **Figure 13.1: Recreational routes within 15km of the Proposed Development.**

## 13.2 Assessment Methodology and Significance Criteria

### Scope of Assessment

13.2.1 The scope of the assessment has been informed by issues identified from the consultation responses received at the EIA Scoping stage, further informed by professional judgement.

### Effects Assessed in Full

13.2.2 The following effects have been considered:

- Direct employment and economic benefits during construction and operation of the Proposed Development and associated indirect/induced employment and economic benefits, such as effects on local commerce.
- Direct effects of the Proposed Development on public access (including rights of way (RoW), core paths and other routes) and indirect effects on recreational activities (such as effects on the visual amenity of users of recreational routes) during construction and operation within 15km of the Proposed Development.
- Direct and indirect effects on tourism during construction and operation.
- Cumulative effects of the Proposed Development on employment and economic benefits, public access and recreation and tourism during construction and operation in conjunction with other wind farms within 40km[1].
- Decommissioning effects on direct and indirect employment and economic benefits, public access and recreation and tourism.

13.2.3 An assessment of the effects of the Proposed Development on recreational amenity during construction and operation relating to visibility is provided in **Chapter 5: Landscape and Visual Impact Assessment**. Where relevant, this socio-economic chapter makes reference to **Chapter 5** to describe the likely indirect effects of the Proposed Development on the visual amenity of users of recreational routes and also tourists.

### Effects Scoped Out

13.2.4 Based on knowledge of the site, direct effects on formal recreation (i.e., activities which require purpose-built facilities such as pitches, tracks etc.) during construction, operation and decommissioning of the wind farm have been scoped out of detailed assessment.

### Assessment Methodology

13.2.5 There is no established guidance for undertaking a social and economic assessment as part of a wider EIA. This assessment uses desk-based information sources to assess the likely scale of effects, supplemented by consultation with local stakeholders, the findings of other relevant chapters as noted above, and LUC's previous experience in undertaking socio-economic assessments.

### Consultation

13.2.6 In undertaking the assessment, consideration has been given to the scoping responses and other consultation undertaken as detailed in **Table 13.1**.

1 An arbitrary distance but defined for clarity/transparency.

## Table 13.1 Consultation Responses

| Consultee and Date | Scoping/Other Consultation | Issue Raised | Response/Action |
|---|---|---|---|
| The Highland Council (THC) 22nd February 2022 | Formal Scoping Consultation | THC do not consider it appropriate to scope out socio-economic impacts from the EIA Report (EIAR) as proposed in the EIA Scoping Report. THC highlight that the Council did not consider the chapter in the previous *[word/words missing from scoping response]* sufficiently developed or detailed to come to a reasoned view of the likely socio-economic benefits of the proposal, which is a material consideration given significant weight in the assessment of onshore energy applications. Therefore, THC maintains that socio-economic, tourism, and recreational impacts should have its own chapter in the EIA-R to ensure that these matters are appropriately addressed and not lost in other assessments. The EIA-R should estimate who may be affected by the development, in all or in part, which may require individual households to be identified, local communities or wider socio-economic groupings such as tourists and tourist related businesses, recreational groups, economically active, etc. The application should include relevant economic information connected with the project, including the potential number of jobs, and economic activity associated with the procurement, construction, operation and decommissioning of the development. In this regard, wind farm development experience in this location should be used to help set the basis of likely impact. This should set out the impact on the regional and local economy, not just the national economy. Any mitigation proposed should also address impacts on the regional and local economy. | A socio-economic assessment is now included in the EIA-R. |
| | | The site is on land with access rights provided by the Land Reform Scotland Act. The potential impact on, and mitigation, for public access should be assessed incorporating core paths, public rights of way, long distance routes, other paths and wider access rights across the site. There are core paths and public rights of way in this area which are likely to be affected during construction and operation phases. In line with the policies and provisions of the Highland-wide Local Development Plan (HwLDP), a plan detailing the following should be submitted as part of the EIAR:<br>• existing public non-motorised public access footpaths, bridleways and cycleways on the site and any proposed access route from the public road infrastructure;<br>• proposed public access provision both during construction and after completion of the development, including links to existing path networks (where appropriate) and to the surrounding area, and access points to water; and<br>• impacts of the Proposed Development on the core paths and proposed mitigation if any. | Effects on Core Paths including on CA13.07 'Thurso Skyline' have been considered within this assessment. A figure showing all recreational routes within 15km of the Proposed Development has been included as **Figure 13.1**. |
| | | An Access Management Plan is required to be submitted with the application. Specifically, the EIA-R requires to assess the development's potential impact on the Affric-Kintail Way long distance route and other improvements to public access on or near the site must be considered. | An outline Outdoor Access Management Plan has been provided as Technical **Appendix 2.7.**<br>**The** Affric Kintail Way runs from Drumnadrochit on the shores of Loch Ness, to Morvich in Kintail, near the west Highlands seaboard. This route is approximately 200km from the Proposed Development and therefore, it has not been considered as part of this assessment. |
| | | Any existing routes should be accommodated before, during and after construction without diversions. If diversions of core paths or rights of way are being considered, then early engagement is recommended to avoid unnecessary delay in the process. The Applicant should also be aware that successful orders may be required to legitimately divert rights of way or core paths, that the Council will charge the Applicant in the region of £1,500 for each order whether or not they are successful and that if unsuccessful, the Applicant will have to accommodate public access along the existing paths. | An outline Outdoor Access Management Plan outlines has been provided as Technical **Appendix 2.7.** |
| Scotways 13th April 2022 | Other Consultation: LUC information request | The National Catalogue of Rights of Way (CROW) does not record any rights of way that cross or are close to the site of interest as shown on the map supplied.<br>There are no Heritage Paths currently recorded that cross or are close to the site as shown on the map supplied.<br>There are no Scottish Hill Tracks currently recorded that cross or are close to the site as shown on the map supplied. | This assessment takes into consideration other forms of public access on the site.<br>There is 138.5m between any road and public right of way and the turbines |

| Consultee and Date | Scoping/Other Consultation | Issue Raised | Response/Action |
|---|---|---|---|
| | | Scotways advised that other forms of public access to land may affect the site and provided details in a Catalogue of Rights of Way Search Guidance Notes.<br>Although Scotways understand that there is very little guidance regarding the siting of turbines in relation to established paths and rights of way, Scotways would like to draw attention to the following:<br>Extract from the Welsh Assembly Government's Technical Advice Note on Renewable Energy (TAN 8) Proximity to Highways and Railways "*2.25 It is advisable to set back all wind turbines a minimum distance, equivalent to the height of the blade tip, from the edge of any public highway (road or other public right of way) or railway line*" | |

## Method of Baseline Characterisation

### Study Area

13.2.7 The study area for the assessment comprises the site and immediate surrounding in relation to potential effects on recreation, access and land use, and the Highland Council (THC) wider local authority area in relation to potential social and economic effects, including effects on tourism. Core paths and rights of way within 5km of the proposed turbines are illustrated on **Figure 13.1**. Due to the higher potential sensitivity of receptors using promoted long-distance footpaths and cycle routes, these are included up to 15km from the turbine area on **Figure 13.1**.

### Desk Study

13.2.8 The following data sources were used to inform the assessment:

- Scotland's National Strategy for Economic Transformation[2];
- The Scottish Tourism Strategy 2012[3];
- The Scottish Index for Multiple Deprivation (2020)[4];
- National Records of Scotland data[5];
- The Nomis (Office for National Statistics) labour market statistics website[6];
- VisitScotland (Tourism in Scotland's Regions statistics)[7];
- The Scottish Government's best practice guidelines on community benefit fund commitments[8];
- The Scottish Tourism Alliance (various documents);
- The Highland Council's Caithness and Sutherland Local Development Plan[9];
- Key Statistics from Highlands and Islands Enterprise[10];
- The Highlands and Islands Enterprise Strategy[11];
- Department of Energy and Climate Change and Renewable UK. Onshore Wind: Direct and Wider Economic Impacts (2012)[12];
- NatureScot (2018) Environmental Impact Assessment Handbook[13];
- Glasgow Caledonian University and the Moffat Centre, the economic impacts of wind farms on Scottish tourism (2008)[14];
- Visit Scotland Insight Department Highland Factsheet 2019[15];
- A number of studies relating to the public attitudes to wind farms (referenced as appropriate throughout text);
- Tourism statistics (from various websites and specific tourist attractions in the area); and
- Local websites (referenced as appropriate throughout text).

2 Scottish Government (2022). *Scotland's National Strategy for Economic Transformation*. Available at: https://www.gov.scot/publications/scotlands-national-strategy-economic-transformation/. Accessed 12/04/2022.

3 Tourism Scotland 2020 (2012). *A Strategy for Leadership and Growth: The Future of our Industry in our Hands*. Available at: https://scottishtourismalliance.co.uk/wp-content/uploads/2019/03/Tourism-Scotland-2020-final.pdf. Accessed 14/04/2022.

4 Scottish Government (2020). *Scottish Index of Multiple Deprivation 2020*. Available at: https://www.gov.scot/collections/scottish-index-of-multiple-deprivation-2020/. Accessed 12/04/2022.

5 National Records of Scotland (2021). Highland Council Area Profile. Available at: Highland Council Area Profile (nrscotland.gov.uk).Accessed 11/07/2022.

6 NOMIS Official Labour Market Statistics (2019). *Labour Market Profile: Highland*. Available at: https://www.nomisweb.co.uk/reports/lmp/la/1946157421/report.aspx. Accessed 12/04/2022.

7 VisitScotland (2017). *Tourism in Scotland's Regions 2016*. Available at: https://www.visitscotland.org/research-insights/regions. Accessed 12/04/2022.

8 The Scottish Government (2019). *Scottish Government Good Practice Principles for Shared Ownership and Community Benefit of Onshore Renewable Developments*. Available at: https://www.gov.scot/publications/scottish-government-good-practice-principles-community-benefits-onshore-renewable-energy-developments. Accessed 12/04/2022.

9 The Highland Council (2018).*Caithness and Sutherland Local Development Plan*. Available at: https://www.highland.gov.uk/info/178/local_and_statutory_development_plans/283/caithness_and_sutherland_local_development_plan. Accessed 11/07/2022.

10 Highlands and Islands Enterprise (2020).*Caithness and Sutherland area profiles*. Available at: https://www.hie.co.uk/media/10590/caithness-area-profile-2020.pdf. Accessed 11/07/2022.

11 The Highlands and Islands Enterprise. (no date). *2019-2022 Strategy*. Available at: https://www.hie.co.uk/media/5006/strategyplusplanplus2019-2022-1.pdf. Accessed 12/04/2022.

12 Department of Energy and Climate Change & Renewable UK (2012). *Onshore Wind: Direct and Wider Economic Impacts*. Available at: https://www.gov.uk/government/publications/onshore-wind-direct-and-wider-economic-impacts. Accessed 14/04/2022.

13 NatureScot (2018). *Environmental Impact Assessment Handbook*. Available at: https://www.nature.scot/doc/handbook-environmental-impact-assessment-guidance-competent-authorities-consultees-and-others. Accessed 21/04/2022.

14 Glasgow Caledonian University and the Moffat Centre (2008). *The economic impacts of wind farms on Scottish tourism*. Available at: https://www.gov.scot/publications/economic-impacts-wind-farms-scottish-tourism/documents/. Accessed 21/04/2022.

15 Visit Scotland Insight Department (2020). *Highland Factsheet 2019*. Available at: https://www.visitscotland.org/binaries/content/assets/dot-org/pdf/research-papers-2/regional-factsheets/highland-factsheet-2019.pdf. Accessed 21/04/2022.

### Field Survey

13.2.9 This assessment is wholly desk based; no field work was undertaken. Details of field survey work undertaken to inform the landscape and visual amenity assessment, the findings of which have been referenced in preparation of this chapter, are set out in Chapter 5: Landscape and Visual Impact Assessment.

## Assessment of Effects

### Criteria for Assessing Significance

13.2.10 The significance criteria, provided in **Table 13.2** below, are based on professional judgement and previous experience of undertaking socio-economic assessments. The criteria primarily consider the magnitude of effects (e.g., the number of people, recreational activities or economic activities affected). However, when applying the criteria, professional judgement has been employed and consideration taken of the receptor sensitivity, where appropriate.

13.2.11 Effects associated with the construction and decommissioning phases of the Proposed Development are considered to be temporary and short-term, and effects during operation are considered to be long-term permanent effects.

**Table 13.2 Criteria for Assessing Significance**

| Significance of Effect | Description |
|---|---|
| major | Where the extent of the effects on economic activities, local businesses, recreation, tourism or the local population is large in scale or magnitude, and a large number of people or activities will be affected (either beneficial or adverse). |
| moderate | Where the extent of effects on economic activities, local businesses, recreation, tourism or the local population is small in scale or magnitude, but a large number of people or activities will be affected (either beneficial or adverse).<br>or<br>Where the extent of effects on economic activities, local businesses, recreation, tourism, or the local population is large in scale or magnitude, but only a small number of people or activities will be affected (either beneficial or adverse). |
| minor | Where the extent of effects on economic activities, local businesses, recreation, tourism or the local population is small in scale or magnitude and will only affect a small number of people (either beneficial or adverse). |
| negligible | Where the extent of effects on economic activities, local businesses, recreation, tourism, or the local population is barely noticeable in scale or magnitude and will only affect a small number of people or activities (either beneficial or adverse). |

13.2.12 Major' and 'moderate' effects are considered to be significant in the context of the EIA Regulations[16].

## Limitations and Assumptions

13.2.13 There are no standards or adopted guidance on how to assess socio-economic, tourism and recreational effects. This assessment, as well as the significance criteria used and data sources consulted, is based on professional judgement and previous experience of undertaking socio-economic, tourism and recreation assessments.

13.2.14 The tourism baseline does not take into account recent tourist activity trends as a result of Covid-19 restrictions; therefore, the assessment has been undertaken assuming a maximum case baseline.

13.2.15 It is beyond the scope of this chapter to calculate the likely direct employment and economic benefits of all surrounding schemes; therefore, the cumulative assessment adopts a conservative approach to assessing these positive effects.

# 13.3 Baseline Conditions

## Current Baseline

13.3.1 This section details:

- Current socio-economic conditions within THC administrative area, including population, demographics and employment.
- Tourism and recreational information and statistics within the respective study areas.
- Published study findings on public attitudes to wind farms, specifically in terms of effects on the amenity of local residents and effects on tourism.

### Population

13.3.2 According to the National Records of Scotland[17], as of 30 June 2020, the population of THC area was 235,430. This is a decrease of 0.2% from 235,830 in 2019. THC area has the 7th highest population in 2020, out of all 32 council areas in Scotland. Between 1998 and 2020, the population of THC area has increased by 12.7%. This is the 8th highest percentage change out of all 32 council areas in Scotland.

13.3.3 In 2020, there were more females (51%) than males (49%) living in the THC area. The 45 to 64 age group was the largest in overall size in 2020 with a population of

16 Scottish Government (2017). *Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017*. Available at: https://www.legislation.gov.uk/ssi/2017/101/contents/made. Accessed 12/04/2022.

17 National Records of Scotland (2020). *Highland Council Area Profile*. Available at: https://www.nrscotland.gov.uk/files//statistics/council-area-data-sheets/highland-council-profile.html. Accessed 12/04/2022.

69,194. In contrast, the smallest group was the 16 to 24 age group which had a population of 20,937. Between 1998 and 2020, the 25 to 44 age group saw the largest percentage decrease, falling by 10.6% whereas the 75 and over age group saw the largest increase at 66.2%.

13.3.4 Between 2018 and 2028, the population of THC area is projected to increase from 235,540 to 236,664. The average age of the population of THC area is projected to increase as the 'baby boomer generation' (born between the end of the World War II and the mid-1960s) ages and more people are expected to live longer.

13.3.5 The Highlands and Islands Area Profiles for Caithness and Sutherland[18] state that the local area has 8.1% of the Highlands population with a population of 38,246. This is projected to decline by 2041. The population density is 5 people per sq.km which is lower than the 12 people per sq.km nationally. There is an older age profile than regionally and nationally in Caithness and Sutherland.

**Deprivation**

13.3.6 The Scottish Index of Multiple Deprivation (SIMD) 2020v2[19] is the Scottish Government's official tool for identifying concentrations of deprivation in Scotland.

13.3.7 The SIMD measures area deprivation based on seven domains namely, income, employment, health, education, housing, geographic access to services and crime. These domains are measured using a number of indicators to form ranks for each domain. Data zones have a ranking from 1 being the most deprived to 6,976 being the least deprived. Each of the seven domain ranks are then combined to form the overall SIMD. This provides a measure of relative deprivation at data zone level, so it demonstrates that one data zone is relatively more deprived than another but not how much more deprived.

13.3.8 The site is entirely within the Caithness north-west data zone S01010797. **Table 13.3** outlines the SIMD scores for this data zone and also immediate neighbouring data zones to the west and east and a further 11 data zones located within Thurso.

**Table 13.3 SIMD Domain Ranks for Caithness North-West Data Zone S01010797**

| Data Zone | Income | Employ-ment | Heath | Education | Housing | Geographic Access | Crime | Rank |
|---|---|---|---|---|---|---|---|---|
| Caithness North-West S01010797 (the site) | 8 | 7 | 9 | 8 | 9 | 1 | 7 | 4771 |
| Caithness North-West S01010798 (neighbouring data zone to the west) | 7 | 6 | 7 | 6 | 8 | 1 | 8 | 3528 |
| Thurso West SO1010809 | 8 | 8 | 7 | 9 | 10 | 2 | 10 | 5175 |
| Thurso West S01010803 | 3 | 2 | 3 | 2 | 6 | 9 | 1 | 1439 |
| Thurso West S01010807 | 6 | 5 | 7 | 5 | 6 | 7 | 7 | 3853 |
| Thurso West S01010808 | 6 | 7 | 7 | 6 | 7 | 7 | 9 | 4734 |
| Thurso West S01010804 | 7 | 6 | 7 | 7 | 8 | 10 | 6 | 5163 |
| Thurso West S01010805 | 7 | 6 | 8 | 6 | 9 | 8 | 5 | 4702 |
| Thurso West S01010806 | 2 | 2 | 3 | 4 | 5 | 5 | 3 | 1442 |
| Thurso East S01010799 | 4 | 4 | 5 | 6 | 6 | 10 | 1 | 2601 |
| Thurso East S01010800 | 5 | 4 | 5 | 3 | 8 | 6 | 4 | 2838 |
| Thurso East S01010801 | 4 | 3 | 4 | 4 | 9 | 7 | 1 | 2334 |
| Thurso East S01010802 | 5 | 4 | 6 | 6 | 9 | 4 | 4 | 3084 |
| Caithness North-West S01010794 (neighbouring data zone to the east) | 6 | 6 | 7 | 4 | 8 | 1 | 8 | 3376 |

18 Highlands and Islands Enterprise (2020). *Highlands and Islands Area Profiles 2020 Caithness and Sutherland*. Available at: https://www.hie.co.uk/media/10590/caithness-area-profile-2020.pdf. Accessed 12/04/2022.

19 The Scottish Government (2020). *Scottish Index of Multiple Deprivation 2020*. Available at: https://www.gov.scot/collections/scottish-index-of-multiple-deprivation-2020/. Accessed 12/04/2022.

13.3.9 **Table 13.3** shows that the Proposed Development is located in an area with low levels of deprivation. The area has good levels of healthcare and education in particular. Conversely, both datasets highlight the area's rural character as it scores poorly for the geographic access domain which is calculated using average drive and public transport travel times to various services and healthcare facilities.

13.3.10 Neither the Proposed Development or the surrounding areas highlighted in **Table 13.3** are located in areas classed as the most deprived 20%, 10% or 5% of Scotland[20]. The SIMD key findings 2020 also note that THC area has seen one of the largest increases in deprivation since the 2016 SIMD. It must be noted that data zones in rural areas such as the Highlands are bigger than urban areas and pockets of households are more likely to experience different levels of deprivation. Thus, analysis of SIMD[21] recommends other data alongside SIMD to identify households in poverty. In rural areas people face different challenges to those in urban areas and in general, the main issues leading to deprivation in rural areas include:

- higher cost of living including higher energy costs;
- challenges with transport to work and study;
- seasonal employment;
- difficulties accessing medical care and amenities;
- delivering education is difficult;
- limited broadband access;
- housing;
- climate change (affecting farming);
- a culture of independence leading to people not accessing income support; and
- stigma surrounding accessing benefits.

**Fuel Poverty and Cost of Living Crises**

13.3.11 The 2019 Scottish House Condition Survey[22] identified that in 2019, 24.6% of all households in Scotland were in fuel poverty which is defined as at least 10% of income is spent on heating. In the same year, 12.4% were in extreme fuel poverty. Between 2018 and 2019, fuel poverty increased in remote rural areas from 33% up to 43%. THC area was one of seven local authority areas which had significantly higher fuel poverty rates than the national average at 33%.

13.3.12 Since 2019 when the data was collected, there have been considerable surges in the costs associated with heating and power, which is expected to increase the proportion of the population in fuel poverty. Prices have been increasing rapidly since mid-2021 for a number of reasons including the Russian invasion of Ukraine which is contributing to a cost-of-living crisis[23].

13.3.13 A Poverty Alliance report highlighting the issues raised by discussions with people living in the Highlands[24] identified that a key issue in the area leading to poverty and deprivation was fuel poverty. It was commonly raised in discussions with people reporting serious challenges in covering the cost of their energy bills. The report highlighted the limited availability of gas in many areas of the Highlands and indeed the worse weather and colder temperatures in rural areas of the region which leads to households in THC area having to pay even more than some other households across Scotland.

13.3.14 On April 1st 2022, the energy price cap rose by over 50%, and now many more households are struggling to heat their homes since the above data was collected. Furthermore, the State of Ageing Report 2022[25] has concluded that pensioners are being hit hard by the big increases in energy prices. More than 200,000 pensioners are now living in relative poverty in the UK.

## Employment and Economic Development

13.3.15 Enterprising Highland[26] suggests that in Caithness and Sutherland, the economy of Thurso has been heavily dependent on the Dounreay nuclear power plant which is now being decommissioned. The health, retail, accommodation, food services and education sectors are the biggest employers. However, there are more part-time

20 It is important to recognise that SIMD has limitations for capturing deprivation across the whole of Scotland as not everyone who is deprived lives in a deprived area, and not everyone who lives in a deprived area is deprived.

21 SIMD (2016). SIMD Rural Deprivation Evidence Summary. Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/research-and-analysis/2017/02/scottish-index-of-multiple-deprivation-rural-deprivation-evidence-and-case-studies/documents/rural-deprivation-an-evidence-review/rural-deprivation-an-evidence-review/govscot%3Adocument/rural%2Bdeprivation%2Bevidence%2Breview.pdf. Accessed 30/06/2022.

22 The Scottish Government (2019) *Scottish House Condition Survey, 2019.* Available at: https://www.gov.scot/collections/scottish-house-condition-survey/. Accessed 16/06/2022.

23 Institute for Government (2022) Cost of living crisis. Available at: https://www.instituteforgovernment.org.uk/explainers/cost-living-crisis. Accessed 16/06/2022.

24 The Poverty Alliance (2019/2020). *Highlands Get Heard Scotland Summary Report.* Available at: https://www.povertyalliance.org/wp-content/uploads/2020/05/GHS_Highlands_FINAL_May2020.pdf#:~:text=The%20Highlands%20is%20an%20area%20that%20has%20lower,poverty%20compared%20with%2011%25%20in%20the%20Black%20Isle.2. Accessed 30/06/2022.

25 Centre for Ageing Better (2022). *State of Ageing Report.* Available at: https://ageing-better.org.uk/state-of-ageing. Accessed 15/06/2022.

26 Enterprising Highlands (2022). *Regions.* Available at: https://investhighland.com/doing-business/economic-overview. Accessed 12/04/2022.

workers in Caithness and Sutherland than in Scotland as a whole, with tourism being seasonal and often part-time. Enterprising Highland[27] also highlights that there has been a 236% national increase in 'Energy Businesses' in the past 8 years. In the Highlands, the renewable energy sector is supported by strategically positioned ports, including Scrabster and Wick in the north, Cromarty, Nigg and Inverness on the east coast and Kishorn on the west coast. Inverness Airport acts as the air hub to the region with a range of daily flights to Heathrow and Amsterdam. There has also been extensive investment in upgrading the road networks, particularly across the south and east of the area.

13.3.16 The Office for National Statistics (ONS)[28] provides employment and unemployment rates across local council regions. Between January 2021 and December 2021, the employment rate for the THC local authority area was 75.3% (115,000) compared to 76.2% for Scotland as a whole. Across the same period, 4,000 people were unemployed, equating to 3.4% of THC's economically active population. This was lower than the same figures for Scotland (3.9%) and the UK (4.4%).

13.3.17 **Table 13.4** shows that the highest proportion of the working population in THC area were employed in 'professional occupations', with the lowest proportion of the working population employed in the 'Process Plant and Machine Operatives' sector.

**Table 13.4 Employment by Occupation in the Highlands (January 2021 – December 2021)**

| Occupation Type | Highlands (%) | Scotland (%) |
|---|---|---|
| Managers, directors and senior officials | 7.7 | 8.7 |
| Professional occupations | 21.5 | 23.8 |
| Associate professional & technical | 14.7 | 15.5 |
| Administrative & secretarial | 8.0 | 9.9 |
| Skilled trades occupations | 11.3 | 9.0 |
| Caring, leisure and Other Service occupations | 10.6 | 9.3 |
| Sales and customer service | 10.5 | 8.4 |
| Process plant & machine operatives | 6.6 | 5.2 |
| Elementary occupations | 9.2 | 9.9 |

13.3.18 A recent study by SSE Renewables[29] has estimated that THC could gain £360million from wind and hydro projects, which would be driven by expenditure across industries such as civil and electrical engineering, environmental and technical evaluation and monitoring, plant hire, fencing, hospitality services, and the creation of a new quarry and concrete plant. Most of the economic contribution is expected during the operational phase of developments.

13.3.19 Onshore Wind: Economic Impacts in 2014 (RenewableUK, 2015[30]) found that a typical UK wind farm will invest £2.97m per MW over its development, construction, and operational stages. Of this, 69% (£2.06m per MW) of the total spend is retained within the UK economy. Approximately 48% of this is spent in the country in which a typical wind farm is located. This is worth £1.43m per MW to the region/nation. Furthermore, 27% (£0.81m) of overall spend is retained within the local authority area. The report goes on to note that, for each MW of installed capacity, it would be reasonable to expect:

- 0.54 jobs and £40,631 Gross Value Added (GVA) in the UK economy to be supported during the development stage;
- 2.49 jobs and £159,251 GVA in the UK economy to be supported during the construction stage; and
- 0.43 jobs and £22,347 GVA per year in the UK economy to be supported during a typical 25-year operational stage (noting that a 35 year operational lifespan is proposed for the Proposed Development).

### Scotland's National Strategy for Economic Transformation

13.3.20 Scotland's National Strategy for Economic Transformation[2] published in March 2022 sets out an approach to delivering sustainable growth in Scotland. The vision of the Strategy aspires to make Scotland stand out as

*"an international benchmark for how an economy can transform itself, de-carbonise and rebuild natural capital whilst creating more, well-paid and secure jobs and developing new markets based on renewable sources of energy and low carbon technology".*

13.3.21 As part of this, the Strategy states that within THC area, a Regional Economic Partnership has been established which will work on growing the region's economy, including to

*"work to pursue strategic regional opportunities and create high value jobs in areas like renewable energy".*

27 Enterprising Highlands. (2022). Renewables. Available at: https://investhighland.com/invest/renewables. Accessed 12/04/2022.

28 NOMIS Official Labour Market Statistics. (2019). Labour Market Profile: Highland. Available at: https://www.nomisweb.co.uk/reports/lmp/la/1946157421/report.aspx. Accessed 12/04/2022.

29 SSE Renewables (2020) Generating Benefits in the Great Glen: SSE Renewables' Socio-Economic Contribution. Available at: https://www.sse.com/media/kvjj4ohp/generating-benefits-in-the-great-glen-june-2020.pdf. Accessed 12/04/2022.

30 Renewable UK (2015). Onshore Wind: Economic Impacts in 2014. Available at: https://cdn.ymaws.com/www.renewableuk.com/resource/resmgr/publications/reports/onshore_economic_benefits_re.pdf. Accessed 21/04/2022.

13.3.22 In addition, the Strategy also states that

> *"The Lloyds Banking Group and Oxford Economics Green Growth Index[31] ranks Scotland as the number one region in the UK for green growth potential and opportunity. This reflects Scotland's existing green industrial base which supports a growing number of green jobs and innovation activity, the take-up of relevant skills and training and the development and use of renewable energy infrastructure".*

13.3.23 Overall, this demonstrates that the purpose of the Proposed Development reflects the vision and strategic approach of Scotland's recently published National Strategy for Economic Transformation.

**Highlands and Islands Enterprise 2019-2022 Strategy**

13.3.24 Highlands and Islands Enterprise is the economic and community development agency for the Highlands and Islands of Scotland and supports a broad range of sectors, organisations and communities. The Highlands and Islands Enterprise 2019-2022 Strategy[10] sets out the ambition to attract new major investments through the region and cites the *"fresh and exciting"* energy sector as key to achieving this. The Strategy recognises that the low carbon economy and renewables sector already contributes substantially to the region and creates many economic and social opportunities. Using its current international reputation of excellence in the energy and the low carbon sector, the Strategy seeks to strengthen these through capitalising upon the UK and Scottish Governments' commitments to move to a lower carbon, decentralised and locally based energy system. For onshore wind farms, the Strategy aims to secure supply chain opportunities and promote a supportive energy policy and regulatory environment.

**Scottish Government Good Practice Principles for Shared Ownership and Community Benefit of Onshore Renewable Developments**

13.3.25 Shared ownership and community benefit, whilst different, are interlinked and can be valuable to communities located within proximity to development projects[32]. The two benefits can be summarised as follows:

- shared ownership involves agreeing a contract with a developer so that an investment is made and the community receives income from a wind farm; and
- community benefit can be a direct or indirect payment to the community, to support their local priorities.

13.3.26 The Scottish Government promotes both forms of community involvement in renewable energy schemes, and advocates flexibility in how this is applied. This may be related to provision of the recommended rate equivalent to £5,000 per MW, but may include a different rate or include scope for the direct funding of specific projects identified by the community. It is also recognised that community benefit in the wider sense can address longer term community needs by generating beneficial social and economic impacts which provide a lasting and meaningful legacy.

**Public Access, Recreation and Land Use**

13.3.27 The site lies approximately 4.5km to the west of Thurso, within THC local authority area. The site is located across the ridge between Cairnmore Hillock (134m Above Ordnance Datum (AOD)) and Scrabster Hill (144m AOD), to the south of the A826 road which links Thurso to Melvick.

13.3.28 Land use within the site and vicinity is predominantly agricultural, mixed with areas of wetter rough pasture and moss; there is also a lochan located within the site. There is no woodland on the site and woodland in the wider area is sparse, with only a small area of woodland located beyond the west of the site at Strathmore House. Farms are regularly spaced in the land surrounding the site with a larger concentration beyond the south-east of the site.

13.3.29 Tracks within the site includes a track extending from the A836 to the north of the site and following a loop around the Hill of Forss. There is an additional track leading to a disused quarry to the south-east of the site.

13.3.30 There is a Core Path[33] located within the east of the site, namely CA13.07 'Thurso Skyline' which is a 4.3km track. The track originates from the A836 to the north-east extending into the site at Blackheath before travelling south-east to the Hill of Forss.

13.3.31 In total, there are 28 other Core Paths located within 5km of the site but outwith the site boundary, concentrated around Thurso[33].

31 Oxford Economics Commissioned by Lloyds Banking Group (2021). *Challenges and opportunities from the Net Zero Transition Across the Nations and Regions of the UK*. Available at: https://www.lloydsbankinggroup.com/assets/pdfs/who-we-are/green-economy/uk-green-growth-index.pdf. Accessed 12/04/2022.

32 The Scottish Government (2019). *Scottish Government Good Practice Principles for Shared Ownership and Community Benefit of Onshore Renewable Developments'*. Available at: https://www.gov.scot/publications/scottish-government-good-practice-principles-community-benefits-onshore-renewable-energy-developments/. Accessed on: 12/04/2022.

33 The Highland Council (no date). *Core Paths in Caithness Map 2 - Thurso*. Available at: https://www.highland.gov.uk/downloads/file/1250/map_2_-_thurso. Accessed on: 12/04/2022.

13.3.32 Scotways were consulted for a Rights of Way search for the site which identified that:

- The National Catalogue of Rights of Way (CROW) does not record any rights of way that cross or are close to the site.
- There are no Heritage Paths currently recorded that cross or are close to the site.
- There are no Scottish Hill Tracks currently recorded that cross or are close to the site.

13.3.33 Wider access rights apply across the site and enable public access to Cairnmore Hillock (ND 05659 67571) and Hill of Forss (ND 06342 68631).

13.3.34 The A836 to the north of the site is part of the 'North Coast 500' route. This road is also part of the 'North and West Highlands' route with the 'North Coast Visitor Centre' located in Thurso and advertised as a stopover as part of this route on the VisitScotland website.

**Tourism**

13.3.35 Tourism makes an important contribution to the national, regional and local economies. In 2018[34], there were over 15.5 million overnight visitors to Scotland, including over 3.5 million visitors from overseas. This represented a spending of almost £5.1 billion.

13.3.36 Within the Highlands, there were approximately 1.69m visits to the Highland region in 2018 by British tourists and approximately 521,000 from overseas. Spend was £425m from British tourists and £195m from overseas tourists.

13.3.37 The top reasons for visiting the Highlands between 2016-18, according to a VisitScotland survey[35], in which respondents were able to provide more than one response, were:

- to see the landscape and scenery (87%);
- always wanted to visit (58%);
- the history and culture (55%);
- to get away from it all (37%); and
- holidayed in the Highlands before and wanted to return (36%).

13.3.38 The most popular activities were:

- sightseeing (81%);
- visiting a historic house (65%); and
- going for a short walk/stroll (59%).

13.3.39 The top five visitor attractions identified by VisitScotland for the Highlands in 2018 were:

- Urquhart Castle (518,195 visitors);
- Glenfinnan Monument (385,352 visitors);
- Glenmore Forest Park (estimated 318,511 visitors);
- Loch Ness by Jacobite (311,613 visitors); and
- Glencoe Visitor Centre (213,343 visitors).

13.3.40 The main visitor attractions within 15km of the site are located within the town of Thurso to the east of the site. The Discover Thurso website[36] advertises a multitude of things to do and places to eat, drink and stay in Thurso and includes a list of "*The 12 places that make Thurso*":

- Harold's Tower;
- Thurso Castle;
- River Thurso & Robert Dick;
- Caithness Horizons Museum;
- Old St Peter's Kirk;
- Thurso Harbour;
- Thurso Beach;
- Victoria Walk;
- Holborn Head, Scrabster;
- Things Va[37,38];
- Wolfburn Distillery; and
- Birthplace of William Alexander Smith.

13.3.41 Situated on the 'North Coast 500' route and 'North and West Highlands' route, Thurso is advertised as a stopover. There are many independent shops, bakeries, restaurants and pubs with live music. In addition, there is a swimming pool and the

34 The Scottish Tourism Alliance (2020). *Scotland Outlook 2030: Responsible Tourism for a Sustainable Future*. Available at: https://scottishtourismalliance.co.uk/wp-content/uploads/2020/03/Scotland-Outlook-2030.pdf. Accessed 12/04/2022.

35 Visit Scotland (2017). *Scotland Visitor Survey 2015 and 2016*. Available at: https://www.visitscotland.org/binaries/content/assets/dot-org/pdf/research-papers/scotland-visitor-survey-the-highlands-2016.pdf. Accessed 12/04/2022.

36 Thurso Community Development Trust (2022) *Discover Thurso Guide*. Available at: https://www.discoverthurso.co.uk/. Accessed 12/04/2022.

37 730m beyond the east of the site.

38 Caithness Broch Project (2022). *Things Va on the Caithness Adventure Map*. Available at: https://www.thebrochproject.co.uk/caithness-adventure-map. Accessed 12/04/2022.

coast is also popular with surfers with companies offering surf lessons and retreats[39]. The previous National Cycle Network (NCN) route 1 used to go north to John o' Groats but now stops at Tain[40] due to changes made by Sustrans to reduce health and safety risks associated with their routes[41].

13.3.42 The Halkirk Highland Games[42] is scheduled to take place in July 2022 after being cancelled due to the Covid 19 pandemic in 2020 and 2021. The event is advertised on the VisitScotland website as being one of the most popular and largest sporting events in Scotland's north Highlands. It takes place at Recreation Park near Halkirk, which is 7.6km from the southern boundary of the site.

13.3.43 Other annual events include the 'Northstone 58 Stonefest' which takes place in Thurso in July, Caithness County Show with Caithness Agricultural Society also taking place in July (odd years in Wick and even years in Thurso) and the Christmas Fun Day and Hogmanay Street Party in Thurso Town Centre.

13.3.44 Additional attractions further from the site include Castlehill Heritage Centre 12.5km to the east, the RSPB Forsinard Flows Nature Reserve which is 13km to the south at its closest point and Dunnet Head, the most northerly point of mainland Scotland, with Dunnet Head Lighthouse located just over 15km to the east of the site.

**Scotland's Tourism Strategy**

13.3.45 Scotland's tourism strategy[3] (prepared pre-Covid pandemic), set outs how Scotland planned to generate an additional £1 billion of visitor spending by 2020, by focusing on four areas of growth:

- nature, heritage and activities;
- business tourism;
- destination towns and cities; and
- events and festivals.

13.3.46 The Scottish Tourism Alliance (STA) sets out how Scotland can benefit from and harness the beauty of its dramatic landscapes and the vibrancy of its culture and history. Scotland's countryside can provide an appropriate setting for holidays, with a range of things to see and do, such as walking, playing golf, visiting castles and taking part in adventure sports.

13.3.47 It emphasises that to capitalise on these assets and grow their value, local communities need to communicate and collaborate to develop quality networks. This will allow the community to turn diverse local assets into authentic experiences. As noted above, this has been evident within the businesses operating within the Study Area.

13.3.48 The Mid Term Review of the Strategy states that since 2012, there has generally been growth in visitor spend from many of Scotland's main markets and a general increase in turnover and jobs supported.

13.3.49 Neither the original strategy, nor the review, consider that renewable energy projects are a barrier to growth.

**Scotland Outlook 2030**

13.3.50 Scotland Outlook[34] is the continuation of Scotland's Tourism Strategy and sets a vision for Scotland to "*be the leader in 21st century tourism*". It seeks to ensure that tourism can and will benefit every person who lives in Scotland, visits Scotland and works in Scotland.

13.3.51 To achieve this, four key priorities are identified:

- *"Our passionate people – attracting, developing and retaining a skilled, committed, diverse and valued workforce.*
- *Our thriving places - creating and developing a sustainable destination together.*
- *Our memorable experiences - providing the very best, authentic and memorable experiences.*
- *Our diverse businesses - building business resilience, sustainability and profitability."*

13.3.52 In addition, the report identifies six conditions for success; digital, policy, investment, connectivity, business network and positioning.

13.3.53 The document recognises that the global tourism industry has changed, from the way tourists travel, to how they share their experiences through digital relationships and connections; what they look for is now more experienced based. It also recognises that Scotland's transition to net zero greenhouse gas emissions has gained global respect which sits well with the rise in travellers making decisions based on conscience and sustainable tourism.

39 North Coast Watersports (2019). Available at: https://www.northcoastwatersports.com/. Accessed 16/06/2022

40 Sustrans (no date). *Route 1*. Available at: https://www.sustrans.org.uk/find-a-route-on-the-national-cycle-network/route-1/. Accessed 15/06/2022.

41 The Guardian (2020). *National Cycle Network cuts a quarter of its routes on safety grounds*. Available at: https://www.theguardian.com/travel/2020/jul/19/national-cycle-network-sustrans-cuts-quarter-uk-routes-safety-grounds?CMP=Share_AndroidApp_Other. Accessed 15/06/2022.

42 Sportimo (2022). *Halkirk Highland Games*. Available at: http://www.halkirkgames.co.uk/. Accessed on: 12/04/2022.

### Studies Into Public Attitudes to Wind Farms

#### Amenity of Local Residents

13.3.54 Potential effects on the amenity of local residents are considered to include changes to views, potential noise disturbance and effects as a result of increased traffic and heavy goods vehicles on nearby routes. There are often preconceptions about wind farms and how they will affect the amenity of local residents and the surrounding area. As a result, a number of surveys and studies have been undertaken to investigate the attitudes of the public to wind farms, including those focused on people who live in close proximity to wind farms.

13.3.55 A survey undertaken by YouGov on behalf of Renewable UK in June 2018[43] found that, of a sample size of 3,609 of British adults, more people (23%) would prefer a wind farm in their local area than other types of infrastructure, such as a fracking site, a new railway line or a new housing development of 150 homes. The survey also found that 69% of respondents support the building of more onshore wind farms as it reduces our dependency on fossil fuels (72% of supporters) and will have beneficial impacts on climate change/meeting carbon reduction targets (53% of supporters).

13.3.56 In the latest BEIS's Public Attitudes Tracker (Spring 2022[44]), 78% of people said they support the development of onshore wind. In addition, 85% of respondents expressed support for renewables in general (including but not limited to wind). Opposition to renewable energy is low with just 1% of people saying that they opposed renewable energy. Reasons for people being happy about energy infrastructure in their local area included providing a sustainable source of power (79% for wind) with around three quarters saying it was because they think it important for reducing emissions (75% for wind). National energy security was also an important reason, with over half of those who were happy about energy infrastructure in their local area believing that this would lower dependence on foreign energy sources.

13.3.57 The Tracker revealed that people are concerned about paying their energy bills, with 64% of people stating that they had been worried about paying their electricity bills over the previous three months[45,46]. People were most worried about paying energy bills compared to all other bills. People were also asked about how they felt about the impact that renewables could have on energy bills. In the short-term, far more people anticipated price rises (53%) than price decreases (11%) as a result of the shift towards renewable energy sources. However, people saw much more potential for prices to decrease over the longer-term, with more people anticipating price decreases (45%) than rises (26%) in 10 or more years' time. The report notes that the findings relating to short-term price increases are likely to be conflated with more general concern about energy price rises, given the current significantly increased energy prices. In Spring 2022, around a fifth said they did not know what to expect regarding the impact of the shift towards renewable energy on prices both in the short term (20%) and longer term (18%).

13.3.58 A recent article published by the Environmental Industries Commission (EIC) in 2022[47], based on research conducted by Copper Consultancy, also shows that public support for renewables has been growing. In publishing the findings, the Energy Director at Copper Consultancy stated that:

"Our research challenges current thinking, showing clear continued public support for the UK's transition to renewables. Consumers and voters want the government to act now, to reduce bills and deliver energy supply security. Such public backing should boost confidence in, and throughout, the sector, as developers continue their sustained drive to help the UK achieve its net zero ambitions by 2050."

#### Amenity of Tourists

13.3.59 A Renewable UK Report[12] suggested that wind farms can have a beneficial effect on tourism as a result of increased funding for improvements to tourism infrastructure and attractions. A study submitted for a Scottish Government Renewables Inquiry (Aitchison 2012[48]) also concluded that any adverse effect is offset by the number of tourists who will visit irrespective of the presence of a wind farm, or of factors related to the wind farm itself.

13.3.60 The YouGov poll[35] indicated that 69% of respondents would not base their decision to visit an area of Scotland on the presence of a wind farm. It has also been found that

43 Renewable UK (2018). Majority of voters say Government should lift onshore wind ban - YouGov poll. Available at: https://www.renewableuk.com/news/409159/Majority-of-voters-say-Government-should-lift-onshore-wind-ban---YouGov-poll-.htm. Accessed 14/04/2022.

44 BEIS (2022) Public Attitudes Tracker (Spring 2022): Energy, infrastructure and Energy Sources. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1082719/BEIS_PAT_Spring_2022_Energy_Infrastructure_and_Energy_Sources.pdf. Accessed 16/04/2022.

45 BEIS (2022) Public Attitudes Tracker (Spring 2022) Heat and Energy in the Home. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1082718/BEIS_PAT_Spring_2022_Heat_and_Energy_in_the_Home.pdf. Accessed 16/06/2022.

46 Survey ran from 24 February to 24 March 2022.

47 The Environmental Industries Commission (EIC) ( 2022). Article – New Research Shows Public Support for Onshore Wind. Available at: https://eic-uk.co.uk/news/net-zero/new-research-shows-public-support-for-onshore-wind/. Accessed 15/06/2022.

48 Aitchison. C (2012). TOURISM IMPACT of WIND FARMS: Submitted to Renewables Inquiry Scottish Government. vol. NA, NA edn, University of Edinburgh, Edinburgh. Available at: https://www.pure.ed.ac.uk/ws/files/4647070/Aitchison_C_WindFarms_2012.pdf. Accessed 19/04/2022.

wind farms may act as tourist attractions in their own right, with 120,000 people visiting the visitor centre at Whitelee Wind farm in the 12 months after its opening in 2009[49].

13.3.61 These studies highlight the varying opinions with regards to wind energy development; however, they suggest that the majority of those surveyed, whether residents or tourists, do not have a negative perception of wind farms.

**Tourism Employment and Onshore Wind**

13.3.62 Biggar Economics also published a research report in 2016 entitled 'Wind Farms and Tourism Trends in Scotland'[50]. To obtain empirical evidence of a relationship between the development of onshore wind farms and the tourism sector in Scotland, changes in employment in the sustainable tourism sector between 2009 and 2013 were considered along with the growth in the onshore wind sector during this period. Overall, the study found no evidence of a decrease in tourism employment caused by wind farms at a local or national level. A more recent study published in 2019 by BiGGAR Economics[51] analysed 44 wind farm case studies in Scotland and found no evidence of a link between wind farm development and trends in tourism employment.

### Future Baseline

13.3.63 If the Proposed Development was not to proceed, there will be little or no change to the baseline condition of the various tourism assets identified within the local area. Local communities will still receive economic benefits in terms of a community benefit package and direct and indirect employment benefits from the construction and operation of other wind farms in the area. This will, however, not be to the same extent if the Proposed Development is not constructed. Absence of the Proposed Development will, however, remove the opportunity for the Proposed Development to provide local employment.

### Implications of Climate Change

13.3.64 The climate is likely to be more variable in future, with observed historical and predicted future changes in global climate[52] due to a combination of both natural and human causes.

13.3.65 It is not expected that climate change projections will materially change the baseline conditions in this Chapter. It is noted, however, that the Proposed Development will be capable of providing low carbon renewable energy, at least cost to the consumer, for around 24,000 homes.

### Design Considerations

13.3.66 No specific design changes have been made to the layout of the Proposed Development in relation to socio-economics, recreation or tourism. A buffer of 110% of the tip height of turbines was applied around the Core Path at the beginning of the design process and the Proposed Development has not encroached within the buffer for the duration of the design of the scheme.

### Micrositing

13.3.67 Any micrositing of infrastructure within the proposed 50m allowance will not alter the findings of the socio-economic assessment.

## 13.4 Assessment of Likely Effects

13.4.1 The assessment of effects is based on the project description as outlined in **Chapter 2: Proposed Development**. Unless otherwise stated, potential effects identified are considered to be adverse. The assessment is structured as follows:

- construction effects;
- operational effects;
- decommissioning effects; and
- cumulative effects of the Proposed Development with other wind farm proposals within the study area during construction and operation, with a focus on operational and consented wind farms.

### Embedded Mitigation Measures

13.4.2 No specific mitigation measures have been embedded into the project to address the potential for socio-economic effects, however the design has taken account of effects on visual amenity at key viewpoints which are of relevance for recreation and tourism.

49 Scottish Power Ltd. (2021). *Press Release on 29/12/2010: MORE THAN 120,000 VISITORS BLOW-IN TO WHITELEE WINDFARM.* Available at: https://www.scottishpowerrenewables.com/news/pages/more_than_120000_visitors_blow_in_to_whitelee_windfarm.aspx#:~:text=The%20visitor%20centre%20at%20Whitelee%20Windfarm%20near%20Glasgow,as%20many%20as%20the%20company%20had%20originally%20forecast. Accessed 19/04/2022.

50 BiGGAR Economics (2016) *Wind Farms and Tourism Trends in Scotland.* Available at: https://biggareconomics.co.uk/wp-content/uploads/2020/01/Research-Report-on-Wind-Farms-and-Tourism-in-Scotland-July-16.pdf. Accessed 19/04/2022.

51 BiGGAR Economics (2021) *Onshore Wind and Tourism in Scotland.* Available at: https://biggareconomics.co.uk/onshore-wind-and-tourism-in-scotland. Accessed 03/05/2022.

52 Met Office (2021). *UK Climate Projections: North Scotland using the 2050s and RCP 8.5 scenario.* Available at: https://www.metoffice.gov.uk/research/approach/collaboration/ukcp. Accessed 21/04/2022.

## Potential Construction Effects

### Direct Employment and Economic Benefits

13.4.3 Scotland and the UK capture the majority of the economic value generated by wind farms which are built here[53]. On average, 66% of the total economic value of a wind farm accrues to the UK; 51% of which is in Scotland. Local areas also benefit, with on average, 16.5% of the total value accruing to the local region[53]. Benefits include local employment and service contracts during project operations, direct payments to local economies via land rents, indirect income through business rates and spend on travel, accommodation and supplies, as well as community benefit packages.

13.4.4 A study in 2009[54] showed that a significant number of jobs were created in the wind energy with a positive relationship between the MW installed and number of jobs. Over 10 years' later, a study into the economic impact of Scotland's renewable energy sector published in 2021[55] found that a significant amount of the FTE employment in renewables was supported by onshore wind (8,780) and offshore wind (4,700). In 2019, the report calculated that Scotland's renewable sector had a turnover of £2.8 billion and approximately 6,440 full-time equivalent employment. The report highlights that the direct employment of renewable activities is mostly in the electricity & gas, construction and manufacturing industries, however, the spill-over impacts extend into many other sectors. It is suggested that, renewable activities[56] support over 3,000 FTE employment in the wholesale & retail sector, 1,600 FTE employment in professional, scientific & technical services, and 1,800 FTE employment in the admin & support services sector.

13.4.5 Wherever reasonably practicable, the Applicant is committed to using local contractors, suppliers and employees during the construction phase of the Proposed Development and as such, the applicant has held numerous conversations with local civil contractors based in the region with regards to their capabilities to help deliver the project. Caithness has an excellent variety of businesses that have extensive experience and skills in wind farm development. Some of the employment opportunities during the construction phase of the Proposed Development relate to civil engineering, groundworks, electrical works, steel fixing, plant hire, concrete and aggregates supply.

13.4.6 An estimated workforce of 30 to 35 people[57] will be employed at any one time during the 12-month construction period for the Proposed Development, with the total number of personnel on-site at any one time varying throughout the programme depending on the tasks being undertaken at any one time.

13.4.7 It is standard practice in economic appraisals to convert temporary employment levels into full-time equivalents (FTEs). For the construction period, this employment is approximately 30 full-time jobs. Using a conversion factor of ten years of full-time employment to one permanent FTE, the total employment generated through construction will be approximately three permanent FTEs.

13.4.8 **Table 13.5** applies both a leakage[58] factor (assuming that all construction jobs will not be secured by local residents) and a displacement[59] factor (assumes that individuals may leave their current employment in order to secure work in the construction project) to arrive at a net employment benefit.

13.4.9 Adopting a conservative approach, it is assumed that ten out of a total workforce of 30 people will be employed by the turbine supplier for the duration of the erection and commissioning activities. It is therefore estimated that the local population will take up to 66% of the direct construction jobs. Notwithstanding this leakage factor of 33%, it is possible that employees from outside THC area may choose to live in the region during their period of employment and may also bring their families. This may in turn increase both population and spending levels within the area, as discussed under 'Indirect and Induced Employment and Economic Benefits' below.

13.4.10 Displacement of existing employees between sectors can occur where individual projects (such as construction) require a large supply of temporary employment. Individuals may use this opportunity to secure higher paid employment for a defined period, or to redirect their career. This impact is deducted from the gross employment generated as the movement of employees does not necessarily result in their old job being made available to the local economy. This impact is estimated to account for 20% of the construction employment secured by local residents moving

53 BVG Associates (2017). *Economic benefits from onshore wind farms.* Available at: https://bvgassociates.com/wp-content/uploads/2017/09/BVGA-18510-Economic-impact-onshore-wind-report-r3.pdf. Accessed 21/04/2022.

54 Blanco, M.I. and Rodrigues, G. (2009). *Direct employment in the wind energy sector: An EU study. Energy Policy*. Available at: https://www.researchgate.net/publication/223854602_Direct_employment_in_the_wind_energy_sector_An_EU_study. Accessed 16/06/2022.

55 Fraser of Allander Institute on behalf of Scottish Renewables (2021). *The Economic Impact of Scotland's Renewable Energy Sector*. Available at: https://www.scottishrenewables.com/publications/857-untitled. Accessed 30/06/2022.

56 Not limited to onshore wind also includes offshore wind, solar, hydro,renewable heat, bioenergy and other renewable electricity.

57 A total of 30 employees has been assumed for calculations, therefore employment estimates remain conservative.

58 Leakage refers to the proportion of output which benefit those outside of the project's target area or group. In other words, if the output were employment, the leakage would relate to how many construction jobs would be secured by people who don't live in THC.

59 Displacement refers to the proportion of project outputs accounted for by reduced outputs elsewhere in the region.

from their current job. Displacement is included to ensure a conservative approach to the assessment of direct employment effects.

**Table 13.5 Direct Employment Created During Construction**

| | FTE Employment Created by Wind Farm Construction | People Coming into THC (Leakage)[60] | Displacement from Other Local Economy Sectors[61] | Net Direct FTEs Generated in the Local Economy[62] |
|---|---|---|---|---|
| Construction Employment | 3.0 | 0.9 | 0.6 | 1.5 |

13.4.11 Once leakage and displacement figures have been accounted for, it is estimated that there will be 1.5 FTEs generated by the construction of the Proposed Development.

13.4.12 The estimated construction cost of the Proposed Development is approximately £21m based on an estimated capital expenditure of £1m per installed MW. Based on economic research for the onshore wind energy industry[30], it is anticipated that this value would be divided approximately as follows: development and planning costs (10%), balance of plant (26%), turbines (58%) and grid connection costs (6%). It is anticipated that up to 10% of the overall value of contracts could be realised in THC (up to £2.1m).

13.4.13 Adopting a conservative approach, it is considered that construction will have an effect of **minor beneficial significance** on the local economy and employment in THC area.

### Indirect and Induced Employment and Economic Benefits

13.4.14 It is likely that there will be some local employment generated indirectly as a result of the construction of the Proposed Development. This could include supply chain spin-offs for local businesses and sub-contracted work relating to the transportation of construction workers and materials. Any construction workers not living locally may choose to reside in local accommodation which will further benefit the local economy through spending in local hotels, B&Bs, shops and restaurants.

13.4.15 The level of supply chain spin-offs and sub-contractor work will depend, in part, upon local capacity. In terms of local skills, it is considered feasible that during the construction process there will be opportunities for 'up-skilling' of local people either directly or indirectly employed in relation to the Proposed Development. Those employed may develop skills that will be of benefit to the local economy in the longer term, such as project management and/or construction skills which are transferrable to other renewable energy developments.

13.4.16 Scottish Government 'Type II Multipliers'[63] can be used to assess the likely scale of indirect employment effects generated by the purchase of goods and services by businesses associated with construction of the Proposed Development, and also induced employment generated by the expenditure of those directly and indirectly employed by the businesses involved with the Development. The Type II multiplier adopted is that for 'construction' and equates to 1.7. Figures for the total direct, indirect and induced employment FTEs generated during construction of the Proposed Development are shown in **Table 13.6.**

13.4.17 As an example, expenditure at another RES project, Freasdail Wind Farm in Argyll and Bute, resulted in a total local spend of £6.35 million once the wind farm was energised in early 2017, including the following:

- local contractors: £4.21 million;
- local materials: £1.56 million;
- supplies/services: £0.36 million; and
- local accommodation: £0.21 million.

**Table 13.6 Indirect and Induced Employment During Construction**

| | Net Direct FTEs Generated in the Local Economy | Indirect Plus Induced Multiplier | Additional Indirect and Induced FTEs[64] |
|---|---|---|---|
| Construction Employment | 1.5 | 1.7 | 2.55 |

13.4.18 Adopting a conservative approach, the effect of the creation of additional indirect and induced employment of 2.55 FTEs is considered to be of **minor beneficial significance** for the local economy.

60 Assumed 33% of 3.0 FTE Employment.
61 Assumed 20% of 3.0 FTE employment.
62 FTE employment (3.0) minus leakage (0.9) and minus displacement (0.6).
63 Scottish Government (2019). *Input-Output Tables and Multipliers for Scotland.* Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/statistics/2019/08/input-output-latest/documents/all-tables-all-years/all-tables-all-years/govscot%3Adocument/SUT-98-17.xlsx. Accessed 15/06/2022.
64 Net direct FTEs (1.5) x type II multiplier (1.7).

**Public Access and Recreation**

13.4.19 The Applicant is committed to keeping any effects on access and recreation during construction to an absolute minimum. This includes keeping the Core Path (CA13.07 'Thurso Skyline') open throughout the construction phase, without compromising the health and safety of the public. The additional wider network of paths which has been identified in the baseline conditions section of this chapter will not be directly affected during construction.

13.4.20 Construction of the Proposed Development is anticipated to last approximately 12 months. It is assumed that from the start of December to the end of March, construction activities would cease, due to operational constraints relating to anticipated adverse weather conditions. When construction activities cease, access restrictions would be removed. During the period when construction activities are possible, access restrictions would remain in place.

13.4.21 Access to the proposed new tracks would be restricted while those construction operations are ongoing. Following completion of these works, access provision would be reinstated. Upon completion of the Proposed Development, the public would be able to fully access the tracks described.

13.4.22 The effects on public access and recreation are predicted to be of **minor adverse significance.**

**Tourism**

13.4.23 Key factors attracting tourists to THC area are the landscape and scenery and sightseeing. It is noted, however, that the Proposed Development is, however, not located in a landscape afforded high policy protection.

13.4.24 It is possible that the construction of the Proposed Development could lead to a decrease in the availability of tourist accommodation within the area surrounding the site, as construction workers from outside the area will require accommodation for the duration of the construction phase. However, it is considered that any reduction in accommodation will be compensated for by revenue generated by the accommodation of site workers.

13.4.25 It is not considered that construction of the Proposed Development, particularly construction traffic, will discourage tourists from visiting the local area.

13.4.26 The effect of construction of the Proposed Development on tourism will be **negligible.**

## Potential Operational Effects

**Direct Employment and Economic Benefits**

13.4.27 Due to their remote operational control and limited need for servicing, wind farms do not create large numbers of jobs during the operational stage. It is expected that about 2.5 FTE staff will be employed to operate the Proposed Development and undertake routine maintenance work during its lifetime (35 years). It is assumed that 80% of these jobs could be filled by regional technicians (giving a leakage factor of 20%). Therefore, it is estimated that the operational phase of the Proposed Development will directly generate two FTE employees[65]. Displacement is not considered likely during the operational phase. Direct employment generation will have an effect of **minor beneficial significance.**

13.4.28 The Applicant proposes to administer a fund in partnership with the Local Chamber of Commerce into which annual benefit payments will be made. The fund will be used to support local businesses to secure long-term economic benefits and will act as a significant contribution to meeting local developmental aspirations. The Applicant will pay £5,000 equivalent per MW of installed capacity per annum into the fund. This equates to £105,000[66] of income per annum, or over £3.67m[67] over the 35-year operational life of the Proposed Development, depending on the eventual turbine type installed and capacity installed.

13.4.29 An effect of **moderate beneficial significance** is predicted for the Proposed Development in relation to direct economic benefits.

**Indirect and Induced Employment and Economic Benefits**

13.4.30 Although low, there will be a temporary increased level of employment from operation of the Proposed Development, with some associated indirect employment and economic benefits. Using the Renewable UK study 'Onshore Wind: Economic Impacts in 2014'[30] it can be assumed that each MW of installed capacity will support 0.43 jobs and £22,347 GVA per year in the UK economy during a 25 year operational lifespan (noting that a 35 year lifespan is being put forward for the Proposed Development). This would result in over £1.5m generated each year.

65 0.80*2.5 FTEs.
66 21MW * £5,000.
67 £105,000 * 35 years.

13.4.31 Adopting a conservative approach, the effect of the creation of additional indirect FTEs and indirect economic benefits is considered to be **negligible** for the local economy.

13.4.32 It is likely that there will be some local employment generated as an indirect result of the operation of the Proposed Development, and this will be associated with induced employment effects resulting from increased household expenditure among those individuals who have gained employment both directly and indirectly as a result of operation of the Proposed Development. The Scottish Government Type II Multipliers[62] suggest that the appropriate indirect plus induced employment multiplier to apply to the operational direct employment for repair and maintenance jobs is 1.5. Figures for the total estimated direct, indirect and induced FTEs generated during operation of the Proposed Development are shown in **Table 13.7**.

**Table 13.7 Indirect and Induced Employment During Operation**

| | Net Direct FTEs Generated in the Local Economy | Indirect Plus Induced Multiplier | Additional Indirect and Induced FTEs[68] |
|---|---|---|---|
| Operational Employment | 2 | 1.5 | 3.0 |

13.4.33 The potential indirect and induced job creation of 3.0 FTEs from the operation of the Proposed Development over 35 years is considered to be of **minor beneficial significance** for the local economy. There is also the potential for employment and local spending to be generated from projects associated with the community benefit payments which, adopting a conservative approach, has not been accounted for.

**Public Access, Recreation and Tourism**

13.4.34 There will be no access restrictions within the site during the operational phase of the Proposed Development. The Applicant also proposes the encouragement of public access to the site with the upgrade of an on-site sheepfold, the creation of dry-stone fielding and car parking at the site entrance with a community noticeboard.

13.4.35 Operation of the Proposed Development will not prevent people from visiting the area or from undertaking recreational activities in the area. However, it is possible that the change in views from certain areas and routes could influence some individuals in their choice of location to visit or recreational activities to undertake. Landscape and visual effects during operation are considered in **Chapter 5** and this assessment takes into consideration the receptors of landscape and visual effects. Viewpoints and routes for the assessment were selected partly on the basis of accessibility and on the number of potential viewers. The 'type' of viewers (i.e., local residents, tourists, walkers etc.) has also been considered when making judgements on the sensitivity of these views to change.

13.4.36 Predicted visual effects from the LVIA assessment of the Proposed Development in relation to viewpoints (VPs) of relevance to recreation and/or tourism, either as tourist attractions or potential stopping points, and in relation to popular recreation walking or driving routes, both within approximately 15km, are outlined below.

- VP2 – Thurso to Reay Road (included as A836 part of North Coast 500)
  - Major significant
- VP3 – A836, Thurso
  - Moderate significant
- VP4 – St Mary's Chapel, Crosskirk
  - Moderate significant
- VP7 – Northlink Ferry (Scrabster to Stromness)
  - Moderate significant
- VP9 – Beinn Ratha
  - Minor not significant
- VP11 – Ben Dorrery
  - Minor not significant
- VP 12 – Dunnet Bay Visitor Centre
  - Minor not significant
- VP 13 – Easter Head Light House car park
  - Minor not significant
- VP 15 – Loch Watten visitor car park
  - Minor not significant
- VP 16 – Strathy Point

68 Net direct FTEs (2) x type II multiplier (1.5).

- Minor not significant

13.4.37 The effect which changes in views will have on public access, recreational activity and tourism will depend on the personal opinion of the viewer and is subjective; some people may be predisposed to dislike wind turbines while others could view them as complementary to the landscape. As a consequence, the alteration in views from surrounding areas (including hill summits and walking routes) may influence some individuals in their choice of location to visit or recreational activities to undertake. However, it is not considered that the changes in views from the viewpoints and routes assessed will result in a significant adverse effect on informal recreation or tourism.

13.4.38 Furthermore, the operation of the Proposed Development will not prevent people from visiting the area around the site. In addition, none of the top tourist attractions in the Caithness and Sutherland region or more locally in the Thurso area are likely to be adversely affected in terms of reduced visitor numbers as a result of the operation of the Proposed Development, given the distance of them from the Site.

13.4.39 The operational effects on both public access and recreation and on tourism are therefore predicted to be of **negligible significance**.

## Potential Decommissioning Effects

### Direct Employment and Economic Benefits

13.4.40 Wherever reasonably practicable, the Applicant is committed to using local contractors, suppliers and employees during the decommissioning phase of the Proposed Development. This will be monitored towards this phase of the project with local businesses being contacted to prepare for upcoming opportunities arising from the decommissioning of the Proposed Development.

13.4.41 Adopting a conservative approach, it is considered that decommissioning will have an effect of **minor beneficial significance** on the local economy and employment in THC area.

### Indirect Employment and Economic Benefits

13.4.42 It is likely that there will be some local employment generated indirectly as a result of the decommissioning of the Proposed Development. This could include supply chain spin-offs for local businesses and sub-contracted work relating to the transportation of workers and parts/materials. Any workers not living locally may choose to reside in local accommodation which will further benefit the local economy through spending in local hotels, B&Bs, shops and restaurants.

13.4.43 Supply chain spin-offs and sub-contractor work will depend upon local capacity. In terms of local skills, it is considered feasible that during the decommissioning process there will be opportunities for 'up-skilling' of local people either directly or indirectly employed in relation to the Proposed Development. Those employed may develop skills that will be of benefit to the local economy in the longer term.

13.4.44 Adopting a conservative approach, the indirect employment and economic benefits are considered to be of **minor beneficial significance** for the local economy.

### Public Access and Recreation

13.4.45 The primary access point for traffic throughout the decommissioning of the Proposed Development would be the same as during construction.

13.4.46 The Applicant is committed to keeping any access impacts to an absolute minimum and to keeping the CA13.07 'Thurso Skyline' Core Path open throughout the decommissioning period where this would not compromise the safety of the general public. Following decommissioning, the public would be able to have full access to the site and any remaining access tracks.

13.4.47 Prior to mitigation, there would be a **minor adverse effect** upon public access and recreation during the decommissioning of the Proposed Development.

### Tourism

13.4.48 The decommissioning of the Proposed Development will not prevent people from visiting the area around the site. In addition, none of the top tourist attractions in the Caithness and Sutherland region or more locally in the Thurso area are likely to be adversely affected in terms of reduced visitor numbers as a result of the decommissioning of the Proposed Development. The site would be returned to the original condition and as such, it is considered that effects on tourism will be **negligible**.

## Potential Cumulative Effects

### Direct Employment and Economic Benefits

13.4.49 Should all the schemes identified within 40km (as identified in Chapter 5) be constructed, the cumulative effect on direct employment and economic benefits will be beneficial for both THC area and the wider economy. It is beyond the scope of this chapter to calculate the likely direct employment and economic benefits of all

surrounding schemes. However, it is known that Baillie wind farm provides £130,000 per annum in local community benefit funds[69]. In addition, at Forss wind farm, community benefit funds have been spent on the erection of Christmas lights, swimming training camps, sports equipment for the local Beaver Scout group and educational trips for students[70]. Lastly, Limekiln wind farm is also committed to providing community benefits for the scheme[71]

13.4.50 Cumulatively with those which are currently operational (Ballie, Forss Phase 1 and 2), consented (Forss Phase 3 and Limekiln Extension) and those which are yet to be consented (Limekiln) but may be built within 40km of the site, a **minor beneficial effect** is predicted for direct employment and economic benefits.

**Indirect Employment and Economic Benefits**

13.4.51 It is likely that there will be some local employment generated indirectly as a result of the construction of the Proposed Development. This could include supply chain spin-offs for local businesses and sub-contracted work relating to the transportation of construction workers and materials. A **minor beneficial effect** is predicted in relation to Indirect employment and economic Benefits.

**Public Access, Recreation and Tourism**

13.4.52 It is predicted that there may be some beneficial cumulative effects on public access and recreation in the wider area through the provision of new paths and access routes available to walkers and cyclists. Adopting a conservative approach, however, the contribution of the Proposed Development to this beneficial effect is considered to be **negligible.**

13.4.53 Chapter 5 also assesses cumulative effects on visual receptors of relevance to public access, recreation and tourism (see 'operation section' above). All cumulative visual effects are predicted to be not significant.

13.4.54 It is possible that the construction of the Proposed Development simultaneously with other schemes nearby could lead to a greater decrease in the availability of tourist accommodation within the area surrounding the site, particularly as there are limited accommodation opportunities within the local area. However, it is unlikely that this would cause a significant effect, and businesses would benefit during the 'off peak' season when there would usually be less demand for accommodation, therefore, a **negligible** effect is predicted.

## 13.5 Mitigation

### Mitigation during Construction

13.5.1 An Outdoor Access Management Plan (OAMP) has been written in line with guidance[72] and provides information on how public access rights would be managed for the Proposed Development (Technical **Appendix 2.7**).

### Mitigation during Operation

13.5.2 No mitigation is proposed during operation of the Proposed Development as there are no significant effects predicted.

### Mitigation during Decommissioning

13.5.3 The OAMP provides information on how public access rights would be managed for the Proposed Development during decommissioning (Technical **Appendix 2.7**).

## 13.6 Assessment of Residual Effects

### Residual Construction Effects

**Public Access and Recreation**

13.6.1 Following implementation of the mitigation discussed, residual effects on public access and recreation are predicted to be **negligible.**

### Residual Operational Effects

13.6.2 The predicted residual effects during the operational phase of the Proposed Development will remain as set out above.

### Residual Decommissioning Effects

13.6.3 The predicted residual effects arising during the decommissioning of the Proposed Development, taking into consideration mitigation as set out above are **negligible**.

### Residual Cumulative Effects

[69] Statkraft (no date). *Baillie Wind Farm*. Available at: https://www.statkraft.co.uk/about-statkraft-uk/where-we-operate/Locations/baillie-wind-farm/. Accessed 16/06/2022.

70 RES (2022). *Forss Wind Farm*. Available at: http://www.forss-windfarm.co.uk/community-fund/. Accessed 16/06/2022.

71 Limekiln Wind Farm (2022). *Benefits*. Available at: https://www.limekilnwindfarm.co.uk/benefits/. Accessed 16/06/2022.

72 NatureScot (formerly SNH) (2010). *Guidance for the preparation of outdoor access plans*. Available at: https://www.nature.scot/sites/default/files/2017-06/B639282%20-%20A%20Brief%20Guide%20to%20Preparing%20Outdoor%20Access%20Plans%20-%20Feb%202010.pdf. Accessed 21/04/2022.

13.6.4 The predicted residual cumulative effects for the Proposed Development will remain as set out in the section above.

## 13.7 Summary

13.7.1 **Table 13.8** below summarises the predicted socio-economic effects of the Proposed Development. The only significant effect identified is for indirect employment and economic benefits during operation of the Proposed Development which are predicted to have an effect of moderate beneficial significance.

**Table 13.8: Summary of Residual Effects**

| Likely Effect | Mitigation | Means of Implementation | Residual Effect |
|---|---|---|---|
| Construction | | | |
| Direct employment and economic benefits – minor beneficial effect | not applicable | not applicable | minor beneficial effect |
| Indirect employment and economic benefits - minor beneficial effect | not applicable | not applicable | minor beneficial effect |
| Public access and recreation – minor adverse effect | Outdoor Access Management Plan (OAMP) | outlined in Technical **Appendix 2.7** | negligible effect |
| Tourism - negligible effect | not applicable | not applicable | negligible effect |
| Operation | | | |
| Direct employment and economic benefits – minor beneficial | not applicable | not applicable | minor beneficial |
| Indirect Employment and Economic Benefits - moderate beneficial effect | not applicable | not applicable | moderate beneficial effect |
| Public Access and Recreation - negligible effect | not applicable | not applicable | negligible effect |
| Tourism – negligible effect | not applicable | not applicable | negligible effect |
| Decommissioning | | | |
| Direct employment and economic benefits – minor beneficial effect | not applicable | not applicable | minor beneficial effect |
| Indirect Employment and Economic Benefits - minor beneficial effect | not applicable | not applicable | minor beneficial effect |
| Public access and recreation – minor adverse effect | Outdoor Access Management Plan (OAMP) | outlined in Technical **Appendix 2.7** | negligible effect |
| Tourism - negligible effect | not applicable | not applicable | negligible effect |
| Cumulative | | | |
| Direct Employment and economic Benefits – minor beneficial effect | not applicable | not applicable | minor beneficial effect |
| Indirect Employment and Economic Benefits – minor beneficial effect | not applicable | not applicable | minor beneficial effect |
| Public Access and Recreation – negligible effect | not applicable | not applicable | negligible effect |
| Tourism – negligible effect | not applicable | not applicable | negligible effect |

# 14 Climate Change

## 14.1 Introduction

14.1.1 This Chapter of the Environmental Impact Assessment Report (EIA Report) evaluates the effects of the Development on the climate change and carbon balance resource, and presents a Climate Change Impact Assessment (CCIA).

14.1.2 This Chapter of the EIA Report is supported by Technical Appendix A15.1: Carbon Balance Calculations provided in Volume III.

14.1.3 This Chapter includes the following elements:

- Legislation, Policy and Guidance;
- Assessment Methodology and Significance Criteria;
- Baseline Conditions;
- Assessment of Potential Effects;
- Mitigation and Residual Effects;
- Cumulative Effect Assessment;
- Summary of Effects; and
- Statement of Significance.

## 14.2 Legislation, Policy and Guidance

14.2.1 The following legislation, policy and guidance have been considered in carrying out this assessment:

- Institute of Environmental Management and Assessment (IEMA) Environmental Impact Assessment Guide to Climate Change Resilience and Adaption 2020[1];
- Electricity Act 1989[2];
- Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017, as amended[3] (the EIA Regulations);
- The Electricity Generation Policy Statement (2013)[4]; Letter from Chief Planner to all Heads of Planning in relation to energy targets and SPP (November 2015)[5];
- Scottish Energy Strategy (December 2017)[6];
- Onshore Wind Policy Statement (December 2017)[7];
- European Commission Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment (2013)[8];
- HM Government UK Climate Change Risk Assessment Government Report (2012)[9];
- Scottish Government's Scottish Climate Change Adaption Programme[10]
- The Scottish Climate Change Plan (2018)[11];
- The Scottish Government's declaration of a Climate Emergency (April 2019)[12]; and
- The Climate Change (Emissions Reduction Targets) (Scotland) Act 2019[13] and the legally binding net zero target for 2045 and interim targets for 2020, 2030 and 2040.

14.2.2 Notable information sources containing baseline and projected climate data include:

- Digest of United Kingdom Energy Statistics (DUKES) 2020[14];
- State of the UK Climate 2018[15];

[1] 2020) Environmental Impact Assessment Guide to Climate Change Resilience and Adaption 2020 [Online]. Available at: https://www.iema.net/resources/reading-room/2020/06/26/iema-eia-guide-to-climatechange-resilience-and-adaptation-2020 (Accessed 19/04/2022)

[2] UK Government (1989) Electricity Act 1989 [Online] Available at: https://www.legislation.gov.uk/ukpga/1989/29/contents (Accessed 19/04/2022)

[3] UK Government (2017) Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 [Online] Available at: https://www.legislation.gov.uk/ssi/2017/101/contents/made (Accessed 19/04/2022)

[4] Scottish Government (2013) Electricity Generation Policy Statement 2013 [Online] Available at: https://www.gov.scot/publications/electricity-generation-policy-statement-2013/ (Accessed 19/04/2022)

[5] Scottish Government (2015) Letter from Chief Planner to all Heads of Planning in relation to energy targets and SPP [Online] Available at: https://www.gov.scot/publications/energy-targets-and-scottish-planning-policy-chiefplanner-letter/ (Accessed 19/04/2022)

[6] Scottish Government (2017) The Future of Energy in Scotland: Scottish Energy Strategy [Online] Available at: https://www.gov.scot/publications/scottish-energy-strategy-future-energy-scotland-9781788515276/ (Accessed 14/08/2020)

[7] Scottish Government (2017) The Future of Energy in Scotland: Scottish Energy Strategy [Online] Available at: https://www.gov.scot/publications/scottish-energy-strategy-future-energy-scotland-9781788515276/ (Accessed 19/04/2022)

[8] European Commission (2013) Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment (2013) [Online] Available at: https://ec.europa.eu/environment/eia/pdf/EIA%20Guidance.pdf (Accessed 19/04/2022)

[9] HM Government (2012) UK Climate Change Risk Assessment: Government Report [online] Available at: https://www.gov.uk/government/publications/uk-climate-change-risk-assessment-government-report (Accessed 19/04/2022)

10 Scottish Government (2014) Scottish Climate Change Adaption Programme (SCCAP) [online] Available at: https://www.gov.scot/publications/climate-ready-scotland-scottish-climate-change-adaptation-programme/ (Accessed 19/04/2022)

11 Scottish Government (2018) Climate Change Plan: Third Report on Proposals and Policies 2018 – 2031 (RPP3) [Online[ Available at: https://www.gov.scot/publications/scottish-governments-climate-change-plan-third-reportproposals-policies-2018-9781788516488/ (Accessed 19/04/2022)

12 Scottish Government (2019) Action to Address Climate Emergency [Online] Available at: https://www.gov.scot/news/action-to-address-climate-emergency/ (Accessed 19/04/2022)

13 Scottish Government (2019) Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 [Online] Available at: http://www.legislation.gov.uk/asp/2019/15/enacted (Accessed 19/04/2022)

14 4 UK Government (2020) Digest of United Kingdom Energy Statistics 2020 [Online] Available at: https://www.gov.uk/government/statistics/digest-of-uk-energy-statistics-dukes-2020 (Accessed 19/04/2022)

15 International Journal of Climatology, volume 39, Issue S1 (July 2019) ed. Radan Huth. Wiley

- Met Office UK Climate Projections 2018 (UKCP18) (updated September 2019)[16]; and
- The Met Office UKCP18 Science Overview Report[17].

14.2.3 Other information sources are referenced throughout the Chapter

## 14.3 Assessment Methodology and Significance Criteria

### Scope of Assessment

14.3.1 The key issues for the assessment of potential climate change and carbon balance effects relating to the Development are:

- The vulnerability of the Development to climate change;
- The influence of the Development on climate change; and
- A summary of effects on environmental receptors sensitive to climate change.

14.3.2 The vulnerability of the Development to climate change considers effects on the Development as a receptor. In contrast, the other two assessments consider effects on environmental receptors as a result of the Development.

### Elements Scoped Out of Assessment

14.3.3 The assessment of the influence of the Development on climate change focusses on the overall balance of greenhouse gas (GHG) emissions as climate change is directly linked to these emissions. No further analysis is undertaken of how climate parameters change in direct response to the emissions balance of the Development.

14.3.4 In relation to the effects on other environmental receptors, a qualitative review is undertaken in this Chapter of whether projected climate change will modify the future baseline without the Development sufficiently to change the results of the assessments undertaken in other chapters. The assessments are not repeated in this Chapter, which should be read in conjunction with the technical chapters.

### Study Area / Survey Area

14.3.5 The study area considered for the assessment of vulnerability of the Development to climate change consists of the proposed infrastructure located within the site boundary (the Site), looking at changes over the planned lifetime of the 35 years from commissioning, i.e. until approximately 2061, assuming a year of construction in 2026. Information on climate trends and projections at the Scottish and local scale (where available) are utilised.

14.3.6 The study area for the assessment of the influence of the Development on climate change considers GHG emissions (current levels and targets) with renewable energy generation and grid mix within the Scottish and UK spatial scale. Reference is made to the global context as appropriate.

14.3.7 The study area for the assessment on future baseline for environmental receptors is outlined in individual technical chapters. Climate projections on a Scottish and Site scale (where available) are utilised for this Chapter.

### Design Parameters

14.3.8 The design of the Development is a balance of technical, resource and environmental considerations. Those of relevance for the assessments in this Chapter include:

- Installed capacity and capacity factor - for calculation of GHG balance;
- Turbine spacing in relation to prevailing wind direction - for effects on generation,turbulence, vulnerability to damage with potential changes to wind speed, direction and storminess;
- Amount and layout of new track and infrastructure in relation to deep peat – for calculation of GHG balance;
- Buffers to watercourses – for assessing vulnerability to flooding due to changes in precipitation events; and
- Construction Management commitments particularly in relation to minimisation of disturbance and re-use of peat, and potential for flooding (as embedded in Technical Appendix 2.1: Construction Environmental Management Plan (CEMP), Technical Appendix 2.2 Peat Management Plan (PMP), etc.) – for assessing potential emissions and vulnerability to flooding

### Baseline Survey Methodology

14.3.9 Climate trends and projections are published by the Met Office through the UK Climate Projections website. The UKCP18 became available in November 2018 and

[16] Met Office (2019) UK Climate Projections – Updated September 2019[Online] Available at: https://www.metoffice.gov.uk/research/collaboration/ukcp (Accessed 19/04/2022)

[17] Lowe, J.A. et al. (2018) UKCP18 Science Overview Report. The Met Office. Available at: https://www.metoffice.gov.uk/pub/data/weather/uk/ukcp18/science-reports/UKCP18-Overview-report.pdf (Accessed 19/04/2022)

was most recently updated in September 2019. The UKCP18 provide the most up to date assessment of how the climate of the UK may change over this century.

14.3.10 UKCP18 uses scenarios for future greenhouse gas emissions called Representative Concentration Pathways (RCPs). The four RCPs attempt to capture a range of potential alternative futures and outcomes linked to global temperature increases and include a wide variety of assumptions on socioeconomic development and commitment to emissions reductions. The sensitivity of the scenario responses is much more pronounced in the second half of the 21st century, where the responses diverge more rapidly than in the first half of the century. The four RCPs are as follows:

- RCP2.6: assumes an increase in global mean surface temperature of 1.6°C (-.9-2.3) by 2081-2100 (no change scenario);
- RCP4.5: assumes an increase in global mean surface temperature of 2.4°C (1.7-3.2) by 2081-2100 (low emissions scenario);
- RCP6.0: assumes an increase in global mean surface temperature of 2.8°C (2.0-3.7) by 2081-2100 (medium emissions scenario); and
- RCP8.5: assumes an increase in global mean surface temperature of 4.3°C (3.2-5.4) by 2081-2100 (high emissions scenario).

14.3.11 Over the 35-year anticipated lifetime of the Development, the choice of scenario is therefore not fundamental to the assessment but, where appropriate, the medium emissions scenario RCP6.0 is utilised as the future baseline. Reflecting the Paris Climate Agreement[18], in which most countries including the UK pledged to reduce emissions by 2030, this scenario assumes no further emissions reductions after 2030 and allows for some increase in emissions.

14.3.12 Projections are reported for 20-year time periods through to 2100. The 2021 – 2040 and 2041 - 2060 periods provide the closest projections to the operational phase of the Development. For the purpose of this CCIA, where appropriate the 2040-2059 time period is used as the impacts of climate change are anticipated to be more evident with time.

14.3.13 Projected climatic changes at the 50% probability level (central estimate) are utilised, unless otherwise indicated. This is the level where there is as much evidence pointing to a lower outcome as a higher one. There is substantial evidence that the actual climatic change outcome will be in the 10th to 90th percentile range and this is also utilised for limited assessment parameters[19].

## Vulnerability of the Development to Climate Change

14.3.14 This section of the CCIA identifies aspects of the Development which are potentially vulnerable to the effects of climate change. Where identified, these vulnerabilities can then be mitigated through embedded mitigation or the application of other measures. Taking into account the nature and location of the Development, the following climate related parameters are considered to have the potential to impact upon the operation of the Development: • Wind (speed, direction and gustiness); • Temperature; and • Precipitation. The construction and decommissioning stages of the Development are not considered to be vulnerable to climate change and have been scoped out of further consideration.

## Influence of the Development on Climate Change

14.3.15 This section of the CCIA seeks to quantify the effect of the Development on climate change.

14.3.16 Scottish Planning Policy (SPP)[20] states that energy infrastructure developments are required to identify their effects on carbon rich soils, using the Scottish Government's Carbon Calculator. This has been completed for the Development using the latest version of the calculator (C-CalcWebV1.6.1)[21] . The carbon assessment methodology used is consistent with that published by the Rural and Environment Research and Analysis Directorate of the Scottish Government entitled 'Calculating carbon savings from wind farms on Scottish peat lands – a new approach'[22] . This publication sets out the approach and assumptions that should be used to estimate potential carbon losses and savings from wind farms on Scottish peatlands. The carbon calculator is included as Technical Appendix 2.6, Volume III.

14.3.17 The calculation evaluates the balance of total carbon savings and carbon losses over the life of the Development. The potential carbon savings and carbon costs associated with wind farms are as follows:

[18] United Nations (2016) Framework Convention on Climate Change. Adoption of the Paris Agreement, 21st Conference of the Parties, Paris [Online] Available at: https://unfccc.int/resource/docs/2015/cop21/eng/10a01.pdf (Accessed 19/04/2022)

[19] Lowe et al (2018) UKCP18 Science Overview Report (Page 13)

[20] Scottish Government (2014) Scottish Planning Policy [Online] Available at: https://www.gov.scot/publications/scottish-planning-policy/ (Accessed 19/04/22)

[21] Scottish Government & SEPA. Carbon Calculator Tool v1.6.1.1 [Online] Available at: https://informatics.sepa.org.uk/CarbonCalculator/index.jsp (Accessed 19/04/22)

[22] Nayak et al (2008) Calculating carbon savings from wind farms on Scottish peat lands: a new approach (Scottish Government) [Online] Available at: https://www.gov.scot/publications/2008/06/25114657/0 (Accessed 19/04/22)

- Carbon emission savings due to generation (based on displacing emissions from different power sources);
- Lifetime costs associated with manufacture of turbines and construction;
- Loss of carbon from backup power generation; • Loss of carbon-fixing potential of peatland;
- Loss and/or saving of carbon stored in peatland (by peat removal or changes in drainage);
- Loss and/or saving of carbon-fixing potential as a result of forestry clearance; and
- Carbon gains due to proposed habitat improvements such as bog restoration.

14.3.18 The calculation of the carbon balance of a proposed wind farm provides a mechanism by which the carbon costs of a wind farm development can be weighed against the carbon savings attributable to the wind farm during its lifetime. This calculation is summarised as the length of time (in years) it will take the carbon savings to amount to the carbon costs and is referred to as the 'payback period'. This information can then inform decision makers of the viability of a wind farm development in terms of overall carbon savings. Calculations are provided for expected, best and worst-case scenarios of Development. Whilst the Development has a proposed total installed capacity up to 21.5 MW, it is considered best practice to calculate the carbon balance and carbon emissions of the Development using a specific candidate turbine in order to produce more accurate and realistic results. For the purposes of assessment, the expected scenario is based on the layout of 5 turbines and a 4.3 Mega Watt (MW) turbine with a total installed capacity of 21.5 MW. The other scenarios are based on varying assumptions regarding wind energy capacity factor, characteristics of peatland and Development land-take.

14.3.19 The data sources and assumptions used in the carbon balance calculation are detailed in Technical Appendix 2.6. The assessment was informed by peat probing, as described in Techncal Appendix 2.4.

### Effects on Environmental Receptors Sensitive to Climate Change

14.3.20 This section of the CCIA identifies where climate change has the potential to significantly impact the findings of assessments undertaken and reported elsewhere in this EIA Report. Reference is made to the specific assessment chapters, where the baseline conditions and sensitivity of receptors are discussed, assessments are not repeated.

## Methodology for the Assessment of Effects

14.3.21 The significance of the potential effects of the Development has been classified by professional consideration of the sensitivity (value and resilience) of the receptor and the magnitude of the potential effect, taking into account uncertainty, to determine whether effects are significant under EIA Regulations. This is based on the professional judgement of the assessor.

### Sensitivity of Receptors

14.3.22 The sensitivity of the baseline conditions, including the importance of environmental features on or near to the Site or the sensitivity of potentially affected receptors, will be assessed in line with best practice guidance, legislation, statutory designations and / or professional judgement. Table 14.2 details the framework for determining the sensitivity of receptors.

**Table 14.2: Framework for Determining Sensitivity of Receptors**

| Sensitivity of Receptor | Definition |
|---|---|
| Very High | The receptor has little or no ability to absorb change without fundamentally altering its present character, is of very high environmental value, or of international importance. |
| High | The receptor has low ability to absorb change without fundamentally altering its present character, is of high environmental value, or of national importance. |
| Medium | The receptor has moderate capacity to absorb change without significantly altering its present character, has some environmental value, or is of regional (e.g. Highland-wide) importance |
| Low | The receptor is tolerant of change without detriment or benefit to its character, is low environmental value, or is of local importance. |
| Negligible | The receptor is resistant to change and is of little environmental value. |

### Magnitude of Change

14.3.23 The magnitude of change will be identified through consideration of the Development, the degree of change to baseline conditions predicted as a result of the Development, the duration and reversibility of an effect and professional judgement, best practice guidance and legislation.

14.3.24 The criteria for assessing the magnitude of change are presented in Table 14.3.

**Table 14.3: Framework for Determining Magnitude of Change**

| Magnitude of Change | Definition |
|---|---|
| High | A fundamental change (positive or negative) to the baseline condition of the receptor, leading to total loss or major alteration of character. |
| Medium | A material change (positive or negative) leading to partial loss or alteration of character. |
| Low | A slight, detectable, alteration of the baseline condition which may be positive or negative. |
| Negligible | A barely distinguishable change from baseline conditions. |

### Significance of Effect

14.3.25 The sensitivity of the asset and the magnitude of the predicted change will be used as a guide, in addition to professional judgement, to predict the significance of the likely effects.

14.3.26 The IEMA guidelines for the CCIA state the following with regards to the assessment of significance:

*"This guidance is not proposing changes to the significance criteria used in the EIA process. However, the susceptibility or resilience of the receptor to climate change must be considered as well as the value of the receptor.*

*Therefore, a high-value receptor that has very little resilience to changes in climatic conditions should be considered more likely to be significantly affected than a high-value receptor that is very resilient to changes in climatic conditions.*

*The uncertainty of the combined effect needs to be taken into account. If uncertainty about how a receptor will adapt to a changing climate is high, then it is recommended that a conservative threshold of significance is adopted within the evaluation".*

14.3.27 Table 14.4 outlines the framework for determining significant effects, which is supported heavily by professional judgement.

**Table 14.4: Framework for Assessment of the Significance of Effects**

| Magnitude of Change | Sensitivity of Resource or Receptor | | | | |
|---|---|---|---|---|---|
| | Very High | High | Medium | Low | Negligible |
| High | Major | Major | Moderate | Moderate | Minor |
| Medium | Major | Moderate | Moderate | Minor | Negligible |
| Low | Moderate | Moderate | Minor | Negligible | Negligible |
| Negligible | Minor | Minor | Negligible | Negligible | Negligible |

14.3.28 Those predicted to be of major or moderate significance are considered to be 'significant' in the context of the EIA Regulations, and are shaded in light grey in the above table.

14.3.29 The categories of effect are described in Table 14.5

**Table 14.5: Categories of Effect**

| Magnitude of Change | Definition |
|---|---|
| Major | A fundamental change to location, environment, species or sensitive receptor. |
| Moderate | A material, but non-fundamental change to a location, environmental, species or sensitive receptor. |
| Minor | A detectable but non-material change to a location, environment, species or sensitive receptor. |
| Negligible | No detectable or material change to a location, environment, species or sensitive receptor. |

14.3.30 Effects assessed can be both negative and neutral. Whilst receptors may be considered "high-value", a non-material magnitude of the impact would result in any effect being considered not significant.

## Assessment Limitations

14.3.31 The climate change projections are based on global models for a range of GHG emissions scenarios and generally consider regional responses to climate change rather than local responses. This is based on best scientific knowledge at this time and judgements on datasets and future socioeconomic drivers.

14.3.32 Downscaling adds another level of uncertainty. There may be more detail, but the uncertainty of the science may be higher. As understanding of the climate system and ability to model it improves it is likely that future projections will be refined.

14.3.33 The probabilities presented and the estimated ranges are based on a set of modelling, statistical and dataset choices with expert judgement playing an important role. As some potential influences on future climate are not yet known, some choices may change as the science develops[23] .

14.3.34 In relation to wind, the UKCP18 Wind Fact sheet[24] states that local variations due to the land surface are hard to model, particularly in very exposed or sheltered locations. This can be particularly relevant in high wind speed situations where local gusts can result from small scale weather events such as thunderstorms.

[23] Lowe et al (2018) UKCP18 Science Overview Report

[24] UKCP18 (2019) Factsheet: Wind [Online]. Available at: https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/ukcp/ukcp18-fact-sheetwind.pdf (Accessed on 19/04/2022)

### Embedded Mitigation

14.3.35 As detailed in **Chapter 2 – Proposed Developed**, the design of the Development has been driven by the key objective of capturing the maximum energy possible, while balancing environmental and technical constraints. The design choices made as a consequence of the key constraints are considered to be mitigation which is 'embedded' in the design; the following are most relevant for the CCIA:

- Development infrastructure is built to withstand strong windspeeds and to harness energy;
- Turbine spacing is sufficient to reduce turbulence effects on turbines downwind;
- The turbines are located to maximise energy generation while minimising environmental impacts;
- The Development design aims to reduce impacts on peat – e.g. through use of existing track layout where possible and avoiding areas of deep peat;
- Implementation of a CEMP, PMP etc. during construction to minimise environmental impacts and peat disturbance; and
- Buffers from watercourses incorporated in layout design, protecting water quality and also protecting Development infrastructure from flooding

## 14.4 Baseline Conditions

14.4.1 The State of the UK Climate 2018[25] provides the latest report on observed climate data for UK. Key findings are as follows:

- The most recent decade 2010-2019 has been on average 0.3°C warmer than the 1981-2010 average and 0.9°C warmer than 1961-1990;
- February 2019 was the second warmest February since 1884 and the warmest February for daily maximum temperature; The years 2014 through 2019 all rank among Europe's six warmest years on record;
    - The most recent decade (2010–2019) has been on average 1% wetter than 1981–2010 and 5% wetter than 1961–1990 for the UK overall. Six of the ten wettest years for the UK in a series from 1862 have occurred since 1998;
    - 2019 UK rainfall was 107% of the 1981-2010 average and 112% of the 1961-1990 average;
    - For the most recent decade (2010–2019), UK summers have been on average 11% wetter than 1981–2010 and 12% wetter than 1961–1990;
    - 2019 was the sixth consecutive year where the number of air and ground frosts was below average; and
    - The most recent decade (2010–2019) has had 6% fewer days of air frost and 10% fewer days of ground frost compared to the 1981–2010 average, and both 16% fewer compared to 1961–1990.

14.4.2 Climate Projections show that the trends over the 21st century in the UK are towards warmer and wetter winters and hotter, drier summers, with an increase in frequency and intensity of extremes. The climate parameters considered most relevant to the assessments referenced within this Chapter are wind speed, temperature and precipitation.

### Wind Speed

14.4.3 The global projections over the UK show an increase in near surface (10 metre [m] height) wind speeds over the UK in the second half of the 21st century, in the winter season when higher wind speeds are generally experienced. The increase is modest when compared to inter-annual variability. This would be accompanied by an increase in frequency of winter storms over the UK[26]. There are no significant changes forecast in the wind speeds over the first part of the century.

14.4.4 These projections are in line with earlier findings by Pryor and Barthelmie (2010)[27] who concluded that in the near-term (i.e. until the 2050s) there will be no detectable significant change in the wind resource of northern Europe.

### Temperature

14.4.5 At a UK level, for period 2041 - 2060 projected changes to annual mean temperature (compared to 1981-2000) is projected at +1.8°C (50% probability) for RCP8.5 (unmitigated scenario). Results for the 10th to 90th percentile range are between +0.9oC to +2.7°C[28] . Key observations are that:

- Both winters and summers will be warmer, with more warming in the summer; and

[25] International Journal of Climatology, volume 39, Issue S1 (July 2019) ed. Radan Huth. Wiley
[26] UKCP18 (2018) Factsheet: Wind
[27] Pryor, S.C. and Barthelmie, R. J. (2010) Climate Change Impact on Wind Energy: A Review. Renewable and Sustainable Energy Review, 14(1): 430-437
[28] Lowe et al (2018) UKCP18 Science Overview Report November 2018 (Updated March 2019) (Table 2.2, Page 16)

- In summer, there is a pronounced north/south divide with greater increases in maximum summer temperatures over the southern UK compared to Northern Scotland.

## Precipitation

14.4.6 Rainfall patterns over the UK are not uniform and vary on regional (e.g. Highland-wide) and seasonal scales, which will continue in the future. Future changes are uncertain but point to wetter winters and drier summers in general. Drying in summer will be strongest in the South of England, whilst Northern Scotland, where the Site is situated, is associated with greatest increased precipitation in winters[29].

14.4.7 Over the UK, the changes to precipitation projected for 2041-2060 (compared to 1981- 2000) for RCP8.5 (unmitigated scenario) are:

- Winter precipitation – increase of 7%. Results for the 10th to 90th percentile range are between -5% and +21%; and
- Summer precipitation – decrease of 15%. Results for the 10th to 90th percentile range are between -31% and +0%.

## Greenhouse Gas Emissions and Renewable Energy

14.4.8 The central aim of the Paris Agreement is to strengthen the global response to the threat of climate change by keeping a global temperature rise this century well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5°C[30] .

14.4.9 A substantial reduction in greenhouse gas emissions is imperative to avoid irreversible damage caused by the impacts of climate change. “When it comes to rises in global average temperature, every fraction of a degree matters” was stated in a recent publication providing analysis for the Global Carbon Budget 2018[31]. The 2018 IPCC Special Report[32] highlighted that to limit global warming to below 1.5°C by the end of the century, emissions would need to decline by approximately 45% by 2030 and reach net zero around 2050. This is the temperature rise when a variety of increasingly severe effects are considered to occur and the IPCC identifies that rapid and far-reaching transitions are required in all sectors including energy. Action is required immediately to reduce emissions by 50% by 2030. However, figures from the Global Carbon Project report that global $CO_2$ emissions from fossil fuels and industry have increased every decade from an average of 11.4 gigatonnes of equivalent carbon dioxide ($GtCO_2$) in the 1960s to an average of 34.7$GtCO_2$ during 2009-2018. Emissions in 2018 reached a new record high of 36.6$GtCO_2$. Though global emissions in 2019 have been project to increase by an additional 6%, which is a slower growth than in the past two years.

14.4.10 The Scottish Government has introduced a number of policies aimed at reducing GHG emissions and meeting renewable energy targets set at a UK, European and International level with ambitious targets for reductions in greenhouse gas emissions. The Climate Change Bill, which amends the Climate Change (Scotland) Act 2009, was introduced to Parliament in May 2018.The Bill was passed in September 2019 and received Royal Assent in October 2019. Following the Committee on Climate Change recommendation, the Bill was amended to set a new target to cut Scottish greenhouse gas emissions to net zero by 2045, five years ahead of the target date set for the whole of the UK, with interim targets now set to cut emissions by 75% and 90% by 2030 and 2040 respectively (in relation to 1990 levels).

14.4.11 The 2nd Scottish Climate Change Adaptation Programme 2019 - 2024 was published in September 2019. This document sets out the Scottish Government’s policies and proposals for climate change adaptation, building on the 1st five-year programme. The Programme is a requirement of the Climate Change (Scotland) Act 2009.

14.4.12 Overall Scottish emissions are now 49% below 1990 levels though the Scottish Parliament’s 2030 target to reduce emissions by 75% will be extremely challenging to meet. To date much of the emissions savings have come from action in the electricity sector, with closure of Scotland’s last remaining coal-fired power station in 2016, and rapid growth in renewable generation to fill the energy gap.

14.4.13 Renewable generation capacity in Scotland has more than trebled in the last 10 years with 11.6 gigawatts (GW) of installed generation capacity across the country as of 2019[33].

[29] Lowe et al (2018) UKCP18 Science Overview Report

[30] UN Climate Change (2015) the Paris Agreement [Online] Available at: https://unfccc.int/process-andmeetings/the-paris-agreement/the-paris-agreement (Accessed 19/04/2022)

[31] Additional Analyses for Carbon Budget 2018: Emissions are still rising: ramp up the cuts by Figueres, C., C. Le Quéré, G. P. Peters, G. Whiteman, A. Mahindra, D. Guan, et al. (2018), Nature, vol 564, 27-30, 2018 [Online] Available at: http://www.globalcarbonproject.org/carbonbudget/18/publications.htm (Accessed 19/04/2022)

[32] Intergovernmental Panel on Climate Change (IPCC) (2018) Global Warming of 1.5°C: Summary for Policymakers [Online] Available at: https://www.ipcc.ch/sr15/ (Accessed 19/04/2022)

[33] Scottish Government (2019) Climate Change Plan: monitoring report 2019 [online] Available at: https://www.gov.scot/publications/climate-change-plan-monitoring-report-2019/ (Accessed 19/04/22)

14.4.14 Consequently, renewables contribution towards the total volume of electricity generated has grown from 18.5% in 2008 to 51.7% in 2017. GHG emissions from the electricity sector decreased by 83% between 1990 and 2016, with the Cities for Climate Protection (CCP) setting out policies and proposals to reduce emissions from this sector by a further 28% between 2018 and 2032, taking the overall reduction within the sector to 87% compared to 1990.

14.4.15 With the continued development of onshore wind farms, in the planning and preconstruction phases, it is anticipated that onshore wind farms will continue to make a sizeable contribution to the energy generated from renewable energy technologies within Scotland. The CCP sets out as one of the policy outcomes for this sector that from 2020 onwards, Scotland's electricity generation intensity will be less than 50 grams of carbon dioxide equivalent per kilowatt hour ($CO_2$eq/kWh), powered by a high penetration of renewables. The CCP latest figures for 2017 show intensity was 24g$CO_2$e/kWh which displays a fall of 56% since 2016[33].

## 14.5 Assessment of Potential Effects

14.5.1 As an energy asset of generation of up to 21.5 MW, the Development can be classed as an asset of regional importance therefore considered to be of medium sensitivity for the following assessments.

### Vulnerability of the Development to Climate Change

#### Wind Speed

14.5.2 As energy content of the wind varies with the cube of the average wind speed[34], small increases in wind speed can result in large increases in wind power. There is a higher risk of damage from strong winds; winds associated with major storm events can be some of the most damaging and disruptive events for the UK with implications for infrastructure.

14.5.3 Wind turbines are designed to capture wind energy, and built to withstand extreme conditions associated with exposed locations. However, wind energy developments could potentially be sensitive to significant changes in variables, including atmospheric circulation and land cover changes as well as changes in the frequency of extreme events (e.g. storms), which could damage wind turbines or alter their efficiency.

14.5.4 Over the lifetime of the Development, UKCP18 states that there are no compelling trends in storminess (as a result of maximum gust speeds) over the last four decades and for wind speed change there is little long-term trend evident. Therefore, the natural variability which exists in wind speed, and subsequently storms, will have a negligible magnitude of change on energy projections and on the efficient operation of the Development.

14.5.5 Given the negligible magnitude of the change and the medium sensitivity of the Development as a receptor, the effect is assessed as negligible and **not significant** in terms of the EIA Regulations predicted as a result of increased wind speeds during the operational phase of the Development.

#### Temperature

14.5.6 Wind energy developments are sensitive to cold weather events and ice forming on blades, although in the UK this has rarely been an issue and where icing does occur the turbines' own vibration sensors are likely to detect the imbalance and inhibit the operation of the machines[35]. With the projected trend to warmer conditions, the predicted magnitude of change is negligible. The effect is assessed as negligible and therefore **not significant** in terms of the EIA Regulations.

#### Precipitation

14.5.7 The risk from increased precipitation is the potential for flooding, particularly if it is associated with extreme events. For the Development, this increases the risk for potential destruction/disruption of infrastructure, e.g. loss of watercourse crossing, flooding to control building. The Development has three watercourse crossing and buffers from watercourses are embedded in the design of the Development, as are best practice drainage design and a CEMP as detailed Technical Appendix 2.1). As such, the Development has medium sensitivity to increase in precipitation.

14.5.8 UKCP18 shows that over the winter season, precipitation in this area of Scotland is projected to increase by up to 30% at the medium estimate. Given the embedded mitigation, the magnitude of change on the operation of the Development is assessed as low and the overall effect is minor and therefore, **not significant**.

### Influences of the Development on Climate Change

#### Carbon Savings

[34] Energy Savings Trust (2019) Wind Turbine: Measuring Wind Speed [Online] Available at: https://www.energysavingtrust.org.uk/sites/default/files/reports/wind%20turbine_measuring%20wind%20speed.pdf (Accessed on 19/04/22)

[35] IEA Wind (2018) IEA Wind TCP Task 19 INTERNATIONAL RECOMMENDATIONS for Ice Fall and Ice Throw Risk Assessments [Online] Available at: https://iea-wind.org/task19/ice-throw/ (Accessed 19/04/2022)

14.5.9 Every unit of electricity produced by a wind farm development displaces a unit of electricity which would otherwise have been produced by a conventional (coal or gas) power station, and therefore presents carbon savings.

14.5.10 The electricity produced from the wind farm is assumed to substitute energy production by entirely coal-fired generation, or a mix of fossil fuels, or the national grid mix of energy generation. A renewable energy development would have a maximum potential to save carbon emissions when substituting coal fired generation, which is a possibility if coal is at the bottom of the cost merit order of generation.

14.5.11 However, it is not appropriate to define the electricity source for which this renewable electricity project would substitute, due to uncertainty in future grid mix. For this reason, carbon emission savings are calculated for each scenario in the carbon calculator (Technical Appendix A15.1).

14.5.12 As detailed in Section 14.3.16, whilst the Development has a proposed installed capacity of up to 21.5 MW, for the purpose of this assessment, a 4.3 MW candidate turbine has been selected. With an installed capacity of 21.5 MW (5 x 4.3 MW turbines) and an anticipated capacity factor of 49.7%, the amount of electricity produced by the Development in the expected scenario has been estimated to be approximately 91.429 Giga Watt hours (GWh) annually, equating to powering the equivalent of approximately 12,182 Scottish homes annually, based on the latest available figures from 2018[36].

14.5.13 This equates to displacing approximately 21,925 tonnes of fossil fuel mix generation equivalent $CO_2$ emissions, based on DUKES emission factors[37], over the operational life which is a beneficial environmental effect. The projected change in wind speeds as a result of climate change over the operational phase of the Development is considered to be non-material for the purposes of this assessment.

**Table 14.6: Carbon Savings for the Development (Expected scenario)**

| Type of Generation | Expected $CO_2$ Saving (t $CO_2$yr-1) |
|---|---|
| Coal fired electricity generation | 43,729 |
| Grid mix electricity generation | 16,746 |
| Fossil fuel mix electricity generation | 21,925 |

**Carbon Losses**

14.5.14 The manufacturing, construction and installation of the wind turbines on the Site will have an associated carbon cost, and carbon losses are also generated by the requirement for extra capacity to back up wind power generation. Carbon losses associated with reduced carbon fixing potential and loss of soil organic matter occurs through excavation of peat for construction and drainage effects.

14.5.15 Organic soils (peatlands) in Scotland act as carbon sinks, whereby they absorb $CO_2$ then they release it due to land use change, such as forestry. Wind farm developments on peatlands may result in an adverse impact on these habitats if not appropriately considered during scheme design and development. Changes to the peatland habitat through development could result in a significant effect on its ability to store carbon, potentially resulting in reduced net carbon benefits of the Development.

14.5.16 A peat depth surveys were undertaken over a series of site visits where it was established that peat was generally shallow across the Site, varying only with depth according to local topographical conditions, with pockets of deep peat situated in topographically flat areas or in the vicinity of bodies of water. There are no designations within the Site; however, two Natura 2000 Sites are located adjacent to the east of the Site; the Caithness and Sutherland Peatlands Special Protection Area (SPA)39 and Special Area of Conservation (SAC)40. The Site is also adjacent to the Caithness and Sutherland Peatlands Ramsar Site, and the East Halladale Site of Special Scientific Interest (SSSI)41 .

14.5.17 The design process sought where possible to avoid disturbance to deposits of deep peat.

14.5.18 Carbon losses for the expected scenario are summarised in Table 14.7.

[36] Department for Business, Energy & Industrial Strategy (2018) Electricity generation and supply figures for Scotland, Wales, Northern Ireland and England, 2004 to 2017 [Online] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/766072/Regional_Electricity_Generation_and_Supply.xls (Accessed 19/04/2022)

[37] 8 DUKES (2018) Digest of United Kingdom Energy Statistics 2020[Online] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/905060/DUKE S_2020_MASTER.pdff (Accessed 19/04/22)

**Table 14.7: Carbon Losses for the Development (Expected Scenario)**

| Type of Generation | t $CO_2$ Equivalent (total for wind farm lifetime) |
|---|---|
| Losses due to turbine life (e.g. manufacture, construction,decommissioning) | 18,012 |
| Losses due to back-up | 14,487 |
| Losses due to reduced carbon fixing potential | 396 |
| Losses from soil organic matter | 1,513 |
| Losses due to Dissolved Organic Carbon (DOC) and Particulate Organic Carbon (POC) leaching | 3 |
| Losses due to felling forestry | 0 |
| Total | 34,411 |

### Payback Period

14.5.19 The carbon payback period is a measurement/indicator to help assess a proposed development. The shorter the payback, the greater benefit the Development will have in displacing emissions associated with electricity generated by burning fossil fuels.

14.5.20 The payback period is calculated taking the total carbon cost (carbon losses) associated with the Development and dividing by the annual carbon gains from displaced fossil fuel power generation and any site improvements (e.g. peatland restoration).

14.5.21 The estimated payback period for the Development is 1.5 years compared to grid-mix electricity generation. In comparison to fossil fuel mix and coal-fired electricity generation, the payback period of the Development reduces to 0.8 and 0.4 years respectively. Table 14.8 below goes into further detail regarding the carbon payback period for the Development.

**Table 14.8: Payback in Years for Each Scenario in the Carbon Calculator**

| Compared to… | Expected scenario | Best case scenario | Worst case scenario |
|---|---|---|---|
| Coal fired electricity generation | 0.4 | 0.1 | 0.8 |
| Grid-mix electricity generation | 1.5 | 0.4 | 3.0 |
| Fossil fuel-mix of electricity generation | 0.8 | 0.2 | 1.7 |

14.5.22 The $CO_2$ emission savings for the operational lifetime beyond that (currently predicted as 35 years) would a net benefit of the Development to reducing climate change. This is considered a low magnitude of change, i.e. a slight, detectable, alteration of the baseline condition.

14.5.23 Given the challenge and international urgency of climate change, as identified in the recent IPCC special report, the climate is considered to have very high sensitivity to changes in GHG emissions. The Development is therefore assessed to have moderate, positive effects that is a **positive significant effect** under the EIA Regulations.

## Effects of Future Climate Change Scenario on Environmental Receptors Sensitive to Climate Change

14.5.24 The potential for environmental receptors to be impacted by the Development is assessed in this EIA Report. Of these, it is considered that ecological, ornithological, peat, geological and hydrological receptors are the most sensitive to climate change and are discussed further in Table 14.9 below.

**Table 14.9: Climate Change Effects on Environmental Receptors**

| EIA Report Chapter | Receptor | Climate Change Effect | Effect on Receptor |
|---|---|---|---|
| 7 | Ecology | Temperature – up to +2.7°C<br>Shift to wetter winters and dryer summers<br>Negligible change in wind speeds | While changes in temperature could affect the composition and growth rates of plant communities and invertebrates, and hence protected species and habitats, the uncertainties are high and it is not clear that the effect of the Development on those receptors would alter substantially as a result |
| 8 | Ornithology | Temperature – up to +2.7°C<br>Shift to wetter winters and dryer summers<br>Negligible change in wind speeds | A rise in temperature has the potential to impact on habitats which in turn may affect the behaviour of bird interests. As noted above uncertainties are high and the type and significance of effects identified from the Development are not anticipated to alter as a result. |
| TA | Hydrology and Hydrogeology and Geology and Peat | Shift to wetter winters and dryer summers | Limited change to future baseline and to the identified effects of the Development. |

14.5.25 Given the relatively limited magnitude of change in climate parameters predicted over the operation of the Development, negligible changes to the baseline for environmental receptors are anticipated during this period. No further assessment is required within the aforementioned technical chapters.

14.5.26 No additional significant effects will occur as a result of climate change during the operational phase of the Development.

## 14.6 Mitigation and Residual Effects

14.6.1 As detailed in Section 14.5.19, the Development will have a positive effect due to the $CO_2$ emission savings for the operational lifetime and beyond resulting in a net benefit of the Development to reducing climate change. Any negative effects as a result of the Development are of such limited, and negligible nature, that they are not significant in terms of the EIA Regulations. As such, no mitigation is required under the EIA Regulations other than that already embedded into the Development and recommended as best practice.

14.6.2 An iterative design approach was taken for the layout of the Development to avoid siting infrastructure in deep peat, to minimise disturbance of peat soils and associated carbon losses. Further micro-siting will be informed by detailed preconstruction ground investigations. A PMP has been produced and is provided as Technical Appendix 2.2. Proposed reuses of the excavated peat are in line with the Scottish Renewables and SEPA Guidance[38] and the outline PMP demonstrates that all excavated peat can be suitably re-used on Site. Methods for handling and storing excavated peat have been described in the Outline PMP to ensure its reuse potential is maximised and any carbon losses are minimised. Monitoring of the reinstated areas will be carried out to ensure that the environmental objectives are realised.

14.6.3 The Outline PMP will be updated prior to construction once more detailed site investigation data and detailed engineering designs are available. The temporary peat storage locations will be identified in the updated PMP and will be guided by a geotechnical engineer. The updated PMP will also include detailed method statements and phasing of works, and will be agreed with SEPA and the planning authority prior to construction commencing.

14.6.4 Other mitigation measures will include the management of wind turbines to maintain operational efficiency during their lifetime. Maintenance plans for wind turbines would be developed to maximise turbine output and efficiency. Key performance indicators to monitor and track operational efficiency would be developed.

## 14.7 Cumulative Effect Assessment

14.7.1 The Scottish and UK Governments have set ambitious targets for reducing greenhouse gas emissions by 2045 and 2050 respectively. The Development, in conjunction with other renewable energy developments, will contribute to Scotland and the UK's aims to reduce carbon emissions and achieve meet its ambitious greenhouse gas emissions targets.

14.7.2 DUKES 2020 details that renewable electricity represented 33% of total UK generation in 2019, which is the first time they have accounted for more than one third of the total generation. This is driven by increased capacity specifically in offshore and onshore wind. Onshore wind was the leading renewable technology in terms of capacity, at 29.9 %.

14.7.3 The Development will contribute up to 21.5 MW of installed capacity which will contribute to increasing renewable energy generation capacity within Scotland and the UK.

14.7.4 The cumulative effect of the Development with other UK renewable energy generation is considered to be a fundamental change in the climate effects of UK energy supply and contribute to the UK's legally binding emission reduction targets. This represents a **major, positive significant effect** in terms the EIA Regulations.

## 14.8 Summary of Effects

14.8.1 Table 14.10 provides a summary of the effects detailed within this Chapter.

**Table 14.10: Summary of Effects**

| Receptor | Potential Effect | Significance of Effect | Mitigation Proposed | Residual Effect |
|---|---|---|---|---|
| **Vulnerability of Development to Climate Change** | | | | |
| Development Infrastructure and generation capacity. | Changes to generation capacity through changes in wind speed. | Negligible | None Mitigation is embedded in design. | None |
| Development Infrastructure and | Damage to infrastructure or operation | Negligible | None | None |

[38] 2 Scottish Renewables, SEPA (2012) Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and Minimisation of Waste [Online] Available at: https://www.gov.scot/Topics/Business-Industry/Energy/Energysources/19185/17852-1/CSavings/guidancepeatwaste (Accessed 20/04/22)

| | | | | |
|---|---|---|---|---|
| operational efficiency. | due to changes in temperature. | | | |
| **Influence of the Development on Climate Change** | | | | |
| Climate - average temperature predictions as linked to GHG emissions. | Reduction in GHG emissions through offsetting of existing conventional generation. | Positive significant effect Major cumulative positive effect. | None Embedded mitigation has reduced payback period and maximise positive impact. | Significant contribution cumulatively to regional emissions and renewable energy generation targets. |
| **Effects on Environmental Receptors** | | | | |
| Environmental Receptors assessed in individual chapters of EIA Report | Change to future baseline of receptors and assessment results. | Negligible<br>Little change over time period to baseline condition of receptors. | None<br>Mitigation as identified in individual assessment chapters. | None |

## 14.9 Statement of Significance

14.9.1 The predicted future climatic baseline conditions are highly unlikely to affect the operation of the Development. The Development will have a positive effect on carbon savings and a significant positive effect when considered cumulatively with Scottish renewable energy deployment. This is a positive significant effect in terms of the EIA Regulations.

14.9.2 No additional significant effects to those already identified within the EIA Report will occur as a result of climate change during the operational phase of the Development.

# 15 Schedule of Mitigation

## 15.1 Introduction

15.1.1 The purpose of this chapter is to summarise the mitigation measures proposed in each of the technical chapters to avoid, reduce, or offset impacts which would otherwise give rise to significant residual environmental effects.

15.1.2 The main aim of the design process was to 'design out' potential for environmental effects as far as possible. This chapter does not summarise 'mitigation by design'; this is summarised in Chapter 3: Design Evolution and Alternatives.

15.1.3 The majority of the pre-construction and construction phase mitigation would be delivered through the proposed Construction Environmental Management Plan (CEMP). The outline content of the proposed CEMP is provided in Technical Appendix 2.1: Outline CEMP. Further detail on specific mitigation measures to be included in the CEMP is contained in each of the technical chapters, where relevant.

15.1.4 Assessment Methodology and Significance Criteria

15.1.5 The predicted effects and mitigation measures have been compiled into Table 15.1. They are presented in the order in which they appear within this EIA.

- Landscape and Visual Amenity;
- Archaeology and Cultural Heritage;
- Ecology;
- Ornithology;
- Traffic and Transport;
- Noise;
- Socio-economic; and
- Hydrology.

## Table 15.1: Summary of Mitigation and Residual Effects

| Topic | Potential Likely Significant Effect (without mitigation) | Mitigation Measures | Effect | Timing | Residual Effect |
|---|---|---|---|---|---|
| Landscape and Visual | Construction:<br>Long term change or loss of characteristic vegetation with consequent effects on the character and amenity of the site and adjoining area.<br>Operation:<br>Effects on receptors from the visibility of the proposed turbines, access tracks and hardstanding areas, any retained off-site highway improvements established during the construction phase of the proposed development and substation/ site control building / battery energy storage facility.<br>Decommissioning:<br>Temporary disturbance of landscape fabric.<br>Temporary effects on landscape character.<br>Temporary effects on visual amenity. | Construction:<br>Mitigation through development design was implemented to avoid or minimise potential significant landscape and visual effects.<br>It is anticipated that a condition of any planning consent would secure the implementation of the proposed outline CEMP in Technical Appendix 2.1. No further mitigation measures have been identified.<br>Operation:<br>The principle source of mitigation of operational landscape and visual effects relates to the siting and design of the proposed development. Chapter 3: Design Evolution and Alternatives provides a summary of the process and findings of the design approach that was informed, amongst other environmental and technical considerations, by detailed landscape and visual analysis.<br>Decommissioning:<br>Mitigation measures adopted during the construction of the proposed development are likely to form at least part of the basis of the decommissioning of the site.<br>Mitigation measures associated with decommissioning would be agreed during the preparation of the final decommissioning plan, that would require approval of The Highland Council (THC). | Reduction and/or avoidance of significant effects. | Pre-Construction, Construction, Post-Construction and Decommissioning | Significant Residual and cumulative effects were identified for LCT 143 Farmed Lowland Plain (THC C9: Farmed Lowland Plain – North Caithness)<br>Significant in-combination effects are predicted at LCTs 141 and North Caithness and Pentland Firth (Seascape Unit 8).<br>Significant residual effects on visual amenity were predicted at Settlements: Janetstown and communities around Cairnmore Hillock/ Hill of Forss Thurso. Roads: A836; Thurso to Reay road; A9 south of Thurso; the Orkney Ferry (Stromness to Thurso); A9 (and Wick to Thurso Railway Line).<br>Significant residual effects were predicted at three viewpoints |
| Archaeology and Cultural Heritage | The assessment considers the potential for significant effects as a result of:<br>▪ Potential direct effects during construction on known or unknown buried archaeological remains.<br>▪ Potential long term indirect 'setting' effects on assets including scheduled monuments, listed buildings, Inventoried GDL and conservation areas. | Construction:<br>No significant effects are predicted and, consequently, no mitigation is required. However, the following mitigation is suggested:<br>• If required under the terms of a planning condition, the scope of any required archaeological watching brief(s) would be agreed through consultation with THC Historic Environment Team (HET) in advance of development works commencing; and<br>• The old sheepfold (8) near turbine T3 to be restored and reused to provide a viewpoint and information point, offering general information on the cultural heritage of the local area Mitigation through development design was implemented to avoid or minimise potential significant cultural heritage effects.<br>It is anticipated that a condition of any consent would secure the implementation of the proposed outline CEMP.<br>All works would be conducted by a professional archaeological organisation, and the scope of works would be detailed in one or more Written Scheme(s) of Investigation (WSI) developed in consultation with HET, acting on behalf of THC.<br>Operation:<br>The layout of the proposed development has been designed to | Reduction and/or avoidance of non-significant effects, | Pre-Construction, Construction and Decommissioning, | Significant Residual effects were identified Thing's Va broch (SM587) and Scrabster Mains broch (SM579).<br>Potential beneficial effect of a low magnitude for restoration of an old sheepfold as described in Chapter 7: Archaeology and Cultural Heritage. |

| | | | | | |
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| | | avoid or reduce as far as possible adverse effects on the settings of heritage assets, by retaining a stand-off from important heritage assets such as Thing's Va broch and using the topography to provide a degree of visual screening of the on-site infrastructure. Excluding mitigation suggested above under construction, no further mitigation is proposed.<br>Decommissioning:<br>Mitigation measures to ensure the preservation in situ of any heritage assets in close proximity to the as built layout of the Proposed Development will be adopted during any future decommissioning works. | | | |
| Ecology | Following the baseline study, potential effects on pine marten, wildcat, red squirrel, great-crested newt, otter, water vole, badger, bats, reptiles and certain habitats of local importance at the site or of low nature conservation value have been scoped out on the basis that there is no potential for significant effects on these receptors.<br>Potential effects on wet dwarf shrub heath habitat were considered, taking account of the following potential impacts:<br>▪ Direct habitat loss; and<br>▪ Indirect habitat loss due to drainage effects.<br>The pre-mitigation assessment found:<br>▪ No likely significant adverse effects for wet dwarf shrub heath habitat in relation to the construction and operation of the proposed development. | Construction:<br>No significant effects are predicted and, consequently, no mitigation is required.<br>Mitigation through development design and micro-siting was implemented to avoid or minimise potential significant ecological effects.<br>Pollution prevention measures, best practice construction methods and a CEMP will be agreed with stakeholders prior to construction.<br>The provision of a CEMP would be required as condition of consent.<br>An ECoW would oversee the construction process and would be required as condition of consent.<br>Habitat enhancement should be agreed in advance of construction as part of a condition to the planning consent.<br>Operation and Decommissioning:<br>No significant effects are predicted and, consequently, no mitigation is required. | Reduction and/or avoidance of non-significant effects. | Pre-Construction, Construction and Post-Construction. | No significant effect on wet dwarf shrub heath habitat is predicted. |
| Ornithology | In total, 18 target species for further assessment based on previous studies/SNH guidance with regard to species likely to be affected by wind farm developments were recorded during flight activity surveys, with seven species identified for further assessment following the baseline study.<br>The assessment considers the potential for significant effects associated with:<br>Direct and indirect loss of foraging habitat and/or breeding habitat;<br>▪ Disturbance to birds due to | Construction and Operation:<br>Mitigation through development design and micro-siting was implemented to avoid or minimise potential significant ornithological effects.<br>It is anticipated that a condition of any consent would secure the implementation of the proposed outline CEMP. This would include the production of a Breeding Birds Protection Plan (BBPP) which would be approved by the planning authority in consultation with NatureScot prior to implementation. In addition, an ECoW would be appointed prior to the commencement of construction to ensure all reasonable precautions are taken to avoid negative effects on ornithological interests.<br>During the operational phase in order to maintain/improve habitat suitability for breeding/wintering waders within the site, it would be proposed to retain boggy ground and create new wet | Reduction and/or avoidance of non-significant effects. | Pre-Construction, Construction and Post-Construction. | No significant adverse effects.<br>Potential beneficial effects for breeding/wintering waders through the implementation of measures described in Chapter 8: Ornithology. |

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| | construction activity;<br>▪ Impacts on commuting routes due to 'barrier effects';<br>▪ Death or injury of birds through collision with turbine blades; and<br>▪ Cumulative impacts of the proposed development in the context of other nearby wind farms (operational and consented).<br>The pre-mitigation assessment found:<br>▪ No likely significant adverse effects for any of the target species assessed.<br>▪ No significant cumulative effects were identified. | areas (including scrapes and small areas of shallow open water) within the site, but away from turbines, by measures such as blocking any active drains and ditches in selected areas. In addition, controlled grazing would be used to create a variable sward length to maintain areas of shorter vegetation for foraging whilst retaining taller vegetation for nesting. | | | |
| Traffic and Transport | Construction and Decommissioning:<br>No significant effects of severance, driver delay, pedestrian delay and amenity, accidents and safety, or dust and dirt have been identified.<br>Operation:<br>No significant effects of operational traffic on the road network have been identified. | Construction:<br>A Construction Traffic Management Plan (CTMP) is proposed to include measures to mitigate traffic impacts and effects associated with the proposed development.<br>A Liaison Officer would be appointed by the Applicant with responsibility for the CTMP. The Liaison Officer would be responsible for the implementation of the mitigation measures and would be a key point of contact with the local community and other stakeholders.<br>With regards to the movement of AIL, the following mitigation measures would be put in place:<br>• All AIL vehicles would be restricted out-with the peak hours when existing traffic flows along the route would be lower;<br>• Information on the movement of AIL would be provided to the local press to help inform the public and those directly affected by the proposed development;<br>• ▪ An escort would accompany all AIL vehicles; and<br>• ▪ Appropriate warning and information signs would be provided along the AIL delivery route.<br>The Liaison Officer would consult and work with other developers of wind farm proposals to mitigate impacts and effects through the appropriate scheduling and control of vehicle access, where appropriate. It is important to recognise that the peak periods associated with wind farm developments are not likely to overlap due to the output capacities of quarries. Scheduling of AIL deliveries would also be discussed with the Scrabster Harbour Master to mitigate impacts, where appropriate. | Reduction and/or avoidance of non-significant effects. | Pre-Construction, Construction and Post-Construction. | No significant effects. |
| Noise | Construction:<br>Significant effects of increased traffic flows and activities associated with the peak of construction activities on daytime noise level criteria at one | Construction:<br>All works would be carried out in accordance with relevant EU Directives and UK Statutory Instruments that limit noise emissions from a variety of construction plant, the guidance set out in BS5228-1: 2009, and Section 72 of the Control of Pollution Act 1974. | Reduction and/or avoidance of significant effects. | Pre-Construction, Construction and Post-Construction. | No significant effects. |

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| | residential property is predicted, and significant effects on weekend noise level criteria at four residential properties are predicted.<br><br>Operation:<br>None.<br><br>Decommissioning:<br>None. | In addition:<br>• Consideration would be given to noise emissions when selecting plant and equipment to be used on site;<br>• All equipment would be maintained in good working order and fitted with the appropriate silencers, mufflers or acoustic covers where applicable;<br>• ▪ Stationary noise sources would be sited as far away as reasonably possible from residential properties and where necessary and appropriate, acoustic barriers could be used to screen them; and<br>• ▪ The movement of vehicles to and from the site would be controlled and employees instructed to ensure compliance with the noise control measures adopted.<br>Site operations would be limited to 0700-1900 Monday to Saturday except during turbine erection and commissioning or periods of emergency work. The number of activities occurring simultaneously, the location of activities or the amount of construction traffic could be controlled on Saturdays between 1300 and 1900, if necessary, to ensure that the relevant criterion of 55 dB(A) is met.<br>Construction noise would be further mitigated by the installation of acoustic barriers if required.<br>Operation:<br>Mitigation through development design was implemented to avoid or minimise potential significant noise effects.<br>Implementation of a noise management strategy to ensure that the operation of the wind turbines can be altered by changing the pitch of the wind turbine blades resulting in a trade-off between power production and noise reduction. This would provide a potential mechanism for further reducing the level of noise experienced at nearby residential properties although the acoustic assessment demonstrates that this is not required.<br>Decommissioning:<br>No specific mitigation measures are anticipated to be necessary during the decommissioning phase although general best practice methods of reducing noise, as employed during the construction phase, should be adopted as a precaution. | | | |
| Socio-economic | Construction:<br>Minor beneficial direct and indirect employment and economic benefit, minor adverse public access and recreation and negligible tourism impacts.<br>Operation:<br>Moderate beneficial direct employment and economic benefit and minor indirect employment and economic benefit, negligible significant effects on recreation and negligible public access and tourism impacts. | Construction:<br>Outdoor Access Management Plan (OAMP) has been written in line with guidance and provides information on how public access rights would be managed for the Proposed Development<br>Operation:<br>No mitigation is proposed during operation of the Proposed Development as there are no significant effects predicted.<br>Mitigation during Decommissioning<br>The OAMP provides information on how public access rights would be managed for the Proposed Development during decommissioning. | Reduction and/or avoidance of significant effects | Pre-Construction, Construction, Post-Construction and Decommissioning | No significant effects. |

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| | Decommissioning:<br>Minor beneficial direct and indirect employment and economic benefit, minor adverse effect on recreation and public access and negligible effect on tourism. | | | | |
| Hydrology | Construction, Operation and Decommissioning:<br>Through successful mitigation by design and industry good practice measures it is considered that there are no likely significant hydrological effects associated with the proposed development. | Mitigation through development design and micro-siting would be implemented to avoid or minimise potential significant effects. This includes implementing hydromorphology improvements to the drain that access track crosses towards T5 and ensuring that all T2 infrastructure will be located at least 25 m from the watercourses.<br>It is anticipated that a condition of any consent would secure the implementation of the proposed outline CEMP. Mitigation will be required to maintain shallow localised flow paths around infrastructure, indicated by the presence of M10 and M23 GWDTE habitats.<br>A drainage management plan will be submitted to SEPA as part of the CAR licence application which will detail measures for both sediment management and attenuation of runoff which require different drainage designs and will recognise the site-specific sensitivities of the site and its existing drainage network. No further mitigation measures have been identified.<br>Implementation of additional good practice measures including those listed in Technical Appendices 2.2: draft Peat Management Plan and 2.3: Peat Landslide Hazard and Risk Assessment. | Reduction and/or avoidance of non-significant effects. | Pre-Construction, Construction and Post-Construction. | No significant effects. |