North Kyle Energy Project

Environmental Impact Assessment Report
Volume 2: Main Report

September 2019

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1 Introduction

1.1.1 This Environmental Impact Assessment Report (EIAR) has been prepared on behalf of North Kyle Wind Farm Limited (NKWFL or 'the Applicant') to accompany an application for consent to construct and operate a 54-turbine wind farm at a site within the North Kyle Forest (NKF), approximately 5.5 km east of Patna, 6 km west of New Cumnock and 2.5 km south of Skares. The site location is shown in Figure 1.1.

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

- Figure 1.1: Site Location;
- Technical Appendix 1.1: Consultation Register;
- Technical Appendix 1.2: Technical Team.

1.1.3 Figures and technical appendices are referenced in the Main Report where relevant.

1.1.4 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 EIAR

1.2.1 The application is being made to Scottish Ministers through the Energy Consents Unit (ECU) under Section 36 of the Electricity Act 1989. In determining the application Scottish Ministers are required to consider the "*desirability of preserving natural beauty, of conserving flora, fauna and geological or physiographical features of special interest and of protecting sites, buildings and objects of architectural, historic or archaeological interest*". The EIAR 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.

1.2.2 The EIAR has been prepared to accompany the application, in accordance with the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 ('the EIA Regulations'). An EIAR 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*."

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 proposals and the potential for significant environmental effects, this is an EIA development.

1.2.4 Each of the technical chapters of the EIAR 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 Documents of the Application

1.3.1 The Application is accompanied by the following documents that do not form part of the EIAR:

- Planning Statement;
- Socio- Economic and Tourism Impact Assessment;
- Design and Access Statement;
- Pre-Application Consultation Report;
- Regeneration and Enhancement Activities Statement[1]; and
- Cover Letter, confirming deposit locations for the EIAR.

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 development are summarised below.

Scoping

1.4.2 The Applicant submitted a request for a Scoping Opinion from the Scottish Ministers in March 2018. This request was accompanied by a Scoping Report, prepared by the Applicant, which set out a summary of the proposals, identified the likely significant environmental effects, and summarised the proposed scope of the EIA. The Scoping Report was simultaneously issued to a list of statutory and non-statutory consultees.

1.4.3 A Scoping Opinion was received from the Energy Consents Unit (ECU) on 14th June 2018. The contents of this and other consultation responses received are summarised in Technical Appendix 1.1: Consultation Register (EIAR Volume 4), along with a list of all bodies consulted during the scoping exercise.

Consultation

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

- Wednesday 13th June 2018 at New Cumnock Town Hall;
- Thursday 14th June 2018 at Dalmellington Community Centre; and
- Friday 15th June 2018 at Ochiltree Community Hub.

1.4.5 In addition, the Applicant contacted local community councils (CC) including Dalmellington CC; New Cumnock CC; Ochiltree CC; Drongan, Rankinston and Stair CC; Cumnock CC; and Netherthird and District CC. All of the CCs were first contacted about the proposal in January 2018, by WordsHQ, on behalf of the Applicant.

1.4.6 Once the project entered the public domain, the Applicant embarked on various meetings with the surrounding community groups, a summary of which can be found in the Table 1.1 below.

[1] The Regeneration and Enhancement Activities Statement describes how the proposed development could uniquely assist (directly and indirectly) in regeneration of the local area through the restoration of abandoned surface coal mining areas within the site. Except where works are included in the project description at Chapter 2 of this EIAR the restoration opportunities described in the report do not themselves form part of the proposed development and have not been assessed within this EIAR.

At each meeting the project was introduced, feedback was received, and contact details were provided. The EIA Scoping Report was issued to the same community groups in April 2018.

1.4.7 The Applicant's representatives met with Jeane Freeman MSP on February 5, 2018, at her Constituency Office in Cumnock. This was a general introduction and discussion of the proposed development, including background and a display of the proposed turbine layout.

1.4.8 The Applicant met with the Coalfield Communities Landscape Partnership (CCLP) on April 26, 2018. Those present were representatives of WordsHQ, the Applicant, and members of the CCLP board representing East Ayrshire Council, Scottish Natural Heritage, Central Scotland Green Network Trust, East Ayrshire Leisure Trust, Forest Enterprise Scotland (now Forestry and Land Scotland) and Galloway and Southern Ayrshire Biosphere.

1.4.9 The Applicant held meetings with senior representatives of HES, RSPB Scotland and SNH in the period between July and August 2018. The Applicant also met with representatives of EAC on various occasions leading up the submission of this application.

Table 1.1: Community Council Contact

Community Council	**Meeting Date(s)**
Netherthird and District Community Council	Despite several emails, there was no resolution to our invitation to meet.
Dalmellington Community Council	August 16, 2018 (this was a joint meeting with Dalmellington Community Action Group and Dalmellington CC). An informal update was provided to Action Group Dalmellington and Dalmellington CC representatives on August 19, 2019. An informal update was given on 19 August 2019 to a group which included CC members and other local interest groups.
Drongan, Rankinston and Stair Community Council	As well as emailing, a hand delivered letter of introduction was posted on March 27, 2018. There was no resolution to our invitation to meet.
New Cumnock Community Council	We contacted the CC on January 27, 2018, and we were redirected to the New Cumnock Business Group. We met with the Group on May 10, 2018. A follow-up meeting was held on August 16, 2018. The Applicant continues to engage with various members of the New Cumnock Development Trust..
Ochiltree & Skares Community Council	Meetings were held on March 26, 2018, and again on August 16, 2018. An informal update was provided on August 19, 2019.
Patna Community Council	As well as emailing, a hand delivered letter of introduction was posted on March 27 2018. There was no resolution to our invitation to meet, but members agreed to come to the public exhibitions held in June 2018.
Cumnock Community Council	As well as emailing, we hand delivered a letter of introduction on March 27 2018 to Rothesay House in Cumnock. There was no resolution to our invitation to meet.

1.4.10 Further detail on the key issues identified through the scoping and consultation process are described in Chapter 3: Design Evolution and Alternatives (EIAR Volume 2).

Baseline Characterisation

1.4.11 Baseline characterisation is the process by which the environmental conditions now and in the future are established. The process has included a combination of desk research, site survey and empirical study and projection.

1.4.12 The environmental baseline adopted for the purposes of the EIA is stated in each of the technical assessment chapters provided in the EIAR. 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. However, potential future baseline scenarios, particularly with regard to the ongoing mining operations and mine restoration work immediately adjacent to the site are included within the assessments, where applicable.

Mitigation by Design and Consideration of Alternatives

1.4.13 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 in the development of the proposed development are set out within Chapter 3: Design Evolution and Alternatives (EIAR Volume 2).

Impact Assessment

1.4.14 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 and cumulative effects and defines the assessment methodology used and the criteria by which a significant effect is defined.

Additional Mitigation

1.4.15 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 necessary and possible, offsetting or compensatory measures are considered.

Statement of Competence

1.4.16 In accordance with regulation 5(5) of the EIA Regulations, by appointing Ramboll Environment and Health UK Limited (Ramboll) the Applicant has ensured that the EIAR has been prepared by 'competent experts'. The EIAR has been compiled and approved by professional EIAR practitioners at Ramboll, 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.

1.4.17 The project team comprises the companies presented in Table 1.2 below. CVs for the lead author of technical reports is included in Technical Appendix 1.2 (EIAR Volume 4) and each of the impact assessment chapters provides details of the relevant professional memberships of the author, code or practice followed and assessment methodology used.

Table 1.2: Project Team

Team Member	Roles & Responsibility
North Kyle Wind Farm Ltd.	Project Developer
Ramboll	EIA Project Management and Landscape and Visual Impact Assessment, Hydrology & Hydrogeology, Coal Mining Risk Assessment,
Pleydell Smithyman	Planning
MacArthur Green	Ecology, Ornithology & Peat (excluding peat slide risk)
SLR	Peat Slide Risk
CFA Archaeology	Cultural Heritage and Archaeology
WYG	Transport
Hayes McKenzie	Noise
DGA Forestry	Forestry
Biggar Economics	Socio-economics
Osprey	Aviation

1.4.18 The process and outcomes of the report are presented in a single document, known as the Environmental Impact Assessment Report (EIAR). This EIAR has been prepared to provide clear and concise information on the likely significant environmental effects associated with the proposed development. The EIAR includes descriptions of the likely significant effects, and it also describes the residual effects that remain following the implementation of mitigation. The EIAR provides environmental information, in accordance with EIA regulations, to inform the environmental impact assessment required to be carried out in respect of this application for consent for this wind farm development under s36 of the Electricity Act 1989.

1.4.19 The EIAR is submitted to:

The Scottish Ministers
Energy Consents Unit
5 Atlantic Quay
150 Broomielaw
Glasgow
G2 8LU

1.4.20 A copy has also been sent to East Ayrshire Council as Planning Authority.

1.5 Copies of the EIAR

1.5.1 An electronic version of the reports supporting the application, including the EIAR, will be available to download from http://www.brockwellenergy.com/our-projects/onshore-wind/north-kyle-application-documents/. Hard copies of the EIAR and other documentation can be viewed at the following locations:

East Ayrshire Council
Planning and Economic Development Service
East Ayrshire Council
The Opera House
8 John Finnie Street
Kilmarnock
KA1 1DD

Dalmellington Area Centre
East Ayrshire Council
Main Street
Dalmellington
KA6 7SN

New Cumnock Development Trust
21 Castle
New Cumnock
KA18 4AN

Ochiltree Community Hub
45 Main Street
Ochiltree
Cumnock
KA18 2PE

1.5.2 The full application package is available at a cost of £700 in hard copy format (including postage and packaging), or on CD-ROM at a cost of £15. A Non-Technical Summary of the EIAR is available free of charge. Copies of documents can be requested from North Kyle Wind Farm Limited using the contact details below:

- By post: Toby Taylor, Caledonian Exchange, 19a Canning Street, Edinburgh, United Kingdom, EH3 8EG
- Telephone: 07976 560218
- email toby.taylor@brockwellenergy.co.uk

1.6 Commenting on the Application

1.6.1 When the application for the proposed development is lodged with Scottish Government the Applicant will advertise the application in accordance with legislation as follows:

- in the Cumnock Chronicle for two successive weeks.
- in The Herald on one occasion.
- in the Edinburgh Gazette on one occasion.
- on the developer's application website at http://www.brockwellenergy.com/our-projects/onshore-wind/north-kyle-application-documents/

1.6.2 The Applicant will provide details of the date by when representations should be made. The ECU will invite formal representations on the proposal, which will be taken into account before any decision is reached on the application.

1.6.3 Any representations in relation to the application should be made to the Energy Consents Unit mailbox, at representations@gov.scot, via the Energy Consents website at www.energyconsents.scot or by post to The Scottish Government, Energy Consents Unit, 4th Floor, 5 Atlantic Quay, 150 Broomielaw, Glasgow, G2 8LU, 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 Development Description

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 the following technical appendices which are presented in Volume 4: Technical Appendix of the EIAR:

- Technical Appendix 2.1: Outline Construction Environmental Management Plan (CEMP);
- Technical Appendix 2.2: Watercourse Crossing Assessment;
- Technical Appendix 2.3: Preliminary Stone Extraction Assessment;
- Technical Appendix 2.4: Private Water Supply Risk Assessment;
- Technical Appendix 2.5: Draft Peat Management Plan;
- Technical Appendix 2.6: Peat Landslide Hazard and Risk Assessment;
- Technical Appendix 2.7: Carbon Balance Assessment;
- Technical Appendix 2.8: Peat Depth Survey and Information to Inform an Assessment of Blanket Mire Condition;
- Technical Appendix 2.9: Phase 2 Peat Depth and Coring Survey;
- Technical Appendix 2.10: Coal Mining Risk Assessment;
- Technical Appendix 2.11: Forestry Report;
- Technical Appendix 2.12: Outline Outdoor Access Management Plan;
- Technical Appendix 2.13: Shadow Flicker Assessment; and
- Technical Appendix 2.14: Aviation, Radar & Infrared Lighting Report.

2.1.3 Figures 2.1-2.17 are presented in Volume 3a: Figures of the EIAR and are referred to in the text where relevant. The figures are as follows:

- Figure 2.1: Indicative Areas of Disturbed Land;
- Figure 2.2: Infrastructure Layout;
- Figure 2.3: Wind Turbine Elevation;
- Figure 2.4: Typical Wind Turbine Foundations Details;
- Figure 2.5: Typical Crane Hardstanding;
- Figure 2.6a-b: Typical Access Track Details;
- Figure 2.7: Typical Substation View;
- Figure 2.8: Typical Substation Elevations;
- Figure 2.9: Typical Cable Trench;

- Figure 2.10a-c: Typical Watercrossing Detail;
- Figure 2.11: Indicative Telecoms Mast;
- Figure 2.12a-d: Indicative General Arrangements for Temporary Stone Extraction Areas;
- Figure 2.13: Temporary Satellite Construction Compound;
- Figure 2.14: Temporary Batching Plant and Construction Compound Layout;
- Figure 2.15: Temporary Access Control Compound;
- Figure 2.16a: A713 Entrance; and
- Figure 2.16b: B7046 Entrance.

2.2 Site Location

2.2.1 The proposed development site ('the site') covers an area of approximately 2,061 hectares (ha) and is located within the North Kyle Forest (NKF), East Ayrshire. It lies approximately 5.5 km east of Patna, 6 km west of New Cumnock and 2.5 km south of Skares (EIAR Volume 3a: Figure 1.1).

2.2.2 The South-West Scotland Interconnector (275 kilo Volt) overhead power line (OHL) runs through the site. The proposed turbines would be located at least 408 m either side of the transmission line, unless otherwise agreed with the transmission line operator.

2.2.3 The site and surrounding area has ongoing commercial forestry operations. It is part of the North Kyle Forest Estate managed by Forestry and Land Scotland (FLS), the Scottish Government agency responsible for managing Scotland's national forests and land. The forest is approximately 4,000 ha in size and is dominated by Sitka spruce. The forest area within the proposed site boundary is used for productive forestry with a significant portion due to be felled in the next 15 years.

2.2.4 Parts of the site and the surrounding area have been subject to extensive surface coal mining for the last few decades, with historic and active surface mine workings at House of Water, Netherton, Benbain, Chalmerston and Skares. Figure 2.1 (EIAR Volume 3a) shows the locations of these previous mine complexes, with areas of previously disturbed land and areas of land that will be disturbed in the future due to existing mining commitments together with areas of land that have not been affected by mining. Surface mining operations are continuing at House of Water; it is understood that these operations are likely to continue through to 2021.

2.2.5 The areas defined by the Coal Authority as surface mining (essentially similar to the 'disturbed land' are based on GIS records and related information provided by Pleydell Smithyman from previous surface mine operators) are associated with the more recent surface mining and are located in the areas where coal seams are concentrated. The extents of surface mining from the Coal Authority records are not entirely consistent with the information provided by previous surface mine operators. It is considered that within the extents of the site, the information provided by mine operators provides a more accurate (site level of detail) record of previous surface mining based on topographic survey record and aerial photography, and this information is presented in Figure 2.1. Parts of the previous mine areas have been restored and rehabilitated as required by previous planning permissions across the various mined areas. However, due to the well documented liquidation of previous coal operators, some areas of the site are highly disturbed and in a state of abandonment, with no prospect of full restoration due to insufficient bonding being in place to fund delivery of restoration.

Several of these areas comprise deep, water-filled voids with steep banks and a lack of topsoil meaning there is little vegetation of note.

2.2.6 An extensive network of forest rides and coal haulage roads exist throughout the site that allow for internal access. The Kyle Forest Haul Road (KFHR) is a private road that links various surface mine sites. The KFHR benefits from its own planning permission to remain in perpetuity and is also subject to a 35-year agreement with FLS.

2.2.7 There is currently limited public access to the site due to the previous surface mine operations and ongoing commercial forestry operations.

2.2.8 A network of watercourses run throughout the site including upper reaches of the River Nith, Beoch Lane and Old March Burn in the south of the site, Black Water and Blueboots Burn in the north and Water of Coyle and Head Mark Lane in the west.

2.3 Project Description

2.3.1 The proposed development comprises 54 horizontal axis turbines, each up to a maximum of 149.9 m to tip height with a total installed capacity of over 50 MW. Key elements of the proposed development include associated access tracks, crane hard standings, substation compounds and underground cabling. During construction and commissioning there would be a number of temporary works including stone extraction areas, concrete batching plant, construction compounds and welfare facilities. The layout of the proposed development is shown in Figure 2.2 (EIAR Volume 3a). The maximum wind turbine elevations are presented on Figure 2.3 (EIAR Volume 3a).

2.3.2 Permission is sought for the proposed development comprising:

- 54 three-bladed horizontal axis wind turbines, with a maximum ground to tip height of up to 149.9 m (EIAR Volume 3a: Figure 2.3);
- Associated transformer within kiosk adjacent to each turbine (if transformer not housed within the turbine);
- Associated turbine foundations (EIAR Volume 3a: Figure 2.4);
- Associated crane hardstanding area at each turbine base with a maximum permanent area of 2,187.5 m^2 at each turbine (EIAR Volume 3a: Figure 2.5);
- A total of approximately 46 km of track of which 29 km would be new on-site access track (EIAR Volume 3a: Figure 2.6);
- Three substation compounds (EIAR Volume 3a: Figure 2.7 and Figure 2.8);
- Underground cabling linking the turbines with the substation (EIAR Volume 3a: Figure 2.9);
- 31 watercourse crossings. The indicative crossing arrangements are presented on Figure 2.10 (EIAR Volume 3a);
- One telecommunication mast (EIAR Volume 3a: Figure 2.11);
- Search areas for up to four temporary stone extraction areas, with a total maximum search area of 88,000 m^2 and a predicted extraction volume of 520,000 m^3 identified (EIAR Volume 3a: Figure 2.12);
- Up to four temporary site construction compounds. One satellite construction compound (5,000 m^2) (EIAR Volume 3a: Figure 2.13), two main construction compounds with

concrete batching plants (15,000 m^2) (EIAR Volume 3a: Figure 2.14), and one access control compound (300 m^2) (EIAR Volume 3a: Figure 2.15);

- Three site entrances (EIAR Volume 3a: Figure 2.16);
- Forestry felling and restocking (EIAR Volume 4: Technical Appendix 2.11: Forestry Report);
- Associated ancillary works;
- Engineering operations this includes for example turbine foundations, access tracks, and peat excavation and restoration work.

Site Layout and Flexibility

2.3.3 A plan is provided of the proposed development showing the positions of the turbines, access tracks, hard standing areas, substation compounds and indicative stone extraction areas in Figure 2.2 (EIAR Volume 3a). The turbine coordinates of the proposed turbines are set out in Table 2.1.

Table 2.1: Turbine Co-ordinates

Turbine ID	Easting	Northing
1	255166	612381
2	254788	611807
3	254632	612390
4	254215	613370
5	253722	613001
6	254054	612394
7	254234	611892
8	253789	611370
9	253634	611903
10	253317	611007
11	253139	611451
12	253120	612033
13	252893	612484
14	252643	612926
15	253168	613072
16	253388	613754
17	252968	614065
18	252610	614415
19	252798	613478
20	252386	613883
21	251959	614176
22	251585	614507
23	251077	614351
24	251347	614000
25	251851	613588
26	252244	613300

Table 2.1: Turbine Co-ordinates		
Turbine ID	**Easting**	**Northing**
27	251449	613073
28	251263	613489
29	250397	613633
30	250273	613254
31	250538	612984
32	250479	612556
33	249835	612776
34	250026	612289
35	249420	612247
36	249055	611721
37	249780	611759
38	250299	611807
39	250487	611237
40	249943	611313
41	249330	611290
42	248691	611201
43	248330	610679
44	248918	610760
45	250004	610815
46	250660	610775
47	250416	610295
48	249829	610193
49	249313	610311
50	248678	610254
51	248855	609723
52	249387	609660
53	250055	609724
54	249657	609229

2.3.4 Although the design process seeks to combine environmental and economic requirements with the best data available at the time, the Applicant requests some flexibility, where necessary, in micrositing the exact positions of the turbines and routes of on-site access tracks and associated infrastructure (100 m deviation in plan from the indicative design[1]). This would allow the accommodation of possible variations in ground conditions across the development 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 should not encroach into environmentally constrained areas and would require approval by the Ecological Clerk of Works prior to any work taking place.

[1] There is a 100 m micrositing allowance for the infrastructure associated with the proposed development. However, this allowance would not encroach within the identified constraints buffers.

Therefore, 100 m flexibility in turbine and infrastructure positioning would help mitigate any potential environmental effects.

Permanent Land Take

2.3.5 The site area is approximately 2,061 ha (EIAR Volume 3a: Figure 1.1). Within this area the permanent land take would be limited to the wind turbine plinths and paths, access tracks, permanent crane hardstandings, substation hardstandings which account collectively for about 2% of the total area within the site boundary.

2.3.6 The turbine foundation (EIAR Volume 3a: Figure 2.4) is made up of a central excavation of approximately 25 m diameter and an approximate depth of 3 m – 4 m subject to prevailing ground conditions. Sloping batters would increase the excavated area to approximately 33 m diameter at ground level.

2.3.7 Each turbine requires a crane hardstanding to facilitate construction and maintenance. At each turbine there would be a 2,187.5 m^2 permanent hardstanding (EIAR Volume 3a: Figure 2.5).

2.3.8 Following completion of the turbine installation, the permanent hardstanding remaining would be approximately 2,187.5 m^2 at each turbine location and a 2 m wide maintenance track/path around the base of the turbine (EIAR Volume 3a: Figure 2.4). The completed foundation would be engineered backfill covered with soil; the foundations would be approximately 2.5 m - 1.5 m deep, leaving only the concrete plinth exposed at ground level to which the steel tower would be attached.

2.3.9 The proposed development would result in the construction of approximately 29 km of new track. The required running width of the track would be typically a minimum of 5 m on straight sections, with 1 m – 2 m wide shoulders on each side. Tracks would be wider on bends. Typical access track details are presented on Figure 2.6 (EIAR Volume 3a). The total permanent land take area for the new tracks would be approximately 274,000 m^2, which includes the hardstanding area for turning heads.

2.3.10 Each substation compound would take up an area of approximately 4,000 m^2 (40 m x 100 m) (EIAR Volume 3a: Figure 2.7). The substation building would require an approximate area of 700 m^2 within the substation compound.

2.3.11 One telecommunication mast is proposed and would take up an area of approximately 10 m^2 (EIAR Volume 3a: Figure 2.11).

Temporary Land Take

2.3.12 The excavation area around each turbine could be up to 850 m^2 and would be temporary. In addition to the permanent crane pads and laydown areas, an additional 60 m^2 of temporary hardstanding for blade laydown areas during the construction phase would be required.

2.3.13 The temporary satellite construction compound would require a hardstanding area of approximately 5,000 m^2 (100 m x 50 m), which allows area for staff parking, welfare and plant and material storage. This area would be re-vegetated after construction is complete (EIAR Volume 3a: Figure 2.13).

2.3.14 The temporary combined concrete batching plant and construction compounds would require a hardstanding area of approximately 15,000 m^2 (100 m x 150 m) (EIAR Volume 3a: Figure 2.14).

2.3.15 The temporary access control compound, located in the northwest of the site, would require a hardstanding area of approximately 300 m^2 (30 m x 10 m), this would accommodate a welfare unit with staff parking (EIAR Volume 3a: Figure 2.15).

2.3.16 Ancillary excavation works and material storage around other parts of the proposed 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 this EIAR.

2.3.17 The area of temporary and permanent land take associated with the proposed development is presented in Table 2.2.

Table 2.2: Summary of Temporary and Permanent Land Take

Energy Project Element	Temporary (m^2)	Permanent (m^2)
Turbines, Crane Pads and Laydown Areas	77382.44	143316.96
Telecommunication Mast	0	25.00
On-site Access Tracks (New)	263921.66	152197.50
On-site Access Tracks (Existing)	156509.08	82695.27
Substations	0	12008.29
Construction Compounds	35379.61	0
Total Land Take	533192.80	390243.02

Wind Turbines

2.3.18 The wind turbine industry is constantly evolving; designs continue to improve both 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 development has not yet been made. The most suitable machine would be chosen before construction, with an overall height limit of up to 149.9 m to blade tip as assessed in this EIAR.

2.3.19 For acoustic assessment purposes, the most suitable candidate turbine available in the market place (4.2 MW nominal capacity[2] and with an overall height to blade tip of 149.9 m) has been assumed. Exact tower and blade dimensions vary marginally between manufacturers, but suitable turbines are produced by Senvion, Nordex, GE and Vestas amongst others. A diagram of a typical 149.9 m tip height turbine is given in Figure 2.3 (EIAR Volume 3a).

2.3.20 The colour and finish of the wind turbine, blades, nacelles and towers would be agreed with EAC; a simple pale colour with a semi-matt finish is suggested for the turbines.

2.3.21 Turbines normally rotate clockwise when viewed from the front, although this can vary between models. The computerised control system within each turbine continuously monitors the wind direction and instructs the turbine to turn (yaw) to face into the wind to maximise

[2] For the purpose of this application for consent, it is assumed that the 54 turbines would each have a capacity of 4.2 MW giving a total installed capacity of 226.8 MW. It is possible that turbines with a different capacity, giving a different total installed capacity, could be used if they are available at the time at which the proposed development is constructed..

the amount of energy that is captured. The turbines will all rotate in the same direction and typically begin generating automatically at a wind speed of around 3 to 4 metres per second (m/s) and have a shutdown wind speed of about 25 m/s.

2.3.22 Following consultation with the Ministry of Defence (MoD) (Technical Appendix 1.1 and Technical Appendix 2.14), it is proposed to install infrared lighting on the turbines in a pattern that is acceptable for aviation visibility purposes. Infrared lighting allows military aircraft with night vision capabilities to detect and avoid the proposed development. Infrared lighting cannot be detected with the naked eye, thereby reducing visual effects.

2.3.23 Each turbine would have a transformer and switchgear. Depending on the final turbine choice the transformers would be either located internally (contained within the nacelle or tower base) or externally adjacent to the base of the turbine Figure 2.4 (EIAR Volume 3a). The transformer's function is to raise the generation voltage from approximately 600 volts to the higher transmission level of 33 kV that is required to transport the electricity around the proposed development to the substations.

Turbine Foundations and Hardstanding

2.3.24 The wind turbines would be erected on steel reinforced concrete foundations. There are a number of base solutions which could be suitable for this site and it is anticipated that the foundations would be of gravity base design or piled foundation design, where ground conditions require. Final base designs would be determined after a full geotechnical evaluation of each turbine location. Figure 2.4 (EIAR Volume 3a) provides an illustration of the construction of a typical wind turbine foundation.

2.3.25 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 2,187.5 m² (EIAR Volume 3a: Figure 2.5) adjacent to the turbine position where the main turbine erection crane would be located. The other areas, totalling 60 m², would be temporary and used to assist turbine erection. The hardstanding would be constructed using the same method as the excavated access tracks. This involves the current surface being replaced with hardcore to around the original ground level.

2.3.26 After construction operations are complete, the temporary crane pad areas shown on Figure 2.5 would be reinstated (EIAR Volume 3a). There would be a requirement to use cranes on occasion during the operational phase of the proposed development and so the main crane hardstanding (2,187.5 m²) would be retained to ease maintenance activities. This approach complies with best practice guidance[3] which recommends crane hardstandings should be left uncovered for the lifetime of a wind farm.

2.3.27 The layout of the proposed development has aimed to avoid placing the turbine foundations and crane hardstandings in any areas of highly dependent Groundwater Dependent Terrestrial Ecosystems (GWDTE). Where this has not been possible, mitigation methods have been identified and are reported in Technical Appendix 7.1: National Vegetation Classification & Habitats Survey Report (Volume 4). For example, where required, proposed mitigation measures include culverts under the track to maintain flow paths upgradient to downgradient of the track at certain locations. Furthermore, cut-off drains around T22 have been recommended to maintain local hydrological connectivity to GWDTE immediately downgradient.

[3] SNH, Scottish Renewables, SEPA and the Forestry Commission Scotland Version 3 (September 2015) "Good Practice during Wind Farm Construction"

2.3.28 No infrastructure, with the exception of watercourse crossings, would be within 50 m of a watercourse buffer[1]. The only exception to this is T12 where the temporary blade finger lay down areas encroach within the watercourse buffer and T11 where the crane pad foundation slightly encroaches into the watercourse buffer. The topography in this area would mean that no excavation works would be required. In addition, the works would be temporary and undertaken under the appropriate SEPA licence.

Substations

2.3.29 The proposed development would require three substations, each substation would require an external compound to accommodate electrical infrastructure. The locations of the substations are presented on Figure 2.2 (EIAR Volume 3a).

2.3.30 The proposed development would be connected to the transmission network operator's substation via the proposed development's substations at 33 kv. In order to transform the 33 kv power supplied by the proposed development's array cables, a 33 kv substation would be constructed. The substation would comprise one building and compound which would incorporate switchgear, control systems, storage and welfare (e.g. substation would typically measure 20 m x 35 m x 6.5 m high). These elements would be contained in a single compound area as detailed in Figures 2.7 and 2.8 (EIAR Volume 3a).

2.3.31 The compound area containing the above described elements would measure 40 m x 100 m. The compound area would provide staff parking and would be illuminated by downwards pointing passive infra-red (PIR) activated lighting. Electrical equipment would be guarded by palisade fencing to protect the general public and workforce.

2.3.32 There is a preference to source water supply for the buildings locally, where possible. This could be through ground water supply or alternatively it could be sourced from a rain water harvesting system. This would collect rain water from the roof of the substation via a modified drain pipe system and feed into a storage tank either within the 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.

2.3.33 The storage tank would supply raw / untreated water to the toilet and water via a UV filter to the hand basin. If an extended period of low rainfall occurs, water would be transported to the site in small tanks, as required.

2.3.34 Following an assessment of foul treatment options through a review of Guidance for Pollution Prevention, it was determined that both the toilet, wash hand basin and sink should drain to a small package treatment plant or septic tank located adjacent to the substation, which would follow the Controlled Activities Regulations (CAR) and be constructed and located in accordance with the relevant Building Standards.

2.3.35 A permanent external waste and recycling storage area would be required within the substation compounds. The area would consist of a concrete plinth typically 7.5 m x 5 m surrounded with a palisade fence and double gate.

On-site Electrical Cabling

2.3.36 Each turbine would be connected to a substation by underground cable (EIAR Volume 3a: Figure 2.9). Within the site the cables would be likely to follow the on-site tracks.

Connection to Electricity Grid

2.3.37 The proposed development benefits from a grid connection agreement with National Grid Electricity System Operator Limited. The proposed development would connect to the New Cumnock Substation to the southeast of the site (NGR NS 51868 08078) via an underground cable.

Access Tracks

2.3.38 Typical access track designs are shown in Figure 2.6 (EIAR Volume 3a). This figure shows the use of floating and excavated tracks.

2.3.39 The on-site access track layout has been designed to minimise environmental disturbance and land take by wherever possible following a route through shallower areas of peat if present, areas of slope below 11% and avoiding or minimising areas of identified environmental constraints, as set out in Technical Appendices 2.6: Peat Landslide Hazard and Risk Assessment, 2.8: Peat Depth Survey & Information to Inform an Assessment of Blanket Mire Condition, and 2.9: Phase 2 Peat Depth and Coring Survey. New tracks are proposed to access the various turbine locations totalling approximately 29 km in length. Also, approximately 17 km of existing tracks constructed as part of the surface coal mining and forestry works would be utilised to reduce the need for new track construction.

2.3.40 Where the track would be required to cross an area of peat and topsoil greater than 1 m thick over an appreciable distance, a 'floating road' construction would be used where practicable. A layer of geotextile reinforcement would be placed directly onto the route of the track. The track would then be built up on the geotextile by laying and compacting stone up to a thickness of approximately 500 mm - 1000 mm, the exact depth being dependent on ground conditions (EIAR Volume 3a: Figure 2.6).

2.3.41 The use of 'floating roads' in areas of deep peat eliminates the need for excavation and minimises effects on ecology and disruption to existing water paths and allows for some filtration. Approximately 20% of the on-site tracks could be constructed as floating track.

2.3.42 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 and the track (approximately 300 mm - 500 mm thick) would be constructed on the subsoil. The upper topsoil layer, together with turf, would be stored separately from the rest of the subsoil in bunds adjacent to, or near to the tracks, where appropriate for later reinstatement.

2.3.43 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 2.6 (EIAR Volume 3a).

2.3.44 The track layout has been carefully designed to minimise the number of watercourse crossings, which are discussed in the section below.

Watercourse Crossings

2.3.45 As noted above, the number of watercourses crossed has been minimised through site design. Nevertheless, there would be a requirement for 31 crossings of watercourses as identified on 1:25k mapping and House of Water Final Restoration Plan. Of these, there are 10 locations where a watercourse would be crossed by a new floating road and nine by a new road of typical construction. There are seven locations where a watercourse is crossed by an existing haul road which would require minimal upgrades, and there are five locations where a watercourse is crossed by an existing forestry road which would require upgrading.

2.3.46 Most of the new crossings are likely to be achieved by culverting. It is expected that several smaller, unmapped crossings would be required, and these would be crossed using simple culverts. An example of the typical watercourse crossing design, which could be applied to some of these smaller unmapped watercourses, is shown in Figure 2.10 (EIAR Volume 3a).

2.3.47 The detailed design would be agreed with SEPA prior to construction and would be dealt with by registration under The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) (CAR) and Water Environment (Miscellaneous) (Scotland) Regulations 2017. The CAR requirements for the watercourse crossings are presented in Technical Appendix 2.2.

2.3.48 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 would not disconnect the watercourses at times of low flow and that they have appropriate flood capacity.

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

2.3.50 The hydraulic requirements of all watercourse crossings would be considered and using the following guidance the watercourse crossings would be appropriately sized:

- Flood Estimation Handbook (Statistical Analysis) and Flood Studies Report (FSR) where appropriate used to determine the design flow;
- CIRIA Culvert design and operation guide (C689);
- SEPA Position Statement on Culverting of Watercourses[4] (WAT-PS-06-02);
- SEPA Supporting Guidance on Sediment Management[5] (WAT-SG-78);
- Scottish Executive (2002) River Crossings and Migratory Fish: Design Guidance (where appropriate);
- Additional factors considered in the design and orientation of watercourse crossings include:
  - use of clear span crossings in order to avoid disruption to the stream bed where stream bed width is >2 m;
  - embedment of closed culverts to allow a natural bed substrate to form;
  - crossing direction to generally be perpendicular with access road direction, therefore minimising the length of stream affected;
  - consideration of the passage of out-of-bank flood flows;
  - provision of mammal (e.g. otter/water vole) passage through the crossing structure in all flow conditions; and
  - consideration of any factors or recommendations arising out of a pre-construction habitat survey of the watercourse channel at the crossing location.

[4] SEPA, 2006, SEPA Position Statement to support the implementation of the Water Environment (Controlled Activities) (Scotland) Regulations 2005: Culverting of Watercourses.

[5] SEPA, 2012, Supporting Guidance: Sediment Management Authorisation (replacing WAT-PS-06-03).

Telecommunication Mast

2.3.51 It is proposed that there would be one telecommunication mast on site measuring up to 15 m in height (EIAR Volume 3a: Figure 2.11).

Temporary Construction Compounds

2.3.52 Four construction compounds are proposed. The satellite construction compound would measure 100 m x 50 m (EIAR Volume 3a: Figure 2.13), the two main construction compounds would measure 150 m x 100 m (EIAR Volume 3a: Figure 2.14), and the temporary access control compound measure 30 m x 10 m (EAIR Volume 3a: Figure 2.15).

2.3.53 The construction compounds would provide welfare, offices and storage facilities across the site. It is envisaged that main site offices and welfare facilities would be established at the southwest site entrance with a similar layout located to the east of the site, the remaining two acting as satellite facilities and as access control respectively. These compounds would be re-instated following completion of construction.

Temporary Stone Extraction Areas

2.3.54 There are potentially considerable sources of stone available in the existing over-widened North Kyle Forest Haul Road (NKFHR), in spoil and overburden areas and in existing overburden stores at various locations within the site and along the route of the wider NKFHR as it extends towards the former Dunstonhill surface coal mine. The preference would be to recover suitable on-site stone resources from these areas in preference to newly-won virgin materials, subject to technical and environmental appraisal of these resources and confirmation that they are suitable for the intended use. This would be informed by detailed site investigation work.

2.3.55 In the event that sufficient stone could not be obtained from these on-site sources or the material proves to be unsuitable, it is proposed that rock would be extracted from four temporary stone extraction areas on-site and would be used primarily in the construction of new tracks and hardstandings. The location of four search areas for stone extraction are shown in Figure 2.2 (EIAR Volume 3a). These areas of search are shown larger than the maximum potential area of stone working extraction and it is not anticipated that these areas would be fully exploited. The larger areas presented include space to store overburden, manage stockpiles and to provide suitable drainage and water management.

2.3.56 Areas of search are shown as the nature and quality of the underlying material would not be defined until the results of detailed pre-construction ground investigations are known. At this point, the exact extent of stone extraction area cannot be defined. Indicative temporary stone extraction working general arrangements are shown in Figure 2.12 (EIAR Volume 3a). These show indicative extraction areas to illustrate the potential works if the search areas prove suitable for stone excavation. It is not expected that all of the search areas would be utilised and, in the event that all are found to be suitable for stone extraction, the preference would be to utilise locations to minimise the haulage of stone across the site.

2.3.57 A Preliminary Stone Extraction Assessment is provided in Technical Appendix 2.3 (EIAR Volume 4). A working method would be put in place to manage topsoil or peaty topsoil removal and reuse for restoration and overburden removal and storage. Provisions for the control of surface runoff both during and post-construction and the re-vegetating of working faces post-construction would also be included.

2.3.58 Blasting could occur up to 2-3 times a week for the first six months, before tapering off and becoming less frequent. Chapter 6: Noise assesses the potential effects of vibration and blasting activity.

2.3.59 Once operations are sufficiently underway, restoration would take place progressively behind the working area to encourage re-vegetation. This would minimise impacts to the surrounding environment by minimising the working area at any point.

Concrete Batching

2.3.60 The concrete batching plants would ideally be located within the two main construction compounds shown on Figure 2.2 (EIAR Volume 3a) as CC1 and CC4. The batching equipment, shown in Figure 2.14 (EIAR Volume 3a) would be located on a hardstanding that would be constructed in the same way as the temporary construction compounds. The final locations for the batching plants would be decided based on the results of site investigation surveys, post-submission.

2.3.61 The construction batching equipment would include:

- concrete and aggregate storage bins;
- concrete batching equipment;
- bunded wash out facilities;
- testing facilities;
- water supply; and
- waste storage area.

2.3.62 It is anticipated that water would be abstracted from surface water (either a watercourse or water-filled mining void) to provide a reliable water supply for the concrete batching plant. Any surface water abstraction would be subject to suitable water quality and yields being available, which would be determined through future site investigation, post-consent. Any abstraction would require suitable authorisation under the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) and Water Environment (Miscellaneous) (Scotland) Regulations 2017.

Site Entrances

2.3.63 There are three proposed access routes to the site from the public highway (EIAR Volume 3a: Figure 2.2). Access to the site for heavy goods vehicles (HGVs) from the south would be from the A713 between Waterside and Dalmellington using the existing KFHR (Chalmerston access) (EIAR Volume 3a: Figure 2.16a). The HGV access to the site from the north would be from the B7046 between Burnton and Sinclairston using the existing KFHR (Piper Hill access) (EIAR Volume 3a: Figure 2.16b). For light site traffic only, a previous site entrance to Pennyvenie surface mine, off the B741 New Cumnock to Dalmellington Road is proposed. Minor upgrades to these access routes are expected to be required. The proposed layouts and indicative amendments to the two HGV site entrances to facilitate abnormal loads are presented on Figure 2.16a and Figure 2.16b (EIAR Volume 3a).

Off-site Works

2.3.64 Minor off-site works would be required along the access routes to the site. The works would typically involve adjustments to road side vegetation, fences, walls, signage and lamp posts adjacent to roads together with localised reprofiling of land to allow abnormal loads better geometry at junctions and bends in the road. The precise land requirements are not known at this stage and would be confirmed during the detailed design of the project. However, the nature, location and scale of the works are considered unlikely to give rise to significant environmental effects and so are not considered within the scope of the EIAR.

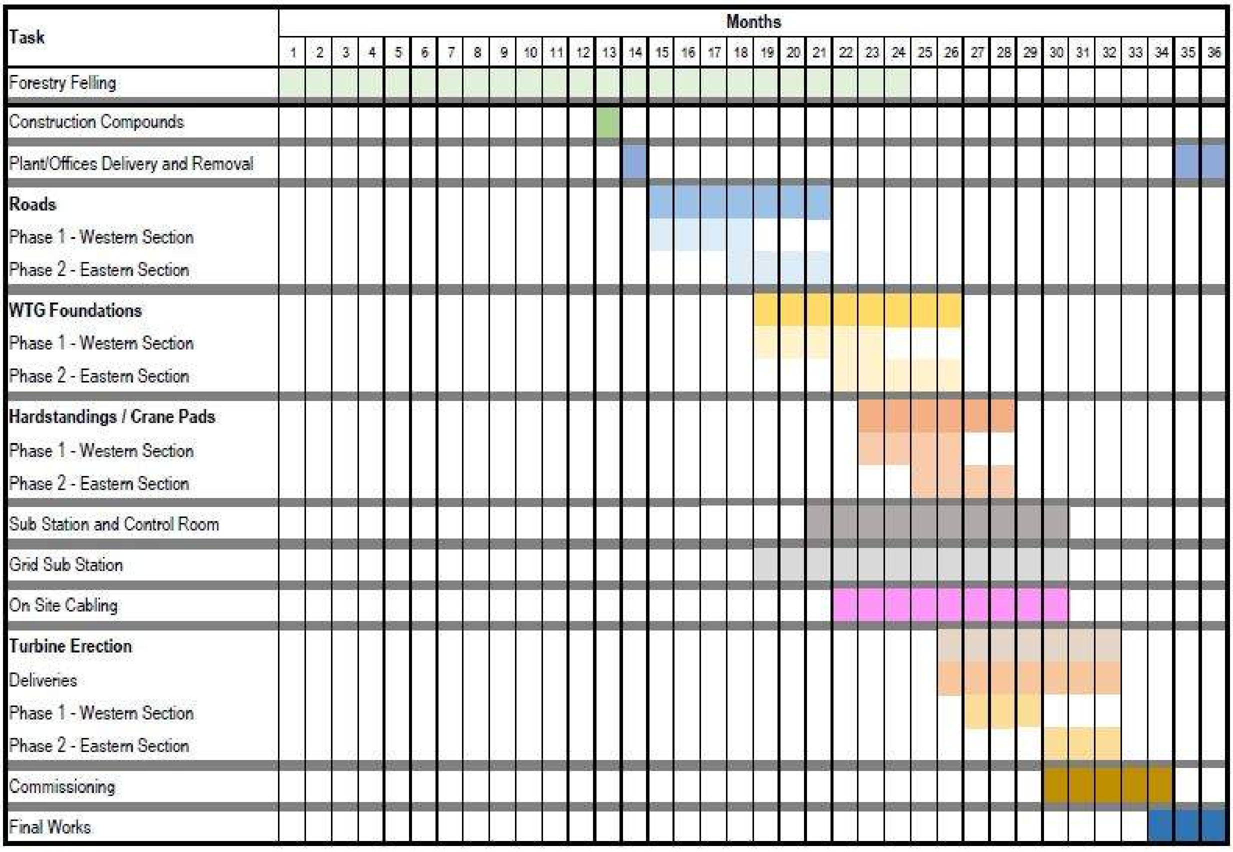
2.3.65 The off-site work (where it does not constitute Permitted Development) would be subject to separate planning applications to EAC rather than forming part of the S36 Application.

2.4 Construction Activities

Construction Programme

2.4.1 It is anticipated that the construction of the proposed development would take 36 months and would be completed in two phases as presented in Diagram 2.1; phase one would be on land to the west of the South-West Scotland Interconnector and phase two would be on land to the east of South-West Scotland Interconnector.

Diagram 2.1: Indicative Construction Programme



Hours of Work

2.4.2 It is envisaged that the construction hours of work would be Monday to Sunday 07.00 to 19.00. Construction activities would be limited after 13:00 on Saturday and all day Sunday and on Public Holidays to ensure no appreciable noise at sensitive noise receptor locations.

Construction Traffic and Plant

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

2.4.4 Chapter 10: Traffic and Transport sets out the expected number of vehicle movements to and from the site each month, taking into account forecast vehicle numbers from construction activities with the highest volume of traffic occurring during months 19 to 30 of the 36-month construction period. A detailed Traffic Management Plan (TMP) would be prepared in consultation with EAC prior to construction commencing should consent for the proposed development be granted. This is discussed further in Chapter 10: Traffic and Transport.

2.4.5 Turbine components would be supervised during their transportation using 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 the 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 relevant authorities prior to any abnormal vehicle movements.

2.4.6 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.

Standard Mitigation and Working Methods during Construction

Construction Environmental Management Plan

2.4.7 The assessment in this EIAR has been carried out on the basis that standard mitigation measures would be implemented during the construction work, including compliance with both project wide and site-specific environmental management procedures, which would be included in a Construction Environmental Management Plan (CEMP). An Outline CEMP is provided in Technical Appendix 2.1 (EIAR Volume 4). A detailed CEMP would be agreed with EAC and relevant statutory consultees prior to construction commencing. The CEMP would, as a minimum, include details of:

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

2.4.8 Technical Appendix 2.1 provides a list of generic mitigation measures that would be included in the CEMP and implemented during the construction and decommissioning of the proposed development. It would be a contractual requirement that the appointed contractor complies with the CEMP.

Watercourse Crossings

2.4.9 Technical Appendix 2.2: Water Crossings Details contains details of the watercourse crossings required as part of the proposed development and the proposed crossing type together with the relevant licensing requirements.

2.4.10 Typical watercourse crossings are presented on Figure 2.10 (EIAR Volume 3a) and the final crossing type would be identified as part of the detailed design of the proposed development prior to construction and in line with current best practice guidance[6].

Private Water Supplies

2.4.11 A review of Private Water Supplies has been undertaken for the site and 5 km buffer around the site boundary (EIAR Volume 4: Technical Appendix 2.4). The assessment identified one PWS within the 250 m buffer. The proposed development at this location is characterised by an existing hardstanding access track. The assessment concludes that the proposed development would not result in the potential for significant changes to the contributing catchment to this PWS.

2.4.12 Regardless of the lack of identified impact on PWSs, mitigation to prevent pollution impacts on any downstream PWS would be set out in a Water Management Plan which would form part of the CEMP, to ensure that the proposed development would not lead to significant impact to water abstraction and other hydrological receptors. The contents of the CEMP and the Water Management Plan would be agreed with SEPA prior to commencement of works.

2.4.13 The outline CEMP is presented in EIAR Volume 4: Technical Appendix 2.1.

Peat Management

2.4.14 Technical Appendix 2.5: Draft Peat Management Plan (DPMP) outlines the proposed working methods where the excavation of peat would be required and provides further details on potential volumes of peat excavated and the likely requirements for reinstatement. This provides details of the predicted volumes of peat that would be excavated for the proposed development, 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 and would be included in the final version of the CEMP.

2.4.15 The peat surveys across the site have identified that approximately 203,273 m^3 of peat (including a 5% contingency) would be excavated as part of the construction activities associated with the proposed development. The DPMP (EIAR Volume 4: Technical Appendix 2.5) outlines how that peat would be recovered, managed and reused within the site. This includes approximately 175,000 m^3 of the peat being placed on unrestored, previous surface mine areas of the site, in order to form a soil horizon and bring these areas back into beneficial after use. The re-use of peat in this way has the potential to enable 35 ha of unrestored and derelict land to be restored as part of the proposed development. The precise extent and locations of the restoration would be secured though the final PMP as part of a planning condition.

2.4.16 The DPMP concludes that the demand for peat for reinstatement purposes is greater than the supply of peat arising from excavation. By adjusting the depth of peat used for restoration

[6] SEPA (November, 2010) Engineering in the water environment: good practice guide, River Crossings, 2nd Edition

works within the temporary SEAs, a balance between supply and demand could be achieved, thereby ensuring there would be no surplus peat generated on-site.

Peat Slide Risk

2.4.17 Technical Appendix 2.6: Peat Landslide Hazard and Risk Assessment (PLHRA) provides further technical information on the likely risk and hazards associated with peat instability, and the proposed standard mitigation and working methods that would be implemented during construction to seek to avoid adverse effects associated with peat instability.

2.4.18 The PLHRA has reviewed the survey data gathered from across the development site. The overall conclusion regarding peat stability is that there would be a negligible to low risk of peat instability over most of the site although some limited areas of medium and high risk have been identified. For these areas, a hazard impact assessment was completed which concluded that, subject to micro siting and the employment of appropriate mitigation measures, all of these areas could be considered as having an insignificant risk of a peat slide occurring. .

Coal Mining Risk Assessment

2.4.19 Technical Appendix 2.10 presents a Coal Mining Risk Assessment (CMRA) for the site. The aim of the CMRA is to identify site-specific coal mining risks and set out the proposed mitigation strategy to show that the site could be made safe and stable for the proposed development.

2.4.20 The report finds that that the site is complex in terms of geology, historic underground mine workings, assessment of probable workings and the extent of subsequent surface mining. Surface mining has resulted in extensive areas of disturbed land across the site.

2.4.21 The report concludes that there are six turbines which are classified as being of higher risk (T1, T2, T9, T47, T48 and T53) but notes that the risks would be investigated, assessed further and mitigated or managed based on the findings of the ground investigation, and are therefore considered to be acceptable at this stage.

2.4.22 The CMRA identifies the risks at each turbine and substation location within the Development High Risk Area and proposes how the risks would be mitigated. This would generally be through intrusive ground investigation and ongoing liaison with the mining companies. Post-submission of the application for consent, the ground investigation would be scoped, designed and specified to provide appropriate information for the proposed development and ensure the mitigation of mining risk to acceptable levels. The investigation and mitigation would correspondingly inform decisions regarding foundation design and the requirement, or otherwise, for enhanced bases, remedial works, or specific geotechnical or geoenvironmental solutions at the site.

2.4.23 The assessment and mitigation (through ground investigation) would also include the other elements of infrastructure that would be required for the proposed development such as crane bases, sub-station buildings, maintenance buildings, access tracks, and stone extraction areas.

Forestry

2.4.24 A Forestry Report has been prepared and is presented in Volume 4 as Technical Appendix 2.11. The report presents the forestry felling and restocking plans both with and without development.

2.4.25 As a result of the proposed development, felling would be advanced on 421.3 ha of commercial forestry as a result of the construction requirements. Felling would take place over 24 months, 12 months of which would overlap with the construction phase.

2.4.26 The species composition of the forest would change as a result of the proposed development. In particular, the area of productive conifer woodland would decrease by 182.01 ha whilst the area of broadleaf woodland would increase by 3.02 ha. There would be the creation of 29.08 ha of woodland fringe and open ground would increase by 23.99 ha to facilitate delivery of the Habitat Management Plan (HMP). The woodland redesign for the proposed development would result in a net loss of principally commercial forestry area of 151.36 ha.

2.4.27 In order to comply with the Scottish Government's Control of Woodland Removal Policy, compensation planting would be required to mitigate for the loss of woodland area. The Applicant is committed to providing appropriate compensatory planting. The extent, location and composition of such planting would be agreed with Scottish Forestry, taking into account any revision to the felling and restocking plans prior to the commencement of operation.

Access Management

2.4.28 Technical Appendix 2.12: Outdoor Access Management Plan sets out the proposals for managing public access to the site during the construction phase of the proposed development.

2.5 Operation Management and Maintenance

2.5.1 Wind turbines and wind energy projects 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.

2.5.2 The proposed development 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.

2.5.3 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.

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

2.5.5 If a fault should occur, the operator would take the necessary steps to ensure that the faulty elements of the wind farm are repaired whilst ensuring the electrical integrity and safety of the site. If the repair warranted the proposed development being disconnected from the grid then the operator would make contact with the network operator. 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 entire proposed wind farm would be automatically disconnected.

2.5.6 Signs would be placed at site entrances and on some elements of the proposed development, where necessary, giving details of emergency contacts. This information would also be made available to the local police station, East Ayrshire Council, ECU and the network operator.

Shadow Flicker

2.5.7 A shadow flicker assessment has been undertaken for the proposed development (Technical Appendix 2.13). Three properties were found to be within 11 rotor diameters of the proposed development's turbines. The results of the assessment have concluded that none of these properties would experience significant effects and therefore no mitigation for shadow flicker is required during the operation of the proposed development.

Aviation, Radar & Lighting

2.5.8 The effects of wind turbines on aviation interests have been widely publicised however the primary concern is that of safety. The two dominant safety concerns surround physical obstruction and the effects on radar and air traffic services. A report on Aviation, Radar and Lighting is presented in Technical Appendix 2.14 and a summary of its conclusions are presented in the following paragraphs.

2.5.9 Wind turbines can present a physical obstruction at or close to an aerodrome or in the military low flying environment. Wind turbines can also present an obstruction by encroaching on the safeguarded areas surrounding Instrument Flight Procedures (IFPs).

2.5.10 Wind turbine clutter appearing on a radar display can affect the safe provision of air traffic services as it can mask unidentified aircraft from the air traffic controller and prevent them from accurately identifying aircraft under their control. In some cases, radar reflections from the turbines can affect the performance of the radar system itself.

2.5.11 Radar Line of Site (LoS) analysis has established that if wind turbines at a blade tip height of 149.9 metres (m) were placed at the majority of potential wind turbine locations on-site, their subsequent detection by radar systems could affect the performance of Air Traffic Control (ATC) radar at Glasgow Prestwick Airport (GPA) and the NATS En-Route radar at Lowther Hill. It is therefore anticipated that the majority of potential wind turbine positions within the proposed development could affect the operations of GPA and NATS.

2.5.12 Modelling studies have determined that the proposed development would encroach on the safeguarded areas for a number of the current IFPs at GPA. Additionally, an Instrument Landing System (ILS) modelling study has predicted that the proposed development would provide noticeable interference to both the ILS' Localiser and Glidepath; however, the interference would be at a level below the International Civil Aviation Organisation (ICAO) Bend Amplitude Limits for GPA's category of ILS. GPA is examining whether the ILS interference would be at acceptable levels for its operations.

2.5.13 Engagement activities with the relevant aviation stakeholders undertaken to date indicate that there are potential mitigation options available for the proposed development's impact on the GPA and NATS radar systems and IFPs at GPA, subject to further analysis and formal approval from air navigation service providers (ANSPs).

2.5.14 During engagement, the Ministry of Defence (MoD) advised that due to the proposed development's proximity to the Galloway Forest Dark Skies Park, the MoD would be content to accept MOD-accredited infrared lighting on all perimeter wind turbines.

2.6 Residues and Emissions

2.6.1 The EIA Regulations require that the EIAR provides an estimate, by type and quantity, of expected residues and emissions (such as water, air and soil and subsoil pollution, noise, vibration, light, heat, radiation and quantities and types of waste produced) resulting from the construction and operation of the proposed development.

2.6.2 Table 2.3 provides a summary of the anticipated residues and emissions.

Table 2.3: Residues and Emissions

Topic	Potential Residue/Emission
Water	Construction: Surface water runoff and discharges from construction working areas are likely during construction, although overall the quantity of surface runoff would not change as a result of the construction work. In addition, occasional and low quantity discharges could arise from pumping, or over-pumping in order to dewater foundation excavations. Pollution sources could arise as a result of soil erosion or from oil/ fuel or chemical storage and use. All discharges would be managed in accordance with the Water Environment (Controlled Activities) (Scotland) Regulations 2011, as amended by The Water Environment (Miscellaneous) (Scotland) Regulations 2017. The proposals for the control and management of water quality and quantity from the proposed development are presented in Technical Appendix 2.1: Outline CEMP (EIAR Volume 4). Operation: No water emissions or pollution sources have been identified for the operational phase.
Air	Construction: The construction phase would require the transport of people and materials by road, with associated emissions to the atmosphere. There are no air quality management areas within the vicinity of the proposed development. Overall the quantity of air emissions is expected to be low relative to the general background air emissions from road traffic. No significant air emissions are anticipated. Operation: Due to the nature of the proposed development no significant point source or diffuse air emissions would be produced during construction or operation. The proposed development would contribute to providing renewable electricity, in turn displacing emissions associated with fossil fuel-based electricity generation elsewhere. The construction of the proposed infrastructure, and subsequent operation and decommissioning of the proposed development would include activities that either directly or indirectly result in CO_2 emissions. The Scottish Government Carbon Calculator for Wind Farm on Peatlands was used to calculate a payback period for the proposed development based on the full development lifecycle. The results of this assessment are contained in Technical Appendix 2.7: Carbon Balance Assessment and indicated that the proposed development would have an expected payback period of 1.8 years (maximum of 6.3 years) compared to fossil fuel mix of electricity generation[2]. The proposed development would save an estimated 244,015 tonnes of carbon dioxide per year (compared to a typical fossil fuel mix of electricity supply).
Noise and Vibration	Construction: Noise sources during the construction phase would include increased traffic flows and noise from construction plant and from blasting of the stone extraction areas. Further details are provided in Chapter 6: Noise (EIAR Volume 2). Operation:

Table 2.3: Residues and Emissions	
Topic	**Potential Residue/Emission**
	The wind turbines would generate noise during operation, and the noise levels would vary according to the wind speed. The location of residential receptors in relation to the proposed development was a consideration in the design development process and the predicted noise levels are within acceptable limits. Further details are presented in Chapter 6: Noise (EIAR Volume 2). There would be no vibration emissions associated with the operation of the proposed development.
Light	Construction: Technical Appendix 2.1: Outline CEMP (EIAR Volume 4) notes that temporary lighting would be required at the temporary construction compounds for security purposes and to ensure that a safe working environment is provided to construction staff. In addition, temporary lighting could be required to ensure safe working conditions at infrastructure locations during construction. All temporary lighting installations would be downward facing and all lights would be switched off during daylight hours and out with working hours. Operation: It is proposed to install infrared lighting on the turbines in a pattern that would be acceptable to the Ministry of Defence (MoD) for aviation visibility purposes. The lighting proposed would not be visible to the naked eye. The substation buildings are likely to be equipped with downward facing passive infra-red (PIR) controlled security lighting. These would illuminate the substation compound area when activated. Any effect would be temporary and not expected to be significant during normal operation of the proposed development.
Waste	Construction: Technical Appendix 2.1: Outline CEMP (EIAR Volume 4) provides details on pollution prevention control and site waste management that would be implemented during construction. A Site Waste Management Plan would be designed to follow the principles of: Avoidance; Minimisation; Separable; Recyclable. Operation: The power generation aspect of the proposed development would not produce any significant waste emissions or pollutants. However, the general operation and maintenance has the potential to produce a small amount of waste. This is likely to be restricted to waste associated with the substations and compounds from employees and visiting contractors and waste gearbox oils and lubricants.
Soil and Subsoil	Construction: Soil and subsoil excavation, handling and storage would be required during construction. All soil and subsoil would be stored temporarily for use in reinstatement, such that there would be no residue (surplus) remaining following the construction work. Peat excavated during construction would be managed in accordance with a Peat Management Plan (PMP), a DPMP is provided in Technical Appendix 2.5 (EIAR Volume 4). Operation: No requirement for soil or subsoil excavation or handling during the operation phase has been identified. No pollution sources have been identified for the operational phase.
Heat and Radiation	No significant sources of heat and radiation have been identified during either the construction or operation phase of the proposed development.

2.7 Decommissioning

2.7.1 The expected lifetime of the proposed development would be 30 years (which includes the operational lifetime of 25 years, plus construction and decommissioning). Towards the end of this period a decision would be made as to whether to refurbish, remove or replace the turbines. If refurbishment or replacement were to be chosen, then relevant 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 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 surface and the entire foundation would be graded over with soil and would be replanted if appropriate.

2.7.2 This approach 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"*) and is retained in the Scottish Government's web-based renewable advice which replaced PAN 45. This approach also follows advice given in the 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."*

2.7.3 In alkaline or neutral pH ground water conditions, no chemical degradation of the concrete foundation would take place. The concrete mass would remain intact and have no effect on the local soil or groundwater. In soft, acidic groundwater conditions (low dissolved calcium content and high dissolved carbon dioxide content), where the water table is in contact with the concrete mass e.g. peat or marshland, sulphate attack of the concrete would tend to take place. This may cause alkali to leach into the groundwater in contact with the concrete. If this effect occurs it would be highly localised around the foundations.

2.7.4 However, as discussed in the foundation construction section above, the concrete mix for the turbine foundations would be designed to withstand sulphate attack and it is therefore likely that the rate of alkali leaching would be low and would not be expected to have a significant effect on the local soil or groundwater conditions.

2.7.5 If the proposed development obtains consent it is expected that provision would be made 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 wind farm, a method statement would be prepared and agreed with EAC.

2.7.6 Unlike most other forms of electricity production, wind energy projects 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 prior existence and no legacy of pollution. The exception to this is that access tracks within the proposed development would be retained for use by local communities, members of the public and other stakeholders. The decommissioning method statement would provide further details of proposals for retention of access tracks.

3 Design Evolution and Alternatives

3.1 Site Selection Considerations

General Considerations

3.1.1 The proposed development site ('the site') covers an area of approximately 2,061 hectares (ha) and lies approximately 5.5 km east of Patna, 6 km west of New Cumnock and 2.5 km south of Skares (Figure 1.1), in East Ayrshire. The site has been selected as it is known to have the following favourable characteristics for development of a wind energy project:

- good wind resource;
- a sufficient landholding to accommodate a viable wind project without subsidy;
- being outside the boundaries of any statutorily protected environmental features and a positive location for the proposed development in terms of adopted planning policies and regeneration opportunities;
- land with brownfield characteristics and abandoned surface coal mining areas that could be utilised and improved (including House of Water, Chalmerston, Pennyvenie, Benbain, Burnston);
- a large amount of existing infrastructure including internal access roads and direct available access from the public road;
- potential for re-use of discarded materials related to previous mining activities;
- potential for new internal sources of virgin stone which could be used for construction of the proposed development;
- proximity to the New Cumnock substation to allow export of power; and
- secured land rights from the two involved landowning entities.

3.1.2 The North Kyle Forest presents the opportunity for a substantial wind farm development, for the reasons outlined in paragraph 3.1.1 above. In terms of alternative iterations of the project design, these are fully described in paragraphs 3.5.5-3.5.20 of this Chapter, which clearly demonstrate the decrease in environmental effects as the design process moved from Layout 1 (Initial Layout) to Layout 5 (Design Freeze Layout).

3.1.3 Opportunities for other renewable technologies such as battery storage and pumped hydro storage have been considered but not taken forward at this time, as they do not present such obvious and immediately feasible ways of contributing to Scottish Government' renewable energy targets. However, it is noted that the North Kyle Energy Project, if consented, would not preclude future use of alternative renewable technologies at the site.

3.2 Current Land Use and Site Context

3.2.1 The site is located within the North Kyle Forest (NKF), which comprises a mix of coniferous plantation woodland, together with existing and previous surface coal mines. There are extensive areas of the previous surface coal mines that have been left unrestored and abandoned with no prospect of significant further restoration. In addition, the Southwest Scotland Interconnector overhead line (OHL) crosses the centre of the site then follows the site boundary southwards to the New Cumnock substation which lies immediately south of the site. No residential properties are located within the site.

3.2.2 One main watercourse, Black Water, runs from the north through the centre of the site southwards, along the site boundary. There are other smaller watercourses within the site including Blueboots Burn and Burnston Burn.

3.3 Policy Considerations

3.3.1 The application is being made to Scottish Ministers through (the Energy Consents Unit (ECU)) under Section 36 of the Electricity Act 1989. In determining the application Scottish Ministers are required to consider the

"desirability of preserving natural beauty, of conserving flora, fauna and geological or physiographical features of special interest and of protecting sites, buildings and objects of architectural, historic or archaeological interest".

3.3.2 The Applicant has taken the consenting requirements in to account throughout the siting and design of the proposed development and has included reasonable mitigation measures.

3.3.3 Relevant legislation, national planning policy and guidance together with Development Plan policy applicable to the site, have also been taken into account. Full details of the applicable planning policy framework are contained in the Planning Statement (which is submitted as a separate document with the application for consent).

3.3.4 Planning policy at a national level is included within:

- National Planning Framework 3, 2014[1] (NPF3); and
- Scottish Planning Policy, 2014[2] (SPP).

3.3.5 Relevant Development Plan policies for the area of the site are included within:

- East Ayrshire Local Development Plan, 2017[3] ('the LDP');
- East Ayrshire Council Supplementary Guidance: Planning for Wind Energy, 2017[4] ('the SPG'); and
- East Ayrshire Minerals Local Development Plan, 2019[5] ('the MLDP').

3.3.6 Paragraphs 152 to 166 of SPP provide policy statements in relation to renewable energy generation. These energy based provisions require to be read alongside wider SPP commitments that reconcile the requirement for development with social and environmental protection.

3.3.7 Table 1 of SPP provides a spatial framework for onshore wind energy that looks to direct development to the correct locations. This spatial strategy has been incorporated in to the LDP:

- Group 1: Areas where development will not be acceptable;
- Group 2: Areas of significant protection. This group contains a number of national and international designations, other nationally important environmental interests and an indicative separation distance for communities of 2 km for visual impact purposes. Wind farms may be appropriate in some circumstances in these areas. Further consideration

[1] The Scottish Government (2014) National Planning Framework 3, The Scottish Government, Edinburgh, June 2014

[2] The Scottish Government (2014) Scottish Planning Policy, The Scottish Government, Edinburgh, June 2014

[3] East Ayrshire Local Development Plan (2017), East Ayrshire Council, April 2017

[4] East Ayrshire Local Development Plan Supplementary Guidance, Planning for Wind Energy (2017), East Ayrshire Council, December 2017

[5] East Ayrshire Minerals Local Development Plan (2019), East Ayrshire Council

will be required to demonstrate that any significant adverse effects on the qualities of these areas can be substantially overcome by siting, design or other mitigation; and

- Group 3: Areas with potential for development. Beyond Groups 1 and 2, proposals for wind energy development are likely to be acceptable subject to detailed consideration at the development management stage against the identified policy criteria listed in Schedule 1of the LDP.

3.3.8 The proposed development is largely located within Group 3 (area with potential for development).

3.3.9 The SPG details EAC's spatial approach to wind energy development and provides further detail on the criteria against which all large-scale wind energy proposals will be assessed. The SPG identifies that the site is largely located in Group 3 (Areas with potential for wind energy development (over 50 metres)) but with areas of carbon and Peatland Areas – Class 1. Group 3 areas have no recognised constraints. Applications in these areas require to be assessed against the criteria identified in section 4 of the SPG.

3.3.10 NPF3 recognises the 'legacy of opencast coal sites' that has been left through the poor management of restoration and requires intervention to ensure restoration. This legacy is also recognised in the MLDP.

3.3.11 The vision of the MLDP focusses on restoration and bringing land back into productive use. Parts of the site are identified in the MLDP as Former Minerals Opportunity Sites that require to be restored or reused resulting in a sustainable environment, economic and social legacy.

3.3.12 This EIAR 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.

3.4 Key Issues and Constraints

3.4.1 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 assets of national importance within a 5 km study area to assess the potential for visibility and setting effects;
- Engineering influences such as ground conditions (including mining risk);
- Minimising forestry removal requirements;
- 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; and
- Hydrology and hydrogeology, including identifying all sensitive surface water features.

Landscape and Visual Considerations

3.4.2 The landscape and visual consultant reviewed the potentially developable area within the surface coal mining sites to inform the final site location. The review considered the following:

- The Skares and Netherton sites were located on prominent elevated slopes at the transition between the Foothills with Forest and Ayrshire lowlands landscape character types with consequent landscape and visual effects on receptors in the lowlands and lowland river valley landscapes in the vicinity, including Dumfries House and its Garden and Designed Landscape (GDL).
- The extent of the original House of Water site straddled the River Nith and extended eastwards, thereby drawing turbines downslope towards the Upland Basin landscape and closer to the Auchingee, Whitehill, Sunnyside and Lanehead residential properties. As such the original House of Water site had potential to affect the character of the neighbouring Upland Basin landscape, as well as the amenity of both the residential properties and the western outlook from the more distant settlement of New Cumnock. Therefore, the eastern area of the original House of Water site was removed from further consideration.
- In contrast, the Chalmerston site was contained within the Foothills with Forest landscape, and therefore separate from the more sensitive Doon valley (Upper River Valley) landscape to the west.

3.4.3 Potential landscape and visual effects were evaluated for each of the four potential development sites (outlined above), and their cumulative effects with each other and other existing and consented developments in the vicinity were considered. Based on this analysis it was concluded that the establishment of numerous separate developments on sensitive elevated slopes at the transition between the Foothills with Forest landscape character type, and more sensitive, incised valley landscapes was undesirable. Consequently, an approach was sought that would draw development away from the most prominent edges of the Foothills, would avoid transitional landscapes, and which would avoid establishing a dispersed pattern of development and the compounding of cumulative effects. It was therefore proposed to establish a single array within the interior of the foothills.

3.5 Alternatives

Do-Nothing Alternative

3.5.1 The “do nothing” scenario is a hypothetical alternative conventionally considered in the EIAR 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 EIAR.

3.5.2 In the absence of the proposed development, it is anticipated that the site would continue to be managed as a coniferous woodland, with limited restoration of some mined areas to address safety concerns, with significant areas of unrestored former surface mine remaining as derelict land. These land uses would continue on the site to some degree whether or not the proposed development proceeds.

3.5.3 It is recognised that the baseline would not remain static for the lifetime of the proposed development. In particular, the site is located within a commercial woodland where routine forestry operations would see successive felling and restocking over parts of the site. Surface coal mining at House of Water are likely to continue through to 2021, where the topography of that part of the site will be subject to change in accordance with the extant planning permission. 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[6] and Scottish Natural Heritage[7] 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 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 EIAR preparation purposes.

Design Evolution and Alternative Layouts

3.5.4 There have been five principal iterations of the site layout, which have been developed at different stages in the project design process (EIAR Volume 3a: Figure 3.1):

- Layout 1: Initial Layout;
- Layout 2: Pre-Scoping Layout;
- Layout 3: Scoping Layout;
- Layout 4: Revised Layout; and
- Layout 5: Design Freeze Layout.

Layout 1: Initial Layout

3.5.5 At this stage in the site layout's development, information on environmental constraints had not been collated. Therefore, the Initial Layout (Figure 3.1a i) was developed on the basis of engineering information using a standard turbine spacing to estimate the number of turbines that could be accommodated within the land available and applying a minimum buffer of 165 m either side of the Southwest Scotland Interconnector OHL. The Initial Layout included 159 turbines at a maximum tip height of 149.9 m.

3.5.6 The tip height was selected in order to maximise the options for commercially available turbines, whilst additionally recognising that most of the turbine tip heights at South Kyle Wind Farm, to the southwest of the site are 149.9 m. The design of the proposed development was intended to ensure coherence with South Kyle Wind Farm.

3.5.7 The maximum tip height for the proposed development was also selected to be under 150 m in order to avoid the requirement for a type of visible aviation lighting that would be triggered by a tip height of 150 m or above thereby avoiding potential impacts associated with visual lighting.

3.5.8 Information gathered in the course of previous surface mining proposals identified areas of deep peat (immediately east of the site) and these areas were excluded from the site boundary.

Layout 2: Pre-Scoping Layout (January 2018)

3.5.9 At this stage in the layout evolution, initial environmental constraints information was available from desk-based studies and some survey work. This information was used to

6 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

7 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: http://www.snh.org.uk/pdfs/publications/commissioned_reports/488_1.pdf

influence the Pre-Scoping Layout and led to the removal of 52 turbines, resulting in a 107-turbine layout (Figure 3.1a ii). Turbines were removed and re-sited in order to respond to, avoid and/or minimise the potential for significant environmental effects. The following information was taken into consideration to inform the Pre-Scoping Layout:

- Residential properties: a 1 km buffer was applied to residential properties and a 2 km buffer was applied to settlements in the area which informed the extent of the maximum proposed development area;
- areas of mapped peat: a review of the SNH Carbon Rich Soil and Deep Peat and Peatlands Habitat Map (2016) and initial peat probing confirmed that areas of peat and organic material are present across the site. Most of the peat is Class 5, 'carbon rich soil and deep peat but no habitat recorded', with some areas of Class 1 ('carbon rich soils and peat') and Class 3 ('carbon rich soil with some areas of deep peat'). Areas of Class 1 peat were avoided in the Pre-Scoping Layout;
- surface water features: a number of surface water features (watercourses and areas of open water) were identified on site based on a review of the 1:10,000 OS map. A 50 m buffer was applied to surface water features;
- slope: turbine siting avoided any slope greater than 15% (this excluded previously mined areas where slope information was not available for consideration in this layout);
- aviation interests: the site boundary for the Pre-Scoping Layout included land within the Final Approach Vectoring Area (FAVA) for Glasgow Prestwick Airport (GPA). The potential for turbines to be accommodated in this FAVA area was ruled out following consultation with GPA and therefore turbines were removed from this area;
- cultural heritage interests: consideration was given to cultural heritage assets through the application of buffers to surviving archaeological remains on-site, and consideration of the setting of designated cultural heritage assets in the surrounding area including: Auchencloigh Castle (Scheduled Monument) (north of site); Dumfries House GDL and relevant Category A Listed Buildings (north of site); and Craigengillan House GDL and relevant Category A Listed Building (southwest of site); and
- landscape and visual receptors: consideration of landscape and visual receptors such as neighbouring settlements, GDLs, recreation routes and key transportation routes. For example, this included removing turbines from the northeastern area of the site to reduce the proposed development's visibility from the A76 corridor (as demonstrated in the wireline images in Figure 3.2b).

3.5.10 Three options for access were identified:

- northern option: the heavy goods vehicle (HGV) access to the site from the north would be from the B7046 Skares to Sinclairston road, and then using the existing Kyle Forest Haul Route (KFHR) at the Piper Hill entrance;
- southwestern option: access to the site for HGVs from the south would be from the A713 between Waterside and Dalmellington via the Chalmerston surface mine site access and KFHR; and
- southern option: this access option would be used for light site traffic only and was formerly a site entrance to Pennyvenie Surface Mine. It is located off the B741 New Cumnock to Dalmellington road.

Layout 3: Scoping Layout (April 2018)

3.5.11 The Scoping Layout (Figure 3.1a iii) resulted in design changes to create a 69-turbine layout. These changes were introduced in order to take account of pre-application feedback from a range of statutory and non-statutory consultees and to respond to additional environmental baseline data that had been collected.

3.5.12 In addition to the points considered for the Pre-Scoping Layout, the following factors influenced the Scoping Layout:

- Aviation interests: turbine bases to be set back 50 m from the FAVA line boundary. In addition, following further consultation, Defence Infrastructure Organisation confirmed on 16 August 2018 that the Ministry of Defence (MoD), due to the proposed development's proximity to the Galloway Forest Dark Skies Park, would be content to accept MoD-accredited infrared lighting on all perimeter wind turbines. Hence, visible lighting would not be required on any of the North Kyle turbines.
- Landscape and visual receptors previously identified, and design guidance provided in the East Ayrshire Capacity Study[8]. A more detailed landscape and visual analysis of the site resulted in the identification of a reduced development area for the proposed development. This revised development area avoids areas in the northeast, west and southwest to remove turbines on particularly prominent and elevated positions (as demonstrated in the wireline images in Figure 3.2).
- Cultural heritage: the proposed development area was also considered in relation to the setting of cultural heritage assets in the vicinity of the site. This included consideration of the following:
  - Auchencloigh Castle (SM5393);
  - Craigengillan House GDL and Category A Listed Building (LB18793);
  - Dumfries House GDL and Category A Listed Building (LB14413); and
  - The Temple Category A Listed Building (LB96).
- Groundwater Dependent Terrestrial Ecosystems (GWDTEs): National Vegetation Classification (NVC) habitat survey mapping was used to identify habitats that fall under potential GWDTE categories. The design approach involved siting turbines outwith areas of potential highly or highly sub-dominant GWDTEs and avoiding potentially moderate GWDTEs, where feasible. The same principle was applied to tracks and other infrastructure wherever possible, whilst taking account of other environmental and technical constraints.
- Phase 1 habitat surveys and the preliminary results from the ornithology and protected species surveys was used to inform the Scoping Layout. For example, the surveys identified the presence of bats across the site, black grouse leks and signs of otters on larger watercourses.
- Existing infrastructure:
  - Increasing the buffer from 165 m to 210 m either side of the 275 kV OHL to allow for topple distance and potential wave effects from the turbines.
  - Minimisation of new permanent infrastructure and use of existing mine and forest tracks.
- Engineering:
  - Slope: a slope model was generated for the site which took into consideration the agreed restoration profiles for the surface mines on site. Future areas which would have a slope of greater than 15% have been discounted as possible turbine locations.

[8] Carol Anderson Associates (2018) East Ayrshire Local Development Plan – Non-statutory Planning Guidance: East Ayrshire Landscape Wind Capacity Study

 - Turbine spacing increased to reduce wake effects and to fulfil the turbine manufacturer's technical spacing requirements.
 - The proposed turbine locations were compared against available mine plans and the Coal Authority's Development High Risk Areas to identify whether the proposed turbine locations had previously been affected by past mining activity.

Layout 4: Revised Layout (November 2018)

3.5.13 The Revised Layout (Figure 3.1a iv) made some further refinements to the Scoping layout and focused on further qualitative changes to consolidate improvements in a number of areas including landscape and visual, cultural heritage and peat. These refinements resulted in a 58-turbine layout (maintaining a maximum tip height of up to 149.9 m).

3.5.14 The key changes to the layout included the following:

- The FAVA line buffer distance was increased from 50 m to 65 m following advice from the aviation specialists.
- Removal of 11 turbines in the north of the site principally in response to landscape and visual, and cultural heritage setting considerations. A reduction in turbine numbers in the north of the site was made to reduce the perceived scale and prominence of the proposed development when viewed from locations to the north, including Dumfries House GDL, the Ayrshire Lowland Landscape Character Type (LCT) and settlements at Ochiltree and Auchinleck. A re-configuration of the remaining turbines was undertaken to provide for mitigation of effects on Craigengillan GDL and Dalmellington, to the southwest and west of the site (refer to the comparative wirelines in Figure 3.2).
- Turbines were moved away from the site boundary to avoid oversail.
- Removal of 11 turbines created some space within the site which led to micrositing of some of the turbines and a review of track length and alignment. The purpose of this review was to ensure that the layout was designed to reduce the extent of new track and number of new watercourse crossings required, where feasible within the wider site constraints. This review resulted in the following:
  - reduction of new access track by approximately 8 km. This was achieved by removing some of the proposed track loops between turbines and instead creating spurs from the tracks, where possible;
  - removal of nine watercourse crossings; and
  - the removal of land in the north from the site's boundary, reducing the site area from 2,531 ha to 2,061 ha. In addition, minor amendments were made to the red line boundary to incorporate bell mouths at the site's entrances.
- All GWDTEs were reviewed based on their hydrogeological setting as the site is underlain by a low productivity aquifer, and mitigation options were considered for the tracks in their current position. The new access tracks would be floated, where feasible.
- Areas of deep peat hosting active blanket bog on the site were avoided, where possible.
- At this point in the site's design, all of the ornithology and ecology surveys had been completed and the survey results were mapped, and appropriate buffers applied to minimise the potential for significant effects on protected species and habitats from the proposed development as far as practicable.
- Phase 2 peat probing (and associated vegetation quadrats) had been carried out across the site. This peat data enabled the creation of a peat depth map and this mapping was combined with habitat data to classify the site in terms of peatland priority in order to refine the design layout. Turbine locations and related infrastructure generally avoided

areas of peat greater than 1 m in depth, which takes account of Scottish Government guidance on deep peat and peat slide risk assessment which defines deep peat as >1 m depth.

- During the peat surveys new evidence of badgers was found, and this was used to revise the infrastructure layout to reduce potential impacts.

Layout 5: Design Freeze Layout (June 2019)

3.5.15 Four turbines in the southwestern corner of the site were removed to achieve further set back from the B741 corridor and to improve views from Doon Valley, Dalmellington and adjoining uplands (refer to the comparative wirelines in Figure 3.2).

3.5.16 Following further consultation with National Grid (the OHL operator) and in accordance with its guidance[9], a standoff distance of three times rotor diameter[10] between the proposed turbines and the OHL has been implemented.

3.5.17 The location of SEA3 (shown on Figure 2.2) is one of the four proposed stone extraction search areas on-site. It is noted that the realigned watercourse for House of Water as part of the restoration plan encroaches within the search area. However, a 50 m watercourse buffer would be applied to ensure that no works would be undertaken within the buffer.

3.5.18 The change in space available led to relocation of nine turbines to optimise both the turbine locations and to enable a reduction in new track length by 2.6 km.

3.5.19 As a result of the changes, the Design Freeze Layout proposes a 54-turbine layout at a maximum height of up to 149.9 m (Figure 3.1b).

3.5.20 The combined constraints are illustrated in Figure 3.3 and were used to inform the Design Freeze Layout.

3.6 Discussion of Comparative Views from Key 'Design Viewpoints'

3.6.1 Figure 3.2 shows the locations of the four key 'design viewpoints' while Figure 3.2a-d provide comparative wireline views to illustrate the efficacy of the design process in reducing potential effects, especially as they relate to landscape and visual receptors. The wirelines represent the effect of proposed mitigation / design iterations on a number of key receptor locations, including:

- The A70 between Drongan and Ochiltree, north of the proposed development;
- The A76 between Cumnock and New Cumnock, east of the proposed development;
- View from Connel View, New Cumnock, to the southeast of the proposed development; and
- The B741, Bogton Loch, in the Doon Valley, southwest of the proposed development.

It should be noted, however, that the design process took account of a wider range of receptors than this.

3.6.2 Examination of the comparative wirelines for each viewpoint demonstrates the efficacy of the mitigation and design priorities proposed:

9 National Grid (2016) Technical Guidance Note 287: Third-party guidance for working near National Grid Electricity Transmission equipment. Available at: https://www.nationalgridet.com/document/82926/download [Accessed 01/07/2019]

10 Rotor diameter buffer: 3x136 = 408 m

- Reducing the prominence, complexity and horizontal spread of turbines in view from the north, including views from the incised landscapes of the Lugar Valley and Dumfries House GDL and setting the proposed development within a skyline context of other existing and consented wind turbines;
- Significantly reducing the visibility of the proposed development form the A76 corridor, utilising the intervening topography and vegetation on the eastern edge of the Foothills to obscure turbines;
- Reducing the prominence, complexity and horizontal spread of the proposed development on the skyline in views from New Cumnock and the adjoining landscape; and
- Significantly reducing the visibility of the proposed development from the Doon Valley and Dalmellington.

Preferred Option

3.6.3 The preferred option which has been taken forward for assessment in this EIAR is Layout 5 which is presented in Chapter 2: Development Description (EIAR Volume 2) and presented on Figure 2.2 (EIAR Volume 3a).

3.7 Mitigation by Design Commitments

3.7.1 As described above, the careful placement of the proposed turbines within the site boundary and the reduction in the number of turbines from 159 to 54 has facilitated effective mitigation, with potentially significant effects avoided or minimised as far as reasonably practicable through the design process. Table 3.1 provides a summary of design commitments.

Table 3.1: Mitigation by Design Commitments

Topic	Mitigation by Design Commitment	Signposting of where Topic is Addressed in the EIAR
Landscape and Visual Amenity (LVIA)	▪ avoid areas subject to landscape designation or classification, close proximity of especially sensitive receptors such as settlements and individual residential properties; ▪ site turbines and ancillary elements within the less visually prominent lower hills and shallow basins within the core of the Foothills which could provide a degree of visual containment for wind turbine development and minimise intrusion and cumulative effects on adjoining more settled smaller scale landscapes; ▪ set back the proposed development from the eastern edge of the Foothills, thereby reducing the visibility and prominence of the proposed development's in views from the A76 corridor, and lessening potential effects on lower lying landscapes, including the Upland Basin landscape; ▪ set back the proposed development from prominent slopes at the northern extents of the Foothills to reduce the perceived scale and prominence of the proposed development when viewed from locations within the Ayrshire Lowlands and associated valleys, including the Lugar valley and Dumfries House GDL, as well as the settlements at Ochiltree and Auchinleck; ▪ set back the proposed development from the south-western edge of the site to provide for mitigation of effects on the Doon Valley, Loch Doon, Craigengillan GDL and Dalmellington;	EIAR Volume 2: Chapter 4: Landscape and Visual Amenity provides an assessment of the residual effects of the proposed development on landscape and visual receptors.

Table 3.1: Mitigation by Design Commitments		
Topic	**Mitigation by Design Commitment**	**Signposting of where Topic is Addressed in the EIAR**
	▪ avoid where possible positioning of turbines and ancillary elements within or immediately adjacent to active mine workings, giving preference, instead, to sites that are due or undergoing restoration and therefore likely to cause less clutter and cumulative effects; ▪ minimise the footprint and geographical extent of the proposed development, confining development to locations that are subject to considerable alteration and intensive management such as large-scale commercial forest management and/or area subject to disturbance such as mine working that are pending restoration as part of extant planning consents; ▪ create an energy project that is consistent with the scale and geometry of turbines at South Kyle Wind Farm an which can assimilate the consented Overhill Wind Farm without it appearing incongruous; and ▪ adopt a maximum tip height that is less than 150 m to avoid the requirement for visible aviation lighting and reduce intrusion as well as cumulative effects on surrounding more sensitive landscapes.	
Cultural Heritage	▪ consider setting effects in the siting of turbines for example, reduce turbine numbers in the north of the site to reduce the perceived scale and prominence of the proposed development when viewed from locations to the north, including Dumfries House GDL; ▪ re-configure the remaining turbines to provide for mitigation of effects on Craigengillan GDL and Dalmellington, to the southwest and west of the site; ▪ review of on-site cultural heritage assets and adopting suitable buffers around known features and committing to appropriate mitigation in the event of uncovering unknown heritage assets during construction; and ▪ the Applicant is committed to the delivery of the measures in the Outline CEMP which presents an approach to managing cultural heritage assets on-site during construction (EIAR Volume 4: Technical Appendix 2.1: Outline CEMP).	EIAR Volume 2: Chapter 5: Cultural Heritage provides an assessment focussed on identifying the likely significant direct and indirect (setting) effects on cultural heritage assets. EIAR Volume 4: Technical Appendix 2.1: Outline CEMP for committed environmental management measures.
Noise	▪ ensure all residential properties were a minimum of 1 km from the location of any turbine. The design freeze layout shows that the nearest residential receptor is located 1.3 km from the nearest turbine, and all residential receptors are more than 300 m from any access track. No properties are located within the site boundary; ▪ ensure that the proposed development would meet the noise criteria both on its own and cumulatively. To achieve this, the noise consultant undertook a noise assessment of the proposed development (in accordance with ETSU-R-97 and in consultation with EAC); and ▪ the Applicant is committed to the delivery of the measures in the Outline CEMP which presents the approach to managing noise during construction (EIAR Volume 4: Technical Appendix 2.1: Outline CEMP).	EIAR Volume 2: Chapter 6: Noise provides an assessment of potential effects associated with construction and operational noise, including cumulative noise effects. EIAR Volume 4: Technical Appendix 2.1: Outline CEMP for committed environmental management measures.
Ecology (non-	▪ with the exception of access track watercourse	EIAR Volume 2: Chapter 7:

Table 3.1: Mitigation by Design Commitments		
Topic	**Mitigation by Design Commitment**	**Signposting of where Topic is Addressed in the EIAR**
avian)	crossings, the design incorporates a minimum 50 m buffer distance[11] around all mapped surface water features on-site, avoiding direct effects; ▪ to reduce impacts on bats, a 100 m radius between turbines and forest edge has been incorporated to the new forest design to allow a 50 m separation from blade tip to maximum tree tip height[11]; ▪ a buffer of 200 m from turbines and 30 m from other infrastructure has been maintained for potential bat roost features; ▪ a minimum 50 m buffer has been maintained from any infrastructure to otter holts or couches; ▪ badger setts have been avoided by 30 m / 100 m (where blasting is likely) apart from one sett as described within EIAR Volume 2: Chapter 7: Ecology; ▪ areas of deep peat and blanket bog have been avoided, where possible; ▪ areas of peatland restoration have been identified and the delivery of the proposed peatland restoration would mean that there would be no net loss of active blanket bog as a result of the proposed development; ▪ adoption of 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; ▪ the location of turbines and access tracks has been designed to avoid sensitive habitats, including peat forming habitats and GWDTEs as far as possible, based on both habitat mapping and peat probing surveys; ▪ a commitment to float access tracks on areas of deep peat, where feasible; and ▪ the Applicant is committed to the delivery of the measures in the Outline CEMP which includes approaches to pollution control, habitats and ecology (including protected species). (EIAR Volume 4: Technical Appendix 2.1: Outline CEMP).	Ecology assesses the residual effects on aquatic and terrestrial habitats, and protected species. EIAR Volume 4: Technical Appendix 2.11 – Forestry sets out the felling and restocking requirements for the proposed development. EIAR Volume 4: Technical Appendix 7.6 – Species Protection Plan. Details further measures for the protection of species (including badger and otter) during construction. Habitat restoration proposals are included in EIAR Volume 4: Technical Appendix 7.7: Outline Habitat Management Plan and summarised in EIAR Volume 2: Chapter 7: Ecology. The GWDTE assessment is presented in EIAR Volume 4: Technical Appendix 7.1: National Vegetation Classification & Habitats Survey Report. EIAR Volume 4: Technical Appendix 2.1: Outline CEMP for committed environmental management measures.
Ornithology	▪ black grouse leks have been avoided by 500 m (recommended operational buffer) with the exception of Lek 3 as described within EIAR Volume 2: Chapter 8: Ornithology; ▪ breeding goshawk, peregrine falcon and barn owl sites have been avoided by 500 m (recommended operational buffer) with the exception of one unconfirmed goshawk nest and one unconfirmed peregrine falcon breeding crag as described within EIAR Volume 2: Chapter 8: Ornithology; ▪ all fencing in proximity to black grouse leks would be ‘marked’ using suitable materials to reduce the likelihood of black grouse collisions with fences; ▪ the Applicant is committed to the delivery of the measures in the Outline CEMP which includes approaches to pollution control and management measures in relation to ornithological interests (EIAR Volume 4: Technical Appendix 2.1: Outline CEMP);	EIAR Volume 2: Chapter 8: Ornithology assesses the residual effects on birds, including presenting the results of collision risk analysis. EIAR Volume 2: Chapter 8: Ornithology describes the appropriate steps to be taken to avoid/mitigate impacts on lekking black grouse and breeding birds (including the provision of a Breeding Bird Protection Plan and pre-commencement bird surveys). Outline habitat management plan (EIAR Volume 4: Technical Appendix 7.7: Outline Habitat Management Plan) includes provisions to improve areas for

[11] There is a 100 m micrositing allowance for the infrastructure associated with the proposed development. However, this allowance would not encroach within the identified constraints buffers.

Table 3.1: Mitigation by Design Commitments

Topic	Mitigation by Design Commitment	Signposting of where Topic is Addressed in the EIAR
		lekking black grouse. EIAR Volume 4: Technical Appendix 2.1: Outline CEMP for committed environmental management measures.
Hydrology, Hydrogeology and Geology	▪ incorporation of good practice drainage design during construction and operation, using a sustainable drainage system (SUDS) approach to control the rate, volume and quality of runoff from the proposed development; ▪ designing all watercourse crossings to accommodate a 1 in 200-year return period peak flow; ▪ minimising the number of watercourse crossings through the design process, with the location of crossings selected to avoid damage and to reuse existing crossings, where possible; ▪ all turbines and associated new infrastructure are located >250 m from private water supply (PWS) abstractions; ▪ avoiding the areas of greatest peat depths when siting the infrastructure, as far as possible, taking account of other environmental constraints (e.g. sensitive habitats, ornithology, landscape and visual receptors etc.); ▪ siting infrastructure in areas of negligible to low risk of peat instability, where possible. Where this has not been possible, the Applicant is committed to delivering the appropriate mitigation as presented in EIAR Volume 4: Technical Appendix 2.6: Peat Landslide Hazard and Risk Assessment where a high risk has been identified; ▪ the design incorporates a minimum 50 m buffer distance around all surface water features (with the exception of access track watercourse crossings), avoiding direct effects on watercourses; ▪ areas of deep peat hosting blanket bog have been avoided, where possible, and through the proposed peatland restoration there would be no net loss of active blanket bog; ▪ siting turbines and access tracks to avoid sensitive habitats, including peat forming habitats and GWDTEs as far as possible, based on both habitat mapping and peat probing surveys; and ▪ the Applicant is committed to the delivery of the measures in the Outline CEMP (EIAR Volume 4: Technical Appendix 2.1) which includes measures in relation to water quality and water quantity, handling of peat, pollution control etc during construction.	Chapter 9: Hydrology, Hydrogeology and Geology assesses the residual effects these receptors. This chapter is supported by a number of technical appendices. EIAR Volume 4: Technical Appendix 2.1: Outline CEMP for committed environmental management measures. Watercourse crossing designs are presented in EIAR Volume 4: Technical Appendix 2.2: Watercourse Crossing Details. PWS assessment is included in EIAR Volume 4: Technical Appendix 2.4: PWS Assessment. A draft Peat Management Plan (PMP) has also been prepared (EIAR Volume 4: Technical Appendix 2.5: Draft PMP). The results of the Stage 1 and Stage 2 peat probing are presented in EIAR Volume 4: Technical Appendix 2.8 and 2.9 respectively. EIAR Volume 4: Technical Appendix 2.6: Peat Landslide Hazard and Risk Assessment provides details of the peat instability assessment and the recommended mitigation measures. A GWDTE assessment is included in EIAR volume 4: Technical Appendix 7.1: National Vegetation Classification & Habitats Survey Report and discussed the mitigation to be applied where GWDTE cannot be avoided interrupting the passage of water.
Traffic and Transport	▪ re-use of existing on-site tracks to minimise requirements for new track and minimise the requirement to import of materials and their associated vehicle movements; ▪ Use of on-site temporary stone extraction areas to minimise the amount of materials needing to be imported and the associated vehicle movements that would be required for delivery; ▪ road widening/ improvements to accommodate abnormal loads and minimise potential effects on other road users; and ▪ the Applicant is committed to the delivery of the measures in the Outline CEMP (EIAR Volume 4: Technical Appendix 2.1: Outline CEMP) in relation to	EIAR Volume 2: Chapter 10: Traffic and Transport provides an assessment of the residual effects associated with the construction traffic. EIAR Volume 4: Technical Appendix 10.1: includes an abnormal load assessment and illustrates constraint points identified on the routes from the likely port of entry in Glasgow. EIAR Volume 4: Technical Appendix 2.1: Outline CEMP for management of construction

Table 3.1: Mitigation by Design Commitments

Topic	Mitigation by Design Commitment	Signposting of where Topic is Addressed in the EIAR
	management of construction traffic.	traffic.
Aviation and Defence	▪ install infrared lighting on the turbines in a pattern that is acceptable to the MoD for aviation visibility purposes; and ▪ increased the FAVA area buffer to 65 m to meet the requirements of Glasgow Prestwick Airport.	The lighting strategy for the turbines is presented in EIAR Volume 2: Chapter 2: Development Description. An aviation report has been prepared and is included as EIAR Volume 4: Technical Appendix 2.14. The report concludes that both Glasgow Prestwick Airport and NATS are likely to raise objections to the proposed development. However, potential mitigation options are available that would safeguard the operations of both organisations whilst facilitating the construction of the proposed development. Further engagement with aviation stakeholders would be undertaken post-submission to agree the final mitigation options and associated commercial contracts.
Shadow Flicker	▪ turbines sited to minimise the potential significant effects from shadow flicker. Three residential properties are located within 11 rotor diameters of proposed turbines.	EIAR Volume 4: Technical Appendix 2.13 presents the shadow flicker assessment.
Forestry	▪ the design of the proposed development sought to minimise the amount of forestry removal required for example, through the reuse of existing tracks; ▪ where felling is required to accommodate the proposed development, key holing into the existing crop has been preferred over clear felling, where possible; and ▪ clear felled coupes have been taken back to the nearest natural break/wind firm edge to minimise the risk of future wind blow.	EIAR Volume 4: Technical Appendix 2.11: Forestry includes forestry assessment.
Socio-economics, Tourism & Recreation	▪ refer to the landscape and visual amenity and cultural heritage sections of this table; and ▪ Technical Appendix 2.12: Outline Outdoor Access Management Plan (EIAR Volume 4) describes how access would be managed during the construction process.	Any adverse effects on socio-economic, recreation and tourism issues, and specifically any potential for significant effects on these resources/ receptors, have been addressed through design or through Chapter 4: Landscape and Visual Amenity and Chapter 5: Cultural Heritage. No other significant effects are predicted and therefore no further assessment is required. A standalone Socio-economics, Recreation and Tourism report has been submitted with the S36 application for consent. Technical Appendix 2.12: Outline Outdoor Access Management Plan (EIAR Volume 4) presents access management proposals during construction.

Table 3.1: Mitigation by Design Commitments		
Topic	**Mitigation by Design Commitment**	**Signposting of where Topic is Addressed in the EIAR**
Air Quality	▪ air quality would be managed throughout the construction phase and the mitigation measures are embedded in the Outline CEMP (EIAR Volume 4: Technical Appendix 2.1). The Applicant is committed to the delivery of the CEMP which includes general measures to manage air quality such as dust control, wheel washing etc.	EIAR Volume 4: Technical Appendix 2.1: Outline CEMP for management of construction traffic presents measures to manage air quality. With adoption of the CEMP no further issues remain and air quality was scoped out of the EIAR.
Ice Throw	▪ The maximum potential distance of ice falling from turbines can be approximated using the formula 1.5 x (blade diameter + hub height)[12]. For the proposed development, the maximum distance from a turbine where ice could be expected to fall is therefore approximately 327 m. Through site design, the risk to public safety is considered to be very low because the distance from the turbines to the nearest public road, residential property or core path is greater than 327 m; and ▪ in line with current guidance[13], a permanent warning sign at the site's entrances is proposed to alert the public to the possibility of ice throw under certain weather conditions.	No issues remaining. No further assessment is required.

12 Seifert, H., Westerhellwg, A. and Kroning, J. (2003) Risk Analysis of Ice Throw from Wind Turbines. [pdf] URL: http://www.windaction.org/posts/13298-risk-analysis-of-ice-throw-from-wind-turbines#.VrDHV01yaUl (accessed 22/07/19)

13 Scottish Renewables, Scottish Natural Heritage, SEPA and Forestry Commission Scotland (2015) Good Practice During Wind Farm Construction, Version 3, URL http://www.snh.gov.uk/docs/A1168678.pdf (Accessed 22/07/19)

4 Landscape and Visual Amenity

4.1 Introduction

4.1.1 This chapter considers the likely significant effects on landscape character and visual amenity associated with the construction, operation and decommissioning of the proposed development. The specific objectives of the chapter are to:

- describe the landscape and visual 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.

4.1.2 The assessment has been carried out by Robert Bainsfair CMLI, of Ramboll Environment and Health UK Ltd. He is a Chartered Landscape Architect with over 21 years of experience working across a wide range of sectors including renewable energy and has extensive experience of managing and undertaking landscape and visual impact assessments (LVIA), cumulative assessments (CLVIA), and has provided expert witness evidence on a number of wind farm developments throughout Scotland. A copy of his CV is included in Technical Appendix 1.2 (EIAR Volume 4).

4.1.3 Figures and technical appendices are referenced in the text where relevant. This chapter is supported by the following figures in Volume 3a:

- Figure 4.1 - Topography;
- Figure 4.2a - Landscape Character Types;
- Figure 4.2b - Landscape Character Types with Zone of Theoretical Visibility (ZTV);
- Figure 4.3a - Landscape Designations;
- Figure 4.3b - Landscape Designations with ZTV;
- Figure 4.4 - Transportation routes and recreational routes;
- Figure 4.5a - Blade Tip ZTV;
- Figure 4.5b - Blade Tip and Hub Height ZTV;
- Figure 4.6 - Cumulative Plan;
- Figures 4.6a to 4.6w - Cumulative ZTVs; and
- Figure 4.7 - Viewpoint Location Plan.

4.1.4 Volume 3b contains the following figures:

- Figures 4.7a to 4.31f - Visualisations.

4.1.5 The chapter is also supported by the following technical appendices:

- Technical Appendix 4.1 - Glossary;
- Technical Appendix 4.2 - Landscape Character Type Descriptions;
- Technical Appendix 4.3 - Residual Effects on Landscape Character Types;
- Technical Appendix 4.4 - Residual Effects on Designated and Classified Landscapes;
- Technical Appendix 4.5 - Statistical Route Analysis;
- Technical Appendix 4.6 - Viewpoint Assessment; and

- Technical Appendix 4.7 - Residential Visual Amenity Study.

4.1.6 A list of abbreviations used in this assessment is presented in Section 4.10 of this chapter.

4.2 Assessment Methodology and Significance Criteria

Scope of Assessment

4.2.1 This chapter assesses the landscape and visual effects of the proposed development as described in Chapter 2: Development Description (EIAR Volume 2). It takes into account the current and future baseline including existing and consented wind farms, and the restoration of existing working and existing unrestored mining sites. This chapter considers effects on:

- landscape fabric, caused by changes to the physical form of the landscape and its elements;
- landscape character, designations and classifications, caused by changes in the key characteristics and qualities of the landscape as a result of the proposed development; and
- visual amenity caused by changes in the views of the landscape and the overall effects on visual amenity as a result of the proposed development.

4.2.2 Effects on landscape fabric occur when there is physical change to components of the landscape such as the landform, land use or land cover. Effects on landscape character arise when there is change to the key characteristics of the landscape and its associated distinct and recognisable pattern of elements. Visual effects are a subset of landscape effects and comprise changes in views of the landscape and the overall effects on visual amenity.

4.2.3 Landscape and visual effects may have effects on cultural heritage facets of the landscape, specifically on the setting of Gardens and Designed Landscapes (GDLs) and on listed buildings and ancient monuments. The LVIA considers potential effects on GDLs, whilst effects on other cultural heritage receptors are considered in EIAR Volume 2: Chapter 5: Cultural Heritage.

4.2.4 Landscape and visual considerations have influenced the design of the proposed development and these are explained in EIAR Volume 2: Chapter 3: Design Evolution and Alternatives.

4.2.5 This chapter also assesses cumulative effects as arising from the addition of the proposed development to the baseline of existing, consented and in planning developments (i.e. which are the subject of a valid planning application). Developments close to the end of their operational life will be included as part of the baseline to present the 'worst case scenario'.

4.2.6 The scope of this assessment has been informed by consultation responses summarised in Table 4.1 and the following guidelines/policies:

- Guidelines for Landscape and Visual Impact Assessment (GLVIA3[1]);
- Landscape Character Assessment[2];
- Techniques for Judging Capacity and Sensitivity[3];
- Siting and Designing Wind Farms in the Landscape[4];

[1] Landscape Institute and Institute of Environmental Management and Assessment (2013) Guidance for Landscape and Visual Impact Assessment – Third Edition.

[2] The Countryside Agency and Scottish Natural Heritage (2002) Landscape Character Assessment.

[3] Scottish Natural Heritage and the Countryside Agency (2002) Topic Paper 6: Techniques and Criteria for Judging Capacity and Sensitivity.

[4] Scottish Natural Heritage (2017) Siting and Designing Wind Farms in the Landscape – Version 3a.

- Assessing Effects on Wild Land[5]; and
- Guidance: Cumulative Effects of Wind Farms[6].

Consultation

4.2.7 Table 4.1 summarises the consultation responses received regarding Landscape and Visual matters and provides information on where and/or how they have been addressed in this assessment.

4.2.8 Full details on the consultation responses can be reviewed in Technical Appendix 1.1: Consultation Register (EIAR Volume 4).

Table 4.1: Consultation Responses

Consultee and Date	Scoping / Other Consultation	Issue Raised	Response / Action Taken
East Ayrshire Council (EAC) (14/05/2018)	Scoping	EAC commented on the following: ▪ An adequate baseline should be provided to describe the wider landscape character and context within the study area, including in relation to the Merrick Wild Land Area, Gardens and Designed Landscapes and to consented and existing wind farms; ▪ Additional viewpoints may be required ▪ Further information on operational and consented wind farms should be provided, as well as an assessment on cumulative effects using two baseline scenarios	The LVIA presents a fully considered baseline in Section 4.4 of this chapter. This includes consideration of landscape designations and classifications (including the Merrick Wild Land Area), Gardens and Designed Landscapes and provides a commentary on the emerging pattern of wind farm development within the study area. All final viewpoints were agreed with EAC prior to the LVIA being undertaken. A cumulative impact assessment is incorporated in Section 4.7 of this chapter.
Scottish Natural Heritage (SNH) (25/05/2018)	Scoping	SNH identified the guidance which should be considered when undertaking the LVIA, including reference to: ▪ the EAC Supplementary Guidance: Planning for Wind Energy and Landscape Wind Capacity Study. ▪ Attention was drawn to the location of the wind farm in relation to the landscape capacity ▪ SNH requested information on how the proposed development fits within the North Kyle Forest Masterplan (NKFM) and that discussion was had with the East Ayrshire Coalfield Landscape Partnership ▪ SNH requested additional viewpoints to include	The LVIA sets out the guidance used in the assessment in Section 4.2. The Design and Access Statement and the LVIA present information on how the proposed development has been designed to respond to the landscape and visual context, including cumulative context. The Planning Statement provides an assessment the proposed development in relation to policy and describes support by the proposed development of various existing initiatives such as the NKFM. The proposed development is intended to support and enhance initiatives such as early those developed by the Coalfield Communities Landscape Partnership (CCLP) and East Ayrshire Coalfield Environment Initiative. SNH, EAC, Dumfries and Galloway Council (DGC) and South Ayrshire

[5] Scottish Natural Heritage (2017) Consultation on draft guidance: Assessing impacts on Wild Land Areas – technical guidance consultation on draft guidance: Assessing impacts on Wild Land Areas – technical guidance.

[6] Scottish Natural Heritage (2012) Assessing the Cumulative Impact of Onshore Wind Energy Developments.

Table 4.1: Consultation Responses			
Consultee and Date	**Scoping / Other Consultation**	**Issue Raised**	**Response / Action Taken**
		representation of a full range of receptors, including increased numbers within the 10 to 20 km zone ▪ SNH requested a cumulative search area plan out to 60 km is included in the LVIA ▪ SNH requested that the detailed cumulative study area is extended to 20 km and that relevant scoping applications are taken into account ▪ Impacts on New Cumnock should be identified and assessed	Council (SAC) have been consulted on the LVIA viewpoints (November 2018). SNH confirmed (31/10/2018) that it welcomed the proposed final viewpoint list which takes SNH's earlier scoping advice into account, and included Cairnsmore of Carsphairn, which SNH identified as a viewpoint for inclusion. SNH advised that, as noted previously, the final selection is the responsibility of Applicant's landscape architect and final viewpoint locations should be microsited to show the worst-case scenario. The cumulative assessment initially considered wind farms within a search area of 60 km of the proposed development and identified those that would contribute to significant effects for receptors within LVIA study area. The list of wind farms for inclusion in the CLVIA is presented in Table 4.8 in Section 4.4 of this Chapter. Visual effects on settlements (including New Cumnock) have been considered as part of the LVIA and CLVIA. A series of representative viewpoints have been used to assess the effect of the proposed development on the approaches and the interior of Cumnock and New Cumnock.
Dumfries and Galloway Council (DGC) (undated)	Scoping	Visual issues are not anticipated to be significant, although the scale of the scheme is such that the extension to the emerging cluster of development to the north of the Carsphairn Hills would be notable and should be considered in terms of cumulative effects. Provided advice on the policy which should be referred to within the assessment: ▪ Provided advice on the guidance, national policies and methodologies which should be used when undertaking the LVIA; ▪ DGC provided advice on the study area for indirect landscape effects and which landscape receptors should be included in the assessment; ▪ Guidance was provided on the visual receptors for inclusion in the assessment and a list of suggested viewpoints was also provided; and ▪ Consideration of effects on private properties should be taken into account.	The LVIA chapter includes consideration of cumulative effects upon visual receptors and landscape character types both within East Ayrshire and adjoining Council jurisdictions, including DGC, including the Carsphairn Hills. The list of cumulative developments to be considered in the EIAR assessment is included in Table 4.8 in Section 4.4 of this Chapter. Relevant policy and guidance that has influenced the assessment methodology for the LVIA as well as design and mitigation priorities for the proposed development are addressed in Section 4.3: Legislation and Policy Context and in the Planning Statement. The LVIA has been undertaken in accordance with the appropriate current guidance. This is set out in the methodology section of this chapter. Consideration has been given to all landscapes character types within 40 km of the proposed development where there is theoretical visibility of the propose development. Technical Appendix 4.2: Landscape Character Type Descriptions (EIAR Volume 4) describes the key

Table 4.1: Consultation Responses			
Consultee and Date	**Scoping / Other Consultation**	**Issue Raised**	**Response / Action Taken**
		The LVIA should fully assess all scenarios of potential cumulative effects with reference to the DGC SG WED (2017), and SNH cumulative (2012) and siting and design (2017) guidance. The northern Glenkens is an area with a dynamic baseline in terms of wind farm development, and the ES will need to address the range of existing, consented, in planning schemes. DGC suggests there could be issue of concern relating to: ▪ The overall scale of development in views such as from the Cairnsmore of Carsphairn; ▪ How this degree of development might impinge on the Galloway Hills, and their special qualities (Merrick WLA, Galloway Forest Dark Sky Park, and RSA); and ▪ Impacts on the wider / strategic wind farm pattern.	characteristics of the landscape character types concerned. The LVIA and CLVIA consider impacts upon all designated and classified landscapes (with visibility of the proposed development) within the 40 km study area. Consultation on LVIA viewpoints was undertaken with DGC, EAC, SAC and SNH in November 2018. Following feedback from DGC the following viewpoints were added: ▪ Cairnsmore of Carsphairn; and ▪ Scottish Dark Sky Observatory. DGC also requested Lowther Hill as a potential viewpoint; however, the key receptor locations within the Lowther Hills are distant and visibility is partially restricted by intervening topography and Lowther Hill was therefore not included in the final LVIA viewpoint list. The LVIA viewpoint assessment does not include an assessment of effects on views from individual private properties. However, a Residential Visual Amenity Study (RVAS) has been prepared (see EIAR Volume 4: Technical Appendix 4.7), taking account of the potential for effects on views for all residential properties within 2 km of the proposed development. A full CLVIA has be carried out as part of the LVIA. The CLVIA has been be undertaken in accordance with current SNH and Landscape Institute (LI) guidance and refers to all relevant national and local policy. The CLVIA provides an assessment of the cumulative impact of the proposed development on landscape and visual receptors within the agreed study area. The assessment includes consideration of key views, landscape character areas and landscape designations/ classifications.

Potential Effects Scoped Out

4.2.9 Effects related to the decommissioning of the proposed development were not assessed within the LVIA as such effects are anticipated to be equivalent to, or possibly less than, those expected to occur during its construction.

Method of Baseline Characterisation

Extent of the Study Area

4.2.10 The study area for the LVIA comprises a 40 km radius area extending from the outermost turbines of the proposed development. This study area is presented on Figures 4.1 - 4.6 (EIAR Volume 3a). The extent of the study area was agreed following production of a preliminary Zone of Theoretical Visibility (ZTV) based on an initial layout for the turbines and in consultations with the Energy Consents Unit (ECU), EAC, and SNH and is consistent with current SNH guidance, as set out in SNH guidance on the visual representation of wind farm developments.

Desk Study

4.2.11 Initially, a desk study was undertaken to establish the baseline context of the proposed development. This considered physical components of the landscape (i.e. landscape fabric) as well as the distinctive recognisable patterns of elements that form the landscape character of the area and of designated and classified landscapes. Visual elements and receptors/receptor locations were also identified including settlements, transportation corridors and recreational trails and summits, as well as specific landscape character types and designated areas.

4.2.12 LCTs considered in the baseline and subsequent assessment are derived from the following Landscape Character Assessments (LCAs):

- EAC (2018) Non-Statutory Guidance: East Ayrshire Landscape Wind Capacity Study[7]; and
- SNH (2019) Scotland Landscape Character Assessment[8];

4.2.13 The description of landscape designations and classifications contained in the LVIA are derived from the following publications:

- EAC (2015) Background Paper: Sensitive Landscape Areas[9];
- Dumfries and Galloway Council Local Development Plan 2: Regional Scenic Areas Technical Paper (2018)[10];
- South Lanarkshire (2010) Validating Local Landscape Designations[11];
- Historic Environment Scotland Gardens and Designed Landscape Inventory[12]; and
- SNH Wild Land Area descriptions.

4.2.14 Where formal citations were not available (such as for the South Ayrshire Scenic Area), the author has collected information from sources, including the landscape character assessments noted above, to provide a description of the considered special qualities.

4.2.15 Other datasets utilised in the preparation of the LVIA included:

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[7] Carol Anderson Associates (2018) East Ayrshire Local Development Plan – Non-statutory Planning Guidance: East Ayrshire Landscape Wind Capacity Study - https://www.east-ayrshire.gov.uk/Resources/PDF/L/Landscape-wind-capacity-study.pdf

[8] SNH (2019) Scotland Landscape Character Assessment - Online map and datasheets - https://www.nature.scot/professional-advice/landscape/landscape-character-assessment/scottish-landscape-character-types-map-and-descriptions

[9] EAC (2015) Background Paper: Sensitive Landscape Areas - https://www.east-ayrshire.gov.uk/Resources/PDF/L/LDP-Sensitive-Landscape-Area-Background-Paper.pdf

[10] https://www.dumgal.gov.uk/media/19851/LDP2-Regional-Scenic-Areas-technical-paper/pdf/Regional_Scenic_Areas_Technical_Paper.pdf?m=636827083977930000 (retrieved 31/07/2019)

[11] Ironside Farrar (2010). Validating Local Landscape Designations. South Lanarkshire Council

[12] https://www.historicenvironment.scot/advice-and-support/listing-scheduling-and-designations/gardens-and-designed-landscapes/search-for-a-garden-or-landscape/ (retrieved 31/07/2019)

- Ordnance Survey 1:50,000 and 1: 250,000 mapping;
- Ordnance Survey 5 m and 50 m Digital Terrain Model;
- Scottish Landscape Character Assessment data - SNH data sets;
- Gardens and Designed Landscapes - Historic Environment Scotland datasets;
- National Scenic Areas - Scottish Government data sets;
- Wild Land Areas - SNH data sets;
- Road network - Meridian 2 data; and
- Cumulative data (Ramboll's own dataset).

Field Survey

4.2.16 Desktop findings were verified and augmented by targeted field reconnaissance during which all key sensitive receptor locations were visited. During the field reconnaissance draft wirelines, mapping, data collection systems and augmented reality tools were utilised to verify theoretical visibility (including cumulative visibility).

Illustrative Materials

4.2.17 The LVIA is illustrated by a range of tools including ZTV plans, photographs, wirelines, and photomontages. All outputs have been prepared in accordance with current best practice comprising:

- SNH (2017) Visual Representation of Wind Farm - Guidance Version 2.2; and
- Landscape Institute (2018) Technical Guidance Note - Photography and Photomontage in Landscape and Visual Impact Assessment - Public Consultation Draft.

4.2.18 ZTVs have been prepared to assist in the identification of areas from where there is potential visibility of the proposed development, illustrated on EIAR Volume 3a: Figure 4.5a: Blade Tip ZTV. ZTVs are based on Ordnance Survey (OS) digital terrain data supplied as gridded height data at 5 m and 50 m interval resolution. This data does not reflect the screening effect of vegetation or built structures and so the visibility shown on the ZTVs is more extensive than actual visibility on the ground. Where the ZTV shows no visibility, it is predicted that no turbines can be seen. Where 5 m DTM has been used, the restored surface mine topographic profile has been modelled to take account of the future baseline scenario (Refer to Section 4.4).

4.2.19 The accompanying visibility analysis provides details of the number of visible turbines and which aspects of the turbines would be visible (i.e. tower, hub, blades).

4.2.20 In order to establish the cumulative theoretical visibility, ZTVs were prepared for all operational, under construction, consented and application stage wind farm projects within 45 km of the proposed development using 50 m DTM. The cumulative ZTVs are included in EIAR Volume 3a: Figures 4.6a to 4.6w.

Criteria for the Assessment of Effects

4.2.21 The aim of the landscape and visual impact assessment is to identify, predict and evaluate potential significant effects arising from the proposed development. Wherever possible, identified effects are quantified, but the nature of landscape and visual assessment requires interpretation by professional judgement. In order to provide a level of consistency to the assessment, landscape sensitivity to change, the prediction of magnitude of impact and assessment of significance of the residual effects has been based on pre-defined criteria, the level of effects being determined by a comparison of the sensitivity of receptors and the magnitude of impact arising from the proposed development.

4.2.22 The LVIA considers landscape and visual effects on designated landscapes in the study area, including Regional Scenic Areas (RSAs), Sensitive Landscape Areas (SeLAs) and Special Landscape Areas (SLAs). Additionally, whilst not landscape designations, a number of sensitive landscape classifications have been assessed, including Wild Land Areas (WLAs) and Gardens and Designed Landscapes (GDLs).

4.2.23 In order to assist in evaluating the potential landscape and visual effects arising from the proposed development, ZTVs were generated to identify the potential extent of the its visibility over the study area (EIAR Volume 3a: Figure 4.5a and 4.5b). An assessment of the predicted visibility of the proposed development from each of the LCTs, designated and sensitive non-designated landscapes in the study area has been carried out by analysing the ZTVs and verifying the findings during field reconnaissance. The visibility assessment has concentrated on the publicly accessible areas including outdoor recreational areas, cycle routes, roads, and the public footpath network.

4.2.24 Mitigation measures which have been incorporated into the final design and layout of the proposed development are described, together with a summary of the design optimisation process carried out in parallel with the LVIA. Further details of the constraints which were identified, and the design process are described in EIAR Volume 2: Chapter 3: Design Evolution and Alternatives.

4.2.25 A selection of viewpoints was chosen in consultation with ECU, EAC and SNH. These viewpoints are considered to be representative of the main sensitive receptors in the study area. The viewpoints have also been checked against the cumulative ZTVs for existing/consented and proposed wind farms within the study area in order to ensure that they provide representative coverage of potential cumulative visibility and related effects. Viewpoint locations are detailed in EIAR Volume 4: Technical Appendix 4.6 and their locations are illustrated in Figure 4.7 in Volume 3b.

4.2.26 Analysis of the potential effects on landscape and visual amenity arising from the proposed development at each of these viewpoints has been carried out. This analysis has involved the production of computer-generated wirelines and/or photomontages to predict the operational views of the proposed development from each of the agreed viewpoints. The existing and predicted views from each of these viewpoints have been analysed to identify the magnitude of impact and the residual effects on landscape character and visual amenity at each viewpoint location.

Criteria for Assessing the Sensitivity of Receptors

4.2.27 The sensitivity of the landscape to change is defined as high, medium or low based on professional interpretation of a combination of its susceptibility to change associated with the type of development proposed, and the value attributed to the landscape. The following parameters were therefore applied in determining the susceptibility of the landscapes within the study area:

- Landscape quality;
- Existing land-use;
- The pattern and scale of the landscape;
- Visual enclosure/openness of views and distribution of visual receptors;
- The scope for mitigation, which would be in character with the existing landscape; and

- The degree to which the particular element or characteristic contribution to the landscape character and can be replaced or substituted.

4.2.28 In determining value the LVIA uses, as its primary indicator, formal landscape designations. Where other clearly defined indicators were identified, these have also been referred to.

4.2.29 Visual receptor sensitivity is also defined as high, medium or low based on an interpretation of a combination of parameters, and also relates to the susceptibility and value ascribed to visual receptors or receptor locations. The following criteria were utilised in determining viewpoint sensitivity:

- The land use or main activity at the viewpoint/receptor location;
- The frequency and duration of use of receptor location; and
- The landscape character and quality of the intervening landscape.

4.2.30 In relation to land use at the viewpoint, visual sensitivity is defined in Table 4.2, below.

Table 4.2: Sensitivity in relation to Receptor Type and Activity

Sensitivity	Receptor Type and Activity
High	▪ Tourists and those engaged in outdoor recreational activities for which the landscape and views form a key part of their experience, including hill walkers and visitors to formal vantage points; ▪ Passengers and tourists travelling on key routes; ▪ Passengers on trains and ferries where visual amenity and scenic qualities form an integral part of receptors experience and expectations; ▪ Walkers on strategic recreational footpaths or on hills, cycle routes or rights of way; ▪ Visitors to landscapes/sites that have a strong physical, cultural or historic connection with the landscape or a particular view; and ▪ Residential receptors at individual dwellings and within settlements.
Medium	▪ Local road users/commuters who are generally travelling alone and/or are focused on the road rather than the adjoining landscape.
Low	▪ People engaged in outdoor sports or recreation (other than appreciation of the landscape); and ▪ Receptors located in commercial buildings, industrial complexes, and other locations where people’s attention may be focused on their work or activity.

Criteria for Assessing the Magnitude of Change

4.2.31 The magnitude of impact arising from the proposed development may be described as Substantial, Moderate, Slight, Negligible or None based on the interpretation of a combination of largely quantifiable parameters, as follows:

- The distance of receptors from the proposed development;
- The duration of the predicted change and whether it is reversible;
- The size and scale of the change anticipated;
- The geographical extent of the study area, landscape character unit, designation or route that would be affected;
- The angle of view in relation to main receptor activity;
- The degree of contrast;
- The background context to the proposed development; and
- The extent and nature of other built development visible, including vertical elements.

4.2.32 The assessment of effects at viewpoints in EIAR Volume 4: Technical Appendix 4.6 quantifies the horizontal angle occupied by the proposed development in each view.

4.2.33 Table 4.3, below, provides a brief definition for different magnitudes of impact.

Table 4.3: Magnitude of Impact

Magnitude	**Definition**
Substantial	Total loss or considerable alteration/interruption of key elements, features or characteristics of the landscape character and/or composition of views resulting in a substantial change to baseline conditions.
Moderate	Partial loss or alteration to one or more key features or characteristics of the baseline, resulting in a prominent, but localised change within a broader unaltered context.
Slight	Discernible loss or alteration to one or more key elements, features or characteristics of the baseline conditions. Change arising from the loss/alteration would be discernible but underlying landscape character or view composition would be broadly consistent with baseline.
Negligible	Very limited or imperceptible loss or alteration to one or more key elements/characteristics of the baseline. Change may be barely discernible.
None	No aspect of the proposed development would be discernible. The proposed development would result in no appreciable change to the landscape resource or view.

Criteria for Assessing Cumulative Effects

4.2.34 In assessing potential cumulative landscape and visual effects, consideration has been given to cumulative effects arising from combined and/ or consecutive (concurrent) visibility (where the observer is able to see two or more developments from one viewpoint location), and sequential effects (where a number of similar developments would be visible individually or simultaneously over a sequence of connected viewpoints, such as would be found along a road or footpath). This is in accordance with current SNH guidance.

4.2.35 Consideration has also been given to the additional effects attributable specifically to the proposed development, as well as its 'in combination' effect, where the combined effect of the proposed development and other cumulative schemes are taken into account.

4.2.36 Table 4.4, below, provides a brief definition for different magnitudes of cumulative impact which have been used as a guide in this assessment.

Table 4.4: Magnitude of Cumulative Impact

Magnitude	**Definition**
Substantial	The proposed development would represent a considerable increase in the influence of wind energy development on the character of the landscape and/or the composition of views.
Moderate	The proposed development would represent a notable increase in the influence of wind energy development on the character of the landscape and/or the composition of views. Moderate cumulative change equates to a localised change within an otherwise unaltered context.
Slight	The proposed development would represent a minor addition to the influence of wind energy development on the character of the landscape and/or the composition of views. The change would be discernible, but the original baseline conditions would be largely unaltered.
Negligible	The proposed development would represent a barely discernible addition to influence of wind energy development on the character of the landscape and/or the composition of views. The baseline condition of the landscape or view would, for all intents and purposes, be unaffected.

Table 4.4: Magnitude of Cumulative Impact	
Magnitude	**Definition**
None	No other cumulative development would be apparent.

4.2.37 In accordance with current SNH and Scottish Government policy, projects which are at scoping stage are generally not included in the detailed assessment as they may undergo substantial change before a formal planning application is submitted and may not progress to an application at all. However, Greenburn Wind Farm, which was at scoping at the time of this assessment, was included as a formal application (for LVIA purposes only) because this scheme was anticipated to be submitted around the time of the application for the proposed development. The final list of cumulative developments for consideration was derived from Ramboll's internal datasets which have been compiled using information from relevant EIA Reports and 'as built' coordinates of wind farm developments within the study area. The cumulative developments are presented in Table 4.8 in Section 4.4 of this chapter and on Figure 4.6 (EIAR Volume 3a).

Criteria for Assessing Significance

4.2.38 Table 4.5 illustrates how residual effects are determined by comparing the sensitivity of receptors with the magnitude of predicted change. For the purposes of this assessment significant effects are **Major** or **Major/Moderate**.

Table 4.5: Residual Effects					
Landscape and Visual Sensitivity	**Magnitude of Change**				
	Substantial	**Moderate**	**Slight**	**Negligible**	**None**
High	**Major**	**Major/Moderate**	Moderate	Moderate/ Minor	None
Medium	**Major/moderate**	Moderate	Moderate/ Minor	Minor	None
Low	Moderate	Moderate/ Minor	Minor	Minor/None	None

4.2.39 In line with the recommendations in the GLVIA the matrix is not used as a prescriptive tool or arithmetically, and the methodology and analysis of potential effects at any particular location must allow for the exercise of professional judgement. Descriptions of residual effects, especially those considered significant, are described in narrative text.

4.2.40 Landscape and visual effects can be adverse (i.e. having a detrimental effect on the physical elements, character and visual amenity of the area) or beneficial (i.e. having a positive effect on the landscape and visual amenity of the area through strengthening or augmentation of baseline conditions and/or improvement of the existing landscape or views). For the purposes of this assessment residual effects are assumed to be adverse, unless stated otherwise.

Limitations and Assumptions

4.2.41 The assessment considers receptors in publicly accessible locations. Where assessment of individual residential properties has been undertaken this was completed from publicly accessible locations. No assessment has been undertaken for individual residential or private properties.

4.2.42 The data utilised in completion of the LVIA has a number of inherent limitations related to data tolerances and levels of accuracy. However, these have been taken into account in the assessment.

4.3 Policy Context

4.3.1 A desk study of the relevant national, regional and local planning guidance and landscape planning policy context was carried out and the findings are summarised in the following paragraphs.

National Policy

4.3.2 The Scottish Government's planning guidance on renewable developments is set out in the National Planning Framework (NPF3)[13] and in the Scottish Planning Policy (SPP)[14] published in 2014.

4.3.3 Much of the relevant material in the SPP in regard to onshore wind farm development relates to the development of spatial frameworks. Paragraph 161 of the SPP states that:

"Planning authorities should set out in the development plan a spatial framework identifying those areas that are likely to be most appropriate for onshore wind farms as a guide for developers and communities, following the approach set out below in Table 1 (page 39 of the SPP). Development plans should indicate the minimum scale of onshore wind development that their spatial framework is intended to apply to. Development plans should also set out the criteria that will be considered in deciding all applications for wind farms of different scales - including extensions and re-powering - taking account of the considerations set out at paragraph 169 of the SPP."

4.3.4 These criteria refer to a number of environmental factors. Those of relevance to the LVIA include:

- cumulative impacts;
- landscape and visual impacts, including effects on Wild Land;
- impacts on long distance walking and cycle routes and scenic routes identified in NPF3; and
- impacts on tourism and recreation.

4.3.5 SPP categories used in spatial frameworks comprise:

- Group 1 Areas: Where wind farms will not be acceptable such as in National Parks (NPs) or NSAs.
- Group 2 Areas: Areas designated/classified for their international or national heritage value, outwith NPs and NSAs including:
  - National and international designations including (principally those relating to cultural heritage and/or ecological value);
  - Sites included in the inventory of GDLs;
  - Other nationally important mapped environmental interests such as Wild Land Areas (WLAs);
  - Community separation for consideration of visual impact (i.e. an area not exceeding 2 km around cities, towns and villages identified on the local plan.
- Group 3 Areas: Areas with potential for wind farm development, subject to detailed consideration against policy criteria.

4.3.6 In addition to matters pertaining to spatial frameworks, the SPP provides guidance on the preparation of development plans. Paragraph 196 of the SPP states that:

[13] The Scottish Government, Edinburgh, 2014, Scotland's Third National Planning Framework

[14] The Scottish Government (June 2014) Scottish Planning Policy

"International, national and locally designated areas and sites should be identified and afforded the appropriate level of protection in development plans. Reasons for local designation should be clearly explained and their function and continuing relevance considered when preparing plans. Buffer zones should not be established around areas designated for their natural heritage importance. Plans should set out the factors which will be taken into account in development management. The level of protection given to local designations should not be as high as that given to international or national designations."

4.3.7 Paragraph 196 of SPP goes on to state that:

"Reasons for local designation should be clearly explained and their function and continuing relevance considered when preparing plans. Plans should set out the factors which will be taken into account in development management. The level of protection given to local designations should not be as high as that given to international or national designations."

4.3.8 Paragraph 197 of SPP goes on to state that the purpose of areas of local landscape value should be to:

- "safeguard and enhance the character and quality of a landscape which is important or particularly valued locally or regionally; or
- promote understanding and awareness of the distinctive character and special qualities of local landscapes; or
- safeguard and promote important local settings for outdoor recreation and tourism."

4.3.9 Paragraph 202 of the SPP provides guidance regarding the siting and design of wind farms and states that:

"The siting and design of development should take account of local landscape character. Development management decisions should take account of potential effects on landscape and the natural and water environment, including cumulative effects. Developers should seek to minimise adverse impacts through careful planning and design, considering the services that the natural environment is providing and maximising the potential for enhancement."

4.3.10 Paragraph 203 of SPP goes on to state that:

"Planning permission should be refused where the nature or scale of proposed development would have an unacceptable impact on the natural environment. Direct or indirect effects on statutorily protected sites will be an important consideration, but designation does not impose an automatic prohibition on development."

4.3.11 Paragraph 203 of SPP goes on to state that:

"Planning authorities should apply the precautionary principle where the impacts of a proposed development on nationally or internationally significant landscape or natural heritage resources are uncertain but there is sound evidence indicating that significant irreversible damage could occur. The precautionary principle should not be used to impede development without justification. If there is any likelihood that significant irreversible damage could occur, modifications to the proposal to eliminate the risk of such damage should be considered. If there is uncertainty, the potential for research, surveys or assessments to remove or reduce uncertainty should be considered."

Regional and Local Policy

4.3.12 The proposed development would be located within the EAC administrative area, the relevant planning context for which is contained in:

- East Ayrshire Local Development Plan, April 2017[15] (EALDP);
- East Ayrshire Council Supplementary Guidance: Planning for Wind Energy, December 2017[16] ('the SPG'); and
- East Ayrshire Minerals Local Development Plan, to be adopted October 2019[17] ('the MLDP').

4.3.13 The relevant non-statutory guidance consists the following:

- East Ayrshire Local Development Plan, Background Paper: Sensitive Landscape Areas, March 2015[18];
- East Ayrshire Landscape Wind Energy Capacity Study, Main Study Report, July 2013[19] (EALWECS, 2013); and
- East Ayrshire Local Development Plan Non-Statutory Planning Guidance - East Ayrshire Landscape Wind Capacity Study, June 2018[7].

East Ayrshire Local Development Plan (EALDP), April 2017

4.3.14 This EALDP replaces the East Ayrshire Local Plan 2010 and the Ayrshire Joint Structure Plan 2007.

4.3.15 Following the methodology set out in SPP, the EALDP contains a spatial framework for wind energy developments of over 50 m to maximum blade tip height, identifying areas that are likely to be more appropriate for onshore wind development in order to provide guidance to developers and communities.

4.3.16 Map 12 of the EALDP shows the spatial framework for wind energy developments that have turbines with a maximum blade tip height of over 50 m. According to Map 12, the proposed site lies predominantly within a Group 3 Area, where proposals for wind energy development are likely to be acceptable subject to detailed consideration at the development management stage against the identified policy criteria listed in Schedule 1: 'Renewable Energy Assessment Criteria' of the EALDP. Those of relevance to the LVIA include:

- Landscape and visual impacts;
- Cumulative impacts;
- Impacts on wild land;
- Impacts on tourism and recreation;
- Public access, including impact on long distance walking and cycling routes and scenic routes identified in NPF3; and
- The appropriate siting and design of turbines and ancillary works.

4.3.17 Discrete areas within the proposed development site are identified as "*Carbon and Peatland Areas - Class 1*" and are therefore classified as Group 2, areas which require significant protection due to their

"nationally important carbon rich soils, deep peat and priority peatland habitat and areas likely to be of high conservation value and restoration potential."

[15] East Ayrshire Local Development Plan, Volume 1: Strategy & Policy, February 2017

[16] East Ayrshire Local Development Plan Supplementary Guidance, Planning for Wind Energy (2017), East Ayrshire Council, December 2017

[17] East Ayrshire Minerals Local Development Plan (2019), East Ayrshire Council

[18] East Ayrshire Local Development Plan, Background Paper: Sensitive Landscape Areas, March 2015

[19] Carol Anderson Associates (July 2013) East Ayrshire Landscape Wind Capacity Study

4.3.18 Policies from the EALDP that are relevant to the proposed development and the landscape and visual resource are summarised in Table 4.6, below.

Table 4.6: East Ayrshire Local Development Plan Policies

Policy	**Policy Content**
Policy RE1: Renewable Energy Developments	Proposals for the generation and utilisation of renewable energy in the form of new build development, infrastructure or retrofit projects will be supported in standalone locations and as integral parts of new and existing developments where it can be demonstrated that there will be no unacceptable significant adverse impacts on all of the relevant Renewable Energy Assessment Criteria set out in Schedule 1 of the LDP, that the scale of the proposal and its relationship with the surrounding area are appropriate and that all relevant policies are met. In this regard, applications for renewable energy proposals should be accompanied by detailed supporting information.
Policy RE3: Wind energy proposals over 50 metres in height	All wind energy proposals over 50 m in height, including extensions and proposals for repowering, will be assessed using the spatial framework for wind development shown on Map 12 and all relevant Renewable Energy and other LDP policies. The Council will afford significant protection to Group 2 areas shown on Map 12. Development may be appropriate in some circumstances within these areas in cases where it can be demonstrated that any significant adverse effects on the environmental characteristics of these areas can be substantially overcome by siting, design or other mitigation and where the proposal is acceptable in terms of all applicable renewable energy criteria set out in Schedule 1. Within those areas shown on the Spatial Framework (Map 12) as Group 3 - Areas with Potential for Wind Energy Development, proposals for wind energy over 50 m in height will be supported where it can be demonstrated that they are acceptable in terms of all applicable Renewable Energy Assessment Criteria set out in Schedule 1. Supplementary Guidance on Planning for Wind Energy will be prepared in order to provide more information on: ▪ the spatial framework ▪ the considerations that will apply to wind energy developments of more than 50 metres in height
ENV4: Gardens and Designed Landscapes	Gardens and Designed Landscapes included in the National Inventory, and those of regional and local importance, are protected and their enhancement encouraged. Development will not be supported where it will have significant adverse impacts upon (i) its character; (ii) important views to, from and within it and; (iii) important features that contribute to its value and that justify its designation, where applicable. Where a proposed development will impact on a Garden and Designed Landscape, the developer will be expected to provide a landscape management plan, to identify conservation needs and direct how change can best be accommodated.
Policy ENV 7: Wild Land and Sensitive Landscape Areas	Areas of wild land, as identified on the 2014 SNH map of wild land areas, have little or no scope to accommodate new development and are safeguarded on the LDP maps. Any development proposed must be able to demonstrate that any adverse effects on the qualities of wild land can be substantially overcome by siting, design or other mitigation. The Council will give priority and prime consideration to the protection and enhancement of the landscape in its consideration of development proposals within the Sensitive Landscape Areas identified on the LDP maps. Any development deemed to have unacceptable impacts on wild land and SLAs will not be supported by the Council. All development proposals within these areas will also require to be assessed against policy ENV 8: Protecting and Enhancing the Landscape. Non-statutory guidance on Sensitive Landscape Areas supports policy ENV 7 by providing further detail on which particular qualities make the SLA valuable and important on a local and regional scale.
Policy ENV8: Protecting and Enhancing the Landscape	The protection and enhancement of East Ayrshire's landscape character as identified in the Ayrshire Landscape Character Assessment will be a key consideration in assessing the appropriateness of development proposals in the rural area. The Council will require that:

Table 4.6: East Ayrshire Local Development Plan Policies	
Policy	**Policy Content**
	(i) Development proposals are sited and designed to respect the nature and landscape character of the area and to minimise visual impact. Particular attention will be paid to size, scale, layout, materials, design, finish and colour. (ii) Where visual impacts are unavoidable, development proposals should include adequate mitigation measures to minimise such impacts on the landscape. (iii) Particular features that contribute to the value, quality and character of the landscape are conserved and enhanced. Development that would result in the loss of valuable landscape features, to such an extent that character and value of the landscape, are unacceptably diminished, will not be supported. Such landscape features include: a. Settings of settlements and buildings within the landscape; b. Skylines, distinctive landform features, landmark hills and prominent views; c. Woodlands, hedgerows and trees; d. Field patterns and means of enclosure, including dry stone dykes; and e. Rights of way and footpaths Development that would create unacceptable visual intrusion or irreparable damage to landscape character will not be supported by the Council.
Policy ENV9: Trees, Woodland and Forestry	The Council will support the retention of individual trees, hedgerows and woodlands within both settlements and rural areas, where such trees contribute to the amenity, nature conservation and landscape value of the area. There will be a presumption against the felling of ancient semi-natural woodlands and trees protected by Preservation Orders. The Council will support proposals for woodland and forestry expansion where they: (i) are consistent with the Ayrshire and Arran Forestry and Woodland Strategy and contribute to Ayrshire's green network; (ii) take account of the landscape and ecological qualities of the area; (iii) demonstrate that recreational opportunities have been fully considered; Proposals that involve the removal of woodland will only be supported where it would achieve significant and clearly defined public benefits and is in line with the Scottish Government's Control of Woodland Policy. Where removal can be fully justified, compensatory planting will be required to the satisfaction of the Council and Forestry Commission Scotland and in line with the provisions of the Ayrshire and Arran Forestry & Woodland Strategy which forms Supplementary Guidance to this LDP. Non statutory guidance in the form of The Ayrshire and Arran Forestry and Woodland Strategy supports policy ENV 9 by providing detailed guidance on the most appropriate tree species and locations for woodland removal and creation.
Policy T4: Development and Protection of Core Paths and Natural Routes	The Council will, through its Core Path Plan, and in association with relevant bodies, landowners and tenants, seek to develop a comprehensive local footpath and cycle route network for access and recreational use for local residents. Priority will be given to the development and promotion of new circular routes and footpath links between settlements, especially where these utilise existing disused railway lines, forestry access roads, minor country roads etc.

The SPG, December 2017

4.3.19 This SPG sets out the EAC's spatial approach to wind energy development and provides further detail on the criteria against which all medium and large-scale wind energy proposals will be assessed, underpinning policy RE3 of the EALDP.

4.3.20 'Map 3: Group 3 Areas' of the SPG shows that the site lies largely within Group 3: Areas with potential for wind energy development. These are areas with no national or internationally important designations, nationally important mapped constraints, and fall outwith adopted community separations. In Group 3 areas, proposals are likely to be acceptable, subject to detailed consideration against identified policy criteria.

4.3.21 As noted in SPG paragraph 1.3.6, discrete areas of peatland habitat within the development boundary are classified as Group 2, requiring significant protection. Section 2.3 of the SPG notes that whilst areas in Group 2 are to be given significant protection, there may be some circumstances where wind energy development may be appropriate.

4.3.22 According to the SPG 'Map 4: Landscape sensitivity for turbines over 70 m' the proposed site lies within 'Medium Sensitivity' area.

4.3.23 An important role of the SPG is to support the development of tourism in East Ayrshire as a key element of the wider local economy. Wind energy applications should provide an assessment of any potential impacts of the development on any relevant tourism resources, including, but not exclusively:

- The high scenic and landscape quality of the Irvine and Doon Valleys, Loch Doon and Glen Afton and associated hill tops and viewpoints.
- The core paths network and rights of way, including end destinations.

4.3.24 According to the SPG 'Map 6: Strategic Tourism resources', the most easterly and westerly of the proposed turbines lie within 'High Scenic & Landscape Quality' area. The central section of the site is not identified for its tourism resource.

The MLDP, to be adopted October 2019

4.3.25 The MLDP is relevant to determination of the application in so far as the site is located within the Coalfield Communities Landscape Partnership Area and furthermore parts of the site are identified in the MLDP as Former Minerals Opportunity Sites.

4.3.26 The MLDP is intended to act as a driver for the regeneration and transformation of East Ayrshire's rural area, particularly areas that have been impacted by the minerals industry. It is to guide development that contributes to environmental enhancement and bring meaningful benefits to local communities. The vision of the MLDP focusses on restoration and bringing land back into productive use.

4.3.27 Former minerals sites require to be restored or reused

"resulting in a sustainable environmental, economic and social legacy, contributing to the wider regeneration and enhancement of East Ayrshire's landscape and environment."

4.3.28 Under Policy MIN SS 1 all developments are to

"Ensure that there are no unacceptable impacts on the landscape character or tourism offer of the area."

4.3.29 The main aim of the Restoration and Placemaking Spatial Strategy of the MLDP is

"to promote high quality restoration schemes which result in resilient and attractive places and to promote opportunity sites potentially capable of accommodating further appropriate development."

East Ayrshire Local Development Plan, Background Paper: Sensitive Landscape Areas, March 2015

4.3.30 The Sensitive Landscape Area (SeLA) was first identified at a strategic level in the 1999 Ayrshire Joint Structure Plan. The SeLA was based on the Ayrshire Landscape Character Assessment (1999).

4.3.31 The 2003 East Ayrshire Local Plan defined the SeLA more precisely on the ground. The SeLA that was included in the 2003 Local Plan was carried forward into the East Ayrshire Local Plan 2010.

4.3.32 As required by SPP, the boundaries of the Sensitive Landscape Areas were reviewed for EALDP Background Paper (2015), to consider whether its extent still remains appropriate. The original assessment was considered to be largely still valid, confirming that the landscape in this area is still of a quality and value to warrant its local landscape designation.

4.3.33 SeLAs are mapped in Map 1 'Key landscape character areas that make up the Sensitive Landscape Area' of the EALDP Background Paper. Technical Appendix 4.4: Residual Effects on Designated and Classified Landscapes (EIAR Volume 4) provides a description of the characteristics and sensitivities of the SeLAs located within the LVIA study area.

East Ayrshire Landscape Wind Energy Capacity Study, Main Study Report, July 2013

4.3.34 EAC published a Landscape Wind Capacity Study[20] to help inform the preparation of the Council's new LDP and to provide guidance on the landscape implications of planning applications for wind farms and wind turbines. The study does not form part of the LDP. It has instead been approved as non-statutory planning guidance but has been cited as a material consideration in the determination of recent planning applications.

4.3.35 The study classifies the proposed development site as being predominantly located within the Foothills with Forestry and Open Cast Mining LCTs, but with the eastern portion of the site extending slightly into the Upland Basin LCT. Based on landscape sensitivity, the Capacity Study makes conclusions about the appropriateness of different scale of developments within landscape character types.

East Ayrshire Local Development Plan Non-Statutory Planning Guidance - East Ayrshire Landscape Wind Capacity Study, June 2018[21] (Capacity Study)

4.3.36 The 2013 Capacity Study was updated in 2018 to take account of both the changing pattern of development and increased size of turbines now being brought forward to planning, both as fresh applications as well as proposals for variations to consented schemes and repowering of developments nearing the end of their consented lives.

4.3.37 The Capacity Study draws a number of conclusions regarding the relative sensitivity of the Foothills with Forestry and Open Cast Mining LCT, within which the proposed development would be located, as summarised in Table 4.7, below.

Table 4.7: Capacity Study Findings

Landscape Character Type	**Summary of Sensitivity**
Foothills with Forestry and Open Cast Mining (LCT17a)	High - medium sensitivity to turbines of over 130 m to blade tip
	The Capacity Study concludes that: *"This landscape forms an expansive upland plateau with a generally simple landform of gently rounded hills and shallow mossy basins. Although this landscape forms a long, low and fairly even upland skyline to the north where it adjoins the East Ayrshire Lowlands (7c), occasional more pronounced hills lie on the southwestern edge and include Benquhat Hill which is prominent in views from the upper Doon Valley.* *In the east, the skyline formed by these uplands to the Upland Basin (15) is also relatively low in comparison with the nearby Southern Uplands (20a) although visibly disturbed ground produces an irregular profile in places. Land cover is simple, dominated by extensive coniferous forestry and with some grass moorland and moss although excavations, large spoil heaps and lagoons from former and current mine workings are clearly evident on the outer fringes of this plateau and these give this landscape a fragmented and degraded character. These uplands are very sparsely*

[20] Carol Anderson Associates (July 2013) East Ayrshire Landscape Wind Capacity Study

[21] Carol Anderson Associates (July 2018) East Ayrshire Landscape Wind Capacity Study

Table 4.7: Capacity Study Findings	
Landscape Character Type	**Summary of Sensitivity**
	settled and their interior is not readily visible from public roads and settlement in the surrounding area. *While the large scale and simple landform and land cover of these uplands could relate in principle to larger turbine typologies, this landscape is not without constraints, the key ones being the need to reduce cumulative landscape and visual effects on adjacent well-settled lowland landscapes and to minimise the exacerbation of the already fragmented nature of this landscape which is characterised by extensive open cast mining. There would be a High-medium sensitivity to the very large typology (turbines >130 m) and a Medium sensitivity to the large typology (70-130 m)."* **Potential Cumulative Issues** *The following issues may arise in association with any possible development* *situated in this and adjacent landscapes:* ▪ Inter-visibility *between larger turbines which are more likely to be located in this upland landscape character type and smaller turbines sited in the adjacent more settled Upland River Valleys (10), Upland Basin (15) and East Ayrshire Lowlands (7c).* ▪ *Exacerbation of the fragmentation of this landscape which may occur if multiple developments and/or a range of different heights and types of turbine were to be sited in this character type and seen in conjunction with past and current opencast mining operations.* ▪ *Potential perceived 'encirclement' of the Upland Basin (15) character type should further wind farm development be sited within this character type and the East Ayrshire Southern Uplands (20a), the Southern Uplands with Forest (20c) and the Plateau Moorlands (18a) and prominent on immediately containing skylines.* ▪ *Cumulative effects on the upper Doon Valley (including effects on the Craigengillan designed landscape and the setting of settlements such as 80 Dalmellington) if wind farms were sited within this character type and further wind farms were located in the Southern Uplands with Forest (20c) and the Foothills west of the Doon Valley (17b) and prominent on immediately containing* skylines. **Constraints** ▪ The more *visually prominent outer slopes and pronounced hills of this landscape which form the containing edges to settled and smaller scale Upland River Valley (10) of the Doon valley to the southwest, the Upland Basin (15) to the east and the East Ayrshire Lowlands (7c) and Lowland River Valley (9) of the Lugar Water to the north-east.* ▪ *Areas of spoil and excavations from current and former mining operations where wind turbines could exacerbate clutter and fragmentation of this landscape, where it may be difficult to achieve an integrated development of multiple turbines in more complex disturbed areas and where extensive wind farm developments could inhibit restoration of the landscape.* ▪ *The less modified* pockets of remnant moss and associated mixed woodlands. **Opportunities** ▪ *Less visually prominent lower hills and shallow basins within the core of these uplands which could provide a degree of visual containment for wind turbine development and minimise intrusion and cumulative effects on adjoining more settled smaller scale landscapes.* **Guidance for Development** *There is very limited scope for the very large typology (turbines >130 m) to be accommodated within this landscape. Turbines <150 m high would reduce intrusion (as well as cumulative effects) on surrounding more sensitive landscapes. Turbines should be set well back from the more sensitive north-eastern, eastern and southwestern edges of these foothills to avoid significant impact on smaller scale settled landscapes and to also minimise cumulative effects with operational and consented wind farms seen from the Upland Basin (15) and Upland River Valley (10) (Upper Doon Valley) landscape character types.* *There is also some scope for the large typology (turbines 70-130 m) with turbines of this size likely to have a more reduced effect on surrounding more sensitive landscapes*

Table 4.7: Capacity Study Findings	
Landscape Character Type	**Summary of Sensitivity**
	than the very large typology provided they were subject to the same siting constraints as noted above. *The outer edges of this landscape remain sensitive to turbines >50 m because of effects on adjacent more sensitive landscapes but also, in the east and west, likely cumulative effects with operational and consented wind farms located in other upland areas.* *All turbine development should be sited well away from current opencast operations or should be planned to be constructed post restoration to reduce clutter and cumulative effects between these two types of development. Where former mining operations have left a legacy of disturbed ground, remedial earth works and landscape restoration should form an integral part of any larger wind farm proposals. The more naturalistic areas of remnant moss and mixed woodlands should be avoided."*

4.3.38 It is important to note that since the Capacity Study was published, the Overhill and Polquhairn wind farms have been consented, thereby adding wind energy development to the characteristic elements of this landscape. It is also the case that this publication represents a strategic appraisal and one based upon a 'snapshot' in time of the cumulative baseline context, and that detailed consideration of individual proposals and sites is therefore necessary.

4.4 Current Baseline

Landscape Baseline

Landform and Hydrology

4.4.1 Figure 4.1 illustrates the topography within the study area. The landform of the study area is varied due to its location on the Southern Upland Faultline (SUF). The study area encompasses a variety of landscapes ranging from fertile pastoral lowlands across the Ayr Basin, to extensive areas of plateau moorland and elevated upland summits present in the southeast. Topographic features include a mosaic of mountains, hills, plateau moorland, agricultural farmland, sea cliffs and coastal landscapes interwoven by a network of valleys, basins and lochs. Topographical extremes within the study area vary between sea level and 843 m Above Ordnance Datum (AOD) (The Merrick) in the Galloway Hills, in the southwest of the study area.

4.4.2 The SUF runs in a southwest/ northeast direction through the study area, passing between Girvan on the west coast and Dunbar on the east, and lies in proximity to the northern boundary of the site. The fault has influenced the alignment of valleys, the orientation of hill ranges, areas of moorland and the ridgelines which run between them.

4.4.3 North of the SUF the topography is low lying, set within the Ayr Basin and comprises a gently undulating, broad agricultural landscape contained by plateau moorlands and foothills to the north and east. It is characterised by pastoral farming activities which take advantage of the simple landform.

4.4.4 To the south of the fault line, the topography rises to form the more elevated plateau moorland and upland hills present in the south and southeast of Ayrshire and characteristic of the Dumfries and Galloway landscape. The southern uplands are modified significantly by glacial erosion which has resulted in a mosaic of smoothly rounded hills intersected by steep valleys. Rugged summits associated with the Merrick Ranges extend to Loch Doon, a large water feature located near the centre of the study area to the southwest of the site. These rugged uplands are some of the most remote and unsettled parts of Ayrshire.

4.4.5 A series of river valleys drain the landscape. Throughout the study area, rivers have created prominent valleys through the surrounding mountains and hills and have become a focus for communication routes, settlement and industrial development. North of the SUF, water features generally run parallel to the fault line in a southwesterly direction to the Firth of Clyde. To the south, watercourses generally flow in a northwest - southeast direction towards the Luce and Wigton Bays (outwith the study area).

4.4.6 Ayrshire and Dumfries and Galloway are punctuated by a high number of small lochs and lochans which are present along the valley systems and at higher elevations across the plateau moorland landscapes. Loch Doon, one of the largest lochs within the study area, is located approximately 9.5 km southwest of the site.

4.4.7 A large area of Ayrshire is underlain by coal which has been exploited over many years of mining, with mining forming one of the key industries of the area. Heavy concentrations of coal at shallow depths are present around the edges of the Ayrshire Basin. This has resulted in a landscape which is heavily modified in some areas. Historically, deep mining predominated, often on a relatively small scale. The area running between Dalmellington, Waterside and Rankinston on the eastern side of the Doon Valley has many relics of coal, limestone and iron ore extraction including bings, inclines and disused railways. The landscape change brought by more recent surface mine workings found above Dalmellington and west of New Cumnock (comprising excavations, coal storage areas, haul roads, site compounds and access roads) is considerably greater than that associated with the smaller scale operations which took place in the 19th Century and the first half of the 20th Century. The effect of this surface mining activity has had a large impact upon the defining characteristics of the landscape in these areas.

4.4.8 The coastal landscape within the study area is a mix of raised beaches and sloping terraces which are characteristic of much of the Ayrshire coast, and of sand dune seascapes with rocky headlands in the area of lower lying basins, such as along the coast near Ayr. Much of these dune landscapes have been reclaimed for urban growth or have been used for recreational purposes, such as golf courses. Few areas of natural dune landscape remain.

Landcover, Land-use and Landscape Elements

4.4.9 The site occupies an area of foothill landscape transitioning between the lower lying agricultural landscape of the north and the elevated plateau moorland and upland landscapes to the south. The site comprises a mosaic of open grassland, large scale coniferous plantations and surface mining works.

4.4.10 Vegetation patterns and the distribution of human settlement and land use have been strongly influenced by the topography of the area. This is evidenced by the key road networks in proximity to the site - the A76 and the A713 which route along prominent river valleys.

4.4.11 Within the area of the site and wider landscape, coal mining has defined the character of land use and land cover over the last four centuries, increasing in size and scale in recent times. Coal and black band iron ore mining has left numerous relics comprising spoil mounds, bings, disused railway lines, mine buildings and infrastructure (and within the site, significant areas of unrestored former surface mines). A further constituent of the established land use in the area is that of mining settlements that are primarily located along local roads.

4.4.12 More recently, commercial forestry has become a key land use, present in greater concentrations to the south and southeast of the study area, and is present across the site. These plantations have been developed over the last century to meet demands for timber, resulting in extensive forests, which are a common feature in the landscape. Deciduous fringes, open spaces within areas of forestry, preservation of heritage features and access routes and provision of recreational facilities are developing and are present within the Loch Doon area of the Galloway Forest Park, to the southeast of the site.

4.4.13 Vegetation cover across the study area is a mix of agricultural grassland, shelterbelts and broadleaved woodland occupying the landscape in the north, and moorland grasses, coniferous plantations and native woodlands across the rounded hills to the south and east. In the lower lying straths, riparian vegetation along waterbodies is common.

4.4.14 The road network across the central and southern parts of the study area is sparse, largely following river valleys and straths. In the area of the proposed development, the site is loosely bounded by the A76 to the east, the A713 to the west and by two local roads to the north and south. Small settlements and clustered communities are scattered on the edges of valleys and along the major roads (A76, A713, A70, A702, B741 and B7046), which are largely concentrated in the valleys or across the lower lying agricultural landscape and along the coastline.

4.4.15 In the north and east of the study area, where the topography is gentler, the road network is more extensive, and settlement is more prolific. However, human influence is characteristic across most of the study area, with few areas being unmodified. However, around 17 km to the southwest of the site the landscape of Merrick has been classified by SNH as a Wild Land Area (Wild Land Area 01).

4.4.16 The diverse nature of the topography creates a varied skyline with a range of different types of views: there are panoramic, long distance views from elevated uplands, enclosed, channelled views along the U-shaped valleys, broader but contained views from undulating agricultural landscapes and wide, open views along the coastline.

Landscape Character Types

4.4.17 The following publications were consulted with a view to determining the existing character of the site and wider study area:

- EAC (2018) Non-Statutory Planning Guidance: East Ayrshire Landscape Wind Capacity Study; and
- SNH (2019) Scottish Landscape Character Types Map and Descriptions.

4.4.18 For the purposes of this assessment, the landscape character types described in the EAC Landscape Wind Capacity Study (EALWCS) have been used to inform the landscape categorisation, baseline description and assessment of effects. Outwith the EAC authority boundary, the SNH (2019) LCT boundaries have been used.

4.4.19 Figure 4.2a reflects the mapping of the above listed character assessments, showing the location and extent of landscape character types found within the study area. The findings of these studies were verified during field reconnaissance and have been taken to represent a suitable baseline context for the assessment.

4.4.20 The site itself lies across two LCTs - the Foothills with Forestry and Open Cast Mining LCT (LCT 17a); the Upland Basin LCT (LCT 15).

4.4.21 Additionally, the LCTs and constituent units within the study area which are subject to potential significant indirect effects of the proposed development include the following:

- EAC LCTs:
  - Southern Uplands (LCT20a) - 1.75 km southeast;

  - Lowlands (LCT 7C) - 1.9 km north;
  - Southern Uplands with Forestry (LCT 20C) - 2.1 km south;
  - Upland River Valleys (LCT 10) - 2.8 km west;
  - Rugged Uplands, Lochs and Forest (LCT 21) - 5.1 km south;
  - Foothills West of the Doon Valley (LCT 17b) - 5.4 km southwest;
  - Upland Glen (LCT14) - 5.4 km southeast;
  - Lowland River Valleys (LCT 9) - 6.4 km west; and
  - Plateau Moorlands (LCT18a) - 6.6 km northeast.
- SNH LCTs:
  - Southern Uplands with Forest: Dumfries and Galloway (LCT 178) - 7.1 km south;
  - Low Hills: Ayrshire (LCT 77) - 7.7 km west;
  - Foothills: Dumfries and Galloway (LCT 175) - 8.7 km south;
  - Pastoral Valleys: Ayrshire (LCT 72) - 9.4 km southwest;
  - Middle Dale: Ayrshire (LCT 71) - 9.4 km west;
  - Upper Dale: Dumfries and Galloway (LCT 165) - 9.7 km south;
  - Rugged Upland: Dumfries and Galloway (LCT 83) - 11.2 km south;
  - Rugged Upland: Ayrshire (LCT 83) - 11.7 km south;
  - Southern Uplands: Dumfries and Galloway (LCT 177) - 11.7 km south/southeast; and
  - Lowland Hills: Ayrshire (LCT 75) - 12.2 km northwest.

4.4.22 Technical Appendix 4.2: Landscape Character Type Descriptions (EIAR Volume 4) provides descriptions of these LCTs, and other LCTs with visibility of the proposed development which lie outwith 15 km of the proposed development along with an assessment of their sensitivity to the type of development proposed based on pre-defined criteria. The assessment of potential residual effects on these LCTs is summarised in Technical Appendix 4.3: Residual Effects on Landscape Character Types (EIAR Volume 4).

4.4.23 Other LCTs which fall within the theoretical viewshed of the proposed development, but that have been omitted from the assessment, are listed in Technical Appendix 4.2: Landscape Character Type Descriptions (EIAR Volume 4), along with the justification for their omission.

Landscape Designations

4.4.24 The location and geographical extent of landscape designations and classifications within the study area are shown on Figure 4.3a.

4.4.25 The site itself is not subject to a landscape designation. Those designated landscapes within the study area which have visibility of the proposed development, and are therefore taken account of in this assessment are:

REGIONAL SCENIC AREAS (RSAS)

- Dumfries and Galloway:
  - Galloway Hills RSA, located approximately 8.5 km south of the proposed development site;
  - Thornhill Uplands RSA, which is located approximately 25 km east of the proposed development site.

SPECIAL LANDSCAPE AREA (SLA)

- South Lanarkshire:

  - Leadhills and Lowther Hills SLA, located approximately 34 km east of the proposed development

SENSITIVE LANDSCAPE AREA (SELA)

- East Ayrshire:
  - East Ayrshire Sensitive Landscape Areas. This designation covers large, non-contiguous areas of landscape within East Ayrshire. It is separated into three discrete areas: The Doon Valley SeLA, the Southern Uplands SeLA and the River Ayr SeLA. At its closest point, the Doon Valley SeLA is located approximately 600 m southwest of a proposed turbine

SCENIC AREAS (SAS)

- South Ayrshire:
  - The South Ayrshire Scenic Area, which is located approximately 6.6 km southwest of the proposed development. The SA extends across a large area of landscape to the west, northwest and southwest of the development site, reaching from the west coast at Marchburn to the Carrick Forest in the Galloway Hills. It comprises four notable areas of landscape quality:
    i. Heads of Ayr;
    ii. the Carrick Hills;
    iii. upland area associated with South Carrick; and
    iv. the coastal strip to the south of the LDP area.

4.4.26 There are 20 Inventory GDLs located within the LVIA study area. Of these, 14 have theoretical visibility of the proposed development.

4.4.27 Due to increased distance and the presence of forestry, woodland, built development and local undulations in topography which are not picked up in the ZTV, the potential for significant effects on GDLs outwith 15 km of the proposed development is considered unlikely.

4.4.28 GDLs with potential visibility of the proposed development, and which lie within 15 km of the proposed development, and which are therefore been taken forward into the assessment comprise:

- Craigengillan GDL - located approximately 3.9 km to the southwest of the proposed development;
- Dumfries House GDL - approximately 4.9 km to the north of the proposed development; and
- Skeldon House GDL - located approximately 10.7 km west of the proposed development.

Landscape Classifications

4.4.29 There is one Wild Land Area located within the study area. The Merrick WLA (WLA 01) is located approximately 18 km south of the site. There would be no views of the proposed turbines from within the WLA. Therefore, this classified landscape is not considered further in this assessment.

VISUAL BASELINE

4.4.30 Visual receptors are individuals or defined groups of people whose visual amenity or viewing experience may be affected by development, and include:

- residents and visitors to settlements;

- road users;
- walkers on long range recreational trails Core Paths;
- cyclists on national cycleways; and
- hill walkers at summits.

SETTLEMENTS

4.4.31 Views from residential properties within settlements are generally static, the same view being obtained daily. The value attached to these views is considered to be high, and the susceptibility of receptors to the type of development proposed is judged to be high. The sensitivity of all residential receptors within settlements is therefore regarded as high.

4.4.32 Within 5 km of the proposed turbines, settlement is largely limited to scattered properties dispersed along the road network which crosses the landscape. The community of Dalmellington (including the satellite settlement areas of Burnton and Bellsbank), is the nearest settlement to, and the only town within 5 km of, the proposed development. Dalmellington is located approximately 3.2 km south of the nearest proposed turbine on the northern banks of the River Doon. This market town is located on the junction of the A713 with the B714 to the north of the Galloway Forest Park.

4.4.33 Properties within Dalmellington comprise a mix of detached and semi-detached bungalows and terraced cottages with some double storey properties in the east. The historic core of the town comprises double storey stone buildings set out along narrow roads. On the periphery of the town, newer houses have been developed. The rising land to the north, in the area of the proposed development, forms a backdrop to the settlement which sits the valley of the Muck Water. Views from the edges of the settlement are largely contained by rising hills of the River Doon valley.

4.4.34 In the wider landscape, in particular to the north and east of the study area, settlement is more frequent. Scattered properties associated with farms are scattered across the landscape and a number of small settlements and towns are present. Key settlements with views to the proposed development area are set out and described further in the following paragraphs.

SETTLEMENTS LOCATED BETWEEN 5 KM AND 10 KM OF A PROPOSED TURBINE

4.4.35 The market town of Cumnock is located approximately 6.3 km northeast of the nearest turbine and is set in a landscape of woodland and moorland. The settlement lies on a slight plateau, 125 m above sea level, in a small valley formed by the Lugar and Glaisnock Waters. The Lugar meets the Glaisnock within the town boundary and then flows on to the west to join the River Ayr near Mauchline.

4.4.36 The Lugar and Glaisnock Waters and their confluence provided natural physical boundaries to the extent and form of the early settlement, while steep topography dominates the eastern end of the town. Evidence of earlier medieval settlement remains in the form of the irregular street patterns and small narrow plots closely packed together and orientated often at odds to the street edge; this area of Cumnock is protected as a Conservation Area.

4.4.37 More recent development has expanded the town to the north and the south. To the south an extended town centre includes commercial and residential properties and comprises residential development of semi-detached bungalows and double storey properties set along a looped street network which contains a number of cul-de-sacs. Along the southern edges of the town, residential development is separated into distinct areas, with open space or farmland providing separation from the main town.

4.4.38 Similarly, recent development at Holmhead - located to the north of the Lugar Water - is extending the settlement footprint further to the north towards Auchinleck and closing the area of open farmland between the two, once distinct, settlements.

4.4.39 The village of Ochiltree is located east of Cumnock, approximately 6.2 km north of the nearest proposed turbine. It is located at the confluence of the Lugar and Burnock Waters and was historically a cotton weaving town. The village has expanded to the north, where detached bungalows align Mauchline Road, and to the east where subdivision development comprising double storey semi-detached properties are set out along circular roads. More recent development on the eastern edge of Ochiltree has extended the town envelope further.

4.4.40 The village of Patna is located on the banks of the River Doon. Patna lies in a valley and is accessed via the A713 to the north of Dalmellington, approximately 6.4 km west of the nearest proposed turbine. Original buildings are single storey miners' cottages, located close to the road (Main Street). Later development has extended the village footprint to the south and east, and comprises larger houses, mainly two storey semi-detached with both front and rear gardens. The predominant orientation is east - west. Carskeoch Hill rises to the west, containing the settlement boundary. The settlement has spread across the river, aligning with the A713 in a narrow band of development which is contained by the slopes of Ewe Hill to the east.

4.4.41 The town of New Cumnock is located approximately 6.6 km east of the nearest turbine. It is situated on the confluence of the River Nith and the Afton Water and is located on low lying topography with aspect across the River Nith floodplain, contained by the rising hills to the south.

4.4.42 New Cumnock expanded as coal mining became a key industry in the area. Now, the town comprises a mix of original and modern buildings. Single and double storey properties align Castle Street (A76), the main street of New Cumnock. Further south, 1950s style double storey semi-detached properties form an extension to the town, set out along curved roads and cul-de-sacs. A number of these properties are unoccupied, and windows are boarded up. Due to the curved character of the street network, there is no clearly defined predominant orientation of properties.

4.4.43 Drongan is located 7.1 km northwest of the nearest turbine, north of the meandering Water of Coyle. The town is predominantly situated on the southeastern slopes of a minor hill, providing elevated aspect to properties located at upper levels. Drongan is a mining village and in 1946,it was redeveloped as a new town and was inhabited by families from small mining communities in the wider area. Properties from this time are largely two-storey semi-detached houses with front and back gardens. More recent development has extended the settlement footprint marginally to the west and north. Property orientation is predominantly north-south, with some variation along curved roads in the southeast of the settlement.

SETTLEMENTS LOCATED BETWEEN 10 KM AND 20 KM OF A PROPOSED TURBINE

- Mauchline (12 km north) - located on sloping topography north of the River Ayr, the town is located on the Glasgow and South Western Railway line;
- Dalrymple (12.8 km west) - a small mining village on the northern bank of the River Doon, located on gently sloping topography and contained by steeply rising hills to the northwest;
- Mossblown (14.2 km northwest) - a mining town located on the Glasgow and South Western Railway line within an area of gently undulating agricultural farmland;

- Tarbolton (14.5 km north) - located south of Tarbolton Loch, elevated above the southern banks of the Water of Fall;
- Ayr (15.5 km northwest) - Ayrshire's central marketplace and a well-known port, Ayr is located on the southern bank of the River Ayr and is the largest settlement in Ayrshire; and
- Maybole (17.5 km west) - built on a sloping hillside amongst undulating farmland with aspect towards the Southern Uplands.

SETTLEMENTS LOCATED BETWEEN 20 KM AND 45 KM OF A PROPOSED TURBINE

- Troon (23.8 km northwest);
- Kilwinning (35.5 km north); and
- Stevenston and Ardrossan (36 km northwest).

4.4.44 Site work has indicated that actual views of the proposed development from towns and settlements at distances of greater than 15 km are unlikely to be significant due to the presence of built infrastructure, landscape features such as areas of woodland and local undulations in topography which are not picked up by the ZTV, and therefore such towns and settlements have not been taken forward any further in the assessment.

TRANSPORT ROUTES

4.4.45 Figure 4.4 shows the location of all transport routes which have been considered in this LVIA.

4.4.46 The value and susceptibility of receptors on key transportation routes varies from medium (in respect of general commuter road users who may be travelling alone and concentrating on the road rather than the adjoining landscape) to high (in respect of tourists who are more likely to carry passengers, and who are likely to focus on the landscape).

4.4.47 Transportation routes within the study area are concentrated in the north, due to the proliferation of settlement in this area and the gentler landform. A network of motorway, A, B and unclassified roads creates a dense pattern of transport corridors across the landscape and provide links between small villages and larger areas of settlement. To the east and south, as the topography becomes more varied and larger mountain ranges characterise the landscape, transport routes follow along the sides and floors of glens and river valleys, such as the River Nith valley (A76), the River Doon valley (A713) and the Bellow Water (A70).

4.4.48 Analysis of the blade tip ZTV (Figure 4.5a) and cumulative ZTVs (Figures 4.6a-4.6w) indicate that the proposed development has the potential to theoretically influence the amenity of a number of routes located to the north, east and west of the site. The ZTV does not show any theoretical visibility of the proposed development on routes to the south of the study area.

4.4.49 Due to the high number of roads which have theoretical views of the proposed development, a desk-based study has been undertaken to identify those roads which would most likely experience significant effects on their visual amenity due to the potential visibility of the proposed development and sequential cumulative views of the other wind farms within the study area.

4.4.50 Following this study, the following transport routes have been identified for assessment:

- B741 New Cumnock to Girvan - 1.6 km south of the proposed development at its closest point;
- B7046 Cumnock to Patna - 2.9 km north of the proposed development at its closest point;

- A713 Ayr to Castle Douglas - 3.9 km southwest of the proposed development at its closest point;
- A76 Dumfries to Kilmarnock - 6.1 km east of the proposed development at its closest point; and
- A70 - Lanark to Ayr - 7 km north of the proposed development at its closest point;

RECREATIONAL ROUTES

4.4.51 Figure 4.4 shows the location of all recreational routes that have been considered in this LVIA.

4.4.52 There are a number of long-distance routes, cycleways and core paths within the 40 km study area. However, not all of these have theoretical visibility of the proposed development.

4.4.53 The only long distance or nationally recognised recreational routes within the study area with potential views of the proposed development are National Cycle Route 7 (NCR) and the River Ayr Way.

4.4.54 At its closest point, the NCR passes within 17 km of the proposed development. Visibility would be extensive along the NCR as it enters the study area from the north, routing through Saltcoats and along the local coastal road network to Ayr. Visibility becomes intermittent south of Ayr as the route passes along the coast to Maybole and Crosshill. As the route enters an area of coniferous woodland to the south of Crosshill, visibility of the proposed development ceases, and no views of the proposed development would be available from the cycle route in either direction for the remainder of the route as it lies within the study area.

4.4.55 The River Ayr Way traces the length of the River Ayr from its source - Glenbuck Loch - to the sea at Ayr. At a distance of 11.5 km north of the proposed development at its closest point, the walkway passes through moorland landscape at Glenbuck, small villages and areas of woodland. The walkway then follows the river through open farmland and estates before reaching the Ayr and finishing at the harbour. Visibility of the proposed development would be intermittent and would be present on the path as it crosses higher elevations such as to the southwest of Mauchline.

4.4.56 EAC's Core Paths Plan identifies a number of Core Paths within 10 km of the proposed development. In order to keep the LVIA proportionate and focussed on assessing those receptors where there is potential for significant effects, paths which are located outwith settlement boundaries or that pass through areas of forestry or woodland and are therefore enclosed and subject to restricted views have been scoped out of the assessment. Representative routes that have a more open aspect and relatively clear visibility of the proposed development and which are therefore included in the assessment are as follows:

- Core Path B14 - River Ayr Way Link;
- Core Paths C9 - Ochiltree to Drongan;
- Core Path C10 - Coalfield Cycle Route;
- Core Path C12 - New Cumnock Circular;
- Core Path C13 - Auchenroy Hill and Dalcairnie Falls;
- Core Path C14 - Glen Afton;
- Core Path D6 - Dumfries Estate; and
- Core Path D16 - Craigengillan to Knockdon.

4.4.57 In addition to the above routes, the study area contains opportunities for access to the countryside of the Southern Uplands under the terms of the Land Reform (Scotland) Act 2013.

A key part of this access is hill walking and the study area contains a number of notable summits, including The Merrick (843 m AOD) and Cairnsmore of Carsphairn (797 m AOD).

4.4.58 For the purposes of this LVIA, a number of summits have been included in EIAR Volume 4: Technical Appendix 4.6: Viewpoint Assessment. The summits selected for assessment are considered to provide a reasonable and proportionate coverage with which to assess effects on the amenity of hill walkers and the character of the hills.

Cumulative Context

4.4.59 The cumulative context for the proposed development is complex. There are a large number of wind farm developments located within the 40 km study area and as such, it has been necessary to identify those wind farms which are likely to contribute to significant cumulative effects when the proposed development is introduced.

4.4.60 Whilst all individual wind farm developments within 20 km of the proposed development are considered individually, those outwith this area have been grouped according to proximity in order to simplify the description of cumulative effects. This approach was agreed with EAC during scoping for the proposed development.

4.4.61 Where applications for variations to a consented wind farm have been made, these have been considered in the assessment.

4.4.62 Table 4.8, below, summarises the cumulative context within 40 km of the proposed development at the time that this LVIA was completed in August 2019. The location of these developments is indicated in Figure 4.6.

Table 4.8: Cumulative Wind Farm Context[22]

Status	Wind Farm	No of Turbines	Height of Turbines to Blade Tip (m)	Direction from the Proposed Development	Approximate Distance from the Proposed Development (km)
Individual Wind Farms within 20 km of the Proposed Development					
Operational	Afton	25	130	Southeast	11 km
	Dersalloch	23	152	Southwest	7.6 km
	Hare Hill	20	100	East	10 km
	Hare Hill Extension	39	125	East	12.3 km
	High Park	1	125	East	10.3 km
	Sanquhar	12	76	Southeast	16.3 km
	Sunnyside	2	125	East	21.9 km
	Whiteside Hill	10	110	Southeast	18 km
	Windy Standard	36	101	Southeast	13.5 km
	Windy Standard II	30	62	Southeast	10.5 km
Consented	Benbrack	18	126	South	10.3 km
	Glenmuckloch	8	100	Northeast	17 km
	Knockshinnoch	2	150	Northwest	7.4 km
	Lethans	22	120	Northeast	16 km

[22] This list and planning status of cumulative schemes was correct at the time that the list was frozen (in August 2019) in order to allow sufficient time to complete the LVIA for submission in October 2019.

Table 4.8: Cumulative Wind Farm Context[22]					
Status	**Wind Farm**	**No of Turbines**	**Height of Turbines to Blade Tip (m)**	**Direction from the Proposed Development**	**Approximate Distance from the Proposed Development (km)**
	Lorg	9	125	Southeast	18.2 km
	Overhill	10	220	East	2.9 km
	Polquhairn	9	125	Northwest	5.3 km
	Sandy Knowe	24	132	East	15.2 km
	Sanquhar Six	6	145	Southeast	13.7 km
	South Kyle	50	121	South	7 km
	Torrs Hill	2	121	South	23 km
	Twentyshilling Hill	9	110	East	25 km
	Windy Rig	12	115	Southeast	13.8 km
	Pencloe Wind Farm	19	111	Southeast	9 km
In Planning	Enoch Hill	16	125	Southeast	4.8 km
	Sanquhar II	50	110	Southeast	13.8 km
	Ulzieside	12	56	Southeast	19.5 km
	Windy Standard III	20	130	Southeast	11.5 km
	Pencloe Wind Farm	19	111	Southeast	8 km
	Hagshaw Hill Wind Farm Repowering	14	54	Northeast	30.5 km
	Lethans 2019	22	120	Northeast	14 km
Scoping	Greenburn Wind Farm	16	149.9	Northeast	2 km
Grouped Wind Farms outwith 20 km of the Proposed Development					
Group 1	Whitelee (o)[23]	140	91	North	34 km
	Whitelee Phase I (o)	36	74	North	31.7 km
	Sneddon Law (c)	15	125	North	31 km
	Whitelee Phase II (o)	39	132	North	28.6 km
	Calder Water (o)	14	81	North	30.2 km
	West Browncastle (o)	12	80	North	31.5 km
Group 2	Kype Muir Extension (c)	18	150	Northeast	30 km
	Kype Muir (o)	26	132	Northeast	31.8 km
	Dungavel (o)	13	150	Northeast	27.5 km
	Bankend Rig (o)	11	126	Northeast	24 km
	Auchrobert (o)	12	126	Northeast	33 km

[23] Status: (o) – Operational Wind Farm; (c) – Consented Wind Farm; (a) – Wind Farm In Planning (at application stage)

Table 4.8: Cumulative Wind Farm Context[22]

Status	Wind Farm	No of Turbines	Height of Turbines to Blade Tip (m)	Direction from the Proposed Development	Approximate Distance from the Proposed Development (km)
	Ladehead Farm (c)	3	134	Northeast	37 km
Group 3	Broken Cross (c)	6	145	Northeast	40 km
	Dalquhandy (c)	15	126	Northeast	32 km
	Nutberry (o)	6	200	Northeast	30.5 km
	Poniel (c)	3	110	Northeast	36 km
	Douglas West (c)	15	126	Northeast	34 km
	Douglas West Extension (a)	13	121.2	Northeast	32 km
	Hagshaw Hill Extension (o)	20	100	Northeast	31.2 km
	Hagshaw Hill (o)	26	150	Northeast	31 km
	Cumberhead (c)	11	176	Northeast	29 km
	Galawhistle (o)	22	100	Northeast	28 km
Group 4	Middle Muir (c)	15	149.9	Northeast	34.1 km
	Glentaggart (a)	5	130	Northeast	32 km
	Andershaw Forest (o)	14	126	Northeast	32.4 km
	Kennoxhead (c)	19	150	Northeast	24 km
	Penbreck & Carmacoup (c)	9	120	Northeast	20.7 km
Group 5	Clyde (o)	152	126	East	44 km
	Clyde Extension (o)	53	142	East	46 km
	Crookedstane (c)	4	74	East	
	Lion Hill (c)	4	149	East	42 km
	Harryburn (a)	17	125	East	37 km
	North Lowther (a)	30	200	East	28.5 km
Group 6	Longburn (a)	10	200	Southeast	21 km
	Cornharrow (a)	11	152	Southeast	22 km
	Wether Hill (o)	14	62	Southeast	23 km
	Glenshimmeroch (a)	10	125	Southeast	26 km
	Margree Forest (a)	17	178	Southeast	28.4 km
	Knockman Hill (c)	5	130	Southeast	30 km
	Blackcraig Hill (o)	23	134	Southeast	33 km
	Mochrum Fell (c)	8	149.9	Southeast	40 km
	Shepherds Rig (a)	19	90	South	19.3 km
	Troston Loch Wind Farm (a)	14	110	Southeast	26 km
Group 7	Hadyard Hill (o)	52	130	Southwest	32 km

Table 4.8: Cumulative Wind Farm Context[22]					
Status	**Wind Farm**	**No of Turbines**	**Height of Turbines to Blade Tip (m)**	**Direction from the Proposed Development**	**Approximate Distance from the Proposed Development (km)**
	Tralorg (c)	8	121	Southwest	36 km
	Assel Valley (o)	10	126	Southwest	37 km
	Mark Hill (o)	28	149.9	Southwest	40 km

4.4.63 The emergent pattern of wind farm development in the study area is complex both in respect of the spatial arrangement of developments and the turbine geometries utilised, reflecting the length of time over which wind energy development has formed a constituent part of the area's landscape, and the changing technology adopted. However, it is apparent that most of the wind farms occupy upland locations within the Southern Uplands with Forest and Foothills with Forest character types. A notable concentration of wind farms is situated to the southeast of the proposed development.

Future Baseline

4.4.64 It is anticipated that the commercial forestry operations across the site and adjoining areas will continue to take place should the proposed development not be taken forward, resulting in areas of clear felling and restocking in line with the forest plans for the area for the foreseeable future.

4.4.65 Additionally, the phased surface coal extraction and restoration operations at House of Water and Greenburn would continue to take place in accordance with planning permissions for those areas. Operations at House of Water are likely to be completed by 2021 and operations at Greenburn are due to be completed during 2019 and subsequently restored. The committed restoration schemes for House of Water and Greenburn are shown on Figure 2.3 of the Scoping Report[24]. The former Netherton and Skares surface mines have been restored. Whilst the House of Water site contains areas currently being mined, there are approved restoration provisions and so the future baseline will, in due course, reflect this. Consequently, the LVIA takes account of this anticipated restoration.

4.4.66 Other areas of the site including Chalmerston and Benbain, that comprise unrestored and abandoned surface mine workings, have little or no prospect of substantial restoration taking place and so for the purposes of EIA, the baseline for the LVIA assumes that these areas of abandonment remain as they are at present.

4.4.67 Outwith the immediate site area, the greatest changes apparent relate to the expansion and changes in settlement pattern, improvements to road infrastructure, introduction of further wind farms and the expansion of power transmission infrastructure.

4.4.68 In the absence of the proposed development and without dramatic changes to policy or economic drivers in the area, the established trends in respect of land use/landcover and the baseline landscape and visual context will remain largely consistent with the scenario described. However, it is anticipated that there will be continued interest in the Foothills with Forestry LCT for wind farm development. Whether it is in the form of smaller scale separate developments or larger scale, single schemes such as that proposed.

[24] Ramboll (April 2018) North Kyle Wind Energy Project – Scoping Report

4.4.69 A further potential driver for change is the Coalfield Communities Landscape Partnership (CCLP). The CCLP is a partnership of public, charitable and government agencies that is looking to secure funding from the Heritage Lottery Fund (HLF) Landscape Partnership grant scheme. CCLP will release funding allocated to deliver projects from 2020 - 2025. The vision of the CCLP is that:

"Coalfield Communities share the benefits of a renewed landscape, welcoming visitors from afar to celebrate their unique heritage and promote stewardship of the land, shaped by an understanding of the past and needs of the future."

4.4.70 Within the North Kyle Forest, the CCLP refers to the North Kyle Forest Masterplan (NKFM) (April 2016) which is an aspirational document that sets out a vision for social, economic and environmental change, largely related to the rehabilitation of existing/legacy mining sites, and aims to:

"create a lasting and positive legacy for the forest area that will replace a blighted landscape with something that is more natural and more welcoming to wildlife; connects communities emotionally and physically with the Forest; provides high quality opportunities for outdoor education, activity and recreation; encourages people to stay healthy and happy; creates valuable job and training opportunities for young people; and helps deliver the Scottish Government's strategic objectives for a Smarter, Healthier, Greener, Wealthier and Fairer, Safer and Stronger Scotland."

4.4.71 The NKFM acknowledges that much of the development activity in this area of East Ayrshire is currently around wind farm development but argues that there needs to be a balance of impact versus local benefit. The NKFM suggests there is some capacity for turbines of up to 70 m to maximum blade tip height, largely based on the 2013 Capacity Study, and there appears to be an acknowledgement in the NKFM that wind farms may have a part to play in the achievement of the masterplan aims. The Planning Statement considers the proposed development in relation to the NKFM.

4.5 Assessment of Likely Effects

4.5.1 The layout and design of the proposed development are described in Chapter 2: Development Description, and illustrated in Figures 2.1 to 2.16b.

4.5.2 The key components of the proposed development with the potential to affect the landscape and visual resource of the study area include those related to construction, operational and decommissioning stages of the development.

Potential Construction Effects

4.5.3 During construction (36-month period) the following elements have the potential to result in effects on the landscape fabric within the site, as well as the landscape character and/or visual amenity of the site and wider study area:

- construction of a new site access tracks;
- construction of temporary site compounds incorporating site offices;
- construction of site infrastructure, including tracks between turbine locations;
- construction of laydown areas and crane pads;
- construction of substations and compounds, incorporating control rooms;
- excavation and construction of turbine foundations;
- erection of turbines;

- excavations of ditches for underground cables;
- excavation of temporary stone extraction areas (SEAs);
- creation of a temporary batching plant;
- HGV and abnormal load deliveries to site and movement of vehicles on site; and
- reinstatement work, including restoration of SEAs and other areas, removal of temporary accommodation works, establishment of habitat management areas, and establishment of replacement forest planting.

4.5.4 Most of the effects occurring during this phase relate to disturbance of existing landcover at the site and potential for long term change or loss of characteristic vegetation with consequent effects on the character and amenity of the site and the adjoining area. However, a large proportion of the construction effects would be managed through adoption of good practice and careful construction management and monitoring regimes (such as those presented in the Outline Construction and Environmental Management Plan (CEMP) (EIAR Volume 4: Technical Appendix 2.1). The proposed replacement planting of forest cover across much of the site would, as the planting matures, result in gradual reversal of construction impacts related to the removal of forestry (EIAR Volume 4: Technical Appendix 2.11: Forestry Report).

4.5.5 Despite the phased manner of the felling and construction activities of the proposed development, short term significant effects are anticipated, primarily within the site and adjacent Foothills with Forestry LCT. These would primarily be associated with the scale of felling activities and consequent temporary loss of characteristic vegetation cover. Such activities are not uncharacteristic in the Foothills with Forestry LCT and would be largely reversible through restocking of forested areas.

Potential Operational Effects

4.5.6 The operational life of the proposed development would be up to 25 years. The operational elements with the potential to affect the landscape and visual amenity of the study area are:

- 54 No. wind turbine generators and external transformers;
- on-site access tracks and hardstanding areas;
- restored temporary SEAs;
- bell mouth and site access improvements established during the construction phase of the proposed development;
- substations/site control buildings; and
- gradual maturation of replacement forest cover.

4.5.7 Effects arising during the operational period of the proposed development would mainly arise from the wind turbines, which represent the most visible and prominent aspects of the operational development.

Potential Decommissioning Effects

4.5.8 Effects arising from the process of decommissioning have been scoped out of the LVIA since they would occur after cessation of the operational phase of the proposed development at which stage the related processes and restoration procedures may have changed from those currently deployed. The decommissioning procedures are likely to be of a similar nature to construction activities, but of a shorter duration and to result in at least a partial reversal of operational effects.

4.6 Mitigation

4.6.1 The siting and design of the proposed development has been influenced by a number of national and regional sources of guidance, including:

- Scottish Planning Policy (SPP);
- SNH's current guidance on the siting and design of wind farms (SNH Guidance)[25]; and
- EALWECS.

SPP

4.6.2 As described in Section 4.3 of this Chapter, SPP provides a hierarchy of categories for use in spatial frameworks to aid the direction of development to the most appropriate locations. The key considerations, in spatial planning terms are:

- avoidance of locations within Group 1 Areas that are subject to nationally important designations such as NPs or NSAs;
- avoidance, where possible, of Group 2 Areas which are designated/classified for their international or national heritage value, outwith NPs and NSAs, sites included in the inventory of GDLs, other nationally important mapped environmental interests such as WLAs and locations within 2 km of cities, towns and villages identified on the local plan; and
- preferential use of Group 3 Areas which are not constrained by landscape designation or classification, which are considered to have potential for wind farm development, subject to detailed consideration against policy criteria.

SNH Guidance

4.6.3 Paragraph 1.15 of the SNH Guidance states that

"Wind farms should be sited and designed so that adverse effects on landscape and visual amenity are minimised and so that landscapes which are highly valued are given due protection."

4.6.4 Paragraph 2.15 states that

"Choice of turbine size is an integral part of the design process. Identification of the key landscape characteristics, their sensitivity and capacity to accommodate change will inform this. Generally speaking, large wind turbines will appear out of scale and visually dominant in lowland, settled, or smaller-scale landscapes, which are often characterised by the relatively 'human scale' of buildings and features. They are best suited to more extensive, upland areas, and set back from more sensitive upland fringes. This can reduce effects on settled and smaller-scale valleys and lowland landscapes."

4.6.5 Paragraph 2.16 states that

"turbine size is also a key issue in upland landscapes, where they are viewed against, or from, landscapes of a more intricate scale and pattern; or where it is otherwise difficult to discern the landscape scale and distance. By illustrating the scale of an upland landscape, wind turbines may seem to conflict with the expansive nature of these areas."

4.6.6 Paragraph 2.20 goes on to propose that

"ancillary elements for a wind farm development should be designed so they relate to the key characteristics of a landscape. It is important that these elements do not confuse the

[25] SNH (2017) Siting and Design of Wind Farms in the Landscape – Version 3a

simplicity of the wind farm design, or act as a scale indicator for the turbines themselves. Undergrounding power lines within the wind farm, using transformers contained within tower bases (where possible), and careful siting of substations, transmission lines, access tracks, control buildings and anemometer masts will all help to achieve a coherent wind farm design. Simplicity of appearance and use of local, high quality materials will further enhance this."

4.6.7 Paragraph 2.25 addresses the layout of turbines and suggests that

"turbines can be arranged in many different layouts. The layout should relate to the specific characteristics of the landscape - this means that the most suitable layout for every development will be different."

4.6.8 Paragraph 3.23 discusses design responses to terrain, stating that

"landform is a key landscape characteristic, whether it is rugged, flat, undulating or rolling, upland or lowland. In flat landscapes, any undulations tend to become accentuated so that even low hills appear substantial."

4.6.9 Paragraph 3.24 goes on to state that

"it is generally preferable for wind turbines to be grouped on the most level part of a site, so the development appears more cohesive, rather than as a poorly related group of turbines."

4.6.10 The guidance identifies skylines to be of critical importance and posits that the design should avoid detracting from or overwhelming the character of distinctive skylines, as well as avoiding variable heights or overlapping turbines.

4.6.11 A further design objective discussed in the guidance is the appropriate scale for the wind farm that is in keeping with that of the landscape. SNH suggests that the proposed development should form an element of:

- *"Minor vertical scale in relation to the other key features of the landscape;*
- *Minor horizontal scale in relation to the key features of the landscape (where the wind farm is surrounded by a much larger proportion of open space than occupied by the development); and*
- *Minor size compared to other key features and foci within the landscape; or separated from these by a sufficiently large area of open space (either horizontally or vertically) so that direct scale comparison does not occur."*

4.6.12 The guidance also discusses the relationship between wind farms. A key factor determining the cumulative impact of wind farms is the distinct identity of each development. This relates to their degree of separation and similarity of design between wind farms. This applies whether they are part of a single development, a wind farm extension, or a separate wind farm in a wider group. A wind farm, if located close to another of similar design, may appear as an extension. However, if it appears at least slightly separate and of different design, it may conflict with the other development.

Capacity Study

4.6.13 The 2018 Capacity Study (EALWECS) concludes that the large scale and simple landform and land cover of the Foothills with Forestry and Open Cast Mining LCT could relate to larger turbine typologies, but that there is a need to:

- reduce potential cumulative landscape and visual effects on adjacent well-settled lowland landscapes;
- minimise the exacerbation of the already fragmented nature of this landscape which is characterised by extensive surface mining;

- avoid exacerbation of the fragmentation of this landscape which may occur if multiple developments and/or a range of different heights and types of turbine were to be sited in this character type and seen in conjunction with past and current opencast mining operations;
- avoid potential perceived 'encirclement' of the Upland Basin (15) character type should further wind farm development be sited within this character type and the East Ayrshire Southern Uplands (20a), the Southern Uplands with Forest (20c) and the Plateau Moorlands (18a) and be prominent on immediately containing skylines;
- minimise cumulative effects on the upper Doon Valley (including effects on the Craigengillan designed landscape and the setting of settlements such as Dalmellington);
- avoid placement of turbines on the more visually prominent outer slopes and pronounced hills of this landscape which form the containing edges to settled and smaller scale Upland River Valley (10) of the Doon valley to the southwest, the Upland Basin (15) to the east and the East Ayrshire Lowlands (7c) and Lowland River Valley (9) of the Lugar Water to the north-east;
- avoid the less modified pockets of remnant moss and associated mixed woodlands; and
- use less visually prominent lower hills and shallow basins within the core of the uplands which could provide a degree of visual containment for wind turbine development and minimise intrusion and cumulative effects on adjoining more settled smaller scale landscapes.

Mitigation during Construction

General Construction Mitigation Measures

4.6.14 The location and management of construction elements has been carefully considered to minimise environmental effects including potential landscape and visual effects during the construction stage. Additionally, the following general precautionary measures would be adopted in order to minimise landscape and visual effects:

- all working areas would be restricted as far as practicable to the specified areas and demarcated to prevent incursion of site plant into non-construction locations;
- material storage/temporary stockpiles would be retained for the shortest duration practicable and would be sited to avoid visual intrusion to neighbouring receptor locations, with particular regard to avoidance of sky-lining such features in views from neighbouring low-lying receptor locations such as the Upland Basin, the Agricultural Lowlands to the north, or the Doon valley to the west;
- peat materials would be placed directly, wherever practicable, to avoid double handling, reduce vehicle movements, and to reduce potential drying and oxidisation of the peat. Where this is not possible the peat would be stored in accordance with the EIAR Volume 4: Technical Appendix 2.5: Draft Peat Management Plan;
- temporary site compounds and temporary SEAs would be reinstated prior to the commencement of the operational phase of the site to avoid the necessity of retaining restoration materials on site over the operational period and to avoid sustained effects on landscape fabric character and visual amenity;
- the surface of lay-down areas would be reinstated to replicate the appearance of adjoining land; and

- excavations for turbines foundations, laydown areas and underground cables would be reinstated prior to commencement of the operational phase of the proposed development; and
- all track sides would be reinstated with suitable material to ensure they would blend in with the adjoining ground at the site.

Temporary Construction Compounds

4.6.15 The use of four temporary compounds is intended:

- CC1 within existing surface mine workings east of Benbeoch;
- CC2 by turbine 35;
- CC3 which is an access control compound, near turbine 29;
- CC4 adjacent to turbine 15 in the eastern part of the application site.

4.6.16 The use of the two main and one satellite construction compounds (CC1, CC2 and CC4) is intended to reduce the overall size required of each compound and to reduce length and frequency of on-site vehicle movements. It is also intended that all four temporary compounds would be returned to a condition consistent with that of the adjoining landscape during final construction works at the site.

Concrete for Turbine Bases

4.6.17 It is the intention that concrete required for the construction of turbine foundations would be produced at batching plant to be established within the two main temporary construction compounds. This would be screened from a large proportion of external receptor locations along key transportation routes and settlements. In any event, this would be a temporary element and would be removed and ground cover restored to tie-in with the surrounding land cover during final construction works at the site.

Stone Extraction Areas (SEAS)

4.6.18 In the event that suitable aggregate is not available on site from existing overwidened roads and areas of overburden, it is proposed that aggregate for new tracks would be won from SEAs at the site. Currently four temporary SEAs are proposed (EIAR Volume 3a: Figure 2.2). Of the SEAs, one is positioned southeast of turbine 54, a second would be located east of turbine 36, the third by High Mount (northeast of turbine 16) and the fourth south of turbine 5. These locations were selected to minimise the visibility of these elements from external receptor locations. Their position was also selected to avoid prominent exposed slopes or ridgelines or highly distinctive topographical forms that might make sympathetic restoration difficult. The distribution of the SEAs is intended to reduce the length of site haulage of stone and its consequent effects on the character and amenity of the adjoining landscape.

4.6.19 It is intended that the size of any excavation would be limited as far as possible to avoid formation of large-scale unsightly excavations that might prove onerous to restore. Detailed designs and restoration proposals for the SEAs would be provided to EAC and SNH but are anticipated to comprise a partially backfilled void topped with selected soils/peat materials and translocated turf (as set out in EIAR Volume 4: Technical Appendix 2.1: Outline CEMP and Technical Appendix 2.5: Draft Peat Management Plan). Additionally, in order to avoid the establishment of anomalous cut faces on the upper part of the excavation the softening of sharp edges of the SEAs by mechanical means or restoration blasting are proposed, the resultant slopes would be covered in restoration substrate and turf to ensure that the restored SEAs blend in with the adjoining landscape.

Crane Pads and Laydown Areas

4.6.20 These elements of the proposed development would be kept to a minimum size and would be surfaced to match the track construction. Laydown areas not potentially required for future maintenance could be removed at the end of the construction phase of the proposed development and the ground reinstated to match adjoining ground. Alternatively, the surface of the laydown areas could be reinstated to match adjoining land whilst a firm sub base is retained for future use if required.

Substations

4.6.21 There would be three substations:

- One northeast of turbine 29;
- One located immediately south of turbine 35; and
- One at the eastern end of the Benbeoch surface mine site.

4.6.22 The substation sites were selected to take advantage of the enclosure of the Foothills with Forestry topography and coniferous tree cover within the interior of the Foothills with Forestry and away from exposed slopes and skylines.

Mitigation during Operation

4.6.23 The design of any onshore wind farm is a matter of balance between commercial, technical and environmental constraints and opportunities. EIAR Volume 2: Chapter 3: Design Evolution and Alternatives provides a summary of the key design drivers and decisions made during the course of the design of the proposed development.

4.6.24 It is clear from the description of the design process that landscape and visual considerations, such as the existing landscape and visual baseline context as well as published guidance, were key to the design development. Those pertaining to the siting and design of the proposed development are summarised below.

Siting

4.6.25 The site location evolved to ensure that the proposed development would be located:

- outwith areas classified as Group 1, and outwith areas defined as Group 2 on landscape and visual grounds in the 2018 spatial framework for onshore wind energy;
- outwith areas subject to landscape designations or classifications such as WLA, and away from settlements and other concentrations of sensitive receptors;
- in larger scale upland moorland and forested locations that are more capable of accommodating wind turbines than smaller scale landscapes;
- in a landscape that is already subject to ongoing modification or change and which contains existing or consented wind farm developments and/or other forms of large-scale development;
- away from distinctive landscape features, the scale and form of which could be compromised;
- to avoid, wherever possible, interrupting views of key landmark landscape features such as Cairnsmore of Carsphairn; and
- to reduce the visibility and prominence of the proposed development from key sensitive receptor locations to the west, east and north, including main settlements, glens and key transportation and tourist/scenic routes and recreational routes in the study area.

Layout and Design

4.6.26 Priority considerations in respect of the design from a landscape and visual perspective included:

- adoption of turbine sizes that would maximise yield whilst simultaneously minimising the proposed development's footprint and infrastructure requirements, thereby reducing impacts on the landscape fabric of the site;
- the preference for turbines of a size that would be consistent with that of the Overhill and the South Kyle wind farm developments, thereby limiting any incongruity between these closest schemes and the proposed development;
- use of turbines with a tip height below 150 m in order to avoid the necessity of visible aviation lighting on turbines, thereby avoiding additional effects on the night landscape character and visual amenity of the area;
- preferential use of existing tracks on site to minimise effects associated with this aspect of the proposed development;
- minimisation of the amount of site infrastructure and ancillary elements required, and careful positioning and design to ensure that such elements are screened from the majority of external receptor locations; and
- careful siting and design of proposed substations and control rooms to minimise visibility from external receptor locations.

Mitigation during Decommissioning

4.6.27 The decommissioning phase of the proposed development would be of a shorter duration than that of the construction phase, with the dismantling of all above ground structures and reinstatement of disturbed ground, subject to a hydrological assessment. Below ground structures would be left in place to avoid further disturbance. There would therefore be a temporary impact from the activities on site to remove structures, but this would be of relatively short duration. Accordingly, the decommissioning phase is considered to be likely to have a minimal effect on the landscape and visual amenity of the locality, ultimately to result in the reversal of a number of effects associated with the operational wind farm. Mitigation measures associated with decommissioning would be agreed during the preparation of the final decommissioning plan, that would require approval of EAC and other statutory consultees.

4.7 Assessment of Residual Effects

Residual Construction Effects

Residual Effects on Landscape Fabric during Construction

4.7.1 Chapter 2: Development Description provides details of the land take associated with different aspects of the construction of the proposed development. This indicates that, including temporary disturbance, the proposed development would cause disturbance or change to around 92 ha of the site. However, of that, around 53 ha would comprise temporary disturbance associated with the establishment of temporary compounds, SEAs, crane pads, and laydown areas. The remaining 39 ha of the site would be subject to long term alteration associated with turbine bases, crane pads, telecommunication mast, the substations and their compounds, and site access tracks.

4.7.2 The key change to the fabric of the landscape within the site would relate to some minor localised changes to site topography and mainly temporary losses of characteristic landcover, namely felling of 421.3 ha of commercial forest as a result of the construction requirements. Felling would take place over 24 months, 12 months of which would overlap with the construction phase.

4.7.3 The species composition of the forest would change resulting in a decrease of 182.01 ha of what is primarily commercial forestry, whilst the area of broadleaf woodland at the site would increase by 3.02 ha. There would be the creation of 29.08 ha of woodland fringe and open ground would increase by 23.99 ha to facilitate delivery of the Habitat Management Plan (HMP). The forest redesign for the proposed development would result in a net loss of forest area of 151.36 ha. However, this shortfall would be made up by compensatory planting elsewhere.

4.7.4 On this basis, the proposed development is considered to result in comparatively limited change to this large-scale landscape and a Moderate/Minor residual effect. Whilst the proposed felling will necessitate large scale felling, this is not uncharacteristic, in itself for a commercial forest and would be accompanied by some notable diversification of forest habitats.

Residual Effects on Landscape Character during Construction

4.7.5 The effect of construction operations at the site would be localised to construction locations and would be of relatively short duration and much of the disturbance associated with construction operations would be ameliorated or removed during subsequent reinstatement activities. Consequently, the effect of construction operations is considered to represent no significant residual effects on landscape character either within or in the adjacent landscape.

Residual Effects on Designated Landscapes during Construction

4.7.6 As with predicted effects on landscape character types, effects on designated landscapes within the study area are also not anticipated to be significant during construction, until the majority of turbines are constructed, thereby approaching the operational appearance of the proposed development. The proposed development would occur outwith designated areas and would therefore have no direct effect on designated landscapes. Whilst indirect effects are likely, primarily as a result of the operation of cranes and erection of turbines, such effects would be localised and would be of a short duration. Consequently, such effects are not considered to represent significant residual effects on adjacent designated landscapes.

Residual Effects on Visual Amenity during Construction

4.7.7 Construction operations would be confined to locations within the site and screened from the majority of key external receptor locations, including settlements, transportation routes and the majority of recreational routes as defined in Section 4.4, the exception to this being the operation of site cranes and erection of turbines. However, even these aspects of the construction operations would be of relatively short duration. In this context, residual construction effects on visual amenity are considered unlikely to be significant.

Residual Cumulative Effects during Construction

4.7.8 Whilst there is potential that construction operations at a number of developments, such as the consented Overhill, Knockshinnoch and Polquhairn, could coincide, there is little certainty the actual timing or duration of the construction of such developments. It is also the case that the duration of construction operations at these sites would be relatively short and geographically confined, and therefore unlikely to provide a basis for significant cumulative effects.

Residual Operational Effects

Effects on Landscape Fabric during Operation

4.7.9 No additional effects on landscape fabric would occur during the operational life of the proposed development. Replanted coniferous plantation at site would gradually mature, re-establishing the characteristic land cover and productive use of the site.

Effects on Landscape Character during Operation

4.7.10 Technical Appendix 4.2: Landscape Character Description contains a description of the characteristic elements of LCTs within the study area that would be subject to views of the proposed development, and Technical Appendix 4.3: Residual Effects on Landscape Character contains a prediction of likely residual effects. LCTs predicted to be subject to potentially significant effects include:

- 76 (LCT:17a): Foothills and Forestry with Opencast Mining, which contains the proposed development
- 74 (LCT:15): Upland Basin;
- 81 (LCT:20a): East Ayrshire Southern Uplands;
- 66: (LCT: 7c): East Ayrshire Lowlands;
- 68 (LCT:9): Lowland River Valleys;
- 69 (LCT:10): Upland River Valleys;
- 76 (LCT:17b): Foothills with Forestry West of the Doon Valley;
- 78 (LCT:18a): East Ayrshire Plateau Moorlands;
- 83: Rugged Upland - Ayrshire

76 (LCT:17A): FOOTHILLS AND FORESTRY WITH OPENCAST MINING

4.7.11 The scale of proposed felling associated with the proposed development would not be typical of the established forest plan for the application site and would result in a considerable increase in the openness and disturbance associated with felling. However, the design of the proposed development provides for retention of a forested edge to the Foothills in views from the majority of external receptor locations. Moreover, effects associated with felling and construction are likely to be reversed as replacement planting matures, re-establishing the forested character of the site.

4.7.12 The introduction of the proposed development would introduce a large-scale commercial wind farm to a landscape with limited such development present, thereby significantly increasing the influence of wind energy development and making it a key characteristic element of the landscape in the long-term, as experienced from both the interior of the LCT as well as from neighbouring receptor locations. Consequently, the magnitude of impact on this landscape would be substantial and the residual effect would be **Major/Moderate** (significant). If proposed wind farms in the study area are taken into account, alongside the baseline of existing and consented developments, the residual cumulative effect would also be **Major/Moderate** (significant). However, as replacement planting matures, much of the cumulative experience from within the LCT would be from summits and recreational routes through the forest, the proposed development adding considerably to the influence of wind energy development on the landscape.

74 (LCT:15): UPLAND BASIN

4.7.13 Seen from locations in the River Nith Corridor and parts of New Cumnock the proposed development would extend southwards from the consented Overhill array and would constitute a substantial impact. Similarly, viewed from parts of New Cumnock the proposed development, whilst more distant, would form a prominent expansion of consented wind energy development on the skyline to the west, resulting in an extension of impacts associated with the existing/consented wind farms in the area and a Substantial Impact and **Major** (significant) residual effect which would be significant.

4.7.14 In contrast, seen from the A76 corridor, the proposed development would be substantially screened from much of this route and seen briefly and obliquely, therefore representing a slight impact and Moderate effect. The existing character of this part of the LCT would remain substantially unaltered.

4.7.15 If proposed wind farms within or theoretically visible from this LCT are considered, the proposed development would continue to pose a Substantial impact and **Major** (significant) effect within the River Nith corridor and parts of New Cumnock, but generally only a Slight impact and Moderate effect within the A76 corridor.

81 (LCT:20A): EAST AYRSHIRE SOUTHERN UPLANDS

4.7.16 Significant effects are anticipated in the unit west of Glen Afton from where the proposed development would be seen to the northwest from elevated summits and north-facing slopes within this unit. Given its proximity and likely prominence, the proposed development is predicted to result in a substantial impact within this LCT. However, the number of receptors that would experience such an impact is likely to be limited due to the unsettled nature of this landscape and absence of formal footpaths.

66: EAST AYRSHIRE AGRICULTURAL LOWLANDS

4.7.17 Residual effects in this LCT would range from Moderate/Minor in the vicinity of Stewarton and east of Prestwick, to Moderate between Kilmarnock and the Ayr Valley, and **Major** (significant), between Ayr and Cumnock.

4.7.18 The significant effects predicted between Ayr and Cumnock would arise from the proposed development's prominence on the skyline west of this part of the LCT. The proposed development would extend wind energy development northwards from the main concentration of wind turbines that are located in the Southern Uplands, to the south.

4.7.19 The proposed development would affect the perceived scale and simplicity of the landscape at the transition with the Foothills and Forestry and add significantly to the cumulative context on the skyline in views from this LCT.

68 (LCT:9): LOWLAND RIVER VALLEYS

4.7.20 Significant effects are predicted at elevated locations along the northern side of the Ayr valley from where the proposed development would add to the complexity of turbines on the horizon and form a notable lateral extension to existing and consented arrays, thereby significantly increasing the complexity and extent of movement and proportion of the prominent horizon that forms the backdrop to the valley. The inclusion of proposed wind farms such as Greenburn would add to this effect.

69 (LCT:10): UPLAND RIVER VALLEYS

4.7.21 This LCT is divided into a series of different units. Those with potential visibility of the proposed development include:

- Doon Valley (around 3 km to the southwest of the proposed development);
- Nith Valley (around 8 km to the east of the proposed development); and
- Berlow Water (around 8 km to the north-east of the proposed development.

4.7.22 Significant effects are predicted within the Nith and Berlow Water units of this LCT which, whilst broad and of larger scale than the Upland Glen landscape type, are oriented towards the site and would form a channelled view towards the proposed development. Combined with the orientation of key roads in these valleys, this places particular emphasis upon the skyline to the west that is formed by the Foothills. The proposed development would constitute a notable extension of wind energy development to the north of the main cluster of existing and consented development, adding increased complexity and movement to a key horizon and backdrop to this incised landscape.

76 (LCT:17B): FOOTHILLS WITH FORESTRY WEST OF THE DOON VALLEY

4.7.23 Localised significant effects would occur on elevated summits and northeastern faces at the eastern end of this LCT unit but, more widely, the proposed development would have a Minor effect.

4.7.24 Where significant effects occur, they would be associated with the increased influence and prominence of wind energy development that would be evident in the middle-ground, to the east of the LCT, where intervisibility with the existing Dersalloch array would occur. Significant effects would occur both in respect of existing and consented developments that form part of the baseline of the landscape adjoining this LCT, as well as if proposed wind farms such as Sanquhar II and Greenburn are taken into account.

78 (LCT:18A): EAST AYRSHIRE PLATEAU MOORLANDS

4.7.25 Significant effects experienced within this LCT would be confined to the LCT unit south of the Ayr valley. From this unit the proposed development would be seen in conjunction with existing, consented and proposed wind energy developments, the proposed development adding notably to the influence of wind energy development and the perceived enclosure formed by developments to the east, south and southwest of this LCT, resulting in a diminishing perception of wildness in the unit. This would remain the case if proposed wind energy developments in the study area are also take in into account.

83: RUGGED UPLAND - AYRSHIRE

4.7.26 Ranging from No Effect across much of the LCT to Moderate/Minor in elevated summits and **Major/Moderate** (significant) at the northern fringes of this LCT, overlooking the Doon Valley.

4.7.27 Seen from the northernmost part of the LCT, the experience of receptors is one largely conditioned by neighbouring landscapes (including Foothills/Foothills with Forest, and Southern Uplands/Southern Uplands with Forest) that are characterised by wind energy development and large-scale coniferous forests. The proposed development, whilst not a wholly new feature in views from this part of the LCT, would constitute a notable increase in the prominence and influence of wind energy development, extending the effect of existing and consented wind farms in the Southern Uplands, into the Foothills to the northeast.

Effects on Landscape Designations and Classifications

4.7.28 Of the designated and classified landscapes assessed, only parts of the Dumfries House GDL are considered to be subject to potentially significant effects. The areas of the GDL liable to significant effects are largely confined to locations on elevated locations on the northern side of the valley in which the GDL is located. Such locations include the original access to the estate and adjoining agricultural fields, as viewed from the B7036 through a breach in roadside vegetation (Ref. Viewpoint- Figure 4.10a in EIAR Volume 3b), and from the elevated sections of the new access track at the western extent of the GDL. From these locations the proposed development would be seen in conjunction with a number of operational and consented wind farms, including Overhill and Polquhairn, and would constitute an intensification of development on the skyline. This would represent a notable increase to the operational and consented development context and distract visitors from the incised wooded landscape of the GDL. The inclusion of proposed wind farms within the study area would exacerbate this effect, most notably Greenburn turbines. However, the western access has been planted with avenue trees and it is expected that views from this track will, in time, be restricted as the trees mature.

Effects on Visual Amenity

SETTLEMENTS

Dalmellington

4.7.29 The blade tip ZTV indicates that up to 12 wind turbines would be theoretically visible from the southwestern edge of Dalmellington, and from Bellsbank to the south of Dalmellington. As the proposed development is set back from the edge of the valley, the enclosure provided by the valley landscape screens to a high degree actual views to the proposed development. This is confirmed by the hub height ZTV which indicates that only blade tips would be visible across the settlement area, and from the approaches in both directions. 3D modelling and field reconnaissance has indicated that actual visibility would be further reduced due to the presence of other built infrastructure (such as the northern extent of Dalmellington), areas of woodland and tree planting and local undulations in topography not picked up by the ZTVs, which foreshorten views or provide localised screening.

4.7.30 At Bellsbank, the prospect from the settlement is focussed downslope towards the River Doon. Views to the proposed development would be to the rear of the most elevated properties in the east of the settlement and would be of blade tips only, which would largely be screened by intervening vegetation.

4.7.31 Given the extremely limited visibility of the proposed development from Dalmellington and Bellsbank, the potential for cumulative effects is considered to be Negligible.

Cumnock

4.7.32 Views from Cumnock would be provided from elevated locations in the northern part of the town, including the B7083 as it approaches the town, parts of the Holmhead housing estate and the area surrounding Drumbrochan Road where gaps between residential properties and road alignment provide longer range views to the southwest. At lower elevations the underlying topography slackens, and views are foreshortened by intervening buildings and vegetation. Views of the proposed development are almost completely screened from most locations at these lower elevations.

4.7.33 Where visible, the proposed development would be seen at a distance of over 6.5 km and would appear as an array of turbines across the skyline. The proposed development would not be viewed in its entirety, as topography and woodland would provide screening of full turbines, turbine towers and hubs to varying degrees. Overhill Wind Farm is not visible from Cumnock, and therefore the proposed development would be seen as a single development, flanked at a distance to the northwest by the consented Polquhairn and to the south by the consented Benbrack and South Kyle Wind Farms. Views further to the south and southeast contain high levels of development across the Southern Uplands (albeit at greater distances), including the operational Windy Standard and Windy Standard II, Hare Hill and extension and High Park and the consented Pencloe. Given the distance at which the proposed development would be seen, its partially obscured appearance, and its developed context, the magnitude of change experienced at this settlement is predicted to range from None to Moderate, representing a localised **Major/Moderate** (significant) effect. However, this would be the exception, as the majority of this settlement would experience no cumulative views.

4.7.34 If the proposed Enoch Hill and Greenburn Wind Farms were to be constructed, this would add to the concentration of wind farms in the vicinity of the proposed development. In this circumstance the magnitude of cumulative change in the clearest views would remain Moderate; however, the proposed development would be set back behind Greenburn in the foreground. The cumulative effect attributable to the proposed development would reduce to Moderate. However, the majority of the settlement would be subject to more restricted visibility.

New Cumnock

4.7.35 This settlement is located on the northwest facing side of the Nith Valley at its confluence with the River Afton. Locations within the settlement affording potential views of the proposed development are situated on the northwestern, western and southern sides of the settlement including from the A76 at Pathhead, Afton Road, Mounhope Terrace, and a southwestern section of Connel View from where clear, open views would be provided. Additionally, open elevated space in the vicinity of Farden Avenue, where the settlement has a more open aspect, would also experience views to the proposed development.

4.7.36 Elsewhere, in the main interior of the settlement and main concentrations of housing to the east of Castle (A76) and to the north of Lanehead Terrace, views of the proposed development would be substantially screened by a combination of intervening built structures and topography. Properties which lie along the eastern edge of New Cumnock, such as at Miller Road, would not have views to the proposed development. Views from these properties extend towards the Knockshinnoch Lagoons Nature Reserve. The reserve contains scrubby vegetation along its western boundary which foreshortens views and would provide extensive screening of all proposed turbines.

4.7.37 In these circumstances the turbines would appear as a large group extending across the skyline approximately 6.5 km to the west and would be seen in conjunction with the consented turbines at Overhill. Turbines at Lethans are visible to the northeast, located within a dip in topography to the north of Corsecon Hill. Further east and southeast, views of Sandy Knowe, Hare Hill, High Park, Windy Standard, Windy Standard II and Pencloe wind farms are visible across the skyline, with the High Park turbine forming a prominent feature in closer proximity on the hill slope to the southeast. Further south, South Kyle Wind Farm is partially visible across the skyline in the background to views. This pattern of development surrounds the settlement to the east, south and west. The proposed development would contribute to reinforcing this pattern of development, consolidating development present to the west of the town. It would not introduce development into an area which is currently without wind turbines but would increase the spread of development in this location.

4.7.38 Given the extent of the proposed development's visibility and its anticipated prominence, the magnitude of impact experienced in this settlement would vary from None to Moderate. Correspondingly, residual effects would vary from None to **Major/ Moderate** (significant), the significant effects being confined to locations to the south and northwest and the open areas within the southeastern part of the settlement.

4.7.39 If the proposed Enoch Hill and Greenburn arrays are taken into account the cumulative magnitude of change would remain None to Substantial, but the proposed development, where visible, would be seen in the context of a further concentration of development in the foothills and across the southern uplands. Views to the north would remain without wind energy development.

Ochiltree

4.7.40 Ochiltree is located on the western bank of the Lugar Water at its confluence with the Burnock Water. Locations within the settlement affording potential views of the proposed development are situated on the western edge of the settlement including from Main Street as it enters the settlement from the west and the A76 as it runs along the southern boundary of Ochiltree. Additionally, open views from the northern end of the village at Mauchline Road, would also experience some views to the proposed development.

4.7.41 As the topography descends into the valley of the Lugar Water, views of the proposed development would be substantially screened by a combination of intervening built structures, vegetation and topography.

4.7.42 Where visible, the turbines would appear as a large group of turbines extending across the skyline approximately 6.5 km to the south in the context of consented development at Overhill and Polquhairn. The proposed development would visually link these two developments, essentially resulting in wind farm development extending across the full skyline for views in this direction. Turbines at Hare hill, Hare Hill extension, High Park, Windy Standard and Lethans are visible in the distance to the southeast across the skyline. Development is largely contained in views to the south and southeast with little or no cumulative context to the north, west or east of the village. The proposed development would contribute to reinforcing this pattern of development and extending turbines across the skyline at closer proximity than much of the existing development is currently.

4.7.43 Given the visibility of the proposed development the magnitude of change experienced in this settlement would vary from None to Moderate. Correspondingly, residual effects would vary from none to **Major/ Moderate** (significant), the significant effects being confined to locations to the west of the settlement.

4.7.44 If the proposed Greenburn and Enoch Hill arrays are taken into account the cumulative magnitude of change would reduce to None to Moderate as the proposed development, where visible, would further concentrate the level of development across the skyline to the south; however, it would only extend development across a small area of the skyline which is without wind energy development. Views to the north, east and west would remain without wind energy development.

Skares

4.7.45 This is a small village situated in otherwise generally open land approximately 2.9 km to the north of the proposed development on the B7046. Viewed from this small settlement, up to 44 of the proposed turbines would be seen on the skyline in the middle ground, the intervening topography which lies in the foreground obscuring the lower columns of all visible turbines, all site infrastructure and some hubs. The proposed development would overlap with the consented Overhill turbines and would be viewed in the context of consented development at Polquhairn and Knockshinnoch Wind Farms further west. Views would be provided from the majority of properties in Skares, clearly visible from the rear of properties to the south of the B7046 and glimpsed between buildings from properties to the north of Skares road. Given the proximity of this settlement to the proposed development, and the prominent elevated position that the proposed turbines would occupy, the magnitude of change experienced at Skares would generally be substantial, equating to a **Major** (significant) residual effect which would be significant. This would remain the case in the event of the proposed Greenburn Wind Park (scoping) scheme being taken into account.

Patna

4.7.46 The proposed development would be screened in views from Patna by topography which forms the eastern banks of the Doon Valley. The ZTVs indicate that, at most, blade tips would be theoretically visible from the very south of the settlement, at Netherhill Crescent. Field reconnaissance and 3D modelling has shown that two blade tips would be visible on very clear days above the skyline. It is considered that the magnitude of impact arising from this change in view would be Negligible. The residual effect would be Minor.

4.7.47 Given the lack of visibility arising from the proposed development on the settlement of Patna, there would be no likelihood of cumulative effects and these are not considered further.

Drongan

4.7.48 Visibility of the proposed development would vary within Drongan, due to screening provided by the built-up area. Where visible between buildings, from open, elevated locations and along road corridors, the proposed development would be clearly visible across the skyline, behind consented development at Polquhairn and in the context of consented development at Overhill. The proposed development would consolidate and connect these two smaller developments creating a full skyline of wind turbines in views to the southeast.

4.7.49 The proposed development would result in a Moderate magnitude of impact in views from Drongan. The proposed development would alter the skyline of the current view but would not introduce new or unfamiliar elements into the view. The residual impact would be **Major/Moderate** (significant).

4.7.50 Should the Greenburn array be consented and constructed, the cumulative effect arising from the proposed development would remain **Major/Moderate** (significant) as wind energy would occupy the skyline across a wide extent of the view.

RESIDENTIAL PROPERTIES WITHIN 2 KM OF THE PROPOSED DEVELOPMENT

4.7.51 Technical Appendix 4.7: Residential Visual Amenity Study (RVAS) provides a detailed assessment of the likely effects of the proposed development upon the visual amenity of individual properties. The purpose of the RVAS is to identify potential effects of the proposed development on residential visual amenity. It is, however, important to note that the assessment of residential visual amenity is separate and distinct from the assessment of visual effects as covered in the LVIA. Whilst residential receptors considered in the RVAS could be subject to significant visual effects, as defined in Section of 4.2 of the LVIA, such effects only become potentially material to the determination of an application for consent if the effects are of such a level as to be 'overbearing' or 'overwhelming' and to represent a matter of public interest. The RVAS in Technical Appendix 4.7 concludes that none of the properties addressed in the assessment would be subject to effects that could be considered overbearing, overwhelming or pervasive. The proposed development was also not considered to contribute to the encirclement of properties by wind farm developments.

TRANSPORTATION AND RECREATIONAL ROUTES

4.7.52 The statistical route analysis in EIAR Volume 4: Technical Appendix 4.5 provides details of the theoretical visibility of the proposed development as well as the cumulative wind farm sites from key transportation and recreational routes. The statistical analysis records visibility along 5 km segments/sections of each route, along with the direction and distance at which the wind farms would be seen. It should be noted, however, that the statistical analysis was based on ZTV outputs and therefore does not take account of the screening effect of built forms or vegetation and therefore represents an overstatement of visibility. Consequently, where visibility is constrained or obscured by features other than topography, this is commented upon in the assessment. EIAR Volume 3a: Figure 4.4 illustrates the location of the assessed routes and shows the position of individual route sections/segments along each route.

A76 - Dumfries To Kilmarnock

4.7.53 The proposed development would be seen from a total of around 18 km of the 75 km section of this route within the study area. Viewpoints 11, 12, 13 are illustrative of the effect of the proposed development on the amenity of this route (Ref visualisations in Figures 4.17a, 4.18a and 4.19a in Volume 3b).

4.7.54 Between Thornhill and Sanquhar the proposed development would be screened by intervening topography. Similarly, between Sanquhar and Kirkconnel views of the proposed development would also be substantially restricted by a combination of topography, vegetation and built forms. The existing Hare Hill and consented Sandy Knowe arrays would, however, be prominent on the skyline to the southwest of this section of the route, whilst Glenmuckloch turbines would occupy the skyline to the northwest.

4.7.55 Westbound receptors between Kirkconnel and New Cumnock would experience highly restricted and intermittent views of the proposed development, the proposed development would be seen distantly and fleetingly. Similarly, the existing High Park turbine would be evident on a prominent knoll overlooking New Cumnock but would be seen obliquely. As the route progresses westwards, through the settlement of New Cumnock, restricted views of the proposed development would be provided and would be framed between the houses that abut the road. In this context, the proposed development would be seen in a context of moving vehicles and numerous vertical elements in the foreground and middle-ground, thereby reducing its prominence in views experienced by road users.

4.7.56 As the route crosses the base of the Nith valley, views would be restricted by a combination of topography and vegetation in the valley and the proposed development would be located to the west/southwest, away from the direction of travel.

4.7.57 North of New Cumnock, as the route climbs the northern side of the Nith valley, the route enters Pathhead and turns north-westwards. At this point, views towards the proposed development would be intermittent, oblique, and interrupted by built forms to the west of the road.

4.7.58 Between Pathhead and Cumnock, views of the proposed development would be intermittent, the extent of the proposed development would also rapidly reduce, with it appearing as a series of blade tips only that would be seen at a distance of over 5.6 km and seen obliquely. Viewpoint 11 (ref Figure 4.17a in Volume 3b) is indicative of the effect on this section of the A76.

4.7.59 North of Cumnock, receptors would be travelling away from the proposed development and so impacts associated with it would cease.

4.7.60 Given the restricted visibility of the proposed development from most of this route, its generally distant appearance and oblique position in views, the magnitude of impact on the amenity of north-bound receptors is predicted to be Slight, equating to a Moderate residual effect. This finding takes account of the baseline context of existing and consented wind farms in the study area.

4.7.61 This would remain the case if the proposed wind farms in the study area were also taken into account as they are generally located within or abutting existing/consented development. A notable exception to this is the proposed Greenburn turbines that would extend eastwards from the proposed development and, as a result, would often form a comparatively more prominent development in views from this route, extending closer to the edge of the Foothills than the proposed development.

4.7.62 Travelling in the opposite direction, southwards from Kilmarnock, views of the proposed development would commence on the approach to Mauchline from where the proposed development would be seen distantly to the south and in conjunction with a number of existing and consented developments (e.g. Afton, Benbrack, Hare Hill, Pencloe, South Kyle, Windy Standard and Windy Standard II) that form a pronounced concentration of wind energy developments on the skyline. As the route enters Mauchline, views of the proposed development and other wind farms are obscured by intervening vegetation and the built form of the settlement.

4.7.63 On the southern fringes of Mauchline, fleeting views of the proposed development and its developed context would be experienced by southbound road users but would cease as the route drops into the Ayr valley. Views would re-occur, thereafter, on the approach to Auchinleck, the proposed development and cumulative schemes in the Southern Uplands and Foothills appearing as prominent features on the skyline, at a distance of over 8 km. At the outskirts of Auchinleck the road enters a cutting, thereby obscuring views of the proposed development. Further south, between Cumnock and Pathhead, the proposed development would be seen at distances of over 5 km and would be seen obliquely, the proposed development's turbines generally seen as blade tips only.

4.7.64 As the route drops down into the Nith valley, views would be partially restricted by intervening vegetation within the valley. This section of the route is represented by Viewpoint 12 (ref Figure 4.18a in Volume 3b). After this, the route turns eastwards away from the proposed development. On this section of the route the existing and consented wind farms of Hare Hill, Sandy Knowe, and Sunnyside enclose the incised landscape of the Nith valley.

4.7.65 As with the northbound experience from this route, the impact upon the visual amenity of southbound receptors would be Slight, equating to a Moderate residual effect. Where the proposed development is visible, it would be seen distantly, obliquely and in the context of a pronounced concentration of development within the Southern Uplands. The inclusion of proposed wind farms would not alter this conclusion.

<u>A70 - Lanark To Ayr - Rigside To Ayr</u>

4.7.66 Between Lanark and the Ayr valley west of Muirkirk there would be no discernible visibility of the proposed development due to the screening effect of topography and vegetation. However, as westbound road users approach Lugar intermittent views of the proposed development would be revealed. The proposed development would be seen distantly to the southwest, in the direction of travel and would be framed by the Berlow Water valley. The proposed development would appear mainly as a series of upper towers and rotors on the skyline. The proposed development would overlap with the consented Overhill array and would be seen in conjunction with the consented Polquhairn and Knockshinnoch arrays. As the route descends towards Cumnock tree cover and built forms increase, thereby reducing potential visibility.

4.7.67 Travelling westwards, between Cumnock and Ochiltree, the proposed development would be all but entirely screened in views south by intervening topography and vegetation of the Ayr valley.

4.7.68 Between Ochiltree and Killoch up to 51 of the proposed development turbines would be visible on the skyline to the south. The turbines would be partially obscured by intervening topography and would therefore be seen as rotors or upper towers and rotors and would overlap with the established concentration of wind energy development that comprises the existing Afton and Windy Standard turbines, and consented turbines of South Kyle and Overhill wind farms. Whilst the proposed development would occupy a large proportion of the horizontal extent of the view, it would be seen obliquely and transiently. Further west, on this route, receptors would be progressing away from the scheme.

4.7.69 Given the restricted visibility of the proposed development from the majority of this route, its generally distant appearance and oblique position in views, the magnitude of impact on the amenity of north-bound receptors is predicted to be Slight, equating to a Moderate residual effect. However, between Ochiltree and Killoch, the proposed development would constitute a Moderate impact and a localised **Major/Moderate** and thus significant effect on the amenity of this route. These finding take account of the baseline context of existing and consented wind farms in the study area.

4.7.70 If the proposed wind farms in the study area are also taken into account, these findings would remain relevant as they are generally located within or abutting existing/consented development.

<u>A713 - Ayr to Castle Douglas</u>

4.7.71 The proposed development would theoretically be visible from around 10 km of the 63 km of this route within the study area.

4.7.72 Visibility from this route is restricted due to the largely enclosed nature of this route. Views would mainly be confined to sections of this route in the vicinity of Dalmellington from where a small number of the proposed development blade tips would be briefly visible to the northeast of the route, and therefore be seen obliquely on the skyline of the view from this road.

4.7.73 Given the substantially constrained nature of the proposed development visibility, its oblique position relative to the main directions of travel and the short duration of potential views, the magnitude of impact on the amenity of this route would be Negligible and the residual effect would be Minor.

<u>B741 - New Cumnock to Girvan</u>

4.7.74 The statistical analysis in Technical Appendix 4.5 indicates that theoretical visibility of the proposed development would occur on 30 km of the nearly 60 km length of this route in the study area. However, field reconnaissance suggests that the proposed development would be screened by intervening topography and/or vegetation between Girvan and Black Hill, east of Straiton. The proposed development would then be revealed in views from eastbound vehicles as they descend into the Doon Valley from where the proposed development would appear as a prominent new feature on the skyline over 5 km to the east of receptors. The proposed development would be seen in conjunction with the existing and consented concentration of turbines in the Southern Uplands, forming a considerable extension of wind energy development in the view in this direction. However, this visibility rapidly falls away as the route descend onto the floor of the Doon valley, where intervening topography all but entirely screens the proposed development. As the route proceeds through Dalmellington and progresses eastwards into a valley between the Southern Uplands and the Foothills with Forest LCTs, intermittent and filtered views of the proposed development, most notably at Clawfin Bridge (Ref. Viewpoint 15 - Figure 21a in Volume 3b), would be experienced. The proposed development would appear as a small number of turbines set back from the edge of the Foothills and would be seen obliquely and elevated above the road, whilst South Kyle turbines would be seen on the skyline to the south of the road. As the route progresses eastward past Maneight, the aspect becomes more open, thereby providing clearer views of both the proposed development, the consented South Kyle turbines appearing mainly as blade tips to the south, away from the proposed development. This remains for most of the route between Peat Hill and New Cumnock from where the proposed development would constitute a considerable addition to the landscape whilst the main concentration of wind farms would be seen to the south. The inclusion of the proposed Enoch Hill array would increase the perceived prominence of development to the south of the road and the influence of wind energy developments on the amenity on this section of the route.

4.7.75 This is a long-range route, most of which would be unaffected by the proposed development, including key parts of the route within the Doon valley and in Dalmellington. However, effects on views between Maneight and New Cumnock are likely to be subject to Substantial impact and **Major**, and thus significant, residual effects in the context of existing and consented wind farms. The inclusion of other proposed wind farms in the study area would not alter these conclusions.

<u>B7046 - Cumnock to Drongan</u>

4.7.76 The proposed development would theoretically be visible from most of this route.

4.7.77 The context for much of the route is a landscape of previous surface and deep mine workings that are in varying degrees of restoration. These sites are gradually being replaced by agricultural restoration and ecological habitats.

4.7.78 Travelling southwards from Cumnock to Garlaff, receptors would experience intermittent, fleeting views of the proposed development, which would generally appear as blade tips. Travelling westwards along Skares road between Garlaff and Auchlin the proposed development would be seen obliquely but would occupy a prominent skyline position to the south where it would overlap with the consented Overhill scheme. Similarly, travelling eastwards, intermittent views of the proposed development would occur between Drongan and Garlaff.

4.7.79 Given the proximity of this route to the proposed development and the prominence and duration of potential views, the magnitude of impact on the amenity of this route would be Substantial and the residual effects, taking into account existing and consented developments in the study area, would be **Major/Moderate** (significant). This would remain the same in the event of proposed developments being taken into account.

<u>Glasgow and South Western Railway Line</u>

4.7.80 Views from passenger trains may be directed to the front or rear of the train but are oblique. This is because views directed to the front or rear of the train are obscured by train bulkheads.

4.7.81 The statistical analysis indicates theoretical visibility of the proposed development from around 37 km of the 92 km section of this route in the study area. Travelling northwards, views from trains would commence in the Nith valley, by Washburn, from where the proposed development would be seen at distances of around 12 km to the west and would occupy a prominent skyline position but would overlap with the consented Overhill wind farm.

4.7.82 As the train progresses westwards, views would become more intermittent, being interrupted by vegetation and built structures at New Cumnock and Pathhead.

4.7.83 After passing through New Cumnock station the railway turns northwest. Between New Cumnock and the Lochside Hotel, passengers on the train would be afforded clear views of the proposed development, which would be seen on the skyline around 6 km to the west. To the southwest, the existing/consented wind farms in the Southern Uplands would be visible on the skyline in this aspect.

4.7.84 As the train passes Creoch Loch the proposed development would be screened by intervening topography and would thereafter enter a cutting east of Netherthird. As the train emerges from the cutting, east of Cumnock, it is carried on a bridge over the A70, revealing brief views towards the Foothills and the proposed development which would be seen around 8 km to the southwest.

4.7.85 Between Cumnock and Auchinleck the train would be in cutting for the majority of the time and the proposed development would therefore be screened from view. As the train progresses northwards it is again in cutting for a large proportion of this section of the route, but glimpsed views of the proposed development would be obtained from short sections of the line between cuttings. In such locations, the proposed development would be seen at a distance of over 9 km, would overlap with the existing Windy Standard II and consented Overhill, South Kyle arrays and in a wider, developed horizon.

4.7.86 Given the constrained nature of the proposed development's visibility from most of this route the overall impact on the amenity of passengers on trains utilising this route would be Slight, but with localised Moderate impacts and **Major/Moderate** (significant) effects anticipated on a short section of the route, west of New Cumnock and northeast of Cumnock. Such effects would be highly localised and of very short duration. This would remain the case if proposed wind farms in the study area are also taken into account. On the basis of this analysis, the overall effect on the amenity of this route would be Moderate and not significant.

RECREATIONAL ROUTES

NCR 7

4.7.87 Views of the proposed development would theoretically be possible from a total of 50 km of the 133 km of this route within the study area.

4.7.88 No views of the proposed development would be provided from the southernmost section of this route between Clatteringshaws Loch and the Waters of Girvan due to the screening effect of intervening topography and vegetation. However, south of Maybole a small number of the proposed development's turbines would be seen distantly on the skyline to the east. Most of the proposed development would be screened by the intervening topography of the hills at the western edge of the Foothills (i.e. Ewe Hill, Bow Hill, Kilmein Hill and Benquhat Hill). Seen at distances in excess of 18 km, the proposed development would be seen in conjunction with the consented South Kyle turbines, but Dersalloch would be the closest and most prominent scheme.

4.7.89 Further north of Maybole, the proposed development would remain partially obscured by intervening topography, but the existing concentration of wind energy development in the Southern Uplands that comprises Afton, Benbrack, Lorg, South Kyle and Windy Standard would be clearly evident. Dersalloch would remain the most prominent of the cumulative developments due to its relative proximity to this section of the route.

4.7.90 Viewed from the south facing flank of Brown Carrick Hill the proposed development would be seen at a distance of over 19 km to the east/southeast and would partially overlap with the existing/consented Afton, Hare Hill, High Park and South Kyle arrays and would be perceived as a lateral extension to an established concentration of development.

4.7.91 Between Saltcoats and Ayr, views of the proposed development would be substantially screened by intervening vegetation and built forms and mitigated by distance. It is also the case that the main source of amenity on this stretch of the route would be seaward views, rather than inland views.

4.7.92 Given the limited proportion of the route affected by views of the proposed development, the distance at which it would be seen where it is visible, and its existing developed context, the magnitude of impact on this route is considered Negligible, with localised Slight impacts at Maybole and Carrick Brown Hill. Consequently, this route would be subject to a Moderate/Minor residual effect overall, but with localised Moderate effects. This would remain the case if other proposed wind farms (such as Greenburn and Windy Standard III) are taken into account.

The River Ayr Way

4.7.93 Most of this long-range trail is set within the incised landscape of the Ayr valley and is shielded from views of the proposed development by a combination of topography and vegetation. However, intermittent views of the proposed development would be provided from a short section of the route southwest of Mauchline, where the route climbs up the side of the valley. From this location, the proposed development would be seen at distances of around 12 km to the south and would appear as a lateral extension to an existing concentration of wind energy developments including Afton, Benbrack, Windy Standard, Windy Standard II, and South Kyle. The proposed development would partially overlap with this existing cluster of developments, thereby reducing its perceived prominence. Notwithstanding this, the proposed development would constitute a notable increase in the influence of developments on this section of the route and would therefore represent a **Major/Moderate** (significant) effect, albeit localised, on the amenity of this section of the route. On the basis of this analysis, the overall effect on the River Ayr Way would be Minor and not significant.

Core Path B14 - River Ayr Way Link

4.7.94 Whilst the ZTV in Figure 4.5a indicates extensive theoretical visibility from this route, field reconnaissance suggests that it is enclosed to south, in the direction of the proposed development, by roadside vegetation with the consequence that views are glimpsed, filtered and oblique. On this basis and given the proposed development's distance from this route (over 7.5 km) the magnitude of impact on the amenity of this route is considered to be Negligible, equating to a Moderate/Minor residual effect which is not considered significant.

Core Paths C9 - Ochiltree to Drongan

4.7.95 The proposed development would be visible from a large proportion of this route, the greatest visibility occurring on the elevated ridge between Clydenoch and Lessnass from where up to 52 turbines (38 rotors and 14 blade tips) would be visible on the skyline, approximately 6 km to the south of the route. The proposed development would occupy a wide horizontal angle in the view and would be seen in the context of the existing Hare Hill and consented Overhill turbines but would constitute a prominent and notable extension to the influence of wind energy development. Given the prominent skyline position and the angle of view that the proposed development would occupy, the impact would be Moderate, equating to a **Major/Moderate** (significant) effect on the amenity of walkers on this route. This remains the case if the proposed Greenburn turbines are taken into account.

Core Path C10 Coalfield Cycle Route

4.7.96 Views of the proposed development would be screened from this route by intervening topography and vegetation. However, restricted views of a small number of blade tips would be provided from sections of this route, southwest of Cumnock, and clear views of a large proportion of the proposed development's turbines would be prominent on the skyline in westward views from the route in the vicinity of Woodend, northwest of Connel. The proposed development would be seen concurrently with the main concentration of development that is located to the south, in the Southern Uplands, including the existing Afton, Hare Hill and High Park arrays, as well as the consented South Kyle and Pencloe turbines. Whilst most of this route would be subject to negligible impacts and a Moderate/Minor effect, the section by Woodend would be subject to localised substantial impact and a **Major** (significant) residual effect. At this location, the proposed development would represent a considerable addition to the cumulative context and introduce development to a section of the view currently without turbines, but currently typified by surface mine activities.

Core Path C12 - New Cumnock Circular

4.7.97 The proposed development would be clearly visible from most of this route and would introduce up to 27 turbines (11 rotors and 16 blade tips) west of the route. The proposed development would be prominent and would occupy a large horizontal angle in westward views. To the south, the existing Hare Hill, High Park and Afton turbines, and the consented Pencloe and South Kyle turbines would be visible on the skyline. Given the relative proximity of the proposed development, its prominent skyline position and the extent of the view from this route it would occupy, the magnitude of impact would be Moderate, equating to a **Major/Moderate** (significant effect on the amenity of this route). This would remain the case if the proposed Greenburn development were to be consented and constructed.

Core Path C13 - Auchenroy Hill and Dalcairnie Falls

4.7.98 The ZTV in Figure 4.5a indicates that the proposed development would be visible from most of this circular route. However, the extent of visibility and prominence of the proposed development would vary greatly. Viewed from low-lying positions adjacent to Bogton Loch and in the vicinity of the Dalcairnie Falls the proposed development would be substantially screened by topography, appearing mainly as a small number of blade tips at a distance of over 4 km. In contrast, on more elevated sections of the route, east of Auchenroy Hill up to 14 turbines (8 rotors and 6 blade tips) would be visible on the skyline around 5 km to the northeast. The proposed development would be seen concurrently and sequentially with the existing Dersalloch array (to the west) as well as the existing Hare Hill and consented South Kyle and Benbrack arrays. Given the proportion of the route affected, its relative proximity to the proposed development and its prominence on the skyline across the Doon Valley, the magnitude of impact on the amenity of this route would be Moderate, equating to a Major/Moderate (significant) effect. The proposed development would add significantly to the existing/consented pattern and influence of wind farm development. This would remain the case if the proposed Enoch Hill were to be incorporated with the cumulative context.

Core Path C14 - Glen Afton

4.7.99 This route is located at the base of the glen form where views of the proposed development would be substantially restricted by intervening topography and vegetation. Consequently, the magnitude of impact on this route would be negligible and the residual effect Minor and not significant.

Core Path D6 - Dumfries Estate

4.7.100 Whilst the ZTV in Figure 4.5a indicates theoretical visibility of the proposed development from a large proportion of the route, it lies within an incised landscape that is characterised by extensive woodland cover. Field reconnaissance suggests that views of the proposed development would be substantially restricted by a combination of intervening topography and vegetation and only visible in oblique views, the proposed development being seen intermittently and appearing as blade tips on a distant horizon over 6 km to the south. Given the limited visibility, largely screened position of the proposed development and its distance form this route, the magnitude of impact on its amenity is predicted to be slight, equating to a moderate residual effect, which is not considered significant.

Core Path D16 - Craigengillan to Knockdon

4.7.101 Around one half of this route would be subject to views of the proposed development, between the Wee Hill of Glenmount and the Bellsbank Plantation, south of Dalmellington. Viewed from low-lying positions by Craigengillan Farm the proposed development would be substantially screened, appearing mainly as a small number of blade tips at a distance of over 6.5 km. As the route climbs up toward Black Loch, around 8 km to the southwest of the proposed development the increased elevation would provide view of up to 28 turbines would be provided, around half of which would appear as blade tips only. The proposed development would be seen concurrently and sequentially with the existing Dersalloch array (to the west) as well as the consented South Kyle turbines, seen to the east. Given the proportion of the route affected, its relative proximity to the proposed development and its prominence on the skyline across the Doon Valley, the magnitude of impact on the amenity of this route would be Moderate, equating to a Major/Moderate (significant) effect. The proposed development would add significantly to the existing/consented pattern and influence of wind farm development. This would remain the case if the proposed Enoch Hill were to be incorporated with the cumulative context.

4.8 Monitoring

4.8.1 Outwith the monitoring of specific aspects of the construction and operation of the proposed development by EAC and relevant statutory consultees (e.g. SEPA and SNH) to ensure compliance with any consent or details pursuant to conditions of consent, no monitoring is anticipated that relates specifically to landscape and visual effects.

4.9 Summary

4.9.1 The preceding LVIA was undertaken by an experienced and competent Landscape Architect and in accordance with an agreed scope and methodology. It considers the current landscape and visual baseline context of the proposed development, which is inextricably linked to the baseline of cumulative developments and surface mining in the vicinity and identifies key sensitive receptors to be addressed in the assessment. Section 4.3 of the LVIA sets out the policy context and Section 4.4 summarises the landscape and visual baseline context.

4.9.2 Section 4.5 of the LVIA identifies key impact generators associated with the construction and operation of the proposed development and prioritises them for mitigation in order to ameliorate potential for significant effects on the landscape and visual resource of a 40 km radius study area.

4.9.3 The design of the proposed development was informed by a number of technical, commercial and environmental drivers. Section 4.6: Mitigation of the LVIA sets out the key guidance and priorities adopted in order to mitigate potential landscape and visual effects, including matters pertaining to the spatial framework and Capacity Study published by EAC.

4.9.4 Section 4.7 of the LVIA describes anticipated residual construction effects. Section 4.8 covers monitoring requirements and Section 4.9 contains a summary of assessment findings the details of which are presented in the following Technical Appendices:

- Technical Appendix 4.3 - Residual Effects on Landscape Character Types;
- Technical Appendix 4.4 - Residual Effects on Landscape Designations and Classifications;
- Technical Appendix 4.5 - Statistical Route Analysis;
- Technical Appendix 4.6 - Viewpoint Assessment; and
- Technical Appendix 4.7 - Residential Visual Amenity Study.

4.9.5 Table 4.9 summarises the significant landscape and visual effects (including cumulative effects) identified by the LVIA for construction and operational phases of the proposed development. It is apparent from this analysis that significant effects would be geographically limited in extent and would not significantly affect nationally important landscapes or regional landscape designations, or the most sensitive landscapes associated with Glen Afton and the Doon Valley.

4.9.6 The decommissioning phase of the proposed development would be of a shorter duration to that of the construction phase, with the dismantling of all above ground structures and reinstatement of disturbed ground. Below ground structures would be left in place to avoid further disturbance. There would therefore be a temporary impact from the activities on site to remove structures, but this would be of relatively short duration. Accordingly, the decommissioning phase is considered to be likely to have a minimal effect on the landscape and visual amenity of the locality. Mitigation measures associated with decommissioning would be agreed during the preparation of the final decommissioning plan that would require approval of EAC and statutory consultees.

4.9.7 Any commercial onshore wind farm in the UK is likely to create some significant effects on landscape character and designations as well as the amenity of the immediately surrounding area. The proposed development is not unusual in this regard. Moreover, whilst the proposed development undoubtedly represents a significant increase in the influence of wind energy development north of the B741, thereby extending the impacts associated with the established cluster of developments that are present in the Southern Uplands to the south, it would achieve a degree of consistency with other adjacent developments such as South Kyle and the current Section 36c application at Pencloe, as well as the recently consented Overhill array which lies close to the centre of the proposed development. It also affords an opportunity for the establishment of a cohesive and well-designed array that takes account of key landscape and visual sensitivities and avoids a more piecemeal and discordant development pattern that could be more deleterious in in landscape and visual terms.

Table 4.9: Summary of Potential Significant Effects of the Proposed Development			
Likely Significant Effect	**Mitigation Proposed**	**Means of Implementation**	**Outcome/ Residual Effect**
Construction			
Potential widespread significant effects on landscape fabric as well as landscape character and amenity of the site	Phased felling and construction and reinstatement/ replanting, to limit the geographical extent of disturbance at any given time and to ensure rapid establishment of replacement planting and landscaping. Felling and replanting requirements are set out in Technical Appendix 2.11: Forestry Report. Effective management of the construction project, using experienced contractors and measures set out in Technical Appendix 2.1: Outline CEMP.	Forest Management Plan to deliver the forestry felling and replanting in Technical Appendix 2.11: Forestry Report. Forestry Management Plan to be delivered as a condition of consent. The CEMP would be finalised and delivered as condition of consent.	Not significant.
Cumulative construction effects on landscape fabric as well as landscape character and amenity of the site	None	None	Not significant
Operation			
Potential significant effects on landscape fabric relating to loss of characteristic land cover	Replacement planting to meet the requirements set out in Technical Appendix 2.11: Forestry Report. .	Forest Management Plan to deliver the forestry felling and replanting in Technical Appendix 2.11: Forestry Report. Forestry Management Plan to be delivered as a condition of consent.	Not significant.
Effects on landscape character	Careful siting and design of the proposed development in accordance with Section 4.6: Mitigation of the LVIA.	Adoption of siting and design priorities, as described in Section 4.6: Mitigation of the LVIA.	Of the 21 LCTs assessed, significant residual effects (including cumulative effects) were predicted in parts of the following LCTs: ▪ 76 (LCT:17a): Foothills and Forestry with Opencast Mining; ▪ 74 (LCT:15): Upland Basin; ▪ 81 (LCT:20a): East Ayrshire Southern Uplands; ▪ 66: East Ayrshire Agricultural Lowlands; ▪ 68 (LCT:9): Lowland River Valleys;

Table 4.9: Summary of Potential Significant Effects of the Proposed Development			
Likely Significant Effect	**Mitigation Proposed**	**Means of Implementation**	**Outcome/ Residual Effect**
			▪ 69 (LCT:10): Upland River Valleys; ▪ 76 (LCT:17b): Foothills with Forestry West of the Doon Valley; ▪ 78 (LCT:18a): East Ayrshire Plateau Moorlands; and ▪ 83: Rugged Upland – Ayrshire.
Effects on Landscape Designations and Classifications	Careful siting and design of the proposed development in accordance with Section 4.6: Mitigation of the LVIA.	Adoption of siting and design priorities, as described in Section 4.6: Mitigation of the LVIA.	Of the designations and landscape classifications assessed, significant residual effects (including cumulative effects) were predicted in parts of the following: ▪ Southern Uplands SeLA; and ▪ Dumfries House GDL. It should be noted that neither were considered to undermine the integrity of either landscape.
Effects on the amenity of settlements	Careful siting and design of the proposed development in accordance with Section 4.6: Mitigation of the LVIA.	Adoption of siting and design priorities, as described in Section 4.6: Mitigation of the LVIA.	Significant residual effects (including cumulative effects) were predicted in parts of: ▪ Cumnock; ▪ New Cumnock; ▪ Ochiltree; ▪ Skares; ▪ Drongan; Such effects are not anticipated to be ubiquitous or pervasive in each settlement.
Transportation Routes	Careful siting and design of the proposed development in accordance with Section 4.6: Mitigation of the LVIA.	Adoption of siting and design priorities, as described in Section 4.6: Mitigation of the LVIA.	Of the routes assessed, significant effects (including cumulative effects) were predicted on sections of the following highways: ▪ A70 – Lanark to Ayr; ▪ A70 – Rigside to Ayr ▪ B741 – New Cumnock to Girvan; and

Table 4.9: Summary of Potential Significant Effects of the Proposed Development			
Likely Significant Effect	**Mitigation Proposed**	**Means of Implementation**	**Outcome/ Residual Effect**
			▪ B7046 – Cumnock to Drongan
Recreational Routes	Careful siting and design of the proposed development in accordance with Section 4.6: Mitigation of the LVIA.	Adoption of siting and design priorities, as described in Section 4.6: Mitigation of the LVIA.	No nationally or regionally important recreational routes would be significantly affected. However, significant effects (including cumulative effects) were predicted on parts of the following Core Paths which are of local importance: ▪ C9: Ochiltree to Drongan; ▪ C10: Coalfield Cycle Route; ▪ C12: New Cumnock Circular Walk; ▪ C13: Auchenroy Hill to Dalcairnie Falls; and ▪ D16: Craigengillan to Knockdon.
Decommissioning			
None	-	-	None

4.10 Glossary and Abbreviations

4.10.1 Technical Appendix 4.1 provides a Glossary of key terms utilised in the LVIA. Abbreviations used in the LVIA are set out in the table, below.

Abbreviation	**Expanded Term**
CMLI	Chartered Member of the Landscape Institute
LVIA	Landscape and Visual Impact Assessment
CLVIA	Cumulative Landscape and Visual Impact Assessment
EIAR	Environmental Impact Assessment Report
ZTV	Zone of Theoretical Visibility
GLVIA3	Landscape Institute and Institute of Environmental Management and Assessment (2013) Guidance for Landscape and Visual Impact Assessment – Third Edition.
EAC	East Ayrshire Council
SNH	Scottish Natural Heritage
DGC	Dumfries and Galloway Council
ECU	Energy Consents Unit
LCT	Landscape Character Type
LCA	Landscape Character Assessment

Abbreviation	**Expanded Term**
DTM	Digital Terrain Model
GDL	Garden and Designed Landscape
NPF	National Planning Framework
SPP	Scottish Planning Policy
AELDP	East Ayrshire Local Development Plan
SG	Supplementary Guidance
SeLA	Sensitive Landscape Area
RSA	Regional Scenic Area
SLA	Special Landscape Area
WLA	Wild Land Area
km	Kilometres
m	metres
NKFM	North Kyle Forest Masterplan
SEA	Stone Extraction Area
N	North
NE	Northeast
E	East
SE	Southeast
S	South
SW	Southwest
W	West
NW	Northwest
EALWECS	East Ayrshire Landscape Wand Energy Capacity Study
ha	Hectare

5 Cultural Heritage

5.1 Introduction

5.1.1 This chapter considers the likely significant 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;
- describe the mitigation and, where appropriate, monitoring measures proposed to address likely significant effects; and
- assess the residual effects remaining following the implementation of mitigation.

5.1.2 The assessment has been carried out by George Mudie MA (Hons) FSA Scot MCIfA, of CFA Archaeology Ltd (CFA), a Registered Organisation (RO) of the Chartered Institute for Archaeologists (CIfA) based in Musselburgh, East Lothian. Mr Mudie is Principal Consultant with CFA and is a Member of the Chartered Institute for Archaeologists (MCIfA). He has over 18 years full-time experience of producing Environmental Impact Assessments (EIAs) for renewable energy developments, and for other industrial and commercial developments across the UK. A copy of his CV is included in Technical Appendix 1.2 (EIAR Volume 4).

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

- Figure 5.1: Cultural Heritage: Inner Study Area;
- Figure 5.2: Cultural Heritage: Outer Study Area;
- Figure 5.3: Cultural Heritage: Cumulative Developments;
- Figure 5.4 to 5.12: Cultural Heritage Visualisations;
- Technical Appendix 5.1: Heritage Assets within proposed development site; excluding areas of former surface mining;
- Technical Appendix 5.2: Heritage Assets recorded in HER within areas of former and current surface mining;
- Technical Appendix 5.3: Assets within Outer Study Area and within 5 km of the proposed development; and
- Technical Appendix 5.4: Assets within Outer Study Area and between 5 km and 10 km of the proposed development.

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

5.2 Assessment Methodology and Significance Criteria

Scope of Assessment

5.2.1 This chapter considers:

- Direct effects on cultural heritage assets;
- Effects on the settings of heritage assets in the wider landscape; and
- Cumulative effects on the settings of heritage assets in the wider landscape.

5.2.2 The chapter assesses cumulative effects as arising from the addition of the proposed development to other cumulative developments, which are the subject of a valid planning application. Operational, under construction and consented 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 effect assessment.

5.2.3 Developments close to the end of their operational life will be included as part of the baseline to present 'worst case scenario'.

5.2.4 The assessment is based on the proposed development as described in Chapter 2: Development Description (EIAR Volume 2) and the results of desk-based assessment and field surveys.

5.2.5 The scope of the assessment has been informed by consultation responses summarised in Table 5.1 and the following guidelines/policies:

- Scottish Planning Policy 2014 (SPP);
- Historic Environment Policy Statement (2019);
- Chartered Institute for Archaeologists (2014) 'Standard and Guidance for Historic Environment Desk-Based Assessment';
- SNH and Historic Environment Scotland (2018) 'Environmental Impact Assessment Handbook';
- Historic Environment Scotland (2019) Designation Policy and Selection Guidance;
- Historic Environment Scotland (2016) 'Managing Change in the Historic Environment: Setting'; and
- Planning Advice Note (PAN) 2/2011.

Consultation

5.2.6 Table 5.1 summarises the consultation responses received regarding cultural heritage and provides information on where and/or how they have been addressed in this assessment. The following organisations made comment on archaeology and cultural heritage: East Ayrshire Council (EAC); Historic Environment Scotland (HES); New Cumnock CC; and West of Scotland Archaeological Service (WoSAS).

5.2.7 Full details on the consultation responses can be reviewed in Technical Appendix 1.1: Consultation Register (EIAR Volume 4).

Table 5.1: Consultation Responses

Consultee and Date	Scoping / Other Consultation	Issue Raised	Response / Action Taken
ECU (14/06/2018)	Scoping Opinion	Ministers agree Craigengillan Inventory Garden and Designed Landscape (GDL), less than 4 km to the southwest of the site, be assessed with regard to any potential significant effects.	Craigengillan GDL is included in the assessment of effects on setting (paragraph 5.4.17 to 5.4.21).
EAC (06/04/2018)	Scoping Opinion	Noted that Craigengillan is not included in the list of GDLs in the vicinity.	Craigengillan GDL is included in the assessment of effects on

Table 5.1: Consultation Responses			
Consultee and Date	**Scoping / Other Consultation**	**Issue Raised**	**Response / Action Taken**
			setting (paragraph 5.4.17 to 5.4.21).
		Noted that the approach to the cultural heritage assessment is generally acceptable. The assessment should include the potential for previously unrecorded archaeological remains.	Noted. The baseline conditions and archaeological potential are addressed in paragraphs 5.3.1 to 5.3.22.
		Advised that the study area for assets in the wider landscape should be extended to take account of the turbine scale. A tiered approach to the assessment could be employed, so that only particular assets, such as those highlighted by consultees or identified using the ZTV are assessed beyond 10km.	Noted. Post scoping consultation was undertaken with HES and WoSAS to agree the appropriate study areas and the scope of work.
		Noted that some former mine workings may be of industrial archaeological value and therefore such assets should be identified and assessed as necessary.	Noted. Mining remains are described in the Baseline Conditions section (paragraph 5.3.7).
HES (22/02/2019)	Pre-Application Consultation and Meeting	Consider that the proposal has the potential to raise significant concerns for HES interests. In particular, there is the potential for adverse impacts on the setting of historic environment assets around the site. In order to address these issues HES recommended that the design of the scheme takes into account the indirect impacts on the historic environment to mitigate any potential significant impacts.	Noted. The advice from HES has informed the design of the proposed development; notably in relation to the assets specifically referred to in the HES response (see below).
		Visualisations should be provided where impacts are likely to be highest: Category A Listed Buildings. Dumfries House (HB no. 14413). Craigengillan House (HB no. 18793).	Noted. Post scoping consultation was undertaken with HES and WoSAS to agree a list of visualisations to inform the assessment.

Table 5.1: Consultation Responses			
Consultee and Date	**Scoping / Other Consultation**	**Issue Raised**	**Response / Action Taken**
		Inventory Gardens and Designed Landscapes. Dumfries House. Craigengillan. Scheduled Monuments. Auchencloigh Castle (SM5393). Laight Castle (SM7690) Waterside, Dalmellington Ironworks (SM4345). Waterside Bing, iron slag bing, Dalmellington Ironworks (SM7544). Waterside, miners' villages & mineral railways N of (SM7863).	
HES (30/04/2018)	Scoping Opinion	Reiterated advice provided at pre-scoping Pre-App meeting.	Noted. See above.
New Cumnock CC (25/04/2018)	Scoping Opinion	The Martyrs Moss and Beoch Lane are of local historical interest as historical places and pathways connecting Dalmellington, Cumnock and New Cumnock and associated with a rich Covenanter history of the area.	Noted. The area's covenanting history is recognised and addressed in the Baseline Conditions section (paragraphs 5.3.16 to 5.3.17).
HES (18/09/2018)	Post-scoping consultation	Content that a 10 km study area from the outermost proposed turbines, informed by the blade tip height ZTV, is sufficient as a study area for assessment of effects on the setting of heritage assets within HES remit. Also, content with the proposed tiered approach to the assessment. Noted that there are no specific assets beyond 10 km that HES would wish to see included in the assessment.	Noted. A 10 km Outer Study Area has been adopted and no assets more than 10 km from the outermost turbines have been identified as having sensitive settings that could be adversely affected by the proposed development.
		Content with the proposed visualisation viewpoints for our historic environment interests. Noted that HES would be happy to comment on any interim visual material produced, where relevant to our cultural heritage interests, once it is available.	The agreed visualisations are included along with the assessment. They are referenced in the appropriate Technical Appendices (5.3 and 5.4) and in the setting assessment text (paragraphs 5.4.8 to 5.4.39 and 5.4.43 to 5.4.46).

Table 5.1: Consultation Responses			
Consultee and Date	**Scoping / Other Consultation**	**Issue Raised**	**Response / Action Taken**
WoSAS (27/09/2018)	Post-scoping consultation	Confirmed that WoSAS would be happy with the 10 km Outer Study Area proposed.	Noted. A 10 km Outer Study Area has been adopted and no assets more than 10 km from the outermost turbines have been identified as having sensitive settings that could be adversely affected by the proposed development.
		Content with the tiered approach to the assessment given that this will consider the effect of the proposed turbines on the setting of non-designated heritage assets that are identified in the old non-statutory register (NSR) and are within 5 km of the nearest turbine, in addition to the various categories of designated asset.	Noted. NSR sites and Category C Listed Buildings within 5 km of the nearest turbine have been considered in the assessment.
		No assets beyond 10 km identified as specifically requiring inclusion in the assessment.	Noted. No assets more than 10 km from the outermost turbines have been identified as having sensitive settings that could be adversely affected by the proposed development.
		Had no assets that WoSAS would wish to add to the list of visualisations.	The agreed visualisations are included along with the assessment. They are referenced in the appropriate Technical Appendices (5.3 and 5.4) and in the setting assessment text (paragraphs 5.4.8 to 5.4.35 and 5.4.43 to 5.4.46).
		Noted that a reasonably large number of features have been identified from within the boundaries of the proposed wind farm, but the potential for each of these to be subject to a direct impact as a result of the proposal will depend on the layout of the proposed turbines and their associated infrastructure.	Noted. The baseline assessment has identified all heritage assets present (or formerly present) within the site and the proposed development has been designed to avoid all of the surviving assets. Any planning condition requirement to undertake survey in specific areas can be accommodated

Table 5.1: Consultation Responses			
Consultee and Date	**Scoping / Other Consultation**	**Issue Raised**	**Response / Action Taken**
			post-consent (paragraph 5.5.9).

Potential Effects Scoped Out

5.2.8 On the basis of the baseline assessment work undertaken, the professional judgement of the 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 5.1), and none whose settings would be significantly affected by the development were identified during the study. The proposed assessment zone of 10 km for such effects was deemed, by the statutory consultees, to be acceptable (Table 5.1).

Method of Baseline Characterisation

Extent of the Study Area

5.2.9 Two study areas were used for the assessment:

- The Inner Study Area (Figure 5.1): the proposed development site (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 as commercial forestry and surface coal mining, including operational workings, former workings (unrestored) and former workings under restoration. Figure 5.1 shows the site boundary, the proposed development layout and the locations of heritage assets identified and described in the gazetteer (Technical Appendix 5.1). Where former heritage assets have been identified within areas that have been subject to surface mine working and there are no longer any remains present, these are listed separately in Technical Appendix 5.2 with their relevant HER reference numbers. For clarity in presentation and because they are no longer present, these former sites are not shown on Figure 5.1.
- The Outer Study Area (Figure 5.2): 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). The study area extent was agreed by statutory consultees as being appropriate and no assets beyond 10 km were identified, either by the consultees, or through preliminary assessment of the 40 km blade tip ZTV as requiring inclusion in the assessment. Figure 5.2 shows the proposed development, together with the blade tip height ZTV and the location of heritage assets within 10 km from which there would be a theoretical view of the turbines and which are included in the assessment. Gazetteers of these heritage assets are provided in Technical Appendices 5.3 and 5.4, which also provide tabulated summary assessments of the predicted effects on their settings on a case-by-case basis.

5.2.10 The consideration of cumulative effects on the settings of heritage assets also uses the 10 km study area. Figure 5.3 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 which are included in the assessment, and the locations and status of other wind energy developments in the wider area are also shown. The cumulative developments included in the assessment are those agreed with consultees and listed in Chapter 4: Landscape and Visual Amenity.

Desk Study

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

- Historic Environment Scotland Spatial Data Warehouse (HES 2019a): 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;
- WoSAS Historic Environment Record (HER): provided a digital database extract in GIS for all assets within 5 km of the site boundary;
- The National Record of the Historic Environment (NHRE) database (Canmore) (HES 2019b): for any information additional to that contained in the HER;
- Relevant bibliographic references were consulted to provide background and historic information. These include the results of field surveys carried out by CFA in 1994[1] and 2004[2];
- Map Library of the National Library of Scotland: for Ordnance Survey maps and other historical map resources;
- Historic Land-Use Assessment Data for Scotland (HLAMap) (HES 2019c): for information on the historic land use character of the site and the surrounding area; and
- Scottish Palaeoecological Archive Database (SPAD) (Coles et al. 1998): consulted for information on sites with palaeoenvironmental and palaeoecological potential.

Field Survey

5.2.12 No walk-over survey of the site was carried out. The site is dominated by commercial forestry plantation and by current and former surface coal mining (Figure 5.1). Previous field survey work (CFA, 1994 and CFA, 2004) has adequately recorded the baseline conditions of those assets that currently survive in areas not directly affected by either commercial forestry or surface coal working. The desk-based study for this assessment has not identified any areas where there is a high probability of the preservation of previously unidentified heritage assets.

5.2.13 The proposed development was designed to avoid the surviving heritage assets identified through the desk-based assessment, with the exception of those of no intrinsic heritage value. The proposed development also utilises existing forestry tracks and coal haul roads as far as practicable, where there are no archaeological constraints.

5.2.14 Any necessity to conduct walk-over surveys for the purpose of micrositing development components would be undertaken during the proposed development construction phase.

Criteria for the Assessment of Effects

5.2.15 The effects of the proposed development on heritage assets will be assessed on the basis of their type (direct effects, impacts on setting and cumulative impacts) and nature (adverse or

[1] CFA (1994) 'House of Water (New Cumnock parish): post-medieval industrial and agricultural landscape, castle', Discovery and Excavation in Scotland (1994) p62

[2] CFA Archaeology Ltd (2004) 'Kyle Wind Farm Environmental Statement: Chapter 15' AMEC Wind Ltd

beneficial). The assessment takes into account the value/sensitivity of the heritage asset and its setting and the magnitude of the predicted impact.

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

Criteria for Assessing the Sensitivity of Receptors

5.2.16 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).

5.2.17 Table 5.2 summarises the relative sensitivity of those heritage assets (including their settings) relevant to the proposed development.

Table 5.2: Sensitivity of Heritage Assets

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

Criteria for Assessing the Magnitude of Change

5.2.18 Criteria for assessing the magnitude of direct (construction phase) impacts, which measures the degree of change (adverse or beneficial) to the baseline condition of an asset that would result from the construction of one or more elements of the proposed development, are presented in Table 5.3.

Table 5.3: Magnitude of Impact		
Magnitude	**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. 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. Changes that 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 appreciably altered. 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. 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. Changes that slightly detract from how a heritage asset is understood, appreciated and experienced.	Changes that result in elements of a heritage asset's fabric or setting detracting from its cultural significance being removed. Changes that result in a slight improvement in the way a heritage asset is understood, appreciated and experienced.
Negligible	Changes to fabric or setting of a heritage asset that leave its cultural significance unchanged and do not affect how it is understood, appreciated and experienced.	
None	No change to fabric or setting of a heritage asset.	

Criteria for Assessing Cumulative Effects

5.2.19 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 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.

5.2.20 As noted above (Paragraph 5.2.2), 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 effect assessment.

Criteria for Assessing Significance

5.2.21 The sensitivity of the asset (Table 5.2) and the magnitude of the predicted change (Table 5.3) 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 5.4. Where two outcomes are possible through application of the matrix, professional judgement supported by reasoned justification, has been employed to determine the level of significance.

Table 5.4: Significance of Effect				
Magnitude of Change	**Sensitivity of Asset**			
	High	**Medium**	**Low**	**Negligible**
High	Major	Major / Moderate	Moderate / Minor	Minor
Medium	Major / Moderate	Moderate	Moderate / Minor	Minor / Negligible
Low	Moderate / Minor	Moderate / Minor	Minor / Negligible	Minor / Negligible
Negligible	Minor	Minor / Negligible	Minor / Negligible	Negligible
None	None	None	None	None

5.2.22 Major and Moderate effects are considered to be significant for the purposes of the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (EIA Regulations). Minor and Negligible effects are considered to be 'not significant'.

Limitations and Assumptions

5.2.23 The desk-based assessment draws on the records in the HER, provided in a digital GIS dataset acquired in December 2017. It is assumed that those records were up-to-date at the time of acquisition. The baseline study draws on the results of field surveys carried out in 1994 and 2004, which cover the whole of the site (including areas of surface mine working) and are assumed to be a full and accurate record of the surviving features of the historic environment at the survey dates.

5.2.24 The desk-based assessment identified a number of heritage assets, recorded in the HER, that lie in areas that have been subject to modern surface mining. It is assumed that all trace of these assets has been removed during mining works and that no remains survive; this has been verified, as far as possible, through examination of modern aerial photographic imagery. These assets are listed in a separate Appendix (Technical Appendix 5.2) along with the relevant HER reference number. As no remains survive, they are excluded from Figure 5.1.

5.2.25 Designated heritage assets within the Outer Study Area have been identified from the HES database downloaded from the HES website in March 2019. That data is assumed to have been current and up-to-date at the time of acquisition.

5.3 Baseline Conditions

Current Baseline

Heritage Assets within the Inner Study Area (refer to Figure 5.1 for locations of assets referenced in brackets below)

MEDIEVAL OR LATER FARMSTEADS

5.3.1 Remains of two farmsteads (8 and 28) survive within the site. Both are post medieval farmsteads, of which there are standing remains of walls. Both farmsteads have their origins in at least the 18th century, being shown on Gen. W. Roy's map (1747-55) but were also evidently only abandoned in the mid-20th century. They have some heritage value, as relicts of the past farming landscape and for their potential to retain archaeological information on farm building architecture and domestic life over their period of occupation. Accordingly, they are assessed as being assets valued at a local level and of low sensitivity.

OTHER BUILDINGS AND STRUCTURES

5.3.2 Remains of a cottage (22), a possible shieling hut (27) and a possible kiln (gravel pit) (30) have been recorded by the study, but no remains of these have been identified. There are no surviving visible remains of the cottage (22), although traces of former cultivation rig do survive. The site of the possible shieling hut (27), on the west side of the Black Burn, is now covered by commercial forestry. The possible kiln (30) is clearly marked on the 1911 Ordnance Survey map as a gravel quarry and is not shown on any historic maps as a kiln.

5.3.3 All three sites are assets of little or no intrinsic heritage value and are accordingly assessed as being of negligible sensitivity.

SHEEPFOLDS, ENCLOSURES AND OTHER STRUCTURES

5.3.4 Six sheepfolds (2, 3, 4, 15, 24 and 27); two pens (11 and 12); three sheep rees (5-7) and one stell (1) are testament to the historic use of the landscape as sheep pasture. Four of the sheepfolds (2, 15, 24 and 27) survive to some degree and are relict features of the historic pastoral land-use. They are assessed as having some local heritage importance and of low sensitivity. Two other sheepfolds (3 and 4) appear to have been damaged or planted over and are assessed as assets of little or no intrinsic heritage value and are accordingly assessed as being of negligible sensitivity.

5.3.5 Two woodland plantation enclosures (10 and 13) are surviving relicts of woodland management; most likely providing a supply of timber for construction purpose or domestic fuel. The enclosure walls survive in good condition and one (13) contains trees that might be survivors of the original woodland. As surviving features of the former farming landscape, they are assessed as being assets valued at a local level and of low sensitivity.

CULTIVATION REMAINS

5.3.6 A possible cultivation terrace (17), two possible field banks or dykes (18 and 26) and three areas of relict rig and furrow cultivation (23, 29 and 31) are surviving remnants of cultivation associated with former farms. They survive as fragmentary remains, forming no coherent pattern. They are assessed as assets of little or no intrinsic heritage value and are accordingly assessed as being of negligible sensitivity.

MINING REMAINS

5.3.7 Several sites of mining remains (19-22, 34 and 35) are recorded within the site in areas that have not been subject to surface mining activities. Three of these sites of mining activity (19-22) lie just outside the southern edge of the House of Water surface mining coal extraction area and are partial remains of a cluster of small pits of late 18th or early 19th century date, most of which have been lost to the ongoing mining operations in this area. Two other recorded historic mining remains (34 and 35) were mid-20th century ventures and there are no surviving remains in an area recorded on HLAmap as being restored agricultural land: recently backfilled and restored from surface or mining activities. These former mining sites are each assessed as assets of little or no intrinsic heritage value and are accordingly assessed as being of negligible sensitivity.

MISCELLANEOUS OTHER REMAINS

5.3.8 Five quarries (14, 16, 25, 32 and 33) are evidence of stone extraction; most likely for the construction of local farm buildings and field boundary walls. They are assessed as assets of little or no intrinsic heritage value and are accordingly assessed as being of negligible sensitivity.

5.3.9 A river crossing of stepping stones (9) lie along the historic farm access route to 'Burnockhead'. They are assessed as assets of little or no intrinsic heritage value and are accordingly assessed as being of negligible sensitivity.

Assessment of Archaeological Potential of the Inner Study Area

5.3.10 The majority of the identified heritage assets across the site are related to historic, post-medieval farming or mining land-use. Relict elements of that former farming activity survive in isolated pockets within the current commercial forestry and around the edges of former and current surface mining.

5.3.11 HLAmap records the site as currently being dominated by forestry and surface mine working and restored agricultural land. Small remnants of rough grazing survive outside the forestry and mining areas; for example, around Peat Sike and Beoch Lane, in the east of the site.

5.3.12 There is no evidence of prehistoric activity within the site; although there are recorded sites in the local area that indicate prehistoric settlement. For example, Bronze Age burial cairns are recorded to the south of the site, alongside the B741 at Beoch and on Rig Hill near Nith Lodge. Another Bronze Age burial cairn has been recorded at Fardenreoch, on Carnivan Hill to the east of the site. There are though no known settlement sites associated with the funerary monuments and the current land-use of commercial forestry and surface mine working is not conducive to the preservation of buried settlement sites.

5.3.13 Medieval settlement evidence in the wider landscape is represented by the sites of two former tower houses (Auchencloich Castle (SM5393)), to the north, and Little Rigend Castle, alongside the River Nith, on the eastern edge of the site.

5.3.14 Peat depth mapping shows that over much of the afforested area peat depths are under 2 m; pockets of peat of greater than 2 m are present. Peat depth of up to 5 m is recorded in Burnockhead Wood, on the north side of the Black Water, but within commercial forestry and unlikely to have survived intact and undisturbed. A second area of deep peat (up to 5 m) is located on the east side of Stannery Knowe, in an area where there are no trees but where surface coal mining has been carried out to its immediate south. The palaeoenvironmental potential of these pockets of disturbed peat is considered to be low.

5.3.15 Based on the available evidence, both from within the site (commercial forestry and surface mining) and in the wider landscape (low frequency of sites or prehistoric and medieval date), it is considered that there is a low or negligible probability of hitherto unidentified archaeological remains being present within the site; especially for remains of prehistoric date.

HISTORIC BACKGROUND

5.3.16 This area has a strong association with Covenanter history (1679-88) recorded in both breadth and depth by Dr Mark Jardine (Jardine 2019). Many of the names of local farms appear in records of events of those times: Benbain; Benbeoch, Benquhat, Pennyvenie and Dalquhairn to name but a few. Martyrs' Moss, immediately to the south of the site contains a site known as 'Whig's Hole' where tradition has it that this natural depression was 'a hole in a moss where it is said The Whigs or Covenanters used to hide from pursuit of the Kings troops'[3]. The Moss is not far from the Covenanter's Grave, a memorial to two men whose grave it marks, on Carsgailoch Hill to the northeast of the Moss, and from Benquhat Farm, to the west of the Moss, the home of James and Robert Dun, notable members of the Covenanter movement.

[3] Jardine Dr M (2019) https://drmarkjardine.wordpress.com/2014/02/21/shot-by-highlanders-two-covenanters-buried-at-cumnock/

Kilmein Farm, close to Benquhat Farm, was the site of secret religious meetings (conventicles) during the Covenanter period (1679-88).

5.3.17 Although none of the farm names within the site has any apparent direct link with any of the events described, the area evidently has a rich history and it is a heritage that many in the local community hold in high regard. Dr Jardine[4] describes the upland parishes in eastern Ayrshire as one of several militant Covenanter strongholds.

Heritage Assets within the Outer Study Area (refer to Figure 5.2 for locations of assets referenced in brackets below)

5.3.18 Within the Outer Study Area there are: 14 Scheduled Monuments; 196 Listed Buildings (ten of Category A, 109 Category B and 77 Category C); five Conservation Areas; and two Inventory Gardens and designed Landscapes, all of which are heritage assets with statutory or non-statutory designations. Amongst these are Dumfries House and Craigengillan (both Category A Listed Buildings, each set within an Inventory Garden and Designed Landscape), raised by HES as requiring consideration in the assessment. Amongst the Scheduled Monuments are: Auchencloigh Castle (SM5393) and Laight Castle (SM7690); and Waterside, Dalmellington Ironworks (SM4345), associated miners' villages (SM7863) and Bing (SM7544). These were also identified by HES as requiring consideration in the assessment. Category A listed Auchinleck House (LB848), which lies within its own designed landscape setting that also includes within it Auchinleck Old House (SM5468) and Auchinleck Castle (SM5269), was identified by WoSAS as requiring consideration in the assessment.

5.3.19 The blade tip height ZTV map 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 5.2 and they are listed in Technical Appendices 5.3 and 5.4.

5.3.20 Analysis of the ZTV shows that there is predicted theoretical visibility of the proposed development (at blade tip height) from: 10 of the Scheduled Monuments; 114 of the Listed Buildings (five of Category A, 57 Category B and 52 Category C); five Conservation Areas; and two Inventory Gardens and Designed Landscapes. Where assets have been identified by Consultees as requiring consideration in the assessment, their settings and the impact of the proposed development upon these assets is described below.

Future Baseline

5.3.21 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 commercial forestry and both restored and unrestored former surface mine areas would be likely to continue and those heritage assets that survive within the site would be subject only to natural decay and erosion processes.

5.3.22 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.

4 Jardine Dr M (2009) 'The United Societies: Militancy, Martyrdom and the Presbyterian Movement in Late-Restoration Scotland, I679 to I688' Edinburgh University, Edinburgh.

5.4 Assessment of Likely Effects

Potential Construction Effects

5.4.1 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, borrow pits, etc.) have the potential to disturb or destroy features of cultural heritage interest. 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.

5.4.2 The proposed development has been designed to avoid all of the sensitive constraints identified. At only two locations does the proposed development intersect with a heritage asset:

- An old sandstone quarry (16), of negligible sensitivity, lies at the location of the hardstanding for turbine T13. Construction work would result in a high magnitude direct adverse impact of minor significance (not significant in EIA terms).
- An area of former rig and furrow cultivation (31), of negligible sensitivity, lies adjacent to the location of turbine T8 and would be crossed by an access track leading to turbines T10 and T11. Construction work would result in a high magnitude direct adverse impact of minor significance (not significant in EIA terms).

5.4.3 In 14 locations, recorded assets lie within 100 m of elements of the proposed development infrastructure:

- A sheep stell (1), of low sensitivity, lies 24 m from an access track (between turbines T44 and T45) that uses an existing forestry track that would require some upgrading;
- An enclosure/pit (2), of low sensitivity, lies 50 m from the edge of a turbine base (T54);
- A pen (11), of negligible sensitivity, lies 50 m east of a new alignment of access track (between turbines T38 and T39), but is beside the Black Water watercourse and within the watercourse buffer;
- A woodland plantation (13), of low sensitivity, lies 30 m from search area for Borrow Pit SEA4;
- An old quarry (14), of negligible sensitivity, lies within 50 m of the track between T13 to T14;
- A possible fragment of former field bank (18), of negligible sensitivity, lies within 50 m of the access track to turbine T9;
- Possible mining remains (19-21), of low sensitivity, lie 30 m south of an access track to turbine T9;
- An area of former rig and furrow cultivation (23), of negligible sensitivity, lies 70 m to the northwest of the access track to T8;
- A sheepfold (24), of low sensitivity, lies 40 m from the access track to turbine T8;
- An old quarry (25), of negligible sensitivity, lies 67 m to the southeast of the access track to T8;
- An area of former rig and furrow cultivation (29), of negligible sensitivity, lies 90 m to the southeast of the access track to T8;
- A possible kiln (30), recorded as a gravel pit on 1910 OS map, of negligible sensitivity, lies 20 m from the edge of the hardstanding at turbine T8;

- An old quarry (32), of negligible sensitivity, lies 97 m to the southeast of the access track to T8; and
- An old quarry (33), of negligible sensitivity, lies within 30 m of hardstanding for turbine T10.

5.4.4 Micrositing of the proposed development could result in high magnitude direct adverse impacts on these assets assessed as being of minor significance.

5.4.5 In all other cases the recorded heritage assets lie more than 100 m from the centreline of the proposed site access tracks and would not be directly affected by the proposed development.

Potential Operational Effects

Direct Effects

5.4.6 The proposed development could result in adverse effects on cultural heritage similar to those arising during construction of the proposed development. Effects could result from any ground breaking activities for any purpose, or other construction activities, such as may be necessary for maintenance or replacement works required during the operational phase. The likelihood of direct effects is similar to, or less than, that expected during the construction phase.

5.4.7 There are no known, previously recorded and identified assets likely to receive a direct effect arising during operation of the proposed development assessed to be significant in EIA terms. 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

5.4.8 The proposed development could result in adverse effects on the setting of cultural heritage assets both within the Inner Study Area and in 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; with any potential effects diminishing with distance from the site. No assets beyond 10 km have been identified by HES or WoSAS as requiring consideration for potential effects on their settings. Technical Appendices 5.3 and 5.4 contain tabulated assessments of the predicted effects.

5.4.9 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 5.2. The criteria detailed in Tables 5.2 to 5.4 have been used to assess the nature and magnitude of the effects which are set out in summary in Technical Appendices 5.3 and 5.4.

5.4.10 The following discussion addresses those assets identified by HES or WoSAS as requiring detailed consideration, even where the significance of the predicted effect is assessed as being not significant in EIA terms. The assessments are supported with visualisations (Figures 5.4 – 5.12) and reference is made to photomontages, prepared in support of the LVIA chapter, where these are useful in representing the visual impact on the settings of heritage assets.

5.4.11 In one other instance (Little Rigend Castle (8024)), where a potentially significant adverse effect has been identified through the tabulated assessment, this is addressed at the end of the following section.

DUMFRIES HOUSE (LB14413) AND GDL

5.4.12 Dumfries House is Category A Listed and stands, now restored, within an Inventory Garden and Designed Landscape (GDL) in the valley of the Lugar Water, west of the town of Cumnock. The GDL covers 580 ha along both sides of the Lugar Water and includes 11 other Listed Buildings including: The Temple (LB96), the Avenue Bridge (LB14414) and the Dovecote (LB14416), all of which are Category A Listed. There are six Category B Listed Buildings including the remains of Terringzean Castle (LB14423), Stockiehill lodges (LB14422), Westgates lodges (LB14421), the coach buildings (LB14420), a sundial (LB14415) and the icehouse (LB14419). Waterloo Bridge (LB14418) and Lady's Bridge (LB14417) are Category C Listed. The GDL is a mixture of farm fields and woodland with formal gardens close to the main House and the renovated Queen Elizabeth Walled Garden set some distance away to the northwest of the House, on the north bank of the Lugar Water. An area of ornamental gardens has been laid out in recent times between the Avenue Bridge and the walled garden, including a pagoda that stands as an eye catcher amidst trees at the end of a newly created tree-lined walk leading southwest from The Temple. The main House and visitor facilities stand within the more wooded southern part of the GDL and a newly created tree-lined vista from the House has been established aligned towards the south southeast and Blackwood Hill, with the ridgeline of Pappet Hill and Carnivan Hill in the distance. Views of Dumfries House within its GDL setting are limited from the surrounding area, but glimpsed views of the House can be seen from the A76 travelling from the north and from along the northern approach drive into the GDL from the B7036.

5.4.13 The blade tip height ZTV (Figure 5.2) shows that theoretical visibility of the proposed development is largely only achieved from the higher ground in the northern part of the GDL, from the vicinity of The Temple (LB96; Figure 5.5) and from along the northern approach drive (LVIA VP4; EIAR Volume 3b: Figure 4.11). Theoretical visibility from the lower lying parts of the GDL and from the land to the south of the Lugar Water is reduced as a result of topographic screening and the proposed development is further screened from any visibility by the woodland character of the surroundings within the GDL.

5.4.14 Figure 5.4 provides a photowireline view from the top of the entrance steps to Dumfries House on its south-facing, principal elevation and demonstrates the visual screening provided by the topography and the woodland. From this vantage point the proposed development would be entirely screened from view and would have no adverse impact on the designed vista south southeast from the House. Figure 5.5 is a photomontage of the view from the western end of The Temple, providing a view south southwest towards the proposed development and shows the unobstructed view across the GDL; Dumfries House is not visible in this view, lying behind the woodland in the left of the image. The Queen Elizabeth Walled Garden is visible on the right of the image; the pagoda can just be made out in the trees in the near distance. The photomontage (Figure 5.5c) shows the proposed development, set back behind the far ridgeline of wooded hills and commercial forestry. The proposed development would be an appreciable modern addition to that view; although the visibility would reduce as the viewer descended the hill. Figure 4.11f (EIAR Volume 3b) provides a photomontage view looking across the GDL from the northern access to the estate; Dumfries House is visible amidst the trees left of centre in the image. The photomontage (Figure 4.11f) shows the proposed development, set back behind the far ridgeline, partly obscured by trees in the foreground; the unobstructed, bare earth visibility is shown on Figure 4.11e.

5.4.15 The views from the elevated northern part of the GDL (EIAR Volume 3b: Figures 4.11 and 5.5) would be appreciably changed from the introduction of the proposed development. However, elsewhere within the GDL, the impact of the proposed development on the setting of the other Listed Buildings and the impact on views and vistas within the gardens would be much lessened by the screening influence of topography to the south and woodland and garden planting within the GDL. The proposed development would be barely, if at all, visible from the majority of the GDL or from the other Listed Buildings within it that give the place its character and sense of place.

5.4.16 The proposed development would result in some changes to some views of medium magnitude and in other cases changes of negligible magnitude, and overall would result in some slight changes to the way in which the asset is understood, appreciated and experienced. The cultural significance of Dumfries House, and that of its GDL and associated Listed Buildings, would be retained and not appreciably diminished by the proposed development. The introduction of the proposed development into the wider landscape, around 6 km to the south of Dumfries House, would result in an adverse effect of low magnitude on an asset of high sensitivity and of moderate significance; significant in EIA terms.

CRAIGENGILLAN HOUSE (LB18793) AND GDL

5.4.17 Craigengillan House is Category A Listed and stands, with an adjoining Category A Listed stables block (LB18794), within an Inventory Garden and Designed Landscape (GDL). The GDL occupies a wooded valley setting along the River Doon, southwest of Dalmellington, between Loch Doon in the south and the B741 north of Bogton Loch in the north. The designed landscape has a non-inventory component that extends the estate to the east, over Bellsbank Plantation to the A713 between Dalmellington and Carsphairn. The GDL includes a Category B Listed lodge (LB1086) as well as two Category B Listed bridges and two Category C Listed bridges carrying access roads over the River Doon and the Dalcairnie Burn. There are two Scheduled Monuments within the GDL: Dalnean Hill farmstead (SM4390) and Bogton Loch airfield (SM13693), in the northern part of the GDL. The GDL is also home to the Scottish Dark Sky Observatory, on the northern slopes of Glessel Hill in the southern part of the GDL. The GDL is a mixture of farmland, woodland and moorland and the main House and Stables are set on an elevated terrace in the southern part of the GDL, having open aspect views to the northeast from the front elevation towards Meikle Hill and westwards over the Doon valley. The House is a notable feature in the landscape when travelling south along the C-class road from Mossdale to Loch Doon, in which view the House is seen set within designed woodland surroundings. The existing Dersalloch Wind Farm is a notable feature of this view, seen to lie in the hills behind the view of the House.

5.4.18 The blade tip height ZTV (Figure 5.2) shows that theoretical visibility of the proposed development is largely only achieved from the higher ground in the western and southwestern parts of the GDL; notably from Auchenroy Hill, Wee Cairn Hill and Shear Hill. Theoretical visibility from the lower lying parts of the GDL along the Doon valley floor is reduced as a result of topographic screening and the proposed development is further screened from any visibility by the woodland character of the surroundings within the GDL. Visibility of the proposed development is particularly limited from the vicinity of the main House and Stables; where the ZTV predicts no visibility from either the House or the Stables. There is also limited visibility of the proposed development from the two Scheduled Monuments in the northern part of the GDL.

5.4.19 Figure 5.6 provides a wireline visualisation of the theoretical bare earth visibility of the proposed development, as seen from a location along the eastern access to Craigengillan House and Stables. There is no predicted visibility from the House or Stables and this viewpoint shows that parts of the blades of only two turbines would be theoretically visible, above and beyond the view to Benbain from that location. Figure 5.7 provides a photomontage visualisation from an elevated viewpoint on Glessel Hill, just outside the southern boundary of the GDL. In this view, which looks northwards across the GDL, Craigengillan House is seen left of centre in the image, set within woodland; the Dark Sky Observatory is visible in the right centre in the image. Figure 5.7d shows the montaged view showing the proposed development, set back behind the far ridgeline of Benbain; three turbine hubs and 11 tips are visible in the montaged view. The main group of turbines is visible beyond Bellsbank, in the middle distance, with Dalmellington beyond. The proposed development does not detract from the character of the GDL. EIAR Volume 3b: Figure 4.31d (LVIA VP 24) shows a photomontage view from the Scottish Dark Sky Observatory, just below the Glessel Hill viewpoint (Figure 5.7), and shows a similar level of visibility of the proposed development. EIAR Volume 3b: Figure 4.25d (LVIA VP 18) provides a photomontage view of the proposed development from the B741 at the Category B Listed bridge (LB1113) near Bogton Loch at the northern end of the GDL; Figure 4.25d showing very limited visibility from that location. EIAR Volume 3b: Figure 4.27f (LVIA VP 20) provides a photomontage view from the summit of Auchenroy Hill, in the northwestern part of the GDL, looking northeast across the northernmost part of the GDL, with Bogton Loch on the right of the image; Dalmellington and the airfield Scheduled Monument (SM13693) lie in the middle distance in the centre of the image. Waterside and the Ironworks Scheduled Monument (SM4345) can be seen right of centre on Figure 4.27d. The photomontage (Figure 4.27f) shows the visibility of the proposed development from this elevated viewpoint, offset to the north of the view over the GDL and not affecting the views southeast across the GDL.

5.4.20 Views across the GDL from the viewpoint on Glessel Hill and from the Scottish Dark Sky Observatory would be altered to a slight degree by the introduction of the proposed development but views from elsewhere within the GDL and from the location of the main House and Stables would be imperceptibly altered. From the southern viewpoints (EIAR Volume 3b: Figures 4.31f and 5.7) the change would be of low magnitude but would not appreciably affect the way in which Craigengillan House and GDL is understood, appreciated and experienced. From other viewpoints the change would neither adversely affect the cultural significance nor affect how the House and GDL are understood, appreciated and experienced.

5.4.21 Overall, it is assessed that the effect of the proposed development around 6.8 km to the northeast of Craigengillan House and GDL would be of negligible magnitude on an asset of high sensitivity and of minor significance; not significant in EIA terms.

Waterside Conservation Area (CA) and Scheduled Monuments (SM4345; SM7544 & SM7863)

Waterside, Dalmellington Ironworks (SM4345); Waterside Bing, iron slag bing, Dalmellington Ironworks (SM7544); Waterside, miners' villages & mineral railways N of (SM7863)

5.4.22 The industrial archaeological remains of the former Ironworks around Waterside CA are an associated group and so are discussed here together as such; they are assessed individually, in summary, in Technical Appendix 5.3.

- The Dalmellington Ironworks (SM4345) includes standing remains of the former Ironworks and associated buildings and structures: workers' housing, ore transportation tramways and railways, the former railway station, brick kilns and chimneys. All are now in a state of general abandonment and extend over the southwest facing hillside above the village of Waterside, which straddles the A713 Dalmellington to Patna road in the Doon valley. Part of the site is home to the Scottish Industrial Railway Centre which has periodic open days during the summer months.

- The Iron Slag Bing (SM7544) is a large heap, 30 m high, on the southwest side of the A713, opposite the Ironworks Entrance and contains an estimated 1,470,000 tonnes of ironstone slag; a waste by-product of the Ironworks. As such it is intimately associated with the Ironworks and an integral part of its setting.
- The Miners' Villages & Mineral Railways (SM7863) extend over the hillside above the Ironworks on the northeast side of the Doon valley and include three miner's villages: Benwhat, Corbie Craigs and Lethanhill. There is also a network of tracks marking the routes of former mineral railways, and bings marking the site of former ironstone pits and adjacent shafts. The villages, railways and bings are component parts of the former Ironworks and as such are an integral part of its setting.
- Waterside CA covers the extent of the village from Chapel Row in the south to New Cottages in the north and includes the former Ironworks, Waterside Institute (LB6565), War Memorial (LB6596), Ardoon House (LB1094), Chapel of Ease (LB1093) and Palace Bar (LB6623), formerly the Company store. The majority of the village buildings are contemporary with the former Ironworks and, as such, the CA is an integral part of its setting.

5.4.23 The blade tip height ZTV (Figure 5.2) shows that theoretical visibility of the proposed development is largely screened by topography from all elements of the Waterside group, with visibility limited to blade tips of between one and 11 turbines. There is no predicted visibility of the proposed development from any of the Listed Buildings within the Waterside CA. Two wireline visualisations (Figures 5.8 and 5.10) are provided to represent the predicted theoretical bare earth visibility of the proposed development. From Corbie Craigs village (Figure 5.8) nine turbines are predicted to be partly visible; the proposed development being mostly screened by the topography of Benquhat Hill. From Waterside village (Figure 5.10), only one turbine blade tip is predicted to be visible; the proposed development almost entirely screened by the topography northeast of the Ironworks.

5.4.24 Overall the impact of the proposed development around 4.7 km to the northeast of the industrial heritage at Waterside is assessed as being of negligible magnitude on assets of medium and high sensitivity, resulting in effects of minor significance; not significant in EIA terms.

LAIGHT CASTLE (SM7690)

5.4.25 Laight Castle is the remains of a tower house, of which only the foundations survive, which stands on a steep sided spur above the Dunaskin Burn in open moorland to the hillside above and to the northeast of the Dalmellington Ironworks. The Castle occupies an elevated position above the Doon valley and set well back from the River Doon. The open aspect view from the Castle is southwards towards the valley and the hills beyond. Views west, north and east are limited by rising topography of Benquhat Hill and the Castle's setting is consequently isolated and relatively secluded; adding to the sense of remoteness and abandonment.

5.4.26 Figure 5.9 provides a wireline visualisation showing the theoretical bare earth visibility of the proposed development from the location of the Castle and shows that only one turbine blade tip would be visible. The blade tip height ZTV (Figure 5.2) shows that there is limited predicted visibility of the proposed development from the area around the Castle remains.

5.4.27 Overall, the change to the setting of Laight Castle around 3.7 km to the southwest of the proposed development would be barely perceptible and the impact is consequently assessed as being of negligible magnitude on an asset of high sensitivity, resulting in an effect of minor significance; not significant in EIA terms.

AUCHENCLOICH CASTLE (SM5393)

5.4.28 The Auchencloigh Castle Scheduled Monument consists of the remains of a tower house, surviving as tumbled walls and several massive fragmentary, lime-bonded blocks. The remains are scrub-covered and a much later stone-walled sheepfold has been built into the southwest side of the site. The Castle remains stand directly to the north side of a belt of mature mixed woodland, forming a shelter belt and the area to the north of the Castle is a restored former surface coal working. The Castle stands on the west side of the Burnton Burn and the main open aspect view from the site is to the north, along the valley of the Burn towards the Lugar valley. Dilapidated corrugated iron sheds lie a short distance to the north of the Castle remains and a recently installed pylon-mounted overhead electricity transmission line passes the site, 175 m to the northeast. The Castle's setting is one of a modified landscape with modern elements in close proximity and it is set within a modern farming landscape.

5.4.29 Figure 5.11 provides a wireline visualisation of the theoretical bare earth visibility of the proposed development; the view being to the south, beyond the shelterbelt of mixed woodland that stands directly adjacent to the Castle. The wireline shows that, in the absence of the intervening woodland, much of the proposed development would be screened by topography, with nine hubs being theoretically visible together with the blade tips of a number of other turbines.

5.4.30 In the absence of the woodland belt there would be a perceptible change to the setting as a result of the change in the views to the south. However, the presence of the mixed woodland provides screening of the view southwards and the main, open views to the north from the Castle would not be adversely affected.

5.4.31 Overall, it is assessed that the impact of the proposed development around 2.8 km to the south of Auchencloich Castle would be of low adverse magnitude on an asset of high sensitivity and the resultant effect is assessed as being of minor significance; not significant in EIA terms.

AUCHINLECK HOUSE (LB948)

5.4.32 Auchinleck House is a category A Listed Building that stands within a designed parkland landscape on the east banks of the Lugar Water at its confluence with the Dippol Burn. Auchinleck House is an 18th century successor to the earlier 17th century Auchinleck Old House (SM5468) and even earlier 13th century Auchinleck Castle (SM5269), both of which lie to the west at the confluence of the two watercourses. The policies of Auchinleck House also include a number of other Listed Buildings and other structures that are component parts of the estate lands and include Wallace's Cave (LB6447), Coachhouse (LB6442), Stables (LB949), dovecote (LB950), an ice or deer cave (LB6446) and other ancillary buildings and bridges.

5.4.33 The group of Listed Buildings and Scheduled Monuments occupy an enclosed loop of land bounded by the Lugar Water and Dippol Burn that is laid out as a mixture of farm fields, parkland and formal and informal woodland planting. The main House, in the Country Mansion style, is oriented to face east southeast and west northwest with views towards Cairn Table and Wardlaw Hill; a broad belt of woodland along the south side of the House provides shelter and seclusion from the adjacent farm buildings, coachhouse and stables. The Old House (SM5468) and former Castle (SM5267) stand in woodland at the confluence of the Lugar Water and Dippol Burn, and a walled garden lies just to the south of the Old House and outwith the woodland.

5.4.34 Figure 5.12 provides a wireline visualisation of the predicted theoretical bare earth visibility of the proposed development from the front (southeast side) of Auchinleck House. The wireline shows that the proposed development would, in the absence of the screening woodland to the south of the House, be visible along and beyond the skyline in distant views to the south across the lower lying valley of the Lugar Water. The visualisation is also representative of the visibility of the proposed development from other locations within the policies, although woodland shelterbelts and plantation blocks across the policies would provide some degree of screening from many locations; particularly to the north of the main House. Views from the main ancillary buildings and from the two Scheduled Monuments would be screened by the close presence around them of mixed woodland planting.

5.4.35 The proposed development would not be seen in the main views from the House, which are to the east southeast and west northwest, or from the main ancillary buildings, due to the screening given by the woodland planting. The proposed development would though be theoretically visible in open views from within the policies towards the south.

5.4.36 Overall, the impact of the proposed development around 8.6 km to the south of Auchinleck House would be of low adverse magnitude on an asset of high sensitivity and the resultant effect would be of minor significance; not significant in EIA terms.

LITTLE RIGEND CASTLE (8024)

5.4.37 The remains of Little Rigend Castle stand in a field beside the River Nith. Previous excavations at the site have confused its appearance, but a basic rectilinear form can be made out, and two internal chambers discerned; traces of three disused earthen banks, which may be associated with the occupation of the castle, have also been recorded in the same field. The castle was formerly a baronial residence of the Cathcart family but there is presently little of the site to been seen or appreciated. The remains lie close to the south bank of the River Nith, close to its confluence with the Beoch Lane, within a valley setting. From the Castle's location the predominant view is to the northeast along the Nith valley although there are also associations with the upstream course of the Nith and with the valley of the Beoch Lane. The valley landscape is presently dominated by surface coal working (House of Water and Greenburn), and commercial forestry cloaks the hill side to the south of and west of the Castle. The current setting is not sympathetic to the cultural significance of the heritage asset and does little to enhance understanding or appreciation of the Castle and the sense of place is overwhelmingly one of a modern, industrial mining landscape; some operational workings, some now restored.

5.4.38 The proposed development would be sited on the hills to the west and north of the Castle; on the far side of the river and with some turbines in close proximity to its location. The view along the valley to the northeast would remain largely open, although some turbines (T1-T3) would be present in the foreground in that view. The introduction of the proposed development would have some impact on the setting; most notably by adding to the current sense of place as an industrial landscape associated with the energy sector. Future restoration of the surface workings would result in a return to a more rural outlook along the valley, through a modified landscape that would lack something of the original panorama. The cultural significance of the Castle would remain slightly diminished by the introduction of the proposed development in place of the ongoing mining operations along the valley and the sense of place would be adversely affected to some degree.

5.4.39 Overall, the impact of the proposed development 0.4 km to the north of Little Rigend Castle would be of low adverse magnitude on an asset of medium sensitivity; but, as the setting is already appreciably diminished, the resultant effect would be of minor significance; not significant in EIA terms.

Potential Decommissioning Effects

5.4.40 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. 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.

5.4.41 There are no known, previously recorded and identified assets likely to receive a direct effect arising from decommissioning of the proposed development assessed to be significant in EIA terms. 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 Construction Effects

5.4.42 Construction of the proposed development would not give rise to any cumulative effects on cultural heritage assets.

Potential Cumulative Operational Effects

5.4.43 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.

5.4.44 Figure 5.3 shows the cumulative developments in the surrounding landscape and the cultural heritage assets that have predicted visibility of the proposed development (Figure 5.2). From this, it can be seen that the assets most likely to receive cumulative effects are those that lie to the north and west of the proposed development. It can also be seen that, based on the list agreed with EAC & SNH, those other developments most likely to give rise to cumulative effects on heritage assets in combination with the proposed development are:

- Dersalloch Wind Farm (operational and part of the baseline).
- Over Hill Wind Farm (consented).
- Polquhairn Wind Farm (consented).
- South Kyle Wind Farm (consented).
- Benbrack Wind Farm (consented).
- Enoch Hill Wind Farm (in planning).
- Greenburn Wind Farm (scoping).

5.4.45 The visualisations provided to inform the assessment of effects on the settings of heritage assets include these cumulative developments where they will be theoretically seen alongside or in combination with the proposed development. Four of these in particular are instructive in consideration of the cumulative effect assessment: Figure 5.5 from The Temple in Dumfries House GDL; Figure 5.7 from Glessel Hill for Craigengillan House and GDL; Figure 5.11 for Auchencloigh Castle; and, Figure 5.12 from Auchinleck House.

- Figure 5.5 shows that from The Temple (LB96) the proposed development would be seen in combination with three consented developments (Over Hill, Polquhairn and Knockshinnoch) but would be closer to the Dumfries House GDL than any of the three; Over Hill would be seen in the same grouping as the proposed development and the other two would be seen as separate and distinct, smaller developments. The proposed development would also be seen in combination with the consented Pencloe development (revised scheme in planning) and the in planning Enoch Hill development; although neither of these would be visually prominent, being largely screened by topography, and both are at much greater distance than the proposed development. The greatest cumulative impact on the Dumfries House GDL would arise from the proposed development in combination with the proposed (in scoping) Greenburn Wind Park development. That development would be slightly closer than the proposed development and would extend the visibility of wind turbines along the skyline in views from this elevated part of the GDL; the proposed development and the Greenburn Wind Park development seen together as one group of turbines. From this viewpoint, the cumulative impact of the proposed development with the Greenburn Wind Park in particular would be such that there would be an overall cumulative impact of medium adverse magnitude, resulting in a cumulative effect of moderate significance; significant in EIA terms.

- Figure 5.7 shows that from the viewpoint on Glessel Hill the proposed development would be visible alongside and in combination with the consented Over Hill development and the proposed (in scoping) Greenburn Wind Park development; all seen together as one group in distant views. Figure 4.31a (LVIA VP24 from the Scottish Dark Sky Observatory) shows a similar disposition of development and similar visibility. From these elevated viewpoints in the southern part of the GDL, consented developments at South Kyle, Benbrack and Windy Rig would be seen separately from the proposed development, in combination with other proposed (in planning) developments at Enoch Hill, Windy Standard III and Sanquhar II, with operational developments at Afton and Windy Standard (I & II) in the background. Figure 4.25a (LVIA VP18 from the northern end of Craigengillan GDL) shows that the proposed development would be seen alone and separate from the South Kyle, Benbrack and Enoch Hill cluster. Figure 4.27a-b (LVIA VP20) shows the view from this rare elevated viewpoint, the proposed development would be visible in combination with Greenburn and Over Hill, together with Kype Muir Extension as one grouping and with South Kyle, Benbrack, Enoch Hill and Pencloe seen separately as a large group in distant views. Considering all of the viewpoints, the cumulative impact on Craigengillan GDL from the proposed development with other proposed developments would be an overall cumulative impact of low adverse magnitude, resulting in a cumulative effect of minor significance; not significant in EIA terms.
- Figure 5.11 shows that for Auchencloich Castle the cumulative effect would arise from the proposed development in combination with only Greenburn Wind Park (in scoping) and Polquhairn (consented). The addition of these two other developments would not appreciably change the impact from the proposed development alone and both would also be screened from view from the Castle by the woodland shelter belt to its south side. Overall, the cumulative impact on Auchencloich Castle from the proposed development with other proposed developments would be an overall cumulative impact of negligible magnitude, resulting in a cumulative effect of minor significance; not significant in EIA terms.
- Figure 5.12 shows that from the Auchinleck House policies the proposed development would be seen together with consented developments at Polquhairn, Over Hill, Pencloe and South Kyle, proposed developments (in planning) at Enoch Hill and Windy Standard III, and the proposed (in scoping) Greenburn Wind Park development. These would all be seen together forming one group on the southern skyline. The policies of Auchinleck are surrounded by woodland shelterbelts that provide some screening and the collected cumulative developments would not be visible in the main views east southeast and west northwest from the main House. Views from the Auchinleck House policies in other

directions and views into the policies would be unaffected. Auchinleck House itself is not a prominent building in views from the wider landscape, occupying a secluded setting. The cumulative impact would be appreciable in open views to the south from the grounds around the House, particularly from the southern part of the policies, but overall the cumulative impact of the proposed development in combination with the other proposed and consented developments to the south would be of low adverse magnitude and minor significance; not significant in EIA terms.

5.4.46 Overall, a moderately significant cumulative effect is predicted on Dumfries House GDL, as a result of the cumulative developments being visible from the higher ground within the GDL and detracting slightly from its sense of place and the way in which the GDL is appreciated and experienced. The GDL's intrinsic cultural significance and the cultural significance of Dumfries House itself would not be significantly diminished.

5.4.47 For the other assets considered above, the cumulative effect is assessed as being of minor significance, either as a result of separation distance from the cumulative developments or limited intrusion into the setting. These factors would result in little detraction from their sense of place or from the way in which the assets are appreciated and experienced. The cultural significance of the heritage assets in the wider landscape would not be diminished or appreciably altered.

5.5 Mitigation

5.5.1 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.

5.5.2 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.

5.5.3 All mitigation works presented in the following paragraphs 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) WoSAS, acting on behalf of EAC.

Mitigation during Construction

Preservation in Situ

5.5.4 Surviving heritage assets that are within 100 m of any proposed access track or crane hardstanding would be marked out for avoidance during the construction phase. The 100 m limit is adopted to correspond with the micrositing allowance and would allow for flexibility to relocate turbines, tracks or other infrastructure components as necessary to accommodate the range of likely constraints.

5.5.5 Marking out would be achieved using high visibility marker posts set 5 m from the edge of the identified heritage assets and these markers would be retained for the duration of the construction phase. Assets for marking out would be identified on the ground by a qualified archaeologist using the baseline information provided in Technical Appendix 5.1. Marking out of the assets would be undertaken by the appointed main contractor.

5.5.6 Heritage assets identified as requiring marking out are:

- Standing remains of a drystone walled sheep stell (1) – 24 m east of access track junction on Greengate Rig;
- Standing remains of an enclosure (sheepfold) and pit (2) – 50 m from the edge of a turbine base (T54) on the slopes of Benbain;
- A standing drystone walled woodland plantation enclosure (13) – 30 m north of borrow pit search area SEA4;
- Former mining remains (19-21) – 30 m south of access track to turbine (T9) on Dow Craig; and
- Earthwork remains of a probable old sheepfold (24) – 40 m southeast of an access track junction on Dow Craig.

No Mitigation

5.5.7 No mitigation is required in relation to direct impacts at proposed turbine locations on an old sandstone quarry (16) on Harescraig Hill and a small patch of former rig and furrow (31) on Little Rigend Hill.

5.5.8 No mitigation is required in respect of ten recorded assets that lie within the 100 m micrositing allowance: the truncated remains of a circular sheepfold (2); the site of a former sheep pen (11); a possible fragment of former field bank (18); a possible kiln (gravel pit) (30); two small areas of former rig and furrow cultivation (23 and 29); and, four old stone quarries (14, 25, 32 and 33). These are all poorly preserved remains of negligible sensitivity that have little or no intrinsic heritage value and do not warrant preservation.

Pre-construction Walkover Survey

5.5.9 If required under the terms of any planning condition, the scope of any additional survey that might be considered necessary by WoSAS for the purpose of micrositing development components would be undertaken during the proposed development construction phase. The scope of any such requirement would be developed in consultation with (and subject to the agreement of) WoSAS and set out in a WSI and implemented as necessary.

Trial Trenching / Watching Brief(s)

5.5.10 The scope of any trial trenching and/or watching brief(s), which could be required as part of a planning condition should the proposed development receive consent, would be agreed with WoSAS on behalf of EAC in advance of development works commencing. The agreed scope of work would be set out in a Written Scheme of Investigation (WSI) for approval of EAC and implemented ahead of the commencement of construction works.

Post-excavation

5.5.11 If significant discoveries are made during any archaeological monitoring works which are carried out, and it is not possible to preserve the discovered site or features in situ, provision would be made for the excavation where necessary of any archaeological remains 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

5.5.12 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.

5.5.13 The guidance would make clear the legal responsibilities placed upon those who disturb artefacts or human remains.

Mitigation during Operation

5.5.14 Mitigation measures to ensure the preservation in situ of any heritage assets in close proximity to the as built layout of the proposed development would be adopted during any future works required during the operational phase (maintenance/replacement works) to ensure that no damage occurs to any heritage assets. The mitigation would include marking out any heritage assets that are within 20 m of any access track or crane hardstanding, using high visibility marker posts that would be retained for the duration of any replacement works.

Mitigation during Decommissioning

5.5.15 Mitigation measures to ensure the preservation in situ of any heritage assets in close proximity to the as built layout of the proposed development would be adopted during any future decommissioning works to ensure that no damage occurs to any heritage assets. The mitigation would include marking out heritage assets within 20 m of any access track or crane hardstanding, using high visibility marker posts that would be retained for the duration of the decommissioning works.

5.6 Assessment of Residual Effects

Residual Construction Effects

5.6.1 Taking account of the mitigation proposals set out above, the following residual construction effects have been identified:

- Direct effect of negligible significance on an old sandstone quarry (16); not significant.
- Direct effect of negligible significance on a small patch of former rig and furrow (31); not significant.
- Possible direct effect of negligible significance on nine recorded assets (11, 14, 18, 23, 25, 29, 30, 32 and 33) within the 100 m micrositing allowance[5]; not significant.

Residual Operational Effects

5.6.2 Taking the recommended mitigation into account, there would be no significant residual direct effects on any of the cultural heritage assets within the site.

5.6.3 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.

[5] There is a 100 m micrositing allowance for the infrastructure associated with the proposed development. However, this allowance would not encroach within the identified constraints buffers.

5.6.4 There would be one residual adverse effect of moderate significance (significant in EIA terms): on the setting of Dumfries House GDL.

Residual Decommissioning Effects

5.6.5 Taking the recommended mitigation into account, there would be no residual decommissioning effects on cultural heritage.

Residual Cumulative Construction Effects

5.6.6 There would be no significant residual cumulative construction effects on any cultural heritage assets.

Residual Cumulative Operational Effects

5.6.7 The residual cumulative effect of the proposed development in combination with other proposed developments on the settings of designated heritage assets would be the same as the predicted operational effects described above.

5.6.8 There would be one residual adverse cumulative effect of moderate significance (significant in EIA terms): on the setting of Dumfries House GDL.

5.7 Monitoring

5.7.1 There are no predicted effects (direct effects or effects on the settings of heritage assets) that require any monitoring measures to be undertaken.

5.8 Summary

5.8.1 A desk-based assessment and field surveys have been carried out to establish the archaeology and cultural heritage baseline. The assessment has been informed by consultation with HES and with WoSAS.

5.8.2 Thirty-five 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 farmsteads and other associated buildings and structures. There are no prehistoric remains present within the site. Some remains of historic mining activity were identified.

5.8.3 Fourteen of the assets identified are of low sensitivity and 21 are assessed as being of negligible sensitivity. Twenty-five former heritage assets were identified that have been lost due to surface mining operations.

5.8.4 An assessment of the identified cultural heritage resource, and consideration of the current and past land-use within and in the immediate vicinity of the Inner Study Area, indicates that there is a low or negligible probability of hitherto unidentified archaeological remains of any date being present within the site.

5.8.5 The layout of the proposed development has been designed to avoid, as far as practicable, 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).

5.8.6 Two heritage assets have been identified that would be affected by construction of the proposed development and 14 that could be affected as a result of micrositing. In each case the predicted effect would be minor or negligible and not significant. The potential for significant direct effects on buried archaeological remains is considered to be low or negligible.

5.8.7 Mitigation is proposed that would avoid potential direct effects on seven heritage assets that lie in close proximity to the proposed development infrastructure. No monitoring measures are required in relation to predicted effects on cultural heritage.

5.8.8 A moderately significant effect on the setting of one Inventory Garden and Designed Landscape is predicted. The predicted effect would arise as a result of the presence of the proposed development in the landscape surroundings of the Dumfries House GDL when seen from certain locations. 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 Dumfries House GDL.

5.8.9 A moderately significant cumulative effect is predicted on the setting of the Dumfries House GDL when seen from certain locations. The cumulative effect would not however result in a change that would be so significant as to reduce the cultural significance or amenity value of the Dumfries House GDL.

Table 5. 5: Summary of Potential Significant Effects of the Proposed Development

Likely Significant Effect	Mitigation Proposed	Means of Implementation	Outcome/Residual Effect
Construction			
Direct impact on assets of negligible sensitivity (no intrinsic value) resulting from track construction and turbine foundations (**16** & **31**).	None proposed	Not applicable	Not significant
Potential direct impact on assets of low sensitivity (local value) in close proximity to working areas (**1**, **2**, **13**, **19**-**21** & **24**).	Marking out using high visibility markers to ensure that the remains are avoided and preserved in situ as set out in the Outline CEMP (EIAR Volume 4: Technical Appendix 2.1).	The CEMP would be finalised and delivered as condition of consent and include these requirements.	Not significant
Potential direct impact on assets of negligible sensitivity (no intrinsic value) within micrositing allowance (**2**, **11**, **14**, **18**, **23**, **25**, **29**, **30**, **23** & **33**).	None proposed	Not applicable	Not significant
Potential direct impact on any buried archaeological remains.	Watching brief if required in sensitive areas; at the discretion of the Council (through WoSAS) as set out in the Outline CEMP (EIAR Volume 4: Technical Appendix 2.1).	The CEMP would be finalised and delivered as condition of consent and include these requirements.	Not significant
Operation			
Potential direct impact on assets in close proximity to working areas (**1**, **2**, **13**, **19**-**21** & **24**).	Marking out using high visibility markers to ensure that the remains are avoided and preserved in situ, prior to maintenance works	Condition of consent	Not significant

Table 5. 5: Summary of Potential Significant Effects of the Proposed Development			
Likely Significant Effect	**Mitigation Proposed**	**Means of Implementation**	**Outcome/Residual Effect**
	taking place in the vicinity of these assets.		
Impact on the setting of Dumfries House GDL.	None proposed	Not applicable	Significant
Decommissioning			
Potential direct impact on assets in close proximity to working areas (**1**, **2**, **13**, **19**-**21** & **24**).	Marking out using high visibility markers to ensure that the remains are avoided and preserved in situ, prior to works taking place in the vicinity of these assets.	Condition of consent	Not significant
Cumulative Construction			
None	None	None	None
Cumulative Operation			
Impact on the setting of Dumfries House GDL.	None proposed	Not applicable	Significant

5.9 Glossary and Abbreviations

Term	**Definition**
Sheep ree	A small enclosure used for impounding livestock. Often used interchangeably with sheepfold.
Shieling	Upland pasture to which animals were driven on a seasonal basis.
Shieling hut	A small dwelling of stone or turf, occupied on a seasonal basis by people tending animals on upland pastures.
Stell	An alternative term for a sheepfold (often found on historic Ordnance Survey maps).

Abbreviation	**Expanded Term**
CIfA	Chartered Institute for Archaeologists
EAC	East Ayrshire Council
GDL	Garden and Designed Landscape (Inventory)
HER	Historic Environment Record
HES	Historic Environment Scotland
HLAMap	Historic Land-Use Assessment Map
NIDL	Non-Inventory Designed Landscape
NRHE	National Record of the Historic Environment
NSR	Non-Statutory Register
SPAD	Scottish Palaeoecological Archive Database
WoSAS	West of Scotland Archaeology Service
WSI	Written Scheme of Investigation
ZTV	Zone of Theoretical Visibility

6 Noise

6.1 Introduction

6.1.1 This chapter considers the likely effects of noise associated with the construction, operation and decommissioning of the proposed development on the surrounding dwellings. The specific objectives of the chapter are to:

- define the existing background noise levels (baseline) and corresponding operational noise limits using the methodology set out within ETSU-R-97, The Assessment and Rating of Noise from Wind Farms (1996) and A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise (GPG, 2013);
- describe the methodology used in completing the assessment;
- describe the potential effects and cumulative effects; and
- discuss any proposed mitigation measures where necessary.

6.1.2 The assessment has been carried out by Mike Craven MIOA, of Hayes McKenzie Partnership Limited (HMPL). Mike is a member of the Institute of Acoustics and has over 12 years' experience in dealing with environmental noise, the majority of which has centred around wind farm developments with work undertaken on over 150 sites for and on behalf of developers, local councils, operators, investors and neighbouring residents. A copy of Mike's CV is included in Technical Appendix 1.2 (EIAR Volume 4).

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

- Figure 6.1: Baseline Noise Measurement Location Map;
- Figure 6.2: North Kyle Noise Contour Plot - 8 m/s Standardised 10 m Height Wind Speed, dB LA90;
- Figure 6.3: Cumulative Noise Contour Plot - 8 m/s Standardised 10 m Height Wind Speed, dB LA90; and
- Technical Appendix 6.1 – Operational Noise Assessment Technical Report.

6.1.4 Technical appendices are referenced in the text where relevant.

6.2 Assessment Methodology and Significance Criteria

Scope of Assessment

6.2.1 This chapter discusses or considers the effects of noise associated with the construction, operation and decommissioning of the proposed development on neighbouring residences in terms of relevant guidance on each matter.

6.2.2 Further to the above, the chapter assesses cumulative effects in terms of noise as arising from the introduction of the proposed development with other relevant developments, which have gained planning consent or are the subject of a valid planning application.

6.2.3 The assessment is based on the proposed development as described in Chapter 2: Development Description (EIAR Volume 2) and assumes the installation of a candidate 4.2 MW[1] turbine with similar dimensions to that described within.

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

- Planning Advice Note PAN1/2011, Planning and Noise, Scottish Government, March 2011;
- Technical Advice Note: Assessment of Noise, Scottish Government, March 2011, Retrieved 25 July 2019 from http://www.gov.scot/Publications/2011/03/02104659/0;
- Onshore Wind Turbines, Scottish Government, (2014). Retrieved 25 July 2019, from http://www.scotland.gov.uk/Resource/0040/00400442.pdf;
- ETSU-R-97, The Assessment and Rating of Noise from Wind Farms, DTI, 1996;
- A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise, Institute of Acoustics, 2013; and
- BS5228:2009 + A1:2014, Code of Practice for Noise and Vibration Control on Construction and Open Sites, British Standards Institution, 2014.

6.2.5 Appendix 6.1: Operational Noise Assessment Technical Report (EIAR Volume 4) provides an overview/summary of the text within each of the above policy/guidance documents that have relevance to noise associated with the operation of wind turbines and construction. Furthermore, relevant issues relating to operational noise including amplitude modulation (AM), low frequency noise (LFN), wind farm audibility and sleep disturbance are also discussed.

Consultation

6.2.6 Table 6.1 summarises the consultation responses received regarding noise and provides information on where and/or how they have been addressed in this assessment.

6.2.7 Full details on the consultation responses can be reviewed in Technical Appendix 1.1: Consultation Register (EIAR Volume 4).

Table 6.1: Consultation Responses

Consultee and Date	Scoping / Other Consultation	Issue Raised	Response / Action Taken
East Ayrshire Council (EAC) Environmental Health Officer, 24th / 25th January 2018	Letter to agree general approach to the operational noise assessment in terms of monitoring locations and potential noise limits.	No objections raised.	None necessary.
ECU & All Relevant Consultees, January 2018	Pre-Scoping Briefing Note.	No objections raised.	None necessary.
ECU (inc. EAC & New Cumnock Community Council (NCCC)), March 2016	Scoping Report	EAC – No specific issues raised, further discussion provided within Scoping Opinion, June 2018.	None necessary.

[1] For the purpose of this application for consent, it is assumed that the 54 turbines would each have a capacity of 4.2 MW giving a total installed capacity of 226.8 MW. It is possible that turbines with a different capacity, giving a different total installed capacity, could be used if they are available at the time at which the proposed development is constructed.

Table 6.1: Consultation Responses			
Consultee and Date	**Scoping / Other Consultation**	**Issue Raised**	**Response / Action Taken**
		NCCC – Suggests 2 km setback distance from turbines to dwellings. Suggests that restoration activity should be considered as part of the cumulative operational noise impact assessment, restoration activities and or noise from other potential planning applications should be considered as part of a cumulative construction noise assessment & suggests that construction noise should not be scoped out of the noise assessment.	Response provided as to limitations and difficulty with their proposed approach i.e. no specific planning requirement for a 2 km setback distance and that the suggestion for the provision of a detailed cumulative assessment of operational and construction noise from the introduction of the proposed development with nearby mining activities and the construction of various other developments will be reviewed. Although, this may be impractical and/or unnecessary in some instances.
EAC, September 2018	Various Correspondence between Ramboll & Consultees.	Revisions to no. and location of noise monitoring locations based on revised turbine layout and scale of site.	No objections/concerns raised.
EAC, NCCC & DGC, Various Dates (see. Stage 1 Gate check Report)	Various Correspondence between Ramboll & Consultees.	Further requests that a cumulative operational noise assessment be undertaken which should take into account noise from existing opencast workings.	Operation of the proposed development is unlikely to coincide with the House of Water coaling and restoration activities as these works are due to be completed by end of 2021. Furthermore, the turbines will be a very different type of noise source and there is certainly no precedent set for this type of approach to be taken. Any potential noise limits associated with restoration activity would also be set on a different basis to that associated with the operation of the turbines. This approach is consistent with that considered for the consented Overhill development, as detailed within the relevant consent documents.

Potential Effects Scoped Out

6.2.8 Construction and decommissioning of the turbines themselves, including forestry felling and on-site construction activities associated with track construction, (see Figure 2.2) will occur at distances that are unlikely to result in noise levels that breach typical construction noise limits prescribed within relevant guidance such as BS 5228 *Code of Practice for Noise and Vibration Control on Construction & Open Sites*. Access tracks to the proposed development are also located at some distance from neighbouring residences and as a result the provision and use of this aspect of the development is not considered to be sensitive in terms of breaching typical limits. Heavy goods vehicles (HGVs) will pass by residences on local roads as a result of the many deliveries of turbine components and materials for the resulting infrastructure. However, these would be relatively infrequent during the course of a typical day, slow moving and will be restricted to normal working hours (as described within EIAR Volume 4: Technical Appendix 2.1: CEMP), although it is noted that there may be fluctuations in the number of movements during the construction phase, with the largest number of movements predicted in months 22-24. These issues combined with the temporary nature of the works means that a detailed assessment of the construction and decommissioning noise impacts has been scoped out and is not considered necessary here. However, standard generic noise mitigation would be employed to minimise any potential construction noise and via the CEMP as or if necessary.

6.2.9 EAC and NCCC have requested that the combined operational impact of the proposed turbines with existing mining and/or restoration activities and operations should be considered and evaluated within the EIAR (see Table 6.1). However, mining and subsequent restoration activities at House of Water are due to be completed by the start of 2021 at which point it is not a realistic assumption to assume that the proposed development would be operational. As a result, this has not been considered further here.

6.2.10 It should be noted that in relation to the proposed Over Hill Wind Farm ACCON reviewed the noise assessment chapter for East Ayrshire Council and confirmed that '*Operational wind farm noise from the Proposed Development and open cast mining activities have not been considered cumulatively due to the significant differences in noise characteristics of these activities. […] ACCON confirm that this approach is appropriate, as we agree that the two types of noise are very different in character*".

6.2.11 In terms of the potential for the construction of the proposed development to coincide with nearby mining operations and/or restoration activities, it is considered that this is also unlikely to occur. Nevertheless, typical daytime construction noise limits at sensitive dwellings are around 10 dB higher than those typically prescribed for mining operations. As a result, the combined impact shows that for both, when assuming that the proposed development and the existing mining and/or restoration activities would be at their limits (a very conservative approach), the additional impact from the mining operations would have an insignificant overall effect over that already typically allowable under construction noise guidance in terms of noise.

Method of Baseline Characterisation

Extent of the Study Area

6.2.12 The study area focuses on dwellings located in proximity to the proposed development and with due regard to cumulative noise impacts associated with other proposed, consented and operational wind farm developments in the area. As a result, this broadly extends to dwellings that surround the proposed development in any given direction.

6.2.13 The results of the desk study described below informed the extent of the study area.

Desk Study

6.2.14 Initial predictions of the operational noise levels associated with the operation of the proposed development were undertaken based on a preliminary turbine layout provided by Ramboll and based on a candidate turbine that corresponds with the proposed dimensions and intended capacity for the site.

6.2.15 Addresses and co-ordinates of many dwellings surrounding the proposed development were provided by Ramboll and reviewed, along with Ordnance Survey (OS) mapping, in order to determine the dwellings/receptors most relevant to the assessment summarised here.

6.2.16 Information submitted in support of the various other consented, planned and operational wind turbine developments in the area was also reviewed in order to obtain relevant assumptions, turbine co-ordinates and the locations of relevant dwellings for the purposes of determining the scale of the cumulative impacts associated with the proposed development with the other schemes nearby. This also informed the extent of the cumulative impact assessment in terms of the relevant dwellings/receptors and the specific wind farm sites that are required to be considered as part of this assessment.

6.2.17 The initial review of all the relevant information indicated that up to 15 dwellings would be required to have background noise monitoring undertaken as part of the requirements of ETSU-R-97. However, this was reduced to 7 locations following revisions to the initial site layout and application area.

Field Survey

6.2.18 An initial background noise survey was undertaken at 13 locations in February/March 2018, but was significantly affected by heavy snowfall and icy conditions, resulting in unrepresentative data. A further survey was carried out in September 2018 at 7 locations; a reduced number due to revisions in the site layout and application area (Figure 6.1). The purpose of the baseline measurements was to characterise the existing baseline noise conditions and to enable noise limits to be derived in accordance with ETSU-R-97, *The Assessment and Rating of Noise from Wind Farms*. The 7 noise monitoring locations are detailed at Table 6.2 below.

Table 6.2: Baseline Noise Measurement Locations		
Location Name	**Easting**	**Northing**
Meiklehill	253476	608917
Lanehead	255774	610922
The Craig House	253911	610445
Clawfin	250618	607438
Skares	252968	617365
Netherton	251626	616795
Upper Beoch*	252229	610064

* It should be noted that the equipment was located on land adjacent to the property as it was not possible to obtain permission to measure within the property curtilage itself.

Criteria for the Assessment of Effects

Operational Noise

PLANNING ADVICE NOTE PAN1/2011, PLANNING AND NOISE

6.2.19 PAN1/2011 identifies two sources of noise from wind turbines; mechanical noise and aerodynamic noise. It states that "*good acoustical design and siting of turbines is essential to minimise the potential to generate noise*". It refers to the 'web based planning advice' on renewables technologies for onshore wind turbines.

SCOTTISH GOVERNMENT 2014, WEB BASED PLANNING ADVICE, ONSHORE WIND TURBINES

6.2.20 The Web Based Planning Advice (The Scottish Government, 2014) on onshore wind turbines re-iterates the sources of noise as "*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" and that "there has been significant reduction in the mechanical noise generated by wind turbines through improved turbine design*". It states that "*the Report, "The Assessment and Rating of Noise from Wind Farms" (Final Report, Sept 1996, DTI), (ETSU-R-97), 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*". It notes that "*this gives indicative noise levels thought to offer a reasonable degree of protection to wind farm neighbours, without placing unreasonable burdens on wind farm developers, and suggests appropriate noise conditions*".

6.2.21 It introduces the Institute of Acoustics (IOA) document, *A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise*, and states that "*The Scottish Government accepts that the guide represents current industry good practice*".

6.2.22 The accompanying Technical Advice Note to PAN1/2011, *Assessment of Noise*, lists BS 5228, *Noise and Vibration Control on Construction and Open Sites* as being applicable for Environmental Impact Assessment (EIA) and planning purposes.

THE ASSESSMENT AND RATING OF NOISE FROM WIND FARMS: ETSU-R-97

6.2.23 ETSU-R-97, The Assessment and Rating of Noise from Wind Farms, presents the recommendations of the Working Group on Noise from Wind Turbines, set up in 1993 by the Department of Trade and Industry (DTI) as a result of difficulties experienced in applying the noise guidelines existing at the time to wind farm noise assessments. The group comprised independent experts on wind turbine noise, wind farm developers, DTI personnel and local authority Environmental Health Officers. In September 1996, the Working Group published its findings by way of report ETSU-R-97. This document describes a framework for the measurement of wind farm noise and contains suggested noise limits, which were derived with reference to existing standards and guidance relating to noise emission from various sources.

6.2.24 ETSU-R-97 recommends that, although noise limits should be set relative to existing background and should reflect the variation of both turbine and background noise with wind speed, this can imply very low noise limits in particularly quiet areas, in which case, "*it is not necessary to use a margin above background in such low-noise environments. This would be unduly restrictive on developments which are recognised as having wider global benefits. Such low limits are, in any event, not necessary in order to offer a reasonable degree of protection to the wind farm neighbour.*"

6.2.25 For daytime periods (07:00 to 23:00), the noise limit is 35-40 dB L_{A90} or 5 dB(A) above the 'quiet day-time hours' prevailing background noise, whichever is the greater. The actual value within the 35-40 dB(A) range depends on the number of dwellings in the vicinity; the impact of the limit on the number of kWh generated; and the duration of the level of exposure. 'Quiet daytime hours' are defined as evenings from 18:00 to 23:00 plus Saturday afternoons from 13:00 to 18:00 and Sundays from 07:00 to 18:00.

6.2.26 For night-time periods (23:00 to 07:00) the noise limit is 43 dB L_{A90} or 5 dB(A) above the prevailing night-time hours background noise, whichever is the greater. The 43 dB(A) lower limit is based on an internal sleep disturbance criterion of 35 dB(A) with an allowance of 10 dB(A) for attenuation through an open window and 2 dB(A) subtracted to account for the use of L_{A90} rather than L_{Aeq}.

6.2.27 Where predicted noise levels are low at the nearest residential properties a simplified noise limit can be applied, such that noise is restricted to the minimum ETSU-R-97 level of 35 dB L_{A90} for wind speeds up to 10 m/s at 10 m height. This removes the need for extensive background noise measurements for smaller or more remote schemes.

6.2.28 It is stated that the $_{LA90,10min}$ noise descriptor should be adopted for both background and wind farm noise levels and that, for the wind farm noise, this is likely to be between 1.5 and 2.5 dB less than the L_{Aeq} measured over the same period. The $_{LAeq,t}$ is the equivalent continuous 'A' weighted sound pressure level occurring over the measurement period 't'. It is often used as a description of the average ambient noise level. Use of the L_{A90} descriptor for wind farm noise allows reliable measurements to be made without corruption from relatively loud, transitory noise events from other sources.

6.2.29 ETSU-R-97 also specifies that a penalty should be added to the predicted noise levels, where any tonal component is present. The level of this penalty is described and is related to the level by which any tonal components exceed the threshold of audibility.

6.2.30 With regard to multiple wind farms in a given area, ETSU-R-97 specifies that the absolute noise limits and margins above background should relate to the cumulative impact of all wind turbines in the area contributing to the noise received at the properties in question. Existing wind farms should therefore be included in cumulative predictions of noise level for proposed wind turbines and not considered as part of the prevailing background noise.

A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise

6.2.31 In May 2013, the IOA published *A Good Practice Guide to the Application of ETSU-R-97* for the Assessment and Rating of Wind Turbine Noise, as referred to in the Web Based Planning Advice. This was subsequently endorsed by the Secretary of State for Energy and Climate Change and by the Scottish Ministers. The publication of the Good Practice Guide (GPG) followed a review of current practice carried out for the Department of Energy and Climate Change (DECC) and an IOA discussion document which preceded the GPG.

6.2.32 The GPG includes sections on Context; Background Data Collection; Data Analysis and Noise Limit Derivation; Noise Predictions; Cumulative Issues; Reporting; and Other Matters including Planning Conditions, Amplitude Modulation, Post Completion Measurements and Supplementary Guidance Notes. The Context section states that the guide "*presents current good practice in the application of the ETSU-R-97 assessment methodology for all wind turbine development above 50 kW, reflecting the original principles within ETSU-R-97, and the results of research carried out and experience gained since ETSU-R-97 was published*". It adds that "*the noise limits in ETSU-R-97 have not been examined as these are a matter for Government*".

6.2.33 As well as expanding on and, in some areas, clarifying issues which are already referred to in ETSU-R-97, additional guidance is provided on noise prediction and a preferred methodology for dealing with wind shear. The guidance within the GPG has been considered and followed for this assessment.

Cumulative Noise

6.2.34 Section 5.1 of the GPG deals with cumulative noise, and re-iterates the position set out in ETSU-R-97 that "*absolute noise limits and margins above background should relate to the cumulative effect of all wind turbines in the area which contribute to the noise received at the properties in question*".

6.2.35 The GPG defines when a cumulative noise assessment is necessary and states that, "*if the proposed wind farm produces noise levels within 10 dB of any existing wind farm/s at the same receptor location, then a cumulative noise impact assessment is necessary*". This is because if the predicted noise is more than 10 dB below that already existing (or the applicable noise limit) its contribution to the overall noise level is negligible.

Construction Noise

6.2.36 The Scottish Government's Technical Advice Note, *Assessment of Noise*, states that, for planning purposes, construction noise should be assessed according to BS 5228, *Noise and Vibration Control on Construction and Open Sites*. The standard provides example criteria for the assessment of the significance of construction noise effects and a method for the prediction of noise levels from construction activities. Two example methods are provided for assessing significance.

6.2.37 The first is based on the use of criteria defined in Department of the Environment Advisory Leaflet (AL) 72, Noise Control on Building Sites which sets a fixed limit of 70 dB(A) in rural suburban and urban areas away from main roads and traffic. Noise levels are generally taken as façade L_{Aeq} values with free-field levels taken to be 3 dB lower, giving an equivalent noise criterion of 67 dB L_{Aeq}.

6.2.38 The second is based on noise change, with a 5 dB increase in overall noise considered to be significant. However, when existing noise levels are low, such as at this site, and construction activities continue for more than one month, minimum criteria are applicable. These are 45, 55 and 65 dB L_{Aeq}, for night-time (2300-0700), evening and weekends, and daytime (0700-1900) including Saturdays (0700-1300) respectively.

Criteria for Assessing the Sensitivity of Receptors

6.2.39 The noise assessment considers the nearest inhabited or inhabitable residential properties, and the sensitivity of each receptor is treated in the same way. If a resident has a direct financial involvement with the development then higher noise limits apply as the receptor may be considered to be less sensitive, however for the proposed development no financial involvement has been assumed at any property.

Criteria for Assessing the Magnitude of Change

6.2.40 For operational noise, the derived noise limits for each receptor location take into account the existing baseline noise conditions and are limited to the daytime or night time lower limiting values, or plus 5 dB above the background noise level. In this way the magnitude of change is limited relative to baseline noise conditions.

6.2.41 Construction noise is assessed against a fixed absolute daytime noise limit of 65 dB L_{Aeq}, and is not set relative to existing baseline noise levels.

Criteria for Assessing Cumulative Effects

6.2.42 As discussed at paragraph 6.2.34 and 6.2.35, the derived operational noise limits apply to noise from all wind farms in the area, such that cumulative effects are considered to be not significant if cumulative predicted noise levels are below the relevant noise limits.

Criteria for Assessing Significance

6.2.43 There are no formal significance criteria for assessing noise from wind farms, but the operational noise impact has been assessed against the ETSU-R-97 noise limits, with the noise impact being considered to be **not significant** if the limits are met.

6.2.44 Construction noise of over one month duration is assessed against the adopted criterion of 65 dB L_{A90} and the impact is therefore judged to be **not significant** if this criterion is met.

Limitations and Assumptions

6.2.45 In order to provide a full representation of the expected impacts the derived noise limits have been also been applied to dwellings where monitoring was not undertaken. This is based on their proximity to a location where monitoring was undertaken, the likelihood of the dwellings experiencing similar background noise levels and/or on a basis that is considered conservative (i.e. the dwelling location is likely to have higher background noise levels, and hence limits, than assumed). Table 6. summarises the assumptions made in this regard, with full details provided in Technical Appendix 6.1: Operational Noise Assessment Technical Report (EIAR Volume 4).

Table 6.3: Summary of Sensitive Receptor Locations and Proxy Monitoring Position

Location Name	Easting	Northing	Baseline Monitoring Position Used As Proxy
Knockenlee	253625	609155	Meiklehill
Lanehead	255740	610883	Lanehead
The Craig House	254942	610430	Clawfin
Clawfin	250605	607352	Clawfin
Auchlin Farm	249709	616998	Clawfin
Corbie Lodge	255918	617027	Clawfin
Skares	252968	617388	Skares
Knockdunder	253385	616032	Netherton
Whitehill	257040	611493	Clawfin
Drumbowie	246600	615347	Clawfin
Ravenscroft	246001	614184	Clawfin
Rankinston	246132	613118	Clawfin
Polquhairn	247442	616261	Clawfin
Upper Beoch	252139	610273	Upper Beoch
The Muir	252207	616736	Netherton
Muirdyke	256144	616642	Clawfin
Maneight	254247	609642	Clawfin
Meiklehill	253469	608915	Meiklehill

Table 6.3: Summary of Sensitive Receptor Locations and Proxy Monitoring Position			
Location Name	**Easting**	**Northing**	**Baseline Monitoring Position Used As Proxy**
Nith Lodge	253605	609297	Clawfin

6.3 Baseline Conditions

Current Baseline

6.3.1 The current baseline noise conditions were characterised through noise measurements at the 7 locations described at Table 6.2 and their locations are presented on Figure 6.1. A full description of the baseline noise measurements is detailed in the Technical Appendix: 6.1: Operational Noise Assessment Technical Report (EIAR Volume 4). It should be noted that the equipment installed at The Craig House malfunctioned, resulting in only 1 day of data being available, and although the data from this location was disregarded it was considered appropriate (based on the result of the February/March 2018 measurements) to use the data from Clawfin as being representative of this location.

6.3.2 Measurements were undertaken with sound levels meters and wind shields that complied with the requirements of the GPG. Measurements were correlated with hub height wind speeds derived from on-site wind speed measurements and standardised[2] to height of 10 m, and periods of rainfall measured at Upper Beoch and Skares were excluded from the analysis.

6.3.3 The measured baseline noise levels correlated with standardised 10 m height wind speeds were plotted for the quiet daytime (1800 to 2300 hours daily, plus Saturday from 1300-2300, and Sunday from 0700-1800) and night hours (2300 to 0700 hours) as required by ETSU-R-97 to derive the prevailing baseline noise levels. The derived prevailing baseline noise levels are shown at Table 6. and Table 6. below for the quiet daytime and night periods respectively.

Table 6.4: Quiet Day-time Baseline Noise Measurement Results (dB L_{A90})										
Location Name	**Standardised 10 m Height Wind Speed (m/s)**									
	3	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Meiklehill	27	27	29	31	35	39	42	46	49	50
Lanehead	28	29	32	34	36	39	41	44	46	49
Clawfin	22	23	26	29	32	35	38	41	43	44
Skares	26	27	29	32	35	39	43	46	49	50
Netherton	29	30	33	37	41	45	49	52	54	54
Upper Beoch	23	23	26	29	34	39	43	47	50	51

Table 6.5: Night-time Baseline Noise Measurement Results (dB L_{A90})										
Location Name	**Standardised 10 m Height Wind Speed (m/s)**									
	3	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Meiklehill	29	29	30	31	34	37	40	43	46	48
Lanehead	29	30	30	32	33	35	38	41	45	50
Clawfin	20	21	23	25	29	32	35	37	38	37
Skares	23	25	27	30	32	35	37	39	40	39

2 Hub height wind speed corrected to 10 m height using the log law and assuming a ground roughness length of 0.05 m.

Netherton	28	29	32	35	38	41	43	44	44	42
Upper Beoch	23	23	24	27	31	35	40	44	48	50

Future Baseline

6.3.4 It is expected that future baseline noise levels in the absence of the proposed development would remain broadly similar to those measured in 2018. At lower wind speeds baseline noise levels are dependent on human and animal activities which vary with time of day and time of year, and changes could occur if e.g. levels of road traffic change. At higher wind speeds local wind induced noise tends to dominate the local noise environment and these levels of local noise are likely to remain similar.

Summary of Sensitive Receptors

6.3.5 The noise assessment considers the nearest residential properties in the vicinity of the proposed development. The properties and their locations are described in Table 6. above.

6.4 Assessment of Likely Effects

6.4.1 Potential noise effects from the construction, operation, and decommissioning phases of the proposed development have been considered in turn below.

Potential Construction Effects

6.4.2 Detailed construction predictions have not been undertaken due to the large separation distances between construction activities and residential properties.

6.4.3 Noise from on-site construction activities are likely to be significantly below the 65 dB L_{Aeq} criterion, and it can therefore be concluded that noise impact from on-site construction, including felling, activities will be **not significant**.

6.4.4 An additional construction noise impact would be blasting associated with the proposed stone extraction areas in order to obtain materials for the construction of turbine bases and the onsite access road. Blasting could occur up to 2-3 times a week for the first six months of construction, before tapering off and becoming less frequent. This type of noise does not typically fall within the assessment of normal construction noise because of the extremely high amplitude and impulsive nature of the waveform. It is very likely that blasting noise could be heard at nearby residential locations, but a construction noise assessment would average noise levels across the day and is therefore not applicable to use for the assessment of blasting noise impacts. Mitigation to reduce the noise impact from blasting activities is set out in section 6.5, and with the mitigation implemented, noise from blasting activities is considered to be **not significant**.

6.4.5 Where highways upgrades and cabling between the site and grid connection is carried out close to residential properties, there may be temporary short term noise impacts, with the level of impact dependant on the specific work required. It is likely, however, that noisy activities near residential properties will generally continue for a duration of less than one month, and therefore this short-term noise impact can be considered to be **not significant**.

Potential Operational Effects

6.4.6 Operational noise predictions have been carried out in line with the GPG using International Standard ISO 9613, *Acoustics - Attenuation of Sound during Propagation Outdoors*. The propagation model described in Part 2 of this standard provides for the prediction of sound pressure levels based on either short-term downwind (i.e. worst case) conditions or long-term overall averages. When the wind is blowing in the opposite direction, noise levels may be significantly lower, especially if there is any shielding between the site and the houses. Only the 'worst case' downwind short-term predictions are carried out here, such that the long-term average predicted noise levels would be lower. The prediction methodology is described in full in Technical Appendix 6.1: Operational Noise Assessment Technical Report (EIAR Volume 4).

6.4.7 As discussed at paragraph 6.2.34, the noise limits apply to cumulative wind farm noise from all turbines that have a relevant contribution to operational noise at sensitive receptors near to the proposed development. There are not expected to be relevant issues at locations located further from the proposed development. Operational noise predictions have therefore been carried out for all wind farms that are consented or in planning in the vicinity where predicted noise levels may be within 10 dB of the derived noise limits at any sensitive receptor assessed. In this respect, Hare Hill and Pencloe wind farms were considered, but predicted noise levels were more than 10 dB below the relevant limits and therefore their contribution was negligible.

6.4.8 The following wind farms have been included in the operational noise assessment.

- The proposed development: North Kyle;
- Polquhairn;
- South Kyle;
- Enoch Hill; and
- Over Hill.

6.4.9 The source sound power levels and octave band spectra for each wind farm are described in Technical Appendix 6.1: Operational Noise Assessment Technical Report (EIAR Volume 4). The results of the operational noise predictions for the proposed development are shown at Table 6. below (Figure 6.2), with the cumulative predicted noise levels presented at Table 6. (Figure 6.3).

Table 6.6: North Kyle Predicted Noise Levels (dB L_{A90})

Location Name	Standardised 10 m Height Wind Speed (m/s)								
	4	5	6	7	8	9	10	11	12
Knockenlee	24	29	33	34	34	34	34	34	34
Lanehead	26	31	35	35	35	35	35	35	35
The Craig House	27	32	36	36	36	36	36	36	36
Clawfin	23	28	32	32	32	32	32	32	32
Auchlin Farm	21	26	30	30	30	30	30	30	30
Corbie Lodge	18	23	28	28	28	28	28	28	28
Skares	21	26	30	30	30	30	30	30	30
Knockdunder	25	30	34	34	34	34	34	34	34
Whitehill	22	27	31	31	31	31	31	31	31
Drumbowie	19	24	28	28	28	28	28	28	28
Ravenscroft	19	24	29	29	29	29	29	29	29
Rankinston	21	26	30	30	30	30	30	30	30
Polquhairn	19	24	28	28	28	28	28	28	28
Upper Beoch	29	34	38	38	38	38	38	38	38

Table 6.6: North Kyle Predicted Noise Levels (dB L_{A90})

Location Name	Standardised 10 m Height Wind Speed (m/s)								
	4	5	6	7	8	9	10	11	12
The Muir	23	28	32	33	33	33	33	33	33
Muirdyke	19	24	28	28	28	28	28	28	28
Maneight	25	30	34	35	35	35	35	35	35
Meiklehill	24	29	33	33	33	33	33	33	33
Nith Lodge	25	30	34	34	34	34	34	34	34

Table 6.7: Cumulative Predicted Noise Levels (dB L_{A90})

Location Name	Standardised 10 m Height Wind Speed (m/s)								
	4	5	6	7	8	9	10	11	12
Knockenlee	29	33	37	38	38	38	38	38	38
Lanehead	29	33	37	38	38	38	38	38	38
The Craig House	30	34	38	39	39	39	39	39	39
Clawfin	26	31	34	35	35	35	35	35	35
Auchlin Farm	26	29	33	33	33	33	33	33	33
Corbie Lodge	21	26	29	30	30	30	30	30	30
Skares	24	28	32	32	32	32	32	32	32
Knockdunder	27	31	35	35	36	36	36	36	36
Whitehill	26	30	34	35	35	35	35	35	35
Drumbowie	32	34	37	37	38	38	38	38	38
Ravenscroft	31	34	36	37	37	38	38	38	38
Rankinston	29	32	35	35	36	36	36	36	36
Polquhairn	29	32	35	35	36	36	36	36	36
Upper Beoch	32	36	40	40	40	40	40	40	40
The Muir	26	30	34	34	34	34	34	34	34
Muirdyke	22	26	30	30	30	30	30	30	30
Maneight	30	34	38	39	39	39	39	39	39
Meiklehill	29	33	37	38	38	38	38	38	38
Nith Lodge	29	33	37	38	38	38	38	38	38

6.4.10 Predicted cumulative operational noise levels have been compared with the daytime and night noise limits derived from baseline noise measurements according to ETSU-R-97. As discussed at paragraph 6.2.25 the choice of lower limiting daytime noise assessment value is dependent on a number of factors that are discussed in detail in Technical Appendix 6.1: Operational Noise Assessment Technical Report (EIAR Volume 4). The daytime noise limits have been calculated on the basis of applying the lower daytime noise limits except at The Craig House, Upper Beoch, Maneight, Knockenlee, Drumbowie, Ravenscroft, Meiklehill, and Nith Lodge, where the upper daytime limit has been applied.

6.4.11 The results of the cumulative noise assessment are presented at Table 6. and Table 6.9 below, for the daytime and night respectively. The tables show the margin between the cumulative predicted noise levels and the derived noise limits.

Table 6.8: Margin Between Cumulative Operational Noise Levels and Derived Daytime Noise Limits (dB L_{A90})

Location Name	Standardised 10 m Height Wind Speed (m/s)								
	4	5	6	7	8	9	10	11	12
Knockenlee	11	7	3	2	5	9	13	15	17
Lanehead	6	3	2	3	6	8	11	13	16
The Craig House	10	6	2	1	1	4	7	9	10
Clawfin	9	4	1	2	5	8	11	13	14
Auchlin Farm	9	6	3	4	7	10	12	14	15
Corbie Lodge	14	9	6	7	10	13	16	18	19
Skares	12	7	5	9	12	16	19	22	23
Knockdunder	8	7	6	11	15	19	22	24	23
Whitehill	9	5	1	2	5	8	11	13	14
Drumbowie	8	6	3	3	2	5	7	9	11
Ravenscroft	9	6	4	3	3	6	8	10	11
Rankinston	6	3	0	1	4	7	10	12	13
Polquhairn	6	3	0	2	4	7	9	11	13
Upper Beoch	8	4	0	0	4	8	12	15	16
The Muir	9	8	8	12	16	20	23	25	25
Muirdyke	13	9	5	7	10	13	15	17	19
Maneight	10	6	2	2	1	4	7	9	10
Meiklehill	11	7	3	2	5	9	13	15	17
Nith Lodge	11	7	3	2	2	5	7	9	11

Table 6.9: Margin Between Cumulative Operational Noise Levels and Derived Night-time Noise Limits (dB L_{A90})

Location Name	Standardised 10 m Height Wind Speed (m/s)								
	4	5	6	7	8	9	10	11	12
Knockenlee	14	10	6	5	5	7	10	13	15
Lanehead	14	10	6	5	5	5	8	12	18
The Craig House	13	9	5	4	4	4	4	4	4
Clawfin	17	12	9	8	8	8	8	8	8
Auchlin Farm	17	14	11	10	10	10	10	10	10
Corbie Lodge	22	17	14	13	13	13	13	13	13
Skares	20	15	12	11	11	11	12	13	13
Knockdunder	16	12	8	8	10	13	14	14	14
Whitehill	17	13	9	8	8	8	8	8	8
Drumbowie	11	9	6	6	5	5	5	5	5

Table 6.9: Margin Between Cumulative Operational Noise Levels and Derived Night-time Noise Limits (dB L_{A90})									
Location Name	**Standardised 10 m Height Wind Speed (m/s)**								
	4	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Ravenscroft	12	9	7	6	6	6	5	5	5
Rankinston	14	11	8	8	7	7	7	7	7
Polquhairn	14	11	8	8	7	7	7	7	7
Upper Beoch	11	7	3	3	3	5	9	13	15
The Muir	17	13	9	9	12	14	15	15	15
Muirdyke	21	17	13	13	13	13	13	13	13
Maneight	13	9	5	5	4	4	4	4	4
Meiklehill	14	10	6	5	5	7	10	13	15
Nith Lodge	14	10	6	5	5	5	5	5	5

6.4.12 The results of the cumulative operational noise predictions show that the predicted noise levels meet the relevant noise limits at all noise sensitive receptors in the vicinity of the proposed development, and therefore operational noise from the proposed development (in conjunction with other consented or proposed wind farms) is **not significant**.

Potential Decommissioning Effects

6.4.13 Noise from decommissioning effects are likely to be similar in level to that associated with the construction of the proposed development, and noise from such activities will be significantly below the adopted construction noise limit and therefore considered to be **not significant**. It should be noted, however, that different construction noise policy guidance may be in use at the time of decommissioning, and, in which case, it will be ensured that decommissioning activities meet the relevant noise guidance applicable at the time.

Potential Cumulative Construction Effects

6.4.14 Construction noise effects are likely to be significantly below the adopted construction noise limit such that if any concurrent construction actives occur that are audible at nearby sensitive receptors construction noise from the proposed development would be **not significant**. It is expected that noise from construction activities would be at least 10 dB below the adopted noise limit such that if any there was any exceedance of the construction noise limit (which is extremely unlikely) it would not be caused by the proposed development.

Potential Cumulative Operational Effects

6.4.15 Predicted cumulative operational effects have been considered within the assessment of operational effects section above as the derived noise limits apply to operational noise from all wind farms in the area. Predicted cumulative noise levels meet the relevant noise limits, and therefore cumulative operational effects are **not significant**.

6.5 Mitigation

Mitigation during Construction

6.5.1 Noise during construction works would be controlled by generally restricting works to standard working hours and exclude Sundays, unless specifically agreed otherwise.

6.5.2 BS 5228 states that the 'attitude of the contractor' is important in minimising the likelihood of complaints and therefore consultation with the local authorities would be required along with providing information to residents on intended activities.

6.5.3 The construction and decommissioning works on-site 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 PAN1/2011 and BS 5228: 2009; and
- Section 61 of the Control of Pollution Act 1974 and Section 80 of the Environmental Protection Act.

6.5.4 Where construction activities relating to highways improvements or cabling for the grid connection are within 200 m of a residential property, contractors would be required to assess noise impacts during the construction phase and a noise control plan would be produced that includes:

- procedures for ensuring compliance with statutory or other identified noise control limits;
- procedures for minimising noise from construction related traffic on the existing road network;
- procedures for ensuring that all works are carried out in accordance with the principle of "Best Practicable Means" as defined in the Control of Pollution Act 1974; and
- general induction training for site operatives, and specific training for staff having responsibility for particular aspects of controlling noise from the site.

6.5.5 With regards to blasting in stone extraction areas, the most appropriate way to address blasting noise is for a pre-blasting noise management programme to be prepared which would identify the most sensitive receptors that could be potentially affected by blasting noise. The programme would contain details of the proposed frequency of blasting, and proposed monitoring procedures. The operator would inform the nearest residents of the proposed times of blasting and of any deviation from this programme in advance of the operations. The programme would also contain contact details which would be provided to local residents should concerns arise regarding construction and blasting activities. In addition, each blast will be designed carefully to maximise its efficiency and to reduce the transmission of noise.

Mitigation during Operation

6.5.6 The relevant noise limits are met at all noise sensitive receptors without the requirement for any specific mitigation measures, and therefore no specific mitigation is proposed. It should be noted that noise-reduced modes of operation are generally available for wind turbines of the scale proposed here that allow noise levels to be reduced by restricting the rotational speed of the machines. This mitigation could be employed if any noise issues arise that would require mitigation to be implemented.

Mitigation during Decommissioning

6.5.7 Noise during decommissioning will be controlled through the relevant standards and best practice available at the time. Noise generation during decommissioning is likely to be similar to during construction and similar measures proposed for noise mitigation, essentially management controls to ensure excessive noise is not generated, would be employed.

6.6 Assessment of Residual Effects

Residual Construction Effects

6.6.1 No significant residual construction effects are predicted as construction noise levels will be below the adopted noise limit, although it is possible that noise from construction activities could be audible at receptor locations at times.

Residual Operational Effects

6.6.2 No significant residual operational effects are predicted as cumulative predicted operational noise levels meet the relevant derived noise limits, although it is likely that noise from the operational wind turbines would be audible at receptor locations at times.

6.6.3 Operational noise would, in practice, be controlled through noise limits set via the planning conditions for the site. Noise limits have been derived for the proposed development operating on its own that take into account the derived noise limits that apply to all North Kyle wind farm noise, along with noise from other consented wind farms and wind farms in planning. The limits for North Kyle have been calculated by logarithmically subtracting the predicted operational noise levels from all wind farms in the area (excluding North Kyle) from the derived cumulative noise limits. The resultant noise limits applicable to North Kyle are shown below for the daytime and night respectively.

Table 6.10: Derived Daytime Noise Limits Applicable to North Kyle Only (dB L_{A90})

Location Name	Standardised 10 m Height Wind Speed (m/s)								
	4	5	6	7	8	9	10	11	12
Knockenlee	38	38	38	38	43	47	51	54	55
Lanehead	34	36	38	40	43	46	49	51	54
The Craig House	38	38	38	38	38	42	45	47	49
Clawfin	33	33	33	35	39	43	45	48	49
Auchlin Farm	34	34	34	36	40	43	46	48	49
Corbie Lodge	35	35	35	36	40	43	46	48	49
Skares	35	35	37	40	44	48	51	54	55
Knockdunder	35	38	41	46	50	54	57	59	59
Whitehill	33	33	33	35	39	43	45	48	49
Drumbowie	37	37	37	37	37	42	45	47	48
Ravenscroft	38	38	38	38	38	42	45	47	48
Rankinston	31	31	31	34	39	42	45	47	49
Polquhairn	30	30	30	33	38	42	45	47	49
Upper Beoch	38	38	38	38	43	48	52	55	56
The Muir	35	38	41	46	50	54	57	59	59
Muirdyke	35	35	35	36	40	43	46	48	49
Maneight	37	37	37	37	37	42	45	47	49
Meiklehill	37	37	37	37	43	47	51	54	55
Nith Lodge	38	38	38	38	38	42	45	47	49

Table 6.3: Derived Night-time Noise Limits Applicable to North Kyle Only (dB L_{A90})									
Location Name	**Standardised 10 m Height Wind Speed (m/s)**								
	4	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Knockenlee	42	42	42	42	42	44	48	51	53
Lanehead	42	42	42	42	42	42	46	50	55
The Craig House	42	42	42	42	42	42	42	42	42
Clawfin	43	43	43	43	43	43	43	43	43
Auchlin Farm	43	43	43	43	43	43	43	43	43
Corbie Lodge	43	43	43	43	43	43	43	43	43
Skares	43	43	43	43	43	43	44	45	45
Knockdunder	43	43	43	43	46	48	49	49	49
Whitehill	43	43	43	43	43	43	43	43	43
Drumbowie	41	41	41	41	41	41	41	41	41
Ravenscroft	42	42	42	42	42	42	42	42	42
Rankinston	42	42	42	42	42	42	42	42	42
Polquhairn	42	42	42	42	42	42	42	42	42
Upper Beoch	42	42	42	42	42	44	49	52	55
The Muir	43	43	43	43	46	48	49	49	49
Muirdyke	43	43	43	43	43	43	43	43	43
Maneight	42	42	42	42	42	42	42	42	42
Meiklehill	42	42	42	42	42	44	48	51	53
Nith Lodge	42	42	42	42	42	42	42	42	42

6.6.4 Application of the above noise limits via planning conditions for the site will ensure that cumulative operational noise levels remain within acceptable ETSU-R-97 noise limits, as derived in accordance with the GPG.

Residual Decommissioning Effects

6.6.5 No significant residual decommissioning effects are predicted as decommissioning noise levels will be below the adopted noise limit, although it is possible that noise from construction activities could be audible at receptor locations at times.

Residual Cumulative Construction Effects

6.6.6 No significant residual cumulative construction effects are predicted.

Residual Cumulative Operational Effects

6.6.7 No significant residual cumulative operational effects are predicted as operational noise levels meet the relevant noise limits without any specific mitigation.

6.7 Monitoring

6.7.1 No significant effects are predicted and therefore no requirement for monitoring is indicated.

6.7.2 Operational noise would be controlled through noise limits that are set in the planning conditions attached to the planning permission. It is usual for there to be provision within the planning conditions to require compliance measurements to be undertaken for operational noise if the Local Planning Authority reasonably consider that there may be a breach of the noise limits in practice, however it is not usual for monitoring of operational noise to be required by planning condition as a matter of course.

6.8 Summary

6.8.1 This noise assessment was carried out to evaluate the potential impact of noise associated with the construction, operation and decommissioning of the proposed development on the surrounding dwellings.

6.8.2 Baseline noise measurements were undertaken at 7 locations near to the proposed development to characterise the baseline noise environment and to inform the noise limits applicable to operational and construction noise.

6.8.3 Operational noise was assessed according to the methodology set out within ETSU-R-97, *The Assessment and Rating of Noise from Wind Farms* (1996) and the Institute of Acoustic document, *A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise*. The results of the operational noise assessment, including an assessment of cumulative noise, indicates that operational noise levels meet the relevant noise limits and no specific mitigation is required. The noise impact is, therefore, determined to be not significant.

6.8.4 Noise from construction and decommissioning activities was assessed against the noise limits set out in BS5228:2009+A1:2014, *Code of Practice for Noise and Vibration Control on Construction and Open Sites*. Noise from such activities is likely to be significantly below the relevant noise limits and therefore no specific mitigation is required and the construction noise impact has been determined to be not significant.

6.8.5 Table 6.4 below describes a summary of the noise impact assessment presented in this chapter.

Table 6.4: Summary of Potential Significant Effects of the Proposed Development

Likely Significant Effect	Mitigation Proposed	Means of Implementation	Outcome/Residual Effect
Construction			
Noise from construction activities including track construction, and turbine erection. Construction noise has been assessed against a noise limit of 65 dB L_{Aeq} as described in BS 5228:2009. Noise from construction activities of duration 1 month or longer will be significantly below 65 dB L_{Aeq}.	The construction and decommissioning works on-site 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 PAN1/2011 and BS 5228:2009; Section 61 of the Control of Pollution Act 1974; and Section 80 of the Environmental Protection Act.	Noise from on-site construction activities generally be significantly below the relevant noise limit such that specific mitigation over normal construction practice is not required. For highways improvements or cabling for the grid connection that are within 200 m of a residential property, a noise control plan will be produced and adhered to. Construction noise to be controlled as a condition of consent.	Not significant.
Blasting at on-site stone extraction sites.	Nearby residential receptors will be identified, and a programme of blasting	Preparation and submission of a pre-blasting programme, and liaison with local	Not significant.

Likely Significant Effect	Mitigation Proposed	Means of Implementation	Outcome/Residual Effect
	activities will be scheduled.	residents to be secured as a condition of consent.	
Operation			
Operational noise from the proposed development has been assessed against the noise limits described in ETSU-R-97.	No specific mitigation is required as the relevant noise limits are met without specific mitigation.	Noise limits for the site would normally be implemented via a condition of consent, and to this end a table of suggested noise limits is set out at Table 6.10 and Table 6.3.	Not significant.
Decommissioning			
Noise from decommissioning activities such as removal of turbines and site restoration activities.	The specific mitigation implemented would depend on the regulations that are in force at the time, but levels of such noise are expected to be similar to or lower than that from construction activities.	Noise from on-site decommissioning activities are likely to be significantly below the relevant noise limits such that specific mitigation over normal construction practice is not required.	Not significant.
Cumulative Construction			
Noise from other construction activities occurring simultaneously with the construction of the proposed development.	No specific mitigation is required as noise from construction activities at any residential property would be dominated by the closest/noisiest activity, such that if the noise limits are met for the noisiest activity then cumulative construction noise levels would also be likely to be below the relevant limits.	No specific mitigation is required, although it will be ensured that construction activities from the proposed development meet the relevant noise limit.	Not significant.
Cumulative Operation			
Noise from the proposed development in conjunction with other consented or 'in planning' wind farms in the vicinity.	No specific mitigation is required as cumulative operational noise levels are below the relevant ETSU-R-97 noise limits.	Noise limits for the proposed development would be set via conditions of consent, and these limits (set out at Table 6.10 and Table 6.3) would ensure that cumulative noise levels remain within allowable levels.	Not significant.

6.9 Glossary and Abbreviations

Term	Definition
A-weighting	A frequency weighting designed to correlate measured sound levels with subjective human response. The human ear is frequency selective and our ears are most sensitive between 500 Hz to 6 kHz, particularly when compared with lower and higher frequencies. The A-weighting applies a frequency correction which reduces the effect of these low and high frequencies on the overall measured level in order to account for the subjective human response at these frequencies.
L_{Aeq}	The A-weighted (see above) equivalent energy average noise level over a given time period.
L_{A90}	The A-weighted noise level exceeded for 90% of the time, often used to describe background or wind turbine noise as it excludes transient noises that affect the LAeq.

Abbreviation	Expanded Term
IOA	Institute of Acoustics
GPG	The IOA document, *A Good Practice Guide to the Application of ETST-R-97 for the Assessment and Rating of Noise from Wind Turbines*.
dB	decibel
m	metres
m/s	metres per second
ETSU-R-97	ETSU-R-97, *The Assessment and Rating of Noise from Wind Farms*

6.10 References

- Planning Advice Note PAN1/2011, Planning and Noise, Scottish Government, March 2011.
- Technical Advice Note: Assessment of Noise, Scottish Government, March 2011, Retrieved 25 July 2019 from http://www.gov.scot/Publications/2011/03/02104659/0.
- Onshore Wind Turbines, Scottish Government, (2014). Retrieved 25 July 2019, from http://www.scotland.gov.uk/Resource/0040/00400442.pdf.
- ETSU-R-97, The Assessment and Rating of Noise from Wind Farms, DTI, 1996.
- A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise, Institute of Acoustics, 2013.
- BS5228:2009 + A1:2014, Code of Practice for Noise and Vibration Control on Construction and Open Sites, British Standards Institution, 2014.
- Department of the Environment Advisory Leaflet (AL) 72, Noise Control on Building Sites.
- Turbine Noise Report on DECC Research Contract 01.08.09.01/492A (Analysis), Analysis of How Noise Impacts are Considered in the Determination of Wind Farm Planning Applications, Department of Energy and Climate Change, 2011.

7 Ecology

7.1 Introduction

7.1.1 This chapter considers the likely significant effects on ecology associated with the construction, operation and decommissioning of the proposed development. The specific objectives of the chapter are to:

- describe the ecological 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 related monitoring requirements; and
- assess the residual effects remaining following the implementation of mitigation.

7.1.2 The assessment has been carried out by David MacArthur of MacArthur Green, who holds undergraduate and postgraduate degrees in relevant subjects, has over 20 years' experience in professional ecology, has extensive professional ecological impact assessment knowledge and ecology survey experience, and holds professional membership of the Chartered Institute of Ecology and Environmental Management (CIEEM). A copy of his CV is included in Technical Appendix 1.2 (EIAR Volume 4).

7.1.3 This chapter is supported by the following figures (EIAR Volume 3a), technical appendices and technical appendix figures (EIAR Volume 4):

- Figure 7.1: Ecological Designated Sites within 5 km;
- Figure 7.2: National Vegetation Classification Study Area and Survey Results;
- Figure 7.3: Future Baseline Habitats in Committed Restoration Areas;
- Figure 7.4: Potential Groundwater Dependent Terrestrial Ecosystems (GWDTE) Study Area and Survey Results;
- Figure 7.5: Potential Groundwater Dependent Terrestrial Ecosystems (GWDTE) Assessment Results;
- Figure 7.6: Protected Species Survey Results;
- Figure 7.7: Great Crested Newt Study Area;
- Figure 7.8: Great Crested Newt Habitat Suitability Index (HSI) Assessment Results;
- Figure 7.9: Pond with Presence/Absence Survey and eDNA;
- Figure 7.10: Bat Survey Locations 2017 and 2018;
- Figure 7.11: *Nyctalus* Species Records within 20 km;
- Figure 7.12: Bat Roost Survey Results;
- Figure 7.13: Temporal Bat Survey Results 2017;
- Figure 7.14: Temporal Bat Survey Results 2018;
- Figure 7.15: Electrofishing & Habitat Survey Results;
- Figure 7.16: Proposed HMP (Habitat Management Plan) Areas;
- Technical Appendix 2.8: Peat Depth Survey & Information to Inform an Assessment of Blanket Mire Condition:

  - Figures 2.8.1 to 2.8.18: Phase 1 Peat Survey and Blanket Mire Condition Assessment Results;
- Technical Appendix 2.9: Phase 2 Peat Depth and Coring Survey:
  - Figures 2.9.1 to 2.9.3: Phase 2 Peat Depth and Coring Survey Results;
- Technical Appendix 7.1: National Vegetation Classification & Habitats Survey Report:
  - Figure 7.1.1: Ecological Designated Sites within 5 km;
  - Figure 7.1.2: National Vegetation Classification Study Area and Survey Results;
  - Figure 7.1.3: Future Baseline Habitats in Committed Restoration Areas;
  - Figure 7.1.4: Potential Groundwater Dependent Terrestrial Ecosystems (GWDTE) Study Area and Survey Results;
  - Figure 7.1.5: Groundwater Dependent Terrestrial Ecosystems (GWDTE) Assessment Results
- Technical Appendix 7.2: Protected Species Survey Report:
  - Figure 7.2.1: Protected Species Survey Results;
  - Figure C7.2.2: Protected Species Survey Results CONFIDENTIAL;
  - Figure 7.2.3: Access Constraints for Protected Species Surveys;
- Technical Appendix 7.3: Great Crested Newt Survey Report:
  - Figure 7.3.1: Great Crested Newt Study Area;
  - Figure 7.3.2: Great Crested Newt Habitat Suitability Index (HSI) Assessment Results;
  - Figure 7.3.3: Pond with Presence/Absence Survey and eDNA;
- Technical Appendix 7.4: Bat Survey Report 2017 and 2018:
  - Figure 7.4.1: Bat Survey Locations 2017 & 2018;
  - Figure 7.4.2: Nyctalus Species Records within 20 km;
  - Figure 7.4.3: Bat Roost Survey Results;
  - Figure 7.4.4: Temporal Bat Survey Results 2017;
  - Figure 7.4.5: Overall Risk Assessment 2017 (May to July) - *Nyctalus spp*.;
  - Figure 7.4.6: Overall Risk Assessment 2017 (July to October) - *Nyctalus spp*.;
  - Figure 7.4.7: Overall Risk Assessment 2017 (May to July) - Leisler's;
  - Figure 7.4.8: Overall Risk Assessment 2017 (July to October) - Leisler's;
  - Figure 7.4.9: Overall Risk Assessment 2017 (May to July) – Noctule;
  - Figure 7.4.10: Overall Risk Assessment 2017 (July to October) – Noctule;
  - Figure 7.4.11: Overall Risk Assessment 2017 (May to July) - Soprano pipistrelle;
  - Figure 7.4.12: Overall Risk Assessment 2017 (July to October) - Soprano pipistrelle;
  - Figure 7.4.13: Overall Risk Assessment 2017 (May to July) - Common pipistrelle;
  - Figure 7.4.14: Overall Risk Assessment 2017 (July to October) - Common pipistrelle;
  - Figure 7.4.15: Temporal Bat Survey Results 2018;
  - Figure 7.4.16: Overall Risk Assessment 2018 (May to October) - *Nyctalus spp*.;
  - Figure 7.4.17: Overall Risk Assessment 2018 (May to October) - Leisler's;
  - Figure 7.4.18: Overall Risk Assessment 2018 (May to October) – Noctule;
  - Figure 7.4.19: Overall Risk Assessment 2018 (May to October) - Soprano pipistrelle;
  - Figure 7.4.20: Overall Risk Assessment 2018 (May to October) - Common pipistrelle;

    - Figure 7.4.21: Overall Risk Assessment 2018 (May to October) - Nathusius' pipistrelle;
- Technical Appendix 7.5: Electrofishing & Fish Habitat Survey:
    - Figure 7.5.1: Electrofishing & Fish Habitat Survey Results;
- Technical Appendix 7.6: Species Protection Plan;
- Technical Appendix 7.7: Outline Habitat Management Plan:
    - Figure 7.7.1: Outline Habitat Management Plan; and
- Technical Appendix 7.8: Ecology Consultation Responses.

7.1.4 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); and
- Groundwater Dependent Terrestrial Ecosystems (GWDTE): SEPA has classified a number of National Vegetation Classification (NVC) communities as potentially dependent on groundwater[1]. Many of the NVC communities on the list are 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. For this reason, the GWDTE assessment is separate to the ecological assessment within this chapter and is presented within: EIAR Volume 4: Technical Appendix 7.1, Annex 7.1.2.

[1] SEPA. (2017). Land Use Planning System SEPA Guidance Note 31: Guidance on Assessing the Impacts of Windfarm Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems. Version 3. Issue date: 11/09/2017.

7.2.2 The chapter assesses cumulative effects which are the subject of a valid planning application. Operational, under construction and consented developments are considered as part of the baseline. Developments close to the end of their operational life are included as part of the baseline to present the 'worst case scenario'.

7.2.3 The assessment is based on the proposed development as described in Chapter 2: Development Description (EIAR Volume 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:

- European Union Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora;
- 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"); and
- Environmental Impact Assessment Directive 2014/52/EU.

7.2.6 The following national legislation is considered as part of the assessment:

- The Wildlife and Countryside Act 1981 (as amended);
- The Protection of Badgers Act 1992 (as amended);
- The Conservation (Natural Habitats &c.) Regulations 1994 (as amended) ("The Habitats Regulations");
- The Water Environment and Water Services (Scotland) Act 2003 (as amended) (WEWS);
- The Nature Conservation (Scotland) Act 2004 (as amended);
- The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended);
- The Wildlife and Natural Environment (Scotland) Act 2011;
- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017.

7.2.7 The following planning policy documents that are of particular relevance to this chapter are:

- UK Post-2010 Biodiversity Framework (2012);
- Scottish Biodiversity Strategy: It's in Your Hands (2004)/2020 Challenge for Scotland's Biodiversity (2013);
- Ayrshire Local Biodiversity Action Plan (LBAP); and
- Scottish Government (2017), Planning Advice Note 1/2013-Environmental Impact Assessment, Revision 1.0.

Policy & Guidance

7.2.8 This assessment is carried out in accordance with the principles contained within the following documents:

- CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (3rd Edition);
- Collins, J. (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edition). Bat Conservation Trust;

- European Commission (2011), Wind Energy Developments and Natura 2000;
- Hundt, L. (2012) Bat Surveys: Good Practice Guidelines (2nd edition). Bat Conservation Trust;
- Joint Nature Conservation Committee (2013) Guidelines for selection of biological Sites of Special Scientific Interest (SSSI);
- Natural England (2014) Natural England Technical Information Note TIN 051. Bats and Onshore Wind turbines – Interim Guidance (3rd Edition);
- 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 wind farm projects. Revision 2014. EUROBATS Publication Series No. 6;
- Scottish Executive (2017) Planning Circular 1/2017: Guidance on The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017;
- Scottish Executive (2006) The Scottish Forestry Strategy (SFS);
- Scottish Executive (2000) 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;
- Scottish Government (2017) Planning Advice Note 1/2013 - Environmental Impact Assessment, Revision 1.0;
- Scottish Government (2001) European Protected Species, Development Sites and the Planning Systems: Interim guidance for local authorities on licensing arrangements;
- Scottish Government (2010) Management of Carbon-Rich Soils;
- Scottish Government (2016) Draft Peatland and Energy Policy Statement;
- Scottish Government (2018) Climate Change Plan: Third Report on Policies and Proposals 2018-2032;
- Scottish Environment Protection Agency (SEPA) (2017) Land Use Planning System Guidance Note 4 - Planning guidance on on-shore windfarm developments;
- 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;
- Scottish Government, SNH and SEPA (2017) Peatland Survey - Guidance on Developments on Peatland;
- SNH (2012) Assessing the Cumulative Impact of Onshore Wind Energy Developments;
- SNH (2013) Planning for Development: What to consider and include in Habitat Management Plans;
- SNH (2015) Scotland's National Peatland Plan;
- SNH (2018) Environmental Impact Assessment Handbook – Version 5: Guidance for competent authorities, consultation bodies, and others involved in the Environmental Impact Assessment process in Scotland;
- SNH, Natural England, Natural Resources Wales, RenewableUK, ScottishPower Renewables, Ecotricity Ltd, the University of Exeter & Bat Conservation Trust (BCT) (2019) Bats and Onshore Wind Turbines: Survey Assessment and Mitigation; and

- Scottish Renewables, SNH, SEPA, Forestry Commission (Scotland), Historic Environment Scotland & AEECoW (2019) Good Practice During Windfarm Construction (4th Edition).

Consultation

7.2.9 In undertaking the assessment, consideration has been given to consultation undertaken with relevant organisations. All consultation responses relating to this chapter are outlined in EIAR Volume 4: Technical Appendix 7.8. Table 7.1 below outlines those consultation responses where more detailed consideration was required and provides information on where and/or how they have been addressed in the assessment.

7.2.10 Full details on the consultation responses can be reviewed in Technical Appendix 2.1: Consultation Register and Technical Appendix 7.8: Ecology Consultation Responses (EIAR Volume 4).

Table 7.1: Consultation Responses

Consultee and Date	Scoping / Other Consultation	Issue Raised	Response / Action Taken
Scottish Natural Heritage – 23^{rd} April 2018	Pre-Scoping	An email was issued to SNH on 9^{th} April 2018 outlining a proposed survey strategy for great crested newt (GCN) surveys at North Kyle. SNH responded on 23^{rd} April 2018 confirming that the proposed GCN survey methodology was adequate. SNH wanted to be kept informed of initial survey results, as depending on the findings, it may be necessary to increase GCN survey effort.	Surveys commenced in line with proposals set out in the initial email.
Marine Scotland – 25^{th} April 2018	Scoping	Marine Scotland reminds that care should be exercised to prevent the spread of invasive non-native species e.g. North American signal crayfish.	Standard biosecurity measures to prevent the spread of invasive non-native species will be outlined in the Construction Environmental Management Plan (CEMP). Such measures will include ensuring all plant and machinery arriving/leaving the site is cleaned in designated washdown areas.
Scottish Natural Heritage – 18^{th} May 2018	Pre-Scoping	An email was issued to SNH on 15^{th} May 2018 providing an update on the night-time field survey results and eDNA results and a proposal to cease further surveys. SNH responded on 18^{th} May 2018 to confirm that no further GCN field survey work was required for the site.	GCN field survey work ceased for the site.
Scottish Natural Heritage – 14^{th} June 2018	Scoping	SNH noted that they had e-mail correspondence with MacArthur Green and following receipt of initial GCN survey results, SNH confirmed that further GCN work was not required.	Noted.
Scottish Natural	Scoping	Bat surveys should follow the recommended levels of survey	Noted. Survey methods also take into account recent advice from SNH on

Table 7.1: Consultation Responses			
Consultee and Date	**Scoping / Other Consultation**	**Issue Raised**	**Response / Action Taken**
Heritage – 14th June 2018		effort set out in the Bat Conservation Trust "Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd Edition)"	other sites to increase the number of static detectors across the site and to deploy them each for seven days per month between May-October.
Scottish Natural Heritage – 14th June 2018	Scoping	As Nyctalus bats are recorded in the initial surveys, increased survey effort, including survey at height, will be necessary. SNH would be happy to advise further if required.	Due to the presence of higher risk bat species on the site, more intensive bat activity surveys were completed during 2017 and 2018. Bat activity was sampled through the deployment of 15 static detectors each month (May to October) for seven nights. This method allows the frequency and distribution of bat activity across the site to be established which in turn informs mitigation. A study on the difference of bat activity in relation to bat detector height found the difference between *Nyctalus* passes at the high altitude and lower altitude detectors not to be statistically significant[2]. A more recent study[3] placed some detectors on the nacelle of wind turbines, and some at ground level, did however find that recording from ground level may underestimate the abundance of soprano pipistrelle and noctule bats within the at-risk zone of the turbine rotor sweep. There were, however, no clear linear relationships between the elevation of the detector and the ratio of passes for all species recorded. It is therefore considered that based on the overall evidence, conducting static detector surveys at ground level only, is not considered to constrain the ability to conduct a robust of the assessment of bat activity at the site. The availability of two years of data at North Kyle increases the robustness of this data set further.
Scottish Natural Heritage – 31st October 2018	Comment on Scoping Opinion Response Letter	With regards to bats, we advise that Ramboll, on behalf of Brockwell Energy Ltd, should assess the relative bat activity levels using Ecobat http://www.ecobat.org.uk/	Ecobat was used to analyse the 2017 and 2018 bat data as detailed within Technical Appendix 7.4.
Scottish Wildlife Trust	Scoping	Martyr's Moss and Glaisnock Moss	Martyr's Moss and Glaisnock Moss are located outwith the site boundary and are not likely to be affected by the proposed development.
SNH – 21st August 2019	Gate-check response	SNH requested that impacts on deer welfare, habitats, neighbouring and other interests (e.g. access and	Information on deer numbers and management was gained from Forestry and Land Scotland (FLS) to inform the baseline and to evaluate whether a

[2] Collins, J. and Jones, G (2009). *Differences in bat activity in relation to bat detector height: implications for bat surveys at proposed windfarm sites*. Acta Chiropterologica 11(2): 343-350. doi: http://dx.doi.org/10.3161/150811009X485576

[3] DEFRA (2016). Understanding the Risk to European Protected Species (bats) at Onshore Wind Turbine Sites to inform Risk Management. University of Exeter

Table 7.1: Consultation Responses			
Consultee and Date	**Scoping / Other Consultation**	**Issue Raised**	**Response / Action Taken**
		recreation, road safety etc.) should be considered in the assessment.	deer management plan for the proposed development would be required.
		SNH recommended that measures to manage and improve the condition of ancient woodland parcels should be included as part of the HMP.	The condition of the two ancient woodland areas identified as part of the ecological desk study (EIAR Volume 3a: Figure 7.1) were surveyed during the National Vegetation Classification surveys and are described within the desk study section of this chapter.

Potential Effects Scoped Out

7.2.11 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.

7.2.12 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, generally common or widely distributed habitats or species out with 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[4]; 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

7.2.13 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 Figures 7.2, 7.6, 7.7, 7.10 and 7.15 (EIAR Volume 3a), associated Technical Appendices 7.1 to 7.5 and Figures (EIAR Volume 4). The specific study areas are as follows:

- National Vegetation Classification (NVC) & Habitats: study area was notably larger than the site boundary and covered an area of 3,710 ha (EIAR Volume 3a: Figure 7.2);
- Protected species: otter (*Lutra lutra*), water vole (*Arvicola amphibius*), badger (*Meles meles*), red squirrel (*Sciurus vulgaris*) and pine marten (*Martes martes*): study area encompassed the site boundary as well as 100 m and 250 m (250 m for otters only)

[4] Scottish Government (2013). Scottish Biodiversity List. URL: http://www.gov.scot/Topics/Environment/Wildlife-Habitats/16118/Biodiversitylist/SBL [21/11/2018]

buffers from the turbines, as they were proposed at the time the surveys were conducted (EIAR Volume 3a: Figure 7.6 and EIAR Volume 4: Technical Appendix 7.2). The site boundary changed periodically throughout the survey period, due to changes to proposed infrastructure locations. This resulted in changes to the protected species study area, which was adapted to ensure appropriate survey coverage of the site and the final design layout. The maximum extent of the protected species study areas used during field surveys is detailed in Figure 7.6 (EIAR Volume 3a);

- Great crested newts (GCN): study area was defined by the proposed infrastructure layout at the time the surveys were conducted, plus a 500 m survey buffer (EIAR Volume 3a: Figure 7.8 and EIAR Volume 4: Technical Appendix 7.3);
- Bats: the study area was defined by the infrastructure layout at the time the surveys were undertaken (EIAR Volume 3a: Figure 7.10 and EIAR Volume 4: Technical Appendix 7.4);
- Electrofishing and fish habitats: study area included watercourses within the site (EIAR Volume 3a: Figure 7.15 and EIAR Volume 4: Technical Appendix 7.5); and
- Peat Depth Survey & Information to Inform an Assessment of Blanket Mire Condition: study area based on a 100 m buffer from the infrastructure proposed at that time (EIAR Volume 4: Figure 2.8.1).

Desk Study

7.2.14 South West Scotland Environmental Information Centre was consulted for bat records within 5 km of the site and hibernation records within 10 km of the site.

Field Survey

7.2.15 Ecological fieldwork (including peat surveys) commenced in May 2017 and was completed in October 2018. The following field surveys were undertaken to establish the baseline ecological conditions and methods used standard best practice (see Technical Appendix 7.1 to 7.5 and 2.8: Peat Depth Survey & Information to Inform an Assessment of Blanket Mire Condition and 2.9: Phase 2 Peat Depth and Coring Survey (EIAR Volume 4) for further details):

NATIONAL VEGETATION CLASSIFICATION & HABITATS SURVEYS

7.2.16 Surveys were undertaken as follows:

- 2017: 24th to 27th October, 30th October to 2nd November, and 13th to 16th November; and
- 2018: 23rd and 27th April, and 11th to 13th June 2018.

7.2.17 Further information on the NVC surveys and methods are outlined in EIAR Volume 4: Technical Appendix 7.1.

PEAT DEPTH, MIRE CONDITION & CORING SURVEYS

7.2.18 Surveys were undertaken as follows:

- Phase 1 peat depth and mire condition assessment: 19th to 23rd March, and 27th to 29th March 2018; and
- Phase 2 peat depth and coring surveys: 10th to 14th September, 17th to 21st September, 25th and 26th September, and 1st to 4th October 2018.

7.2.19 Further information on the phase 1 peat surveys is provided in EIAR Volume 4: Technical Appendix 2.8: Peat Depth Survey & Information to Inform an Assessment of Blanket Mire

Condition. Information related to the phase 2 peat depth survey and coring is contained within EIAR Volume 4: Technical Appendix 2.9: Phase 2 Peat Depth and Coring Survey.

PROTECTED SPECIES SURVEYS

7.2.20 Surveys were undertaken as follows:

- Otter and water vole: 15th to 18th August 2017, 4th to 6th April, 12th to 13th April, 17th and 18th April and 26th April 2018; and
- Badger, pine marten and red squirrel: 13th, 19th, 22nd and 23rd February, and 12th September (badger only) 2018.

7.2.21 Further information related to the protected species surveys and their methods can be found in EIAR Volume 4: Technical Appendix 7.2.

GREAT CRESTED NEWT SURVEYS

7.2.22 Surveys were undertaken as follows:

- Habitat Suitability Index (HSI) surveys: undertaken between 6th March and 16th March 2018;
- eDNA surveys: 7th and 8th May 2018; and
- Presence/likely absence surveys: undertaken between 17th April and 17th May 2018.

7.2.23 Further information related to the GCN surveys, methods and study area can be found in EIAR Volume 4: Technical Appendix 7.3.

BAT SURVEYS

7.2.24 Surveys were undertaken as follows:

- Preliminary bat roost assessment: 11th December 2017;
- Activity surveys – point counts and transects: May and June 2017 (undertaken by Echoes Ecology);
- Automated activity surveys – static detectors (2017): between May and July 2017 (undertaken by Echoes Ecology) and between July and October 2017 (undertaken by MacArthur Green); and
- Automated activity surveys – static detectors (2018): between May and October 2018.

7.2.25 Further information on bat surveys and methods can be found in EIAR Volume 4: Technical Appendix 7.4.

FISH

7.2.26 Surveys were undertaken as follows:

- Fish habitat survey: 28th to 31st August 2017, and 25th to 26th April 2018; and
- Electrofishing: 22nd to 24th August, and 26th to 27th September 2018.

7.2.27 Further information on the electrofishing and habitat surveys can be found in EIAR Volume 4: Technical Appendix 7.5.

Criteria for the Assessment of Effects

7.2.28 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 Effect.

7.2.29 There can often be varying degrees of uncertainty over the sensitivity 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.

7.2.30 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 possible and any necessary monitoring where required;
- opportunities for enhancement are considered; and
- residual effects after mitigation, compensation or enhancement are considered.

Determining Nature Conservation Value of Ecological Features

7.2.31 Nature Conservation Value is defined on the basis of the geographic context given in Table 7.2 (which follows the standard guidance[5]). 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, an 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).

7.2.32 Where possible, the valuation of habitat/populations within this assessment makes use of any relevant published evaluation criteria (e.g. The SBL[6], Joint Nature Conservancy Council (JNCC) on selection of biological SSSIs[7]). Furthermore, JNCC guidance[8] 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 when necessary).

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[5] CIEEM (2018). Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (3rd Edition).

[6] Scottish Government (2013). Scottish Biodiversity List. URL: http://www.gov.scot/Topics/Environment/Wildlife-Habitats/16118/Biodiversitylist/SBL [21/11/2018]

[7] JNCC (2013). Guidelines for selection of biological SSSIs. URL: http://jncc.defra.gov.uk/page-2303 [26/11/2018]

[8] JNCC (2014). NVC & Other Classifications. URL: http://jncc.defra.gov.uk/page-4266 [26/11/2018]

7.2.33 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[9]

Importance of Feature in Geographical Context	Description
International	An internationally designated site (e.g. SAC).
	Site meeting criteria for international designations or qualifying species of a SAC where there is connectivity.
	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.
	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).
	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).
	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.

7.2.34 IEFs to be assessed were taken to be those features of local, regional, national and international importance.

Criteria for Assessing the Magnitude of Change

7.2.35 Determining the magnitude of any likely effects 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.

7.2.36 Effect magnitude refers to changes in the extent and integrity of an ecological receptor. A suitable definition of ecological 'integrity' is found within Scottish Executive circular 6/1995 updated in Scottish Executive 2000[10] 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 designated sites (SACs and SPAs), it is applied to wider countryside habitats and species for the purposes of this assessment.

[9] Adapted from Hill, D, Fasham, M, Tucker, G, Shewry, M and Shaw, P (2005). *Handbook of Biodiversity Methods – Survey, Evaluation and Monitoring*. Cambridge: Cambridge University Press.

[10] Scottish Executive (2000). 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;

7.2.37 Effects can be adverse, neutral or beneficial. Effects are judged in terms of magnitude in space and time. There are five levels of spatial effect and five levels of temporal effect as described in Table 7.3 and Table 7.4 respectively.

Table 7.3: Definition of Spatial Effect 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 Effect Magnitude upon IEFs

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) 20 years.
Short term	Up to (but not including) 5 years.
Negligible	No effect.

Criteria for Assessing Cumulative Effects

7.2.38 SNH's cumulative assessment guidance[11] 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 is considered for each scoped in feature, appropriate to its ecology.

[11] SNH (2012). Assessing the Cumulative Impact of Onshore Wind Energy Developments.

Criteria for Assessing Significance

7.2.39 The potential significance of the effect is determined through a standard method of assessment based on professional judgement, considering the nature conservation value of the IEF and the magnitude of change.

7.2.40 Table 7.5 details the significance criteria that are used in assessing the effects of the proposed development. 'Major' and 'Moderate' effects are considered to be significant in accordance with EIA Regulations. 'Minor' and 'Negligible' effects are considered to be not significant in accordance with EIA Regulations.

Table 7.5: Significance Criteria

Level of 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.

7.2.41 Using these definitions, it is decided whether there could be any effects which would 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

7.2.42 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.

7.2.43 There were few limitations experienced with regards access and weather conditions preceding and during surveying (see Technical Appendices 7.1 – 7.5, EIAR Volume 4).

7.2.44 Access restrictions existed across the site for many of the ecology surveys. These were associated with the active and historic mining works, ongoing forestry and harvesting operations, wind-blow within the forestry as well as restrictions of access to those areas where survey buffers existed out with the site boundary. Survey limitations due to access restrictions, where these existed, are outlined within the respective Technical Appendices 7.1 to 7.5 (EIAR Volume 4).

7.2.45 In addition to the access restrictions, the GCN surveys had limitations associated with the weather during the HSI survey and presence/likely absence surveys as well as some of the water levels during the bottle trapping surveys. Further information is contained within EIAR Volume 4: Technical Appendix 7.3.

7.2.46 The limitations and assumptions related to the bat survey data are outlined within Technical Appendix 7.4 (EIAR Volume 4) and are mainly associated with the collection and analysis of the temporal survey data.

7.2.47 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 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.

7.2.48 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 (not including ornithology) within 5 km of the site;
- desk-based study results;
- habitats and vegetation (EIAR Volume 4: Technical Appendix 7.1); and
- protected or notable species recorded during baseline surveys (EIAR Volume 4: Technical Appendix 7.2).

Designated Sites

7.3.2 Information gathered from the consultation exercise revealed that there are no statutory nature conservation designations within the site but that the proposed development is within 5 km of five SSSIs (EIAR Volume 3a: Figure 7.1, EIAR Volume 4: Technical Appendix 7.1 and Table 7.6 below).

Table 7.6: Designated Sites within 5 km of the Proposed Development

Designated Site Name	Distance from Proposed Development	Qualifying Feature Category	Qualifying Features (Ecological)	Status
Dalmellington Moss	0.02 km from site entrance; 3.36 km from main site	SSSI	Raised bog	Unfavourable Recovering 05/10/2007
Barlosh Moss	0.56 km from site entrance; 4.01 km from main site	SSSI	Hydromorphological mire range Raised bog	Favourable Maintained 25/08/22004 Unfavourable Declining 19/03/2013
Bogton Loch	0.69 km from site entrance; 4.09 km from main site	SSSI	Open water transition fen	Unfavourable Declining 19/09/2008
Ness Glen	3.93 km from site entrance; 5.83 km from main site	SSSI	Upland mixed ash woodland	Unfavourable Declining 10/06/2014
Loch Doon	4.99 km from site entrance; 6.68 km from main site	SSSI	Arctic charr (Salvelinus alpinus)	Unfavourable Declining 03/07/2008

Desk Studies

7.3.3 The site is approximately centred around grid reference NS 515 132. A search on the NBN Atlas for protected mammal, reptile, amphibian and fish species records in a 10 km buffer from this location contained records from 1997 of the following relevant protected or notable species:

- Badger;
- Brown hare (*Lepus europaeus*);
- Grey Squirrel (*Sciurus carolinensis*);
- Mountain hare (*Lepus timidus*);
- Otter;
- Red squirrel;
- Daubenton's bat (*Myotis daubentonii);*
- 45Khz Pipistrelle (*Pipistrellus pipistrellus*);
- 55Khz Pipistrelle (*Pipistrellus pygmaeus*);
- Pipistrelle (*Pipistrellus sp*.);
- Atlantic salmon (*Salmo salar*);
- Brown trout (*Salmo trutta fario*);
- Eel (*Anguilla anguilla*);
- Sea trout (*Salmo trutta trutta*); and
- Common lizard (*Zootoca vivipara*).

7.3.4 A number of ecological surveys were undertaken as part of the Chalmerston, Benbain surface mine scheme in 2010/11 (overlapping with the south of the site)[12],[13]. A summary of the relevant results is provided below:

- Hair tube surveys (34 tubes) found no evidence of red squirrel despite the woodland being of cone producing age;
- A small number of commuting and forging bats were recorded during surveys. These included Soprano pipistrelle, unconfirmed pipistrelle sp. and brown long-eared bat (*Plecotus auritus*); and
- No evidence of otter, water vole or badger was recorded.

7.3.5 Information on bog restoration work undertaken by East Ayrshire Coalfield Initiative[14] was reviewed[15]. This indicated a restoration area adjacent to the northeast boundary of the site covering Black Hill and Beddminnie Moss. This area was considered during the design process to avoid any direct or indirect impacts.

7.3.6 Roe (*Capreolus capreolus*) and red deer (*Cervus elaphus*) with low numbers of fallow (*Dama dama*) and sika (*Cervus nippon*) deer are present within the core Galloway Forest Park (Strath

[12] Hannah, A.C. (2011) Squirrel Hair-Tube Survey at the Proposed Benhain Surface Min near Dalmellington East Ayrshire (NS 500 095). Dunnock Environmental Services.

[13] Davis, L. (2010) Benhain (Pennyveinie/Chalmerston Surface Mines, Near Dalmellington, East Ayrshire, KA6 7PT. Echoes Ecology Ltd.

[14] http://www.ea-cei.org.uk/enhancement-sites-tappethill-moss/

[15] Pendleton Hydro Ltd, (August 2015) Hydrological Survey of Black Hill, Bedminnie Moss and Tappethill Moss

Caulaidh Ltd, 2013[17]). Current population estimates[16] for the wider area are 7 +/- 2.3 deer per km^2)[17]. The Wildlife Ranger for Forestry and Land Scotland (FLS) has advised that the current cull targets set for North Kyle forest would indicate that this is a fairly accurate estimate but will most likely to be toward the higher end of the range[18]. Deer management within the area of the proposed development would continue throughout the construction and operation phases.

7.3.7 Two areas of historic ancient woodland were identified during the desk study (EIAR Volume 3a: Figure 7.1). The NVC surveys (EIAR Volume 4: Technical Appendix 7.1 and Figure 7.1.2k) confirmed that the most northerly area of ancient woodland on the northern red line boundary contains no old growth trees and is Sitka spruce plantation. The other area of ancient woodland in the north east corner of the site contains areas of bog and Sitka spruce plantation. No suitable bat roost trees were recorded in this location either indicating the absence of mature trees (EIAR Volume 3a: Figure 7.12).

Field Surveys

7.3.8 Details regarding field survey methodologies and results are included within Technical Appendices 7.1 to 7.5 (EIAR Volume 4). The following section summarises the baseline conditions as identified during these surveys.

Habitat Surveys

7.3.9 The NVC study area for the proposed development was notably larger than the site boundary, covering approximately 3,710 ha (EIAR Volume 3a: Figure 7.2 and EIAR Volume 4: Technical Appendix 7.1) to ensure sufficient survey coverage of earlier and larger proposed infrastructure layouts. Where any calculations related to habitats have been conducted, these have been undertaken within the site boundary excluding access tracks (covering 2,051 ha), as opposed to within the NVC study area, in order to make these more relevant to the proposed development. These calculations include the area and percentage of each habitat type within the site boundary.

7.3.10 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 EIAR Volume 4: Technical Appendix 7.1). Where the text refers to 'the site', it is referring to the area within the site boundary.

PHASE I HABITATS

7.3.11 The NVC data was cross-referenced to the Phase 1 Habitat Survey Classification[19] to allow a broader characterisation of habitats. The extent of Phase 1 habitat types was calculated using the correlation of specific NVC communities to their respective Phase 1 types (see Table 7.7 below and Technical Appendix 7.1 (EIAR Volume 4) for details), and their extents were determined within GIS; including within mosaic areas.

7.3.12 The results of this analysis are summarised below in order of extent in Table 7.7. Figure 7.2 (EIAR Volume 3a) displays the Phase 1 and NVC survey results for the NVC study area.

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[16] Forestry and Land Scotland has advised that the last Estimated Deer utilisation survey to be carried out in North Kyle was completed in 2000. However in 2012 a survey was carried out in the main block of Galloway which is the most accurate up to date data regarding deer populations in the South (email of 26/08/19).

[17] Strath Caulaidh Ltd (2013). Monitoring in the abundance of wild deer in the Galloway Forest Park, Dumfries & Galloway, UK

[18] Pers. Comment Wildlife Ranger Manager FLS 26/08/2019

[19] Joint Nature Conservation Committee (2010). Handbook for Phase 1 habitat survey - a technique for environmental audit. http://jncc.defra.gov.uk/PDF/pub10_handbookforphase1habitatsurvey.pdf

Table 7.7: Phase 1 Habitat Types within the Site

Phase 1 Habitat Code	Phase 1 Habitat Description	NVC & Habitats Recorded	Area (ha)	% of Site
A1.1	Woodland: broadleaved - semi-natural/plantation	W4, W7, W11, W17, BP	13.62	0.66
A1.2.2	Woodland: coniferous, plantation	W18, CP, YCP	874.59	42.65
A1.3.1	Woodland: mixed - semi-natural	ST	0.02	0.001
A2.1	Scrub: dense/continuous	W22	0.02	0.001
A4.2	Recently-felled woodland: coniferous	CF, CF>CP, CF>H12a, CF>H9a, CF>Je, CF>M19, CF>M19a, CF>M20, CF>M23b, CF>M25, CF>M25a, CF>M25b, CF>M6c, CF>MG9, CF>OV27, CF>U2, CF>U2b, CF>U4, CF>U4d, CF>W4, CF>W4b	317.08	15.46
B1.1	Acid grassland: unimproved	U2, U4, yU4	31.71	1.55
B2.1	Neutral grassland: unimproved	MG1, MG9, Hm	14.09	0.69
B5	Marsh/marshy grassland	M23, M25b, M25c, M27, MG10, Je, Ja	119.69	5.84
C1.1	Bracken: continuous	U20	4.34	0.21
C3.1	Other tall herb & fern: tall-ruderal	OV25, OV27, W24	3.23	0.16
D1.1	Dry dwarf shrub heath - acid	H9, H10, H12	1.84	0.09
D2	Wet dwarf shrub heath	M15	0.19	0.01
E1.6.1	Bog: blanket	M3, M18, M19, M20	70.91	3.46
E1.7	Bog: wet modified	M25, M25a	49.15	2.40
E2.1	Flush/spring: acid/neutral	M4, M6	6.42	0.31
F1	Swamp	S9, S10, S12	0.85	0.04
G1	Open water – standing water	SW	22.40	1.09
G2	Open water – running water	RW	2.36	0.11
I2.2	Spoil	UM, UM>CP, UM>Je, UM>M19a, UM>M23b, UM>OV27, UM>U4, UM>W17	224.84	10.96
I2.3	Mine	MI	213.28	10.40
J4	Bare ground	BG	79.11	3.86
J5	Other habitat	RM>Je	0.92	0.04
TOTAL			2050.67	100

NVC COMMUNITIES

7.3.13 NVC communities and non-NVC habitat types recorded within the site are detailed in Table 7.8 below and include the proportions of a particular community or habitat type that are found within the site boundary, including proportions within mosaic habitats. Full descriptions of the habitats, NVC communities and associated flora of the NVC study area is provided in EIAR Volume 4: Technical Appendix 7.1 and Figure 7.1.2.

7.3.14 The NVC surveys recorded 44 recognised NVC communities within the NVC study area, with various associated sub-communities. In addition, a number of non-NVC habitat types or features were also mapped, many of these accounting for the majority of the NVC study area; for instance, areas of conifer plantation, clear-fell, and surface mining areas (active, recently restored and historic). Semi-natural habitats within the NVC study area are much less extensive, with the most common being a number of peatland, rush-mire and grassland communities as well as some notable areas of active blanket bog.

ANNEX I HABITATS

7.3.15 Certain NVC communities can also correlate to various Annex I habitat types listed under the Habitats Directive[20]. 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.

7.3.16 NVC survey data and field observations have been compared to JNCC Annex I habitat listings and descriptions[21]. Those habitats within the site which could be considered Annex I habitats are also summarised in Table 7.8.

7.3.17 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 7.8). Full details and discussion of Annex I habitat types present with the NVC study area are provided within EIAR Volume 4: Technical Appendix 7.1.

SCOTTISH BIODIVERSITY LIST PRIORITY HABITATS

7.3.18 The Scottish Biodiversity List (SBL)[22] is a list of animals, plants and habitats that Scottish Ministers consider to be of principal importance for biodiversity conservation in Scotland. Some of these priority habitats are broad and can correlate to many NVC types.

7.3.19 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 EIAR Volume 4: Technical Appendix 7.1. These SBL priority habitats also correlate with UK Biodiversity Action Plan (BAP) Priority Habitats[23].

[20] As defined by the Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora – the 'Habitats Directive'

[21] JNCC (2016). Annex I habitats and Annex II species occurring in the UK. URL: http://jncc.defra.gov.uk/page-1523 [21/11/2018].

[22] Scottish Government (2013). Scottish Biodiversity List. URL: http://www.gov.scot/Topics/Environment/Wildlife-Habitats/16118/Biodiversitylist/SBL [21/11/2018]

[23] JNCC (2016). UK BAP priority habitats. URL: http://jncc.defra.gov.uk/page-5718 [21/11/2018]

GROUNDWATER DEPENDENT TERRESTRIAL ECOSYSTEMS

7.3.20 The NVC results were referenced against SEPA guidance[24], 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 site are also summarised in Table 7.8; these are shown in Figure 7.4 (EIAR Volume 3a) for the full study area.

7.3.21 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.

7.3.22 Where a potential high GWDTE exists in a polygon, it outranks any potential moderate GWDTE communities within that same polygon.

7.3.23 GWDTE sensitivity has been assigned here according to SEPA listings[25]. 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 (EIAR Volume 4), provided to SEPA as part of pre-application information on the assessment of GWDTE.

Table 7.8: Summary of NVC Communities Recorded within the Site

NVC Community Code and Name		**Extent in the Site (ha)**	**% of the Site**	**Potential Groundwater Dependency**	**Annex I Habitat Type**	**SBL Priority Habitat**
Mires and Flushes						
M3	*Eriophorum angustifolium* bog pool community	0.07	0.003	-	7130 Blanket bog	Blanket bog
M4	*Carex rostrata - Sphagnum fallax* mire	0.15	0.01	-	7140 Transition mires and quaking bogs	Upland flushes, fens and swamps
M6c, M6d	*Carex echinata - Sphagnum fallax/denticulatum* mire	6.27	0.31	High	-	Upland flushes, fens and swamps
M18, M18a, M18b	*Erica tetralix – Sphagnum*	23.26	1.13	-	7130 Blanket bog	Blanket bog

[24] SEPA. (2017). Land Use Planning System SEPA Guidance Note 31: Guidance on Assessing the Impacts of Windfarm Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems. Version 3. Issue date: 11/09/2017.

[25] SEPA. (2017). Land Use Planning System SEPA Guidance Note 31: Guidance on Assessing the Impacts of Windfarm Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems. Version 3. Issue date: 11/09/2017.

Table 7.8: Summary of NVC Communities Recorded within the Site						
NVC Community Code and Name		**Extent in the Site (ha)**	**% of the Site**	**Potential Groundwater Dependency**	**Annex I Habitat Type**	**SBL Priority Habitat**
	papillosum blanket mire					
M19, M19a	*Calluna vulgaris – Eriophorum vaginatum* blanket mire	36.40	1.77	-	7130 Blanket bog	Blanket bog
M20, M20a, M20b	*Eriophorum vaginatum* blanket mire	11.19	0.55	-	7130 Blanket bog	Blanket bog
M23, M23a, M23b	*Juncus effusus/acutiflorus – Galium palustre* rush-pasture	31.51	1.54	High	-	Upland flushes, fens and swamps
M25, M25a, M25b, M25c	*Molinia caerulea – Potentilla erecta* mire	71.71	3.5	Moderate	7130 Blanket bog, where peat depth is greater than 0.5 m	Blanket bog, where peat depth is greater than 0.5 m
M27	*Filipendula ulmaria – Angelica sylvestris* mire	0.15	0.01	Moderate	-	Upland flushes, fens and swamps
Wet Heaths						
M15b, M15d	*Trichophorum germanicum – Erica tetralix* wet heath	0.19	0.01	Moderate	4010 Northern Atlantic wet heaths with *Erica tetralix*	Upland heathland
Dry Heaths						
H9a	*Calluna vulgaris – Deschampsia flexuosa* heath	0.39	0.02	-	4030 European dry heaths	Upland heathland
H10a	*Calluna vulgaris – Erica cinerea* heath	0.04	0.002	-	4030 European dry heaths	Upland heathland
H12a, H12c	*Calluna vulgaris – Vaccinium myrtillus* heath	1.41	0.07	-	4030 European dry heaths	Upland heathland
Grasslands and Bracken						
U2a, U2b	*Deschampsia flexuosa* grassland	0.42	0.02	-	-	-
U4, U4a, U4b, U4d, yU4	*Festuca ovina – Agrostis capillaris – Galium saxatile* grassland	31.28	1.53	-	-	-
U20, U20a, U20c	*Pteridium aquilinum – Galium saxatile* community	4.34	0.21	-	-	-
MG1	*Arrhenatherum elatius* grassland	1.65	0.08	-	-	-

Table 7.8: Summary of NVC Communities Recorded within the Site						
NVC Community Code and Name		**Extent in the Site (ha)**	**% of the Site**	**Potential Groundwater Dependency**	**Annex I Habitat Type**	**SBL Priority Habitat**
MG9, MG9a	*Holcus lanatus – Deschampsia cespitosa* grassland	12.14	0.59	Moderate	-	-
MG10, MG10a	*Holcus lanatus – Juncus effusus* rush-pasture	1.25	0.06	Moderate	-	-
Woodland and Scrub						
W4, W4b, W4c	*Betula pubescens – Molinia caerulea* woodland	7.01	0.34	High	-	Wet woodland
W7, W7c	*Alnus glutinosa – Fraxinus excelsior – Lysimachia nemoreum* woodland	3.68	0.18	High	-	Wet woodland
W11	*Quercus petraea – Betula pubescens – Oxalis acetosella* woodland	0.12	0.01	-	-	-
W17	*Quercus petraea – Betula pubescens – Dicranum majus* woodland	2.27	0.11	-	-	-
W18, W18c, W18d	*Pinus sylvestris – Hylocomium splendens* woodland	0.22	0.01	-	-	-
W22	*Prunus spinosa – Rubus fruticosus* scrub	0.02	0.001	-	-	-
W24	*Rubus fruticosus – Holcus lanatus* underscrub	0.01	0.0005	-	-	-
Swamp and Tall-Herb Fens						
S9, S9a	*Carex rostrata* swamp	0.45	0.02	-	-	Upland flushes, fens and swamps
S10, S10a, S10b	*Equisetum fluviatile* swamp	0.16	0.008	-	-	Upland flushes, fens and swamps
S12, S12a, S12b, S12d	*Typha latifolia* swamp	0.25	0.01	-	-	-
Vegetation of Open Habitats						
OV25	*Urtica dioica – Cirsium arvense* community	0.05	0.002	-	-	-
OV27, OV27c	*Chamerion angustifolium* community	3.17	0.16	-	-	-
Non-NVC Community or Feature Types						

Table 7.8: Summary of NVC Communities Recorded within the Site

NVC Community Code and Name		**Extent in the Site (ha)**	**% of the Site**	**Potential Groundwater Dependency**	**Annex I Habitat Type**	**SBL Priority Habitat**
CP	Conifer plantation	869.17	42.38	-	-	-
YP	Young plantation	5.20	0.25	-	-	-
BP	Non-NVC broadleaved plantation	0.54	0.03	-	-	-
CF	Clear-fell	317.08	15.46	-	-	-
ST	Scattered trees	0.02	0.001	-	-	-
MI	Active mine workings	213.28	10.40	-	-	-
RM	Restored mine areas	0.92	0.04	-	-	-
UM	Unrestored or abandoned mine areas	224.84	10.96	-	-	-
BG	Bare ground, soil, rock, borrow pit, tracks & hardstandings	79.11	3.86	-	-	-
Ja	*Juncus acutiflorus* acid grassland community	9.77	0.48	Moderate[26]	-	-
Je	*Juncus effusus* acid grassland community	54.45	2.66	Moderate[26]	-	-
Hm	*Holcus mollis* dominant neutral grassland	0.30	0.01	-	-	-
RW	Running water	2.36	0.11	-	-	-
SW	Standing water	22.40	1.09	-	-	-
TOTAL		2050.67	100	-	-	-

7.3.24 A brief description of the main Phase 1 habitats and associated NVC types recorded within the NVC study area is presented below (full descriptions are provided in EIAR Volume 4: Technical Appendix 7.1 and Figure 7.1.2 and EIAR Volume 3a: Figure 7.2). In the following paragraphs where reference is made to NVC community codes, the full community name can be cross-referred to Table 7.8 above.

7.3.25 Marsh/marshy grassland is made up of NVC communities M23, M25 (specifically sub-communities b and c), M27, MG10, Je and Ja within the NVC study area (see Table 7.8 for site coverage areas). M23 is common and widespread through open sections of the NVC study area. It is found as small patches or borders around most watercourses and ponds, along many forest rides and water collecting hollows and gullies. Large expanses also occur over damp poorly drained level and gently sloping ground, particularly around Skares. Both M23a *J. acutiflorus* sub-community and the M23b *J. effusus* sub-community are common throughout

[26] In light of the SEPA classification on potential GWDTEs the non NVC types 'Je' and 'Ja' should also qualify for potential GWDTE status. The classification of moderate sensitivity is keeping in line with other similar Juncus spp. dominated grassland communities (e.g. MG10).

the NVC study area, however M23b is most abundant, and the more species-poor community. M27 within the NVC study area was recorded in only four small closely related stands near House of Water; three flanking the upper River Nith and the other around the upper Beoch Lane watercourse. In all cases the stands are characteristically dominated by *Filipendula ulmaria*. MG10 and the MG10a typical sub-community is scattered as small fragments and small stands throughout the NVC study area, quite often in mosaics with other *Juncus spp*. dominated communities. The vegetation is generally species-poor.

7.3.26 Flushes/springs (acid/neutral) within the NVC study area are made up of NVC communities M4, M6 and non-NVC community Pcom (Polytrichum commune). A few small areas of M4 mire were recorded within the NVC study area, generally as small percentage of a mosaic with other mire types. M6 is frequently scattered around the NVC study area, often around watercourses, and usually as relatively small patches of flush or a component part of a larger marsh/marshy grassland mosaic. All four of the M6 sub-communities were recorded but the vast majority of the vegetation present is of the most species-poor M6c *Juncus effusus* sub-community; a smaller number of stands of the similar M6d *Juncus acutiflorus* sub-community were recorded.

7.3.27 Blanket bog and wet modified bog are made up of NVC communities M2, M3, M18, M19, M20, and M25 (specifically community level and the M25a sub-community) in the NVC study area. A relatively small number of areas of M18 blanket bog were recorded within the NVC study area. These areas generally represent the best examples of blanket mire vegetation within the study area. The largest and highest quality area of M18 is found in the southwest of the study area around Benbain, located in an unplanted section of forestry west of Greengate Rig; locally M18 is also present further west by the NVC study area boundary, and extends beyond it in a notable area of active blanket bog. Other isolated patches exist to the south of the NVC study area, north of Clawfin; around Over Hill, Loch Rig and Martyr's Moss; and within an unplanted area of forestry around Black Hill in the eastern NVC study area. A single small M2 bog pool was recorded within a forestry ride to the east of High Mount in the very east of the NVC study area. Two small patches of habitat correlating to the M3 community were recorded and were characteristic swards of *Eriophorum angustifolium*. Numerous small, isolated and fragmentary stands of M19 blanket bog and modified bog are found scattered throughout the NVC study area, however the highest concentration is towards the southwest in the vicinity of Headmark Moss. Relatively infrequent small patches of M20 are found throughout the NVC study area, it is mostly found in rides but a couple of relatively larger patches exist, the main one being to the northwest of Little Rigend Hill, by House of Water.

7.3.28 There are a number of fragmented patches of M25 and M25a wet modified bog across the NVC study area, although the community rarely forms large stands. Most M25 is found within peaty forestry rides or along watercourses, with only a small number of larger stands, such as west of Little Rigend Hill and southwest of Tappet Hill.

7.3.29 Wet heath is rare within the NVC study area and is found as small fragments of habitat within mosaics of other mires and grasslands. Just five small patches of M15b Typical sub-community and one small patch of the M15d *Vaccinium myrtillus* sub-community were recorded.

7.3.30 Dry heath is rare within the NVC study area and found as only scattered fragments of habitat. Four small patches of H9 were recorded, corresponding to areas where Calluna is dominant with some sparse *Deschampsia flexuosa* in the sward. A single patch of H10a typical sub-community was recorded near House of Water on a steep dry slope flanking the Beoch Lane watercourse. A few isolated stands of H12 were recorded within the NVC study area and all were small and fragmented.

7.3.31 There are a number of woodland communities present within the NVC study area. Five mappable areas of W4 (birch and/or grey willow) woodland were recorded, including the W4b *Juncus effusus* sub-community and W4c Sphagnum sub-community. Three stands were considered semi-natural, including patches of young and short newly colonising woodland more akin to scrub near Skares and Benbain and one mature stand south of Skares. Two stands were part of mixed woodland, a recently planted young stand in the Chalmerston area and a more mature stand south of Skares. Small patches of W7 are scattered throughout the NVC study area; these areas tend to be dominated by *Salix spp*. rather than characteristic *Alnus glutinosa*, although *A. glutinosa* and *Betula spp*. are present in some patches. Some stands were semi-natural, but the majority were young plantations on wet ground, or a component part of mixed plantation. Many areas of W7 were more scrub like than woodland, being characterised by short scrubby *Salix spp*. over a wet neutral field flora. There are much lesser extents of drier W11 and W17 woodlands present within the site (Table 7.8).

7.3.32 A number of swamp communities and tall herb-fens were recorded within the NVC study area. A single stand of S4a was recorded adjacent to the River Nith by House of Water. A few small patches of S9 and the S9a sub-community were recorded; in each case being an area of *Carex rostrata* in shallow water with no or few associates. A number of patches of S12 are present in the former and sometimes in-filled mining settlement ponds in the floodplain of the River Nith, south of House of Water. It is also found in some larger lagoons and flanking associated outflow channels.

7.3.33 21 non-NVC vegetation or feature types were also mapped during the survey. Five of these were associated with plantation woodland (conifer plantation, young conifer plantation, mixed plantation, young mixed plantation and non-NVC broadleaved plantation) and were unremarkable in terms of their flora and species composition. Conifer plantation makes up the vast majority of the NVC study area, mainly *Picea sitchensis* plantation. Several of the non-NVC community or feature types related to the mining activities within the site (active, restored or unrestored/abandoned mine) or were associated with the works (e.g. bare ground, soil, rock, borrow pit, tracks, hardstandings, bare/exposed peat or recently disturbed ground). These non-NVC features lacked vegetation or were floristically poor and were of negligible botanical importance. They are therefore not discussed further in this chapter.

Peatland

7.3.34 During Phase 1 peat probing surveys, undertaken on a 100 m^2 grid of the peat study area, a blanket mire condition assessment was also undertaken. The blanket mire condition assessment included collecting various data at sample locations on the vegetation assemblage, foliar and basal vegetation cover, the presence of key peat forming species, the presence of drains, and information on the amount and types of peat erosion present (EIAR Volume 4: Technical Appendix 2.8: Peat Depth Survey & Information to Inform an Assessment of Blanket Mire Condition for full details).

7.3.35 The Carbon and Peatland Map 2016[27] was consulted to determine likely peatland classes present in the peat study area; the map provides an indication of the likely presence of peat at a coarse scale (EIAR Volume 4: Technical Appendix 2.9: Phase 2 Peat Depth and Coring Survey, Figure 2.9.1). The Carbon and Peatland map has been developed as *"a high-level*

[27] Scottish Natural Heritage (2016). Carbon and Peatland 2016 map. URL: http://map.environment.gov.scot/Soil_maps/?layer=10 [21/11/2018]

planning tool to promote consistency and clarity in the preparation of spatial frameworks by planning authorities[27]". 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 *"of potentially high conservation value and restoration potential".*

7.3.36 Figure 2.9.1 (EIAR Volume 4: Technical Appendix 2.9: Phase 2 Peat Depth and Coring Survey) indicates that, according to this map, the site contains only small areas of Class 1 peatlands and no Class 2 peatlands. A full interpolation of peat depth, accounting for both the phase 1 and phase 2 peat depth data, can be seen on Figure 2.9.3 (EIAR Volume 4: Technical Appendix 2.9: Phase 2 Peat Depth and Coring Survey).

7.3.37 As detailed within the blanket mire condition assessment undertaken during the phase 1 peat surveys (EIAR Volume 4: Technical Appendix 2.8: Peat Depth Survey & Information to Inform an Assessment of Blanket Mire Condition and Figures 2.8.1 to 2.8.18) most of the peat areas within the site have been degraded by commercial forestry, which covered 79% of sample locations. Due to the drying and shading effects of commercial forestry, blanket bogs often lose their vegetation and become inactive, typically referred to as 'moribund' bog. This degraded bog condition is indicated at the site by the scarcity of peat forming species and bare ground (Sphagnum species – particularly broad branched Sphagnum, bog cotton, bare ground/spruce needles) and the dominance of species indicating drier conditions (non-Sphagnum mosses, grasses, rushes). Despite the adverse effects of the conifer plantation, several islands of intact bog remain within the forestry. The blanket mire condition assessment indicates that isolated areas of bog in the west of the site are in reasonably good 'active' condition.

7.3.38 As the Carbon and Peatland Map is a high-level tool, peat depth surveys have also been carried out to inform the detailed site assessment on peatland, which is required to identify the actual effects of the proposed development; including siting, design and mitigation. The results of these surveys are discussed in Technical Appendices 2.8: Peat Depth Survey & Information to Inform an Assessment of Blanket Mire Condition and 2.9: Phase 2 Peat Depth and Coring Survey (EIAR Volume 4) and their influence on the site's design are discussed in Chapter 3: 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 (EIAR Volume 4):

- Protected species (including otter, water vole, badger, pine marten and red squirrel): Figure 7.6 (EIAR Volume 3a), Technical Appendix 7.2 and Figures 7.2.1 to 7.2.3 (EIAR Volume 4);
- GCN: Figure 7.7 to Figure 7.9 (EIAR Volume 3a), Technical Appendix 7.3 and Figures 7.3.1 to 7.3.3 (EIAR Volume 4);
- Bats: Figure 7.10 to Figure 7.14 (EIAR Volume 3a), Technical Appendix 7.4 and Figures 7.4.1 to 7.4.21 (EIAR Volume 4); and
- Fish: Figure 7.15 (EIAR Volume 3a), Technical Appendix 7.5 and Figure 7.5.1 (EIAR Volume 4).

7.3.40 The summary for each species is provided below:

Otter

7.3.41 Evidence of otter was recorded throughout the protected species study area (EIAR Volume 4: Technical Appendix 7.2), with the results illustrated on Figure 7.6 (EIAR Volume 3a) and Confidential Figure 7.2.2 (EIAR Volume 4).

7.3.42 Field signs of otter recorded during the surveys included a sighting, spraints, anal jelly, prints and paths. Six potential holts and a potential couch were recorded. An otter was sighted along the River Nith to the south of the site during a peat survey in September 2018.

7.3.43 Spraints were recorded along the majority of the larger watercourses within the site, as well as around many of the waterbodies. The waterbodies within the site seem to act as an important food resource for otter, given the number of field signs recorded within their vicinity. It is likely that otter move between the waterbodies and watercourses within the site to gain access to prey resources throughout the year.

7.3.44 Three potential holts were recorded along the River Nith and Beoch Lane, as well as a further three recorded along unnamed and unmarked watercourses and ponds close to the Pennyvenie Glen. A potential couch was recorded to the north of the protected species study area, on a watercourse leading to the Belston Loch.

Water Vole

7.3.45 Burrows which were of a size and structure suitable for supporting water vole were recorded in eight locations across the protected species study area (EIAR Volume 4: Technical Appendix 7.2 and EIAR Volume 3a: Figure 7.6). No further definitive evidence of water vole presence was recorded. Three records of potential feeding remains (clipped vegetation) were recorded, some in the vicinity of potential burrows, although these could not be confirmed as water vole.

7.3.46 There are several watercourses within the protected species study area that offer suitable habitat for supporting water vole. The slow water flow and soft bank substrate offers suitable burrowing habitat, and many are fringed with suitable riparian vegetation which offer foraging opportunities.

7.3.47 Water vole are a mobile species and are effective at dispersal. They are known to move their colonies along watercourses over time and can disperse over land and along waterways, where suitable habitat exists[28]. It is possible that water voles could move into the suitable habitats within the site, if they are present within the wider area.

Badger

7.3.48 Evidence of badger was recorded within the protected species study area. 12 setts were recorded, along with numerous badger field signs including sightings, latrines, guard hairs, prints and paths.

7.3.49 Due to the sensitivity of the data related to badgers, this has been contained within a confidential annex and figure, and the distribution of these documents should be restricted (EIAR Volume 4: Technical Appendix 7.2, Confidential Annex 7.2.4). The results are illustrated on Confidential Figure 7.2.2 (EIAR Volume 4).

7.3.50 The habitats within the study area offer suitable habitat for supporting badger. There are numerous areas which are drier and have a suitable substrate for sett-building. There are numerous foraging opportunities offered within the site, and numerous records of feeding

[28] Waterside Ecology. 2014. Water vole survey of Beinn Eighe National Nature Reserve. Scottish Natural Heritage Commissioned Report No. 541.

signs, including dug out wasps' nests, were recorded. The site offers good connectivity to the surrounding habitats and it is likely that badgers commute within the site, as well as between the site and its surrounding habitats.

Pine Marten

7.3.51 Evidence of pine marten was recorded within the protected species study area (EIAR Volume 4: Technical Appendix 7.2 and EIAR Volume 3a: Figure 7.6).

7.3.52 An incidental sighting of a pine marten crossing the coal haul road was recorded in August 2017, during an ornithology survey.

7.3.53 Records of potential pine marten scats were recorded in 16 locations across the protected species study area. There is often uncertainty associated with identifying scats produced by pine marten due to their variability in composition and similarity to those of fox. The scats recorded during the surveys were therefore considered as 'potential' and a precautionary approach is applied when discussing utilisation of the site. Given the confirmed sighting of the pine marten within the site, it is likely that at least some scat is pine marten and that the site forms part of a home range.

7.3.54 No protected features for pine marten (i.e. dens) were recorded within the protected species study area. The site offers good habitat for supporting pine marten, given the mixed age of coniferous forestry and presence of features which offer denning opportunities.

7.3.55 Pine marten have a recognised presence within the Galloway Forest, which is located approximately 10 km southwest of the site. Given the field signs recorded during the surveys, it is likely they periodically utilise the habitats within the site for foraging, commuting and sheltering.

Red Squirrel

7.3.56 Evidence of red squirrel was recorded within the protected species study area (EIAR Volume 4: Technical Appendix 7.2 and EIAR Volume 3a: Figure 7.6).

7.3.57 A red squirrel was sighted crossing the track to the west of the study area. A potential drey was recorded within the forestry plantation to the northeast of the site. There were 45 records of stripped cones recorded across the site. It is likely that at least some of these feeding signs could be attributed to the presence of red squirrel given the confirmed sighting of the species in the area.

Reptiles

7.3.58 Six sightings of common lizard (*Zootoca vivipara*) were recorded during the protected species surveys, as well as four features namely stone ruins and walls, which were recorded as having the potential to act as hibernaculum (EIAR Volume 4: Technical Appendix 7.2 and EIAR Volume 3a: Figure 7.6).

7.3.59 The site offers suitable habitat for supporting reptiles, with the sunny, open aspects offering basking opportunities and the damper areas offering foraging potential.

Amphibians

7.3.60 HSI surveys were undertaken on 274 ponds within the GCN study area. During the survey, an assessment of the Health & Safety of access for further surveys (including night surveys) was undertaken. Of the 274 ponds, two were categorised as 'excellent', 47 as 'good', 77 as 'average', 56 as 'below average', and 83 as 'poor' suitability for supporting GCN. Nine ponds were not surveyed (EIAR Volume 4: Technical Appendix 7.3).

7.3.61 73 ponds were assessed as being safe to access during daylight hours and of these, 39 were assessed as being safe to access during night surveys.

7.3.62 Given the number of ponds present, and the access restrictions associated with the site, SNH was consulted (Table 7.1) and it was agreed that surveys would be undertaken on a representative subsample of 16 ponds (see EIAR Volume 4: Technical Appendix 7.3).

7.3.63 Presence/likely absence surveys were conducted on 14 ponds (two were not accessible during night surveys) within the GCN study area. There were no GCN or GCN field signs recorded during any of the presence/likely absence surveys.

7.3.64 Palmate newts (*Lissotriton helveticus*) were recorded in all of the ponds surveyed. Common frogs (*Rana temporaria*) and common toads (*Bufo bufo*) were also recorded in several of the waterbodies that were surveyed.

7.3.65 eDNA surveys were undertaken on 22 ponds within the GCN study area, including those where presence/likely absence surveys were undertaken. Laboratory analysis results indicated GCN absence in all pond samples, apart from two which were inconclusive (EIAR Volume 4: Technical Appendix 7.3).

Bats

7.3.66 Six trees and two structures with bat roost potential were recorded during surveys. One tree was found to have high bat roost potential. Four trees showed moderate bat roost potential and one tree low potential. The two structures were assessed to have low bat roost potential. One structure is a derelict stone building with deep walls (c.a. 1 m deep), the other structure also consists of collapsed stone walls from an old building, approximately 0.5 m wide and 1.5 m high. It was noted that there were some bat boxes present in trees near House of Water (EIAR Volume 4: Technical Appendix 7.4 and EIAR Volume 3a: Figure 7.12).

7.3.67 A total of ten bat species and two genus classifications were recorded for the site (EIAR Volume 3a: Figure 7.10 to Figure 7.13, EIAR Volume 4: Technical Appendix 7.4 and Figures 7.4.1 to 7.4.21). Species recorded were soprano pipistrelle, common pipistrelle, Nathusius' pipistrelle (*Pipistrellus nathusii*), Leisler's (*Nyctalus leisleri*), noctule (*Nyctalus noctula*), Daubenton's, Natterer's (*Myotis nattereri*), whiskered (*Myotis mystacinus*), Brandt's (*Myotis brandti*), and brown long-eared. Bat registrations identified to genus level were *Nyctalus species (spp.)* and *Myotis spp*.

7.3.68 The species assemblage represents the full suite of bat species known to occur in Scotland. Although confident identification of whiskered and Brandt's bat using sound analysis is limited, whiskered bats are known to occur in low numbers in this area of Scotland and there are indications that a small population of Brandt's bats may still be present in the nearby Galloway Forest.

7.3.69 High collision risk species (defined by SNH *et al.*, 2019[29]) recorded on-site comprise five species: *Nyctalus spp.* (both noctule and Leisler's), Nathusius' pipistrelle, common pipistrelle and soprano pipistrelle (EIAR Volume 4: Technical Appendix 7.4).

7.3.70 Both the amount of activity on site and the timing of activity throughout the night indicate that maternity roosts of four high collision risk species are likely present within the nearby surrounding areas. The site may therefore represent an important habitat for the

[29] Scottish Natural Heritage, Natural England, Natural Resources Wales, Renewable UK, Scottish Power Renewables, Ecotricity Ltd, the University of Exeter & Bat Conservation Trust (BCT). (2019). Bats and Onshore Wind Turbines: Survey Assessment and Mitigation

metapopulations of Nyctalus (both Leisler's and noctule), and common and soprano pipistrelle bats in this region of Scotland.

7.3.71 All other bat species recorded are categorised as low collision risk. These species comprise: Daubenton's, Natterer's, whiskered and potentially Brandt's (*Myotis spp.*), and brown long-eared bat (EIAR Volume 4: Technical Appendix 7.4).

7.3.72 Ecobat[30] was used to gain estimates of relative bat activity recorded in 2017 and 2018 at the site. SNH *et al.* (2019) 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 a numerical way of interpreting the levels of bat activity recorded at a site across regions in Britain."* Data from the site was compared with data within a range of 100 km of the site and within 30 days of the survey date (EIAR Volume 4: Technical Appendix 7.4).

7.3.73 Table 7.9 presents the results of the Ecobat analysis for the site. The percentile is attributed to one of the following five bat activity categories as defined within SNH *et al.* (2019): Low (0-20%), Low-Moderate (20-40%), Moderate (40-60%), Moderate High (60-80%) and High (80-100%).

Table 7.9: Percentile Bat Activity – Site Level

Bat Species	2017		2018	
	Median Percentile	Maximum Percentile	Median Percentile	Maximum Percentile
Noctule	52	99	51	97
Leisler's	27	100	51	100
Nyctalus spp.	75	100	77	100
Nathusius' pipistrelle	n/a	n/a	15	58
Common pipistrelle	65	99	71	100
Soprano pipistrelle	65	100	68	100
Daubenton's	27	71	15	54
Natterer's	27	27	4	38
Whiskered	n/a	n/a	15	15
Brandt's	n/a	n/a	15	15
Myotis spp.	27	85	15	68
Brown long-eared	27	52	15	51

7.3.74 The site has been categorised as a High (level 4) Site Risk to bats due to its 'large' project size and 'moderate' habitat risk (see consideration within EIAR Volume 4: Technical Appendix 7.4).

Fish

7.3.75 The main watercourse on the site draining into the Ayr catchment is the Black/Burnock water, which flows from south to north through the site. Notable tributaries include the Head Mark Lane and the Blueboots Burn. Within these watercourses, where trout are present, they exist in variable densities ranging from very low to excellent classification. Other species recorded within these watercourses include stone loach, common minnow, European eel and a single

[30] http://www.mammal.org.uk/science-research/ecostat/

larval lamprey was also recorded (EIAR Volume 4: Technical Appendix 7.5 and EIAR Volume 3a: Figure 7.15).

7.3.76 The main watercourses on the site draining into the Nith catchment are the upper reaches of the River Nith and the Beoch Lane, both of which flow west to east, south of the House of Water mining area. Where juvenile salmon (fry and parr) were recorded, they also exist in variable densities ranging from very low to excellent classification (EIAR Volume 4: Technical Appendix 7.5). Brown trout were often also present, however were typically recorded more infrequently and in lower densities than salmon. Other species recorded within these watercourses include stone loach and common minnow.

Future Baseline

7.3.77 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 forestry or restoration of the areas of former and current surface mining.

7.3.78 This chapter considers those areas of the site which are associated with active and historic surface mining works as they would be in the future condition of the site due to foreseeable changes to the baseline conditions. The phased surface coal extraction and restoration operations at House of Water and Greenburn will continue to take place in accordance with permissions for those areas. It is anticipated that operations at House of Water are to be completed in 2022 and at Greenburn in 2019. Given that these areas are currently being worked with committed and enforceable restoration schemes to be secured over a short time frame, it is intended for the purposes of the EIAR that the baseline for each assessment in these particular areas is based on the future condition of the site following the completion of consented restoration works (as per EIAR Volume 3a: Figure 7.3). The site also contains parts of the former Chalmerston surface mine complex that does not have any real prospect of substantive restoration being undertaken. EAC took planning enforcement action in 2018 to secure limited restoration work across the Chalmerston complex that focussed on making areas safe but those works are currently held in abeyance pending the outcome of the wind project application. In the event of permission being granted it is envisaged that an alternative restoration strategy would be developed for parts of the Chalmerston Complex but, should permission be refused, then the limited restoration works from the enforcement notice would be procured by EAC. The works that were contemplated in the EAC enforcement scheme would not materially alter the assessment undertaken within this chapter but an alternative restoration approach could offer opportunities for ecological improvement

7.3.79 Future forestry baseline without the proposed development is detailed within Technical Appendix 2.11: Forestry (EIAR Volume 4).

7.3.80 All habitats outlined in Table 7.10 below are considered to be those that would exist in the future condition of the site and are prefixed within the tables below as 'Committed Restoration Plan' ('CRP') followed by their proposed habitat type. 'NR' in the table refers to areas which have been categorised as 'Naturally Regenerating'.

7.3.81 The areas of the site that are designated as part of the CRP make up an area of 259.67 ha (12.66% of the site). These areas were predominately recorded as active mine during the NVC surveys. All CRP areas within the site are located in the area of the active House of Water mine. The other CRP areas, such as those associated with Skares mine, are located out with the site boundary. Table 7.10 outlines the habitats that are included as part of the CRP and these are shown on Figure 7.3 (EIAR Volume 3a).

Table 7.10: Future Baseline Habitats within CRP Areas of the Site

CRP Habitat Type	Best-fit Phase 1 Community Description	Total Extent in the Site (ha)	% in the Site (ha)
CRP_D5: Dry Heathland / Scrub / Acidic Grassland Mosaic	D5: Dry Heath/Acid Grassland Mosaic	129.62	6.32
CRP_FP_WA: Floodplain Grassland / Wetland Area	B5: Marsh/Marshy Grassland	5.84	0.28
CRP_G1/G2: Waterbody / Watercourse	G1: Standing Water	17.68	0.86
CRP_NR_D5: Natural Regeneration (leading to Dry Heathland / Scrub / Acidic Grassland Mosaic)	D5: Dry heath/acid grassland	88.54	4.32
CRP_NR_W: Naturally Regenerating Woodland	A1.3.1: Semi-natural mixed woodland	10.20	0.50
CRP_Peat: Peaty Areas	D2: Wet dwarf shrub heath	4.37	0.21
CRP_Road: Track / Road	J4: Bare ground	3.43	0.17
TOTAL		259.67	12.66

Design Layout Considerations

7.3.82 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. This involved:

- a minimum 50 m buffer for any infrastructure or construction activity around all watercourses, except where a minimum number of watercourse crossings are required. The layout has sought to minimise the number of watercourse crossings. The use of a 50 m watercourse buffer would minimise effects on associated habitats and species;
- avoidance of deeper peatland (>1 m) and active blanket bog areas for the location of turbines and other infrastructure as far as practicable; and
- the track length and alignment has been designed to reduce the extent of track and number of watercourse crossings required, where practicable, and to use existing tracks where possible.

Summary of Sensitive Receptors

Scoped-out IEFs

7.3.83 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 MacArthur Green 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.

7.3.84 There are no designated sites present within the site. Based on the qualifying interests and distance from the site, all five designated sites within 5 km of the site have been scoped out of the assessment based on a lack of connectivity. The wildlife sites Martyr's Moss and Glaisnock Moss are not within the site and would not be affected by the proposed development, these sites are therefore also scoped out.

7.3.85 Otter and water vole were not identified as IEFs and have been scoped out of the assessment. There were numerous field signs of otter recorded across the study area, including six potential holts and a potential couch. The locations of the protected features have been considered as part of the final layout, which has been designed to avoid the features and account for appropriate disturbance buffers. Two of the potential holts and the potential couch are located along access routes, which are not considered to require any upgrading. None of the remaining four potential holts are located closer than 50 m from proposed infrastructure. It is recommended that the status of any potential holt structures located within the vicinity of infrastructure are checked during pre-construction surveys to assess their status and are monitored, where required, to determine if they are being used for breeding. SNH would be consulted on any structures being monitored for otter, and the appropriate survey licence obtained prior to the start of the monitoring. Structures would be demarcated with a 30 m disturbance buffer, which would increase by 100-200 m if the structure is used by breeding otter[31]. Where works within these buffers cannot be avoided, licences and consultation with SNH would be required. Potential water vole burrows and feeding remains (clipped vegetation) were recorded within the study area, but no further distinctive evidence was recorded. To avoid direct or indirect impacts on these receptors, a minimum 50 m buffer would be kept between turbine locations and watercourses (see Design Layout Considerations and paragraph 7.3.82 above). A Species Protection Plan (SPP) has been drafted (EIAR Volume 4: Technical Appendix 7.6) which would ensure all reasonable measures are taken to avoid disturbance to protected species or damage to their places of shelter during construction and decommissioning.

7.3.86 Pine marten were not identified as IEFs and have been scoped out of the assessment. A pine marten was sighted within the study area in 2017 and several potential scats were recorded. No pine marten dens were recorded within the study area (EIAR Volume 3a: Figure 7.6 and Volume 4: Technical Appendix 7.2). The SPP (EIAR Volume 4: Technical Appendix 7.6) would ensure appropriate measures are put in place to protect pine marten during construction activities.

7.3.87 Red squirrel has been scoped out of the assessment. A red squirrel was sighted during the surveys. A potential drey was recorded as well as numerous feeding remains (stripped cones). The nearest proposed infrastructure (stone extraction area) is approximately 1.1 km from the potential drey, and it is therefore considered unlikely that this would cause disturbance if it is in use by red squirrel[32].

7.3.88 The site is not located within or close to any proposed red squirrel strong hold sites. The closest proposed strong hold site (Fleet Basin) is 32.3 km to the south of the site. The closest grey squirrel control zone is 683 m to the east of the site[33].

7.3.89 Hair tube surveys at Benbain in 2010 and 2011 recorded no signs of red squirrel and no squirrelled cones (paragraph 7.3.4).

7.3.90 Guidance produced by the Forestry Commission states that forestry with dominant Sitka spruce (*Picea sitchensis*) has a low potential carrying capacity with an estimated 0.00 to 0.11

[31] Scottish Natural Heritage (SNH) (2017). Protected species advice for developers: Otter. Available at: https://www.nature.scot/professional-advice/planning-and-development/natural-heritage-advice-planners-and-developers/planning-and-development-protected-animals [29/11/2018].

[32] Scottish Natural Heritage (SNH) (2017). Protected species advice for developers: Red Squirrel. Available at: https://www.nature.scot/professional-advice/planning-and-development/natural-heritage-advice-planners-and-developers/planning-and-development-protected-animals [29/11/2018].

[33] https://forestry.gov.scot/forests-environment/biodiversity/conserving-scotlands-red-squirrels.

squirrels per hectare (Gurnell *et al*., 2009). Due to the woodland areas within the Forestry Study Area having a low tree species diversity (95% is Sitka spruce, mixed conifers, or other conifers and 5% is mixed broadleaves or mixed woodland (see Technical Appendix 2.11: Forestry and Figure 2.11.3)) it is highly likely that the carrying capacity of the forest is at the lower end of this range as indicated by the low frequency of sightings during field surveys. Sitka spruce tends to start producing cones at around 25 years and cone production can vary considerable between years with large crops (mast crops) only being produced between 3-5 years (Broome *et al*., 2016[34]) with virtually none being produced in between (Petty *et al*[35], 1995). Compounding the irregular cone production is the synchronous cone production of Sitka spruce across an area >600 km (Broome *et al.,* 2007[36]). Furthermore, Sitka spruce tends to shed most of the seeds from its cones in the first four months after they mature in September (Fletcher, 1992[37]), thus only providing squirrels with a source of food during the autumn. Under the proposed development's forestry restocking plan (Technical Appendix 2.11: Forestry and Figure 2.11.7), the area of Sitka spruce would reduce by 128.84 ha, mixed conifers would reduce by 15.88 ha, mixed woodland would reduce by 1.45 ha, Sitka spruce/other conifer would reduce by 37.29 ha and broadleaved woodland would increase by 3.02 ha resulting in an overall total woodland area reduction of 151.36 ha (this equates to a 5.6% reduction in stocked woodland cover or 3.8% of the Forest Plan Area). This limited area of forestry reduction represents a negligible loss of habitat which is already sub-optimal for red squirrel. There would also be an increase in advanced felling of 421.36 ha (10.5% of the Forest Plan Area) followed by decreases in felling over the rest of the plan period. This represents a negligible change to already sub-optimal habitat.

7.3.91 The SPP (see EIAR Volume 4: Technical Appendix 7.6) would ensure appropriate measures are put in place to protect red squirrels during construction activities. In addition to this, given the proximity of the adjacent grey squirrel control area, there could be opportunities for the proposed development to support control measures in the area (section 7.5).

7.3.92 Badger was not identified as an IEF and has been scoped out of the assessment. Numerous badger field signs were recorded across the study area, including 12 setts (see EIAR Volume 4: Technical Appendix 7.2, Confidential Annex 7.2.4). The locations of the badger setts were considered in the final layout of the proposed infrastructure, designed to avoid the features and account for appropriate disturbance buffers. Sett A, sett B and sett C are located in the vicinity of an existing mining access track which is not due to be upgraded for the proposed development. It is unlikely that the proposed development would cause disturbance to these setts, given that sett A and sett B are located more than 2 km, and sett C more than 600 m, from any new proposed infrastructure. These setts are therefore scoped out of the assessment.

7.3.93 Sett H to sett L are located to the south of the protected species study area. These setts are scoped out of the assessment, based on their distances to the nearest proposed infrastructure, as follows: sett H is approximately 160 m from the nearest proposed track and 274 m from the nearest proposed turbine; sett I is approximately 81 m (track) and 101 m (turbine); sett

[34] Broome, A. Summers, R.W. and Vanhala, T. (June 2016). Understanding the provision of conifer seed for woodland species. Research Note. Forestry Commission

[35] Petty, S.J., Patterson, I.J., Anderson, D.I.K., Little, B. and Davison, M. (1995). Numbers, breeding performance, and diet of the sparrowhawk Acipiter nisus and merlin Falco columbarius in relation to cone crops and seed-eating finches. For. Ecol. Manage. 79 133-146.

[36] Broome, A. Hendry, S. and Peace, A. (2007). Annual and spatial variation in coning shown by the Forest Condition Monitoring programme data for Norway spruce, Sitka spruce and Scots pine in Britain. Forestry, Vol. 80, No. 1.

[37] Fletcher, A.M. (1992). Flower, fruit and seed development and morphology. In Seed Manual for Forest Trees. A-G. Gordon (ed.). Forestry Commission Bulletin No 83. HMSO, London, 59-70

J is approximately 62 m (track) and 106 m (turbine); sett K is approximately 31 m (track) and 256 m (turbine); and sett L is approximately 41 m (track) and 150 m (turbine) from the nearest proposed infrastructure.

7.3.94 None of the proposed infrastructure is located within the badger sett disturbance buffers (30 m or 100 m if blasting/piling). If any of the infrastructure is to be microsited, checks would be undertaken prior to construction to ensure that these disturbance buffers would be avoided. If these could not be avoided, appropriate measures would need to be undertaken, such as licencing and consultation with SNH. Pre-construction checks would also be undertaken within the vicinity of the setts to determine their status and extent and to record any new setts in the area.

7.3.95 Sett D, sett E, sett F and sett G are located in the northeast of the protected species study area. Sett D, sett E and sett F were recorded incidentally during the peat surveys, in the location of a proposed stone extraction area (EIAR Volume 4: Technical Appendix 2.3: Outline Preliminary Stone Extraction Assessment, and EIAR Volume 3a: Figure 2.12d). Infrastructure within this area was then microsited away from this area to avoid this ecological constraint. The setts are scoped out of the assessment, based on their distances to the nearest proposed infrastructure, as follows: sett D is approximately 102 m from the nearest proposed track and 88 m from the nearest proposed turbine; sett E is approximately 102 m (hardstanding) and 125 m (turbine); and sett F is approximately 70 m (track) and 305 m (turbine) from the nearest proposed infrastructure. The proposed infrastructure is outwith the badger sett disturbance buffers (30 m or 100 m if blasting/piling). Pre-construction checks would be undertaken to determine the status of the setts and to determine the presence of any new setts, prior to the commencement of construction. It is likely that the location of setts within this area would provide a limitation for micrositing, but infrastructure should be microsited, if necessary, to avoid the disturbance buffers.

7.3.96 Sett G was recorded during the peat depth survey of an updated stone extraction area location (EIAR Volume 4: Technical Appendix 2.3: Preliminary Stone Extraction Assessment, and EIAR Volume 3a: Figure 2.12d), after this stone extraction area was moved from its original proposed location following discovery of sett D, sett E and sett F. Sett G is located in an area that overlaps with that of the new proposed stone extraction area in this area, meaning it is likely to be affected by the proposed development. In order to protect the sett, it would be recommended that the other three proposed stone extraction areas should be utilised as a priority. If it is necessary to utilise the stone extraction area in this location, it is recommended that a badger survey is undertaken by a suitably trained Ecological Clerk of Works (ECoW) within this area prior to construction to determine the status of the setts and the location of any new setts. Where possible, the stone extraction area should be microsited to avoid the sett.

7.3.97 It is likely that badger are using those areas of the site with a drier, more suitable substrate for sett building rather than the areas of deeper peat. Similarly, those areas most suitable or favourable to provision of a stone extraction area are likely to be those with shallower or limited peat which may correspond with those areas preferred by badger. It is therefore recommended that the badger survey results are used to inform any micrositing of the stone extraction areas (EIAR Volume 4: Technical Appendix 2.3: Preliminary Stone Extraction Assessment) to avoid any potential effects on any further setts. If it is not possible to microsite the stone extraction area, in particular in relation to sett G which would be directly impacted by the works, it could be necessary to obtain a licence from SNH to disturb/destroy the sett, depending on the location of the works and the status of the sett. As stated above, if other stone extraction areas are favoured in their use, or the relevant stone extraction area is microsited away from sett G to avoid its disturbance buffer (30 m or 100 m if blasting/piling), then it is unlikely that sett G would be subject to any disturbance or effect of the proposed development. Sett G was not considered to be a breeding sett at the time the surveys were conducted and the other sett records in the surrounding area suggest that there are other suitable alternative setts within the vicinity of the sett G that could be utilised by the social group. The sett is located in an area of coniferous plantation and although foraging habitat within the footprint of the stone extraction area would be lost during its construction, there is considered to be enough habitat of a similar type within the vicinity of the sett that could still be utilised by the social group. The SPP (see EIAR Volume 4: Technical Appendix 7.6) would ensure appropriate measures are put in place to protect badgers and their setts during construction activities.

7.3.98 Reptiles were not identified as IEFs and have been scoped out of the assessment. A number of common lizards were recorded during the surveys, and these are a mobile species which are considered to be capable of avoiding disturbance except during the hibernation period. All structures recorded as potential hibernacula are located at least 100 m from any proposed infrastructure. The recommended disturbance buffer for a potential hibernaculum is 30 m[38], making it unlikely that the proposed development would cause disturbance to any of these structures. The SPP (EIAR Volume 4: Technical Appendix 7.6) would ensure appropriate measures are put in place to protect reptiles and any hibernaculum during construction activities.

7.3.99 GCN and other amphibians were not identified as IEFs and have been scoped out of the assessment. Based on the results of the presence/likely absence surveys and eDNA sampling, the site was assessed as not currently being used by GCN (EIAR Volume 4: Technical Appendix 7.3). Palmate newts, common frogs and common toad were all recorded as present within the site. It is recommended that general best practice[39] for any works near waterbodies should be followed. Prior to any pumping of water from any waterbodies, advice from the ECoW should be sought regarding recommendations for mitigation for palmate newts (e.g. netting placed over the in-pipe of the pipe, where required) for animal welfare reasons.

7.3.100 Construction, operational, decommissioning and cumulative effects on roosting bats have been scoped-out of the assessment. One low bat roost potential structure is located 250.25 m from a turbine location (within the recommended buffer of 268 m by 17.75 m). Due to the low roost suitability and distance from turbines, this is not considered further. All other potential roost sites are greater than 300 m from turbines. None of the trees and structures identified as having bat roost potential are situated within 30 m of any infrastructure – with the closest point of non-turbine infrastructure 99 m away (EIAR Volume 4: Technical Appendix 7.4 and EIAR Volume 3a: Figure 7.12).

7.3.101 Operational and cumulative effects arising from collision mortality on low collision risk bat species are scoped out of the assessment (as per page 16 of SNH *et al*, 2009[29]). Low collision risk species are detailed in paragraph 7.3.71.

7.3.102 Fish were not identified as IEFs and are scoped out the assessment. To avoid direct or indirect impacts on these receptors, a minimum 50 m buffer distance would be kept between turbine locations and watercourses (except at watercourse crossing locations). It is also assumed that pollution prevention measures and a Construction Environmental Management Plan

[38] Catherine, C. (2018). ARG UK Advice Note 10: Reptile Survey and Mitigation Guidance for Peatland Habitats. Amphibian and Reptile Groups of the United Kingdom.

[39] English Nature (2001). Great crested newt mitigation guidelines. August 2001.

(CEMP) would be implemented during construction and operation of the proposed development to ensure no adverse impacts occur from pollution, sedimentation etc (EIAR Volume 4: Technical Appendix 2.1: Outline CEMP). In addition to these measures, it is proposed that monitoring be carried out specifically in relation to fish populations. This would be in the form of pre, during and post-construction monitoring surveys to identify whether there has been any impact on fish populations or habitats. The main method of determining fish populations would be by the use of electrofishing surveys. The surveys would be carried out at locations agreed with SNH and the relevant fisheries trust as part of a condition of consent. Post-construction surveys would be completed during the first year of operation.

7.3.103 Deer are scoped out of this assessment. Section 7.3.6 explains that deer densities are predicted to be around 7 deer per km^2 +/- 2.3 within the site and surrounding area. Strath Caulaidh (2015[40]) explains that, *"FES[41] deer management teams generally try to maintain deer densities at less than 10 deer per km^2 (and ideally closer to 5 per km^2) to help the other FES functions deliver their objectives."* FES objectives are principally to produce quality timber and to protect the environment (Strath Caulaidh, 2015[40]). For impacts on peatland habitats, which are sensitive to impacts arising from deer, densities are considered to be high if they exceed a density of ~15 deer/km^2 (Cummins *et al.* 2011)[42]. SNH (2016)[43] state that, *"As a general guide, sustainable deer densities of <3-5 deer/km^2 may be appropriate for woodland establishment and for blanket bog sites, while <8-12 deer/km^2 may be appropriate for some less susceptible moorland habitats."* Thus, given that the site is dominated by mature commercial forestry plantation with minor areas of peatland habitat it is considered that the densities are at an appropriate level.

7.3.104 Deer management would continue at the same level as it is currently undertaken throughout construction and operation of the proposed development as part of FLS's ongoing deer management plan for this area. This is expected to be sufficient to maintain an appropriate deer population. The construction impacts associated with the proposed development are considered to be sufficiently similar to ongoing commercial forestry activities within the site, and with habitat change largely limited to key-holed areas and small sections of new access track, significant effects on deer or large-scale displacement of deer from the site is unlikely. In the event, however, that deer are temporarily displaced by construction activity, the most likely scenario is that they would move elsewhere to similar habitat within the large expanse Galloway Forestry to the east and south of the site.

7.3.105 The majority of the study area is made up of non-NVC habitats such as conifer plantation, mixed plantation, clear-fell, bare ground and current and former surface mining areas (including restored, unrestored, abandoned and spoil areas) (EIAR Volume 4: Technical Appendix 7.1). These habitats are considered to be of low conservation value and are therefore scoped out of the assessment.

7.3.106 Marshy grassland, which within the study area is of the M23, M25b, M25c, M27 and MG10 NVC types and Je and Ja non-NVC types, is scoped out of the ecology assessment. M23 is a rush dominated habitat generally of low ecological value unless particularly species-rich

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[40] Strath Caulaidh Ltd (2015). Assessment of Deer Population Dynamics: Western Galloway. Report prepared for Forest Enterprise Scotland

[41] Forestry Enterprise Scotland (FES) Now changed to Forestry and Land Scotland.

[42] Cummins, R., Donnelly, D., Nolan, A., Towers, W., Chapman, S., Grieve, I. and Birnie, R.V. (2011). Peat erosion and the management of peatland habitats. Scottish Natural Heritage Commissioned Report No. 410.

[43] SNH (2016). Planning for development: What to consider and include in deer assessments and management at development sites. Version 2.

examples are found. The M23 within the site is not species-rich, often consisting of little more than a dense sward of soft rush (EIAR Volume 4: Technical Appendix 7.1). This is a very common habitat type locally, regionally and nationally and the small direct and indirect losses predicted at the site, as per Tables 7.12 and 7.13 below, are of negligible significance. M23 is considered a potentially high GWDTE[44], [45], 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 (see Chapter 9: Hydrology, Hydrogeology and Geology (EIAR Volume 2)).

7.3.107 The following additional habitats are identified as 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 and EIAR Volume 4: Technical Appendix 7.1). However, because they occupy such small areas within the site, they are species-poor examples, or any direct or indirect effects on the habitat are so minor, effects on them are scoped out of the assessment: flushes; dry dwarf shrub heath; swamp; and broadleaved woodland.

7.3.108 Dry heath/acid grassland mosaic and wet dwarf shrub heath habitats are scoped out of the assessment. These particular habitat types which are predicted to be affected by the proposed development are all located within the House of Water CRP area and as such do not currently exist, and are part of the predicted future baseline of the site (paragraphs 7.3.80 to 7.3.81 and Table 7.10 above; EIAR Volume 3a: Figure 7.3). Although some of the CRP area has been proposed to restore to dry heath/acid grassland mosaic and wet heath, it is considered unlikely that the areas will restore to these habitats. It is more likely that these areas will restore to a rush (*Juncus spp.*) dominated habitat, given the lack of a heath seed bank, and given that those areas which have already been restored or are in the process of being restored within the site are dominated by rushes. It is therefore likely that the same will occur within the CRP area. Given the small predicted habitat losses (Tables 7.12 and 7.13), and that these habitats are only proposed as being present following restoration of House of Water, it is unlikely that they would be affected by the proposed development and are not considered further within the assessment.

Scoped-in IEFs

7.3.109 The assessment of likely effects is undertaken for those 'scoped-in' IEFs of local, regional, national, and international Nature Conservation Value (see Table 7.2) that are known to be present within the site or surrounding area (as confirmed through survey results and consultations outlined above). These comprise blanket bog and wet modified bog; and high collision risk bat species.

Table 7.11: Summary of Receptor Sensitivity

IEF	Nature Conservation Value	Justification
Blanket bog and wet modified bog	Local	Blanket bog and wet modified bog within the site are scattered in small patches, mainly in the southwest of the site. Blanket bog and wet modified bog are indicated by NVC types M2, M3, M18, M19, M20, and M25 within the site. Many of these blanket bog and wet

[44] SEPA. (2017). Land Use Planning System SEPA Guidance Note 4. Planning guidance on on-shore windfarm developments. Version 3. Issue date: 11/09/2017

[45] SEPA. (2017). Land Use Planning System SEPA Guidance Note 31. Guidance on Assessing the Impacts of Windfarm Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems. Version 3. Issue date: 11/09/2017.

Table 7.11: Summary of Receptor Sensitivity		
IEF	**Nature Conservation Value**	**Justification**
		modified bog stands show evidence of degradation from forestry, although there are small islands present within the forestry which are considered to be in relatively good condition. The Carbon and Peatland Map (EIAR Volume 4: Figure 2.8.1) indicates that there are only small scattered areas of Class 1 peatland present on site. There is no Class 2 peatland. In line with the classification categories within the Carbon and Peatland Map, Class 1 peatland is considered to be a priority peatland. It is recognised that this definition is not purely for nature conservation and so not directly applicable to evaluating the Nature Conservation Value of a peatland. All of these blanket bog and wet modified bog communities (with the exception of M25 for this site) are also associated with Annex I and SBL blanket bog classifications. Blanket bog and wet modified bog within the study area is not considered to be nationally or regionally important due to its limited extent and high degree of degradation through forestry. The Nature Conservation Value is considered to be Local.
Bats	Regional for *Nyctalus* spp., and Nathusius' pipistrelle. Local for all other bat species recorded on-site.	All bats species are protected under the following legislation: ▪ The Habitats Directive 92/43/EEC; ▪ The Conservation (Natural Habitats &c.) Regulations 1994 (as amended) ("The Habitats Regulations); ▪ The Wildlife and Countryside Act 1981 (as amended); and ▪ The Nature Conservation (Scotland) Act 2004 (as amended). Recent research work has estimated through spatial modelling that between 16% and 24% of the regional populations of high-risk species (*Nyctalus* spp. and *Pipistrellus nathusii*) in southern Scotland overlaps existing and approved wind farms, with 50% of this overlap concentrated at just 10% of wind farms[46], indicating that there are very localised risk areas for *Nyctalus* spp. and Nathusius' pipistrelle. The study used spatial modelling to stratify the region (southern Scotland) according to potential impact on high risk species by highlighting areas of risk. According to this spatial modelling the predicted occurrence probability and predicted activity (a proxy for abundance) of *Nyctalus leisleri* is distributed in the south and west of the region, with *Nyctalus noctula* having a predicted occurrence probability and predicted activity to the south and east of the region, with some scattered predicted occurrence to the west. Predicted occurrence probability for Nathusius' pipistrelle is scattered around the area, indicating a likely localised distribution of this species. The predicted activity of Nathusius' pipistrelle found in the study was low (less than 0.5 bat registrations per night (brpn)) and therefore not mapped. The proposed development is within this area of predicted occurrence and predicted activity for both Nyctalus species as well as within a potential occurrence area for Nathusius' pipistrelle therefore the value has been categorised as Regional, following the precautionary principle, although reliable population estimates are currently not available.

[46] Newson, S.E., Evans, H.E., Gillings, S., Jarrett, D. & Wilson, M.W. 2017. *A survey of high risk bat species across southern Scotland*. Scottish Natural Heritage Commissioned Report No. 1008

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 the baseline studies. The assessment of effects is based on the development description outlined in Chapter 2: Development Description, 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:

- The short-term construction period would include stone extraction area creation, 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 period and 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 all 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;
- An SPP (EIAR Volume 4: Technical Appendix 7.6) would be implemented during the construction phase. The SPP details measures to safeguard protected species known to be in the area. The SPP includes surveys in advance of construction activities and good practice measures during construction. Surveys would be undertaken to check for any new protected species in the vicinity of the construction works;
- SNH *et al*., 2019[29] (section 7.1.2) requires a 50 m buffer from blade tip to feature height. To achieve this at the proposed development a minimum keyhole radius of 95.36 m is required. A 100 m keyhole is proposed and therefore this requirement would be met (EIAR Volume 4: Technical Appendix 2.11: Forestry); and
- Implementation of appropriate pollution prevention measures (particularly in relation to watercourses) and standard good practice construction environmental management would occur across the site as standard and form part of a CEMP. An Outline CEMP is included as Technical Appendix 2.1: Outline Construction Environmental Management Plan (EIAR 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 stage of the proposed development would be direct habitat loss due to the construction of the turbines and associated tracks, hardstandings, laydown areas, compounds, substation and stone extraction areas. Much of this infrastructure would be permanent, however the temporary construction compound and a proportion of each crane hardstanding would be restored during the construction period. Despite the restoration, and taking a precautionary approach, it is assumed for the assessment that the areas of land-take for this infrastructure also represent permanent losses of habitat due to the complexities in re-creating functioning habitat types such as blanket bog and wet heath.

7.4.6 There could also be some indirect habitat losses to wetland habitats due to drainage effects, and changes to the hydrological regime may also occur. For the purposes of this assessment it is assumed that wetland habitat losses due to indirect drainage effects may extend out to 10 m from infrastructure (i.e. in keeping with indirect drainage assumptions within the carbon calculator). It is expected that any indirect drainage effects would only impact wetland habitats at the site such as blanket bog, flushes & springs, wet heath and swamp. No indirect drainage effects are expected to impact or alter the quality or composition of dry habitats (e.g. acid grassland).

7.4.7 Tables 7.12 and 7.13 detail the estimated direct and indirect losses expected to occur, by habitat type, for all new infrastructure.

7.4.8 Temporary disturbance during construction has been noted out to 5 m around infrastructure. This has been included as indirect habitat loss for dry habitats in Table 7.12 and is denoted by an asterisk (*). This 5 m temporary disturbance has been discounted for the wetland habitats in Table 7.12 as this area overlaps with the 10 m indirect habitat loss buffer that is already accounted for (i.e. to prevent 'double-counting' of such effects).

7.4.9 Habitat losses due to the possible creation of up to four stone extraction areas have been calculated separately and are detailed in Table 7.13. It is not expected that all four temporary stone extraction areas would be required; however, taking a worst-case approach Table 7.13 details habitat loss if all four stone extraction areas were fully utilised. Stone extraction areas have been considered separately to permanent infrastructure as all of them are unlikely to be required and although the existing habitat would be lost, these areas would be restored. However, the habitat type which results after restoration may not be the same as the original habitat type due to changes in topographical or hydrological conditions. Indirect loss of habitats has only been considered for wet habitats, and the 10 m buffer associated with potential indirect drainage effects applied. No indirect effects have been considered for dry habitats as the temporary disturbance areas (paragraph 7.4.8) overlap with the stone extraction areas and these are already considered in the direct habitat loss impacts for stone extraction areas. Therefore, for dry habitats, the direct habitat loss and the direct plus indirect habitat loss calculations in Table 7.12 would be the same.

Table 7.12: Estimated Loss of Habitat for Permanent Infrastructure							
Phase 1 Habitat Type[47]	**Phase 1 Extent in Site (ha)**	**NVC Community or Habitat Type[48]**	**NVC Extent in Site (ha)[49]**	**Direct Habitat Loss per NVC (ha)**	**Direct & Indirect Habitat Loss per NVC (ha)[50]**	**Direct Habitat Loss as % of Phase 1 Extent in Site**	**Direct & Indirect Habitat Loss as % of Phase 1 Extent in Site**
A1.1 Broad-Leaved Woodland (dry)	13.43	W17	2.27	0.26	0.42*	2.5	6.5
A1.1 Broad-Leaved Woodland (wet)		W4, W4b	5.37	0.02	0.13		
		W7	2.81	0.06	0.32		
A1.2.2 Coniferous Plantation Woodland	874.34	CP, YCP	874.12	14.77	31.13*	1.7	3.6
A1.3 Mixed Woodland	10.20	CRP_NR_W	10.20	0.58	1.3*	5.7	12.7
A4.2 Recently Felled Coniferous Woodland	279.33	CP, CF>CP, CF>H12a, CF>H9a, CF>Je, CF>M19, CF>M19a, CF>M20, CF>M23b, CF>M25, CF>M25a, CF>M25b, CF>M6c, CF>MG9, CF>OV27, CF>U2, CF>U2b, CF>U4	277.63	2.46	5.07*	0.9	1.8
B1.1 Unimproved Acid Grassland	29.28	U2b	0.41	0.02	0.07*	4.2	9.8
		U4, U4a, U4d	27.75	1.20	2.8*		
B2.1 Unimproved Neutral Grassland (dry)	11.16	Hm	0.30	0.004	0.01*	1.2	4.4

[47] The only habitat considered an IEF at the proposed development is blanket bog/wet modified bog (embolden in respective tables). Effects on all other habitat/feature types 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.

[48] Only specific habitats, communities or features subject to habitat losses are presented within this table. Any habitats or communities not listed here are not subject to any predicted direct or indirect habitat losses.

[49] Values presented are the site coverage of the specific NVC community or sub-communities listed, they do not necessarily directly correlate to the extent of associated Phase 1 habitat types, as Phase 1 habitats can consist of multiple NVC community types.

[50] Values suffixed with '*' relate to direct losses plus the 5 m temporary disturbance buffer around infrastructure (applies to terrestrial non-wetland habitats as per paragraph **Error! Reference source not found.**). All other values in this column relate to direct losses plus a 10 m indirect drainage loss for wetland habitats.

Table 7.12: Estimated Loss of Habitat for Permanent Infrastructure							
Phase 1 Habitat Type[47]	**Phase 1 Extent in Site (ha)**	**NVC Community or Habitat Type**[48]	**NVC Extent in Site (ha)**[49]	**Direct Habitat Loss per NVC (ha)**	**Direct & Indirect Habitat Loss per NVC (ha)**[50]	**Direct Habitat Loss as % of Phase 1 Extent in Site**	**Direct & Indirect Habitat Loss as % of Phase 1 Extent in Site**
B2.1 Unimproved Neutral Grassland (wet)		MG9, MG9a	10.68	0.13	0.48		
B5 Marsh/ Marshy Grassland	123.47	CRP_FP_WA	5.84	0.04	0.21	1.8	5.9
		Ja	9.51	0.14	0.46		
		Je	53.37	1.11	3.18		
		M23a, M23b	30.99	0.27	1.31		
		M25b	21.56	0.53	1.92		
		M27	0.12	0.001	0.003		
		MG10, MG10a	1.25	0.09	0.25		
C1.1 Continuous Bracken	4.08	U20c	3.98	0.19	0.26*	4.7	6.4
C3.1 Tall Ruderal	3.10	OV27	2.91	0.02	0.06*	0.6	1.9
D1.1 Acid Dry Dwarf Shrub Heath	1.84	H12a	1.38	0.003	0.004*	0.2	0.2
D2 Wet Dwarf Shrub Heath	4.56	CRP_Peat	4.37	0.16	0.81	3.5	17.8
D5 Dry Heath/Acid Grassland Mosaic	218.16	CRP_D5, CRP_NR_D5	218.16	6.59	13.96*	3.0	6.4
E1.6.1 Blanket Bog	70.78	M18a	21.03	0.00	0.0004	0.3	1.6
		M19, M19a	36.27	0.21	1.07		
		M20, M20a, M20b	11.19	0.01	0.08		
E1.7 Wet Modified Bog	48.93	M25, M25a	48.93	0.89	2.58	1.8	5.3
E2.1 Acid / Neutral Flush	6.38	M6c, M6d	6.23	0.04	0.22	0.6	3.4
F1 Swamp	0.41	S9	0.31	0.001	0.004	0.49	2.0
		S10, S10	0.08	0.001	0.004		
		S12	0.02	0.00	0.0001		
G1 Standing Water	40.08	SW, CRP_G1/G2	40.08	0.02	0.04*	0.05	0.1
G2 Running Water	2.16	RW	2.16	0.004	0.02*	0.2	0.9

Table 7.12: Estimated Loss of Habitat for Permanent Infrastructure							
Phase 1 Habitat Type[47]	**Phase 1 Extent in Site (ha)**	**NVC Community or Habitat Type[48]**	**NVC Extent in Site (ha)[49]**	**Direct Habitat Loss per NVC (ha)**	**Direct & Indirect Habitat Loss per NVC (ha)[50]**	**Direct Habitat Loss as % of Phase 1 Extent in Site**	**Direct & Indirect Habitat Loss as % of Phase 1 Extent in Site**
I2.2 Spoil	224.84	UM, UM>CP, UM>Je, UM>OV27, UM>U4, UM>W17	223.32	5.62	10.73*	2.5	4.8
I2.3 Mine	2.77	MI	2.77	0.18	0.28*	6.5	10.1
J4 Bare Ground	79.97	BG, CRP_Road	79.97	6.05	16.45*	7.6	20.6
SITE TOTALS				41.67	95.64	2.03	4.66

Table 7.13: Estimated Loss of Habitat by Stone Extraction Areas							
Phase 1 Habitat Type[47]	**Phase 1 Extent in Site (ha)**	**NVC Community or Habitat Type[48]**	**NVC Extent in Site (ha)[49]**	**Direct Habitat Loss per NVC (ha)**	**Direct & Indirect Habitat Loss per NVC (ha)[51]**	**Direct Habitat Loss as % of Phase 1 Extent in Site**	**Direct & Indirect Habitat Loss as % of Phase 1 Extent in Site**
A1.2.2 Coniferous Plantation Woodland	874.34	CP	868.91	2.61	As per direct	0.3	As per direct
A4.2 Recently Felled Coniferous Woodland	279.33	CF, CF>Je, CF>MG9, CF>U4	180.79	2.74	As per direct	1.0	As per direct
B5 Marsh/ Marshy Grassland	123.47	Je	53.37	0.04	0.08	0.04	0.08
		M23b	25.88	0.004	0.02		
		M25b	21.56	0.00	0.001		
D5 Dry Heath/Acid Grassland Mosaic	218.16	CRP_D5, CRP_NR_D5	218.16	3.19	As per direct	1.5	As per direct
E1.6.1 Blanket Bog	70.78	M19a	23.45	0.01	0.02	0.01	0.03
E1.7 Wet Modified Bog	48.93	M25a	45.89	0.00	0.003	0	0.006
E2.1 Acid / Neutral Flush	6.38	M6c	6.07	0.00	0.01	0	0.2
G1 Standing Water	40.08	SW	17.68	0.05	As per direct	0.1	As per direct
I2.2 Spoil	224.84	UM	201.45	0.01	As per direct	0.004	As per direct

[51] As there is no 5 m temporary disturbance area associated with the stone extraction areas there is no indirect loss for 'dry' habitats. Indirect losses due to the 10 m drainage buffer effects around stone extraction areas only apply to terrestrial wetland habitats.

Table 7.13: Estimated Loss of Habitat by Stone Extraction Areas							
Phase 1 Habitat Type[47]	**Phase 1 Extent in Site (ha)**	**NVC Community or Habitat Type[48]**	**NVC Extent in Site (ha)[49]**	**Direct Habitat Loss per NVC (ha)**	**Direct & Indirect Habitat Loss per NVC (ha)[51]**	**Direct Habitat Loss as % of Phase 1 Extent in Site**	**Direct & Indirect Habitat Loss as % of Phase 1 Extent in Site**
J4 Bare Ground	79.97	BG	76.55	0.12	As per direct	0.2	As per direct
SITE TOTALS				8.77	0.43	8.85	0.43

7.4.10 The following sections assess the effect of these losses for each scoped-in IEF

7.4.11 As detailed in paragraph 7.3.100 there is limited bat roost potential within 300 m of the turbines. Consequently, there is considered to be no potential for construction, operational or decommissioning effects upon roosting bats.

Blanket Bog and Wet Modified Bog

7.4.12 Effect: Direct effects (through habitat loss occurring during construction of the proposed development) and indirect effects (through potential drying effects upon neighbouring bog habitats) occurring from the construction period into the operational period. Direct loss would occur in areas where access tracks pass through this habitat type or where infrastructure such as turbine foundations, crane pads, hardstandings, compounds etc. are sited on these habitat types. In addition, there may be indirect losses as a result of drainage around infrastructure (around 10 m from infrastructure is assumed) and disruption to hydrological flows.

7.4.13 Nature Conservation Value: As per Table 7.11 blanket bog and wet modified bog within the site is considered to be of Local Value.

7.4.14 As per Table 7.11 blanket bog is an Annex I and SBL habitat type, and the small patches in the southwest of the site are classified as Class 1 'carbon rich soils and priority peatland', and this is defined as a 'nationally' important resource for these attributes (carbon storage and priority peatland habitat). It is recognised that this definition is not purely for nature conservation and so not directly applicable to evaluating the nature conservation value of a peatland.

7.4.15 SNH guidance[52] on spatial planning emphasises "*The location of a proposal in the mapped area does not, in itself, mean that the proposal is unacceptable, or that carbon rich soils, deep peat and priority peatland habitat will be adversely affected. The quality of peatland tends to be highly variable across an application site and a detailed assessment is required to identify the actual effects of the proposal".*

7.4.16 Additionally, Scottish Planning Policy[53] explains that, "*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".*

7.4.17 Therefore, the presence of Class 1 peatland does not preclude wind farm development. The state and quality of the peatland habitat within the site has been discussed throughout this chapter and within EIAR Volume 4: Technical Appendix 7.1 and 2.8: Peat Depth Survey &

[52] SNH (2015). Spatial Planning for Onshore Wind Turbines – Natural Heritage Considerations.

[53] https://beta.gov.scot/publications/scottish-planning-policy/documents/00453827.pdf [30/11/2018].

Information to Inform an Assessment of Blanket Mire Condition. Furthermore, peat depth surveys have been carried out at the site to facilitate a detailed assessment, appropriate siting, design and mitigation (EIAR Volume 2: Chapter 9: Hydrology, Hydrogeology and Geology and EIAR Volume 4: Technical Appendices 2.8: Peat Depth Survey & Information to Inform an Assessment of Blanket Mire Condition and 2.9: Phase 2 Peat Depth and Coring Survey). Overall the blanket bog and wet modified bog in the site does not qualify as Nationally important (for instance not meeting all the criteria for selection as a SSSI[54]) nor Regionally important and thus a nature conservation value of Local is considered appropriate.

7.4.18 Conservation Status: of blanket bog as assessed in the JNCC report on blanket bog[55] is 'Bad and Declining' at the UK level. The larger, intact area of blanket bog that exists to the west of the site is considered to be in relatively good condition. However, the remaining areas of bog are degraded, largely due to the detrimental influences from commercial conifer forestry (see EIAR Volume 4: Technical Appendix 2.8: Peat Depth Survey & Information to Inform an Assessment of Blanket Mire Condition).

7.4.19 Magnitude: The UK has an estimated 2,196,736 ha of blanket bog[56] of which around 1,759,000 to 1,800,000 ha is in Scotland (approximately 23% of the land area)[57].

7.4.20 Blanket bog covers 70.78 ha (3.45%) of the site and is made up of the M18, M19 and M20 blanket mire communities.

7.4.21 Direct habitat loss for blanket bog communities is predicted to be 0.22 ha due to permanent infrastructure (M19 and M20 communities as per Table 7.12). If all stone extraction areas are utilised, then an additional 0.01 ha of blanket bog would be lost. This results in a potential total direct loss of 0.23 ha, equivalent to 0.32 % of the blanket bog resource within the site. This direct loss is a minor loss of this habitat type in the local and regional context. In line with the definitions of Spatial and Temporal Effect Magnitude (Table 7.3 and Table 7.4), given that this is less than 10% habitat loss, the magnitude of loss for blanket bog is considered to be Negligible to Low and Long Term.

7.4.22 In addition, there could be some indirect losses because of the zone of drainage around infrastructure (assumed to extend out to 10 m from infrastructure as per paragraph 7.4.11). In the unlikely scenario that all indirect drainage effects are fully realised out to 10 m in all blanket bog areas then predicted blanket bog losses increase to 1.15 ha for permanent infrastructure and 0.02 ha for stone extraction areas (Tables 7.12 and 7.13). This is a total of 1.17 ha or 1.65% of the blanket bog within the site. This is still considered to represent a minor loss locally and regionally. In line with the definition of Spatial and Temporal Effect Magnitude (Table 7.3 and Table 7.4), given that this is less than 10% habitat loss, the magnitude of loss for blanket bog is considered to be Negligible to Low and Long Term.

7.4.23 Wet modified bog covers 48.93 ha (2.4%) of the site and is made up of 3.04 ha of the M25 NVC community and 45.89 ha of M25a NVC sub-community.

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[54] Joint Nature Conservation Committee (JNCC). (2013). Guidelines for selection of biological SSSIs. http://jncc.defra.gov.uk/page-2303.

[55] Joint Nature Conservation Committee (JNCC) (2013). Third Report by the United Kingdom under Article 17 on the implementation of the Directive from January 2007 to December 2012. H7130 – Blanket bogs. URL: http://jncc.defra.gov.uk/pdf/Article17Consult_20131010/H7130_UK.pdf. [30/11/2018].

[56] Joint Nature Conservation Committee. (2007). Second Report by the UK under Article 17 on the implementation of the Habitats Directive from January 2001 to December 2006. Peterborough: JNCC. URL: www.jncc.gov.uk/article17. [30/11/2018].

[57] Scottish Natural Heritage (SNH) (2017). Blanket bog. URL: https://www.nature.scot/landscapes-habitats-and-ecosystems/habitat-types/mountains-heaths-and-bogs/blanket-bog. [30/11/2018].

7.4.24 Direct habitat loss for wet modified bog is predicted to be 0.89 ha due to permanent infrastructure (Table 7.12). No direct loss is predicted as a result of the utilisation of the stone extraction areas for wet modified bog. This results in a direct loss of 1.82 % of wet modified bog from the site.

7.4.25 Indirect losses associated with the zone of drainage around infrastructure (assumed to be 10 m from infrastructure as per paragraph 7.4.11) are predicted to be an additional 2.58 ha for permanent infrastructure and 0.003 ha for stone extraction areas. This is a total of 2.58 ha or 5.27% of the wet modified bog within the site. This is considered to represent a minor loss locally or regionally. Accounting for the definitions of Spatial and Temporal Effect Magnitude (Table 7.3 and Table 7.4), given that this is less than 10% habitat loss, the magnitude of loss for wet modified bog is Low and Long Term.

7.4.26 However, it is considered very unlikely that any indirect drainage effects would have any notable effect on the type of M25 wet modified bog present at the site or cause a change in the habitat type, because this habitat is dominated by purple moor-grass. This M25 habitat develops on more aerated peats and peaty-soils, and therefore drainage is less likely to have an effect as it favours the spread of purple moor-grass; it can persist in relatively dry habitats and is a hardy perennial. If habitat shifts are observed due to indirect drainage effects, then it may be more likely a subtle change in sub-community type from the wetter M25a cross-leaved heath sub-community to the drier M25b sweet vernal grass sub-community. Therefore, losses to wet modified bog (M25) are most likely only to be as a result of direct loss.

7.4.27 When considering the above likely direct and indirect habitat losses on blanket bog and wet modified bog, and accounting for the abundance, distribution and quality of the habitat within the site as well as the wider area, an effect magnitude of Low Spatial and Long-Term temporal is deemed appropriate.

7.4.28 Significance of Effect: Given the above consideration of Nature Conservation Value, Conservation Status and Magnitude, the effect significance is **Minor adverse** and **not significant** under the terms of the EIA Regulations.

Potential Operational Effects

Blanket Bog and Wet Modified Bog

7.4.29 All likely direct and indirect effects on blanket bog and wet modified bog have been considered in the Construction Effects section above. Indirect effects on habitats would largely occur during the operational phase as drying impacts take effect. However, for ease and clarity of assessing effects on habitats these are considered together within the construction effects section.

Bats

7.4.30 Effect: During the operational phase, there is potential for collision risk upon bat species, together with the risk that bats may be affected by barotrauma when flying in close proximity of the turbine blades. For the purposes of this assessment, the potential impacts from barotrauma are assumed to be the same as for collision risk. This is due to the lack of published empirical evidence in causes of bat fatalities around wind farms and the difficulties in determining whether bat fatalities are due to strikes (collisions) with the turbine blades or barotrauma.

7.4.31 Research work by Exeter University[58] found that most bat fatalities at UK wind farms have been common pipistrelle, soprano pipistrelle and noctule bats. In addition, single carcasses of Nathusius' pipistrelle bat and Natterer's bat have been recorded.

7.4.32 Nature Conservation Value: As detailed in Table 7.11 the Nature Conservation Value of Leisler's, noctule and Nathusius' pipistrelle bats are Regional and common and soprano pipistrelle are Local.

7.4.33 Conservation Status: The Conservation Status of each of the five high collision risk bat species found to occur within the site is summarised in Table 7.14. The low population estimate for Leisler's bats in Scotland is likely due to under-recording and an underestimate of the population occurring here.

Table 7.14: Conservation Status of Bats and Population Estimate[59]

Species	Conservation Status in the UK	Population in the UK (favourable reference population)	Population Estimate in Scotland
Leisler's bat	Favourable	28,000	250
Noctule	Favourable	50,000	250
Nathusius' pipistrelle	Unknown	At least several hundred in UK	At least several hundred in UK
Common pipistrelle	Favourable	1,390,000	352,000
Soprano pipistrelle	Favourable	774,000	198,000

7.4.34 Evaluating the vulnerability of a bat population to wind farms is based on three factors: activity level recorded, population vulnerability (determined by collision risk of species and population size) and site risk level. These factors are used to generate an overall risk assessment score per species of either Low (0-4), Moderate (5-12) or High (15-25) (SNH et al. 2019[29]). EIAR Volume 4: Technical Appendix 7.4 presents the results of this risk assessment for each high collision risk species.

7.4.35 Magnitude - *Nyctalus spp.* (Leisler's and noctule) and Nathusius' pipistrelle:

7.4.36 EIAR Volume 4: Technical Appendix 7.4 and Figures 7.4.5 to 7.4.21 provide the detailed results from the Ecobat analysis. A summary is provided below to inform the assessment.

7.4.37 Average Site Activity Level 2017: The following activity levels (Median and Maximum percentiles) were recorded for the following bat species:

- Nyctalus: Moderate-High to High.
- Leisler's: Low-Moderate to High.
- Noctule: Moderate to High.

7.4.38 Average Site Activity Level 2018: The following activity levels were recorded for the following bat species:

- Nyctalus: Moderate-High to High.
- Leisler's: Moderate to High.
- Noctule: Moderate to High.

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[58] DEFRA (2016). Understanding the Risk to European Protected Species (bats) at Onshore Wind Turbine Sites to inform Risk Management. University of Exeter.

[59] JNCC (2013). Individual Species Reports - 3rd UK Habitats Directive Reporting 2013. URL: http://jncc.defra.gov.uk/page-6391. [December 2018].

- Nathusius' pipistrelle: Low to Moderate.

7.4.39 Activity between years is very similar between species. The only difference between years is that Leisler's activity was slightly higher in 2018 and Nathusius' pipistrelle was absent in 2017 but was recorded at low levels in 2018.

7.4.40 Population Vulnerability: Due to a 'high' collision risk and a 'rarest' population abundance rating, these three bat species are all classified as having 'high population vulnerability'.

7.4.41 Site Risk Level: The site has been categorised as a High (level 4) Site Risk to bats due to its 'large' project size and 'moderate' habitat risk (see consideration within EIAR Volume 4: Technical Appendix 7.4).

7.4.42 Risk Assessment Score 2017: The following risk assessment score for Median and Maximum percentiles was obtained for the undernoted bat species:

- Nyctalus: High (15) to High (18).
- Leisler's: Medium (8) to High (18).
- Noctule: Medium (12) to High (18).

7.4.43 Risk Assessment Score 2018: The following risk assessment score for Median and Maximum percentiles was obtained for the undernoted bat species:

- Nyctalus: High (15) to High (18).
- Leisler's: Medium (12) to High (18).
- Noctule: Medium (12) to High (18).
- Nathusius' pipistrelle: Low (4) to Medium (12).

7.4.44 Although no bat roosts were found within the site, the bat activity data for the site suggests that maternity roosts of Nyctalus and Leisler's bats may be in relatively close proximity to the site (EIAR Volume 4: Technical Appendix 7.4).

7.4.45 The risk level varied between May and October in both 2017 and 2018 with June, July and August being the months with greatest bat activity across the site (EIAR Volume 3a: Figure 7.14, EIAR Volume 4: Technical Appendix 7.4 and Figures 7.4.4 to 7.4.10 and 7.4.15 to 7.4.18).

7.4.46 Significance of Effect – *Nyctalus spp.* and Nathusius' pipistrelle:

7.4.47 Given the above consideration of Nature Conservation Value, Conservation Status and Magnitude, the effect significance of collision risk on Nyctalus bats is **Moderate** to **Major adverse** and **significant** under the terms of the EIA Regulations.

7.4.48 Given the above consideration of Nature Conservation Value, Conservation Status and Magnitude, the effect significance of collision risk on Nathusius' pipistrelle is **Minor adverse** and **not significant** under the terms of the EIA Regulations.

7.4.49 Magnitude – Common and soprano pipistrelle:

7.4.50 EIAR Volume 4: Technical Appendix 7.4 and Figures 7.4.5 to 7.4.21 provide the detailed results from the Ecobat analysis. A summary is provided below to inform the assessment.

7.4.51 Average Site Activity Level 2017: The following activity levels were recorded for these bat species:

- Common pipistrelle: Moderate-High to High.
- Soprano pipistrelle: Moderate-High to High.

7.4.52 Average Site Activity Level 2018: The following activity levels were recorded for these bat species:

- Common pipistrelle: Moderate-High to High.
- Soprano pipistrelle: Moderate-High to High.

7.4.53 Population Vulnerability: Due to a 'high' collision risk and a 'common' population abundance rating, these two bat species are all classified as having 'medium population vulnerability'.

7.4.54 Site Risk Level: The site has been categorised as a High (level 4) Site Risk to bats due to its 'large' project size and 'moderate' habitat risk (see consideration within EIAR Volume 4: Technical Appendix 7.4).

7.4.55 Risk Assessment Score 2017: The following risk assessment score for Median and Maximum percentiles was obtained for the undernoted bat species.

- Common pipistrelle: High (15) to High (18).
- Soprano pipistrelle: High (15) to High (18).

7.4.56 Risk Assessment Score 2018: The following risk assessment score for Median and Maximum percentiles was obtained for the undernoted bat species:

- Common pipistrelle: High (15) to High (18).
- Soprano pipistrelle: High (15) to High (18).

7.4.57 Although no bat roosts were found within the site, the bat activity data for the site suggests that maternity roosts of soprano and common pipistrelle bats may be in relatively close proximity to the site (EIAR Volume 4: Technical Appendix 7.4).

7.4.58 The risk level varied between May and October in both 2017 and 2018 with June, July and August being the months with greatest bat activity across the site (EIAR Volume 4: Technical Appendix 7.4 and Figures 7.4.5 to 7.4.21).

7.4.59 Significance of Effect – Common and soprano pipistrelle: Given the above consideration of Nature Conservation Value, Conservation Status and Magnitude, the effect significance of collision risk on common and soprano pipistrelle bats is **Moderate adverse** and **significant** in the context of the EIA Regulations.

Potential Decommissioning Effects

7.4.60 Decommissioning effects, because of the distant timeframe until their occurrence (typically >30 years) are difficult to predict with confidence. They are however considered for the purpose of this assessment to be similar to (or less than) those of construction effects in nature and are likely to be of shorter duration. The significance of effects predicted for IEFs in the construction effects section above are therefore considered appropriately precautionary for assessing decommissioning effects. As detailed in paragraph 7.4.10, there is considered to be no potential decommissioning effects for bats.

7.4.61 With respect to blanket bog and wet modified bog (i.e. the only habitat based IEF assessed at the site as per the construction effects section above), decommissioning of the proposed development 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 would not lead to any further direct or indirect habitat losses, rather, it is predicted that due to restoration of upland habitats such as wet modified bog in these areas, there would be a net positive effect. Therefore, the effect significance is **Minor beneficial** and **not significant** under the terms of the EIA Regulations.

Potential Cumulative Construction and Operational Effects

7.4.62 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.

7.4.63 Wind farm projects at scoping stage have been scoped out of the cumulative assessment because they generally do not have sufficient information on potential impacts to be included, as the baseline survey period is ongoing, or results have not been published. Projects that have been refused or withdrawn have also been scoped out.

7.4.64 Small projects with three or fewer turbines have also been excluded from the cumulative assessment as often these projects are not subject to the same level of detail of assessment, and so there are no directly comparable data. Due to the small scale of such projects, effects are likely to be negligible on the IEFs assessed here.

Blanket Bog and Wet Modified Bog

7.4.65 Blanket bog and wet modified bog have been scoped-out of the cumulative assessment as it is considered unlikely that any significant ecological cumulative effects at a regional level would arise as a consequence of the proposed development adding to habitat loss associated with other projects. This is due to the negligible/low magnitude of loss of blanket bog and wet modified bog habitat due to the proposed development, as outlined above (Tables 7.12 and 7.13). There are limited areas of relatively good condition bog within the site, with the majority having been degraded by forestry. No significant cumulative effects are predicted for blanket bog and wet modified bog (**Minor adverse** and **not significant**).

Bats

7.4.66 Bats are most likely to be affected by cumulative wind farm development because of the distances travelled by some species of foraging bat and the cumulative risks to bat populations as a result of barotrauma and/or collision with wind turbines during operation.

7.4.67 The implementation of standard good practice measures regarding buffer distances of turbines from forestry edges to minimise impacts on commuting and foraging bats, reduces the extent of cumulative impacts (paragraph 7.4.2).

7.4.68 Leisler’s, noctule, (*Nyctalus spp.*), Nathusius’ pipistrelle: With limited information available on the activity levels of Nyctalus bat species and Nathusius’ pipistrelle at wind farms within the vicinity of the proposed development, information from the published study report on high risk bat species across southern Scotland[60] has been taken into account to provide additional data for a cumulative assessment.

7.4.69 The study examines the likelihood of Nyctalus species and Nathusius’ pipistrelle being present at wind farms in the region, using spatial modelling. The ranges occupied by the three species in southern Scotland were found to be restricted with little overlap. For both noctule and Leisler’s, occupancy and activity patterns were found to be particularly aggregated, indicating that smaller areas where the species are found may be of particular importance for the overall

[60] Newson, S.E., Evans, H.E., Gillings, S., Jarrett, D. & Wilson, M.W. (2017). A survey of high risk bat species across southern Scotland. Scottish Natural Heritage Commissioned Report No. 1008.

population, whereas Nathusius' pipistrelle was recorded dispersed across the area covered by the study with some localised clustering in the southwest and north. It was estimated that 16% to 24% of the populations of these three species are exposed to existing and approved wind farms. An analysis of spatial patterns of distribution and activity was undertaken to produce a map of core areas across the three species, where they are likely to be at highest risk from wind farm development, with the proposed development falling within the core area.

7.4.70 As detailed in Chapter 8 Ornithology (EIAR Volume 2) there are a total of 78 wind farms (installed, approved, in planning and with more than three turbines) within Natural Heritage Zone 19.

7.4.71 Information from Newson *et al.* (2017)[60] suggests that the cumulative impacts on Leisler's and noctule (although noctule appears to be a lower concern) could be high, due to the apparent aggregated distribution of the Nyctalus species within an area with numerous wind farm developments. Furthermore, the populations of the two species (within Scotland) are likely confined to southern Scotland, therefore the area of the proposed development represents the northern population distribution edge within the UK.

7.4.72 Taking into account the Medium to High Risk Assessment Scores for both Nyctalus species at the proposed development (see paragraph 7.4.41 and 7.4.42) and the currently available data on Leisler's and noctule discussed above, the spatial and temporal magnitudes of cumulative effects on the populations of these species across the site are considered to be Moderate Spatial and Long-Term Temporal. Significant cumulative effects are predicted for Leisler's and Noctule - **Moderate adverse** and **significant** in the context of the EIA Regulations.

7.4.73 The dispersed spatial pattern of distribution and activity of Nathusius' pipistrelle found in the study by Newson et al. (2017)[60] indicates that cumulative impacts from wind farm developments, even where lower activity rates occur, could weight highly in regard to potential cumulative effects on this species. Although there is very little data available on the population of this species in the UK, the overall distribution of this species within Scotland may reach further north and it is unlikely that the area around the proposed development represents a population distribution edge for the UK.

7.4.74 Given the Low to Medium Risk Assessment Score at the proposed development in 2018 and irregular activity of Nathusius' pipistrelle on the site (the species was not recorded in 2017) cumulative effects are considered to be Negligible Spatial and Long-Term Temporal. No significant cumulative effects are predicted for Nathusius' pipistrelle (**Negligible** and **not significant** in the context of the EIA Regulations).

7.4.75 Common pipistrelle and soprano pipistrelle: Both common and soprano pipistrelle are widespread in southern Scotland, with distributions of these species reaching into northern parts of Scotland.

7.4.76 Although the study Newson et al. (2017)[60] focussed on *Nyctalus spp*. and Nathusius' pipistrelle, data presented on common and soprano pipistrelle show that the two species are likely to occur throughout southern Scotland with predicted high activity rates.

7.4.77 As detailed in Chapter 8: Ornithology (EIAR Volume 2) there are a total of 78 wind farms (installed, approved, in planning and with more than three turbines) within Natural Heritage Zone 19.

7.4.78 Taking into account the High Risk Assessment Score at the proposed development for both species and considering the distribution and applying the precautionary principle, cumulative effects are considered to be Moderate Spatial and Long-Term Temporal.

7.4.79 Significant cumulative effects are predicted for common pipistrelle and soprano pipistrelle bats – **Moderate adverse** and **significant** in the context of the EIA Regulations.

7.5 Mitigation

Mitigation during Construction

7.5.1 There is no mitigation required during construction in addition to the standard in-built mitigation (50 m watercourse buffer) 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, the presence of an ECoW and implementation of appropriate pollution prevention and standard good practice construction environmental management as part of a CEMP. An Outline CEMP is included as Technical Appendix 2.1: Outline Construction Environmental Management Plan; 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 would be site specific and adapted to the local ground conditions.

Bats

7.5.2 The SPP (EIAR Volume 4: Technical Appendix 7.6) should be in place prior to the commencement of construction on site in order to protect any bats or their roosts found within the site.

7.5.3 The implementation of standard good practice measures regarding buffer distances of turbines from forestry edges to minimise impacts on commuting and foraging bats, minimises likelihood of cumulative impacts (paragraph 7.4.2).

Mitigation during Operation

7.5.4 An Outline Habitat Management Plan (EIAR Volume 3a: Figure 7.16 and EIAR Volume 4: Technical Appendix 7.7) has been prepared which details measures to enhance the areas of blanket bog in the southwest of the site. This includes areas that are identified as Class 1 priority peatland areas.

7.5.5 In total, 50.29 ha would be restored from commercial forestry to blanket bog habitat and 30.07 ha would be managed to enhance existing blanket bog. With the total (direct + indirect) loss of blanket bog and wet modified bog estimated at 3.75 ha (Table 7.13), this proposed management covers an area over 21 times greater than the total loss of bog habitat.

7.5.6 In addition to the blanket bog enhancement detailed above, it is proposed to restore 35 ha of unrestored surface mine to marshy/acid grassland mosaic using peat excavated from the construction of the proposed development. The Draft Peat Management Plan (EIAR Volume 4: Technical Appendix 2.5) outlines how that peat would be recovered, managed and reused within the site. This includes approximately 175,000 m^3 of the peat being spread across unrestored previous surface mine areas of the site, in order to form a soil horizon and improve the ecological value of these areas. The re-use of peat in this way has the potential to see 35 ha of unrestored and derelict land being restored as part of the proposed development with the precise locations of the restoration to be secured through the final Peat Management Plan as part of a planning condition.

7.5.7 To reduce effects on Leisler’s, noctule, common and soprano pipistrelle bats to a non-significant level, a Bat Mitigation and Monitoring Plan (BMMP) would be developed and agreed with SNH and East Ayrshire Council prior to construction of the proposed development. The BMMP would include and consider the following measures:

- Reduced rotation speed whilst idling: SNH *et al.* (2019)[29] recommends this as a best practice measure. The guidance notes that, *"The reduction in speed resulting from feathering compared with normal idling may reduce fatality rates by up to 50%".* Given the known activity levels on site this measure would be put in place from the start of the operational period of the proposed development.
- Post-construction Monitoring Programme to refine mitigation: This would involve a bat activity monitoring programme combined with high resolution weather data, and carcass searches. This monitoring would continue for a minimum of three years. After the first year, the information could be used to inform the development of a detailed curtailment plan if required. If implemented, the curtailment plan would be monitored for a further three years to establish its effectiveness and any changes in activity created by surrounding habitat change associated with forestry operations.
- Curtailment: Curtailment would be implemented from Year 2 of operation if the results of the first year of post-construction monitoring conclude that further *measures are required to reduce the risk to bats. As detailed in SNH et al. (2019)[29] "this involves raising the cut-in speed with associated loss of power generation in combination with reducing the blade rotation below the cut-in speed".* This should be considered where reduced rotation speed whilst idling does not provide sufficient reduction in risk to bats. Effective and efficient curtailment plans require high resolution information on bat activity combined with detailed weather data on rainfall and wind speed plus information from carcass searches. This information allows curtailment to focus on specific times and dates corresponding with periods of high bat activity.

Mitigation during Decommissioning

7.5.8 Mitigation measures are likely to be similar to those outlined for the construction phase (outlined in paragraph 7.5.1).

7.6 Assessment of Residual Effects

7.6.1 Although no unmitigated significant effects were predicted for blanket bog or wet modified bog, the inclusion of the Outline Habitat Management Plan (EIAR Volume 3a: Figure 7.16 and EIAR Volume 4: Technical Appendix 7.7) would further reduce the likelihood of any adverse effects. Taking into account the proposed enhancement measures the residual significance of construction effects on blanket bog are considered to improve to **Minor-Moderate beneficial** and **not significant**.

7.6.2 The inclusion of the proposed BMMP would reduce the significance of effects to **not significant** for all bat species.

7.6.3 Residual effects on Leisler's, noctule and Nathusius' pipistrelle bats reduce to **Minor adverse** and **not significant**.

7.6.4 Residual effects on common and soprano pipistrelle bats reduce to **Minor adverse** and **not significant**.

7.6.5 Table 7.15 below summarises the significance of effect for each receptor and the residual significance after mitigation measures are considered.

Table 7. 15: Summary of Residual Effects			
Predicted Effect	**Significance**	**Mitigation**	**Significance of Residual Effect**
Construction & Decommissioning			
Blanket bog/wet modified bog	Not significant.	It is assumed pollution prevention measures, best practice construction methods and a CEMP incorporating relevant guidance would be agreed with stakeholders prior to construction. An ECoW would oversee the construction process. Longer term enhancement is proposed through an Outline Habitat Management plan (EIAR Volume 3a: Figure 7.16 and EIAR Volume 4: Technical Appendix 7.7).	Not significant.
Operational			
Bat species: *Nyctalus spp.*	Significant.	As detailed in Section 7.5 Mitigation, with measures including a BMMP and provision of a SPP.	Not significant.
Bat species: Nathusius' pipistrelle	Not Significant.	As detailed in Section 7.5 Mitigation, with measures including a BMMP and provision of a SPP.	Not significant.
Bat species: Common and soprano pipistrelle	Significant.	As detailed in Section 7.5 Mitigation, with measures including a BMMP and provision of a SPP.	Not significant.

Residual Cumulative Construction Effects

7.6.6 Blanket bog and wet modified bog have been scoped out of the residual cumulative construction assessment given that no significant cumulative effects are predicted for this feature (paragraph 7.4.64).

Residual Cumulative Operational Effects

7.6.7 Residual cumulative operational effects of the proposed development on Leisler's, noctule, common and soprano pipistrelle bat species are considered to be **Negligible** and **not significant** under the EIA Regulations when accounting for the mitigation outlined in paragraph 7.5.7.

7.7 Monitoring

7.7.1 Bat monitoring is proposed during the operation of the proposed development as part of the BMMP (Paragraph 7.5.7).

7.7.2 Bog habitat and deer impact monitoring is proposed as part of the outline Habitat Management Plan for the proposed development (EIAR Volume 3a: Figure 7.16 and EIAR Volume 4: Technical Appendix 7.7).

7.7.3 Fisheries monitoring (pre, during and post- construction) is proposed to identify any impacts on fish populations or habitats by the proposed development (paragraph 7.3.102). The main method of determining fish populations would be electrofishing surveys. The surveys would be carried out at locations to be agreed with SNH and the relevant fisheries trust as part of a condition of consent. Post- construction surveys would be completed during the first year of operation.

7.8 Summary

7.8.1 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[61].

7.8.2 It was possible to scope out most species and habitats recorded in the 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 effects.

7.8.3 Potential construction and operational effects on blanket bog and wet modified bog were assessed. The main effect being direct and indirect habitat loss due to land take for infrastructure and associated hydrological disturbance. Habitat losses would be Minor and not significant. No significant effects are predicted.

7.8.4 An Outline Habitat Management Plan would be implemented to enhance blanket bog and wet modified bog communities that have previously been degraded by commercial forestry plantation. This is predicted to deliver a net benefit to this ecological feature.

7.8.5 Potential operational (collision risk) effects on bats were assessed. Moderate-Major significant effects on Leisler's, noctule and Moderate significant effects on common and soprano pipistrelle bat species were predicted given their high population vulnerability, high collision risk and high risk levels on-site.

7.8.6 A BMMP would be developed to mitigate the predicted significant effect on bats as a result of collision. This plan would include: reduced rotation speed whilst idling as a standard best practice approach and a detailed monitoring plan to inform a turbine curtailment plan if required. This mitigation would reduce the predicted operational effects to not significant for the other bats recorded on the site.

7.8.7 No further specific construction mitigation is proposed in addition to the in-built mitigation that is already proposed within this chapter (e.g. CEMP, SPP, presence of an ECoW) to be implemented as standard, as described above.

7.8.8 No residual adverse significant effects on any IEFs are predicted. Table 7.16 below summarises the predicted effects of the proposed development on the IEFs assessed.

Table 7.16: Summary of Potential Significant Effects of the Proposed Development

Likely Significant Effect	Mitigation Proposed	Means of Implementation	Outcome/Residual Effect
Construction & Decommissioning			

[61] CIEEM (2018). Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (3rd Edition).

Table 7.16: Summary of Potential Significant Effects of the Proposed Development			
Likely Significant Effect	**Mitigation Proposed**	**Means of Implementation**	**Outcome/Residual Effect**
Blanket bog and wet modified bog: direct loss of habitat and indirect loss from drainage (this also includes operational effects).	It is assumed pollution prevention measures, best practice construction methods and a CEMP (EIAR Volume 4: Technical Appendix 2.1: Outline Construction Environmental Management Plan) incorporating relevant guidance would be agreed with stakeholders prior to construction. An ECoW would oversee the construction process. The Habitat Management Plan would deliver net benefits for blanket bog over the life of the proposed development.	The provision of a CEMP would be required as a condition of consent. An ECoW would be required as a condition of consent. The Outline Habitat Management Plan (EIAR Volume 4: Technical Appendix 7.7) would be finalised and delivered as a condition of consent.	Not significant.
Bat species: all species.	As detailed in Section 7.5 Mitigation and information contained within the SPP (EIAR Volume 4: Technical Appendix 7.6).	The SPP would be delivered as a condition of consent.	Not significant.
Operation			
Collision risk for *Nyctalus spp.*, and Nathusius' pipistrelle.	Mitigation measures as outlined in Section 7.5, including a BMMP.	BMMP would be implemented via a condition of consent.	Not significant.
Collision risk for, common and soprano pipistrelle.	Mitigation measures outlined in Section 7.5 including a BMMP.	BMMP would be implemented via a condition of consent.	Not significant.
Cumulative Construction			
Blanket bog and wet modified bog: direct loss of habitat and indirect loss from drainage (also includes cumulative operational effects).	The Habitat Management Plan would deliver net benefits for blanket bog and wet modified bog over the lifetime of the proposed development.	The Outline Habitat Management Plan (EIAR Volume 4: Technical Appendix 7.7) would be finalised and delivered as a condition of consent.	Not significant.
Cumulative Operation			
Collision risk for *Nyctalus spp.*, common and soprano pipistrelle.	Bat Mitigation and Monitoring Plan (BMMP) (measures are outlined in Section 7.5, Chapter 7: Ecology). Mitigation measures as outlined in Section 7.5, such as curtailment of turbines within the vicinity of locations that recorded high activity levels.	BMMP would be implemented via a condition of consent. Turbine curtailment if required would be implemented via a condition of consent.	Not significant.

7.9 Abbreviations

Abbreviation	Expanded Term
brpn	Bat registrations per night
CEMP	Construction Environmental Management Plan
CIEEM	Chartered Institute of Ecology and Environmental Management
CRP	Committed Restoration Plan
EAC	East Ayrshire Council
EIA	Environmental Impact Assessment
GCN	Great Crested Newt
GWDTE	Groundwater Dependent Terrestrial Ecosystems
ha	Hectare
HSI	Habitat Suitability Index
IEF	Important Ecological Feature
JNCC	Joint Nature Conservancy Council
LBAP	Local Biodiversity Action Plan
LNR	Local Nature Reserve
NBN	National Biodiversity Network
NR	Naturally regenerating
NVC	National Vegetation Classification
HMP	Habitat Management Plan
SAC	Special Area of Conservation
SBL	Scottish Biodiversity List
SEPA	Scottish Environment Protection Agency
SNH	Scottish Natural Heritage
SPA	Special Protection Area
spp.	Species
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 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;
- assess 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.

8.1.2 The assessment has been carried out by David MacArthur of MacArthur Green (MG), who holds undergraduate and postgraduate degrees in relevant subjects, has over 20 years' experience in professional ecology, has extensive professional ornithological impact assessment knowledge and survey experience, and holds professional membership of the Chartered Institute of Ecology and Environmental Management (CIEEM). A copy of his CV is included in Technical Appendix 1.2 (EIAR Volume 4).

8.1.3 Effects on habitats and non-avian fauna are addressed separately in EIAR Volume 2: Chapter 7: Ecology.

8.1.4 This chapter is supported by the following figures (EIAR Volume 3a), technical appendices and technical appendix figures (EIAR Volume 4):

- Figure 8.1 Site Boundary, 2016/2017 and 2017 Survey Areas and EIA Study Areas;
- Figure 8.2 Site Boundary, 2017/2018 and 2018 Survey Areas and EIA Study Areas;
- Figure 8.3 Vantage Points and Viewsheds: September 2016 to September 2017;
- Figure 8.4 Vantage Points and Viewsheds: October 2017 to August 2018;
- Figure 8.5 Ornithological Designated Sites within 20 km;
- Figure 8.6 Ornithological Cumulative Impact Assessment: Wind Farms Considered;
- Technical Appendix 8.1: Ornithology:
  - Annex A: Ornithological Legal Protection;
  - Annex B: Ornithological Survey Methodology;
  - Annex C: Ornithological Survey Effort and General Information;
  - Annex D: Ornithological Survey Results;
  - Annex E: Collision Risk Assessments; and
  - Annex F: Golden Plover Population Model.
  - Figure 8.1.1 Site Boundary, 2016/2017 and 2017 Survey Areas and EIA Study Areas;
  - Figure 8.1.2 Site Boundary, 2017/2018 and 2018 Survey Areas and EIA Study Areas;
  - Figure 8.1.3 Vantage Points and Viewsheds: September 2016 to September 2017;
  - Figure 8.1.4 Vantage Points and Viewsheds: October 2017 to August 2018;

  - Figure 8.1.5 Flight Activity: Barn Owl, Golden Eagle and Merlin;
  - Figure 8.1.6 Flight Activity: Black Grouse;
  - Figure 8.1.7 Flight Activity: Curlew;
  - Figure 8.1.8 Flight Activity: Dotterel;
  - Figure 8.1.9 Flight Activity: Golden Plover;
  - Figure 8.1.10 Flight Activity: Goldeneye and Whooper Swan;
  - Figure 8.1.11 Flight Activity: Goshawk;
  - Figure 8.1.12 Flight Activity: Greylag Goose;
  - Figure 8.1.13 Flight Activity: Hen Harrier;
  - Figure 8.1.14 Flight Activity: Herring Gull;
  - Figure 8.1.15 Flight Activity: Lapwing;
  - Figure 8.1.16 Flight Activity: Osprey;
  - Figure 8.1.17 Flight Activity: Oystercatcher;
  - Figure 8.1.18 Flight Activity: Peregrine Falcon;
  - Figure 8.1.19 Flight Activity: Pink-footed Goose;
  - Figure 8.1.20 Flight Activity: Red Kite and Short-eared Owl;
  - Figure 8.1.21 Flight Activity: Ringer Plover;
  - Figure 8.1.22 Flight Activity: Ruff;
  - Figure 8.1.23 Flight Activity: Woodcock;
  - Figure 8.1.24 Wader Activity: 2017;
  - Figure 8.1.25 Wader Activity: 2018;
  - Figure 8.1.26 Winter Bird Activity: 2016/2017;
  - Figure 8.1.27 Winter Bird Activity: 2017/2018;
  - Figure 8.1.28 Raptor Activity 2017 and 2018; and
  - Figure 8.1.29 Black Grouse Lek Locations and Activity: 2017 to 2018.
- Confidential Technical Appendix 8.2: Confidential Ornithology; and
  - Confidential Figure 8.2.1 Raptor Nest Locations: 2017 and 2018.

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 assessment concentrates on the effects of construction, operation and decommissioning of the proposed development upon those ornithological features identified during the review of desk-based information and field surveys (the extents of the study areas are set out in 8.3 Baseline Conditions below). Effects upon the following features are assessed:

- Direct habitat loss for birds through construction of the proposed infrastructure.
- Displacement of birds through indirect loss of habitat where birds avoid the proposed development and its surrounding area due to construction activity, turbine operation and maintenance, and visitor disturbance. Displacement can also include barrier effects in which birds are deterred from using normal routes to feeding or roosting grounds.

- Habitat modification due to change in land cover (e.g. deforestation or effects on hydrology), and consequent effects on bird populations.
- Death or injury of birds through collision with turbine blades, overhead wires (if any), anemometer masts, or fences (if any) associated with the proposed development.

8.2.2 The chapter assesses cumulative effects as arising from the addition of the proposed development to other cumulative developments, which are the subject of a valid planning application. Operational, under construction, consented and EIA application stage developments are considered as part of the baseline. Developments close to the end of their operational life will be included as part of the baseline to present 'worst case scenario'.

8.2.3 The assessment is based on the proposed development as described in Chapter 2: Development Description (EIAR Volume 2).

8.2.4 The scope of the assessment has been informed by consultation responses summarised in Table 8.1 and the following legislation, guidelines and policies:

- Chartered Institute of Ecology and Environmental Management (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine, 3rd edition. CIEEM, Winchester;
- Circular 1/2017: The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017;
- Directive 2009/147/EC on the Conservation of Wild Birds (Birds Directive);
- Directive 92/43/EEC on Conservation of Natural Habitats and of Wild Fauna and Flora (as amended) (Habitats Directive);
- Eaton, M., Aebischer, N., Brown, A., Hearn, R., Lock, L., Musgrove, A., Noble, D., Stroud, D. and Gregory, R. (2015[1]). Birds of Conservation Concern 4: The population status of birds in the UK, Channel Islands and Isle of Man. British Birds 108: 708-746;
- Environmental Impact Assessment Directive 85/337/EEC (as amended);
- Policy Advice Note PAN 1/2013 – Environmental Impact Assessment (Scottish Government 2013);
- Scottish Natural Heritage (SNH, 2000) Windfarms and birds: calculating a theoretical collision risk assuming no avoidance action;
- SNH (2009) Environmental Statements and Annexes of Environmentally Sensitive Bird Information; Guidance for Developers, Consultants and Consultees;
- SNH (2011) Dealing with Construction and Breeding Birds;
- SNH (2012) Post-construction Management of Windfarms on Clear-felled Forestry Sites; Reducing the Collision Risk for Hen Harrier, Merlin and Short-eared Owl from Special Protection Areas;
- SNH (2013a) Avoidance Rates for Wintering Species of Geese In Scotland At Onshore Wind Farms;
- SNH (2013b) Geese and wind farms in Scotland: new information;
- SNH (2014, revised March 2017) Recommended Bird Survey Methods to Inform Impact Assessment of Onshore Wind Farms;
- SNH (2016) Assessing connectivity with Special Protection Areas (SPAs);

1 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: 708-746.2 SNH (2014, revised March 2017) Recommended Bird Survey Methods to Inform Impact Assessment of Onshore Wind Farms.

- SNH (2018a) Assessing Significance of Impacts from Onshore Wind Farms Out-with Designated Areas;
- SNH (2018b) Assessing the cumulative impacts of onshore wind farms on birds;
- 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;
- The Ayrshire Local Biodiversity Action Plan;
- The Nature Conservation (Scotland) Act 2004 (as amended);
- The Scottish Biodiversity List;
- The Wildlife and Countryside Act 1981 (as amended); and
- Wind Energy Developments and Natura 2000 (EC 2011).

Consultation

8.2.5 Table 8.1 summarises the consultation responses received relating to ornithology and provides information on where and/or how they have been addressed in this assessment.

8.2.6 Full details of the consultation responses can be reviewed in Technical Appendix 1.1: Consultation Register (EIAR Volume 4).

Table 8.1: Consultation Responses

Consultee and Date	Scoping / Other Consultation	Issue Raised	Response / Action Taken
East Ayrshire Council 14th May 2018	Scoping	Details of any habitat enhancement programme to be provided.	Outline Habitat Management Plan (HMP) supplied (EIAR Volume 4, Technical Appendix 7.7).
		State whether appropriately qualified environmental scientists/ecologists are to be used as Clerk of Works or in other roles during construction to provide specialist advice.	Recommendations for suitably qualified ornithologists are included in the Breeding Bird Protection Plan.
New Cumnock Community Council 25th April 2018	Scoping	Particular attention should be paid to connectivity between the SPA sites particularly as 'wildlife corridors' including the Muirkirk and North Lowther Uplands SPA.	It was agreed during consultation with SNH (see below) that connectivity between the Muirkirk and North Lowther Uplands SPA and the site is unlikely. No likely significant effects are therefore predicted.
RSPB Scotland 10th May 2018	Scoping	Results of the bird survey work should be used to inform the layout and design of the wind farm, with particular focus on priority species such as hen harrier, black grouse and breeding wading birds.	Relevant survey results were fed into the design process – refer to Chapter 3: Design Evolution and Alternatives (EIAR Volume 2).
		It is important to assess any ornithological impacts in light of changes to the forest layout as a result of the installation of the turbines e.g. the creation of additional open ground habitat may attract open ground species not previously present.	Changes to habitat considered for each ornithological feature in relevant sections of the impact assessment.

Table 8.1: Consultation Responses			
Consultee and Date	**Scoping / Other Consultation**	**Issue Raised**	**Response / Action Taken**
		A draft HMP should be submitted with the EIA.	Outline HMP supplied (Technical Appendix 7.7, EIAR Volume 4).
Scottish Wildlife Trust 23rd April 2018	Scoping	Target species for surveys seems to be too limited, Annex 1 [EU Birds Directive] and at least the Red list [Birds of Conservation Concern, Eaton *et al*. 2015] should not be scoped out.	As detailed in the scoping report and in line with SNH guidance[2], non-passerine species listed on Annex 1 of the EU Birds Directive, Schedule 1 of the Wildlife and Countryside Act or those species listed as Red on the BoCC 4 list (Eaton *et al.* 2015) were considered as target species.
		Consideration should be given to possible local and long-distance bird migration routes across the proposed development area as the turbines may impact on bird movements across the area.	Barrier effects are considered in the impact assessment under Potential Operational Effects.
SNH 25th May 2018	Scoping	The proposed development is situated outwith the core foraging range of all the SPA [Muirkirk and North Lowther Uplands] species and there is no connectivity between the SPA and the proposed development. It is therefore unlikely that the proposed development will have a significant effect on any of the qualifying interests (indirectly or directly). No further consideration of the SPA is required and it can be scoped out of the EIA. This reasoning is also applied to the Muirkirk Uplands SSSI.	Noted. All SPAs and SSSIs are scoped out of the assessment.
		Advise that ground/vegetation clearing work is undertaken outwith the main nesting period (March to August inclusive). If not possible, a suitably qualified ecologist should check for the presence of nesting birds prior to any works commence – if nesting birds are located, a suitable buffer zone (in which no work can take place) should be created that is maintained until the young have fledged/the nest is no longer in use. This will ensure no nests are destroyed during the construction works and therefore no offences are committed under the Wildlife and Countryside Act 1981 (as amended).	See mitigation (Section 8.5) for details relating to ground clearance, pre-construction surveys, breeding bird protection plan and specific black grouse mitigation.
		Recommend that pre-construction surveys for breeding black grouse are undertaken. Recommend that no turbine should be sited within 500 m of any black grouse lek and that appropriate mitigation (e.g. avoiding noisy work during the sensitive breeding period for black grouse and marking any fences to avoid collision) should be put in place to minimise impacts on black grouse.	

2 SNH (2014, revised March 2017) Recommended Bird Survey Methods to Inform Impact Assessment of Onshore Wind Farms.

Project Assumptions

8.2.7 The following assumptions are included in the assessment:

- The short-term construction period would include creation of temporary stone extraction areas, construction of access tracks, hard-standings, turbines and other infrastructure, and site restoration[3].
- No stone quarries would be located within 500 m of any known peregrine nest sites.
- All electrical cabling between the turbines and the associated infrastructure would be underground in shallow trenches which would be reinstated during the construction period and, in all cases, follow the access tracks.
- Any ground 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 negative effects on ornithological interests during construction and decommissioning, the Applicant would appoint a suitably qualified Ecological Clerk of Works (ECoW) prior to the commencement of construction and decommissioning and they would advise the Applicant and the Principal Contractor on all ornithological matters (with the assistance of a suitably qualified/licenced ornithologist if required). The ECoW would be required to be present at the site during the construction and decommissioning periods and would carry out monitoring of works and briefings with regards to any ornithological sensitivities at the site to the relevant staff within the Principal Contractor and subcontractors.
- A Breeding Bird Protection Plan (BBPP) will be produced and implemented during construction and decommissioning of the proposed development to ensure that all reasonable precautions are taken to ensure that all relevant wildlife legislation is adhered to. The BBPP will detail measures to safeguard breeding birds known to be in the area. The BBPP shall include pre-construction surveys and good practice measures during construction. Pre-construction surveys will be undertaken to check for any new breeding bird activity in the vicinity of the construction/decommissioning works (refer to Section 8.5 for further detail).
- Work on the proposed development, including tree clearance and construction of the access tracks, turbine hard standings, site compound(s) and erection of the turbines is predicted to last up to 36 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 breeding season of most birds at the proposed development extends from April to July (Forrester *et al*. 2012[18]). 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 breeding for a maximum of three years, assuming that construction would take approximately 36 months.

Potential Effects Scoped Out

8.2.8 No potential effects were scoped out prior to commencement of surveys.

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3 Of temporary construction areas rather than any restoration of the dormant surface mine.

8.2.9 On the basis and findings of the survey work undertaken, the professional judgement of MG, experience from other relevant projects and policy guidance or standards, effects on a number of target species have been scoped out. A total of 118 bird species were recorded within the site or respective survey buffers during the ornithological surveys (Technical Appendix 8.1 Annex D Table D-7). Following recommendations in SNH (2018a[4]), all target species of Low Nature Conservation Importance (as defined by Table 8.2 below) have been scoped out.

Method of Baseline Characterisation

Extent of the Study Area

8.2.10 A range of surveys were employed to accurately record baseline conditions within the proposed development and appropriate survey buffers. Terms referred to are as follows (and are detailed on Figure 8.1 and Figure 8.2 (EIAR Volume 3a)):

- '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 effects on each species at the time of assessment, and also as the area used for any desk-based study.

8.2.11 Details of the spatial and temporal extent of each survey area is described in the relevant sections of the Current Baseline section (8.3) of this chapter, and Technical Appendices 8.1 and 8.2 (EIAR Volume 4).

8.2.12 Following the completion of field surveys, the Collision Risk Analysis Area (CRAA) was defined for the purpose of collision modelling. The CRAA was created on GIS by using Delaunay triangulation around proposed turbine locations to create a wind farm area which was then buffered by 500 m (Figures 8.3 and 8.4, EIAR Volume 3a). Including this buffer around the turbines (as per SNH, 2017 guidance) accounts for possible inaccuracies in the recording of flightlines and ensures the assessment is precautionary.

Desk Study

8.2.13 The following data sources were considered as part of the assessment:

- SNH Sitelink (https://sitelink.nature.scot/) for designated sites;
- South Strathclyde Raptor Study Group (SSRSG) for historical breeding raptor records; and
- Forestry and Land Scotland (FLS) (formerly known as Forest Enterprise Scotland (FES)) – for incidental records of black grouse.

Field Survey

8.2.14 Ornithological surveys were undertaken to establish the baseline ornithological conditions at the site (plus appropriate survey buffers). Fieldwork commenced in September 2016 and was completed in August 2018. This provided data covering two complete breeding seasons (2017 and 2018) and two complete non-breeding seasons (2016/2017 and 2017/2018), as per SNH (2017) guidance.

8.2.15 The following surveys were undertaken within the relevant survey areas (refer to Technical Appendix 8.1, Annex C (EIAR Volume 4) for detailed survey dates):

4 SNH (2018a) Assessing Significance of Impacts from Onshore Wind Farms Out-with Designated Areas.

- Flight activity surveys – September 2016 to August 2018 (Figure 8.3 and Figure 8.4 (EIAR Volume 3a) detail vantage point locations and viewshed areas);
- Scarce Breeding Bird Surveys, proposed development plus a 2 km buffer (Figure 8.1 and Figure 8.2, EIAR Volume 3a) – spring/summer 2017 and 2018;
- Black grouse surveys, proposed development plus a 1.5 km buffer (Figure 8.1 and Figure 8.2, EIAR Volume 3a) – spring 2017 and 2018;
- Breeding Bird Surveys, proposed development plus a 500 buffer (Figure 8.1 and Figure 8.2, EIAR Volume 3a) – spring/summer 2017 and 2018; and
- Winter Walkover surveys, proposed development plus 500 m buffer (Figure 8.1 and Figure 8.2, EIAR Volume 3a) – winter 2016/2017 and 2017/2018.

8.2.16 Field surveys were conducted following the relevant SNH (2014, revised March 2017) guidance as detailed above. Refer to Technical Appendix 8.1 Annex B (EIAR Volume 4) for detailed survey methodologies.

Criteria for the Assessment of Effects

8.2.17 The evaluation for wider-countryside interests (interests unrelated to Natura 2000 designated sites, but including Sites of Special Scientific Interest (SSSIs)) under the EIA Regulations involves the following process:

- Identifying the potential effects of the proposed development;
- Considering the likelihood of occurrence of potential effects where appropriate;
- Defining the sensitivity of a feature via the Nature Conservation Importance (NCI) of the bird populations present, and their population's Conservation Status;
- Establishing the magnitude of the likely effect (both spatial and temporal);
- Based on the above information, making a judgement as to whether or not the identified effect is significant with respect to the EIA Regulations;
- If a potential effect is determined to be significant, including measures to mitigate or compensate the effect where required;
- Considering opportunities for enhancement where appropriate; and
- Considering residual effects after mitigation, compensation or enhancement.

Criteria for Assessing the Sensitivity of Features

8.2.18 Determination of the level of sensitivity of a feature is based on a combination of the feature's NCI and Conservation Status, described in the sections below.

Methods Used to Evaluate the Nature Conservation Importance (NCI) of Bird Populations

8.2.19 There are three levels of NCI as detailed below in Table 8.2. Important Ornithological Features (IOFs) (CIEEM 2018[5]) are those target species with High or Medium NCI.

Table 8.2: Determining Factors of an Important Ornithological Feature's NCI

Importance	Definition
High	Populations receiving protection due to inclusion as features of an SPA, Ramsar Site, SSSI or which would otherwise qualify under selection guidelines. Species present in nationally important numbers (>1 % national breeding population).
Medium	The presence of target species listed in Annex 1 of the Birds Directive (but the population does not meet the designation criteria under selection guidelines).

5 Chartered Institute of Ecology and Environmental Management (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine, 3rd edition. CIEEM, Winchester

Table 8.2: Determining Factors of an Important Ornithological Feature's NCI	
Importance	**Definition**
	The presence of breeding species listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended). The presence of non-passerine species noted on the latest Birds of Conservation Concern (BoCC) 'Red' list (Eaton *et al*. 2015[1]). 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 wind farm. Species present in regionally important numbers (>1 % regional breeding population).
Low	All other species' populations not covered by the above categories.

METHODS USED TO EVALUATE CONSERVATION STATUS OF BIRD POPULATIONS

8.2.20 As defined by SNH (2018a[4]), 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 (which for the purposes of the Birds Directive is the EU)".

8.2.21 Conservation Status is considered favourable under the following circumstances (SNH 2018a[4]):

- *"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 it 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"*.

8.2.22 SNH (2018a) states that "an impact should therefore be judged as of concern when it would adversely affect the existing favourable conservation status of a species or prevent a species from recovering to favourable conservation status in Scotland".

8.2.23 The relevant scale for breeding species is considered to be the appropriate Natural Heritage Zone (NHZ), in this case the Western Southern Uplands and Inner Solway (NHZ 19). For some populations, insufficient information may exist for the NHZ population and in these circumstances the national population estimate can be used as a basis for determining appropriate scale population size. For wintering or migratory species, the migratory or national population is often considered to be the relevant scale for determining effects on the Conservation Status (SNH 2018a[4]) and this approach is used in this assessment.

Criteria for Assessing the Magnitude of Change

8.2.24 In determining the magnitude of change, an effect is defined as a change to the abundance and/or distribution of a population as a result of an impact caused by the proposed development. Effects can be adverse, neutral or beneficial, and are judged in terms of magnitude in space and time. There are five levels of spatial and temporal effects as detailed in Table 8.3 and Table 8.4 below.

8.2.25 There can often be varying degrees of uncertainty over effects as a result of limited information. A precautionary approach is adopted where the response of a population to an impact is uncertain.

8.2.26 As part of determining the magnitude of change, the resilience of a population to recover from temporary adverse conditions is considered in respect of each potentially affected population.

8.2.27 The response of individual species to disturbance during relevant behaviours is considered when determining spatial and temporal magnitude of effect and is assessed using guidance including Bright *et al.* (2006[6]), Hill *et al.* (1997[7]) and Ruddock and Whitfield (2007[8]).

Table 8.3: Spatial Magnitude of Effect

Spatial Magnitude	Definition
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. Guide: >80 % of population lost through additive mortality.
High	Major reduction in the status or productivity of a bird population due to mortality, displacement or disturbance. Guide: 21-80 % of population lost through additive mortality.
Moderate	Partial reduction in the status or productivity of a bird population due to mortality, displacement or disturbance. Guide: 6-20 % of population lost through additive mortality.
Low	Small but discernible reduction in the status or productivity of a bird population due to mortality, displacement or disturbance. Guide: 1-5 % of population lost through additive mortality.
Negligible	Very slight reduction in the status or productivity of a bird population due to mortality, displacement or disturbance. Reduction barely discernible, approximating to the "no change" situation. Guide: <1 % population lost through additive mortality.

Table 8.4: Temporal Magnitude of Effect

Temporal Magnitude	Definition
Permanent	Effect continuing indefinitely beyond the span of one human generation (taken as approximately 25 years), except where there is likely to be substantial improvement after this period – in this case, Long Term may be more appropriate.
Long Term	Approximately 15-29 years or longer (see above).
Medium Term	Approximately 5-14 years.
Short Term	Up to approximately 4 years.
Negligible	Very minor (<6 months) or no temporal effect.

Criteria for Assessing Cumulative Effects

8.2.28 The assessment of cumulative effects is undertaken following the same methodology as detailed above for the proposed development alone (paragraphs 8.2.17 to 8.2.27). The assessment follows SNH (2018b[9]) guidance for cumulative assessment.

6 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.

7 Hill, D.A., Hockin, D., Price, D., Tucker, G., Morris, R. and Treweek, J. (1997). Bird disturbance: improving the quality of disturbance research. Journal of Applied Ecology 34: 275-288.

8 Ruddock, M. and Whitfield, D. P. (2007). A Review of Disturbance Distances in Selected Bird Species. A report from Natural Research (Projects) Ltd to Scottish Natural Heritage.

9 SNH (2018b) Assessing the cumulative impacts of onshore wind farms on birds.

Criteria for Assessing Significance

8.2.29 The predicted significance of the effect has been determined through a standard method of assessment based on professional judgement, considering both sensitivity (i.e. each bird species' relative sensitivity to a particular effect) and magnitude of change of that effect. The significance criteria used in this assessment are listed in Table 8.5.

Table 8.5: Significance of Effect

Significance of Effect	Description
Major	Likely to result in a long-term/permanent significant adverse effect on the integrity of a feature.
Moderate	Likely to result in a medium term or partially significant adverse effect on the integrity of a feature.
Minor	Likely to adversely affect a feature at an insignificant level by virtue of its limitations in terms of duration and/or extent, but there will probably be no effect on its integrity.
Negligible	No measurable adverse effect.

8.2.30 Major and moderate effects are considered to be Significant in accordance with EIA Regulations.

8.2.31 Minor and negligible effects are considered to be Not Significant in accordance with EIA Regulations.

Limitations and Assumptions

8.2.32 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.

8.2.33 In September 2017, the site was extended to the north west (around Brown Rig and Knockguldron), north (around Auchlin Rig and the Skares surface mine), east (around Burnston and Black Hill to include more of the House of Water surface mine), and south (around Benbain). Ultimately, the majority of this additional area was later dropped (by March 2018), with only a small area around Benbain (Turbines 51, 52, 53 and 54) and around Burnston (in the active House of Water surface mine, Turbines 1, 2, 3, 4, 5 and 6) retained. Figure 8.1 and Figure 8.2 (EIAR Volume 3a) detail the changes to the survey areas across the baseline survey period following the changes to the site boundary[10].

8.2.34 The viewsheds were revised to cover this new survey area from October 2017 with Vantage Points (VPs) 1, 4, 5, 6, 7 remaining the same across the complete survey period, VPs 2 and 3 rotated to create VPs 11 and 12, and VPs 8, 9 and 10 added (from October 2017). EIAR Volume 3a Figure 8.3 (September 2016 to September 2017) and Figure 8.4 (October 2017 onwards) detail the two viewshed iterations. As a result of the ongoing surface mining works (and resulting changing ground conditions and Health and Safety restrictions) at the House of Water surface mine, Turbines 1, 2 and 7 continued to be outwith viewshed 8 (Figure 8.4, EIAR Volume 3a), however Turbines 3, 4, 5, 6, 9 and 15 (also located in viewshed 8) are also located within the active surface mine workings and the activity recorded within viewshed 8 is therefore considered to also be representative of Turbines 1, 2 and 7.

10 Please note: for clarity, previous site boundaries are not shown on any figures/

8.2.35 As a result of these changes to the potential development site, there are two small areas around Benbain (Turbines 51, 52, 53 and 54) and Burnston (in the active House of Water surface mine, Turbines 1, 2, 3, 4, 5 and 6) with limited survey coverage for the 2016/2017 winter walkover survey area and the 2017 breeding bird, scarce breeding bird and black grouse survey areas (Figure 8.1, EIAR Volume 3a). These areas are covered by the 2017/2018 winter walkover survey area and 2018 breeding bird, scarce breeding bird and black grouse survey areas (Figure 8.2, EIAR Volume 3a). Whilst these two small areas are only covered by the survey areas from the second year (2017/2018 non-breeding and 2018 breeding seasons, Figure 8.2, EIAR Volume 3a), these areas are considered to be of limited ornithological value (considering one area is an active surface mine and the other is unrestored surface mine) and the data gathered during year 2 is considered to be representative.

8.3 Baseline Conditions

Current Baseline

8.3.1 This section describes the existing conditions within the ornithological study area comprising:

- Statutory nature conservation designated sites for birds within 20 km of the proposed development;
- Birds recorded during baseline surveys (refer to Technical Appendix 8.1 (EIAR Volume 4) for full details), including the results from the collision modelling and breeding wader territory analysis; and
- Historic breeding records from the SSRSG (raptors and owls) and FLS (black grouse).

Designated Sites

8.3.2 Information gathered from the consultation exercise revealed that there are no statutory nature conservation designations with the site but that the site is within 20 km of one SPA (Figure 8.5, EIAR Volume 3a):

- Muirkirk and North Lowther Uplands SPA (Table 8.6) (underpinned by Muirkirk Uplands SSSI^ and North Lowther Uplands SSSI*), 9.3 km to the north east.

Table 8.6: Summary of Qualifying Features of the Muirkirk and North Lowther Uplands SPA (and Muirkirk Uplands SSSI^ and North Lowther Uplands SSSI*)

Feature	Qualifying Feature Category	Condition	Description
Golden plover Pluvialis apricaria Breeding	SPA	June 2015: Unfavourable declining	Breeding population of European importance: estimated minimum of 154 breeding pairs (1999) representing 0.7% of the GB population. Selected as one of the most suitable sites for golden plover in GB.
Hen harrier Circus cyaneus Breeding	SPA, SSSI^*	July 2008: Unfavourable declining	Breeding population of European importance: average of 29.2 breeding females (1994-1998) representing 6% of the GB population and more recently an average of 12 breeding pairs (1991-1995) representing 2% of the GB population.
Hen harrier Circus cyaneus Non-breeding	SPA, SSSI^	December 2004: Unfavourable declining	Winter on the site in nationally important numbers.
Merlin	SPA	July 2009: Unfavourable no	Breeding population of European importance: average of nine breeding pairs (1989-1998) representing 0.7% of

Table 8.6: Summary of Qualifying Features of the Muirkirk and North Lowther Uplands SPA (and Muirkirk Uplands SSSI^ and North Lowther Uplands SSSI*)			
Feature	**Qualifying Feature Category**	**Condition**	**Description**
Falco columbarius Breeding		change	the GB population. Selected as one of the most suitable sites for merlin in GB.
Peregrine falcon Falco peregrinus Breeding	SPA	August 2004: Unfavourable no change	Breeding population of European importance: average of six breeding pairs (1992-1996) representing 0.5% of the GB population. Selected as one of the most suitable sites for peregrine falcon in GB.
Short-eared owl Asio flammeus Breeding	SPA, SSSI^	July 1998: Favourable maintained	Breeding population of European importance: average of 26 breeding pairs (1997-1998) representing 3% of the GB population.
Breeding bird assemblage	SSSI^	May 2015: Unfavourable no change	Mosaic of habitats that supports a diverse upland breeding bird community of national importance including: buzzard, curlew, dunlin, red grouse, redshank, ring ouzel, snipe, stonechat, teal, wheatear and whinchat.
Breeding bird assemblage	SSSI*	August 2008: Favourable maintained	Range of heather dominated habitats that support a diverse upland breeding bird community of national importance including: curlew, dunlin, raven, red grouse, redshank, snipe, teal, wheatear and whinchat.

8.3.3 SNH (2016[11]) details foraging distances from a nest site during the breeding season for the each of the qualifying features of the SPA as follows:

- Golden plover – core range of 3 km, maximum range of 11 km;
- Hen harrier – core range of 2 km, maximum range of 10 km;
- Merlin – 5 km range;
- Peregrine falcon – core range of 2 km, maximum recorded range of 18 km; and
- Short-eared owl – core range of 2 km, maximum range of 5 km.

8.3.4 Considering that the site is outwith the core foraging ranges of any of the qualifying features of the Muirkirk and North Lowther SPA (and associated SSSIs), connectivity between the two is unlikely. Consequently (and as agreed in consultation with SNH, Table 8.1), the Muirkirk and North Lowther Uplands SPA and associated SSSIs are scoped out of the assessment.

Black Grouse

8.3.5 Surveys during the 2017 breeding season identified one lek within the site (Lek 1, Figure 8.1.29, EIAR Volume 4) with a single male recorded lekking. No females were recorded in attendance at the lek, however solitary females were recorded to the south of Lek 1 around Little Rigend Hill on four occasions in April and May 2017 (Figure 8.1.29, EIAR Volume 4). Surveys during the 2018 breeding season identified five leks (Leks 1 to 5, Figure 8.1.29, EIAR Volume 4) with a single male in attendance at Leks 1, 3, 4 and 5 and a male with a female in attendance at Lek 2. A single female and a pair (in flight) of black grouse were also recorded in April 2018 (Figure 8.1.29, EIAR Volume 4). Black grouse not associated with any leks/not displaying lekking behaviour were recorded on 11 occasions during the 2017 breeding season and on two occasions during the 2018 breeding season (Figure

11 SNH (2016) Assessing connectivity with Special Protection Areas (SPAs).

8.1.29, EIAR Volume 4) – all bar one of these records were of single birds, with the other record of a pair. Construction (500 m) and operational (750 m) buffers (Figure 8.1.29, EIAR Volume 4) were applied to the 2018 breeding season lek records as this was the most recent and comprehensive dataset of black grouse lek activity around the proposed development.

8.3.6 A male black grouse was also recorded on the open moorland around Lek 1 on two occasions during the 2017/2018 non-breeding season (Figure 8.1.29, EIAR Volume 4).

8.3.7 Overall breeding and non-breeding activity was concentrated around the open moorland between Tappet Hill Moss and Little Rigend Hill (the area directly to the west of the House of Water surface mine) with Lek 1 the only lek attended in both 2017 and 2018 (Figure 8.1.29, EIAR Volume 4) – with activity in the area to the south west around Headmark Moss only recorded during 2018 and with no activity recorded prior to the 2018 breeding season.

8.3.8 Flight activity surveys recorded four flights (detailed in Technical Appendix 8.1 Annex D Table D-1 and Figure 8.1.6, EIAR Volume 4) across the entire flight activity survey period (two breeding and two non-breeding seasons). Two of these flights were identified to be 'at-risk[12]' and following collision risk modelling, a mean annual collision risk of 0.0007 was predicted for black grouse (equivalent to one bird every 1,377 years).

8.3.9 Considering the lek activity recorded within the site and the species' sensitivity to wind farm disturbance (e.g. SNH 2018a), black grouse is scoped in to the assessment.

Raptors and Owls

Barn Owl

8.3.10 Flight activity surveys recorded one flight (detailed in Technical Appendix 8.1 Annex D Table D-1 and Figure 8.1.5, EIAR Volume 4) across the entire flight activity survey period (two breeding and two non-breeding seasons). This flight was identified to be 'at-risk' and following collision risk modelling, a mean annual collision risk of 0.0022 was predicted for barn owl (equivalent to one bird every 464 years – see EIAR Volume 4 Technical Appendix 8.1 Annex E for results).

8.3.11 Scarce breeding bird surveys recorded barn owl in owl boxes (breeding was unconfirmed) attached to trees near the House of Water surface mine access track at the edge of the site, with unconfirmed reports[13] that a pair was also breeding within the building complex of Braehead Farm (now the site office for the adjacent Keir mining operations) (shown as BO_1 and BO_2 on Confidential Figure 8.2.1, EIAR Volume 4). BO_2 is over 1 km (recommended survey buffer, SNH 2017[14]) from the nearest proposed turbine or access track and BO_1 is approximately 650 m from the nearest proposed turbine or access track. Both nests are well over the recommended 175 m disturbance buffer for continuous heavy construction (Shawyer 2011[15]).

8.3.12 Considering this species' low on-site activity, no evidence of breeding within 500 m and negligible predicted risk of collision, barn owl is scoped out of the assessment.

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12 'At-risk' is defined as – a flight having at least part of its duration (i) at Potential Collision Height (PCH); (ii) within the CRAA; and (iii) recorded within the 2 km viewshed of the associated VP.

13 Access was not possible to the Keir mining land.

14 SNH (2014, revised March 2017) Recommended Bird Survey Methods to Inform Impact Assessment of Onshore Wind Farms.

15 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.

Golden Eagle

8.3.13 There is no known golden eagle breeding activity within 6 km of the site. Consultation with the SSRSG did not indicate any historic or current breeding activity within 2 km of the proposed development. Flight activity surveys recorded one flight (detailed in Technical Appendix 8.1 Annex D Table D-1 and Figure 8.1.5, EIAR Volume 4) across the entire flight activity survey period. This flight was identified to be at-risk and following collision risk modelling, a mean annual collision risk of 0.0013 was predicted for golden eagle (equivalent to one bird every 799 years). The bird recorded during flight activity surveys was recorded on 23rd October 2017 and golden eagle (especially non-breeding individuals) can range widely in the winter.

8.3.14 Considering this species' low on-site activity, absence of breeding within 6 km and negligible predicted risk of collision, golden eagle is scoped out of the assessment.

Goshawk

8.3.15 Two goshawk territories were identified during the 2018 breeding season, shown on Confidential Figure 8.2.1 (EIAR Volume 4) as GI_1 and GI_2 (refer to Confidential Technical Appendix 8.2, EIAR Volume 4 for further detail) and breeding was confirmed at GI_1 (minimum of two fledged juveniles). A second pair was suspected to have held a territory at GI_2[16], however following display/general activity over the area in March 2018, no further activity (despite frequent watches of the area) was recorded until a single flight in June 2018 and breeding was unconfirmed (Figure 8.1.28, EIAR Volume 4). Consultation with the SSRSG did not provide any historic breeding activity within 2 km of the proposed development.

8.3.16 GI_1 is outside of the site and 1.29 km from the nearest proposed turbine and 1.18 km from the nearest access track, and GI_2 is within the site, 160 m from the nearest turbine and 13 m from the nearest access track. It should be noted that the location of GI_2 is an approximate location within an area of wind blow where breeding was suspected but never confirmed.

8.3.17 Goshawk were present throughout the seasons with a pair recorded during the 2017/2018 winter walkover surveys (Figure 8.1.27, EIAR Volume 4) and birds recorded on ten occasions during winter flight activity surveys (Figure 8.1.11, EIAR Volume 4).

8.3.18 Flight activity surveys recorded 31 flights (detailed in Technical Appendix 8.1 Annex D Table D-1 and Figure 8.1.11, EIAR Volume 4) across the entire flight activity survey period. Twenty-five of these flights were identified to be at-risk and following collision risk modelling, a mean annual collision risk of 0.1055 was predicted for goshawk (equivalent to one bird every 9.48 years or 2.64 birds across the lifespan of the proposed development).

8.3.19 Considering this species' breeding activity and predicted risk of collision, goshawk is scoped in to the assessment.

Hen Harrier

8.3.20 Flight activity surveys recorded seven hen harrier flights (detailed in Technical Appendix 8.1 Annex D Table D-1 and Figure 8.1.13, EIAR Volume 4) across the entire flight activity survey period (two breeding and two non-breeding seasons). Five of these flights were identified to be at-risk and following collision risk modelling, a mean annual collision risk of 0.0035 was predicted for hen harrier (equivalent to one bird every 284 years).

16 Approximate location as breeding was unconfirmed.

8.3.21 Hen harrier were not recorded during any other surveys across the two year survey period. Consultation with the SSRSG did not indicate any historic or current breeding activity within 2 km of the site.

8.3.22 The proposed development is situated across open ground (mainly comprised of active, unrestored or restored surface mine working with a small area of moorland around Harecraigs Hill) and commercial conifer plantation (a mixture of mature plantation and recent clearfell with some areas of thicket stage replanting). Felling is planned for parts of the plantation within the site (EIAR Volume 4: Figure 2.11.6: Wind Farm Felling Plan). The forest will be clear felled and replanted to a key hole design to allow for the construction of tracks/turbine pads and clearance for the rotor swept areas (EIAR Volume 4: Figure 2.11.7: Wind Farm Restocking Plan). Of the 2,777.4 ha of woodland within the site, 421.36 ha will be felled in advance of construction with 151.36 ha proposed to be replanted and 127.37 ha to be retained as open ground around the turbines/tracks (EIAR Volume 4: Technical Appendix 2.11: Forestry). Whilst it is acknowledged that the felling associated with the proposed development could create additional suitable habitat for foraging hen harrier (SNH 2012), the potential creation of relatively small additional areas of moderately suitable habitat is considered unlikely to generate substantial changes in the level of hen harrier activity at the proposed development (especially considering there have been no recorded nesting attempts within 2 km across the entire survey period).

8.3.23 Considering this species' low on-site activity, absence of breeding within 2 km and negligible predicted risk of collision, hen harrier is scoped out of the assessment.

Merlin

8.3.24 No indication of breeding merlin was located during either the 2017 or 2018 breeding season surveys. Consultation with the SSRSG did not indicate any historic or current breeding activity within 2 km of the site. Merlin were recorded once during the 2017/2018 winter walkover surveys (Figure 8.1.27, EIAR Volume 4) and twice during the 2018 scarce breeding bird surveys (Figure 8.1.28, EIAR Volume 4).

8.3.25 Flight activity surveys recorded six flights (detailed in Technical Appendix 8.1 Annex D Table D-1 and Figure 8.1.5, EIAR Volume 4) across the entire flight activity survey period. Three of these flights were identified to be at-risk and following collision risk modelling, a mean annual collision risk of 0.0028 was predicted for merlin (equivalent to one bird every 362 years).

8.3.26 The proposed development is situated across open ground (mainly comprised of active, unrestored or restored surface mine workings with a small area of moorland around Harecraigs Hill) and commercial conifer plantation (a mixture of mature plantation and recent clearfell with some areas of thicket stage replanting). Felling is planned for parts of the plantation within the site (EIAR Volume 4: Figure 2.11.6: Wind Farm Felling Plan). The forest will be clear felled and replanted to a key hole design to allow for the construction of tracks/turbines and clearance for the rotor swept areas (EIAR Volume 4: Figure 2.11.7: Wind Farm Restocking Plan). Of the 2,777.4 ha of woodland within the site, 421.36 ha will be felled in advance of construction with 151.36 ha proposed to be replanted and 127.37 ha to be retained as open ground around the turbines/tracks (EIAR Volume 4: Technical Appendix 2.11: Forestry). Whilst it is acknowledged that the felling associated with the proposed development could create additional suitable habitat for foraging merlin (SNH 2012), the potential creation of relatively small additional areas of moderately suitable habitat is considered unlikely to generate substantial changes in the level of merlin activity at the proposed development (especially considering there have been no recorded nesting attempts within 2 km across the entire survey period).

8.3.27 Considering this species' low on-site activity, absence of breeding within 2 km and negligible predicted risk of collision, merlin is scoped out of the assessment.

OSPREY

8.3.28 Flight activity surveys recorded four osprey flights (detailed in Technical Appendix 8.1 Annex D Table D-1 and Figure 8.1.16, EIAR Volume 4) across the entire flight activity survey period. Three of these flights were identified to be at-risk and following collision risk modelling, a mean annual collision rate of 0.0136 was predicted for osprey (equivalent to one bird every 74 years).

8.3.29 Osprey were recorded on two occasions during 2018 breeding season surveys, however both flights were recorded to the south west of the site (Figure 8.1.28, EIAR Volume 4). The waterbodies on-site are a mixture of settling ponds, flooded voids and standing water as a result of the current, restored and unrestored surface mine workings and whilst it is possible that there are some fish in these waterbodies, they are considered to be of lower suitability in comparison to other surrounding natural waterbodies (e.g. Bogton Loch to the south). Consultation with the SSRSG did not indicate any historic or current breeding activity within 2 km of the proposed development.

8.3.30 Considering this species' low on-site activity, zero predicted risk of collision and no breeding activity, osprey is scoped out of the assessment.

PEREGRINE FALCON

8.3.31 Four potential peregrine falcon territories were identified across the 2017 and 2018 breeding season surveys and are shown on Confidential Figure 8.2.1 (EIAR Volume 4) as PE_1, PE_2, PE_3 and PE_4 (refer to Confidential Technical Appendix 8.2, EIAR Volume 4 for further detail). Breeding was confirmed at PE_4 in 2017 (one fledged juvenile) and at PE_2 and PE_3 in 2018 (failed, and two fledged juveniles, respectively). Despite activity around PE_1 in both years (Confidential Figure 8.2.1, EIAR Volume 4), breeding activity was never observed and this location was concluded not to be a territory but an infrequent roosting location for non-breeding birds. This was further substantiated by the data received from the SSRSG (Confidential Technical Appendix 8.2, EIAR Volume 4) that showed no evidence of PE_1 being used as a breeding territory (records from 2009 onwards). It should also be noted that as part of the ongoing surface mining works at House of Water, the quarry face on which PE_4 was located was dug out in early 2018 (in consultation with licenced ornithologists) and this nest site no longer exists.

8.3.32 Consultation with SSRSG confirmed that two peregrine falcon territories have existed within 2 km of the proposed development since 2009: Site A (consisting of two alternative nest sites equivalent to PE_3 and PE_4) and Site B (two alternative nest sites, one of which is the equivalent to PE_2, with the other outside of the 2km ornithology study area). A summary of breeding success and distances from the various nest sites to the proposed development is detailed in Confidential Technical Appendix 8.2 (EIAR Volume 4).

8.3.33 Flight activity surveys recorded 25 flights (detailed in Technical Appendix 8.1 Annex D Table D-1 and Figure 8.1.1, EIAR Volume 4) across the entire flight activity survey period. Thirteen of these flights were identified to be at-risk and following collision risk modelling, a mean annual collision risk of 0.0335 was predicted for peregrine falcon (equivalent to one bird every 29.84 years).

8.3.34 Considering breeding activity within 1 km of the site and potential collision risk, peregrine falcon is scoped in to the assessment.

RED KITE

8.3.35 Flight activity surveys recorded one flight (detailed in Technical Appendix 8.1 Annex D Table D-1 and Figure 8.1.20, EIAR Volume 4) across the entire flight activity survey period. This flight was identified to be at-risk and following collision risk modelling, a mean annual collision risk of 0.0073 was predicted for red kite (equivalent to one bird every 138 years).

8.3.36 Red kite was not recorded during any other surveys and consultation with the SSRSG did not indicate any historic or current breeding activity within 2 km of the site.

8.3.37 Considering this species' low on-site activity, absence of breeding within 2 km and negligible predicted risk of collision, red kite is scoped out of the assessment.

SHORT-EARED OWL

8.3.38 Flight activity surveys recorded three flights (detailed in Technical Appendix 8.1 Annex D Table D-1 and Figure 8.1.19, EIAR Volume 4) across the entire flight activity survey period, however none of these flights were considered to be at-risk and consequently no collisions were predicted.

8.3.39 A short-eared owl was also recorded twice on the 11th April 2017 (Figure 8.1.28, EIAR Volume 4), however no breeding behaviour was observed. Consultation with the SSRSG did not indicate any historic or current breeding activity within 2 km of the proposed development.

8.3.40 Considering this species' low on-site activity, absence of breeding within 2 km and zero predicted risk of collision, short-eared owl is scoped out of the assessment.

Waders

CURLEW

8.3.41 No curlew were recorded within 500 m of the proposed development's turbines in 2017 or 2018. During the 2018 breeding season, one potential pair of curlew were identified to be breeding (Technical Appendix 8.1 Table 8.1.9 and Figure 8.1.25, EIAR Volume 4) within 500 m of the proposed development's northern access track (which is currently in use as the Kyle Forest Coal Haul Route).

8.3.42 Flight activity surveys recorded six flights (detailed in Technical Appendix 8.1 Annex D Table D-1 and Figure 8.1.7, EIAR Volume 4) across the entire flight activity survey period. One of these flights was identified to be at-risk and following collision risk modelling, a mean annual collision risk of 0.0004 was predicted for curlew (equivalent to one bird every 2,461 years).

8.3.43 Considering this species' low on-site activity, negligible predicted risk of collision and low breeding activity, curlew is scoped out of the assessment.

DOTTEREL

8.3.44 Flight activity surveys recorded one flight (detailed in Technical Appendix 8.1 Annex D Table D-1 and Figure 8.1.8, EIAR Volume 4) across the entire flight activity survey period, however this flight was not considered to be at-risk and consequently no collisions were predicted.

8.3.45 Dotterel were not recorded during any other surveys between September 2016 and August 2018 and it is likely that the individual recorded was a migratory bird passing through the region (flight was recorded in September 2016).

8.3.46 Considering this species' low activity, lack of breeding evidence and zero predicted risk of collision, dotterel is scoped out of the assessment.

GOLDEN PLOVER

8.3.47 No evidence of breeding golden plover was recorded during baseline surveys.

8.3.48 Flight activity surveys recorded 31 flights (Technical Appendix 8.1 Annex D Table D-1 and Figure 8.1.9, EIAR Volume 4) across the entire flight activity survey period. Golden plover were only recorded as non-breeding birds during flight activity surveys with flocks of between three and 58 birds (average flock size of 31 birds) recorded from September 2016 to April 2017 and from October 2017 to January 2018.

8.3.49 Sixteen of these flights were identified to be at-risk and following collision risk modelling, a mean non-breeding collision risk of 2.57 collisions per annum was predicted for golden plover (equivalent to one bird every 0.39 years or 64.21 birds across the lifespan of the proposed development).

8.3.50 Golden plover were also recorded during the 2016/2017 (seven occasions) and 2017/2018 (four occasions) winter walkover surveys (Figure 8.1.26 and Figure 8.1.27, EIAR Volume 4) with birds recorded utilising the ground associated with the mine workings for roosting.

8.3.51 Overall, wintering golden plover activity was focussed in three areas (detailed below) which are all scrub habitat/bare ground associated with the recently restored or unrestored surface mine workings.

- Area A: south west section of the restored Skares surface mine (located just to the north of Laigh Mount and outwith the site (to the north));
- Area B: area of unrestored/abandoned surface mine workings in the western side of the site (located just to the east of Stannery Knowe); and
- Area C: area of unrestored/abandoned surface mine workings in the southern section of the site (located just to the north of Benbain).

8.3.52 Considering a predicted loss of 2.57 birds per annum as a result of collisions and the use of areas of the proposed development for winter roosting, golden plover is scoped in to the assessment.

LAPWING

8.3.53 No lapwing were recorded within 500 m of the proposed development turbines. Lapwing were recorded breeding within 500 m of the proposed development southern access track during the 2017 and 2018 breeding season with a maximum of one potential territory identified (refer to Technical Appendix 8.1 Table 8.1.9, Figure 8.1.24 and Figure 8.1.25, EIAR Volume 4). This potential territory is situated in an area of spoil between Clawfin Bridge and Pennyvenie Glen and is 100 m from the proposed development southern access track (this track already exists as a former coal haul route). This track is not currently in use and whilst the use of it during the construction and operation of the proposed development may result in the loss of this breeding pair, there is considered to be more suitable breeding habitat surrounding the southern access track, and it is more likely that the potential pair breeding at this location would be marginally displaced by activity on the southern access track rather than lost altogether.

8.3.54 Flight activity surveys recorded eight flights (detailed in Technical Appendix 8.1 Annex D Table D-1 and Figure 8.1.15, EIAR Volume 4) across the entire flight activity survey period, however none of these flights were considered to be at-risk and consequently no collisions were predicted.

8.3.55 Considering this species' low on-site activity, zero predicted risk of collision and low breeding activity, lapwing is scoped out of the assessment.

REDSHANK

8.3.56 A single redshank was recorded in July 2018 near Bogton Loch (Figure 8.1.25, EIAR Volume 4). No other redshank were recorded and no breeding activity was observed.

8.3.57 Considering this species' low on-site activity, zero predicted risk of collision and no breeding activity, redshank is scoped out of the assessment.

RINGED PLOVER

8.3.58 Ringed plover were recorded breeding within 500 m of the site during the 2018 breeding season[17] with between five and 11 territories identified within 500 m of turbines and a further one to three territories identified within 500 m of the proposed development access track between Turbine 54 and Clawfin (refer to Technical Appendix 8.1 Table 8.1.9 and Figure 8.1.25, EIAR Volume 4). Due to their highly mobile nature (of both adults and chicks) and nests being little more than a scrape in bare ground/between stones, it was not possible to estimate a specific number of territories and hence a minimum and maximum has been used with the true number of ringed plover territories likely to lie between these estimates.

8.3.59 Forrester *et al.* (2012[18]) estimates the Scottish breeding population to be between 4,900 and 6,700 pairs and the potential worst-case permanent loss of 14 pairs from the population as a result of the proposed development would therefore equate to a loss of 0.3 % of the Scottish population. Considering this species' known use of man-made habitats (oystercatcher are another species known to utilise man-made habitats successfully), and particularly active gravel pits, they are likely to be able to tolerate and/or habituate to a level of human disturbance, it is therefore considered unlikely that all breeding pairs would be permanently lost as a result of the proposed development, however it is likely that some pairs will experience some displacement (in particular during the construction phase).

8.3.60 Breeding activity was entirely associated with the unrestored surface mine ground located on the western side of the site with breeding activity concentrated around the various small to medium sized waterbodies located within this bare/scrub ground. Forrester *et al.* (2012[18]) notes that ringed plover are widespread breeders around Scottish coasts but have also bred inland in a variety of habitats (including man-made habitats) from around the 1920s and so their presence on the unrestored surface mine workings is not unusual. It should also be noted that the long-term availability of this ringed plover breeding habitat has only resulted due to these worked surface mining areas remaining unrestored following the collapse of Scottish Coal in 2013. In standard surface mining lifecycles, these areas would have been restored, once worked, to similar habitats that existed prior to the presence of the surface mine.

8.3.61 Whilst ringed plover are not listed as a priority bird species for onshore wind farm assessment or as a species with a restricted range potentially at-risk from onshore wind farm development (SNH 2018a), considering their status as BoCC red listed species (Eaton

17 Breeding bird surveys in 2017 were not undertaken by MG and the data provided from the 2017 breeding bird surveys did not include ringed plover, however incidental records from flight activity surveys during the 2017 breeding season indicate that ringed plover were likely present in the same unrestored mine areas as the 2018 breeding bird surveys identified – summary notes from VPs 2, 7, 3 and 1 during the 2017 breeding season include notes on calls and display calls from ringed plover out of sight of the surveyor on the VP.

18 Forrester, R.W., Andrews, I.J., McInerny, C.J., Murray, R.D., McGowan, R.Y., Zonfrillo, B., Betts, M.W., Jardine, D.C. and Grundy, D.S. (eds) (2012). The [Digital] Birds of Scotland. Scottish Ornithologists Club, Aberlady.

et al. 2015), it is proposed to retain areas of suitable breeding habitat[19] for ringed plover within the unrestored surface mining areas on the west of the site. In addition, the BBPP would include measures to safeguard ringed plover nests, with pre-construction checks for breeding ringed plover undertaken by the ECoW or suitably qualified ornithologist to locate any breeding activity.

8.3.62 Flight activity surveys recorded 26 flights (detailed in Technical Appendix 8.1 Annex D Table D-1 and Figure 8.1.21, EIAR Volume 4) across the entire flight activity survey period. Fifteen of these flights were identified to be at-risk and following collision risk modelling, a mean annual collision risk of 0.0190 was predicted for ringed plover (equivalent to one bird every 53 years).

8.3.63 Considering the proposed retention of key breeding habitat, the provision of the BBPP and the negligible predicted risk of collision, ringed plover are scoped out of the assessment.

RUFF

8.3.64 Flight activity surveys recorded two flights (detailed in Technical Appendix 8.1 Annex D Table D-1 and Figure 8.1.22, EIAR Volume 4) across the entire flight activity survey period, however neither of these flights were considered to be at-risk and consequently no collisions were predicted. No other ruff were recorded and no breeding activity was observed.

8.3.65 Considering this species' low on-site activity, zero predicted risk of collision and no breeding activity, ruff is scoped out of the assessment.

WOODCOCK

8.3.66 Flight activity surveys recorded one flight (detailed in Technical Appendix 8.1 Annex D Table D-1 and Figure 8.1.23, EIAR Volume 4) across the entire flight activity survey period, however the flight was not considered to be at-risk and consequently no collisions were predicted.

8.3.67 Woodcock were recorded on four occasions during the 2016/2017 winter walkover surveys (Figure 8.1.26, EIAR Volume 4) and on one occasion during the 2017/2018 winter walkover surveys (Figure 8.1.27, EIAR Volume 4). No breeding activity was recorded during the 2017 or 2018 breeding seasons.

8.3.68 Considering this species' low on-site activity, absence of breeding within 500 m and zero predicted risk of collision, woodcock is scoped out of the assessment.

Wildfowl and Gulls

GOLDENEYE

8.3.69 Flight activity surveys recorded three flights (detailed in Technical Appendix 8.1 Annex D Table D-1 and Figure 8.1.10, EIAR Volume 4) across the entire flight activity survey period, however none of these flights were considered to be at-risk and consequently no collisions were predicted.

8.3.70 Winter walkover surveys during the 2016/2017 and 2017/2018 non-breeding seasons frequently recorded goldeneye loafing on the various waterbodies[20] associated with the surface mine workings (Figure 8.26 and Figure 8.27, EIAR Volume 4).

19 These areas all currently consist of an area of open water with a mixture of damp bare and rocky ground, self-regenerated scrub and small patches of swamp which mimic the natural breeding and feeding habitat preferred by ringed plover.

20 These waterbodies are a mixture of settling ponds, flooded voids and standing water as a result of the current, restored and abandoned/unrestored surface mine workings.

8.3.71 Considering this species' absence of breeding, presence only during the non-breeding season and negligible predicted risk of collision, goldeneye is scoped out of the assessment.

Greylag Goose

8.3.72 Flight activity surveys recorded six flights (detailed in Technical Appendix 8.1 Annex D Table D-1 and Figure 8.1.12, EIAR Volume 4) across the entire flight activity survey period. Five of these flights were identified to be at-risk and following collision risk modelling, a mean annual collision risk of 0.0303 was predicted for greylag goose (equivalent to one bird every 33 years).

8.3.73 A single greylag goose was also incidentally recorded on two occasions (once as part of a flock of Canada geese landing on a pool next to Belston Loch to north of the site).

8.3.74 Considering this species' low collision risk, low on-site activity and lack of suitable feeding habitat within the site, greylag goose is scoped out of the assessment.

Herring Gull

8.3.75 Flight activity surveys recorded 64 flights (detailed in Technical Appendix 8.1 Annex D Table D-1 and Figure 8.1.14, EIAR Volume 4) across the entire flight activity survey period. Forty-four of these flights were identified to be at-risk and following collision risk modelling, a mean annual collision risk of 0.4264 was predicted for herring gull (equivalent to one bird every 2.35 years or 10.66 birds across the lifespan of the proposed development).

8.3.76 Herring gull activity recorded during surveys at the site was primarily associated with the larger waterbodies resulting from the surface mine workings (flooded voids, large settlement ponds etc.) with birds also recorded following earth moving machinery at the House of Water surface mine (likely foraging) with this activity related to non-breeding birds loafing/roosting on the waterbodies throughout the year (Figure 8.1.26 and Figure 8.1.27, EIAR Volume 4).

8.3.77 Considering this species' lack of breeding activity and low predicted risk of collision, herring gull is scoped out of the assessment.

Pink-Footed Goose

8.3.78 Flight activity surveys recorded 12 flights (detailed in Technical Appendix 8.1 Annex D Table D-1 and Figure 8.1.19, EIAR Volume 4) across the entire flight activity survey period. SNH guidance (2013a[21], 2013b[22]) on potential wind farm impacts on pink-footed geese states that "*SNH will now no longer require* [Collision Risk Modelling] *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*"(SNH[23]). Pink-footed geese are not listed as a feature at any designated sites within 20 km of the site and the pink-footed geese recorded are therefore considered to be part of the wider countryside population and therefore no collision risk modelling is required.

8.3.79 Considering the SNH guidance regarding pink-footed goose avoidance rates and collision risk, and lack of suitable habitat within the site, pink-footed goose is scoped out of the assessment.

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21 SNH (2013a) Avoidance Rates for Wintering Species of Geese In Scotland At Onshore Wind Farms.

22 SNH (2013b) Geese and wind farms in Scotland: new information.

23 https://www.nature.scot/professional-advice/planning-and-development/renewable-energy-development/types-renewable-technologies/onshore-wind-energy/wind-farm-impacts-birds

WHOOPER SWAN

8.3.80 Flight activity surveys recorded one flight (detailed in Technical Appendix 8.1 Annex D Table D-1 and Figure 8.1.10, EIAR Volume 4) across the entire flight activity survey period, however the flight was not considered to be at-risk and consequently no collisions were predicted.

8.3.81 Whooper swan were occasionally recorded on the large waterbodies associated with the mine (two waterbodies near Belston Loch, north of the site, Figure 8.1.26 and Figure 8.1.27, EIAR Volume 4) and incidentally on Bogton Loch to the south west of the site.

8.3.82 Considering this species' low on-site activity, absence of breeding and zero predicted risk of collision, whooper swan is scoped out of the assessment.

Future Baseline

8.3.83 In the absence of the proposed development and assuming the continuation of current land management practices (notably the commercial forestry), and allowing for changes in bird behaviour related to climate change (e.g. delayed, reduced or increased breeding attempts depending on the species range), bird populations are likely to continue to be present in similar abundances and distributions to those described in the baseline. It should be noted that with a continuation of the commercial rotational forestry practices, abundances and distributions of species are likely to vary through time.

8.3.84 This chapter considers those areas of the site which are associated with active and historic mining works, as they would be in the future condition of the site due to foreseeable changes to the baseline conditions. The phased coal extraction and restoration operations at House of Water and Greenburn surface mines will continue to take place in accordance with planning permissions for those areas. It is anticipated that operations at House of Water are to be completed in 2021 and at Greenburn in 2019. Given that these areas are currently being worked with committed and enforceable restoration schemes to be secured over a short time frame, it is intended for the purposes of the EIAR that the baseline for each assessment in these particular areas is based on the future condition of the site following the completion of consented restoration works (as per EIAR Volume 4: Figure 7.1.3). The site also contains parts of the former Chalmerston surface mine complex that does not have any real prospect of substantive restoration being undertaken. East Ayrshire Council (EAC) took planning enforcement action in 2018 to secure limited restoration work across the Chalmerston complex that focussed on making areas safe but those works are currently held in abeyance pending the outcome of the North Kyle Energy Project application. In the event of permission being granted, it is envisaged an alternative restoration strategy would be developed for parts of the Chalmerston complex, but should permission be refused then the limited restoration works from the enforcement notice would be procured by EAC. The works that were contemplated in the EAC enforcement scheme would not materially alter the assessment undertaken within this chapter, but an alternative restoration approach could offer opportunities for ecological improvement.

Summary of Sensitive Features

Table 8.7: Summary of IOFs		
Feature	**NCI**	**Justification**
Black grouse	Medium	BoCC Red listed; sensitive to wind farm effects (SNH 2018a[4]).
Golden plover	Medium	Annex 1 species.
Goshawk	Medium	Schedule 1 species.
Peregrine falcon	Medium	Schedule 1 species.

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. The assessment of effects is based on the development description outlined in Chapter 2: Development Description (EIAR Volume 2), and is structured as follows:

- Construction effects;
- Operational effects – collision risk;
- Operational effects – displacement;
- Decommissioning effects; and
- Cumulative effects.

Potential Construction Effects

8.4.2 The main potential effects of construction activities across the site are the displacement and disruption of breeding and foraging birds as a result of noise and general 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).

8.4.3 Effects on breeding birds would be confined to areas in the locality of temporary construction compounds, turbines, tracks and other infrastructure.

8.4.4 Direct habitat loss would also occur due to the construction of the proposed development, which would be both short-term (e.g. temporary compounds, laydown areas) and long-term (access tracks and turbines). This may impact on breeding or foraging individuals.

Black Grouse

8.4.5 **Effect**: temporary displacement of black grouse from existing lekking, nesting or foraging areas during construction could lead to effects on productivity and survival. If the current population of black grouse is limited by habitat then any displacement of foraging grouse from the areas presently used may have a material effect on the population’s viability.

8.4.6 **Sensitivity**: as a BoCC Red listed species considered to be sensitive to wind farms, black grouse is considered to be of medium NCI. The regional/NHZ and national populations are considered to be in unfavourable conservation status as a result of a long-term nationwide decline (Forrester *et al*. 2012[8]). As such black grouse is considered to be of medium-high sensitivity.

8.4.7 **Magnitude of Change**: According to an expert review by Ruddock and Whitfield (2007[8]), leks may be actively disturbed at 300–500 m from a disturbance source, and SNH has more recently advocated that a buffer of up to 750 m should be applied to avoid all disturbance during the construction phase, based on information in Zwart *et al.* (2015[24]).

8.4.8 Of the five leks located, three were recorded within 750 m of turbines (Table 8.8) with leks 4 and 5 recorded 1.3 km and 3.1 km from the nearest turbine (Figure 8.1.29, EIAR Volume 4). In light of the above information on black grouse disturbance distances during construction, there is considered to be no potential for disturbance to leks 4 and 5.

Table 8.8: Black Grouse Leks and Distances

Lek	Maximum Number of Males	Distance to Nearest Proposed Turbine	Distance to Nearest Infrastructure
1	1 (2017) 1 (2018)	128 m (turbine 13) 521 m (turbine 13)	16 m (existing House of Water mine track) 65 m (existing House of Water mine track)
2	1 (2018)	632 m (turbine 54)	187 m (existing mine track)
3	1 (2018)	379 m (turbine 48)	44 m (existing forestry track)

8.4.9 Wilson *et al.* (2015[29]) estimate the NHZ 19 population to be 121 lekking males and so although unlikely, the potential unmitigated disturbance of all three lekking males from leks 1-3 would represent around 2.5% of the NHZ population. Considering the presence of additional lek sites (leks 4 and 5) outwith the proposed development but within reach of the birds present at leks 1, 2 and 3, any birds that are disturbed at leks 1, 2 and 3 may shift to these other leks (and continue lekking) rather than be lost to the NHZ population. However, a worst-case scenario is adopted which assumes that breeding activity would be disrupted over the course of two breeding seasons. Whilst the presence of lek 1 in close proximity to the active House of Water mine (where activities include regular blasting and other mining activities relating to surface coal extraction) suggests that birds attending the lek may have developed some tolerance to human activities, as a worst case (assuming the loss of three males), the unmitigated effect of construction disturbance on the regional (NHZ 19) black grouse population is considered to be low spatial and short term temporal magnitude.

8.4.10 **Significance of Effect**: the unmitigated effect is considered to be **moderate** and is therefore potentially **Significant** in the context of the EIA Regulations. Mitigation is however proposed during construction (paragraph 8.5.1) to reduce the likelihood of a significant effect given the sensitivity of the black grouse population.

Golden Plover

8.4.11 **Effect**: wintering golden plover may be displaced from the site during construction, either by disturbance or direct habitat loss.

8.4.12 **Sensitivity**: as an Annex 1 listed species, golden plover are classified as medium NCI and are considered to be in a favourable/stable conservation status. Wintering numbers in Scotland are thought to have remained fairly stable over recent decades – Forrester *et al.* (2012[18]). As such, the species' overall level of sensitivity is considered to be medium.

8.4.13 **Magnitude of Change**: golden plover were identified overwintering/roosting during the non-breeding season (September to mid-April) with activity focussed in three areas of the study area associated with the recently restored surface mine workings, or unrestored

24 Zwart, M. C., P. Robson, S. Rankin, M. J. Whittingham, and P. J. K. McGowan. 2015. Using environmental impact assessment and post-construction monitoring data to inform wind energy developments. Ecosphere 6(2):26. http://dx.doi.org/10.1890/ES14-00331.1

workings. Of these, one area is over 500 m to the northeast of the site (an area of the restored Skares surface mine north of Laigh Mount) and displacement of any birds from this area as a result of the proposed development is considered unlikely. The other two areas are within 500 m of the site on the unrestored surface mine workings southeast of Stannery Knowe and northeast of Benbain (Figure 8.1.9, EIAR Volume 4). The habitat in both these areas consists predominantly of bare wet ground/spoil with small fragments of marshy grassland (Figures 7.1.2c, 7.1.2e and 7.1.2f, EIAR Volume 4) and a maximum flock size of 56 birds was recorded in these areas. Records of golden plover at these areas across the 2016/2017 and 2017/2018 non-breeding seasons were variable, however peak activity was during autumn migration (September to November).

8.4.14 Wintering golden plover may be displaced from these two areas within 500 m of the site during construction, however given the abundance of similar suitable habitat within the wider area (including the area already identified to be used by golden plover to the northeast of the proposed development near Laigh Mount), the magnitude of this effect on the regional wintering population is considered to be low spatial and short-term temporal.

8.4.15 **Significance of Effect**: the unmitigated effect is considered to be **minor** and is therefore **Not Significant** in the context of the EIA Regulations.

Goshawk

8.4.16 **Effect**: breeding or foraging goshawks may be displaced from the site during construction, either by disturbance or direct habitat loss.

8.4.17 **Sensitivity**: as a Schedule 1 listed species, goshawk is classified as being of medium NCI and the national and regional/NHZ 19 populations are in favourable conservation status (Green listed). The species' overall sensitivity is therefore considered to be medium.

8.4.18 **Magnitude of Change**: baseline survey data indicates that there may be up to two territories (one confirmed) within 2 km of the site, with only one territory (GI_2) located within the site. During the construction period, any breeding attempts within 400 m of construction activity may be subject to disturbance pressures (Petty 1996[25]). In 2018, GI_1 was 1.29 km from the nearest turbine and 1.18 km from the nearest access track, so is unlikely to be affected by habitat loss or construction disturbance associated with the proposed development. In 2018, GI_2 was 159 m from the nearest turbine and 13 m from the nearest access track (Confidential Figure 8.2.1, EIAR Volume 4), and therefore disturbance is a possibility should breeding occur again in a similar location.

8.4.19 There was inter-annual variation in territory numbers during baseline surveys (no breeding activity was recorded during 2017) and this is likely due to ongoing commercial forestry activities within the site (although this may also be partially as a result of a different, smaller survey area in 2017): either clear-felling of potential or historic nesting areas, or ongoing forestry activities dissuading birds from attempting to nest within a particular location. Under the future baseline scenario, this pattern of variability of nest site distribution, if not numbers, is likely to continue over the long-term period.

8.4.20 The Forest Design Plan (see EIAR Volume 4: Technical Appendix 2.11 and Figure 2.11.7 for further details) provides details on the replanting and restructuring of the woodland throughout the lifetime of the proposed development. For the purposes of the proposed development, approximately 127 ha of commercial forestry, predominantly Sitka spruce,

25 Petty, S. J. (1996) Reducing disturbance to goshawks during the breeding season. Research Information Note 267, issued by the Forestry Commission.

will be felled without replanting. It should be noted that whilst compensatory planting is proposed to mitigate the loss of this forestry, the extent, location and compensation will be agreed with Scottish Forestry prior to commencement of operation, and so the worst-case permanent loss of the forestry is considered here for goshawk. Although this may slightly reduce the amount of nesting and foraging habitat available over the long-term, the viability of any territories are unlikely to be significantly compromised and numbers are likely to remain consistent with those under the future baseline scenario. Some felling locations may provide further opportunities for nesting or foraging due to the opening up of forestry and provision of better vantage points for birds. Habitat loss is therefore considered to be of low spatial and long-term temporal magnitude.

8.4.21 Based on survey results, one (unconfirmed) territory may be affected by disturbance if construction activities are concurrent across the site. As already stated, with the presence of ongoing forestry operations, this scenario is not dissimilar to the future baseline scenario and therefore continuation of breeding within the site or nearby is more likely than abandonment of territories. The magnitude of effect due to construction disturbance is therefore considered to be low spatial and short-term temporal on the NHZ 19 population.

8.4.22 **Significance of Effect**: the unmitigated effect is considered to be **minor** and therefore **Not Significant** in the context of the EIA Regulations.

Peregrine Falcon

8.4.23 **Effect:** breeding or foraging peregrine falcons may be displaced from the site during construction, either by disturbance or direct habitat loss.

8.4.24 **Sensitivity:** as a Schedule 1 listed species, peregrine falcon is classified as being of medium NCI and the national and regional/NHZ 19 populations are in favourable conservation status (Green listed). The species' overall sensitivity is therefore considered to be medium.

8.4.25 **Magnitude of Change:** baseline survey data indicates that there may be up to two (confirmed) breeding territories within 2 km of the site (PE_2 [SSRSG Site B, Nest 1] and PE_3 [SSRSG Site A, Nest 2]). A third territory (PE_4 [SSRSG Site A, Nest 1]) was also present in 2017, however as detailed in paragraph 8.3.31, this nest is no longer in existence.

8.4.26 A review of disturbance distances by Ruddock and Whitfield (2007[8]) concluded 500-750 m as a maximum distance for passive disturbance effects, but that even this may be over precautionary with few observations of disturbance actually recorded (and where they were, the distances were considerably less than 500-750 m). Indeed, Petty (1998[26]) recommends a 400-600 m disturbance buffer for peregrine falcon. In addition, peregrine falcon are known to successfully nest in active quarries/urban settings (historically and in the more recent past as populations have recovered) and are considered to be highly tolerant (or at least easily habituate, Ruddock and Whitfield 2007[8]) to human activity/disturbance.

8.4.27 Even considering the maximum 750 m recommended buffer distance for peregrine falcon, PE_3 (SSRSG Site A, Nest 2) and SSRSG Site B, Nest 2 are well outside this distance (being located outwith the site) and construction disturbance is not considered to pose any concern to these nest sites.

26 Petty, S. J. (1998) Ecology and Conservation of Raptors in Forests. Research Information Note 118, issued by the Forestry Commission.

8.4.28 Whilst PE_2 (Site B, Nest 1) is within 750 m of the proposed development (but is outwith the site), this is only in relation to a fixed point of infrastructure 620 m away with the nearest turbine 860 m away (Confidential Figure 8.2.1, EIAR Volume 4). Considering that 750 m is thought to be an over precautionary maximum (Ruddock and Whitfield 2007[8]), that this nest is still outwith the maximum 600 m recommended by Petty (1998[26]), and that the nest crag is approximately 160 m higher in elevation from the construction compound, actual disturbance to this pair as a result of construction is considered to be negligible.

8.4.29 **Significance of Effect:** the unmitigated effect is considered to be **negligible** and therefore **Not Significant** in the context of the EIA Regulations.

Potential Operational Effects – Collision Risk

8.4.30 Birds that utilise the airspace within the turbine area at potential collision heights during the lifetime of the proposed development would be at risk of collision with turbines. The risk of collision with moving wind turbine blades is related to the amount of flight activity over the site, its topography, the species' behaviour, and the ability of birds to detect and manoeuvre around rotating turbine blades.

8.4.31 Band *et al.* (2007[27]) 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. This results in a figure for the likely collision rate at the wind farm which is then assessed within the context of the species' relevant populations to determine the significance of any losses. Collision Risk Modelling (CRM) results are summarised in Table 8.1.7 and Table 8.1.8 of Technical Appendix 8.1 (EIAR Volume 4) with details of all the collision modelling input parameters and results located in Technical Appendix 8.1, Annex E (EIAR Volume 4).

Black Grouse

8.4.32 **Effect**: birds flying within the site may be subject to a collision risk with turbines, thereby potentially affecting survival rates at a population level. Black grouse are known to be at risk of colliding with structures close to ground level, such as fences and wires - deer and stock fencing has proved to be a particular hazard for this species[28]. Zeiler and Grünschachner-Berger (2009[38]) reported cases of black grouse mortality resulting from collisions with various structures close to ground level, and they report strong declines in black grouse numbers in local populations in areas where three wind farms were constructed in the Alpine zone in Austria.

8.4.33 **Sensitivity**: medium-high.

8.4.34 **Magnitude of Change**: Following collision risk modelling, a mean annual collision rate for black grouse of 0.0008 was predicted (one bird every 1,309 years). Permanent forestry removal for the proposed development infrastructure will however create open areas of habitat close to turbines, which may be more suitable for black grouse, thereby increasing the risk of collisions with infrastructure.

8.4.35 The risk of collisions with turbine blades for this species is however likely to remain low as typical flight behaviour suggests that the large majority of flights would be below rotor

27 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.

28 https://www.forestry.gov.uk/PDF/FCTN019.pdf/$FILE/FCTN019.pdf

height. Wilson *et al.* (2015[29]) estimated that there may be 121 lekking males within NHZ 19 and considering an annual adult mortality of 0.28 (BTO BirdFacts[30]) this would equate to a natural loss of 33.8 birds per year from the NHZ population. The additional predicted loss of 0.0008 birds per year due to collision would therefore equate to an additional mortality of 0.002% arising from turbine collision. In addition to this, there may be some mortality through the collision with other structures such as rails associated with steps leading into the turbines. However, even taking into account the potential for collisions with other infrastructure, the magnitude of effect on the NHZ population is considered to be negligible spatial and long term temporal.

8.4.36 **Significance of Effect**: the unmitigated effect is considered to be **minor** and is therefore **Not Significant** in the context of the EIA Regulations. Mitigation (in the form of fence marking) is however proposed in section 8.5 to further reduce the likelihood of a significant effect, given the sensitivity of the black grouse population.

Golden Plover

8.4.37 **Effect**: wintering golden plover flying within the site may be subject to collision risk with turbines, which could affect the regional wintering population.

8.4.38 **Sensitivity**: medium.

8.4.39 **Magnitude of Change**: Following collision risk modelling, a mean non-breeding season collision rate for golden plover of 2.57 was predicted (one bird every 0.39 years). The natural mortality rate of golden plover is around 0.27 (BTO BirdFacts) which is equal to an annual natural loss of 27% of the regional wintering population. The regional wintering population is considered to be in excess of 10,000 birds (Technical Appendix 8.1 Annex F, EIAR Volume 4) which would result in an annual natural loss of 2,700 birds and the additive mortality due to the proposed development would therefore be 0.1% of the regional wintering population.

8.4.40 A population model was constructed to investigate how this level of mortality would affect populations of between 5,000 and 15,000 individuals (Technical Appendix 8.1 Annex F, EIAR Volume 4). The results indicated that annual collision mortality of 2.57 would reduce the annual growth rate of a (precautionary) population size of 10,000 by 0.02%. To provide context for this magnitude of reduction, the UK resident breeding population (which is a constituent of the wintering population) grew by 19% between 2000 and 2005 (leading to the species being delisted as one of conservation concern, Eaton *et al.* 2015[1]).

8.4.41 Consequently, the predicted additional loss due to collisions with wind turbines will lead to an effect considered to be negligible spatial and long term temporal at the Scottish and regional population levels.

8.4.42 **Significance of Effect**: the unmitigated effect is considered to be **negligible** and therefore **Not Significant** in the context of the EIA Regulations.

Goshawk

8.4.43 **Effect**: goshawk flying within the site may be subject to a collision risk with turbines or other infrastructure, thereby potentially affecting survival rates at a population level.

29 Wilson, M.W., Austin, G.E., Gillings, S. and Wernham, C.V. (2015). Natural Heritage Zone Bird Population Estimates. Scottish Windfarm Bird Steering Group (SWBSG) Commissioned Report No. 1504.

30 https://app.bto.org/birdfacts/results/bob3320.htm

8.4.44 **Sensitivity**: medium.

8.4.45 **Magnitude of Change**: Wilson *et al.* (2015[29]) estimated that there may be 31 breeding pairs of goshawk within NHZ 19 and considering an annual adult mortality rate of 0.17 (BTO BirdFacts[31]) this would equate to a natural loss of 10.54 breeding birds per year from the NHZ population. The additional predicted loss of 0.1055 birds a year due to collision would therefore equate to an additional mortality of 1.0%.

8.4.46 It should be noted that the recorded activity rates and predicted collision rates for goshawk during the operational period may be misleading, since existing forestry within the vicinity of proposed turbine locations is likely to be removed or altered prior to operation (turbine key hole areas of 100 m radius), and so habitat and goshawk activity levels in these areas will differ compared to the baseline period. In addition, the NHZ population estimates are likely to be an underestimation of current goshawk breeding populations as the 2016 and 2017 Scottish Raptor Monitoring Scheme annual reports[32] indicate that the Scottish breeding goshawk population is increasing with 144-173 estimated breeding pairs in 2016, which is an increase on the 136 breeding pairs estimated by Wilson *et al.* (2015[29]) for the NHZ Bird Population Estimates Report. Considering the above information, the potential additional mortality as a result of the proposed development is likely to be less than the 1.0% calculated on the basis of the NHZ 19 breeding population estimate. From estimates provided by Wilson *et al.* (2015[29]), NHZ 19 held 22.7% of the Scottish population of breeding goshawk which would suggest that the 2016 NHZ 19 population would be 32-39 breeding pairs and would indicate a potential additional loss of 0.9-0.8% of the breeding population.

8.4.47 It is acknowledged that goshawk may forage within open areas in the vicinity of mature forest. However, unlike much of the flight activity recorded over mature forest during the baseline survey period, this activity is likely to take place mainly at low altitude, below turbine rotor height, as is appropriate to the type of prey that goshawks capture, and the style of hunting they deploy (being short duration sit-and-wait predators). Goshawks hunt in enclosed forest environments and are adept at avoiding collisions with trees, and so although activity may continue in proximity to turbines, the collision risk is likely to be low.

8.4.48 Considering the likely favourable population status of goshawk within NHZ 19, the predicted additional loss due to collisions with wind turbines will lead to an effect that is (at worst case) considered to be low spatial and long term temporal at regional (NHZ 19) population levels.

8.4.49 **Significance of Effect**: the unmitigated effect is considered to be **minor** and therefore **Not Significant** in the context of the EIA Regulations.

Peregrine Falcon

8.4.50 **Effect**: peregrine falcon flying within the site may be subject to a collision risk with turbines or other infrastructure, thereby potentially affecting survival rates at a population level.

8.4.51 **Sensitivity**: medium.

8.4.52 **Magnitude of Change:** Wilson *et al.* (2015[29]) estimated that there may be 34 breeding pairs of peregrine falcon within NHZ 19 and considering an annual adult mortality rate of

31 https://app.bto.org/birdfacts/results/bob2670.htm

32 http://raptormonitoring.org/annual-report

0.2 (BTO BirdFacts[33]) this would equate to a natural loss of 13.6 breeding birds per year from the NHZ population. The additional predicted loss of 0.0335 birds a year due to collision would therefore equate to an additional mortality of 0.25%.

8.4.53 As with goshawk, more recent Scottish population estimates for peregrine falcon from the Scottish Raptor Monitoring Scheme annual reports[32] suggest that the Scottish population has increased in recent years with 523 estimated breeding pairs in 2016 and 2017, as opposed to 485 breeding pairs estimated by Wilson *et al.* (2015[29]) for the NHZ Bird Population Estimates Report.

8.4.54 Considering the likely favourable population status of peregrine falcon within NHZ 19, the predicted additional loss due to collisions with wind turbines will lead to an effect that is (at worst case) considered to be negligible spatial and long term temporal at regional (NHZ 19) population levels.

8.4.55 **Significance of Effect:** the unmitigated effect is considered to be **minor** and therefore **Not Significant** in the context of the EIA Regulations.

Potential Operational Effects – Displacement

8.4.56 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.

8.4.57 Displacement away from operational turbines has been found to occur in a number of individual wind farm studies, although the effects vary considerably between sites and species. Considering a range of breeding bird species but predominantly waders and passerines at upland wind farms, Pearce-Higgins *et al.* (2012[37]) showed that there were no displacement effects on any bird species from wind farms during the operational phase other than those that had already occurred during construction, and for some species the effects during construction were reversed during operation with numbers returning to pre-construction numbers.

8.4.58 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 the construction effects (see previous Potential Construction Effects section).

8.4.59 An additional consideration is the displacement of birds from larger areas where the wind turbines act as a barrier to bird movement. The likelihood of this effect occurring tends to increase with wind farm size, with larger turbine arrays giving rise to a greater risk that birds are forced to alter their regular flight paths, resulting in an increase in distance flown and so energy expended. Modelling of energy costs to migrating bird species most likely to be sensitive to barrier effects (large and long-lived breeding birds such as seabirds) by Masden *et al.* (2010[34]) found that there are unlikely to be any significant effects on populations. However, the increased cost of repeated diversions around a wind farm made by breeding birds moving between their nests and foraging areas may be more substantial (see Masden *et al.* 2010[34]). This may also be the case for roosting birds such as geese

33 https://app.bto.org/birdfacts/results/bob3200.htm

34 Masden, E.A., Haydon, D.T., Fox, A.D. & Furness, R.W. (2010). Barriers to movement: modelling energetic costs of avoiding marine wind farms amongst breeding seabirds. Marine Pollution Bulletin 60: 1085-1091.

regularly moving to feeding areas. Humphreys *et al.* (2015[35]) concluded that the extent to which barrier and displacement effects have been differentiated between in the field is however highly debatable as both are manifested as a reduction of birds within the wind farm (Cook *et al.* 2014[36]). It may be the case therefore that barrier effects during the breeding season have already been accounted for as displacement effects.

8.4.60 Pearce-Higgins *et al.* (2009[37]) observed certain species experiencing localised population increases with proximity to wind farm infrastructure installations, so while some birds may be displaced locally, others may benefit from the introduction of new structures into the habitat, or some other consequence of construction. This finding was further supported by Pearce-Higgins *et al*. (2012[37]) who reported significant increases in breeding numbers of skylarks and stonechats at wind farms.

Black Grouse

8.4.61 **Effect**: black grouse are recognised as a species being potentially sensitive to the presence of wind farms (SNH 2018[4]), and wind farm operation may cause some displacement of breeding and foraging black grouse from areas close to turbines and other infrastructure. It is considered that operational disturbance (e.g. from maintenance activities) has, in general, a lesser effect than construction disturbance as operational disturbance is generally of shorter duration and smaller extent.

8.4.62 **Sensitivity**: medium-high.

8.4.63 **Magnitude of Change:** According to an expert review by Ruddock and Whitfield (2007[8]), leks may be actively disturbed at 300–500 m from a disturbance source, and SNH has also advocated that a buffer of up to 500 m should be applied to avoid all potential displacement effects during wind farm operation. Evidence from Austria has suggested that leks may be adversely affected by wind farms, although it is not clear what the exact causes may be – potentially a combination of turbine noise, maintenance activities or collisions (Zeiler and Grünschachner-Berger 2009[38]). At the operational Griffin Wind Farm, early indications were that there were no obvious effects of the turbines on the closest lek approximately 500-600 m from a turbine (Ross 2012[39]). Early stage operational monitoring (in 2014 and 2015) at Berry Burn Wind Farm indicates that, like Griffin Wind Farm, there has been no obvious effect on black grouse behaviour with two different leks recorded within 250 m and 420 m of turbines and black grouse activity recorded across the whole wind farm (droppings and birds) (Nevis 2015[40] and 2016[41]).

8.4.64 Of the five leks located during baseline surveys, two were recorded within around 500 m of proposed turbine locations (leks 1 and 3, Table 8.8) with leks 2, 4 and 5 recorded 632 m, 1.3 km and 3.1 km respectively from the nearest turbine (Figure 8.1.29, EIAR Volume 4).

35 Humphreys, E.M., Cook, A.S.C.P., and Burton, N.H.K. (2015). Collision, Displacement and Barrier Effect Concept Note. BTO Research Report No. 669. British Trust for Ornithology, Thetford.

36 Cook, A.S.C.P., Humphreys, E.M., Masden, E.A., & Burton, N.H.K. (2014). The avoidance rates of collision between birds and offshore turbines. Scottish Marine and Freshwater Science Volume 5 Number 16. Marine Scotland Science, Aberdeen.

37 Pearce-Higgins, J. W., Stephen, L., Langston, R. H. W., Bainbridges, I. P., and Bullman, R. (2009). The distribution of breeding birds around upland wind farms. Journal of Applied Ecology, 46: 1323-1331.

38 Zeiler H., V. Grünschachner-Berger (2009): Impact of wind power plants on black grouse, Lyrurus tetrix in Alpine Regions. Folia Zool. 58(2): 173–182

39 Ross, A. (2012). Griffin Windfarm LMP: Black grouse lek survey report 2012. Northern Ecological Services report to SSE Renewables.

40 Nevis (June 2015) 2014 Habitat Management Plan Implementation.

41 Nevis (February 2016) 2015 Habitat Management Plan Implementation.

Based on available evidence from studies, at these distances, there is considered to be no potential for displacement of birds at leks 2, 4 and 5 during operation.

8.4.65 Lek 1 is considered to be, relatively, the most important lek at the site, with one lekking male recorded in 2017 and 2018 in addition to frequent foraging activity in the vicinity of the lek (across the whole area between Harecraigs Hill at the north and Little Rigend Hill at the south). Black grouse have continued to use the moorland around Tappet Hill and Harecraigs Hill (for both lekking and foraging) in the presence of the operational House of Water surface mine with mining works occurring well within 500 m of the lek, providing further evidence that black grouse are able to habituate to human/machine related activities (e.g. mining activities, vehicle movements, machinery noise). The design process has ensured that there are no turbines within 500 m of the lek location in 2018, suggesting that lekking should be able to continue unaffected.

8.4.66 A single male was recorded lekking along a forestry track (Lek 3) in April, May and June 2018. There were no records in 2017. This lek is located within commercial forestry plantation and the surrounding forestry blocks are currently either clear fell or thicket stage new plantation, and this mixture of open and varying density forestry habitat has created habitat currently suitable for black grouse. In the absence of the proposed development and with the continuation of the forestry management, the replanted areas would continue to mature and the clear fell areas would also be replanted, thus slowly reducing the suitability of the area for black grouse. Consequently, this lek is considered to be of relatively low importance over the medium to long-term as it is likely that the male recorded lekking here would be displaced, potentially to other nearby lek locations (leks 2 and 4) even in the absence of the proposed development.

8.4.67 Considering the presence of additional lek sites (leks 2, 4 and 5) outwith the site but within reach of the birds present at leks 1 and 3, it is more likely that any birds that are displaced from leks 1 and 3 would to shift to these other leks (and continue lekking) rather than be lost to the population. In addition, considering the available information regarding black grouse at operational wind farms and the HMP proposal for the proposed development, it is also likely that any birds at lek 1 would remain at the lek during the operation of the proposed development. However, a worst-case scenario is adopted here that breeding at leks 1 and 3 would be disrupted over the course of the proposed development (25 years). Wilson *et al.* (2015[29]) estimate the NHZ 19 population to be 121 lekking males and so the potential unmitigated disturbance of up to two lekking males would represent around 1.65% of the NHZ population. Some feeding habitat may also be lost due to displacement effects, although this is unlikely to directly result in the reduction of numbers within the local population. Consequently, the worst case unmitigated effect (based on the loss of two males) of operational displacement on the regional (NHZ 19) black grouse population is considered to be low spatial and long term temporal magnitude.

8.4.68 **Significance of Effect**: the unmitigated effect is considered to be **moderate** and is therefore potentially **Significant** in the context of the EIA Regulations. Mitigation is proposed in section 8.5 to reduce this effect further given the sensitivity of the black grouse population.

Golden Plover

8.4.69 **Effect**: wintering golden plover may be displaced from the site during operation, either by disturbance or displacement.

8.4.70 **Sensitivity**: medium.

8.4.71 **Magnitude of Change**: golden plover were identified overwintering/roosting in three areas during the non-breeding season (September to mid-April). Two of these areas were within 500 m of the site (areas of unrestored surface mine workings south east of Stannery Knowe and north east of Benbain) with flocks of up to 56 birds recorded (paragraph 8.4.13).

8.4.72 It is possible that foraging golden plover may be displaced by the presence of the operational wind farm. Sansom *et al.* (2016[42]) have shown information to suggest that breeding golden plovers may be affected by operational turbines up to 400 m away, although displacement was less than complete, with an estimated 79% reduction.

8.4.73 The results of an ongoing long-term study of golden plover within an active wind farm however suggest minimal effects on the species' breeding success (Fielding & Howarth 2012[43]). Similarly, Pearce-Higgins *et al*. (2012[37]) reported no significant effect of wind farm construction or operation on golden plover densities. 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 (Black Law, Dersalloch and Hare Hill Wind Farms). Considering these results and given the abundance of similar suitable habitat within the wider area, it is unlikely that wintering birds (as opposed to breeding birds) would be lost to the local area, and no impacts on the survival rates of the wintering populations are predicted. As such the magnitude of this effect is considered to be negligible spatial and long-term temporal.

8.4.74 **Significance of Effect**: the unmitigated effect is considered to be **negligible** and is therefore **Not Significant** in the context of the EIA Regulations.

Goshawk

8.4.75 **Effect**: breeding or foraging goshawks may be at risk of displacement from around turbines or other infrastructure or as a result of habitat loss due to felling related to the proposed development.

8.4.76 **Sensitivity**: medium.

8.4.77 **Magnitude of Change**: baseline survey data indicates that there may be up to two territories (one confirmed) within 2 km of the proposed development, with inter-annual variation in numbers and distribution likely to occur each year under the future baseline scenario as a result of ongoing commercial forestry activities within the site.

8.4.78 Key hole felling is proposed for 34 (of the 54) turbines that are located within existing forestry[44] and approximately 127 ha of commercial forestry, predominantly Sitka spruce, will be felled without replanting (paragraph 8.4.20). GI_1 (confirmed nest/territory) is located outwith the site boundary and considering that no felling for the proposed development will be undertaken within 1.2 km of this nest, neither habitat loss (as a result of felling for the proposed development) nor disturbance due to operational activity is expected to compromise the integrity of this territory.

8.4.79 GI_2 (unconfirmed territory, paragraph 8.3.16) is 159 m from the nearest turbine and 13 m from the nearest access track and this unconfirmed territory is likely to be affected by felling related to the proposed development. The approximate territory centre is located on

42 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. doi:10.1111/ibi.12364

43 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

44 The remaining 20 turbines are located on open ground (either moorland or as a result of the surface mine workings).

the edge of a felling area for an access track. In addition, one turbine (which will require key hole felling) is within 500 m of the approximate territory centre point, with a further ten turbines requiring key hole felling within 1 km of the approximate territory centre point. As a predominantly woodland species, goshawk are only likely to be displaced around operational turbines or other infrastructure where forestry has been cleared, and the loss of foraging or nesting habitat within this potential territory may potentially compromise the integrity of this unconfirmed territory.

8.4.80 As discussed in paragraph 8.4.46, the NHZ 19 population is estimated to be 32-39 breeding pairs and so the potential unmitigated loss of one breeding pair would represent around 3.1-2.5% of the NHZ population, which would be low spatial and long-term temporal magnitude. However, it should be noted that there will continue to be available forestry habitat adjacent to the proposed development and that the potential displacement of a pair of breeding goshawk as a result of felling for the proposed development will equate to a very similar effect to the displacement of goshawk as a result of commercial forestry operations, under the future baseline scenario, meaning that no additional effects on the NHZ population due to the proposed development are predicted.

8.4.81 **Significance of Effect**: the unmitigated effect is considered to be **minor** and therefore **Not Significant** in the context of the EIA Regulations.

Peregrine Falcon

8.4.82 **Effect**: breeding or foraging peregrine falcons may be at risk of displacement from around turbines or other infrastructure or as a result of habitat loss.

8.4.83 **Sensitivity**: medium.

8.4.84 **Magnitude of Change:** baseline survey data indicates that there may be up to two (confirmed) breeding territories within 2 km of the site (PE_2 [SSRSG Site B, Nest 1] and PE_3 [SSRSG Site A, Nest 2]). A third territory (PE_4 [SSRSG Site A, Nest 1]) was also present in 2017, however as detailed in paragraph 8.3.31, this nest is no longer in existence.

8.4.85 PE_3 (SSRSG Site A, Nest 2) and PE_2 (SSRSG Site B, Nest 1) are both located outwith the site boundary and are 2 km and 860 m respectively from the nearest turbine. Considering these distances and the 2 km core foraging range of breeding peregrine falcon (SNH 2016), there is considered to be no potential to compromise the integrity of PE_3 (SSRSG Site A, Nest 2) either by habitat loss (as a result of displacement) or disturbance due to operational activity. Turbines are present within the 2 km core range of PE_2 (SSRSG Site B, Nest 1), however turbines only overlap with less than a quarter of the 2 km range for this territory (five turbines to the north of the nest), and considering the majority of the 2 km territory will continue to remain unchanged, the potential habitat loss (as a result of displacement) is considered to be limited in the context of the overall territory and is not considered to have the potential to compromise the integrity of the territory.

8.4.86 **Significance of Effect**: the unmitigated effect is considered to be **minor** and therefore **Not Significant** in the context of the EIA Regulations.

Potential Decommissioning Effects

8.4.87 Decommissioning effects, because of the long timeframe until their occurrence (>25 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 would be able to return. Thus, effects assessed during construction are considered to apply to decommissioning.

Potential Cumulative Effects

8.4.88 This section presents information about the potential cumulative effects of the proposed development combined with other nearby existing or proposed wind farm projects[45].

8.4.89 SNH (2018b[9]) has provided guidance on assessing the cumulative effects on birds. This assessment follows the principles set out in that guidance.

8.4.90 Cumulative effects 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 (2018b) "*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*". For the cumulative assessment, the NHZ 19 level is considered practical and appropriate for breeding species of wider countryside interest.

8.4.91 The assessment uses a three-tiered approach based on the levels of likelihood and confidence that a particular project will be consented and combine with the proposed development to act on an IOF to create a cumulative effect. The tiered process of assessment takes the following form:

i. The proposed development with operational and in-construction projects;
ii. The proposed development with operational, in-construction and approved projects; and
iii. The proposed development with operational, in-construction, approved and in-planning projects.

8.4.92 Wind farm projects at scoping stage have been scoped out as they do not have sufficient information on potential impacts to be included, as the baseline survey period is ongoing, or results have not been published. Projects that have been refused or withdrawn have also been scoped out.

8.4.93 Small projects with three or fewer turbines have also been excluded as often these projects are not subject to the same level of detail of ornithological assessment, and so there are no directly comparable data. Because of the small scale of such projects, effects are likely to be negligible on the IOFs assessed here. Other small-scale renewable projects such as micro hydro schemes have also been scoped out for similar reasons.

8.4.94 SNH's Natural Spaces website was accessed to download the Onshore Wind Farm Proposals GIS Shapefile (downloaded July 2019[46]), which presents the location of wind farms across Scotland, to provide the initial scope for this assessment. Further internet searches were required to check and update the status of some projects.

8.4.95 From a total of 115 projects within, or partly overlapping with NHZ 19 presented by SNH (a small number of other projects were added to this list), 78 were taken forward for consideration (Figure 8.6, EIAR Volume 3a), with the remainder being at scoping stage, withdrawn, refused appeal or comprising 1-3 turbines. Harryburn Wind Farm, which is on the border of NHZ 19 and NHZ 20 (Border Hills) was considered by SNH to be more

45 There are no other major non-wind farm projects in the planning process (to the best of our knowledge) that require consideration in this assessment.

46 https://gateway.snh.gov.uk/natural-spaces/dataset.jsp?dsid=WINDFARM

representative of projects within NHZ 20 for the purposes of that project's cumulative assessment, and so has been excluded here. Information on ornithological impacts was obtained for the majority of these projects via Environmental Statements available on the planning portals accessed on the relevant local authority websites. In 12 cases, noted in the tables below, information for a project was not available on the local authority website.

Table 8.9: Scoped In Wind Farm Projects within NHZ 19

Project	Status	Number of Turbines	Information Available
Installed (Operational) Wind Farms			
Afton	Operational	27	Variation ES, NTS
Airies	Operational	14	ES chapter
Andershaw Forest	Operational	11	ES chapter
Arecleoch	Operational	60	No info available
Artfield Fell	Operational	15	NTS
Auchrobert	Operational	12	No info available
Balmurrie Fell (Artfield Fell Extension)	Operational	7	NTS
Bankend Rig	Operational	11	No info available
Barlockhart Moor Wind Farm	Operational	4	From Barlockhart Moor Wind Farm Extension ES
Blackcraig Hill	Operational	23	No info available
Carscreugh	Operational	18	ES chapter
Clyde	Operational	152	ES chapter
Dalswinton (Pennyland Moor)	Operational	15	ES chapter
Dersalloch	Operational	23	ES chapter, 2006 and 2012 addendum
Dungavel	Operational	13	ES chapter and technical report
Galawhistle	Operational	22	ES chapter
Glen App	Operational	11	ES chapter
Glenchamber	Operational	11	From Barlockhart Moor Wind Farm Extension ES
Hare Hill Phase 1	Operational	20	No info available
Hare Hill Phase 2	Operational	39	ES chapter
Harestanes	Operational	68	ES chapter
Kilgallioch	Operational	96	ES chapter and addendum
Kype Muir	Operational	26	ES chapter
Mark Hill	Operational	28	NTS
Middle Muir	Operational	15	ES chapter
Minnygap	Operational	10	No info available
Nutberry	Operational	6	ES chapter
Sanquhar (Community Windfarm)	Operational	9[47]	SEI chapter
Wether Hill	Operational	14	ES chapter

47 12 consented, 9 built.

Table 8.9: Scoped In Wind Farm Projects within NHZ 19			
Project	**Status**	**Number of Turbines**	**Information Available**
Windy Standard (Brockloch Rig 1)	Operational	36	No info available
Windy Standard II (Brockloch Rig)	Operational	30	No info available
Whiteside Hill	Operational	10	NTS
Approved Wind Farms			
Benbrack	Consented	18	ES chapter
Chirmorie	Consented	21	ES chapter
Crookedstane	Consented	4	ES chapter
Cumberhead	Consented	11	ES chapter
Gass	Consented	9	ES chapter
Glenmuckloch	Consented	8	ES chapter
Kennoxhead	Consented	19	ES chapter
Knockman Hill	Consented	5	Environmental Report
Kype Muir Extension	Consented	18	ES chapter
Lethans	Consented	22	ES chapter
Lion Hill	Consented	4	ES chapter
Lorg	Consented	15	ES chapter
Mochrum Fell	Consented	8	ES chapter
Overhill	Consented	10	ES chapter
Penbreck	Consented	9	ES chapter
Pencloe	Consented	19	ES chapter
Polquhairn	Consented	9	ES chapter
Sandy Knowe	Consented	24	ES chapter
Sanquhar Six	Consented	6	ES chapter
South Kyle	Consented	50	ES chapter
Stranoch	Consented	24	ES chapter
Twentyshilling Hill	Consented	9	ES chapter
Windy Rig	Consented	12	SEI chapter
Application Wind Farms			
Altercannoch	In planning		No info available
Ashmark Hill	In planning	7	ES chapter
Auchencrosh	In planning	Unknown	No info available
Balunton	In planning	9	ES chapter
Barlockhart Moor Extension	In planning	4	ES chapter
Blackwood	In planning	5	ES chapter
Cornharrow	In planning	11	ES chapter
Enoch Hill	In planning	16	ES chapter
Glenshimmeroch	In planning	10	Supporting information
Glentaggart	In planning	5	ES chapter
Harryburn	In planning	17	No info available

Table 8.9: Scoped In Wind Farm Projects within NHZ 19			
Project	**Status**	**Number of Turbines**	**Information Available**
Knockendurrick	In planning	7	ES chapter
Lethans 2019	In planning	22	ES chapter
Longburn	In planning	10	ES chapter
Margree	In planning	25	ES chapter
North Lowther Energy Initiative	In planning	35	ES chapter
Pencloe 2019	In planning	19	ES chapter
Sanquhar II	In planning	50	ES chapter
Shepherds Rig	In planning	19	ES chapter
Stranoch 2	In planning	20	ES chapter
Trotston Loch	In planning	14	ES chapter
Ulzieside	In planning	12	No info available
Windy Standard III (Brockloch Rig 2)	In planning	20	ES chapter

8.4.96 Predicted cumulative effects for each IOF during the construction and operational phases are assessed below. It is not considered that any further species apart from those IOFs assessed for the proposed development alone would have any potentially significant cumulative effects when considered alongside other projects.

8.4.97 Golden plover was recorded at a number of project sites during baseline surveys, with breeding observed at some of these locations, and others hosting flocks during the non-breeding season only. No breeding activity was recorded during baseline surveys at the site, and so any effects would occur within the context of the non-breeding national or migratory populations. As such, an NHZ 19 breeding population level cumulative assessment is not considered to be appropriate in this case. With the national golden plover wintering population large and likely to be in stable/favourable condition, and the fitness/survival impacts of wind farms likely to be lower for wide-ranging species such as golden plover in winter, significant cumulative effects are considered to be unlikely. As such, non-breeding golden plover has been scoped out of the cumulative assessment. Furthermore, because there is considered to be no potential for the proposed development to compromise the integrity of either of the two breeding peregrine falcon territories identified (both of which are outwith the site boundary), breeding peregrine falcon are also scoped out of the cumulative assessment.

8.4.98 In the case of goshawk, whilst there is the potential for the integrity of one unconfirmed territory to be compromised as a result of displacement (due to habitat loss from felling), it has been established that the potential displacement of a pair of breeding goshawk as a result of felling for the proposed development would equate to a very similar effect to the displacement of goshawk as a result of commercial forestry operations, under the future baseline scenario, meaning that no additional effects on the NHZ population due to the proposed development are predicted. Consequently, breeding goshawk are also scoped out of the cumulative assessment.

8.4.99 Due to the potential for the proposed development alone to potentially have an unmitigated significant effect on the regional breeding population, black grouse has been scoped into the cumulative assessment.

8.4.100 There is the potential for the construction phase of the proposed development to coincide with up to 23 consented wind farm projects, and up to 23 projects at the application stage. Predicted cumulative effects on black grouse are considered in the following text.

Black Grouse

Potential Disturbance and Displacement Effects

8.4.101 A total of 34 other wind farm projects within NHZ 19 recorded black grouse, and 18 of these projects considered black grouse as part of their impact assessment (Table 8.10, where # = the number of individuals potentially affected prior to consideration of mitigation measures).

8.4.102 There is the potential for the construction phase of the proposed development to coincide with the construction phase of 9 Tier 2 approved projects where black grouse were considered, and up to 4 Tier 3 projects at the in-planning stage, with the in-planning stage projects likely to have the greater chance of temporal overlap with the proposed development's construction period.

8.4.103 It was considered possible that up to 45 lekking males (Benbrack, Kennoxhead, Kype Muir Extension, Lethans, Lion Hill, Over Hill, Sandy Knowe, Twentyshilling Hill and Windy Rig) may be affected by unmitigated construction activity at the Tier 2 approved wind farm sites. Including the possibility of up to three males being affected at the proposed development if unmitigated, this total of 48 males represents 40 % of the NHZ 19 population (121 males, Wilson *et al*. (2015)). However, it is considered unlikely that this total loss to the population will occur during the construction period, especially considering the standard mitigation measures (similar to those detailed for the proposed development) that will be included in the conditions of consent for any of these projects.

8.4.104 There is a greater likelihood for the construction phase at the proposed development to overlap with projects that are currently at the in-planning stage. Up to 23 males may be affected at the Tier 3 in-planning sites, and alongside the proposed development, this would represent 21 % of the NHZ 19 population. As stated above, it is unlikely that this total loss to the population will occur, especially when considering the standard mitigation measures (similar to those detailed for the proposed development) that will be included in the conditions of consent for any of these projects.

8.4.105 The proposed temporal and spatial mitigation during the construction phase for the proposed development and other projects is likely to result in the continuation of lekking and foraging activity during the construction phase at all sites. It is acknowledged that some short-term disruption to foraging, breeding or resting areas may result for some birds, but the NHZ 19 population is unlikely to be significantly affected.

8.4.106 During the operational phase, it is possible that a cumulative displacement effect may exist for black grouse in the vicinity of Tier 1-3 projects.

8.4.107 **Tier 1:** of the nine Tier 1 projects, lekking black grouse have had the potential to be affected by disturbance/displacement at Glenchamber, Harestanes, Middle Muir, Nutberry and Sanquhar (however for Nutberry it is not clear from the information available where these leks were in relation to the developments), if unmitigated (Table 8.10). Existing Tier 1 projects are unlikely to have affected lekking activity based on survey results. It is unclear exactly how many birds may be affected, with some uncertainty over lekking locations at Nutberry.

8.4.108 **Tier 1 + Tier 2:** although the likelihood is low, an opportunity exists for Tier 2 projects' construction phases to overlap with that of the proposed development. When considering the 9 Tier 2 projects alongside the proposed development, a reasonably large proportion of the NHZ population (potentially up to 40 %) may be affected if no mitigation measures are considered, although there is some uncertainty over how many individuals may actually be affected due to limited available information.

8.4.109 **Tier 1 + Tier 2 + Tier 3:** in addition to the disturbance-displacement effects on Tier 1 and Tier 2 projects, when accounting for the four Tier 3 projects further lekking males may be affected by cumulative construction and operational activities (up to 23 males if no mitigation measures are considered, or 21 % of the NHZ population including the proposed development). Again, it is not clear exactly how many males were found within potential disturbance-displacement distances.

8.4.110 Although there is a good deal of uncertainty regarding how many leks and how many individuals may be affected by disturbance-displacement, the magnitude of potential effects, in the unlikely scenario that all Tier 1-3 projects become operational, is considered high spatial and long term temporal within the context of the NHZ population. The effect is classified as **moderate-high** and is therefore potentially **Significant** in the context of the EIA Regulations.

8.4.111 Paragraph 8.5.6 outlines the habitat management mitigation for black grouse during the operational phase (refer to Technical Appendix 7.7, EIAR Volume 4 for full details of the Habitat Management Plan) and specific measures will be detailed for black grouse in the BBPP (paragraph 8.2.7). Measures such as these are standard practice for mitigating for any potential significant effects on black grouse caused by wind farm projects, and, are likely to be consent conditions at the majority of projects considered in this cumulative assessment where black grouse is a potential issue.

8.4.112 Although a large proportion of the NHZ 19 black grouse population was recorded within the respective study areas of projects considered in the cumulative assessment, when considering the mitigation measures likely to be implemented during the construction and operational phases of projects (including the proposed development), there is a low likelihood that a widespread loss of lekking males to the NHZ 19 population would occur. Nevertheless, an adverse effect on the NHZ 19 population would likely occur if all projects became operational, through fragmentation of habitat or cumulative effects on productivity over a long-term period. The likelihood of all application and appeal projects becoming operational is however low, and so a **minor** and therefore **Not Significant** effect on the NHZ 19 population is concluded.

Table 8.10: Predicted Cumulative Effects within NHZ 19 Relating to Black Grouse

Project	Information	Disturbance-Displacement Potential	#
Tier 1: Installed (Operational) and In-Construction Wind Farms			
Dersalloch	Single male 1 km and 1.8 km from turbines.	No	N/A
Dungavel	Two males at one lek 1 km from turbines.	No	N/A
Glenchamber	4-6 males lekking at 4 leks within 300 m.	Yes	6
Hare Hill Phase 2	Small breeding population of black grouse (at least four males) associated with forest habitats adjacent to the site. Individuals occasionally forage within the site, mainly in winter. No leks within 1km.	No	N/A

Table 8.10: Predicted Cumulative Effects within NHZ 19 Relating to Black Grouse			
Project	**Information**	**Disturbance-Displacement Potential**	**#**
Harestanes	Black grouse 'territory' within 250 m of turbines.	Yes	1
Kype Muir	4 leks with up to 8 males 1.4-2.3 km from nearest turbines.	No	N/A
Middle Muir	Up to two males lek on site >750 m from turbines but closer to compound and tracks.	Yes	2
Nutberry	4 males lekking within survey area.	Yes	4
Sanquhar (Community Windfarm)	Lek of 2 birds 300 m from access road.	Yes	2
Wether Hill	2 males lekking 1.5 km from site boundary.	No	N/A
Tier 2: Consented Wind Farms			
Benbrack	2 leks with a maximum of three males.	Yes	3
Crookedstane	Peak of 10 males within survey area but outwith site boundary.	No	N/A
Glenmuckloch	Single males but no evidence of lekking.	No	N/A
Kennoxhead	4 leks of up to 10 males within survey area, of which two leks comprising six males were within 500m of turbines.	Yes	6
Kype Muir Extension	4 males within 1.5 km survey area.	Yes	4
Lethans	4 males lekking within 1.5 km of site boundary, one within site boundary, one within 500m buffer.	Yes	1
Lion Hill	2 leks. A peak of 13 males was reported using the main lek site and a peak of 8 males was recorded using the second lek site. Birds were not recorded using both lek sites simultaneously, therefore they were considered to be alternative sites. Main lek 200 m from turbines. Mitigation and habitat management proposed.	Yes – however mitigation proposed	13
Lorg	A single male lekking 1.4 km from turbine. Individuals foraging to north and south of site.	No	N/A
Mochrum Fell	Single black grouse (no lekking behaviour) recorded within 2 km survey area.	No	N/A
Overhill	1 lek, maximum of 4 males.	Yes	4
Pencloe	Single males recorded lekking 1.2 and 2.4 km from development.	No	N/A
Sandy Knowe	2 leks comprising a single displaying male at each. 1 lek approximately 100 m from the development. The second lek was located within the development site boundary.	Yes	2
Sanquhar Six	Lek over 1 km from development.	No	N/A
Twentyshilling Hill	5 leks, two of which within site. Up to 4 males present on any day.	Yes	4
Windy Rig	Peak count of 8 males at three leks.	Yes	8
Tier 3: Application Wind Farms			
Ashmark Hill	Single male north of survey area.	No	N/A
Balunton	Single bird recorded 900 m from site.	No	N/A
Enoch Hill	Peak of 3 males.	Yes	3
Glenshimmeroch	2 leks over 1 km from turbines.	No	N/A

Table 8.10: Predicted Cumulative Effects within NHZ 19 Relating to Black Grouse			
Project	**Information**	**Disturbance-Displacement Potential**	**#**
Glentaggart	2 male black grouse were recorded in May 2009 and a single male in April 2010.	Yes	2
North Lowther Energy Initiative	5 leks with a maximum of 15 males, 4 leks and 12 males within 750 m of turbines.	Yes – however mitigation proposed	12
Pencloe 2019	Single males recorded lekking 1.2 and 2.4 km from development.	No	N/A
Troston Loch	Only area of black grouse activity over 500 m from development, lekking unclear.	No	N/A
Windy Standard III (Brockloch Rig 2)	6 active leks - further details in confidential appendix.	Yes	6 (minimum)

POTENTIAL CUMULATIVE OPERATIONAL EFFECTS – COLLISION RISK

8.4.113 No collision risk modelling was undertaken for black grouse for any other project, due to the lack of 'at-risk' flights. It therefore follows that, similar to that predicted for the proposed development, collision risk is of **minor** significance to the NHZ 19 population.

8.5 Mitigation

Mitigation during Construction

Black Grouse

8.5.1 As a worst-case scenario, the unmitigated effect of construction disturbance on black grouse was considered to be **moderate** and therefore potentially **Significant**. The following mitigation is therefore proposed in order to reduce the level of effect to **minor** and therefore **Not Significant**.

- Surveys for lekking black grouse following the methodology detailed within Gilbert *et al*. (1998[48]) and SNH (2017[14]) will be completed in March, April and May in the season prior to construction commencing. Should any leks be identified within 750 m of the site, a 750 m disturbance buffer area will be established and no activity should occur in these areas during the periods prior to 9am and after 6pm within the black grouse breeding season of April to July. The ECoW should oversee the implementation of the above measures.
- To minimise the possibility of disturbance to any leks within 750 m of access tracks, a maximum speed limit of 15 mph will be enforced, and personnel will remain within vehicles wherever possible. Any construction activity (e.g. track widening) required along access tracks should take place outside of the black grouse breeding season if possible, or if not, at least 750 m from lek sites and/or outside of the daily lekking period as described above. Where possible, gates within 750 m of lek sites will remain open after first arrival, therefore avoiding all subsequent arrivals opening and closing the gate and the associated potential disturbance to the lek due to pedestrian activity.
- It is also proposed that fencing related to the proposed development should be kept to a minimum and any fencing used should be 'marked' using suitable materials to reduce

48 Gilbert, G., Gibbons, D.W. & Evans, J. (1998) Bird Monitoring Methods. RSPB, Sandy.

the likelihood of black grouse collisions with fences (Trout and Kortland 2012[49]). Any wires/guy-lines (e.g. those associated with met masts) should also be 'marked' with suitable bird flight diverters/line markers to reduce collision likelihood. Bird diverters have already been installed on the guy wires of the two met masts that are currently operating on the site.

- Supplementary feeding will also be considered as mitigation during construction for any feeding black grouse potentially disturbed by construction activities. Food hoppers filled with grain would be placed in carefully selected open locations, away from threats of predation and sources of disturbance.

Golden Plover

8.5.2 No construction mitigation is required in relation to non-breeding golden plover. Should pre- or during construction surveys record any nesting golden plover in proximity to the site, a BBPP, approved by the planning authority in consultation with SNH prior to implementation, would ensure that any breeding golden plover, or their nests, eggs or young are not affected by construction activities.

Goshawk

8.5.3 Surveys for breeding goshawk following the methodology detailed within SNH (2017[14]) will be undertaken prior to any works (including felling) being undertaken within 400 m of forested areas between March and August. Should any nest be identified, a 400 m disturbance buffer will be established, and no activity should occur in these areas during the periods within the goshawk breeding season of March to August whilst the goshawk are still known to be breeding. The ECoW should oversee the implementation of the above measures, as part of the BBPP.

Peregrine Falcon

8.5.4 Surveys to monitor breeding activity at PE_2 will be undertaken during the construction phase to ensure reasonable precautions are taken to avoid disturbance (which is outwith the 500 m disturbance buffer is within the maximum recommended 750 m disturbance buffer). It is also recommended that lighting at the construction compound is kept to a minimum and is angled away from the direction of the nest to limit any visual disturbance to the nest as a result of the lighting.

Mitigation during Operation

Black Grouse

8.5.5 As a worst-case scenario, the unmitigated effect of operational displacement on black grouse was considered to be **moderate** and therefore potentially **Significant**.

8.5.6 Measures outlined in Technical Appendix 7.7 (EIAR Volume 4) Outline HMP are designed to increase the quality of habitat available for black grouse within the site throughout the lifespan of the proposed development. This will help offset any loss of habitat due to displacement from turbines, and, aim to ensure no birds are lost to the local area. Measures include woodland management (including feathering of forest edges and replanting of suitable native broadleaf species) and moorland management, which will benefit breeding, lekking and foraging birds.

49 Trout, R. and Kortland, K. (2012) Fence marking to reduce grouse collisions. Forestry Commission Technical Note.

8.5.7 Whilst no mitigation is required to reduce turbine collisions, any fencing erected between the proposed development and the black grouse leks will be 'marked' using suitable materials to reduce the likelihood of black grouse collisions with fences (Trout and Kortland 2012[49]).

Golden Plover

8.5.8 No operational mitigation required. Moorland management as part of the HMP would provide improved habitat for golden plover.

Goshawk

8.5.9 No operational mitigation required. Woodland management as part of the HMP would provide improved habitat for goshawk.

Peregrine Falcon

8.5.10 No operational mitigation required.

Mitigation during Decommissioning

8.5.11 Mitigation during decommissioning will be the same as for the construction phase and is detailed in paragraphs 8.5.1 to 8.5.3.

8.6 Assessment of Residual Effects

Residual Construction Effects

Black Grouse

8.6.1 The proposed mitigation (spatial and temporal restrictions of construction activity around lek sites) is likely to result in the continuation of lekking and foraging activity. As such the residual level of significance on the NHZ 19 population can be reduced to **minor** and therefore **Not Significant** in the context of the EIA Regulations.

Golden Plover

8.6.2 Given that no mitigation is required, the residual effects of construction disturbance on wintering golden plover remain as above, i.e. **Not Significant**.

Goshawk

8.6.3 The residual effects of construction disturbance on goshawk will be **Negligible** and therefore **Not Significant** in the context of the EIA Regulations.

Peregrine Falcon

8.6.4 The residual effects of construction disturbance on peregrine falcon will be **Negligible** and therefore **Not Significant** in the context of the EIA Regulations.

Residual Operational Effects

Black Grouse

8.6.5 Given the predicted unmitigated significance of effect, and additional mitigation (marking of any new fencing), the residual effects of operational collision risks on black grouse remain as above, i.e. **Not Significant**.

8.6.6 In relation to disturbance effects, the proposed mitigation (management as part of the HMP) is likely to result in the continuation of lekking and foraging activity. As such the residual level of significance on the NHZ 19 population can be reduced to **minor** and therefore **Not Significant** in the context of the EIA Regulations.

Golden Plover

8.6.7 Given that no mitigation is required, the residual effects of the operational collision risk and displacement on wintering golden plover remains as above, i.e. **Not Significant**.

Goshawk

8.6.8 Given that no mitigation is required, the residual effects of the operational collision risk and displacement on goshawk remains as above, i.e. **Not Significant**.

Peregrine Falcon

8.6.9 Given that no mitigation is required, the residual effects of the operational collision risk and displacement on peregrine falcon remains as above, i.e. **Not Significant**.

Residual Decommissioning Effects

8.6.10 As detailed in paragraph 8.4.87, residual decommissioning effects 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 would be able to return. Thus, effects assessed during construction are considered to apply to decommissioning.

Residual Cumulative Construction and Operational Effects

8.6.11 Black grouse were the only IOF scoped in to the cumulative assessment and the residual cumulative effects are considered to be **minor** and therefore **Not Significant** in the context of the NHZ 19 population.

8.7 Monitoring

Black Grouse

8.7.1 As detailed in paragraph 8.5.1, pre-construction surveys are proposed to inform the BBPP which will then include any specific measures required to mitigate any construction/ decommissioning effects to lekking black grouse. Surveys would be completed in March, April and May in the season prior to construction commencing following standard survey methodology (paragraph 8.5.1).

8.7.2 In addition to the pre-construction surveys, black grouse lek surveys would be undertaken during construction/ decommissioning (to ensure that all active leks within 750 m of the proposed development are considered in any proposed mitigation) and during years 1, 2, 3, 5, 10 and 15 during the operational life of the proposed development (to establish the success of the proposed habitat management for black grouse), as detailed in Technical Appendix 7.7 (Outline Habitat Management Plan), EIAR Volume 4).

Golden Plover

8.7.3 No monitoring is proposed as either a requirement to mitigate a significant effect or as best practice.

Goshawk

8.7.4 As detailed in paragraph 8.5.3, surveys would be undertaken to check for breeding goshawk prior to any felling being undertaken within 400 m of forested areas between March and August.

8.7.5 No further monitoring is proposed as best practice, however, effort would be made to provide access to the proposed development to the Dumfries and Galloway and South Strathclyde Raptor Study Groups throughout the operational life of the proposed development to ensure continued breeding raptor monitoring can be undertaken (as part of the wider Scottish Raptor Monitoring Scheme).

Peregrine Falcon

8.7.6 As detailed in paragraph 8.5.4, surveys would be undertaken during construction and decommissioning to monitor breeding activity at PE_2 between March and August (the location of this nest is detailed in Confidential Technical Appendix 8.2, EIAR Volume 4).

8.7.7 No further monitoring is proposed as best practice, however, effort would be made to provide access to the proposed development to the Dumfries and Galloway and South Strathclyde Raptor Study Groups throughout the operational life of the proposed development to ensure continued breeding raptor monitoring can be undertaken (as part of the wider Scottish Raptor Monitoring Scheme).

8.8 Summary

8.8.1 This chapter has considered the potential effects on the ornithological 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[5]).

8.8.2 On the basis of the results of the desk study and survey work undertaken, statutory guidance on ornithological assessment, and the application of professional judgement derived through experience gained from other relevant projects, black grouse, golden plover, goshawk and peregrine falcon were the only IOFs identified to be at risk of effects due to the proposed development.

8.8.3 Taking into account all available data, and appropriate mitigation measures where required, the assessment considered the potential for residual effects on these IOFs during construction, operation and decommissioning to be **Not Significant** in the context of the EIA regulations.

Table 8.11: Summary of Potential Significant Effects of the Proposed Development

IOF	Mitigation Proposed	Means of Implementation	Outcome/Residual Effect
Construction			
Black Grouse	Pre-construction surveys. 750 m construction buffer from leks during particular times. Best-practice construction (pedestrian restrictions, speed limits).	The Outline Habitat Management Plan (EIAR Volume 4: Technical Appendix 7.7) would be finalised and delivered as a condition of consent. BBPP and ECOW:	Not Significant

Table 8.11: Summary of Potential Significant Effects of the Proposed Development			
IOF	**Mitigation Proposed**	**Means of Implementation**	**Outcome/Residual Effect**
		The Outline CEMP (EIAR Volume 4: Technical Appendix 2.1) includes requirements for a BBPP and ECoW. The CEMP would be finalised and delivered as condition of consent.	
Golden Plover	None required (Pre-construction surveys during breeding season).	(The Outline CEMP (EIAR Volume 4: Technical Appendix 2.1) includes requirements for a BBPP and ECoW. The CEMP would be finalised and delivered as condition of consent.	Not Significant
Goshawk	Pre-construction surveys. 400 m construction buffer from any nests located for duration of breeding attempt.	BBPP and ECOW: The Outline CEMP (EIAR Volume 4: Technical Appendix 2.1) includes requirements for a BBPP and ECoW. The CEMP would be finalised and delivered as condition of consent.	Not Significant
Peregrine Falcon	Pre-construction surveys. 500 m construction buffer from any nests located for the duration of breeding attempt.	BBPP and ECOW: The Outline CEMP (EIAR Volume 4: Technical Appendix 2.1) includes requirements for a BBPP and ECoW. The CEMP would be finalised and delivered as condition of consent.	Not Significant
Operation – Collision Risk			
Black Grouse	Increase visibility of structures using fence markers.	Condition of consent.	Not Significant
Golden Plover	None required.	N/A	Not Significant
Goshawk	None required.	N/A	Not Significant
Peregrine Falcon	None required.	N/A	Not Significant
Operation – Displacement			
Black Grouse	Habitat improvement for black grouse.	The Outline	Not Significant

Table 8.11: Summary of Potential Significant Effects of the Proposed Development			
IOF	**Mitigation Proposed**	**Means of Implementation**	**Outcome/Residual Effect**
		Habitat Management Plan (EIAR Volume 4: Technical Appendix 7.7) would be finalised and delivered as a condition of consent.	
Golden Plover	None required.	N/A	Not Significant
Goshawk	None required.	N/A	Not Significant
Peregrine Falcon	None required.	N/A	Not Significant
Decommissioning			
Black Grouse	Pre-decommissioning surveys. 750 m decommissioning buffer from leks during particular times. Best-practice decommissioning (pedestrian restrictions, speed limits).	BBPP, HMP and ECoW	Not Significant
Golden Plover	None required. (Pre-decommissioning surveys during breeding season).	(BBPP and ECoW during the breeding season)	Not Significant
Goshawk	Pre-decommissioning surveys. 400 m decommissioning buffer from any nests located for duration of breeding attempt.	BBPP and ECoW	Not Significant
Peregrine Falcon	Pre-decommissioning surveys. 500 m decommissioning buffer from any nests located for duration of breeding attempt.	BBPP and ECoW	Not Significant
Cumulative Construction			
Black Grouse	Pre-construction surveys. 750 m construction buffer from leks during particular times. Best-practice construction (pedestrian restrictions, speed limits).	The Outline Habitat Management Plan (EIAR Volume 4: Technical Appendix 7.7) would be finalised and delivered as a condition of consent. BBPP and ECOW: The Outline CEMP (EIAR Volume 4: Technical Appendix 2.1) includes requirements for a BBPP and ECoW. The CEMP would be finalised and delivered as condition of consent.	Not Significant

Table 8.11: Summary of Potential Significant Effects of the Proposed Development			
IOF	**Mitigation Proposed**	**Means of Implementation**	**Outcome/Residual Effect**
Cumulative Operation			
Black Grouse	Increase visibility of structures.	Fence markers	Not Significant
	Habitat improvement for black grouse.	The Outline Habitat Management Plan (EIAR Volume 4: Technical Appendix 7.7) would be finalised and delivered as a condition of consent.	Not Significant

8.9 Abbreviations

Abbreviation	Expanded Term
BBPP	Breeding Bird Protection Plan
BoCC	Birds of Conservation Concern
BTO	British Trust for Ornithology
CIEEM	Chartered Institute of Ecology and Environmental Management
CRAA	Collision Risk Analysis Area
CRM	Collision Risk Model
EAC	East Ayrshire Council
ECoW	Ecological Clerk of Works
EIA	Environmental Impact Assessment
FLS	Forestry and Land Scotland (formerly Forest Enterprise Scotland (FES))
HMP	Habitat Management Plan
IOF	Important Ornithological Feature
NCI	Nature Conservation Importance
NHZ	Natural Heritage Zone
MG	MacArthur Green
RSPB	Royal Society for the Protection of Birds
SNH	Scottish Natural Heritage
SPA	Special Protection Area
SSRSG	South Strathclyde Raptor Study Group
SSSI	Site of Special Scientific Interest
SWT	Scottish Wildlife Trust
VP	Vantage Point

9 Hydrology, Hydrogeology and Geology

9.1 Introduction

9.1.1 This chapter considers the likely significant effects on Hydrology, Hydrogeology and Geology associated with the construction, operation and decommissioning of the proposed development. The specific objectives of the chapter are to:

- describe the Hydrology, Hydrogeology and Geology 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.

9.1.2 The assessment has been carried out by Christopher Day, of Ramboll UK Ltd (Ramboll). Chris has 10 years' experience in environmental consultancy with particular expertise in hydrology, flood risk assessment, hydraulic modelling and conceptual drainage design. A copy of his CV is included in Technical Appendix 1.2 (EIAR Volume 4).

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

- Figure 9.1: Surface Watercourses (North);
- Figure 9.2: Surface Watercourses (South);
- Figure 9.3: Engineering activities and the water environment (North);
- Figure 9.4: Engineering activities and the water environment (South);
- Technical Appendix 2.2: Watercourse Crossing Assessment;
- Technical Appendix 2.3: Preliminary Stone Extraction Assessment;
- Technical Appendix 2.4: Private Water Supply (PWS) Risk Assessment;
- Technical Appendix 2.5: Draft Peat Management Plan;
- Technical Appendix 2.6: Peat Landslide Hazard and Risk Assessment (PLHRA);
- Technical Appendix 2.10: Coal Mining Risk Assessment (CMRA); and
- Technical Appendix 7.1: National Vegetation Classification & Habitats Survey Report.

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

9.2 Assessment Methodology and Significance Criteria

Scope of Assessment

9.2.1 The proposed development would introduce physical changes which have the potential to alter the hydrological and hydrogeological characteristics of the site. This assessment considers likely significant effects on water quality, flooding and water resources during both the construction and operation of the proposed development, as described in Chapter 2: Description of Development. The assessment of residual effects is made based on the assumption that best practice measures will be followed in construction and operation of the site and that these will be set out in a Construction Environmental Management Plan (CEMP) (EIAR Volume 4: Technical Appendix 2.1: Outline CEMP to be implemented by the contractor.

9.2.2 The effects on surface and groundwater may also result in secondary effects on terrestrial ecology such as peat forming habitats and groundwater dependent terrestrial ecosystems (GWDTE) and/or aquatic ecology. Such receptors are considered in this chapter only in terms of the potential for changes to the hydrological and hydrogeological regimes to impact upon them. Further assessment of the effects on GWDTEs are considered in Technical Appendix 7.1: National Vegetation Classification & Habitats Survey Report (EIAR Volume 4).

9.2.3 Further information on the extent and depth of peat on the site is considered in Technical Appendix 2.5: Draft Peat Management Plan (DPMP) (EIAR Volume 4).

9.2.4 The chapter assesses cumulative effects as arising from the addition of the proposed development to other cumulative developments, which are the subject of a valid planning application. Operational, under construction and consented developments are considered as part of the baseline. Developments close to the end of their operational life are included as part of the baseline to present 'worst case scenario'.

9.2.5 With regard to the protection of specific water resources, permissible water quality standards and related policy are set out in the following European legislation:

- EC Water Framework Directive (2000/60/EC);
- EC Groundwater Directive (2006/118/EC);
- EC Urban Waste Water Treatment Directive (91/271/EEC);
- EC Nitrates Directive (91/676/EEC); and
- The Habitats Directive 92/43/EEC.

9.2.6 The scope of the assessment has been informed by consultation responses summarised in Table 9.1 and the following guidelines/policies:

- Water Environment and Water Services (Scotland) Act 2003;
- Water Environment (Controlled Activities) (Scotland) Regulations 2011;
- Flood Risk Management (Scotland) Act 2009;
- The Water Supply (Water Quality) (Scotland) Regulations 2001;
- Private Water Supplies (Scotland) Regulations 2006;
- Water Environment (Oil Storage) (Scotland) Regulations 2006;
- Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000;
- PPG01: Understanding your environmental responsibilities – good environmental practices;
- GPP 5: Works and maintenance in or near water;
- PPG06: Working at construction and demolition sites;
- GPP 21: Pollution incident response planning;
- SNH, Forestry Commission, Good Practice During Wind Farm Construction, Fourth Edition, 2019;
- SEPA, Technical Flood Risk Guidance for Stakeholders, Version 12, May 2019 (SS-NFR-P-002);
- SEPA, Regulatory Position Statement: Culverting of Watercourses Version 2, June 2015;
- CIRIA, The SuDS Manual (C753), 2015;
- Scottish Government, Scottish Natural Heritage, SEPA (2017) Peatland Survey. Guidance on Developments on Peatland; and
- SEPA, Engineering in the water environment: good practice guide - River crossings, Second edition, November 2010.

Consultation

9.2.7 Table 9.1 summarises the consultation responses received regarding Hydrology, Hydrogeology and Geology and provides information on where and/or how they have been addressed in this assessment.

9.2.8 Full details on the consultation responses can be reviewed in Technical Appendix 1.1: Consultation Register (EIAR Volume 4).

Table 9.1: Consultation Responses

Consultee and Date	Scoping / Other Consultation	Issue Raised	Response / Action Taken
SEPA 30th April 2018	Scoping Response	The information outlined below and in the attached appendix must be submitted in support of the application. a) Map and assessment of all engineering activities in or impacting on the water environment including proposed buffers, details of any flood risk assessment and details of any related CAR applications. b) Map and assessment of impacts upon GWDTE and buffers. c) Map and assessment of impacts upon groundwater abstractions and buffers. d) Peat depth survey and table detailing re-use proposals. e) Map and table detailing forest removal. f) Map and site layout of borrow pits (referred to as Stone Extraction Areas (SEAs) within this project). g) Schedule of mitigation including pollution prevention measures. h) Quarry or Borrow Pit (SEA) Site Management Plan of pollution prevention measures. i) Map of proposed waste water drainage layout.	Mapping of proposed engineering activities in proximity to the water environment is provided. Areas of potentially sensitive GWDTEs have been identified within Technical Appendix 7.1 (EIAR Volume 4) in accordance with SEPA guidance and the siting of infrastructure has avoided these areas where possible. Additional measures to avoid impacts on GWDTE are provided within this chapter and within the Outline Construction Environmental Management plan (CEMP) (EIAR Volume 4: Technical Appendix 2.1). Potential groundwater abstractions are considered within Technical Appendix 2.4 (EIAR Volume 4). Peat surveys are detailed within Technical Appendix 2.8 and 2.9 (EIAR Volume 4). Issues relating to Forestry are considered within Technical Appendix 2.11 (EIAR Volume 4). Potential Stone Extraction Areas are identified within Figures 9.3 and 9.4 (EIAR Volume 3a). A schedule of mitigation, including that required for Stone Extraction Areas, would be provided within a CEMP prior to commencement. Waste water drainage provisions would be confirmed by the contractor prior to commencement of

Table 9.1: Consultation Responses

Consultee and Date	Scoping / Other Consultation	Issue Raised	Response / Action Taken
			construction.
SEPA 30th April 2018	Scoping Response	SEPA would not be supportive of an assessment of the impacts on hydrogeology/geology being scoped out of the EIA for this site.	Such an assessment is provided within this chapter.
SEPA 30th April 2018	Scoping Response	The redline boundary for the site covers numerous operational and unrestored surface mine sites, including House of Water, Benbain, Chalmerston and Netherton as detailed in the EAC Surface Coal Mine Visual Register. In addition, there may also be some areas of historic underground mining. The suggested assessment for Private Water Supplies (PWS) and Ground Water Dependent Terrestrial Ecosystems (GWDTE) would probably be sufficient at a site without a mining. However, for these proposals we should expect an assessment of the mining history at the site and how this relates to the hydrogeology and current ground conditions.	A Coal Mining Risk Assessment is provided within Technical Appendix 2.10 (EIAR Volume 4).
SEPA 30th April 2018	Scoping Response	Of particular note is that material (mine backfill) excavated during turbine and track formation may present runoff and contaminant release risks if not appropriately managed. This should be considered in a geology / hydrogeology / water resources chapter and will likely require specific material management measures to be outlined in a Construction Environment Management Plan (CEMP).	These issues are considered within this chapter.
SEPA 30th April 2018	Scoping Response	A CAR construction site licence under the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) (CAR) will be required. The EIA should identify the levels of CAR authorisation required for any engineering activities and point source discharges.	A Watercourse Crossing Assessment is provided in Technical Appendix 2.2 (EIAR Volume 4).
SEPA 30th April 2018	Scoping Response	We would also expect the EIA to include pollution prevention/site drainage strategy to address pollution	Such mitigation would be set out within the Outline CEMP in Technical Appendix 2.1 (EIAR

Table 9.1: Consultation Responses			
Consultee and Date	**Scoping / Other Consultation**	**Issue Raised**	**Response / Action Taken**
		control measures. The potential impact from forestry operations should be considered together with assessment of the issues/mitigation for the works on areas of unrestored surface mine site.	Volume 4).
SEPA 30th April 2018	Scoping Response	Essential infrastructure may be appropriate in flood risk area provided it remains operational during design flood and does not impede flows. Watercourse crossings must convey the 200 year flow plus freeboard as determined by the Flood Risk Management Authority.	The Outline CEMP (EIAR Volume 4: Technical Appendix 2.1) confirms that watercourse crossings would convey the 200 year flow plus an appropriate freeboard.
SNH 25th May 2018	Scoping Response	The 2018 scoping report confirms that following a review of the SNH Carbon and Peatland Map 2016 and initial peat probing there are significant areas of peat within the site and further peat depth, mire condition assessment and coring surveys are planned in 2018. SNH recommend that survey results should also be used to inform the design and layout process, so that the development avoids, where possible, fragile and priority habitats and other sensitive areas (e.g. blanket bog and peat). Where this is not possible, suitable restoration and/or compensation measures should be presented in the ES in the form of a draft Habitat Management Plan (HMPs).	A Draft PMP is provided in Technical Appendix 2.5 (EIAR Volume 4).
SNH 25th May 2018	Scoping Response	An assessment of impacts of hydrological changes (particularly related to groundwater) on habitats should also be included. In addition to turbine foundations access tracks are the elements that will result in the greatest land take, habitat fragmentation and hydrological disruption. SNH note that the existing access tracks may not require upgrading, however, it is important that the track construction methods for any new track to be constructed are clearly described in the ES, along with the rationale for their type and location,	Such issues and appropriate mitigation measures are considered within this chapter.

Table 9.1: Consultation Responses			
Consultee and Date	**Scoping / Other Consultation**	**Issue Raised**	**Response / Action Taken**
		and all direct and indirect impacts assessed.	
SNH 21st August 2019	Gatecheck Response	In our May 2018 scoping response, we highlighted the presence of three other geological SSSI's within 5km of the proposed development these are; Benbeoch Site of Special Scientific Interest (SSSI), Dunaskin Glen SSSI and Nith Bridge SSSI. However, in our May 2018 scoping response we advised that *"we do not consider that the any of the above SSSIs are connected to the development site and are satisfied that they do not require further consideration and can be scoped out of the EIA."*	Noted. The location of the SSSIs is discussed in the baseline section of this chapter.

Potential Effects Scoped Out

9.2.9 The site is not underlain by any designated sites of geological interest. As excavations exceeding 1m in depth would only be required at proposed turbines, there is not considered to be potential for impact on geological character.

Method of Baseline Characterisation

Extent of the Study Area

9.2.10 The study area includes land within a 1 km radius of the site, as detailed in Chapter 2: Development Description, and watercourses with downstream connectivity with the site (as well as their relevant 50 m buffer zones[1]).

Desk Study

9.2.11 The methodology for baseline characterisation is set out as follows:

- describe surface water hydrology, including watercourses, springs and ponds;
- identify existing catchment pressures;
- identify private drinking water abstractions and public water supplies within the study area;
- identify any flood risks;
- describe the hydromorphological conditions of watercourses;
- collect soil, geological and hydrogeological information; and
- confirm surface water catchment areas and watersheds.

9.2.12 This chapter considers those areas of the site which are associated with active and historic mining works, as they would be in the future condition of the site due to foreseeable changes to the baseline conditions. The phased coal extraction and restoration operations at House of Water and Greenburn surface mines will continue to take place in accordance

1 There is a 100 m micrositing allowance for the infrastructure associated with the proposed development. However, this allowance would not encroach within the identified constraints buffers.

with planning permissions for those areas. It is anticipated that operations at House of Water are to be completed in 2021 and at Greenburn in 2019. Given that these areas are currently being worked with committed and enforceable restoration schemes to be secured over a short time frame, it is intended for the purposes of the EIAR that the baseline for each assessment in these particular areas is based on the future condition of the site following the completion of consented restoration works (as per EIAR Volume 4: Figure 7.1.3).

9.2.13 Published information consulted to determine baseline conditions is outlined in Table 9.2.

Table 9.2: Baseline Information Sources

Topography	Aerial Photography. 1:25,000 Ordnance Survey (OS) Raster Data.
Designated Nature Conservation Sites	In-house GIS based Designated Site database. SNHi Sitelink website (https://sitelink.nature.scot/home).
Solid and Superficial Geology	British Geological Survey (BGS) online mapping and BGS Solid and Drift Geological Plans (Sheet 14E Cumnock). BGS archive borehole records (BGS Geo Index). Coal Authority defined Development High Risk Areas. GIS layers defining areas of surface mining and disturbed ground (Coal Authority and previous surface mining operator derived).
Soils and Peat	Technical Appendix 2.8: Peat Depth Survey (EIAR Volume 4). Technical Appendix 2.9: Phase 2 Peat Depth and Coring Survey (EIAR Volume 4).
Surface Water Hydrology	1:10,000 OS Raster Data. 1:25,000 OS Raster Data. FEH CD-ROM.
Flooding	Indicative River and Coastal Flood Map (SEPA) www.sepa.org.uk.
Water Quality	SEPA water environment hub which provides information on current condition and future targets for rivers, lochs, coastal waters and groundwaters (https://www.sepa.org.uk/data-visualisation/water-environment-hub)/.
Water Resources	East Ayrshire Council PWS Records. Drinking Water Quality Regulator – PWS Map (http://dwqr.scot/private-supply/pws-location-map/). Scottish Water Asset Location Mapping. Polquhairn Wind Farm PWS Assessment (December 2016).
Hydrogeology	SEPA, Vulnerability of the Groundwater in the Uppermost Aquifer, SEPA 2004.

Field Survey

9.2.14 A hydrological site survey was undertaken by Amanda Chan and Elizabeth Butler of Ramboll on the 24th to 27th September 2018 in order to verify mapped features and identify any further surface water features.

Criteria for the Assessment of Effects

Criteria for Assessing the Sensitivity of Receptors

9.2.15 Effects on water resources are described as beneficial, neutral or adverse and are considered with reference to the value or sensitivity of the receptor, as described in Table 9.3.

Table 9.3: Sensitivity of Environmental Resource		
Sensitivity of Receptor	**Definition**	**Typical Criteria**
High	International or national level importance. Receptor with a high quality and rarity, regional or national scale and limited potential for substitution/ replacement.	▪ High likelihood of fluvial/ tidal flooding in the sub catchment – defined as 1:10 probability in a year. ▪ EC Designated Salmonid / Cyprinid fishery. ▪ Surface water WFD class 'High'. ▪ Scottish Government Drinking Water Protected Areas. ▪ Aquifer providing regionally important resource such as abstraction for public water supply, abstraction for PWS. ▪ Supporting a site protected under EC or UK habitat legislation / species protected by EC legislation. ▪ Protected Bathing Water Area. ▪ Active floodplain. ▪ Highly GWDTE. ▪ Qualifying characteristics for class 1 priority peatland habitat – all vegetation cover indicates priority peatland habitat; all soils are carbon rich soils and deep peat.
Medium	Regional, county and district level importance. Receptor with a medium quality and rarity, regional scale and limited potential for substitution/replacement.	▪ Medium likelihood of fluvial/ tidal flooding in the sub catchment – defined as a 1:200 probability in a year. ▪ Surface water WFD class 'Good' or 'Moderate'. ▪ Aquifer providing water for agricultural or industrial use. ▪ Local or regional ecological status / locally important fishery. ▪ Contains some flood alleviation features. ▪ Qualifying characteristics for class 2 peatland habitat – most vegetation cover indicates priority peatland habitat; all soils are carbon rich soil and deep peat. ▪ Moderately GWDTE.
Low	Local importance. Receptor is on-site or on a neighbouring site with a low quality and rarity, local scale. Environmental equilibrium is stable and is resilient to changes that are greater than natural fluctuations, without detriment to its present character.	▪ Surface water WFD class 'Poor'. ▪ Unproductive strata / no abstractions for water supply. ▪ Sporadic fish present. ▪ No flood alleviation features. ▪ Sewer. ▪ Qualifying characteristics for class 3, 4 or X habitat – vegetation cover does not indicate priority peatland habitat (as defined by SNH[2]). ▪ Potential GWDTE confirmed to be of low sensitivity to change due to heavily modified underlying groundwater bodies.

Criteria for Assessing the Magnitude of Change

9.2.16 The size or magnitude of each impact is determined as a predicted deviation from the baseline conditions during construction, operation and decommissioning, as described in Table 9.4.

Table 9.4: Magnitude of Impact on a Receptor	
Magnitude of Impact	**Criteria**
Large	Large alteration / change in the quality or quantity of and / or to the physical or biological characteristics of environmental resource.
Medium	Medium alteration / change in the quality or quantity of and / or to the physical or biological characteristics of environmental resource.

2 Scottish Natural Heritage (2016) Carbon-rich soils, deep peat and priority peatland habitat mapping, Consultation analysis report. URL: https://www.nature.scot/carbon-and-peatland-map-consultation-analysis-report

Table 9.4: Magnitude of Impact on a Receptor	
Magnitude of Impact	**Criteria**
Small	Small alteration / change in the quality or quantity of and / or to the physical or biological characteristics of environmental resource.
None	No alteration / change detectable in the quality or quantity of and / or to the physical or biological characteristics of environmental resource.

9.2.17 In describing a potential effect, consideration has also been given to its geographical scale and duration, which have been defined as follows:

- The geographical scale of an impact refers to the zone of influence, and can be described as: localised, site-wide, a specific distance / range from a source, regional, national, global; and
- The duration of an impact can be described as: short to long term, permanent or temporary for the duration of the construction / operational period.

Criteria for Assessing Cumulative Effects

9.2.18 The construction and subsequent operation of the wind farms identified in Chapter 4: Landscape and Visual Amenity, along with the proposed development, has the potential to cumulatively affect the water environment. With regard to active mining works, it is anticipated that operations at House of Water are to be completed in 2021 and at Greenburn in 2019. Given that these areas are currently being worked with committed and enforceable restoration schemes to be secured over a short time frame, it is not considered necessary to consider the cumulative effects of these mining works with the proposed development.

9.2.19 Assuming the successful implementation of detailed mitigation and monitoring plans it is expected that any cumulative effects would be negligible and therefore not significant in EIA terms.

Criteria for Assessing Significance

9.2.20 The significance of residual effects is defined as a function of the sensitivity of receptors and the magnitude of change, as presented in Table 9.5, taking account of any mitigation proposed. Differentiations between categories, and thus the final significance ratings, are based upon professional judgement.

Table 9.5: Significance Criteria				
	Magnitude of Change			
Sensitivity	**None**	**Small**	**Medium**	**Large**
High	None	Minor	Major	Major
Medium	None	Minor	Moderate	Moderate
Low	None	Negligible	Minor	Minor

9.2.21 Major and moderate impacts (shaded in grey) are deemed significant in the context of the EIA Regulations. Minor and negligible impacts are not considered significant in EIA terms.

Limitations and Assumptions

9.2.22 Access restrictions existed across the site for the site walkover survey. These were associated with the active and historic mining works, ongoing forestry and harvesting operations, wind-blow within the forestry as well as restrictions of access to those areas where survey buffers existed outwith the site boundary. Survey limitations due to access restrictions, where these existed, are outlined within the respective Technical Appendices.

9.2.23 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.

9.3 Baseline Conditions

Current Baseline

Surface Hydrology

9.3.1 A number of water features within the centre and north of the site including, Blueboots Burn and the Black Water (and its smaller tributaries the Broadhag Burn, Otter Sike, Palmsike Burn and Head Mark Lane) generally drain to the north of the site and are tributaries of the Burnock Water. The majority of the site falls within this catchment.

9.3.2 Land in the southeast of the site generally drains towards the River Nith via tributaries including the Burnston Burn, Peat Sike, Old March Burn, Beoch Lane and Pumarleuch Burn.

9.3.3 A small area of land in the west of the site drains to the Water of Coyle and a small area of land in the south of the site discharges via the Black Burn to the Cummock Burn.

9.3.4 These surface watercourses are presented in Figures 9.1 and 9.2.

Flood Risk

9.3.5 A review of the Scottish Environment Protection Agency (SEPA) online Flood Mapping[3] indicates that areas of high and medium flood risk are confined to the areas immediately adjacent to surface water bodies or the Black Water and its tributaries. The extent of potential flood risk areas is not shown to exceed a 50 m buffer from the Black Water. However, no infrastructure, apart from track crossings, would be located within these flood risk areas. The track crossings within flood risk areas are already existing haul roads which would require minimal upgrades. Therefore, no further assessment of fluvial or tidal flood risk is considered necessary.

9.3.6 Due to the topography, hydrology and infrastructure location it is not considered that infrastructure would be significantly affected by localised groundwater flooding.

Water Quality

9.3.7 The Burnock Water, which is fed by tributary watercourses draining the majority of site, in particular the Black Water, has been classified under SEPA's River Basin Management Plans (RBMP) as having Good water quality, with a target to keep this status in the forthcoming years.

9.3.8 The Water of Coyle and Cummock Water are similarly classified under SEPA's River Basin Management Plans (RBMP) as having Good water quality.

9.3.9 The current status of these water bodies meets the requirements of the Water Framework Directive, thus SEPA intends to ensure that no deterioration from good status occurs, unless caused by a new activity providing significant specified benefits to society or the wider environment. No other watercourses within the site have been classified under the RBMP.

9.3.10 The River Nith is designated as being only of Moderate overall quality, due to a moderate physical condition caused by modifications to bed, banks and shore. The objective is for the River Nith to achieve Good quality by 2027.

3 http://map.sepa.org.uk/floodmap/map.htm

Geology

9.3.11 A review of online British Geological Survey (BGS) mapping indicates that majority of the site is underlain by igneous Western Midland Valley Westphalian to Early Permian Sills - Microgabbro. The south western part of the site is underlain by Scottish Middle and Lower Coal Measures Formations. A number of faults are also shown to be present in the area and crossing the site.

9.3.12 The superficial geology at the site predominantly comprises peat and organic deposits, with areas of till and alluvium. Some areas are mapped as having no superficial deposits present which could imply that rockhead is relatively shallow in these areas. The surrounding area is dominated by historical and current surface coal mining. A review of the Coal Authority website indicates that whilst there are no records of mine entrances and coal activity at the site, there is potential for features to be present.

9.3.13 Benbeoch SSSI, illustrates sills of alkali-enriched basaltic composition, is located approximately 25 m to the southwest of the site and Dunaskin Glen SSSI, demonstrating a sequence of Upper Carboniferous sediments and Palaeozoic Palaeobotanical interest, is located approximately 1.7 km southwest of the site. The Nith Bridge SSSI, providing an important exposure in the glacial deposits of South-west Scotland, is located 3.7 km east.

9.3.14 As set out in Technical Appendix 2.10: CMRA (EIAR Volume 4), with reference to the mining legacy, the site is located within predominantly Coal Measures strata of Carboniferous age. The strata comprise the Lower and Middle Coal Measures with include coal seams. Associated with the Coal Measures are areas of late Carboniferous - early Permian intrusive igneous rocks – primarily dolerite rock and dolerite with quartz encroaching on the eastern site boundary. The superficial geology at the site predominantly comprises peat and organic deposits, with areas of till and alluvium. Some areas are mapped by the BGS as having no superficial deposits present which implies that rockhead is relatively shallow in these areas. The area is dominated by historical and current surface coal mining. Quarry features are also present that historically extracted aggregates.

9.3.15 There are no designated geological sites within the site boundary.

Soils and Peat

9.3.16 A peat survey was carried out by MacArthur Green in March 2018. Peat depths were collected at 1453 sample points located on a 100 m^2 systematic grid orientated in a north to south direction across the peat study area.

9.3.17 The study area was found to be dominated by conifer plantation, clear-fell and surface mining areas. However, more semi-natural habitats are also present, notably peatland (including areas of blanket mire), rush-mire and grassland. A few deeper pockets of peat were found scattered throughout the site, with a maximum sample depth of 7.58 m recorded.

9.3.18 Overall, approximately 1300 ha may be classified as having some form of underlying blanket mire habitat due to the peat depths recorded, where blanket mire is defined as habitats with a peat depth of greater than 50 cm. Approximately 390 ha have shallow peat deposits of less than 51 cm with the remainder of the samples (approximately 50 ha) recorded as non-peat substrates.

Groundwater Bodies

9.3.19 The site is underlain by the Cumnock Groundwater Body (ID 150646 under SEPA's RBMPs) which extends to approximately 288 km^2 in area. The 2014 condition of this groundwater body was designated under SEPA's River Basin Management Plans as being Poor overall, consisting of Good water flows and levels but Poor water quality due to a legacy of pollution relating to mining or quarrying. It is stated that the legacy pollution pressures have not ceased and the long term aspiration is to achieve good quality, although this is not reflected in future objectives for 2021 and 2027 which remain at a poor water quality level.

Private Water Supplies

9.3.20 As described in Technical Appendix 2.4: PWS Assessment (EIAR Volume 4), a PWS is considered to be a small abstraction of less than 10 m^3 per day from a source such as a borehole, spring / well, or surface water body.

9.3.21 SEPA has stated that all groundwater abstractions within the following distances of development need to be identified, in order to assess potential risk:

- within 100 m radius of all excavations shallower than 1 m; and
- within 250 m of all excavations deeper than 1 m.

9.3.22 PWS locations were identified through consultation with Sandy Loudon at East Ayrshire Council and a review of the Drinking Water Quality Regulator PWS Map. A review was also undertaken of the Polquhairn Wind Farm PWS Assessment (which was produced by MacArthur Green in December 2016) as East Ayrshire Council had suggested review of this document to identify additional PWS locations.

9.3.23 Only one PWS source (Clawfin) is located within 250 m of the site. This is listed as being sourced from a surface water spring. However, it is noted that the proposed development at this location is characterised by an existing hardstanding access track. This access route into the proposed development is not a primary access route and would not be used for HGV access but only for light vehicles. The access track, which extends from the B741 into the site, joins with one of the other main access tracks into the site approximately 770 m north of the Clawfin PWS.

Groundwater Dependant Terrestrial Ecosystems

9.3.24 The National Vegetation Classification (NVC) results within Technical Appendix 7.1 (EIAR Volume 4) were referenced against SEPA guidance[4], to identify those habitats which may be classified, depending on the hydrogeological setting, as being potentially groundwater dependent.

9.3.25 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.

4 SEPA. (2017). Land Use Planning System SEPA Guidance Note 31: Guidance on Assessing the Impacts of Windfarm Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems. Version 3. Issue date: 11/09/2017.

9.3.26 GWDTE sensitivity was assigned within Technical Appendix 7.1 (EIAR Volume 4) according to SEPA listings[5]. However, depending on several factors such as geology, superficial geology, presence of peat and topography, it was identified that many of the potential GWDTE communities recorded may in fact be only partially groundwater fed or not dependent on groundwater.

9.3.27 The semi-natural communities recorded within the study area which may be considered potential GWDTE are presented in Table 9.6. Areas of potential GWDTE are presented in Technical Appendix 7.1, Figure 7.1.6 (EIAR Volume 4).

Table 9.6: Communities Within the Site which may Potentially be Classified as GWDTE

NVC Code	NVC Community Name
M15 (Moderate)	*Trichophorum germanicum – Erica tetralix* wet heath
M25 (Moderate)	*Molinia caerulea – Potentilla erecta* mire
M27 (Moderate)	*Filipendula ulmaria – Angelica sylvestris* mire
M28 (Moderate)	*Iris pseudacorus – Filipendula ulmaria* mire
MG9 (Moderate)	*Holcus lanatus – Deschampsia cespitosa* grassland
MG10 (Moderate)	*Holcus lanatus – Juncus effusus* rush pasture
Je & Ja (Moderate)	*Juncus effusus* & *J. acutiflorus* acid grasslands
W4 (High)	*Betula pubescens – Molinia caerulea* woodland
W7 (High)	*Alnus glutinosa – Fraxinus excelsior – Lysimachia nemoreum* woodland
M6 (High)	*Carex echinata – Sphagnum fallax/denticulatum* mire
M23 (High)	*Juncus effusus/acutiflorus – Galium palustre* rush pasture

9.3.28 Further specific GWDTE Assessment was completed by MacArthur Green and is shown within Annex 7.1.2 of Technical Appendix 7.1 (EIAR Volume 4). It is noted that where the habitat has developed on mine workings it has been considered to have a low sensitivity. This is on the basis that the ground is highly disturbed and, in most instances, is adjacent to land with more intrusive excavations than will occur as a result of the proposed development. Where the ground has been previously mined and since restored, the water table may be rebounding. The compacted restored material is likely to have poor infiltration levels creating a waterlogged surface. GWDTE habitats may develop in this wet environment, however, the likelihood of the habitats being connected to the underlying groundwater is considered to be low.

Future Baseline

9.3.29 There is potential for climate change to impact on future baseline conditions. Climate change studies generally predict a potential decrease in average summer precipitation and an increase in winter precipitation alongside slightly higher average temperatures. Extreme summer storms are, however, predicted to be of greater individual intensity. Peak fluvial flows associated with extreme storm events may, therefore, increase in volume and velocity. These climate change factors have been taken into account when considering the potential for likely significant effects.

5 SEPA. (2017). Land Use Planning System SEPA Guidance Note 31: Guidance on Assessing the Impacts of Windfarm Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems. Version 3. Issue date: 11/09/2017.

Summary of Sensitive Receptors

Table 9.7: Summary of Receptor Sensitivity

Receptor	Sensitivity	Justification
Burnock Water and tributaries including the Black Water, Broadhag Burn, Otter Sike, Palmsike Burn and Head Mark Lane	Medium	Good water quality status. Potential to impact on flood risks within the downstream catchments.
Water of Coyle and tributaries	Medium	Good water quality status.
Cummock Burn and the Black Burn	Medium	Good water quality status.
River Nith and tributaries including the Burnston Burn, Peat Sike, Old March Burn, Beoch Lane and Pumarleuch Burn	Medium	Moderate water quality status.
Soils and Peat	Medium	Areas of Highly Dominant and Moderately Dominant potential GWDTE identified. However, the habitats and underlying groundwater body are assessed as having a reduced sensitivity across this site, compared to a natural environment.
Groundwater	Medium	No public or Private Water Supplies identified from a groundwater body. The 2014 condition of the Cumnock Groundwater Body was designated as being Poor overall. There is one PWS source (Clawfin) located within 250 m of the site which is listed as being sourced from a surface water spring. However, there are no development works within the 250m radius of this source.

9.4 Assessment of Likely Effects

Potential Construction Effects

Effects on Soils and Peat (Including GWDTE)

9.4.1 The construction of infrastructure for the proposed development will generate excavated peat in the areas of infrastructure underlain by peatland. The peat erosion potential of any peat disturbed may also be exacerbated as a consequence of localised drying of the peat and resultant oxidation. The locations of proposed turbines and infrastructure have been selected such that the majority of any areas of deep peat are avoided and micro-siting will be used as far as possible to further reduce effects on peat.

9.4.2 It is demonstrated in Technical Appendix 2.5 (EIAR Volume 4) that the demand for peat for reinstatement purposes is greater than the supply of peat arising from excavation. By adjusting the depth of peat used for restoration works, and within the temporary Stone Extraction Areas (SEAs), a balance between supply and demand can be achieved, thereby ensuring there is no surplus generated on the proposed development. It is also apparent that there is also much spare reuse capacity in the event more peat is excavated than predicted, or other reuse areas cannot accommodate the predicted amounts. The extent of abandoned and unrestored surface mining areas within the site offer additional capacity for suitable peat reuse and restoration, if required.

9.4.3 The overall conclusion regarding peat stability (as presented in EIAR Volume 4: Technical Appendix 2.6: PLHRA) is that there is a negligible to low risk of peat instability over most of the site although some limited areas of medium and high risk have been identified. For these areas, a hazard impact assessment was completed which concluded that, subject to micrositing and the employment of appropriate mitigation measures, all of these areas can be considered as having an insignificant risk of a peat slide occurring.

9.4.4 Excavation of soil and bedrock during the construction phase of the proposed development may cause localised disruption and interruption to groundwater flow. Interruption of groundwater flow would potentially reduce the supply of groundwater to GWDTEs thereby causing an alteration/change in the quality or quantity of and/or the physical or biological characteristics of the GWDTE. Contamination of groundwater may also cause physical or chemical contamination to the GWDTE.

9.4.5 The habitats and underlying groundwater body are assessed as having a reduced sensitivity across this site, compared to a natural environment (as described within EIAR Volume 4: Technical Appendix 7.1: NVC & Habitats Survey Report). The results of peat surveys also identified that, although the site has an extensive covering of peat of varying depth, much of the peatland is inactive due to the almost ubiquitous coverage of commercial conifer plantation. In addition, there are areas of abandoned and active surface mine where the peatland has been removed. Therefore, the sensitivity of the soil and peat resource is considered to range from low in areas of highly modified peat (e.g. subject to extensive artificial drainage), to medium where less modified active peat forming habitats are present. In the absence of further mitigation, the magnitude of potential impacts on the soil and peat resource during construction is considered to be None to Small as the demand for peat for reinstatement purposes is greater than the supply of peat arising from excavation.

9.4.6 Therefore, the level effect is predicted to be **Minor adverse and not significant**.

Impact on Runoff Volumes and Rates and Fluvial Morphology through the Alteration of Drainage Patterns

9.4.7 There is the potential to alter in-channel or overland flow regimes through excavations, disruption to artificial drains, exposure of bare earth or rock and the construction of new and upgraded existing watercourse crossings as well as the potential crossing of smaller land / field drains (see EIAR Volume 4: Technical Appendix 2.2). There is the potential for the proposed development to lead to a temporary increase in flood risk and indirect effects on aquatic ecology, fluvial morphology upstream and downstream of the site as a result of changes to the hydrological response to rainfall events. The sensitivity of the catchments to impacts on runoff volume, rate and changes in morphology is considered to be medium.

9.4.8 All of the watercourse crossings identified for the proposed development would be designed in compliance with requirements of The Water Environment (Controlled Activities) (Scotland) Regulations 2011 as amended. The design of watercourse crossings would also take account of the future 'with climate change' baseline, and to avoid altering the flow regime would be sized for a 1:200 year plus climate change flood event.

9.4.9 Therefore, the level of effect is predicted to be **Minor adverse and not significant**.

Impact on Water Quality and Fluvial Morphology Associated with Sediment-laden Runoff or Impacts on Bank Integrity

9.4.10 There is the potential to increase erosion and transport of sediment to watercourses as a result of watercourse crossing construction, vegetation and soil stripping, excavations and dewatering activities. Potential effects include indirect effects on aquatic ecology, fluvial morphology and PWS downstream of the site.

9.4.11 All drainage from constructed areas would be managed through a Sustainable Drainage System (SuDS) as specified in Chapter 2: Development Description, to attenuate flow rate, manage the volume of run-off and ensure no degradation in water quality using measures such as v-notch weirs, check dams, silt traps and settlement ponds.

9.4.12 Therefore, the level of effect is predicted to be **Minor adverse and not significant**.

Effects on Water Quality from Pollution Associated with Contaminated Runoff / Pollution

9.4.13 There is the potential to impact on receiving soils, groundwater and watercourse quality through the release of contaminated water and stored chemicals used on-site during construction works. Potential effects include effects on water quality and indirect effects on aquatic ecology. Pollution prevention measures specified in the Outline CEMP (EIAR Volume 4: Technical Appendix 2.1) would ensure compliance with SEPA Pollution Prevention Guidelines, with all equipment, material and chemicals securely stored and bunded, where applicable, at least 50 m away from watercourses.

9.4.14 In addition, there is the potential to impact on watercourse chemistry. Catchments draining peat tend to be acidic. Disturbance of peat may therefore also result in increased acidification of draining waterbodies. In addition, deforestation can increase nitrogen mineralisation and nitrification, which can promote nitrate leaching and enhance acidity in waters draining some soils. The effect can last between two to five years after felling, depending upon the rate at which vegetation re-establishes.

9.4.15 Therefore, the level of effect in the absence of further mitigation is predicted to be **Moderate adverse and potentially significant**.

Water Use

9.4.16 There is likely to be a requirement for water use in concrete production and other general requirements. It is anticipated that this would equate to an approximate overall volume of 52,250,000 litres. This assumes an approximate volume of 150 litres per cubic metre of concrete.

9.4.17 There is no water abstraction location specified at this stage. It is likely that this would be a surface water abstraction. Such an abstraction would be required only at the construction phase. An application for the abstraction would be made under the CAR regulations by the contractor. It is assumed that the rate of abstraction would be set and authorised such that there is no impact on downstream water resource. Therefore, the level of is predicted to be **Minor and not significant**.

Potential Operational Effects

Alteration of Natural Drainage Patterns and Runoff Volumes

9.4.18 Permanent site infrastructure, if inappropriately located or designed, could impact on flood risks, aquatic ecology and water resources by modifying surface water runoff responses to precipitation. In particular, infrastructure could lead to long-term increases in volumes or concentrations of surface water runoff from hardstanding areas thereby leading to increases in erosion and sediment discharge to watercourses. Some impacts, in particular on aquatic ecology, may take a longer time-frame to be realised. However, the locations of proposed turbines and infrastructure have been determined through spatial analysis of hydrology, hydrogeology and geology constraints such that inappropriate location or design has been avoided. In addition, all drainage from constructed areas would be managed through SuDS, as specified in Chapter 2: Development Description and EIAR Volume 4 Technical Appendix 2.1: Outline CEMP, to attenuate flow rates and manage the volume of run-off. Therefore, no significant effect on natural drainage patterns or runoff volumes are anticipated.

Potential Decommissioning Effects

9.4.19 Effects arising from the process of decommissioning involve similar, but smaller scale, processes to those employed during construction. As such no additional potential for significant effects during decommissioning is identified.

Potential Cumulative Construction Effects

9.4.20 All but one of the developments identified as having a potentially cumulative environmental effect are within river catchments that are hydrologically separate from those identified in this chapter as being potential receptors, or are a significant distance downstream such that no significant interaction of effects would be anticipated.

9.4.21 Although the Over Hill wind farm also lies within the catchment areas of Black Water and the Beoch Lane, upgradient hydrologically from the proposed development, the watercourses which emerge within the Over Hill wind farm area are characteristic of small upland streams with very low surface conveyance. Therefore, the Over Hill wind farm is not likely to have a significant impact on downstream hydrology and, given the very low potential for the proposed development to have a significant impact on Hydrology, Hydrogeology and Geology, and assuming the successful implementation of detailed mitigation and monitoring plans, it is expected that any cumulative effects would be minor and not significant.

Potential Cumulative Operational Effects

9.4.22 As is the case for cumulative construction effects, the Over Hill wind farm is not likely to have a significant impact on downstream hydrology and no further cumulative impacts during the operational phase have been identified.

9.5 Mitigation

Mitigation during Construction

9.5.1 The principal mitigation measures to address the potential impacts on peat and peat soils, groundwater, runoff volumes and rates, fluvial morphology, water quality in watercourses and water bodies (ponds) and pollution associated with chemical contaminated runoff / pollution are embedded within the proposed design and incorporated into the standard construction environmental management measures, embedded in the design described in Chapter 2: Development Description.

9.5.2 All construction and decommissioning work would be executed in accordance with a site-specific CEMP, written in accordance with the relevant best practice guidance on pollution prevention and mitigation, namely the SEPA PPGs and GPPs relevant to construction and CIRIA guidance[6,7] which, although published for linear construction projects, includes principles which would also be applicable to the proposed development.

6 Pollution Prevention Guidelines, published by SEPA –URL: https://www.sepa.org.uk/regulations/water/guidance/ (July 2019)

9.5.3 It should be noted that the locations of proposed turbines and infrastructure have been determined through spatial analysis of hydrology, hydrogeology and geology constraints. Furthermore, the layout of the turbines, and hence tracks and cables, would be subject to 100 m micrositing[8]. Any micrositing changes would be based on further detailed site investigation to both consider peat depth and respect the hydrology buffer exclusion zones defined within this chapter.

9.5.4 A 50 m buffer has been designed around watercourses within which the siting of infrastructure has been avoided. Where access tracks are required to be located within this buffer zone, appropriate mitigation measures, in particular in terms of site drainage design would be developed to avoid potential impacts on the watercourses. It is noted that some initial design plans had included a potential stone extraction area within 50 m of a watercourse to be installed as part of the mine area restoration in the east of the site. Land within 50 m of this watercourse would not be used for stone extraction.

9.5.5 Water emissions are anticipated to be limited to surface water, and very small quantities of waste water from the site welfare facilities. The site would be designed to ensure that surface water runoff does not exceed the pre-development volume or rate of run-off. Access tracks would be designed to be semi-permeable and to act in a similar manner to a Sustainable Drainage System (SUDS), allowing some infiltration of surface water through the track surface. In addition, there would be a trackside drainage system installed during construction incorporating measures to attenuate the flow and provide for physical filtration and infiltration of surface water. Runoff from areas of hardstanding such as crane pads and foundations is expected to infiltrate locally on unsurfaced areas.

9.5.6 At all construction works areas, clean runoff (i.e. non-silty surface water flow, including that which has not passed over any disturbed construction areas) would be kept separate from potentially contaminated water from construction areas as far as possible. Where required, interceptor ditches and other drainage diversion measures would be installed immediately in advance of any excavation works in order to collect and divert clean runoff away from construction disturbed areas.

9.5.7 Any SEA(s) would feature a perimeter surface drain, which would aim to prevent water in-flow into the SEA. The water collected within the surface drains would be discharged either into the surrounding vegetation, or into suitably located settlement lagoons. Where necessary surface settlement lagoons would be constructed within the SEA. These would be constructed with the aim of containing any surface water collection within the excavation voids, and from collection of water from the perimeter surface drains. The lagoons would be contained within a bunded area at the base of the SEA, with suitable pumping systems installed allowing water to be pumped to soakaways as required.

9.5.8 Discharge of diverted clean runoff would be into an area of vegetation for dispersion or infiltration and would occur as close as possible to the location of interception in order to ensure that there is no effect on soil moisture regimes downstream of the works and to ensure that the availability of water to GWDTEs identified is not reduced.

9.5.9 The CEMP would include plans to minimise potential problems related to dewatering such as:

- dewatering progressively in cells;
- reducing the inflow of water by sealing worked surfaces;

7 Control of water pollution from linear construction projects. Technical guidance (C648), CIRIA.

8 There is a 100 m micrositing allowance for the infrastructure associated with the proposed development. However, this allowance would not encroach within the 50 m watercourse buffer.

- managing temporary soil storage mounds and slope stability in line with industry best practice;
- avoiding seepage of contaminated runoff through the floor of SEAs; and
- ensuring inert fill is used for backfilling purposes.

9.5.10 As set out in Technical Appendix 2.5 (EIAR Volume 4), the following is a list of controls that would be implemented for works in all areas of peat during detailed design stage:

- During the excavation and reuse of peat deposits, where any layered structuring within the peat exists, namely the 'acrotelm' and underlying 'catotelm', these layers would be preserved as far as is practicable. This approach would aid in the successful re-vegetation and prevent drying and desiccation of the peat;
- Any underlying substrate material removed as part of the excavations should also be stored separately (not mixed with the peat material) and used as the base layer in restoration of temporary SEAs (to mimic the natural stratigraphy of a peatland);
- Peat would be stored suitably close and reused as close to its source location as far as practicable;
- Where feasible, reinstatement and restoration would be carried out concurrently with construction rather than at its conclusion;
- Limiting the width of the peat verges to 1.5 m, as detailed above, will minimise unnecessary smothering of intact vegetation adjacent to infrastructure; and
- All peat reuse and landscaping activities should be agreed in advance with the onsite Ecological Clerk of Works (ECoW), and suitably qualified engineer if required. If, under the advice of the ECoW/engineer some areas are unsuitable for peat reuse then there is spare reuse capacity within other areas of the site.

9.5.11 All runoff from the proposed access tracks would be treated in accordance with SuDS principles. The drainage system will be sized to adequately treat runoff from each section of development. This will ensure that any increase in development footprint will require a corresponding increase in treatment volume.

9.5.12 Where watercourse crossings are being installed or upgraded, best practice construction measures would be adopted to prevent contamination through the use of coffer dams and sediment isolation techniques. All watercourse crossings would be subject to appropriate CAR Authorisation and would be in accordance with good practice guidance to minimise impacts on watercourse morphology, aquatic habitat and flood risk. The watercourse crossing design and capacity, and the methods used for construction would be agreed in advance with SEPA.

9.5.13 In addition to the use of SuDS, petrol interceptors and spill kits will be utilised where chemical spillage, for example as a result of refuelling, is a possibility. Site personnel will also be trained in river and stream protection measures to ensure a quick response to any accidental spillages or contamination.

Mitigation during Operation

9.5.14 On-going maintenance of all on-site drains and culverts is essential to ensure the operation of drainage measures, preventing flow disruptions and associated increased flood risk, sediment transport etc. This would ensure that silt management measures remain effective for the lifetime of the proposed development.

9.5.15 The likelihood of chemical pollution during operation of the proposed development is considerably lower than during construction as there will generally be no construction related traffic and machinery on-site. Appropriate pollution control measures, similar to those used during construction, would also be adopted within the completed development to mitigate against remaining risks of spills associated with turbine gearbox lubricants, transformer oils and hydrocarbons associated with maintenance vehicles.

Mitigation during Decommissioning

9.5.16 As set out above, effects arising from the process of decommissioning involve similar, but smaller scale, processes to those employed during construction and as such it is considered that the mitigation proposed for construction would be similarly effective in controlling the potential effects arising from decommissioning.

9.6 Assessment of Residual Effects

Residual Construction Effects

Effects on Soils and Peat (including GWDTE)

9.6.1 It is demonstrated in Technical Appendix 2.5 (EIAR Volume 4) that the demand for peat for reinstatement purposes is greater than the supply of peat arising from excavation. Furthermore, following the consideration of the principal mitigation measures to be set out within a site-specific CEMP, the magnitude of potential impact on soils and peat (Medium Sensitivity) would be Small. **Therefore, no significant residual effect is predicted**.

Impact on Runoff Volumes and Rates and Fluvial Morphology through the Alteration of Drainage Patterns

9.6.2 Following the implementation of mitigation measures, in particular consideration of natural drainage paths during development of site drainage design (in accordance with SuDS principles) in order to avoid potential impacts on watercourses (Medium Sensitivity), the magnitude of potential impact would decrease from Medium to Small. **Therefore, no significant residual effect is identified**.

Impact on Water Quality and Fluvial Morphology Associated with Sediment-laden Runoff or Impacts on Bank Integrity

9.6.3 As a result of mitigation including best practice construction measures to prevent contamination through the use of coffer dams and sediment isolation techniques, the potential impact on the bank integrity of watercourses (Medium Sensitivity) would reduce from Medium to Small magnitude. **Therefore, no significant residual effect is predicted**.

Effects on Water Quality from Pollution Associated with Contaminated Runoff / Pollution

9.6.4 As a result of the SuDS, supplemented by petrol interceptors and spill kits where chemical spillage is a possibility, the potential impact on surface water and groundwater quality (both Medium Sensitivity) would reduce from Medium to Small magnitude. **Therefore, no significant residual effect is predicted**.

9.6.5 Site personnel will also be trained in river and stream protection measures to ensure a quick response to any accidental spillages or contamination.

Residual Operational Effects

Alteration of Natural Drainage Patterns and Runoff Volumes

9.6.6 Following appropriate site drainage design and construction, no further impacts on surface water runoff and drainage would be realised during the operational phase. Therefore, the magnitude of potential impact on watercourses (Medium Sensitivity) would decrease from Small and **no significant residual effect is predicted**.

Residual Decommissioning Effects

9.6.7 Effects arising from the process of decommissioning involve similar, but smaller scale, processes to those employed during construction and as such it is considered that the assessment of residual effects during construction would remain applicable at decommissioning also.

Residual Cumulative Construction Effects

9.6.8 No significant cumulative construction effects were identified.

Residual Cumulative Operation Effects

9.6.9 No significant cumulative operational effects were identified.

9.7 Monitoring

9.7.1 As set out previously, on-going maintenance of all on-site drains and culverts is essential to ensure the operation of drainage measures, preventing flow disruptions and associated increased flood risk, sediment transport etc. Therefore, visual inspections would be undertaken regularly, in accordance with best practice, in order to ensure that all measures remain remain effective for the lifetime of the proposed development.

9.8 Summary

Table 9. 8: Summary of Potential Significant Effects of the Proposed Development

Likely Significant Effect	Mitigation Proposed	Means of Implementation	Outcome/Residual Effect
Construction			
Effects on Soils and Peat (Including GWDTE)	It is demonstrated in the Draft Peat Management Plan (DPMP) (EIAR Volume 4: Technical Appendix 2.5) that the demand for peat for reinstatement purposes is greater than the supply of peat arising from excavation.	The DPMP (EIAR Volume 4: Technical Appendix 2.5 contains a draft PMP) would be finalised and delivered as condition of consent to ensure appropriate peat reinstatement and reuse.	Not Significant
Impact on runoff volumes and rates and fluvial morphology through the alteration of drainage patterns	All of the watercourse crossings identified for the proposed development would be designed in compliance with requirements of The Water Environment (Controlled Activities) (Scotland) Regulations 2011 as amended. The design of watercourse	An application for the watercourse crossings would be made under the CAR regulations by the contractor.	Not Significant

Table 9. 8: Summary of Potential Significant Effects of the Proposed Development

Likely Significant Effect	Mitigation Proposed	Means of Implementation	Outcome/Residual Effect
	crossings would also take account of the future 'with climate change' baseline, and to avoid altering the flow regime would be sized for a 1:200 year plus climate change flood event.		
Impact on water quality and fluvial morphology associated with sediment-laden runoff or impacts on bank integrity	All drainage from constructed areas would be managed through a Sustainable Drainage System (SuDS).	SuDS form an integral part of site design. The final SuDS design would be prepared prior to construction and included in the CEMP. The Outline CEMP (EIAR Volume 4: Technical Appendix 2.1) would be finalised and delivered as condition of consent.	Not Significant
Effects on water quality from pollution associated with contaminated runoff / pollution	Compliance with SEPA Pollution Prevention Guidelines and Guidance for Pollution Prevention, with all equipment, material and chemicals securely stored and bunded, where applicable, at least 50 m away from watercourses.	Pollution prevention measures specified in the CEMP (EIAR Volume 4: Technical Appendix 2.1). The CEMP would be finalised and delivered as condition of consent.	Not Significant
Water Use	It is assumed that the rate of abstraction would be set and authorised such that there is no impact on downstream water resource.	An application for the abstraction would be made under the CAR regulations by the contractor.	Not Significant
Operation			
Alteration of Natural Drainage Patterns and Runoff Volumes	Proposed watercourse crossings and SuDS measures to be inspected and appropriately maintained for the lifetime of the proposed development.	An appropriate inspection and maintenance plan to be prepared prior to completion, to be secured as a condition of consent.	Not Significant
Decommissioning			
Effects arising from the process of decommissioning involve similar, but smaller scale, processes to those employed during construction.			Not Significant
Cumulative Construction			
None Identified	No mitigation, further to that already describes, is considered necessary.	Not applicable	No Significant Impact
Cumulative Operation			
None Identified	No mitigation, further to that already describes, is considered necessary.	Not applicable	No Significant Impact

9.9 Glossary and Abbreviations

Abbreviation	Expanded Term
PMP	Peat Management Plan
CEMP	Construction Environmental Management Plan
FEH	Flood Estimation Handbook
GWDTE	Groundwater Dependent Terrestrial Ecosystem
CAR	Controlled Activities Regulations
SuDS	Sustainable Drainage Systems
PWS	Private Water Supply

10 Traffic and Transport

10.1 Introduction

10.1.1 This chapter considers the likely significant effects on traffic and transport associated with the construction, operation and decommissioning of the proposed development. The specific objectives of the chapter are to:

- describe the traffic and transport 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 WYG Environment Planning Transport Limited, part of the WYG Group in accordance with the Institute of Environmental Assessment (now Institute of Environmental Management and Assessment (IEMA) and referred to as such below) Guidelines for the Environmental Assessment of Road Traffic[1]. All staff contributing to this chapter have undergraduate and/or postgraduate degrees in relevant subjects, have professional transport assessment experience, and hold professional membership of the Chartered Institute of Logistics and Transport. The report has been reviewed and approved by Liz Hunter of WYG. A copy of her CV is included in Technical Appendix 1.2 (EIAR Volume 4).

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

- Figure 10.1: Study Area and Count Sites;
- Figure 10.2: Abnormal Indivisible Load Route; and
- Technical Appendix 10.1: Transport Assessment.

10.2 Assessment Methodology and Significance Criteria

Scope of Assessment

10.2.1 This chapter considers the potential for likely significant effects on receptors using transport routes resulting from vehicle movements associated with the construction, operational and decommissioning phases of the proposed development. Receptors include vehicle drivers, pedestrians, cyclists and communities.

10.2.2 This chapter considers effects on:

- Severance;
- Driver delay;
- Pedestrian delay;
- Pedestrian amenity;

[1] Institute of Environmental Assessment (1993). Guidelines for the Environmental Assessment of Road Traffic

- Fear and intimidation; and
- Accidents and safety.

10.2.3 The chapter assesses the potential for significant cumulative effects arising from the addition of the proposed development to other cumulative developments, which are the subject of a valid planning application. Operational, under construction and consented developments are considered as part of the baseline. Traffic flows associated with developments close to the end of their operational life are captured in surveys of existing traffic movements and therefore form part of the baseline to present 'worst case scenario'.

10.2.4 The assessment is based on the proposed development as described in Chapter 2: Development Description (EIAR Volume 2).

10.2.5 The scope of the assessment has been informed by consultation responses summarised in Table 10.1 and the following guidelines/policies:

- National Planning Framework[2] (NPF);
- Scottish Planning Policy[3] (SPP);
- Planning Advice Note (PAN) 75[4];
- Transport Assessment Guidance[5];
- Guidelines for the Environmental Assessment of Road Traffic[6]; and
- East Ayrshire Local Development Plan[7].

Consultation

10.2.6 Table 10.1 summarises the consultation responses received regarding traffic and transport and provides information on where and/or how they have been addressed in this assessment.

10.2.7 Full details on the consultation responses are provided in Technical Appendix 1.1: Consultation Register (EIAR Volume 4).

Table 10.1: Consultation Responses

Consultee and Date	Scoping / Other Consultation	Issue Raised	Response / Action Taken
East Ayrshire Council (14 May 2018)	Scoping Opinion	Transport and Access should not be scoped out and an Assessment of significance of impacts should be in accordance with IEMA Guidelines for the Environmental Assessment of Road Traffic.	This Traffic and Transport chapter considering the IEMA Guidelines forms part of the EIAR. Technical Appendix 10.1: Transport Assessment (EIAR Volume 4) has been produced to provide further information.
		Routes for abnormal loads and for all types of construction traffic should be identified in the assessment.	Construction traffic routes and abnormal load traffic routes are identified in Sections 6 & 9, respectively, of

[2] Scottish Government (2014). Scotland's Third National Planning Framework

[3] Scottish Government (2014). Scottish Planning Policy

[4] Scottish Executive (2005). Planning Advice Note PAN75 Planning for Transport

[5] Transport Scotland (2012). Transport Assessment Guidance

[6] Institute of Environmental Assessment (1993). Guidelines for the Environmental Assessment of Road Traffic

[7] East Ayrshire Council (2017). East Ayrshire Local Development Plan

Table 10.1: Consultation Responses

Consultee and Date	Scoping / Other Consultation	Issue Raised	Response / Action Taken
			Technical Appendix 10.1: Transport Assessment (EIAR Volume 4) and in section 10.4 of this chapter.
		The EIA should focus on the standalone and cumulative impacts during the construction and decommissioning periods.	Standalone and cumulative impacts during the construction and decommissioning phases are considered in Section 10.4 of this chapter.
		The EIAR should identify potential sources of materials (e.g. stone quarries) and consider impacts on those routes including communities along those routes.	Materials sources are considered in Section 6 of Appendix 10.1: Transport Assessment (EIAR Volume 4) and Section 10.4 of this chapter.
		Assessment should assume the importation of aggregates for infrastructure construction.	The proposed development has been designed to reuse existing tracks, where possible and temporary Stone Extraction Areas (SEAs) have been identified on site (Figure 2.2, EIAR Volume 3a). It is the intention that they would be used to provide construction aggregate with only aggregate for concrete, sand for concrete and cable trenches, cement and rebar to be imported. Assuming the import of all aggregate for construction would be unrealistic in this case. The assessment therefore considers only the materials that would be imported. This is discussed in Section 10.4 of this chapter and Section 6 of Technical Appendix 10.1: Transport Assessment (EIAR Volume 4).
		The EIAR should include an outline Traffic Management Plan as a Technical Appendix.	Section 10 of Technical Appendix 10.1: Transport Assessment (EIAR Volume 4) includes a Framework Abnormal Load Traffic Management Plan.
		Details of the site accesses should be set out with clear justification for the chosen option,	Details of the site's access points are shown

Table 10.1: Consultation Responses

Consultee and Date	Scoping / Other Consultation	Issue Raised	Response / Action Taken
		should be within the application site boundary and incorporate appropriate geometry and visibility sightlines.	in Figure 2.16 (EIAR Volume 3a).
		Any off-site accommodation works outwith the public road boundary will also require to be within the application site boundary.	There would be a requirement for minor off site works along the access routes to the site. The works would typically involve adjustments to road side vegetation, fences, walls, signage and lighting columns adjacent to roads together with localised reprofiling of land to improve the geometry for the movement of abnormal loads at junctions and bends in the road. The off-site works (where not Permitted Development) would be subject of separate planning applications to EAC rather than forming part of the S36 Application. The precise land requirements are not known at this stage and would be confirmed during the detailed design of the proposed development. The nature, location and scale of those works are unlikely to give rise to significant environmental effects and so are not considered within the scope of the EIAR
Dumfries and Galloway Council (undated)	Scoping Opinion	The development site lies entirely within East Ayrshire, with access proposed from roads within East Ayrshire. Should any future submission envisage use of access routes within Dumfries and Galloway it would be appropriate that Dumfries and Galloway Council Roads Service be consulted.	None required.
Transport Scotland (16 April 2018)	Scoping Opinion	Requires a full Abnormal Load Route Assessment for all trunk road sections of the delivery route including a detailed review of the chosen	An Abnormal Load Route Assessment has been undertaken for the routes between the Port of Entry (PoE) which is King George V Dock, Glasgow and the site's two HGV

Table 10.1: Consultation Responses			
Consultee and Date	**Scoping / Other Consultation**	**Issue Raised**	**Response / Action Taken**
		route to the site's access to be provided.	access points (Section 9 of Technical Appendix 10.1: Transport Assessment (EIAR Volume 4)).
		If Heavy Goods Vehicle (HGV) movements involve the Trunk Roads, potential trunk road environmental impacts (associated with increased traffic during construction) such as driver delay, severance, pedestrian amenity, safety etc should be considered and assessed where appropriate.	This chapter contains an assessment of the potential likely significant environmental impacts in accordance with IEMA Guidelines.
New Cumnock Community Council (25 April 2018)	Scoping Opinion	NCCC states that the fundamental issue with transport and access is that of whether rock will need to be imported or not.	Temporary Stone Extraction Areas have been identified on site (Figure 2.2, EIAR Volume 3a). It is the intention that they would be used to provide construction aggregate with only aggregate for concrete, sand for concrete and cable trenches, cement and rebar would be imported. The assessment considers vehicle movements associated with the materials that would be imported. This is reported in Section 10.4 of this chapter and Section 6 of Technical Appendix 10.1: Transport Assessment (EIAR Volume 4)
		NCCC requests for investigations into viable borrow pits to be made to assess what importation of rock would be required. NCCC states that this assessment is vital as the number of HGV movements to and from the site, be it timber, rock, abnormal loads or other material delivers all must come through surrounding communities.	As discussed above, the design of the proposed development includes temporary stone extraction areas. Indicative extraction rock volumes would be estimated based on desk-based information. A Preliminary Stone Extraction Assessment has been completed and included as Technical Appendix 2.3, (EIAR Volume 4). Detailed site investigation of the proposed stone extraction areas would be completed post-consent.
		NCCC requests for detailed site investigations to be undertaken to clearly	

Table 10.1: Consultation Responses			
Consultee and Date	**Scoping / Other Consultation**	**Issue Raised**	**Response / Action Taken**
		identify sources of rock prior to the final application to give communities the comfort that proposed traffic figures are reasonably accurate and not mere 'desk-based guesses'.	The assessment considers the sources of other materials and routes that would be used by construction traffic. This is reported in Section 10.4 of this chapter and Section 6 of Technical Appendix 10.1: Transport Assessment (EIAR Volume 4)
		NCCC requests for detailed analysis of felling plans to be provided so that the traffic created through timber traffic is well understood and quantified.	The assessment determines the number of HGV movements required to remove the timber from the site based on detailed assessments of tonnage produced by the forestry consultants. Vehicle movements are considered in relation to the overall construction programme / vehicle movements. This is reported in Section 10.4 of this chapter and Section 6 of Technical Appendix 10.1: Transport Assessment (EIAR Volume 4)
		NCCC states the vitality that cumulative effects with other wind farm and construction projects are assessed.	Cumulative impacts are considered in Section 10.4 of this chapter.
		NCCC feels that the above has a significant potential to affect residents and that transport and access must be scoped in.	Following receipt of the Scoping Opinion it was agreed that a Traffic and Transport chapter would be prepared and included in the EIAR.

Potential Effects Scoped Out

10.2.8 It is anticipated that the volume of traffic associated with the construction of the proposed development would not have a discernible effect on roads and sensitive receptors outwith the study area (see below for definition of the study area) as the potential effects of traffic would be diluted with increasing distance from the point of origin.

Method of Baseline Characterisation

10.2.9 The methodology adopted in this assessment has involved the following key stages:

- determine baselines;
- review the proposed development to identify potential effects;
- evaluate significance;

- identify mitigation; and
- assess residual effects.

Extent of the Study Area

10.2.10 The study area for the traffic and transport assessment was identified through a review of the likely routes between suppliers of equipment and materials and the site. The traffic and transport study area is defined as the public roads which would be used during the construction phase to access the proposed development and is shown in Figure 10.1 (EIAR Volume 3a).

Desk Study

10.2.11 The baseline review focuses on the nature of the surrounding road infrastructure and the level of traffic that uses it. It has been informed by the following:

- review of responses to the scoping report;
- collection of traffic flow data;
- review of roads hierarchy;
- identification of sensitive locations;
- identification of constraints to the roads network, with or without height/width/weight restrictions;
- identification of areas of road safety concern;
- identification of traffic sensitive receptors in the area (routes, communities, buildings etc.);
- review of Ordnance Survey (OS) plans to derive a local area roads network; and
- consideration of potential supply locations for construction materials to inform extent of roads network to be considered in the assessment.

Field Survey

10.2.12 Automatic Traffic Count (ATC) surveys to determine existing traffic flows and speeds on the surrounding road network were undertaken to further enhance the understanding of the road network in the traffic and transport study area.

10.2.13 Site visits were undertaken as part of the Abnormal Indivisible Load (AIL) route assessment which considered potential constraints to the movement of AILs in terms of height, width and weight restrictions.

Criteria for the Assessment of Effects

10.2.14 In terms of traffic and transport effects, the receptors are the users of the roads within the traffic and transport study area and the locations through which those roads pass.

Criteria for Assessing the Sensitivity of Receptors

10.2.15 The IEMA Guidelines document includes guidance on how the sensitivity of receptors should be assessed. Using that as a base, professional judgement was used to develop a classification of sensitivity for users based on the characteristics of roads and locations. This receptor sensitivity classification is summarised in Table 10.2.

Table 10.2: Classification of Receptor Sensitivity				
Receptor	**Negligible**	**Low**	**Medium**	**High**
Users of Roads	Where roads have no adjacent settlements. Includes new strategic trunk roads that would be little affected by additional traffic and suitable for Abnormal Loads and new strategic trunk road junctions capable of accommodating Abnormal Loads.	Where the road is Trunk or A-class, constructed to accommodate general and HGV traffic moving between primary destinations. Includes roads with little or no traffic calming or traffic management measures.	Where the road is a local A or B class road, capable of regular use by HGV traffic. Includes roads where there is some traffic calming or traffic management measures.	Where the road is a minor rural road, not constructed to accommodate frequent use by HGVs. Includes roads with traffic control signals, waiting and loading restrictions, traffic calming measures.
Users of Locations	Where a location includes individual dwellings or scattered settlements with no facilities.	Where a location is a small rural settlement, few community or public facilities or services.	Where a location is an intermediate sized rural settlement, containing some community or public facilities and services.	Where a location is a large rural settlement containing a high number of community and public services and facilities.

Criteria for Assessing the Magnitude of Change

10.2.16 The following rules, also taken from the IEMA Guidelines were used to determine which links within the traffic and transport study area should be considered:

- Rule 1 - include highway links where traffic flows are predicted to increase by more than 30% (or where the number of heavy goods vehicles is predicted to increase by more than 30%).
- Rule 2 - include any other specifically sensitive areas where traffic flows are predicted to increase by 10% or more.

10.2.17 The IEMA Guidelines identify the key effects that are most important when assessing the magnitude of traffic impacts from an individual development: the effects and levels of magnitude are discussed below:

- Severance - the IEMA Guidance states that, "severance is the perceived division that can occur within a community when it becomes separated by a major traffic artery." Further, "Changes in traffic of 30%, 60% and 90% are regarded as producing 'slight', 'moderate' and 'substantial' changes in severance respectively." However, the Guidelines acknowledge that "the measurement and prediction of severance is extremely difficult" (Para 4.28).
- Driver delay - the IEMA Guidelines note that these delays are only likely to be "significant [or substantial] when the traffic on the network surrounding the development is already at, or close to, the capacity of the system" (Para 4.32).
- Pedestrian delay - the delay to pedestrians, as with driver delay, is likely only to be substantial when the traffic on the network surrounding the development is already at, or close to, the capacity of the system. An increase in total traffic of approximately 30% can double the delay experienced by pedestrians attempting to cross the road and would be considered 'substantial'.

- Pedestrian amenity - the IEMA Guidelines suggest that a tentative threshold for judging the significance of changes in pedestrian amenity would be where the traffic flow (or its lorry component) is halved or doubled (Para 4.39). It is therefore considered that a change in the traffic flow of -50 % or +100 % would produce a 'substantial' change in pedestrian amenity.
- Fear and intimidation - there are no commonly agreed thresholds for estimating levels of fear and intimidation, from known traffic and physical conditions. However, as the impact is considered to be sensitive to traffic flow, changes in traffic flow of 30%, 60% and 90% are regarded as producing 'slight', 'moderate' and 'substantial' changes in severance respectively.
- Accidents and safety - professional judgement would be used to assess the implications of local circumstances, or factors which may elevate or lessen risks of accidents.

Criteria for Assessing Cumulative Effects

10.2.18 Traffic associated with operational wind farms and other development is currently using the road network and therefore flows are captured in baseline traffic surveys undertaken across the traffic and transport study area in June 2018.

10.2.19 Traffic associated with wind farm developments that have received consent but have not yet been constructed (committed developments) and which is identified to impact on the traffic and transport study area, is considered as part of the future year baseline. Traffic flow information for relevant committed developments is extracted from documentation submitted with the planning applications.

10.2.20 Developments that are the subject of valid planning applications and where it is identified that construction traffic flows would impact on the traffic and transport study area over the period of construction of the proposed development are considered in a cumulative assessment.

Criteria for Assessing Significance

10.2.21 To determine the overall significance of the effects, the results from the receptor sensitivity and effects magnitude assessment are correlated and classified using a scale set out in Table 2.4 of Volume 11, Section 2, Part 5 of the Design Manual for Roads and Bridges (DMRB)[8] and summarised in Table 10.3.

Table 10.3: Significance of Effects

Receptor Sensitivity	**Magnitude of Change**				
	Substantial	**Moderate**	**Slight**	**Negligible**	**None**
High	Major	Major/ Moderate	Moderate / Minor	Minor	None
Medium	Major/ Moderate	Moderate	Minor	Minor / Neutral	None
Low	Moderate / Minor	Minor	Minor	Minor / Neutral	None
Negligible	Minor	Minor	Minor / Neutral	Neutral	None

10.2.22 In terms of the EIA Regulations, effects would be considered significant where they are assessed to be major or moderate.

[8] Highways Agency (2008). Design Manual for Roads and Bridges, Volume II Environmental Assessment, Section 2 Environmental Assessment

Limitations and Assumptions

10.2.23 In line with standard practice, daily baseline traffic flows have been developed from the average traffic flows collected over the course of a week-long count survey. Although it is possible that the flows may over or under represent the baseline annual average daily flow, this is considered to be a robust approach because surveys were undertaken during an average period in terms of vehicle movements and no incidents likely to affect traffic flow were reported over the course of the surveys.

10.2.24 Construction traffic flows associated with committed development were included within the baseline assessment assuming that the peak period of construction for all developments would occur simultaneously. This is considered a very robust assumption.

10.2.25 It was assumed that aggregate for concrete, sand for concrete and cable trenches, cement and rebar required for the proposed development would be delivered from off-site quarries and that concrete would be batched on-site.

10.2.26 For the purposes of this assessment, it is assumed that all staff and construction traffic would be generated from outside the traffic and transport study area. This is a robust assumption as it is likely that some staff would originate from within the traffic and transport study area and their movements would not therefore impact on all roads under consideration.

10.2.27 Based on the distribution of the local population, 40% of staff trips were assumed to originate from Ayr, 40% from Kilmarnock, 10% from locations accessed via A77(T) south and 10% from locations accessed from A76(T) south.

10.3 Baseline Conditions

Current Baseline

Study Area

10.3.1 The traffic and transport study area adopted for this assessment focussed on the following roads:

- A70 between its junctions with the A77(T) and A76(T);
- U728 between its junctions with the A70 and B7046;
- B7046 between its junction with the U728 and the proposed north site access;
- A713 between its junction with the A77(T) and Dalmellington;
- B741 between its junctions with the A713 and A76(T);
- A76(T) between Auchinleck and New Cumnock; and
- A77(T) between St Quivox and Nether Auchindrane.

10.3.2 All roads within the study area, except the trunk roads, are local roads managed by the Ayrshire Roads Alliance (ARA). The A76(T) and A77(T) are strategic trunk roads managed by Transport Scotland (TS) and its managing agent Scotland Transerv. The B7046, A713, B741 and A70 are generally two-way, rural, single carriageways subject to the national speed limit except where they pass through settlements. The A76(T) and A77(T) are also generally two-way, rural, single carriageways subject to the national speed limit except where they pass through settlements; the only exceptions to this are sections of the A77(T) east of Ayr which are dual carriageway.

10.3.3 The relevant sections of the road network within the study area are shown on Figure 10.1 (EIAR Volume 3a).

Existing Traffic Movements

10.3.4 To determine the existing road usage, Automatic Traffic Count (ATC) surveys were commissioned at six sites on the local roads in June 2018. In addition, 2017 Annual Average Daily Traffic Flow (AADT) data for two sites on the trunk road network was extracted from the online Department for Transport database of count sites[9]. The locations of the traffic count sites are illustrated on Figure 10.1 (EIAR Volume 3a) and are as follows:

- 1. A70 between Ochiltree and U728 (ATC);
- 2. U728 between A70 and B7046 (ATC);
- 3. B7046 at proposed north site access (ATC);
- 4. A713 between Dalmellington and Patna (ATC);
- 5. B741 Main Street Dalmellington (ATC);
- 6. B741 north of Dalmellington (ATC);
- 7. A76(T) north of Auchinleck (DfT site); and
- 8. A77(T) north of A70 (DfT site).

10.3.5 The existing weekday traffic flows at each count site are summarised into cars and Light Goods Vehicles (LGV) and HGVs in Table 10.4.

Table 10.4: Existing Traffic Movements (Weekday Average Two-way Flows)			
Survey Location	**Cars & LGV**	**HGV**	**Total**
1. A70 between Ochiltree and U728	5883	1258	7141
2. U728 between A70 and B7046	415	315	730
3. B7046 at proposed north site access	529	234	763
4. A713 between Dalmellington and Patna	3436	759	4195
5. B741 Main Street Dalmellington	2481	335	2816
6. B741 north of Dalmellington	521	284	805
7. A76(T) north of Auchinleck	9224	707	9931
8. A77(T) north of A70	31067	1845	32912

Vehicle Speeds

10.3.6 The ATC sites used to provide traffic volume data were also used to collect speed statistics. The two way five-day average and 85th percentile speeds observed at the count locations are summarised in Table 10.5.

Table 10.5: Speed Summary (Weekday Average Two-way Flows)			
Survey Location	**Average Speed (MPH)**	**85th Percentile Speed (MPH)**	**Speed Limit (MPH)**
1. A70 between Ochiltree and U728	52.9	62.5	60
2. U728 between A70 and B7046	52.9	61.5	60

[9] https://roadtraffic.dft.gov.uk/ (accessed 23/07/ 2018)

Table 10.5: Speed Summary (Weekday Average Two-way Flows)			
Survey Location	**Average Speed (MPH)**	**85th Percentile Speed (MPH)**	**Speed Limit (MPH)**
3. B7046 at proposed north site access	42.9	58.5	60
4. A713 between Dalmellington and Patna	51.3	58.8	60
5. B741 Main Street Dalmellington	17.4	22.5	30
6. B741 north of Dalmellington	39.0	46.9	60

10.3.7 The speed survey data indicates that average speeds at all sites are lower than the speed limit. Except for the A70 and U728 the 85th percentile speeds at all locations were also below the speed limit.

Accident History

10.3.8 WYG obtained road traffic accident data from CrashMap[10] for the study area roads covering the five years to the end of 2017.

10.3.9 Section 5 of Technical Appendix 10.1: Transport Assessment (EIAR Volume 4) provides a summary of the personal injury accidents recorded on the study area road network, for the five year period. This indicates the majority of accidents resulted in slight injuries; just over half of the serious and fatal accidents involved two vehicles, while 87 % involved at least one car. Only two of the accidents involved an HGV, which is important to note as most of the movements associated with the proposed development would be undertaken by goods traffic.

Path / Cycle Network

10.3.10 None of the roads within the study area forms part of the core path network or are part of a formally designated cycle route.

Future Baseline

Traffic Flows

10.3.11 Construction of the proposed development is likely to take 36 months. There would be a 24 month period of forestry extraction, which would commence 12 months prior to the start of the construction of the proposed development and overlap for the second 12 month period with other construction activities. The forestry and construction start dates would be determined following consent (if granted). However, as the traffic and transport assessment requires a baseline year to be identified and for which base traffic flows are developed (against which estimates of increased traffic related to the proposed development are considered), for the purposes of this assessment it was assumed that the peak construction period would fall during 2023 and this was used as the baseline year.

10.3.12 Future year baseline year traffic flows were determined by applying a National Road Traffic Forecast (NRTF) factor to the surveyed traffic flows and adding construction traffic associated with committed (consented) wind farm developments.

10.3.13 The NRTF low growth factor for 2018 to 2023 is 1.0354 and from 2017 to 2023 is 1.0438. These factors were applied to the 2018 ATC and 2017 DfT survey data respectively to estimate the 2023 traffic flows.

[10] http://www.crashmap.co.uk/ (accessed 24/07/2018)

10.3.14 Construction traffic flows associated with committed wind farm developments, construction routes for which would impact on the study area, were included within the baseline assessment assuming that the peak period of construction for all developments would occur simultaneously. This is considered a very robust assumption as it is unlikely they would overlap. Traffic flows were extracted from planning documentation where available.

10.3.15 Committed developments accounted for were South Kyle Wind Farm, Lethans Wind Farm, and Polquhairn Wind Farm.

10.3.16 Benbrack Wind Farm and Sandy Knowe Wind Farm are also consented. However, planning information indicates that construction traffic would not impact on the same sections of the road network as construction traffic associated with the proposed development. It is also considered very unlikely that AILs, which could use sections of the same approach route as the proposed development, would be permitted to move simultaneously with the proposed development.

10.3.17 It is considered that the use of the NRTF growth factor in developing baseline flows adequately accounts for any committed development traffic not specifically accounted for. It is also considered that the use of the NRTF growth factors accounts for the interface of construction traffic associated with small-scale developments such as single turbines with the proposed development.

10.3.18 The estimated future year baseline traffic movements are shown in Table 10.6.

Table 10.6: Future Year Baseline Traffic (Weekday Average Two-way Flows)

Survey Location	Cars & LGV	HGV	Total
A70 between Ochiltree and U728	6140	1407	7547
U728 between A70 and B7046	479	430	909
B7046 at proposed north site access	597	346	943
A713 between Dalmellington and Patna	3758	856	4614
B741 Main Street Dalmellington	2569	347	2916
B741 north of Dalmellington	639	329	968
A76(T) north of Auchinleck	9720	912	10632
A77(T) north of A70	32477	2030	34507

Summary of Sensitive Receptors

10.3.19 A summary of the receptors identified as being sensitive to traffic associated with the proposed development and which have been 'scoped-in' to the assessment are given in Table 10.7, together with the justification for inclusion.

Table 10.7: Summary of Receptor Sensitivity

Receptor	Sensitivity	Justification
A70	Low	Local A class road, constructed to accommodate frequent use by HGVs.
U278	Medium	Despite U class status, considered to be constructed to be capable of accommodating regular use by HGVs as it provides a key connection between an A class and a B class road.
B7046	Medium	Local B class road, capable of regular use by HGV traffic
A713	Medium	Local A class road, capable of regular use by HGV traffic
B741	Medium	Local B class road, capable of regular use by HGV traffic

Table 10.7: Summary of Receptor Sensitivity

Receptor	Sensitivity	Justification
A76(T)	Low	Trunk road constructed to accommodate general and HGV traffic moving between primary destinations
A77(T)	Low	Trunk road constructed to accommodate general and HGV traffic moving between primary destinations
Ochiltree (on A70)	Medium	Intermediate sized rural settlement, some community or public facilities and services
Coylton (on A70)	Medium	Intermediate sized rural settlement, some community or public facilities and services
Sinclairston (on B7046)	Low	Small rural settlement, few community or public facilities or services
Patna (on A713)	Low	Small rural settlement, few community or public facilities or services
Dalmellington (on A713 and B741)	Medium	Intermediate sized rural settlement, some community or public facilities and services

10.4 Assessment of Likely Effects

Potential Construction Effects

Development Traffic Generation

10.4.1 During the assumed 36 month construction programme, it is anticipated the following vehicle types would require regular access to the site from the public road:

- Heavy and light goods traffic related to the extraction of forestry over the first 24 months of the programme;
- Staff transport, cars, vans and staff minibuses (cars and LGV);
- Construction equipment and materials, deliveries of machinery and supplies such as concrete raw materials;
- AILs consisting of the wind turbine components and heavy lift crane(s); and
- Escort vehicles for AIL deliveries, cars and LGV.

10.4.2 Except for the turbine components, most traffic would be normal construction plant and would include grading tractors, excavators, high capacity cranes, forklifts and dumper trucks. Most would arrive at the site on low loaders.

10.4.3 The turbines would be delivered to site in component sections and would be assembled on-site. The nacelle, hub, drive train, blade sections and tower sections are classified as AIL due to their weight and/or length, width and height when loaded.

10.4.4 The components could be delivered on a variety of transport platforms with typical examples illustrated in Section 9 of Technical Appendix 10.1: Transport Assessment.

10.4.5 In addition to the turbine deliveries, up to two high capacity erection cranes would be needed to offload some components and erect the turbines. The cranes would be likely to be mobile cranes with a capacity up to 1,000 tonnes that would be escorted by boom and ballast trucks to allow full mobilisation on-site. Smaller erector cranes would also be present to allow the assembly of the main cranes and to ease overall erection of the turbines.

Construction Vehicle Movements

10.4.6 The assessment is based upon information provided by the Applicant and developed from experience of other wind farms of a similar scale which is detailed in Section 6 of Technical Appendix 10.1: Transport Assessment.

10.4.7 The candidate turbine used in the Route Assessment (discussed later in this chapter), represents the most onerous component dimensions likely to be transported to the site, in order to ensure that a reasonable worst case scenario of turbine parameters has been assessed.

10.4.8 As noted above, the extraction of forestry would commence before construction of the proposed development but coincide with the first 12 months of the construction programme. Consideration has therefore been given to associated traffic volumes. It is understood that 7,500 timber lorry loads, generating 15,000 two-way vehicle movements would be required to extract timber from the site.

10.4.9 Materials testing has confirmed that samples taken from proposed SEA locations are considered to be of adequate quality to supply aggregate for infrastructure construction. Concrete would be batched on-site which reduces the number of associated transport movements by around one third compared with delivery of ready-mix material. Aggregate and sand for concrete, cement, sand for cable trenches and rebar will need to be imported to the site from off-site quarries and suppliers. The background information relating to the calculation of associated vehicle movements is set out in Section 6 of Technical Appendix 10.1: Transport Assessment (EIAR Volume 4).

10.4.10 To enable comparison of the estimated future year baseline traffic movements with total volumes including predicted construction traffic, average daily two-way movements for each month assuming a 22-day working month for deliveries were determined. Traffic movements were also split by vehicle type in line with the baseline data and the peak period for construction traffic determined. The final daily construction profile, by activity, is set out in Appendix 10.1.1 of Technical Appendix 10.1: Transport Assessment (EIAR Volume 4) and summarised in Table 10.8.

Table 10.8: Daily Construction Traffic (Weekday Average Two-way Flows)

Vehicle Type	**Month**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Car / LGV	0	0	0	0	0	0	0	0	0	0	0	0
HGV	28	28	28	28	28	28	28	28	28	28	28	28
Total	28	28	28	28	28	28	28	28	28	28	28	28
	Month											
	13	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
Car / LGV	13	32	32	63	63	95	95	126	126	126	126	126
HGV	36	33	30	31	31	31	70	71	71	84	84	84
Total	49	65	62	94	94	126	165	197	197	210	210	210
	Month											
	25	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**
Car / LGV	126	137	137	137	137	137	137	137	126	126	95	63
HGV	57	36	27	27	27	27	13	12	7	4	6	7

Table 10.8: Daily Construction Traffic (Weekday Average Two-way Flows)												
Total	183	173	164	164	164	164	150	149	133	130	101	70

10.4.11 The maximum traffic movements associated with construction of the proposed development are predicted to occur in months 22 to 24 of the programme. During these months, an average of 846 HGV movements are predicted per day and it is estimated that there would be a further 126 car and minibus / LGV movements per day to transport construction workers to and from the site.

Development Traffic Routeing / Distribution

10.4.12 The origin of vehicle traffic would depend on the location of staff accommodation and the source of materials being imported. It is likely that staff would be accommodated across a wide area. The highest volume of traffic would be generated by the requirement for aggregate, sand and cement for on-site batching of concrete. It is assumed that materials would be imported primarily from Garpel Quarry, Muirkirk. Details of the assumed distribution are set out in Section 6 of Technical Appendix 10.1: Transport Assessment (EIAR Volume 4).

10.4.13 Staff traffic would be permitted to use all three site accesses, while general HGV traffic and AILs would be required to use the access points on the B7046 and A713 only.

10.4.14 AIL traffic and crane trips would originate from King George V (KGV) Dock, Glasgow and travel to the site via M8/M73/M74/M77/A77 and A713, accessing the site via the A713 access point or M8/M73/M74/M77/A76/A70/U728, accessing the site via the B7046 access point. The proposed routes are indicated in Figure 10.2 (EIAR Volume 3a).

Predicted Impact

10.4.15 To estimate the total trips on the study network during the construction phase, daily construction traffic flows were combined with the future year baseline traffic data. The resulting figures were compared with the weekday future year baseline traffic.

10.4.16 Table 10.9 summarises the daily peak construction traffic at the various locations within the traffic and transport study area and Table 10.10 summarises the future year baseline plus peak construction traffic (total) flows.

Table 10.9: Daily Peak Construction Traffic (Weekday Average Two-way Flows)

Survey Location	Cars & LGV	HGV	Total
A70 between Ochiltree and U728	50	51	101
U728 between A70 and B7046	76	63	139
B7046 at proposed north site access	76	63	139
A713 between Dalmellington and Patna	38	21	59
B741 Main Street Dalmellington	13	0	13
B741 north of Dalmellington	13	0	13
A76(T) north of Auchinleck	50	54	104
A77(T) north of A70	50	19	69

Table 10.10: Total Traffic (Weekday Average Two-way Flows)

Survey Location	Cars & LGV	HGV	Total
A70 between Ochiltree and U728	6190	1458	7648

Table 10.10: Total Traffic (Weekday Average Two-way Flows)			
Survey Location	**Cars & LGV**	**HGV**	**Total**
U728 between A70 and B7046	555	493	1048
B7046 at proposed north site access	673	409	1082
A713 between Dalmellington and Patna	3796	877	4673
B741 Main Street Dalmellington	2582	347	2929
B741 north of Dalmellington	652	329	981
A76(T) north of Auchinleck	9770	966	10736
A77(T) north of A70	32527	2049	34576

10.4.17 Table 10.11 shows the percentage increase in total traffic over future year baseline traffic.

Table 10.11: Percentage Increase in Total vs Baseline Traffic			
Survey Location	**Cars & LGV**	**HGV**	**Total**
A70 between Ochiltree and U728	0.81%	3.63%	1.34%
U728 between A70 and B7046	15.88%	14.65%	15.29%
B7046 at proposed north site access	12.74%	18.19%	14.74%
A713 between Dalmellington and Patna	1.01%	2.45%	1.28%
B741 Main Street Dalmellington	0.51%	0.00%	0.45%
B741 north of Dalmellington	2.03%	0.00%	1.34%
A76(T) north of Auchinleck	0.51%	5.92%	0.98%
A77(T) north of A70	0.15%	0.94%	0.20%

10.4.18 With reference to rule 1 of the IEMA guidelines, the results in Table 10.11 indicate that during construction of the proposed development, neither total traffic flows nor HGV flows are anticipated to increase by more than 30% on any route.

10.4.19 With reference to rule 2 of the IEMA guidelines, total traffic flows are anticipated to increase by over 10% on the U728 and B7046. Rule 2 also indicates that a full assessment is required where such an uplift is anticipated in relation to highly sensitive receptors. Both the U728 and B7046 are considered receptors of medium sensitivity so assessment is not required. However, for robustness the links have been taken forward to an assessment of effect significance. Due to their similar characteristics, the two links have been considered together.

10.4.20 Table 10.12 summarises the potential effects (as identified in the IEMA Guidelines), the predicted magnitude of the impact from increase in traffic movements on the U278 and B7046 with no mitigation in place and the significance of the effect.

Table 10.12: Assessment of Construction Traffic and Transport Effects			
Receptor	**Potential Effect**	**Magnitude of Impact**	**Significance of Effect**
U278 and B7046 – medium sensitivity	Severance	Slight	While there could be a demand for pedestrians to cross the sections of road, pedestrian movements are observed to be very low. Increase in traffic could result in difficulties for people crossing the road during the construction period. Total traffic volumes could change by just over 16%.

Table 10.12: Assessment of Construction Traffic and Transport Effects			
Receptor	**Potential Effect**	**Magnitude of Impact**	**Significance of Effect**
			The magnitude of the impact on severance is considered to be of slight. The effect, without mitigation, is assessed as **minor** and **not significant**.
	Driver Delay	Slight	The road network is not considered to experience operational difficulties as traffic movements are very low. The change in traffic volumes would not take the system close to capacity limits and the driver delay impact is therefore considered to be slight magnitude. The effect, without mitigation, is assessed as **minor** and **not significant**.
	Pedestrian Delay	Slight	While there could be a demand for pedestrians to use and cross the road sections, pedestrian flows are observed to be very low. Pedestrians could experience delay if their movements conflict with those of construction traffic. Total traffic volumes could change by just over 16%. The impact on pedestrian delay is considered to be slight. The effect, without mitigation, is assessed as **minor** and **not significant**.
	Pedestrian Amenity	Moderate	While there could be a demand for pedestrians to use and cross the road, pedestrian flows are observed to be very low. Pedestrian amenity could be affected where their movements conflict with those of construction traffic. Total traffic volumes could increase by just over 16% and HGV flows by just under 19%. The impact on pedestrian amenity is considered to be minor. The effect, without mitigation, is assessed as **minor** and **not significant**.
	Fear and Intimidation	Slight	As traffic volumes could change by under 30%, the impact is considered to be minor. The effect, without mitigation, is assessed as **minor** and **not significant**.
	Accidents and Safety	Slight	There is potential for impact on safety due to driver frustration, particularly with regards to the potential conflict between construction and local traffic. The impact is considered to be minor. The effect, without mitigation, is assessed as **minor** and **not significant**.

Potential Operational Effects

10.4.21 It is predicted that during the operation of the site there would be up to two vehicle movements per week for maintenance purposes. Also, there could be occasional abnormal load movements to deliver replacement components in the event of a major component failure.

10.4.22 In terms of the IEMA Guidelines, such a small number of traffic movements and the associated percentage uplift over baseline traffic movements are not likely to result in significant effects.

Potential Decommissioning Effects

10.4.23 Prior to decommissioning of the site, assumed to be 30 years from commissioning for the purposes of this EIAR, a traffic assessment would be undertaken and appropriate traffic management procedures would be followed.

10.4.24 The decommissioning phase would result in fewer trips on the road network than the construction phase 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 standard HGVs, reducing the potential for large numbers of AILs.

10.4.25 As decommissioning would result in fewer vehicle trips on the road network than the construction phase, assuming the baseline has not substantially changed, the significance of any effects would not be greater. It can therefore be assumed that the assessment of the construction phase covers the reasonable worst-case scenario in terms of decommissioning.

Potential Cumulative Construction Effects

10.4.26 Consideration was given to the cumulative impact of the proposed development plus Pencloe Wind Farm, Overhill Wind Farm and Enoch Hill Wind Farm. Ashmark Hill Wind Farm was not included having been refused planning consent in September 2018.

10.4.27 It is highly unlikely that the construction programmes for the proposed development and the identified wind farms would coincide. However, for the purposes of this assessment it was assumed that the peak periods of the construction programmes would overlap and as such, the cumulative assessment has considered the reasonable worst-case scenario.

10.4.28 Peak period traffic flows for the cumulative wind farms were extracted from planning documentation and added to the future year flows where they impact on the study area.

10.4.29 Table 10.13 shows the percentage increase in cumulative traffic (future year baseline plus proposed development plus cumulative development) over future year baseline traffic.

Table 10.13: Percentage Increase in Cumulative vs Baseline Traffic

Survey Location	Cars & LGV	HGV	Total
A70 between Ochiltree and U728	0.81%	3.63%	1.34%
U728 between A70 and B7046	15.88%	14.65%	15.29%
B7046 at proposed north site access	12.74%	18.19%	14.74%
A713 between Dalmellington and Patna	2.61%	12.27%	4.40%
B741 Main Street Dalmellington	0.51%	0.00%	0.45%
B741 north of Dalmellington	2.03%	0.00%	1.34%
A76(T) north of Auchinleck	1.13%	33.55%	3.91%
A77(T) north of A70	0.15%	0.94%	0.20%

10.4.30 With reference to rule 1 of the IEMA guidelines, the results in Table 10.13 indicate that when considering cumulative construction phases, total traffic flows would not increase by more than 30% on any route. HGV movements would not increase by over 30% on any route except the A76(T), a receptor of low sensitivity.

10.4.31 With reference to Rule 2 of the IEMA guidelines, while total cumulative traffic flows could increase by over 10% on the U728 and B7046 neither of these links is considered to be highly sensitive. No further assessment of these links has therefore been undertaken.

10.4.32 As cumulative HGV flows may increase by just over 30% on the A76(T), this link has been taken forward to an assessment of effect significance although it is considered unlikely that the proposed development would be constructed simultaneously with Enoch Hill Wind Farm, at 204 HGV movements, the principal generator of HGV traffic onto the A76(T) in the cumulative scenario.

10.4.33 Table 10.14 summarises the potential cumulative effects (as identified in the IEMA Guidelines), the predicted magnitude of the impact from increase in traffic movements on the A76(T) with no mitigation in place and the significance of the effect.

Table 10.14: Assessment of Cumulative Construction Traffic and Transport Effects

Receptor	Potential Effect	Magnitude of Impact	Significance of Effect
A76(T) – low sensitivity	Severance	Slight	While there could be a demand for pedestrians to cross the sections of road, pedestrian movements are observed to be very low. Increase in traffic could result in difficulties for people crossing the road during the construction period. Total traffic volumes could change by just under 4%. The magnitude of the impact on severance is considered to be of slight. The effect, without mitigation, is assessed as **minor** and **not significant**.
	Driver Delay	Slight	The road network is not considered to experience operational difficulties. The change in traffic volumes would not take the system close to capacity limits and the driver delay impact is therefore considered to be slight magnitude. The effect, without mitigation, is assessed as **minor** and **not significant**.
	Pedestrian Delay	Slight	While there could be a demand for pedestrians to use and cross the road sections, pedestrian flows are observed to be very low. Pedestrians could experience delay if their movements conflict with those of construction traffic. Total traffic volumes could change by just under 4%. The impact on pedestrian delay is considered to be slight. The effect, without mitigation, is assessed as **minor** and **not significant**.
	Pedestrian Amenity	Moderate	While there could be a demand for pedestrians to use and cross the road, pedestrian flows are observed to be very low. Pedestrian amenity could be affected where their movements conflict with those of construction traffic. Total traffic volumes could increase by just under 4% and HGV flows by just over 30%. The impact on pedestrian amenity is considered to be minor. The effect, without mitigation, is assessed as **minor** and **not significant**.
	Fear and Intimidation	Slight	As traffic volumes could change by under 30%, the impact is considered to be minor. The effect, without mitigation, is assessed as **minor** and **not significant**.
	Accidents and Safety	Slight	There is potential for impact on safety due to driver frustration, particularly with regards to the potential conflict between construction and local traffic. The impact is considered to be minor. The effect, without mitigation, is assessed as **minor** and **not significant**.

10.4.34 Before the introduction of mitigation, it is considered that no significant cumulative effects would arise.

Potential Cumulative Operation Effects

10.4.35 It is predicted that during the operation of the cumulative wind farm sites there would be up to two vehicle movements per week for maintenance purposes to each site and occasional abnormal load movements to deliver replacement components in the event of a major component failure.

10.4.36 In terms of the IEMA Guidelines, such a small number of traffic movements and the associated percentage uplift over baseline traffic movements are not significant.

10.5 Mitigation

Mitigation during Construction

General Construction Traffic

10.5.1 During the construction period a community liaison group would be set up to disseminate information and take feedback, and the project website would be regularly updated to provide the latest information relating to traffic movements associated with vehicles accessing the site. This would be agreed with ARA as the Local Roads Authority.

10.5.2 With the exception of staff vehicles, construction traffic would be permitted to approach and depart the site via the U278 / B7046 and A713 access points only.

10.5.3 The following measures would be implemented during the construction phase through a Construction Traffic Management Plan (CTMP):

- All materials delivery lorries (dry materials) would be sheeted to reduce dust and stop spillage on public roads;
- Specific training and disciplinary measures would be established to ensure the highest standards are maintained to prevent construction vehicles from carrying mud and debris onto the carriageway;
- Wheel wash facilities would be established at the site entrance;
- Working hours would be limited to between 0700 and 1900 Monday to Saturday though deliveries would be prohibited after 1300 on a Saturday save for AIL component delivery which could take place outside these hours;
- Appropriate traffic management measures would be put in place on the U278, B7046 and A713 to avoid conflict with general traffic, subject to the agreement of the roads authority. Typical measures would include adherence to statutory speed limits, HGV turning and crossing signs, banksmen at the site access during peak flow periods, and warning signs;
- Provision of construction updates on the project website and a newsletter to be distributed to residents within an agreed distance of the site;
- All drivers would be required to attend an induction to include:
  - a safety briefing;
  - the need for appropriate care and speed control over the sections of the construction route pass through settlements;
  - identification of specific sensitive areas;
  - identification of the specified route; and
  - the requirement not to deviate from the specified route.
- An Abnormal Load Traffic Management Plan (TMP) (which would form part of the CTMP).

10.5.4 Video footage of the pre-construction phase condition of the abnormal loads access routes and the construction vehicles routes would be recorded to provide a baseline of the state of the road prior to any construction work commencing. This baseline would allow identification of any change in the road conditions during the construction stage of the proposed development. Any necessary repairs would be coordinated with the Roads Authority. Any damage caused by traffic associated with the proposed development during the construction period, that would be hazardous to public traffic, would be repaired immediately.

10.5.5 Damage to road infrastructure caused directly by construction traffic would be made good, and street furniture that is removed on a temporary basis would be fully reinstated.

10.5.6 There would be a road edge review on a daily basis and any debris and mud removed from the carriageway using an onsite road sweeper to keep the road clean and safe.

10.5.7 The impact of construction traffic will be mitigated through alternative methods of material sourcing such as use of on-site SEAs for provision of aggregate.

Abnormal Indivisible Loads (AIL)

10.5.8 The swept path assessments undertaken as part of the Access Route review (which are discussed in Section 9 of Technical Appendix 10.1: Transport Assessment (EIAR Volume 4)) identified the areas where remedial works would be required to accommodate the movement of AILs and the required modifications.

10.5.9 The required road improvements would be carried out in agreement with ARA and the appropriate statutory authorities to ensure that during delivery of turbine components minimal damage would be caused to road surfaces, verges, street furniture and surrounding vegetation.

10.5.10 A Traffic Management Plan for the delivery of abnormal loads would be developed to reduce conflicts between abnormal load traffic and other road users. A framework for the Traffic Management Plan is set out in Section 10 of Technical Appendix 10.1: Transport Assessment (EIAR Volume 4).

10.5.11 Before the AILs traverse the route, the following tasks would be undertaken to ensure load and road user safety:

- review clearance heights with utility providers and the transport agencies along the route. The Applicant would ensure, in consultation with providers, that there is sufficient clearance with an appropriate safety factor, especially with respect to power lines;
- ensure any vegetation which could foul the loads is trimmed back to allow passage;
- confirm that there are no roadworks or closures that could affect the passage of the loads;
- check that no new or diverted underground services on the proposed route would be at risk from the abnormal loads;
- confirm that the police are satisfied with the proposed movement strategy; and
- the Applicant would contact the appropriate agencies to ensure that the above points are reviewed before the transport of AIL components commences.

Mitigation During Operation

10.5.12 With the exception of maintaining and monitoring site entrance roads (to be undertaken by NKWFL and any other significant users at the time, no mitigation measures during operation are proposed as it is predicted that there would only be a very small number of vehicle movements per week for maintenance purposes. Consideration could have to be given to the very occasional AIL movement to deliver replacement components, although any required mitigation to allow for this would be determined at the time.

Mitigation During Decommissioning

10.5.13 Given that similar operations would be required to decommission the proposed development, the mitigation measures would be likely to be comparable with those indicated for the delivery and construction period. Contemporary best practice and prevailing guidance would be followed.

10.6 Assessment of Residual Effects

Residual Construction Effects

10.6.1 An evaluation of the likely effects of the increase in traffic on the local roads to be used as the route for construction traffic was undertaken. This considered the traffic effects on different environmental receptors identified, in accordance with the IEMA Guidelines, with no mitigation in place see Table 10.12. As no significant construction effects were identified, no significant residual effects are anticipated.

Residual Operational Effects

10.6.2 No significant operational effects were identified. As such, no residual effects are anticipated.

Residual Decommissioning Effects

10.6.3 No significant decommissioning effects were identified. As such, no residual effects are anticipated.

Residual Cumulative Construction Effects

10.6.4 No significant cumulative construction effects were identified. As such, no residual effects are anticipated.

Residual Cumulative Operation Effects

10.6.5 No significant cumulative operational effects were identified. As such, no residual effects are anticipated.

10.7 Monitoring

10.7.1 No significant residual effects are predicted and no requirement for monitoring is indicated.

10.7.2 However, in line with best practice, the following monitoring will be undertaken:

- During construction, there would be a road edge review on a daily basis and any debris and mud removed from the carriageway; and
- During operation, the condition of the site entrance roads would be monitored.

10.8 Summary

10.8.1 Existing traffic data established a base point for determining the impact during the construction phase and was factored to future levels to help determine the effect of construction traffic on the local road network.

10.8.2 The construction traffic would result in a temporary increase in traffic flows on all roads within the study area subject to the movements of construction traffic.

10.8.3 During the construction of the proposed development, the associated traffic effects are predicted to be greatest on the B7046 and U728 between the north site access and the A70.

10.8.4 The maximum traffic effect associated with construction of the proposed development is predicted to occur in months 22 to 24 of the overall programme. During these months, an average of 84 HGV movements is predicted to approach and depart the site per day (via all points of access) and it is estimated that there would be a further 126 car and light van movements per day to transport construction workers to and from the site.

10.8.5 No potentially significant construction effects were identified on any roads except the U728 and B7046 as neither total nor HGV traffic flows are anticipated to increase by more than the relevant threshold of 30%. HGV traffic flows are anticipated to increase by more than 10% on the U728 and B7046 and although the links are not considered highly sensitive, for robustness, a full assessment was undertaken 28. The assessment of effects and residual effects indicated that there would be no significant adverse effects associated with the construction of the proposed development.

10.8.6 Potentially significant cumulative construction effects were identified for the A76(T) on which HGV traffic flows could increase by just over 30% were all the identified developments constructed simultaneously. The assessment of effects indicated that there would be no significant adverse effects associated with the cumulative construction of the proposed developments. It is also considered very unlikely that the identified developments would be constructed simultaneously.

10.8.7 No significant operational or decommissioning effects were identified.

10.8.8 Mitigation measures will be implemented during the construction phase including:

- the establishment of a community liaison group;
- the development of a CTMP relating to construction traffic movements and a TMP relating to the movement of AILs;
- a road condition survey;
- repair of damage to road infrastructure caused directly by construction traffic;
- reinstatement of street furniture removed on a temporary basis;
- daily road edge reviews and alternative methods of material sourcing such as use of on-site SEAs for provision of aggregate; and
- remedial works to accommodate the movement of AILs.

10.8.9 As no significant construction, operational or decommissioning effects were identified, no residual effects are anticipated.

Table 10.15: Summary of Potential Significant Effects of the Proposed Development

Likely Significant Effect	Mitigation Proposed	Means of Implementation	Outcome/Residual Effect
Construction			
Severance caused by increased traffic movements, particularly uplift in HGV traffic	No significant effects identified. However, general construction traffic movements would be managed through the provision of a CTMP to include traffic management at site access points, restricted delivery hours etc. AIL movements would be managed through a TMP.	CTMP and TMP to be secured as a condition of consent.	No significant effects and therefore no significant residual effects anticipated

Table 10.15: Summary of Potential Significant Effects of the Proposed Development			
Likely Significant Effect	**Mitigation Proposed**	**Means of Implementation**	**Outcome/Residual Effect**
	Construction updates would be provided to local community through project website and newsletter		
Driver delay caused by increased traffic movements, particularly during AIL movements	No significant effects identified. However, AIL movements would be managed through a TMP. Construction updates would be provided to local community through project website and newsletter	TMP and community communication to be secured as conditions of consent.	No significant effects and therefore no significant residual effects anticipated
Pedestrian delay caused by increased traffic movements, particularly uplift in HGV traffic	No significant effects identified. However, general construction traffic movements would be managed through the provision of a CTMP to include traffic management at site access points, restricted delivery hours etc. Construction updates would be provided to local community through project website and newsletter	CTMP and community communication to be secured as conditions of consent.	No significant effects and therefore no significant residual effects anticipated
Decreased pedestrian amenity caused by increased traffic movements and change in composition to include higher percentage of large vehicles	No significant effects identified. However, general construction traffic movements would be managed through the provision of a CTMP to include traffic management at site access points, restricted delivery hours etc. Construction updates would be provided to local community through project website and newsletter	CTMP and community communication to be secured as conditions of consent.	No significant effects and therefore no significant residual effects anticipated
Fear and Intimidation resulting from increased traffic movements and change in composition to include higher percentage of large vehicles	No significant effects identified. However, general construction traffic movements would be managed through the provision of a CTMP to include traffic management at site access points, restricted delivery hours etc. Construction updates would be provided to local community through project website and newsletter	CTMP and community communication to be secured as conditions of consent.	No significant effects and therefore no significant residual effects anticipated

Table 10.15: Summary of Potential Significant Effects of the Proposed Development			
Likely Significant Effect	**Mitigation Proposed**	**Means of Implementation**	**Outcome/Residual Effect**
Increased risk of accidents and decreased safety due to driver frustration, particularly with regards to the potential conflict between construction and local traffic	No significant effects identified. However, construction traffic would be managed through the provision of a CTMP to include traffic management at site access points, restricted delivery hours etc. AIL movements would be managed through a TMP.	CTMP and TMP to be secured as a condition of consent.	No significant effects and therefore no significant residual effects anticipated
Operation			
Increased movement of vehicles at site access	Maintenance and monitoring of site entrance roads	Condition of Consent	No significant effects and therefore no significant residual effects anticipated
Decommissioning			
Refer to construction effects	Refer to construction mitigation	Conditions of future consents	No significant effects and therefore no significant residual effects anticipated
Cumulative Construction			
Increase in traffic flows	Not significant therefore no mitigation measures proposed in addition to the CTMP, TMP and construction updates detailed above.	N/A	N/A
Cumulative Operation			
None identified	N/A	N/A	N/A

10.9 Glossary and Abbreviations

Abbreviation	Expanded Term
ARA	Ayrshire Roads Alliance
ATC	Automatic Traffic Counter
CTMP	Construction Traffic Management Plan
DfT	Department for Transport
DMRB	Design Manual for Roads and Bridges
EIAR	Environmental Impact Assessment Report
HGV	Heavy Goods Vehicle
IEMA	Institute of Environmental Management and Assessment
LGV	Light Goods Vehicle
mph	Miles per hour
NRTF	National Road Traffic Forecast
OS	Ordnance Survey
PoE	Port of Entry
(T)	Trunk Road
TMP	Traffic Management Plan
TS	Transport Scotland

11 Schedule of Mitigation

11.1 Introduction

11.1.1 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 could otherwise give rise to significant residual environmental effects.

11.1.2 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', please see Table 3.1 in EIAR Volume 2: Chapter 3: Design Evolution and Alternatives for mitigation by design commitments. This chapter covers the mitigation measures proposed to avoid, reduce or off-set significant residual environmental effects of the proposed development during the construction and operation phases (Table 11.1). It is anticipated that the mitigation measures outlined below would be secured through appropriately worded conditions of consent.

11.1.3 Most of the pre-construction and construction phase mitigation would be delivered through a Construction Environmental Management Plan (CEMP). The outline content of the proposed CEMP is provided in EIAR Volume 4: Technical Appendix 2.1: Outline CEMP. Further details on specific measures to be included in the final CEMP are contained in each of the technical chapters of the EIAR, where relevant.

Table 11.1: Mitigation Summary Table				
Topic	**Potential Likely Significant Effect (without mitigation)**	**Mitigation Proposed**	**Means of Implementation/ Timing**	**Outcome / Residual Effect**
Construction				
Landscape and Visual	Potential widespread significant effects on landscape fabric as well as landscape character and amenity of the site.	Phased felling and construction and reinstatement/ replanting, to limit the geographical extent of disturbance at any given time and to ensure rapid establishment of replacement planting and landscaping. Felling and replanting requirements are set out in Technical Appendix 2.11: Forestry Report. Effective management of the construction project, using experienced contractors and measures set out in Technical Appendix 2.1: Outline CEMP.	Forest Management Plan to deliver the forestry felling and replanting in Technical Appendix 2.11: Forestry Report. Forestry Management Plan to be delivered as a condition of consent. The CEMP would be finalised and delivered as condition of consent.	Not significant.
Cultural Heritage	Potential direct impact on assets of low sensitivity (local value) in close proximity to working areas (Turbines 1, 2, 13, 19-21 & 24).	Marking out using high visibility markers to ensure that the remains are avoided and preserved in situ as set out in the Outline CEMP (EIAR Volume 4: Technical Appendix 2.1).	The CEMP would be finalised and delivered as a condition of consent and include these requirements.	Not significant.
	Potential direct impact on any buried archaeological remains.	Watching brief if required in sensitive areas; at the discretion of the Council (through West of Scotland Archaeological Service) as set out in the Outline CEMP (EIAR Volume 4: Technical Appendix 2.1).	The CEMP would be finalised and delivered as a condition of consent and include these requirements.	Not significant.
Noise	Noise from construction activities including track construction, and turbine erection. Construction noise has been assessed against a noise limit of 65 dB L_{Aeq} as described in BE 5228:2009.	The construction works on-site 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 PAN1/2011 and BS5228:2009;	Noise from on-site construction activities would generally be significantly below the relevant noise limit such that specific mitigation over normal	Not significant.

Table 11.1: Mitigation Summary Table				
Topic	**Potential Likely Significant Effect (without mitigation)**	**Mitigation Proposed**	**Means of Implementation/ Timing**	**Outcome / Residual Effect**
	Noise from construction activities of duration 1 month or longer will be significantly below 65 dB L_{Aeq}.	Section 61 of the Control of Pollution Act 1974; and Section 80 of the Environmental Protection Act.	construction practice is not required. For highways improvements or cabling for the grid connection that are within 200 m of a residential property, a noise control plan will be produced and adhered to. Construction noise to be controlled through a condition of consent.	
	Blasting at on-site stone extraction sites.	Nearby residential receptors would be identified, and a programme of blasting activities would be scheduled.	Preparation and submission of a pre-blasting programme, and liaison with local residents to be secured as a condition of consent.	Not significant.
	Noise from other construction activities occurring simultaneously with the construction of the proposed development (cumulative construction noise).	No specific mitigation would be required as noise from construction activities at any residential property would be dominated by the closest/noisiest activity, such that if the noise limits are met for the noisiest activity then cumulative construction noise levels would also be likely to be below the relevant limits.	No specific mitigation is required, although it would be ensured that construction activities from the proposed development meet the relevant noise limits.	Not significant.
Ecology	Blanket bog and wet modified bog: direct loss of habitat and indirect loss from drainage (this also includes operational effects).	It is assumed pollution prevention measures, best practice construction methods and a CEMP (EIAR Volume 4: Technical Appendix 2.1: Outline CEMP) incorporating relevant guidance would be agreed with stakeholders prior to construction.	The CEMP would be finalised and delivered as a condition of consent. An ECoW would be required as a condition of consent. The Outline HMP (EIAR Volume 4: Technical Appendix 7.7) would be	Not significant.

Table 11.1: Mitigation Summary Table				
Topic	**Potential Likely Significant Effect (without mitigation)**	**Mitigation Proposed**	**Means of Implementation/ Timing**	**Outcome / Residual Effect**
		An Ecological Clerk of Works (ECoW) would oversee the construction process. The Habitat Management Plan (HMP) would deliver net benefits for blanket bog over the life of the proposed development.	finalised and delivered as a condition of consent.	
	Bat species: all species.	As detailed in Section 7.5 Mitigation (Chapter 7: Ecology) and information contained within the Species Protection Plan (SPP) (EIAR Volume 4: Technical Appendix 7.6).	The SPP would be delivered as a condition of consent.	Not significant.
	Cumulative construction effects on blanket bog and wet modified bog: direct loss of habitat and indirect loss from drainage.	The Outline HMP would deliver net benefits for blanket bog and wet modified bog over the lifetime of the proposed development.	The Outline HMP (EIAR Volume 4: Technical Appendix 7.7) would be finalised and delivered as a condition of consent.	Not significant.
Ornithology	Black grouse	Pre-construction surveys. 750 m construction buffer from leks would be adopted as required for relevant construction activities. Best-practice construction techniques (e.g. pedestrian restrictions, speed limits, timing restrictions when in proximity to leks).	The Outline HMP (EIAR Volume 4: Technical Appendix 7.7) would be finalised and delivered as a condition of consent. Breeding Birds Protection Plan (BBPP) and ECoW: The Outline CEMP (EIAR Volume 4: Technical Appendix 2.1) includes requirements for a BBPP and ECoW. The CEMP would be finalised and delivered as a condition of consent.	Not Significant.
	Golden plover	None required (Pre-construction surveys during breeding season).	(The Outline CEMP (EIAR Volume 4: Technical Appendix 2.1) includes requirements for a BBPP and ECoW. The CEMP would be	Not Significant.

Table 11.1: Mitigation Summary Table				
Topic	**Potential Likely Significant Effect (without mitigation)**	**Mitigation Proposed**	**Means of Implementation/ Timing**	**Outcome / Residual Effect**
			finalised and delivered as a condition of consent.	
	Goshawk	Pre-construction surveys. 400 m construction buffer from any nests located for duration of breeding attempt.	BBPP and ECOW: The Outline CEMP (EIAR Volume 4: Technical Appendix 2.1) includes requirements for a BBPP and ECoW. The CEMP would be finalised and delivered as a condition of consent.	Not Significant.
	Peregrine falcon	Pre-construction surveys. 500 m construction buffer from any nests located for the duration of breeding attempt.	BBPP and ECOW: The Outline CEMP (EIAR Volume 4: Technical Appendix 2.1) includes requirements for a BBPP and ECoW. The CEMP would be finalised and delivered as a condition of consent.	Not Significant.
	Cumulative construction: Black Grouse	Pre-construction surveys. 750 m construction buffer from leks during particular times. Best-practice construction (e.g. pedestrian restrictions, speed limits, timing restrictions when in proximity to leks).	The Outline HMP (EIAR Volume 4: Technical Appendix 7.7) would be finalised and delivered as a condition of consent. BBPP and ECOW: The Outline CEMP (EIAR Volume 4: Technical Appendix 2.1) includes requirements for a BBPP and ECoW. The CEMP would be finalised and delivered as a condition of consent.	Not Significant.
Hydrology, Hydrogeology and Geology	Effects on Soils and Peat (Including GWDTE).	It is demonstrated in the Draft Peat Management Plan (DPMP) (EIAR Volume 4: Technical Appendix 2.5) that the demand for peat for reinstatement purposes is greater	The DPMP (EIAR Volume 4: Technical Appendix 2.5 contains a draft PMP) would be finalised and delivered as a condition of consent to	Not Significant.

Table 11.1: Mitigation Summary Table				
Topic	**Potential Likely Significant Effect (without mitigation)**	**Mitigation Proposed**	**Means of Implementation/ Timing**	**Outcome / Residual Effect**
		than the supply of peat arising from excavation.	ensure appropriate peat reinstatement and reuse.	
	Impact on runoff volumes and rates and fluvial morphology through the alteration of drainage patterns.	All of the watercourse crossings identified for the proposed development would be designed in compliance with requirements of The Water Environment (Controlled Activities) (Scotland) Regulations 2011 as amended. The design of watercourse crossings would also take account of the future 'with climate change' baseline, and to avoid altering the flow regime would be sized for a 1:200 year plus climate change flood event.	An application for the watercourse crossings would be made under the CAR regulations by the contractor.	Not Significant.
	Impact on water quality and fluvial morphology associated with sediment-laden runoff or impacts on bank integrity.	All drainage from constructed areas would be managed through a Sustainable Drainage System (SuDS).	SuDS form an integral part of site design. The final SuDS design would be prepared prior to construction and included in the CEMP. The Outline CEMP (EIAR Volume 4: Technical Appendix 2.1) would be finalised and delivered as a condition of consent.	Not Significant.
	Effects on water quality from pollution associated with contaminated runoff / pollution.	Compliance with SEPA Pollution Prevention Guidelines and Guidance for Pollution Prevention, with all equipment, material and chemicals securely stored and bunded, where applicable, at least 50 m away from watercourses.	Pollution prevention measures specified in the CEMP (EIAR Volume 4: Technical Appendix 2.1). The CEMP would be finalised and delivered as a condition of consent.	Not Significant.
	Water Use	It is assumed that the rate of abstraction would be set and authorised such that there is no	An application for the abstraction would be made	Not Significant.

Table 11.1: Mitigation Summary Table

Topic	Potential Likely Significant Effect (without mitigation)	Mitigation Proposed	Means of Implementation/ Timing	Outcome / Residual Effect
		impact on downstream water resource.	under the CAR regulations by the contractor.	
Traffic and Transport	Severance caused by increased traffic movements, particularly uplift in HGV traffic.	No significant effects identified. However, general construction traffic movements would be managed through the provision of a Construction Traffic Management Plan (CTMP) to include traffic management at site access points, restricted delivery hours etc. Abnormal Indivisible Load (AIL) movements would be managed through a TMP. Construction updates would be provided to local communities and residents through the project website and newsletters.	CTMP and TMP to be secured as a condition of consent.	No significant effects and therefore no significant residual effects anticipated.
	Driver delay caused by increased traffic movements, particularly during AIL movements.	No significant effects identified. However, AIL movements would be managed through a TMP. Construction updates would be provided to local communities through the project website and newsletters.	TMP and community communication to be secured as conditions of consent.	No significant effects and therefore no significant residual effects anticipated.
	Pedestrian delay caused by increased traffic movements, particularly uplift in HGV traffic.	No significant effects identified. However, general construction traffic movements would be managed through the provision of a CTMP to include traffic management at site access points, restricted delivery hours etc. Construction updates would be provided to local communities and residents through the project website and newsletters.	CTMP and community communication to be secured as conditions of consent.	No significant effects and therefore no significant residual effects anticipated.

Table 11.1: Mitigation Summary Table

Topic	Potential Likely Significant Effect (without mitigation)	Mitigation Proposed	Means of Implementation/ Timing	Outcome / Residual Effect
	Decreased pedestrian amenity caused by increased traffic movements and change in composition to include higher percentage of large vehicles.	No significant effects identified. However, general construction traffic movements would be managed through the provision of a CTMP to include traffic management at site access points, restricted delivery hours etc. Construction updates would be provided to local communities and residents through the project website and newsletters.	CTMP and community communication to be secured as conditions of consent.	No significant effects and therefore no significant residual effects anticipated.
	Fear and intimidation resulting from increased traffic movements and change in composition to include higher percentage of large vehicles.	No significant effects identified. However, general construction traffic movements would be managed through the provision of a CTMP to include traffic management at site access points, restricted delivery hours etc. Construction updates would be provided to local communities and residents through the project website and newsletters.	CTMP and community communication to be secured as conditions of consent.	No significant effects and therefore no significant residual effects anticipated.
	Increased risk of accidents and decreased safety due to driver frustration, particularly with regards to the potential conflict between construction and local traffic.	No significant effects identified. However, construction traffic would be managed through the provision of a CTMP to include traffic management at site access points, restricted delivery hours etc. AIL movements would be managed through a TMP.	CTMP and TMP to be secured as a condition of consent.	No significant effects and therefore no significant residual effects anticipated.
Operation				
Landscape and Visual	Potential significant effects on landscape fabric relating to loss of characteristic land cover.	Replacement planting to meet the requirements set out in Technical Appendix 2.11: Forestry Report.	Forest Management Plan to deliver the forestry felling and replanting in Technical Appendix 2.11: Forestry Report. Forestry	Not significant.

Table 11.1: Mitigation Summary Table				
Topic	**Potential Likely Significant Effect (without mitigation)**	**Mitigation Proposed**	**Means of Implementation/ Timing**	**Outcome / Residual Effect**
			Management Plan to be delivered as a condition of consent.	
Cultural Heritage	Potential direct impact on assets in close proximity to working areas (Turbines 1, 2, 13, 19-21 & 24).	Marking out using high visibility markers to ensure that the remains are avoided and preserved in situ, prior to any maintenance works taking place in the vicinity of these assets.	Condition of consent.	Not significant.
Noise	Operational noise from the proposed development has been assessed against the noise limits described in ETSU-R-97.	No specific mitigation would be required as the relevant noise limits would be met without specific mitigation.	Noise limits for the site would normally be implemented via a condition of consent.	Not significant.
	Noise from the proposed development in conjunction with other consented or 'in planning' wind farms in the vicinity (cumulative operational noise).	No specific mitigation would be required as cumulative operational noise levels are below the relevant ETSU-R-97 noise limits.	Noise limits for the site would normally be implemented via a condition of consent.	Not significant.
Ecology	Collision risk for *Nyctalus* spp., and Nathusius' pipistrelle.	Bat Mitigation and Monitoring Plan (BMMP) (measures are outlined in Section 7.5, Chapter 7: Ecology).	BMMP would be implemented via a condition of consent.	Not significant.
	Collision risk for common and soprano pipistrelle.	Bat Mitigation and Monitoring Plan (BMMP) (measures are outlined in Section 7.5, Chapter 7: Ecology).	BMMP would be implemented via a condition of consent.	Not significant.
	Cumulative effect on blanket bog and wet modified bog: direct loss of habitat and indirect loss from drainage (also includes cumulative operational effects).	The HMP would deliver net benefits for blanket bog and wet modified bog over the lifetime of the proposed development.	The Outline HMP (EIAR Volume 4: Technical Appendix 7.7) would be finalised and delivered as a condition of consent.	Not significant.
	Cumulative collision risk for *Nyctalus* spp., common and soprano pipistrelle.	Bat Mitigation and Monitoring Plan (BMMP) (measures are outlined in Section 7.5, Chapter 7: Ecology). Mitigation measures as outlined in Chapter 7: Ecology (Section 7.5), such as curtailment of turbines within	BMMP would be implemented via a condition of consent. Turbine curtailment, if required, would be	Not significant.

Table 11.1: Mitigation Summary Table				
Topic	**Potential Likely Significant Effect (without mitigation)**	**Mitigation Proposed**	**Means of Implementation/ Timing**	**Outcome / Residual Effect**
		the vicinity of locations that recorded high activity levels.	implemented via a condition of consent.	
Ornithology	Collision Risk: Black Grouse	Increase visibility of structures using fence markers.	Condition of consent.	Not Significant.
	Displacement: Black Grouse	Habitat improvement for black grouse.	The Outline HMP (EIAR Volume 4: Technical Appendix 7.7) would be finalised and delivered as a condition of consent.	Not Significant.
Hydrology, Hydrogeology and Geology	Alteration of natural drainage patterns and runoff volumes.	Proposed watercourse crossings and SuDS measures to be inspected and appropriately maintained for the lifetime of the proposed development.	An appropriate inspection and maintenance plan to be prepared prior to completion of construction, to be secured as a condition of consent.	Not Significant.
Traffic and Transport	Increased movement of vehicles at site access.	Maintenance and monitoring of site entrance roads.	Condition of consent.	No significant effects and therefore no significant residual effects anticipated.