ARCUS

MOORSHIELD WIND TURBINES PLANNING APPLICATION

APPENDIX **2.**5: BIODIVERSITY AND NATURAL HERITAGE APPRAISAL REPORT

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1 INTRODUCTION

1.1 Overview

Arcus Consultancy Services Ltd (Arcus) has been commissioned by Moorshield Wind Farm Ltd (the Applicant) to carry out an assessment of the potential effects of the proposed Moorshield wind turbines (the Development) on biodiversity and natural heritage.

The Development is described in Section 2 of the accompanying Supporting Statement and is summarised as three wind turbines of approximately 15 Megawatts (MW) capacity with associated infrastructure, however, the grid generations allows for up to 18 MW.

This Report includes a summary of baseline information and identifies potential ecological impacts of the Development. The Report then sets out the requirement for mitigation, enhancement and monitoring measures, where appropriate.

The Report is accompanied by the following annexes:

- Annex A: Phase 1/ NVC Habitat Map Figure
- Annex B: Moorshield Habitat & Protected Species Survey Report;
- Annex C: Moorshield Bat Survey Report; and
- Annex D: Moorshield Bird Survey Report.

1.2 Relevant Legislation and Policy

1.2.1 Legislation

The following is a summary of key legislation of relevance to this document:

- Council Directive 92/43/EEC (the 'Habitats Directive')[1];
- Council Directive 2000/60/EC ('Water Framework Directive')[2];
- Council Directive 2009/147/EC (the 'Birds Directive')[3];
- Wildlife and Countryside Act 1981 (as amended)[4];
- Conservation (Natural Habitats, & c) Regulations 1994 (the 'Habitat Regulations')[5];
- Conservation of Habitats and Species Regulations 2017[6];
- Wildlife and Natural Environment (Scotland) Act 2011[7];
- Protection of Badgers Act 1992[8];
- Nature Conservation (Scotland) Act 2004[9]; and
- The Council Directive on the Conservation of Wild Birds 2009/147/EC (The EU 'Birds Directive').

1.2.2 Policy and Guidance

In addition to the above legislation and the detailed survey guidance detailed below (see Section 2), the following is a summary of the key policy and guidance of relevance to this document:

[1] European Commission (1992) Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora

[2] European Commission (2000) Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy

[3] European Commission (2009) Directive 2009/147/EC of the European Parliament and of the Council on the conservation of wild birds.

[4] UK Government (1981) Wildlife and Countryside Act 1981, Chapter 69. Part 1

[5] Scottish Government (1994) The Conservation (Natural Habitats, &c.) Regulations 1994

[6] UK Government (2017) The Conservation of Habitats and Species Regulations 2017

[7] Scottish Government (2011) Wildlife and Natural Environment (Scotland) Act 2011

[8] UK Government (1992) Protection of Badgers Act 1992

[9] Scottish Government (2014) Nature Conservation (Scotland) Act 2004

- EU Biodiversity Strategy[10];
- The Scottish Government, 2020 Challenge for Scotland's Biodiversity[11];
- Scottish Biodiversity List (SBL)[12];
- SEPA Guidance on Assessing the Impacts of Windfarm Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems[13,14] ;
- Good Practice During Wind Farm Construction[15];
- Scottish Natural Heritage (SNH) General pre-application/ scoping advice to developers of onshore wind farms[16];
- SNH Recommended bird survey methods to inform impact assessment of onshore wind farms[17];
- SNH Decommissioning and Restoration Plans for wind farms; and
- Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines for Ecological Impact Assessment (EcIA)[18].

[10] European Commission, (2011). EU Biodiversity Strategy. Available at: http://ec.europa.eu/environment/nature/biodiversity/strategy/index_en.htm [Accessed 06/11/2019]

[11] Scottish Government (2015). Scotland's Biodiversity, a Route Map to 2020. Available online at: http://www.gov.scot/Resource/0048/00480289.pdf [Accessed 06/11/2019]

[12] Scottish Government (2013) Scottish Biodiversity List. Available online at: https://www.gov.scot/Topics/Environment/Wildlife-Habitats/16118/Biodiversitylist/SBL [Accessed 06/11/2019]

[13] SEPA (2017). Guidance on Assessing the Impacts of Windfarm Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems. Land Use Planning System SEPA Guidance Note 31. Version 2, October 2014

[14] SEPA (2014). Planning guidance on on-shore windfarm developments. Land Use Planning System SEPA Guidance Note 4. Version 7, May 2014

[15] Scottish Renewables, SNH, SEPA, Forestry Commission Scotland, Historic Environment Scotland (2015). Good Practice During Wind Farm Construction. Version 3, September 2015

[16] SNH (2018). General pre-application/ scoping advice to developers of onshore wind farms. Available at: https://www.nature.scot/sites/default/files/2018-02/SNH%20General%20pre-application%20and%20scoping%20advice%20%20to%20developers%20of%20onshore%20wind%20farms.pdf [Accessed 06/11/2019].

[17] SNH (2017) Recommended bird survey methods to inform impact assessment of onshore wind farms. Version 2, March 2017

[18] CIEEM (2018). Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Chartered Institute of Ecology and Environmental Management, Winchester

2 METHODS

2.1 Appraisal Methods

The scope of the Report, and the methods used, reflect the fact that the Development does not require Environmental Impact Assessment (EIA)[19]. The Report does however present an appraisal of the likely potential effects of the Development on all ecological features associated with the Site. This appraisal does not attempt to judge the 'significance' of the effects, as would be carried out for EIA following the Guidelines for Ecological Impact Assessment in the UK and Ireland[18]. However, a judgement is made as to whether or not there are 'likely significant effects' on Natura 2000 sites (i.e. Special Protection Areas (SPAs) and Special Areas of Conservation (SACs), if relevant, as required under the terms of the Habitat Directive and Birds Directive, in order to determine the need for an appropriate assessment.

2.2 Desk Study

A Desk Study provides existing ecological information which is used to help establish the baseline condition and context of the Site and surrounds. Information about statutory designated sites (e.g. Sites of Special Scientific Importance (SSSIs), non-statutory designated sites (e.g. Local Wildlife Sites (LWSs) and legally protected and non-native invasive species was sought within an area extending up to 2 kilometre (km) radius from the Site, with the search extended to 10 km for statutory sites.

2.2.1 Identification of Statutory Sites

As part of the Desk Study, a search was undertaken for the following statutory sites designated for nature conservation interest:

- Sites of international importance for ecological features present within 10 km of the Site:
  - SACs; and
  - Ramsar sites.
- Sites of international importance for ornithological features present within 20 km of the Site:
  - SPAs; and
  - Ramsar (birds only) sites.
- Sites of national importance present within 10 km of the Site:
  - Sites of Special Scientific Interest (SSSIs); and
  - National Nature Reserves (NNRs).

Information on statutory sites was obtained via the SNH Sitelink website[20] and the JNCC website[21].

2.2.2 Identification of Existing Records

Searches for species records were limited to legally protected animals considered to be potentially sensitive to the Development, as well as local conservation priorities. A 2 km search radius was deemed appropriate (hereafter referred to as 'the Search Area') and

[19] A screening request made to East Renfrewshire Council. Screening opinion PREAPP/2019/0139 states that the Development will not require EIA.
[20] Scottish Natural Heritage (SNH) SiteLink. Available at: https://sitelink.nature.scot/home [Accessed 13/02/2020]
[21] JNCC. Available at: https://jncc.gov.uk [Accessed 13/02/2020]

records were obtained from publicly available resources, such as National Biodiversity Network (NBN Atlas)[22] .

2.3 Extended Phase 1 Habitat Survey

A Phase 1 Habitat Survey is used to classify and map semi-natural habitats and their constituent plant species. The survey was 'Extended' to include an assessment of the potential of habitats and features to support notable animal species.

The survey was conducted by a suitably experienced ecologist on 24th July 2019, within the optimal survey period and in accordance with standard methods[23]. The survey area included the area within the Site as well as a 250 metre (m) buffer, where access permitted. Full details of the survey, including a map of the survey area, are provided in Annex A.

2.3.1 Phase 1 Habitat Mapping

Phase 1 Habitat Survey is a standardised method of identifying and recording habitat and vegetation types, as set out in the Joint Nature Conservation Committee (JNCC) survey handbook[23].

The vegetation present within the survey area was mapped in the field onto 1:10,000 scale maps, using standard colour codes to represent each habitat type. Notes were also taken in the field to describe each habitat type present.

In addition, descriptive habitat/botanical 'target notes' were noted, and photographs taken, as required to document any notable habitats or features, or those too small to map, with locations recorded using a hand-held global positioning system (GPS) device.

Although all habitats present were identified and mapped, particular attention was paid to identifying habitats of ecological importance, particularly those potentially corresponding with habitats listed on Annex B of the Habitats Directive[24].

2.3.2 Search for Protected Non-avian Species

A Protected Non-avian Species Survey was also undertaken on 24th July 2019 to look for signs of presence of protected mammal species including otter (*Lutra lutra*), water vole (*Arvicola amphibious*) and badger (*Meles meles*). This involved searching for evidence of these protected mammal species with the survey areas, as described in relevant field guides and following standard survey guidance. A summary of the survey methods and relevant guidance for each species is provided in Table 1 below.

All signs of protected species were recorded as descriptive target notes, with photographs taken where appropriate, and locations recorded using a hand-held GPS device.

[22] National Biodiversity Network. NBN Atlas. Available online at: https://nbnatlas.org/ [Accessed 13/02/2020]

[23] Joint Nature Conservation Committee (2003) *Handbook for Phase 1 Habitat Survey – a technique for environmental audit.* Peterborough: JNCC.

Table 1: Protected mammal species methods and survey guidance

Species	Relevant guidance	Field signs
Otter	Otters and River Habitat Management Handbook (1993)	• Holts – below ground resting places; • Couches – above ground resting places; • Prints; • Spraints – faeces used as territorial markers • Prey remains; and • Paths and slides.
Water vole	Water Vole Conservation Handbook (Strachan et al., 2011)	• Burrows; • Droppings/latrines; • Prints; and • Feeding signs – gnawed vegetation, and grazed 'lawns' which are often associated with burrows.
Badger	Surveying badgers (Harris et al., 1989).	• Setts; • Prints; • Latrines/dung pits (used as territorial markers); • Hairs; • Feeding signs (i.e. snuffle holes); and • Paths

2.4 NVC Survey

A National Vegetation Classification (NVC) Survey was carried out on 25th July 2019 on areas of the Site and surrounds with comparatively more semi-natural vegetation, including peatland habitats. Surveying peatland habitats to NVC level allows identification of habitats corresponding with those listed on Annex B of the Habitats Directive[24].

Identification of particular NVC communities also indicates the potential presence of groundwater-dependent terrestrial ecosystems (GWDTEs). As GWDTEs are specifically protected under the Water Framework Directive (WFD), all wetland habitats recorded during the NVC Survey were evaluated in terms of their potential to be ground-water dependent. When evaluating groundwater dependency, reference was also made to the Water Framework Directive-UK technical advisory group (UKTAG) draft guidance[25], as well as the hydrogeological setting in which the habitat was recorded (although this typically requires further hydrogeological assessment that is out with the scope of this report).

The NVC Survey Area comprised the area within the Site as well as a 250 m buffer, where access permitted, to ensure compliance with SEPA guidance for GWDTE. The survey area is shown in the 'NVC Habitat Survey Results' Figure within Annex A.

Habitats were classified to NVC level based on published descriptions[26] and mapped in the field. Quadrat data were collected to assist with the assessment of NVC communities present. The Domin scale[27] was used to evaluate percentage cover of vegetation within the quadrats.

[24] A list of Annex B habitats and Annex BI habitats occurring in the UK is available online at http://archive.jncc.gov.uk/default.aspx?page=1523 [Accessed 13/02/2020]

[25] UKTAG produced draft guidance on the identification and risk assessment of GWDTE in 2004; Annex 1 of this document, which comprises a table listing NVC communities and their dependency on groundwater was subsequently revised and published online in 2009.

[26] Rodwell, J.S. (ed.) 1991a, 1991b, 1992 & 1995. British Plant Communities Volumes 1, 2, 3 & 4. Cambridge University Press.

[27] The Domin scale is a system devised by K. Domin for quantifying each plant species contribution to the cover in a vegetation community.

Descriptions of each of the NVC communities present within the survey areas were also recorded, with target notes and photographs taken as required to document any notable habitats or features, or those too small to map.

2.5 Bat Survey

The following Bat Survey methods were chosen to reflect the consideration that the Site consists of habitats of low quality for foraging and roosting bats. In accordance with guidance[29], sites with low quality habitats do not necessarily require the full set of survey types (such as Bat Activity Transects and Vantage Point Surveys). SNH were consulted in June 2019 and confirmed their agreement with this approach and method. Surveys at the Site consisted of a Preliminary Roost Assessment (PRA) and an Automated Bat Detector Survey; further details are provided in Annex B.

2.5.1 Preliminary Roost Assessment (PRA)

A PRA was conducted on 4th June 2019 which looked for Potential Roost Features (PRFs) that could support bat roosts, including maternity roosts and significant hibernation and/or swarming sites. The survey area consisted of the area within the Site boundary and a 200 m buffer. This buffer was extended to include Shieldhill Farm, which lies approximately 250 m from the Site boundary as shown on the 'Bat Detector Locations' Figure in Annex B. The bat roost assessment and subsequent recommendations were carried out using torch and endoscope where possible, following the guidelines produced by the Bat Conservation Trust (BCT)[28] and the recently published multi-stakeholder guidance[29]. This initial bat roost assessment would inform whether or not further surveys would be required to assess the potential effects of the Development on bats.

During the PRA any structures were also assessed as to their suitability to support hibernating bats over winter.

Full details of the PRA methods are provided in Annex B.

2.5.2 Automated Bat Detector Survey

A walkover assessment of the Site was conducted on 4th June 2019 to assess the habitats within the Site and determine the locations for the static automated bat detectors. The methods followed the most recent survey guidelines[29] and full-spectrum static detectors were deployed at each of the three turbine locations as shown in the 'Bat Detector Locations' Figure in Annex B.

Static bat detectors were deployed at the three locations over three visits timed in June, August and October.

Full details of the Automated Bat Detector Surveys methods are provided in Annex B.

2.5.3 Bat Survey Limitations

Although the Automated Bat Detector Surveys were undertaken over three visits, the latest guidance[29] states that these should be timed in spring (April – May), summer (June – mid-August) and autumn (mid-August - October). During the surveys detailed in Section 2.5.2 above, the first session was undertaken within the 'summer' time period rather than 'spring'. However, the three visits undertaken were well spaced out and the first visit commenced in early June. Furthermore, given the relative northerly and exposed nature of the Site it is likely that the delayed start will have not have had any notable effects on the results.

[28] Collins, J. (ed.) (2016) *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (3rd edn). The Bat Conservation Trust, London. ISNB-13 978-1-872745-96-1

[29] SNH & Multiple Stakeholders (2019). *Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation*. SNH

2.6 Ornithology Survey

As the Development is considered a small-scale wind farm and following consultation with SNH, it was considered that the full set of ornithology surveys normally undertaken for wind farm sites was not required. Given the location of the Site and the absence of any designated sites with likely connectivity, the breeding season surveys would be sufficient to allow the baseline to be described as this represented the time when sensitive species were most likely to be present. Therefore, the survey programme commenced during the spring migration period so that the surveys would cover the period when the most sensitive bird species were likely to be present on Site.

In accordance with SNH guidance[17], the field surveys and assessment concentrate on a specific set of target species which are either of conservation concern or which are potentially vulnerable to the effects of wind farm developments. These include:

- Birds listed on Annex B of the EU Birds Directive[3];
- Birds listed on Schedule 1, 1A and A1 of the Wildlife and Countryside Act 1981 (as amended)[4];
- Birds that are qualifying features of nature conservation designated sites within 20 km of the Site;
- Red-listed Birds of Conservation Concern[30]; and
- Species which are typically recognised as being potentially vulnerable to the effects of wind farm developments but which do not fall under any of the above categories, such as certain wader and waterfowl species.

Sections 2.6.1 and 2.6.2 provide a summary of the methods used for each of the surveys carried out at the Site, while full details of the survey methods are provided in Annex D.

2.6.1 Flight Activity Surveys

Flight Activity Surveys (FAS) were carried out at the Site over six months between 30th March 2019 and 25th August 2019 following standard SNH survey guidance[17].

These surveys, which are designed to record the flight activity of birds using the airspace over the Site and the spatial and temporal variation of that usage, were conducted from one suitability elevated vantage point (VP), the details of which are provided in Annex D. The viewshed coverage of this VP is presented in Figure 1, Annex D which demonstrates that the vast majority of the airspace of the Site and the surrounding area at 20 m above ground level is visible from this location.

A total of 36 hours of survey effort was carried out at the VP during the breeding season in accordance with SNH survey guidance[17].

2.6.2 Breeding Bird Surveys

Breeding Bird Surveys were undertaken during four survey visits in May, June and July 2019 within areas of open habitat located within the Site and a surrounding buffer of approximately 1 km, as shown in Figure 2, Annex D. These surveys aimed to document the presence of breeding birds associated with the Site and followed an adapted Brown and Shepherd method[31], as outlined in the standard SNH survey guidance[17].

[30] Eaton MA, Aebischer NJ, Brown AF, Hearn RD, Lock L, Musgrove AJ, Noble DG, Stroud DA and Gregory RD (2015) Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and Isle of Man. British Birds 108, 708–746.

[31] Calladine, J., Garner, G., Wernham, C. & Thiel, A. (2009). *The influence of survey frequency on population estimates of moorland breeding birds.* Bird Study, 56:3, 381-388.

2.6.3 Breeding Raptor Surveys

Breeding Raptor Surveys were also undertaken within the Site and a surrounding buffer of approximately 2 km, also shown in Figure 2, Annex D. All birds seen or heard during the survey (and raptors and species sensitive to wind farms in the raptor survey area) were recorded using BTO (British Trust for Ornithology) codes on dedicated survey maps. The data gathered during these surveys was used to identify breeding bird territories following the territory mapping methods described in Gilbert et al[32] and Bibby et al[33].

Full details of the bird survey methods are provided in Annex D.

3 RESULTS

3.1 Desk Study

3.1.1 Designated Sites

There are no statutory sites designated for nature conservation within the Site boundary, and no statutory designed sites of international importance located within 10 km or 20 km for ecological or ornithology features, respectively, of the Site boundary.

As shown in Table 2, one SSSI designated for ecological features is located within 5 km, with a further one located within 10 km.

There are two non-statutory designated nature conservation sites within the Site boundary. As shown in Table 2, these are both Local Biodiversity Sites (LBSs). LBSs are defined as any non-statutory site recognised to be of importance for biodiversity in the local context[34]. A further two LBSs are located within 2 km of the Site.

[32] Gilbert, G., Gibbons, D.W., and Evans J (eds) (1998). *Bird Monitoring Methods; a manual of techniques for key UK species.* RSPB, Sandy.

[33] Bibby, C., Burgess N., Hill, D. and Mustoe, S. (2007). Bird Census Techniques, 2nd Edition, Academic Press, London.

[34] Scottish Planning Policy uses the nomenclature 'local nature conservation sites' (which encompasses both local biodiversity sites and local geodiversity sites) to describe Local Biodiversity Sites designated for their local nature conservation value.

Table 2: Designated Sites within the Search Area

Site	Status	Closest Proximity to Site boundary.	Designated Features
Statutory designated sites			
Brother and Little Lochs	SSSI	2 km NW	Oligotrophic loch – best example of open waterbodies and emergent vegetation communities within west central Scotland; Varnished hook-moss *Hamatocaulis verniculosus* – nationally scarce bryophyte occurring in base-rich flushes and springs feeding Little Loch.
Cart and Kittoch Valleys	SSSI	10 km NE	Upland mixed ash woodland – a wooded gorge fringing the rivers Cart and Kittoch with diverse ground flora.
Non-statutory designated sites			
Shieldhill Bog	LBS	On site	A large area of blanket bog; a relatively undamaged site with a good range of associated plants and one notable species (round-leaved sundew *Drosera rotundifolia*). The Shieldhill Bog LBS covers an area of approximately 88.3 ha.
Floak Bridge grassland	LBS	On site	A large and typical upland composite grassland site, predominately acid grassland, with extensive marshy grassland where drainage is poor.
Bennan Loch and Lochcraig Reservoir	LBS	Adjacent to site	Rich marginal vegetation around the fringes of Lochcraig Reservoir. In contrast, Bennan Loch has very little marginal vegetation or any visible aquatic interest. Both sites may be important for birds.
Ballageich Bog	LBS	1 km NE	A small area of blanket bog lying between Ballagleich Hill and Bennan Loch. Modified by drainage and grazed. The vegetation is very typical of bog modified by management.

3.1.2 Species Records

With the exception of bird species, the desk study did not return any records of protected species within the Search Area, with no records originating from the Site itself. In total, 71 species of bird were found to have been recorded within the Search Area. One of these species, common crossbill (*Loxia curvirostra*) is listed as Schedule 1 species on the Wildlife and Countryside Act 1981 (as amended)[4]. However, of the 71 species recorded, 32 species are currently Red- or Amber- listed on the Birds of Conservation Concern 4 (BoCC)[30] and, of these, seventeen are listed on the SBL. These are summarised in Table 3 below.

Table 3: Summary of protected or notable bird species identified during the Search Area

Species*	Scientific Name	Conservation Designations**	Most recent record within Search Area
Greylag goose	*Anser anser*	Amber;	11/03/2014
Wigeon	*Mareca Penelope*	Amber;	17/12/2015
Mallard	*Anas platyrhynchos*	Amber;	07/04/2015
Red grouse	*Lagopus lagopus*	Amber; SBL;	06/07/2015
Oystercatcher	*Haematopus ostralegus*	Amber;	06/07/2015

Species*	Scientific Name	Conservation Designations**	Most recent record within Search Area
Golden plover	*Pluvialis apricaria*	Ann1; SBL;	07/04/2015
Curlew	*Numenius arquata*	Red; SBL;	07/04/2015
Dunlin	*Calidris alpine*	Amber; Ann1; SBL;	30/05/2015
Woodcock	*Scolopax rusticola*	Red; SBL;	29/01/2011
Snipe	*Gallinago gallinago*	Amber;	19/12/2015
Redshank	*Tringa tetanus*	Amber;	07/04/2015
Common sandpiper	*Actitis hypoleucos*	Amber;	20/08/2015
Black-headed gull	*Chroicocephalus ridibundus*	Amber; SBL;	06/07/2015
Common gull	*Larus canus*	Amber;	30/05/2015
Herring gull	*Larus argentatus*	Red; SBL;	06/07/2014
Lesser black-backed gull	*Larus fuscus*	Amber;	23/12/2007
Swift	*Apus apus*	Amber; SBL;	06/07/2015
Kestrel	*Falco tinnunculus*	Amber; SBL	19/09/2015
Skylark	*Alauda arvensis*	Red; SBL;	20/08/2015
House martin	*Delichon urbicum*	Amber;	21/07/2015
Willow warbler	*Phylloscopus trochilus*	Amber;	20/08/2015
Starling	*Sturnus vulgaris*	Red; SBL;	19/12/2015
Whinchat	*Saxicola rubetra*	Red;	07/06/2009
Dipper	*Cinclus cinclus*	Amber;	29/12/2013
House sparrow	*Passer domesticus*	Red; SBL;	19/12/2015
Dunnock	*Prunella modularis*	Amber; SBL;	07/04/2015
Pied wagtail	*Motacilla alba*	Amber;	06/07/2014
Meadow pipit	*Anthus pratensis*	Amber;	19/12/2015
Linnet	*Linaria cannabina*	Red; SBL;	22/07/2014
Lesser redpoll	*Acanthis cabaret*	Red; SBL;	14/03/2015
Common crossbill	*Loxia curvirostra*	Sch1;	14/03/2015
Yellowhammer	*Emberiza citronella*	Red; SBL;	11/03/2014
Reed bunting	*Emberiza schoeniclus*	Amber; SBL;	11/11/2015

*Species names and order follow the British List maintained by the BOU[35]

** Annex B = species listed on Annex B of the Birds Directive[3] ; Sch1 = species listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended)[4]; Red = UK Red-listed BoCC[30]; Amber = UK Amber-listed BoCC[3030]; SBL = Scottish Biodiversity List species[12]

[35] British Ornithologists' Union. (2017). *The British List: A Checklist of Birds of Britain (9th edition)*. Ibis 160: 190-240.

3.2 Habitats within the Site

3.2.1 Overview

Annex A provides descriptions of each community present within the 155-hectare (ha) Survey Area, and the context of the location in which it has been found. The relationship with other associated communities is discussed, and where appropriate, the protection which it is afforded through inclusion in relevant legislation is highlighted. The 'Phase 1 Habitat Results' Figure in Annex A shows the Phase 1 Habitats found within the Survey Area, whilst the 'NVC Habitat Survey Results' Figure in Annex A shows the NVC communities present within the Survey Area.

Table 4 below summarises the NVC communities (and Phase 1 habitats) present within the Site (59.2 ha) along with their GWDTE potential and area (ha) within the Site.

Table 4: Habitats present within the Site

NVC Code	NVC Community	Associated Phase 1 Habitat Type	GWDTEs Potential	Area (ha)
M4	*Carex rostrata-Sphagnum fallax* mire	E2 Flush & Spring	None	0.2
M6	*Carex echinata – Sphagnum fallax* mire	E2 Flush & Spring	High	3.4
M15	*Trichophorum cespitosum – Erica tetralix* wet heath	D2 Wet dwarf shrub heath	Moderate	2.4
M17	*Trichophorum cespitosum – Eriophorum vaginatum* blanket mire	E1 Bog	None	16.2
M23	*Juncus effusus/acutifloris – Gallium palustre* rush pasture	B5 Marshy grassland	High	5.2
MG6	*Lolium perenne – Cynosurus cristatus* grassland	B4 Improved grassland	None	4.3
U2	*Deschampsia flexuosa* grassland	B1 Acid grassland	None	21.7
U5	*Nardus stricta – Galium saxatile* grassland	B1 Acid grassland	None	0.7
U6	*Juncus squarrosus – Festuca ovina* grassland	B1 Acid grassland	None	5.1

3.3 Habitats beyond the Site

Most of the surrounding habitats are simply an extension of those within the Site: marshy grassland, acid grassland and bog. One other potentially ecologically important habitat bordering the is an extensive area of bog (NVC community: M19 *Calluna vulgaris – Eriophorum vaginatum* blanket mire). This is located on the other side of the B764 road.

Further details are provided in Annex A.

3.4 Protected Mammals

3.4.1 Otter

Evidence of otter was found along the southern shore of Bennan Loch, adjacent to the Site boundary. The evidence consisted of three otter spraints, no holts or couches (protected resting areas) were recorded during the survey. Therefore, otters are likely to be regularly present on the Site, using it for feeding and/or commuting. Further details are provided in Annex A.

3.4.2 Badger

No evidence of badger was recorded within or immediately adjacent to the Site. Habitats were generally unsuitable across most of the Site and adjacent land due to the prevalence of wet ground and general lack of cover and exposed, upland character of the Site. The desk study returned no records of badger. Badger is considered to be absent from the Site.

3.4.3 Water vole

The Site is considered to have some suitability for water vole, particularly along some of the watercourses that run through the Site and provide suitable banks for burrowing and sources of food such as marginal vegetation. However, there were no signs of water vole identified during the survey and it is considered unlikely that they are currently present on the Site. The desk study returned no records of water vole.

3.5 Bat Surveys

3.5.1 Preliminary Roost Assessment

No structures with suitability for bat roosts were present on the Site. The only structures present within the survey area were the buildings associated with Shieldhill Farm, consisting of the farmhouse and two large corrugated metal barns.

The farmhouse and adjoined outbuildings were considered to have high suitability for summer roosting bats. The two large corrugated metal barns were deemed to have negligible suitability for roosting bats. No evidence of bats was found during external or internal inspection of any of the buildings.

Shieldhill Farm is located approximately 250 m from the Site boundary. Habitat connectivity to this potential roost feature is limited, with the farm set in open grassland bounded by stock proof fencing. The Site is located at a higher elevation to the farm. Lower lying areas off-site would potentially provide more suitable sheltered foraging habitat such as the edge of the coniferous plantation adjacent to Soame Burn.

The farm is occupied and in current use, and as such any features identified are unlikely to provide the stable cool and humid conditions required for large numbers of over-wintering bats.

Further details are provided in Annex B.

3.5.2 Automated Bat Detector Surveys

The static bat detectors recorded the presence of common pipistrelle (*Pipistrellus pipistellus*) and soprano pipistrelle (*Pipistrellus pygmaeus*), along with *Nyctalus* and *Myotis* calls that could not be identified to species level.

A total of 210 bat passes were recorded throughout the three static deployments. 94% of all bats recorded were either soprano pipistrelle or common pipistrelle, with soprano pipistrelle the most commonly recorded species. Very small numbers of *Nyctalus* spp. and *Myotis* spp. accounted for 6% (3% and 3%) of total bats recorded.

Bat activity was greatest during the August deployment with a total of 158 bat passes in total, accounting for 75% of the total bat passes recorded during the survey period. Bat activity dropped off in October with only one bat pass recorded. Bat activity also varied spatially with substantial differences in the levels of activity between detector locations. The bat detector located closest to Shieldhill Farm recording the lowest levels of activity while the bat detector located nearest Bennan Loch recorded the highest level of activity.

Annex B provides further detail on the results of the Automated Bat Detector Surveys.

3.6 Ornithology Surveys

3.6.1 Flight Activity Surveys

Seven species in total were recorded during the FAS. Table 5 summarises the results of the FAS that were undertaken between March 2019 and August 2019.

Table 5: Summary of Bird Species Recorded during FAS

Species*	Scientific Name	Conservation Designations**	Max no. of birds	No. of flights	Total seconds	Seconds at risk height
Mallard	*Anas platyrhynchos*	Amber	2	1	228	228
Teal	*Anas crecca*	Amber	3	1	114	0
Cormorant	*Phalacrocorax carbo*	-	1	1	348	297
Oystercatcher	*Haematopus ostralegus*	Amber	5	2	297	0
Lapwing	*Vanellus vanellus*	Red; SBL	4	11	2,528	520
Curlew	*Numenius arquata*	Red; SBL	4	23	2,899	1,220
Peregrine	*Falco peregrinus*	Sch1; Ann1; SBL	1	1	196	196

*Species names and order follow the British List maintained by the BOU[36]

** Annex B = species listed on Annex B of the Birds Directive[3] ; Sch1 = species listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended)[4]; Red = UK Red-listed BoCC[30]; Amber = UK Amber-listed BoCC[30]; SBL = Scottish Biodiversity List species[12]

3.6.2 Breeding Bird Surveys

A total of 54 species were recorded during the Breeding Bird Surveys (BBS); results are summarised below.

3.6.2.1 Species of Conservation Concern

Species recorded during the BBS included 32 species of conservation concern, three of which were assessed as breeding within the survey area (shown in bold in table below), with a further 12 considered to be breeding within the surrounding area. Numbers of territories of each of these species are provided in Table 6 and territory locations are shown in Annex D.

[36] British Ornithologists' Union. (2017). *The British List: A Checklist of Birds of Britain (9th edition).* Ibis 160: 190-240.

Table 6: Summary of Breeding Bird Species of Conservation Concern Recorded during the BBS

Species*	Scientific Name	Conservation Designations**	No. of possible breeding territories within the Site	Breeding birds recorded within surrounding area?
Greylag goose	*Anser anser*	Amber	0	No
Mallard	*Anas platyrhynchos*	Amber	0	Yes
Red grouse	*Lagopus lagopus*	Amber; SBL	0	No
Oystercatcher	*Haematopus ostralegus*	Amber	0	Yes
Lapwing	*Vanellus vanellus*	Red; SBL	2	Yes
Curlew	*Numenius arquata*	Red; SBL	2	Yes
Snipe	*Gallinago gallinago*	Amber	0	Yes
Common sandpiper	*Actitis hypoleucus*	Amber	0	No
Redshank	*Tringa tetanus*	Amber	0	No
Black-headed gull	*Chroicocephalus ridibundus*	Amber; SBL	0	No
Common gull	*Larus canus*	Amber	0	Yes
Great black-backed gull	*Larus marinus*	Amber	0	No
Herring gull	*Larus argentatus*	Red; SBL	0	No
Lesser black-backed gull	*Larus fuscus*	Amber	0	No
Cuckoo	*Cuculus canorus*	Red; SBL	0	No
Kestrel	*Falco tinnunculus*	Amber; SBL	0	No
Merlin	*Falco columbarius*	Red; Sch1; Ann1; SBL	0	Yes
Skylark	*Alauda arvensis*	Red; SBL	12	Yes
House martin	*Delichon urbicum*	Amber	0	No
Willow warbler	*Phylloscopus trochilus*	Amber	0	Yes
Grasshopper warbler	*Locustella naevia*	Red; SBL	0	Yes
Starling	*Sturnus vulgaris*	Red; SBL	0	No

Species*	Scientific Name	Conservation Designations**	No. of possible breeding territories within the Site	Breeding birds recorded within surrounding area?
Song thrush	*Turdus philomelos*	Red; SBL	0	Yes
Mistle thrush	*Turdus viscivorus*	Red	0	No
Grey wagtail	*Motacilla cinereal*	Red	0	No
Tree pipit	*Anthus trivialis*	Red; SBL	0	No
Linnet	*Linaria cannabina*	Red; SBL	0	No
Lesser redpoill	*Acanthis cabaret*	Red; SBL	0	No
Common crossbill	*Loxia curvirostra*	Sch1	0	No
Siskin	*Spinus spinus*	SBL	0	No
Reed bunting	*Emberiza schoeniclus*	Amber; SBL	0	Yes
*Species names and order follow the British List maintained by the BOU[37] ** Annex B = species listed on Annex B of the Birds Directive[3] ; Sch1 = species listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended)[4]; Red = UK Red-listed BoCC[3030]; Amber = UK Amber-listed BoCC[30]; SBL = Scottish Biodiversity List species[12]				

3.6.3 Species of Low Conservation Concern

Species of conservation concern which were recorded during the BBS but did not have any possible breeding territories within the Site were as follows:

The remaining 22 species recorded during the BBS, which are generally common and widespread, were as follows: Canada goose (*Branta canadensis*), grey heron (*Ardea cinerea*), cormorant (*Phalacrocorax carbo*), sparrowhawk (*Accipiter nisus*), buzzard (*Buteo buteo*), woodpigeon (*Columba palumbus*), great-spotted woodpecker (*Dendrocopos major*), jay (*Garrulus garrulus*), jackdaw (*Coloeus monedula*), carrion crow (*Corvus corone*), Raven (*Corvus corax*), coal tit (*Periparus ater*), sand martin (*Riparia riparia*), swallow (*Hirundo rustica*), chiffchaff (*Phylloscopus collybita*), sedge warbler (*Acrocephalus schoenobaenus*), wren (*Troglodytes troglodytes*), robin (*Erithacus rubecula*), pied wagtail (*Motacilla alba*), chaffinch (*Fringilla coelebs*) and goldfinch (*Carduelis carduelis*). The majority of these species are associated with woodland and are therefore not likely to be breeding within the Site.

3.6.4 Breeding Raptor Surveys

As shown in sections 3.6.2 and 3.6.3, four species of raptor were recorded within the Breeding Raptor Survey area: sparrowhawk, buzzard, kestrel and merlin.

Sparrowhawk: One observation was recorded of an individual near Shieldhill farm. There were no further observations of this species and no evidence of any breeding within 2 km of the Site.

[37] British Ornithologists' Union. (2017). *The British List: A Checklist of Birds of Britain (9th edition).* Ibis 160: 190-240.

Buzzard: Multiple individuals were seen during the surveys with three possible territories in different areas of forestry being recorded, one in the north of the survey area, on to the west and the final one in the southwest.

Kestrel: Two possible kestrel territories were identified. A single male was observed once and a female observed on two different occasions around the area of the Shieldhill farm buildings, which would also provide suitable nesting habitat, however no nest was located. The two possible territories were located outside of the survey area.

Merlin: Two juveniles and an adult male were recorded during the July visit suggesting that breeding had occurred in the vicinity of the sighting. This was outside of the Site but within the survey area, closer to Whitelee Windfarm.

4 ASSESSMENT

The main potential negative impacts on ecological features arising from the proposed works are likely to be:

- Direct habitat loss – this will result in long-term to permanent effects for most of the habitats affected;
- Disturbance, damage/injury/mortality to habitats or protected species – this may result in temporary or permanent effects, depending on the nature of the impact; and
- Indirect impacts on habitats or protected species (e.g. due to pollution or sedimentation) – again, this may result in temporary to permanent effects, depending on the nature of the impact (but provided appropriate mitigation is implemented, this type of effect is likely to be temporary or short-term).

4.1 Designated Sites

4.1.1 Statutory Designated Sites

There are no Natura 2000 sites designated for ornithological features located within 20 km of the Site. Likewise, there are no Natural 2000 sites designated for ecological features located within 10 km of the Site. Therefore, it is highly unlikely that the Development will have any significant impacts upon such sites. Therefore, there is no requirement for an appropriate assessment.

The nearest statutory designated site to the Site is Brother and Little Lochs SSSI located approximately 2 km northwest of the Site. It is considered highly unlikely that the Development will have any impact on the designated habitat features of the SSSI due to the lack of any hydrological connectivity between them.

4.1.2 Non-statutory Designated Sites

There are four non-statutory designated sites within 2 km of the study area including two which partially lie within the Site and one lying adjacent. All four are designated for their habitats and associated plant species.

Proposals for the Site will involve mitigation measures to avoid any direct or indirect impacts on these sites. Additionally, the bog restoration measures planned for areas adjacent to the Site will provide enhancements that will help to support the species for which Shieldhill Bog LBS has been designated for. Additionally, with mitigation and enhancement it is unlikely that the Development will adversely affect this or any other non-statutory designated sites. Mitigation and enhancement measures with respect to non-statutory designated sites are addressed in Section 5.1.

4.2 Habitats

The impacts on habitats are highlighted in the following sections, with recommendations for mitigation and enhancement of habitats detailed in Section 5.2.

The Development will result in the permanent loss of a 1.39 ha of habitat, which makes up approximately 2.4% of the total habitat within the Site as a whole.

Table 7: Areas of Habitat Lost Due to Wind Turbine Construction by aspect of Development

Aspect of Development	Phase 1 Code	Phase 1 Description	Area of Habitat Lost (ha)
Access track	D6	Wet heath/acid grassland mosaic	0.33
	E1.6.1	Blanket sphagnum bog	0.19
	B2	Neutral grassland – semi-improved	0.07
	D5	Dry heath/acid grassland mosaic	0.05
	B5	Marsh/Marshy grassland	0.04
	E2	Acid/neutral flush	0.03
	J1	Cultivated/disturbed land	<0.01
Substation	D6	Wet heath/acid grassland mosaic	0.1
	B5	Marsh/Marshy grassland	0.04
Crane hardstandings	E1.6.1	Blanket sphagnum bog	0.1
	B2	Neutral grassland – semi-improved	0.1
	D6	Wet heath/acid grassland mosaic	0.1
Working area	E1.6.1	Blanket sphagnum bog	0.03
	B2	Neutral grassland – semi-improved	0.03
	D6	Wet heath/acid grassland mosaic	0.03
Turbine foundations	E1.6.1	Blanket sphagnum bog	0.05
	B2	Neutral grassland – semi-improved	0.05
	D6	Wet heath/acid grassland mosaic	0.05
Total			1.39

Wet heath/acid grassland mosaic (D6) is the habitat type most affected by the construction activity, with 0.61 ha lost. The vast majority of this loss is due to the access track installation (0.33 ha). The next largest habitat type to be affected during construction is blanket sphagnum bog with 0.37 ha lost. Again, the majority of this change is due to the access track installation which accounts for 0.19 ha of the blanket bog loss. Blanket bog is a UK Biodiversity Action Plan[38] (UKBAP) priority habitat and should therefore be avoided as much as possible. However, as shown in Table 8, the area of habitat lost accounts for 1.7% of the total area of blanket bog present in the Site.

[38] JNCC (2012) UK Biodiversity Action Plan (Online) Available from: https://jncc.gov.uk/our-work/uk-bap/ [Accessed 13/02/2020]

Table 8: Areas of Habitat Lost due to Development by Phase 1 Habitat Type

Phase 1 Code	Phase 1 Description	Area of Habitat Lost (ha)	Percentage of Site Habitat Lost (%)
D6	Wet heath/acid grassland mosaic	0.61	2.7
E1.6.1	Blanket sphagnum bog	0.37	1.7
B2	Neutral grassland – semi-improved	0.25	5.9
B5	Marsh/Marshy grassland	0.08	1.5
D5	Dry heath/acid grassland mosaic	0.05	1.9
E2	Acid/neutral flush	0.03	0.9
J1	Cultivated/disturbed land	<0.01	<1
Total		1.39	-

Phase 1 Habitat types which are most sensitive to hydrological change are marshy grassland and blanket bog. Of these habitats, a number of the NVC polygons were identified as containing habitats classified as being likely to be classified as GWDTEs according to SEPA guidance[39]. These were M6c, M6d, M23, M23a, M23b and U6b and are all considered to have medium to high potential to support GWDTEs.

GWDTEs can be damaged or change through direct impacts but also through change of drainage as potentially occurring during construction. Therefore, specific mitigation is required to ensure that GWTDEs and other sensitive habitats (such as blanket bog) are protected during construction, as detailed in section 5.2. Provided this mitigation is implemented, no substantial negative impacts on habitats are predicted.

4.3 Protected Mammals

4.3.1 Otter

Otter is a European Protected Species (EPS), listed on the SBL and was included in the most recently produced East Renfrewshire LBAP as a UK priority species that is present in East Renfrewshire. Signs of this species were recorded at several locations adjacent to the Site, however, no holts or resting places were found.

It is highly unlikely that habitat loss will affect otters. However, it is possible that the species could be disturbed, especially if there is a resting site or holt within 30 m of construction work. There could also be indirect impacts on this species resulting from negative impacts on watercourses, e.g. pollution. As such, specific mitigation is required to ensure that otters and their habitat are protected at all times during construction; proposed mitigation is detailed in section 5.3. Provided this mitigation is implemented, no substantial negative residual impacts on otter are predicted.

4.4 Bats

Operational wind turbines can affect bats in the following ways:

- Collision mortality and other injuries;
- Loss or damage to commuting and foraging habitat (wind turbines may form barriers to commuting or seasonal movements, and can result in severance of foraging habitat;
- Loss of, or damage to, roosts; and

[39] Scottish Environmental Protection Agency (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

- Displacement of individuals or populations (due to wind turbine construction or because bats avoid the wind farm area);

All bat species that occur in Scotland are EPS and all are included on the SBL.

Activity levels of the bat species recorded during the bat surveys were relatively low, as was expected prior to surveying. This is likely due to the lack of suitable foraging habitat present on Site (such as sheltered woodland edge and hedgerows). The one suitable roost that was recorded during the PRA was also located more than 250 m from the Site boundary. The small number of bats that were recorded during the surveys were likely to be from bats commuting through the Site to or from areas of greater foraging suitability.

It is therefore recommended that no further bat surveys are required, however, additional mitigation measures will be required (see section 5.4). Provided that appropriate mitigation outlined in section 5.4 is followed, no substantial negative residual impacts on bats is predicted.

4.5 Birds

Wind turbines present three main potential risks to birds:

- Direct habitat loss through construction of wind turbine infrastructure;
- Displacement if birds avoid the wind turbines and its surrounding area due to turbine construction and operation. Displacement may also include barrier effects in which birds are deterred from using normal routes to feeding or roosting grounds; and
- Death through collision or interaction with turbine blades and other infrastructure.

During the FAS, 38 flights were recorded for five target species. Of these, 89% of flights were undertaken by just two species: curlew (23) and lapwing (11). Furthermore, curlew and lapwing were two of the three species with probable breeding territories recorded within the Site (along with skylark). In addition to being species of conservation concern, these species typically nest on the ground. Potential impacts of the Development on ground-nesting birds include loss of nesting, foraging and/or roosting habitat; disturbance and/or displacement during construction and operational maintenance; and collision risk during operation.

The remaining bird activity recorded during the FAS consisted of a low number of flights from species which are likely to be associated with Bennan Loch to the north of the Site. These were mallard, teal oystercatcher and cormorant. One flight of a peregrine was also recorded; however, due to lack of suitable breeding habitat (such as cliffs or tall buildings) it is considered unlikely that this species is breeding within 2 km of the Site and was likely to be using the Site for transit or hunting.

Breeding merlin was recorded breeding within 2 km of the Site. It is thought that the nest was close to 2 km from the Site boundary and likely within Whitelee Wind Farm. Therefore, it is unlikely that the Development will impact future breeding attempts due to its distance from the suspected breeding territory and availability of suitable hunting habitat throughout the wider local area (i.e. Whitelee Wind Farm). Furthermore, mitigation detailed in Section 5.5 will ensure that Schedule 1 species such as merlin will not be disturbed during construction and further impacts during operation will be minimal.

Some non-breeding species of conservation concern may also be affected by loss of foraging and/or roosting habitat such as gull species or raptor species. However, as non-breeding surveys were not undertaken it is difficult to assess the potential impacts on such species.

Due to the relatively small size of the Development and the availability of similar habitats in the surrounding area, loss of habitat for curlew, lapwing and skylark as a result of construction works is expected to be low. Flight activity of target species was relatively low over the period of the FAS, as such it is considered that collision risk is likely to be very low

for all species encountered. However, as suitable nesting habitat is present within the Site (and breeding territories were identified during the BBS), mitigation measures are proposed in Section 5.5. Provided this is implemented, no substantial negative residual impacts are predicted for any bird species.

5 MITIGATION AND ENHANCEMENTS

5.1 Non-statutory Sites

Mitigation procedures for the four non-statutory sites will follow those outlined below in Section 5.2 which aims to prevent negative impacts to all on- and off-Site habitats. Furthermore, habitat enhancement in the form of ditch blocking will be undertaken in order to increase biodiversity in the area surrounding the Site as detailed below in Section 5.1.1.

5.1.1 Ditch blocking

It is suggested that further mitigation is offered to offset the minor negative effects that the Development will have on sensitive habitats such as blanket bog within the Site. Therefore, a programme of ditch blocking will be implemented to promote re-wetting of selected peatland, particularly areas of M17a blanket bog around the central area of the Site. Drains appear to be frequent here and further surveys will be required to identify those which are eroding, or potentially eroding, following best practice guidelines. The ditch-blocking programme would aim to block ditches and re-wet an area of at least the same size of the total area of blanket bog lost as a consequence of the Development (0.37 ha).

5.2 Habitats

This baseline appraisal has assumed embedded mitigation – which includes good-practice construction procedures with respect to management of site drainage, water-crossings and pollution.

All relevant mitigation measures will be implemented through the Construction and Environmental Management Plan (CEMP), which will be prepared in consultation with, and to the satisfaction of East Renfrewshire, SEPA and SNH. These will include measures such as:

- Dust control practices to ensure air mobile pollution does not affect sensitive habitats both on- and off- site;
- A minimum 50 m buffer will be maintained, where possible, between working areas, machinery and watercourses in all areas except at watercourse crossing points;
- Pollution prevention measures will be installed and maintained as appropriate, including sediment interception traps, settlement lagoons or mobile sediment-trapping units (such as Siltbusters or equivalent device), and installation of splash-boards at watercourse crossing points to prevent contamination from track run-off;
- Chemicals, oils and hazardous materials will be stored in designated areas securely at a minimum distance of 50 m from watercourses and waterbodies;
- Spill kits will be provided in all site vehicles and there will be daily checks for oils and fuel leaks;
- Application of best practice in relation to the removal and storage of vegetation turfs and soils to ensure effective reinstatement of vegetation wherever possible;
- Application of best practice techniques of track and turbine base construction to ensure that drainage patterns and water quality within the study area are maintained;
- Application of best practice to ensure materials appropriate to site geology are used in construction activities;
- Where construction activities will affect peat, best practice peat management will be followed and incorporated into the CEMP; and
- Pollution incident response and drainage management measures will be prepared as part of the CEMP to minimise potential pollution effects.

A suitably experience Environmental Clerk of Works (ECoW) will be present on site to oversee enabling works and construction. The ECoW's role will be to:

- Ensure works are carried out in accordance with the CEMP;
- To monitor compliance with international and national legislation;
- Monitor compliance with planning conditions and provide advice; and
- Assist with or undertake checks associated with mitigation measures for protected mammals, bats and birds (detailed in the relevant sections below).

5.2.1 GWDTE

Measures should be taken to protect any confirmed GWDTE, for example by micro-siting works to avoid these areas where possible. SEPA guidance[39] recommends that the following buffer zones should be implemented around GWDTE:

- 100 m for works requiring excavations less than 1m in depth; and
- 250 m for works requiring excavations deeper than 1 m.

Where works cannot be avoided within these areas, measures should be taken to minimise potential impacts. For example, to avoid indirect impacts which may cause disturbance or less to sensitive GWDTE, in particular where they are associated with tributary burns that culvert beneath the haul road, silt fences should be installed to minimise disturbance. Any trenches should include impermeable barriers and/or clay plugs to avoid the trench acting as a water conduit. Areas disturbed during construction should be fully restored on completion of the works using the original rock and soil to recreate the former habitat as far as possible.

5.2.2 Peat

Removal of peat should be avoided where possible, particularly areas of deeper peat (>1 m). Where this cannot be avoided, measures should be taken to minimise impacts on peat. For example, turfs and peat should be stored as close to excavation sites as possible in order to prevent their break up during transportation, and should be stored appropriately to reduce the potential for drying out and erosion to occur. Time between excavation and reinstatement should be kept to a minimum, and reinstated materials should be returned to their original location.

5.3 Protected Mammals

Otter is very likely to be active within the Site and although no holts or resting sites for this species was identified within the proposed footprint of the Development, the potential remains for the distribution of such species to alter and to move closer to the works due to their highly mobile nature. As such, the implementation of the following pre-construction and construction mitigation is required.

5.3.1 Pre-construction mitigation

Prior to commencement of works on site, a Pre-construction Protected Species Survey based on existing data for protected mammals will be carried out to check for changes in baseline conditions. This will enable any refinements to be made (if necessary) through micro-siting of the proposed turbine locations and/or adjustments to the construction programme, to take into account any updated distributions or presence of species.

Should otter resting sites be identified during the Pre-construction Protected Species Surveys, 30 m (as a minimum, up to 200 m for breeding holts) buffer zones around any resting sites will be clearly demarked to ensure that no damage or disturbance to otters using these features occurs. Where works are required within the buffer zones (i.e. water crossing upgrading works), they will be carried out under a licence from SNH and under supervision of the ECoW.

Surveys will be undertaken at most 6 months prior to commencement of the construction works in order to obtain as accurate a representation of the baseline conditions as possible.

Should more than 6 months elapse between Pre-construction Protected Species Surveys and commencement of works, then the need to repeat surveys will be assessed by a suitably experienced ecologist.

5.3.2 Construction mitigation

This appraisal has assumed that embedded mitigation will be implemented during construction – which includes good-practice construction procedures with respect to management of site drainage, water-crossings and pollution as well as in relation to protected mammals.

All relevant mitigation measures will be implemented through the CEMP which will detail measures to minimise the potential for disturbance and injury to protected mammal species. These will include:

- Covering all trenches, trial pits and excavations to prevent animals entering these holes;
- Provision of a method of escape (e.g. a ramp or plank) where such excavations cannot be closed or filled on a nightly basis;
- The use of direction lighting for works during the hours of darkness to avoid illuminating dark corridors utilised by nocturnal mammal species, such as watercourses or trees lines;
- Demarcation of working zones to limit disturbance to species; and
- Maximum vehicle speeds will be restricted across the Site in order to minimise the risk of collisions with animals.

5.4 Bats

This appraisal has assumed that embedded mitigation will be implemented during construction – which includes good-practice construction procedures with respect to management of site drainage, water-crossings and pollution as well as in relation to bats.

5.4.1 Construction Mitigation

All relevant mitigation measures will be implemented through the CEMP which will detail measures such as:

- Implementation a night-time lighting strategy (i.e. use of directional lighting for works during the hours of darkness to avoid illuminating dark corridors utilised by bats, such as watercourses or tree lines); and
- All habitats within 50 m distance of the blade tip of turbines will be maintained in a state which offers poor foraging for bats (i.e. tree and scrub growth to be controlled and pond formation to be avoided;

5.5 Birds

There is a need to follow best practice during the construction of the proposed Development to ensure compliance with the legislation concern disturbance to nesting birds.

Under the Wildlife and Countryside Act 1981 (as amended) it is an offence to intentionally or recklessly:

- Take, interfere with, damage or destroy the nest of any wild bird whilst it is in use or being built;
- Take, interfere with or destroy the egg of any wild bird;
- Obstruct or prevent a wild bird from using its nest; or
- Disturb any wild bird listed on Schedule 1 while it is nest building, or at (or near) a nest containing eggs or young, or disturb the dependent young of such a bird.

Adherence to best practice will be necessary to reduce the possibility of damage, destruction or disturbance to active bird nests during the construction of the Development. The best practice measures outlined below will be adopted in order to minimise or avoid any of the predicted adverse effects on birds.

5.5.1 Timing of Construction Activities and Pre-construction Checks

Site clearance and construction activities should ideally be timed to take place outside the main breeding season so as to avoid nest destruction and disturbance to nesting birds. The breeding season is generally taken to extend from March to August inclusive but for the majority of birds the main breeding season extends from mid — March to at least the end of July (depending on the species concerned).

SNH recognises that avoiding construction work within the breeding season for birds may not be possible, as the season coincides with the best weather for construction, and recommends precautionary measures will to be taken in relation to breeding birds. For instance, if works will coincide with the breeding season in a given year it is considered advantageous to start before mid-March, if possible. This would allow birds the opportunity to take potential disturbance into account in the process of selecting a nest site, and those birds with a choice of nest sites may select an alternative area where disturbance is less intrusive in which to nest for that season.

During the breeding season, pre-construction checks would be made ahead of the works in all areas of potential bird nesting habitat by the ECoW or other suitably qualified ecologist, in order to check for the presence of nesting birds. These should include surveys for the presence of merlin (a Schedule 1 species) in order to identify areas where nesting by this species may be taking place and within which more detailed searches should be focussed prior to construction.

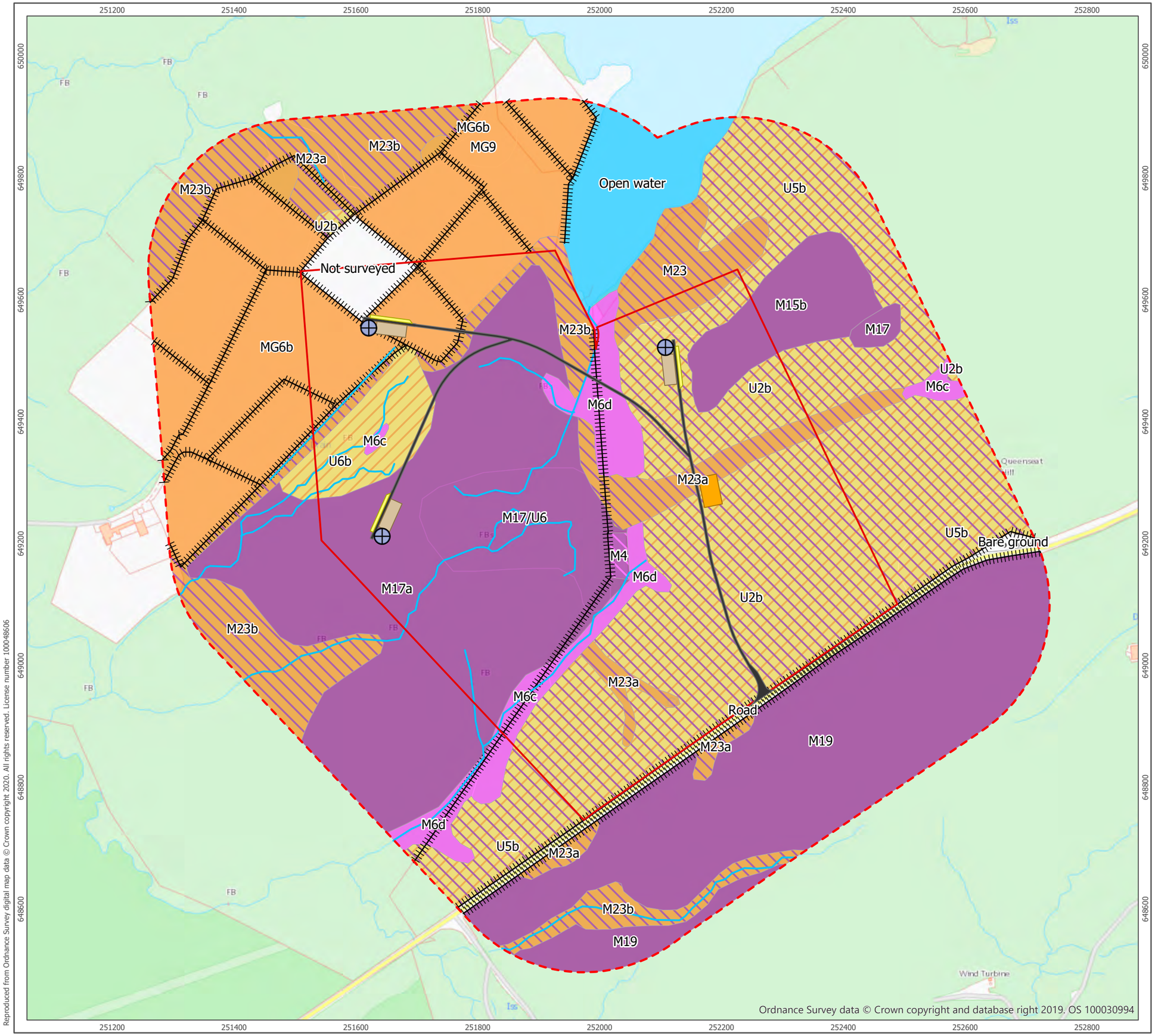
Any active nests found would be cordoned off to a distance which will be commensurate with the sensitivity of the species in question and with adherence to relevant guidance[40]. For example, an exclusion zone of 20 m or 30 m may be acceptable for more disturbance-tolerant species while exclusion zones of up to 750 m may be required for specially protected species such as those listed on Annex A of the EU Birds Directive and/or Schedule 1 of the Wildlife and Countryside Act (as amended), such as merlin. All site personnel would be made aware of the works exclusion zone and construction operations will be delayed within the exclusion zone until the young have fledged and the nest becomes vacant. This will be confirmed by the ECoW or ecologist prior to the recommencement of construction. Active nests would be regularly monitored by the ECoW or ecologist to check on the progress of the nesting attempt.

6 SUMMARY

Following implementation of the mitigation and enhancements outlined in Section 5 above, residual impacts on all ecological features are likely to be reduced to a negligible to low level. Therefore, no substantial negative residual effects are predicted during the construction, operation and decommissioning of the Moorshield Wind Turbines.

[40] Such as: Ruddock, M., Whitfield, D.P. (2007) *A review of disturbance distances in selected bird species. Report from Natural Research (Projects) Ltd. to Scottish Natural Heritage.* Natural Research, Banchory, UK

ANNEX A: FIGURE 1: PHASE 1/NVC HABITATS MAP



wind2

ARCUS

- Site Boundary
- Survey Area
- Proposed Turbine Location

Site Infrastructure

- Access Track
- Crane Hardstanding
- Substation/Control Building and Construction Compound
- Turbine Foundation
- Working Area

Phase 1 Habitats

- Bare ground
- Blanket sphagnum bog
- Cultivated/disturbed land - arable
- Dry heath/acid grassland
- Fen - basin mire
- Flush and spring - acid/neutral flush
- Marsh/marshy grassland
- Neutral grassland - semi-improved
- Standing water
- Track
- Wet heath/acid grassland
- Fence
- Running water

1:6,000 Scale @ A3

0 125 250 m

NORTH

Produced By: LS	3520-REP-026
Checked By: JA	Date: 04/02/2020

Phase1/NVC Habitats Map
Figure 1

Moorshield Wind Turbines Ecological Appraisal

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