

Appendix 8.4 Additional Ornithological Information

Note: Drawings referenced in this Appendix are in a Confidential Annex.



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The following response relates to the proposal currently submitted as a planning application to construct and operate Nisthill Wind Farm (hereafter referred to as the 'Proposed Development'), at site centre British National Grid (BNG) HY 30393 27104. This response relates to request for further information regarding impacts of habitat loss due to the Proposed Development on the populations of hen harrier and short-eared owl in the nearby Orkney Mainland Moors SPA.

The Proposed Development is located approximately 5 km west of Birsay and immediately west of Loch of Swannay (the 'Site') in Orkney Island Council (OIC) area. The Proposed Development will comprise four wind turbines up to 180 m blade tip height and associated infrastructure including site access, internal access tracks, crane hardstanding, underground cabling, on-site substation and maintenance building, temporary construction compound(s) and borrow pit search area.

Nature Scot Response 31st July 2023

"Our advice is that this proposal is likely to have a significant effect on hen harrier and short-eared owl of Orkney Mainland Moors SPA. Consequently, Orkney Islands Council, as competent authority, is required to carry out an appropriate assessment in view of the site's conservation objectives for its qualifying interest(s). To help you do this, we propose to carry out an appraisal to inform your appropriate assessment.

To enable us to carry out this appraisal, the following information is required:

Further information and analysis is required to quantify the potential habitat loss for the hen harrier and short-eared owl known to be nesting in the vicinity of the proposed site. This should include a reassessment of the potential area that is available to hen harrier and short-eared owl based on the known ranging behaviour (males and females) during the breeding season and outwith the breeding season, as well as the habitats known to be important for each species.

The analysis of the hen harrier home range needs to be repeated with a more realistic home range radii. Based on the Applicant's reference to Hardey, et al. (2013) a home range of 7.3km² should be used for the analysis of habitat loss, and not a home range radius of 7.3km as used by the Applicant.

Rather than applying a single home range radius, it is advised to model a range of radii starting from the minimum up to a maximum home range figure based on the relevant research on known ranging behaviour. For hen harrier, this range should be from 2km to a maximum of 5km.

Further analysis is required to more accurately define the habitats used by the SPA hen harrier and shorteared owl. It is known that rough, unmanaged grassland is key to the successful breeding of hen harrier, and it is likely that proportionately more foraging will occur across this habitat (Amar et al., 2008). The analysis of habitat loss should reflect this understanding, and should exclude any potentially unsuitable or unused habitat.

We advise that any further analysis is based on the relevant published literature available on both hen harrier in general across Scotland (as quoted in Hardey, et al., 2013), as well as the specific published research available on Orkney hen harrier (e.g. Amar, Arjun, et al.) Specific reference should be made to the body of work by Amar, et al., whose research is important for hen harrier habitat use and the role that habitat loss plays or has played in hen harrier population change in Orkney."



Meeting 31st August 2023

Following a meeting between NatureScot and ITPEnergised the following clarity was provided around the approach:-

"The most recent version of the SEI only accounted for the habitat loss directly from windfarm development footprint. What we are looking for is a recognition that there will also be displacement of hen harrier and a reduction in foraging in the area around the wind turbines, which may present valuable foraging grounds for the birds known to be nesting in the vicinity of the proposed development. Relevant research literature states that there could be an approximate 50% reduction in hen harrier habitat usage within 500m of a turbine array

(https://besjournals.onlinelibrary.wiley.com/doi/epdf/10.1111/j.1365-2664.2009.01715.x). We are content with the analysis work already carried out for the direct habitat loss, and this should be repeated to account for the potential indirect habitat loss. We advise that the habitat loss calculations should be repeated for a 500m buffer around each turbine to account for the potential indirect habitat loss and displacement of hen harrier in the vicinity of the proposed windfarm.

Until we understand the full impacts of direct and indirect habitat loss on the SPA hen harrier feature, we cannot make a full judgement on how this may or may not undermine the conservation objectives of the SPA when carrying out the appropriate assessment of the HRA. Therefore, in terms of your query on the use of a HMP as mitigation, we would only be able to comment on the suitability of this approach and of any proposed mitigation (i.e. the HMP) once we know what the likely impacts are on the SPA features as a result of the proposed Nisthill wind farm. "

Applicant Response

Damage, deterioration or loss of supporting habitats for Orkney Mainland Moors SPA qualifying species

As outlined in Section 5.1.3 of the Nisthill Wind Farm Shadow HRA (Appendix 8.3 to the SEI Report), the Site may be considered a supporting habitat to the key SPA species, given its close proximity to the SPA and presence of similar habitat types. Although an SPA qualifying feature, loss of habitat within the Site is not considered likely to impact on red-throated diver (*Gavia stellata*). Although they are known to commute over the Site, they spend almost the entirety of their time on water bodies or on nests on the direct fringes of water.

Habitat loss as a result of the Proposed Development is assessed in full within EIA Report Chapter 7: Ecology and Nature Conservation. Just under 110 ha of the total Site area of 306 ha (i.e. approximately 36 % of the site) is considered to be potential supporting habitat for hen harrier and short-eared owl in the form of blanket bog, marshy grassland and wet heath.

The areas by habitat type within the Site boundary are presented in Table 1 below.



Phase 1 Habitat Code	NVC Type (where relevant)	Extent in Study Area (ha)
B4 Improved grassland	MG6 Lolium perenne-Cynosurus cristatus grassland	87.69
J5 Other habitat	n/a	51.94
B5 Marsh/marshy	MG10 Holcus lanatus – Juncus effusus rush-pasture	34.18
grassland	M23 Juncus effusus/acutiflorus–Galium palustre rush-pasture	25.03
E1.6.1 Blanket bog	M17 Trichophorum germanicum –Eriophorum vaginatum blanket mire (inclusive of the M17a Drosera rotundifolia-Sphagnum species sub-community and the M17c Juncus squarrosus-Rhytidiadelphus loreus sub-community)	13.21
	M19a <i>Calluna vulgaris-Eriophorum vaginatum</i> blanket mire, the <i>Erica tetralix</i> sub-community	5.59
E1.7 Wet modified bog	M25 <i>Molinia caerulea-Potentilla erecta</i> mire (including the M25a <i>Erica tetralix</i> sub-community and the M25c <i>Angelica sylvestris</i> sub-community	13.21
	M27c Filipendula ulmaria-Angelica sylvestris mire, the Juncus effusus-Holcus lanatus sub-community	11.61
E3.1 Valley mire	M28a <i>Iris pseudacorus-Filipendula ulmaria</i> mire, the <i>Juncus</i> species sub-community	0.69
D6 Wet heath/acid grassland mosaic	U6c Juncus squarrosus-Festuca ovina grassland, the Vaccinium myrtillus sub-community	8.62
D2 Wet dwarf shrub heath	D2 Wet dwarf shrub heath M15b <i>Trichophorum cespitosum–Erica tetralix</i> wet heath, the Typical sub-community (but some stands could not be identified to sub-community level)	
B1.2 Semi-improved acid grassland	U5 Nardus stricta-Galium saxatile grassland (including the U5a Species-poor sub-community and the U5c Carex panicea-Viola riviniana subcommunity)	2.78
E2.1 Flush and spring – acid and neutral	M6 <i>Carex echinata–Sphagnum fallax /denticulatum</i> mire (Sub- community M6d)	2.6
F2.2 Inundation vegetation	S23 Other water-marginal vegetation	2.42
51 Supra	S27b <i>Carex rostrata-Potentilla palustris</i> tall-herb fen, the <i>Lysimachia</i> sub-community	1.90
F1 Swamp	S9b Carex rostrata swamp, the Menyanthes trifoliata-Equisetum fluviatile sub-community	0.08
D1.1 Acid Dry Dwarf shrub heath	H9d Calluna vulgaris-Deschampsia flexuosa heath, the Galium saxatile sub-community	1.41
G1 Standing water	n/a	36.72
Running water	n/a	0.00
TOTAL		305.92

Table 1. - Habitat Extents within Study Area

Direct Habitat Loss

The direct footprint of the Proposed Development is 6.5 ha in total, including compounds, substation, borrow pit, access roads and four crane pads which includes turbine foundations Table 2 presents direct

and permanent habitat loss by habitat type for all areas lost to the proposed development. For further information regarding indirect and temporary habitat loss please refer to Chapter 6: Ecology of the EIA.

Phase 1 habitat	NVC community or habitat types	Permanent loss (ha)
B4 Improved grassland	MG6 Lolium perenne-Cynosurus cristatus grassland	1.36
B5 Marsh/marshy	MG10 Holcus lanatus – Juncus effusus rush-pasture	0.52
grassland	M23 Juncus effusus/acutiflorus–Galium palustre rush-pasture	2.39
E1.6.1 Blanket bog	5.1 Blanket bog M17 <i>Trichophorum germanicum –Eriophorum vaginatum</i> blanket mire	
	M19 Calluna vulgaris-Eriophorum vaginatum blanket mire	0.00
E1.7 Wet modified bog	M25 Molinia caerulea-Potentilla erecta mire	0.00
E3.1 Valley mire	M27 Filipendula ulmaria-Angelica sylvestris mire	0.56
	M28 Iris pseudacorus-Filipendula ulmaria mire	0.00
D6 Wet heath/acid grassland mosaic	U6 Juncus squarrosus-Festuca ovina grassland	0.24
G2 Running water (burns and canalised burns*)	Running water (measured as a linear feature)	3.48 m
D2 Wet dwarf shrub heath	M15 Trichophorum cespitosum–Erica tetralix wet heath	0.60
J5 Other habitat	n/a	0.81
Total		6.5

Table 2. - Habitat Loss for SPA Associated Habitats Resulting from the Proposed Development

Three of the proposed turbines are located within habitats which are considered to have the potential to support SPA species; one of which lies within an area of blanket bog and two within marshy grassland. The area of this is relatively small, covering 3.65 ha in total (approximately 3% of the equivalent potential supporting habitat on site), therefore considered a minor permanent loss of habitat. However, the visual presence of the turbines may deter, or displace, birds from using some areas of the Site so the potential indirect 'loss' of habitat could effectively be larger than the development footprint itself. This may result in a loss of foraging/hunting grounds.

Access roads will form part of the Proposed Development, and so maintenance activities in the operational phase will be limited to occasional use of the access roads and crane pads by operational personnel. Therefore, following the initial habitat loss due to the development footprint, any further long-term damage, loss or deterioration of the supporting habitat is unlikely to occur.

Indirect Habitat Loss

Pearce Higgins *et al.* (2009) completed a study on the impacts of operating windfarms in upland areas on a selection of key species, including hen harrier. The study describes that hen harrier show significant avoidance of wind turbines to at least 250 m and summarised that windfarms lead to on average a 52 % reduction in flight activity by hen harrier within 500 m of an operating turbine. In order to outline the impacts of this indirect effect, as a worst case scenario, this study will assume that there is a displacement from the habitat around the turbines and a wider 500 m buffer for both hen harrier and short-eared owl.

The impacts of habitat loss are therefore considered to be both the direct loss of habitat of the footprint of the scheme, this includes habitats that are considered to be suitable for both breeding and foraging

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for both hen harrier and short-eared owl, as well as the indirect impacts due to the displacement of foraging hen harrier and short-eared owl from habitats within 500 m of turbines.

A quantitative assessment of the impacts of habitat loss on the SPA breeding populations of hen harrier and short-eared are outlined by species below.

Hen Harrier

Introduction

Between September 2020 and August 2022 a total of 67 flights of individual hen harrier were recorded throughout the VP surveys, with flight activity recorded all year round. The total flight time recorded was 8,373 seconds, of which 6,790 seconds was recorded within the Site boundary and 6,752 seconds (i.e. 99 % of the total recorded flight time) of this time in the Site was recorded at below 20 m height. A total of 38 seconds was recorded at potential collision height (PCH), i.e. 25-180 m. Flight activity was relatively constant throughout the 24 month survey period, with 29 flights registered in Year 1 and 38 in Year 2 of survey.

A total of two breeding attempts were recorded during the breeding raptor walkover surveys, in both 2021 and 2022. Both breeding attempts were located outside the Site boundary (see **Technical Appendix 8.1** of the SEI Report for full details).

Methods

In order to assess the impacts of habitat loss on breeding hen harrier it is first important to establish the typical size of the area used by the species for foraging during the breeding season. Then establish the types of habitat important to hen harrier for both breeding and foraging located within the Site boundary to calculate the potential area within a home range that may be lost due to the Proposed Development.

Hen harrier males have larger home ranges during the breeding season, being 7.3 km² as compared to 3.6km² for females (Hardey *et al.*, 2013). This equates to a foraging distance of 1.52 km and 0.7 km, respectively, from a nest location presuming a circular foraging range. Hen harrier males, however, can range up to 10 km from a nest site with females typically remaining within 500 m (Arroyo *et al.*, 2009).

Known historical hen harrier nest sites lie within 600 m of the Site boundary (720 m of the nearest infrastructure), and the Site therefore lies within the typical hunt zone of the two known breeding territories. Hen harrier will defend their nest sites (with territories likely to consist of an area of 300-500 m, with female birds typically defending the territory and the areas they typically forage in during the breeding season (Hardey *et al.*, 2013) but will forage across the wider area with multiple males foraging over the same wider habitat.

As mentioned above, Hardey *et al.* (2013) outline an average territory size for hen harrier as being 7.3 km² which would equate to a circular area of 1.52 km from a nest. Although, given a realistic scenario, hen harriers will avoid using unsuitable habitats for hunting such as water, forestry, hard standing. As such, acknowledging that a harrier's core range is unlikely to be circular and more likely to extend further than the 1.52 km where habitat preferences dictate.

For this study we propose using a core foraging range of 2 km from a nest. Arrayo *et al.* (2004) studied the home range of hen harriers in Orkney and the results showed that males were recorded over 5 km from the nest in two out of the three territories studied with the maximum distance recorded being 5.6 km. The historical data obtained from the Raptor Study Group indicated that the majority of records for

all three nest locations were located less than 2 km from the Site. It is therefore considered that the core foraging range of male hen harrier during the breeding season is within 2 km of the nest but, as required (and depending on additional territories formed with other females), males will hunt further from the nest and up to a wider area of 5 km and occasionally beyond.

In order to quantify the impacts of habitat loss on hen harrier the key foraging range and wider area territory sizes (2 km - 5 km) was plotted onto GIS with the aim to calculate the amount of both foraging and breeding habitat lost for each of the breeding pairs recording during baseline surveys.

Amar and Redpath (2005) outlined in their study on the implications of land use change on hen harriers three main habitat types in their classification:

- Habitat 1: upland moorland (dominated by Heather Calluna vulgaris);
- Habitat 2: lowland rough grazing, principally a mixture of Heather and unmanaged grass, often located at the edges of moorland areas; and
- Habitat 3: intensive pasture, dominated by managed re-seeded grass species, heavily grazed by sheep and cattle.

Their study aimed to identify which were the key foraging habitats for hen harrier and outlined that they were found to hunt most frequently where unmanaged grass was most abundant. This habitat (Habitat 2) had previously been shown by Palmer (2002) to contain the highest proportion of the key prey species for hen harrier, i.e. Orkney vole (*Microtus arvalis orcadensis*) as well as snipe (*Gallinago gallinago*). Amar *et al.* (2008) further reiterated this outcome, identifying a positive correlation between breeding performance and the presence of unmanaged grassland within hen harrier territories on breeding success in Orkney. The study outlines the requirement for the presence of key prey species (being Orkney vole, snipe and meadow pipit) as the key factors in breeding success.

Therefore, in order to assess the impact of habitat loss due to the Proposed Development on breeding hen harrier it is therefore necessary to calculate the impacts on the Habitats 1-3 outlined above within the foraging range of each recorded breeding attempt. The three habitat types described above broadly align to Habitat 1 being the 'key nesting habitat', Habitat 2 -'key foraging habitat' and Habitat 3 -'lower value foraging habitat'. In addition, for this study a further habitat, Habitat 4 -'other' will also be used to outline habitats with little or no value to hen harrier such as hard standing and open water.

The four different habitat types outlined above were defined as those located within 2 km from each known territory and plotted using a combination of the habitat survey data and satellite imagery. Once the four habitat types were plotted on GIS the areas of each habitat type were calculated for each of the two known hen harrier breeding territories. It was then possible to calculate a percentage of each of the four habitat types that were to be lost within 2 km of each breeding territory due to both direct habitat loss and indirect habitat loss. Additional areas of the male bird key breeding and foraging habitats were also plotted between two and five km from each territory. This allowed for an assessment of additional availability of these key habitats within the wider foraging range for male hen harriers.

It is understood that this method of defining the habitat is open to a number of inaccuracies due to the age of the satellite imagery within GIS (i.e. those areas outwith the habitat baseline survey area completed to inform the ecological impact assessment) and also due to the required interpretation of the data. This may result in habitat having altered since the image was created or been incorrectly identified. In addition it is also noted that hen harrier males on Orkney are commonly known to be

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Development

0.44%

Indirect loss 7.75% 21.5% 19.1%

22.4%

polygynous with the same male having multiple nests, in these instance the home ranges from the nest may be different to those proposed.

Results and Discussion

The total areas lost to direct or permanent habitat loss and indirect or displacement from habitat loss (i.e. applying the 500 m buffer from turbines) associated with the Proposed Development for each of Habitats 1-4 were calculated and shown in Table 3 below:

Classification	NVC community in Proposed Development	Permanent loss (ha)	Indirect Loss (ha)
Habitat 1	E.1.6.1 Blanket bog, E3.1 Valley mire, D2 Wet dwarf shrub heath	1.17	34.13
Habitat 2	B5 Marshy Grassland and D6 Wet heath/acid grassland mosaic	3.14	92.18
Habitat 3	B4 Improved grassland	1.36	53.56
Habitat 4	Other (and running water 3.48m)	0.81	40.31
Total		6.48	220.18

Table 3. - Total habitat areas lost to the Proposed Development

Habitat Lost to Hen Harrier Nest Sites

The areas for the four key habitat types within the core foraging range for male hen harriers from Nest 1 and Nest 2 are shown in Table 4 and Table 5 respectively and displayed in Drawing 1 and Drawing 2. The amount of each of the four habitat types lost due to the Proposed Development in terms of the percentage available within 2 km of the nest are also shown in Table 4 and Table 5.

Classification	Nest 1 - Lost due to Proposed Development in 2 km buffer (ha)		Habitat available: Nest 1 – 2 km	Nest 1: % lost due to Proposed Developmen	
	Direct loss	Indirect loss	buffer (ha)	Direct loss	Indirect lo
Habitat 1	1.17	34.1	440.00	0.26%	7.75%
Habitat 2	2.51	77.4	360.00	0.70%	21.5%
Habitat 3	0.85	53.6	280.00	0.30%	19.1%

40.3

205.4

Table 4. - Habitat lost within 2km - Hen harrier: Nest 1

Table 5. - Habitat lost within 2km - Hen harrier: Nest 2

0.80

5.33

Classification	Nest2 -Lost due to Proposed Development in 2 km buffer (ha)		Habitat available: Nest 2 – 2 km	Nest 2: % Proposed [lost due to Development
	Direct loss	Indirect loss	buffer (ha)	Direct loss	Indirect loss
Habitat 1	1.17	32.7	620.00	0.19%	5.27%
Habitat 2	0.48	42.1	330.00	0.15%	12.76%
Habitat 3	0.00	4.25	220.00	0.00%	1.93%
Habitat 4	0.40	25.1	90.00	0.44%	27.89%
Total	2.05	104.14	1,260.00		

180.00

1,260.00

Habitat 4

Total



Loss of Hen Harrier Nesting and Foraging Habitat – Core Area: 2km Range

As discussed above, in the UK and Ireland hen harrier nest in heather moorland (or plantation forestry) and prefer rank heather for the building of nest sites (Hardey *et al.*, 2013) which is classified as Habitat 1 'key breeding habitat' and shown for each nest on **Drawing 1** and **Drawing 2**. The direct loss of breeding habitat due to the Proposed Development was calculated as 0.26 % and 0.19 % for Nest 1 and Nest 2, respectively, making an average of **0.23** % loss per territory within the core 2 km area. The indirect loss of breeding habitat due to the Proposed Development was calculated as 7.75 % and 5.27 % for Nest 1 and Nest 2 respectively making an average of **6.51** % indirect loss per territory within the core 2 km area.

Amar and Redpath (2005) and Amar *et al.* (2008) outlined the importance of rough and unmanaged grassland and a mixture of rough grassland and heather type habitats as a source of prey for hen harrier, these habitats being key for the presence of Orkney vole, snipe and meadow pipit. These habitat types were classified as Habitat 2 'key foraging habitat' and mapped within the core foraging zone (2 km) of nest 1 and nest 2 and are displayed on Drawing 1 and Drawing 2.

As shown in Table 4 and Table 5, the total amount of foraging direct habitat lost within the core foraging zone for Nest 1 and Nest 2 was 0.7 % and 0.15 % loss respectively, making an average of **0.43** % per territory within the core 2 km area. The indirect habitat lost within the core foraging zone for Nest 1 and Nest 2 was 21.5 % and 12.76 % respectively, making an average of **17.13%** loss per territory within the core 2 km area.

The majority of the wider 5 km foraging range, i.e. the area between 2 km and 5 km from the two territories is made up of improved grassland fields or open water (both fresh water and sea water). In order to further calculate the impact of habitat loss including the wider foraging zone, the areas of Habitat 1 (key breeding habitat) and Habitat 2 (key foraging habitat) were digitised between 2-5 km and the amount of breeding and foraging habitat lost to the Proposed Development calculated to include the fact that the male birds may utilise the wider areas as part of the territories.

Given the fact that hen harrier are not restricted by the requirement to return to the nest to feed young and / or breeding partner it is considered their foraging range in the winter months would include as a minimum the full 5 km foraging range.

The remaining habitats were not classified as either key foraging or breeding habitat and consisted of habitats such as improved grassland which can provide good foraging at certain times of year but much of the year can be either poached due to intensive grazing or long dense grass used for sileage, fresh water or saltwater bodies, small built-up areas or clearly defined cereal crops. These habitats are classified out to 2 km and shown in **Drawing 1 and Drawing 2**.

Classification	Habitat Lost due to Proposed Development in 5 km buffer (ha)		Habitat available: Nest 1 – 5 km	Nest 1: % lost due to Proposed Development	
	Direct loss	Indirect loss	bullet (lia)	Direct loss	Indirect loss
Habitat 1	1.17	34.1	1,129.40	0.10%	3.02%
Habitat 2	3.14	82.7	773.90	0.41%	10.7%



Classification	Lost due t Development (I	o Proposed t in 5km buffer na)	Habitat available: Nest 2 – 5 km buffer	Nest 1: % lo Proposed De	ost due to evelopment
	Direct loss	Indirect loss	(ha)	Direct loss	Indirect loss
Habitat 1	1.17	32.7	1,929.80	0.06%	1.69%
Habitat 2	3.14	42.1	1,200.10	0.26%	3.51%

Table 7. - Key habitat loss for Hen harrier to 5 km: Nest 2

Loss of Hen Harrier Nesting and Foraging Habitat – Wider Area -5 km Range

Given the inclusion of the wider territory area out to 5km, means there are significant further areas of breeding habitat available to both territories (totalling 1,129.4 ha for Nest 1 and 1,929.8 ha for Nest 2) the majority of which lie to the south and south-east within the SPA. If it is considered this habitat is available to the breeding pairs it means the loss of Habitat 1 due the Proposed Development accounts for 0.1 % direct loss and 3.02 % indirect loss and 0.06 % direct loss and 1.69 % indirect loss for Nest 1 and Nest 2, respectively, giving an average of **0.08** % direct loss and **2.34** % indirect loss for each territory of the wider 5 km study area.

Given that hen harriers are known to forage out to 5 km from nest site expansion of the study area to 5 km means there are significant further areas of additional foraging habitat available to both territories (773.9 ha for Nest 1 and 1,200.10 ha for Nest 2) the majority of which lie to the south and south-east bordering the SPA. Given this additional foraging habitat is available with the loss of 3.14 ha of the key foraging habitat, Habitat 2, to Nest 1 and Nest 2 due to the Proposed Development, this equates to 0.41 % and 0.26%, respectively, giving an average of **0.34**% for each territory across the wider 5 km study area.

Indirect losses of habitat 2 to nest 1 and nest 2 amount to 82.7 ha and 42.1 ha, respectively, which equates to 10.7% and 3.51% of habitat indirectly lost, giving an average of **7.12**% across the study area.

Summary

It is calculated that an average of 0.23 % and 0.08 % of breeding habitat (habitat 1) will be lost due to direct habitat loss for hen harrier across the 2 km and 5 km ranges respectively. These figures rise to 6.51 % and 2.34 % if, as a worst case scenario, the indirect losses are included due to displacement from operating turbines. Given hen harriers are known to be site faithful in their breeding locations and the fact that neither breeding location is within 500 m of the proposed turbines then it is considered these indirect impacts are unlikely to impact on the breeding locations of hen harrier at the Site. It is therefore considered that the direct and indirect impacts on hen harrier due to breeding habitat loss during both construction and operation of the wind farm (both breeding and non-breeding season) are negligible and not significant is therefore concluded that the assessment in terms of breeding habitat at the site as discussed in the HRA and Chapter 8 of the submitted EIA Report remains unchanged.

It is calculated that an average of 0.43 % and 0.34 % of key foraging habitat (Habitat 2) will be lost due to direct habitat loss for hen harrier across the 2 km and 5 km ranges, respectively. These figures rise to 17.13 % and 7.12 % for indirect losses due to displacement from operating turbines. As mentioned above hen harriers were frequently recorded (67 flights across 2 years) foraging in this 500 m turbine buffer and therefore if the operating turbines lead to displacement from the Site then this foraging resource will be lost to the SPA population. The figures of 0.34 % and 0.43 % direct loss are considered to be negligible and not significant, but when the indirect impacts are considered the potential loss of 17.13

% of habitat within the 2 km core foraging range (reduced to 7.12% across the wider 5 km range) this is considered to be a significant loss and is a change from the outcome concluded within the assessment in terms of breeding habitat at the site as discussed in the Shadow HRA and Chapter 8 of the submitted EIA Report.

Nisthill Wind Far

To mitigate for any habitat loss, the habitat management plan (HMP) proposed will form mitigation and enhancement (see **Chapter 8** of the EIA Report) and includes for the restoration of foraging and ground-nesting breeding bird habitats with the implementation of grazing regimes within the windfarm site.

Mitigation Response

The Applicant has proposed the following response in order to mitigate for the predicted average of 52% reduction in flight activity due to displacement within 500 m of the proposed turbines (as per Pearce Higgins *et al.*, 2009).

The area where there is a predicted reduction in flight activity (i.e. the 52% reduction) consists of approximately 60 ha of Habitat 2 (the key foraging habitat) across the two recorded nest locations.

Drawing 6 outlines three proposed areas for habitat enhancement and management;

- **Area 1** measuring 10 ha is already classified as rough grassland but will be mainained through the grazing mangement to improve the quality to be improved in quality habitat and classified as habitat 2.
- Area 2 comprises two fields and 9 ha of improved grassland which will implement through controlled grazing in order to return to unmanaged grassland to the equivalent nature and structure of Habitat 2 (defined above) in order to provide suitable habitat for prey species, such as Orkney vole and ground nesting birds such as snipe and meadow pipit.
- Area 3 comprises nine fields and 14 ha of improved grassland which will implement through controlled grazing in order to return to unmanaged grassland to the equivalent nature and structure of Habitat 2 (defined above) in order to provide suitable habitat for prey species, such as Orkney vole and ground nesting birds such as snipe and meadow pipit.

The three proposed are a combined total 33 Ha which equates to approximately 55% of the 60 Ha area considered impacted foraging habitat within 500m of the proposed turbines.

The specific grazing regime wihtin the proposed areas (to be approved by NatureScot) will involve creating rough grass habitats defined as lowland rough grazing, principally a mixture of heather and unmanaged grass, often located at the edges of moorland areas made up of grass heath, moorland grass and rough/marsh grass (Amar and Redpath, 2005).

The Farm Advisory Service(FAS) (2017) outline recommended stocking levels for grassland in Scotland and the stokcing rates are expressed as Livestock Units (LU) per hectare per year. Cows > 24 months old are defined as 1.0 LU, cattle 6-24 months are 0.6 and ewes (incl. lamb) are considered to be 0.15. Grasslands tend to be more productive and require higher stocking rates than most other semi-natural habitats, but appropriate stocking rates can range from 0.2-1.0 LU/ha/yr (FAS, 2017). For Poor quality grassland with typical dominant grasses to include *Molinia/Nardus*, an annual stocking rate of 0.25 is recommended. This can be achieved by the following stocking rates:



Time of year	Stocking Rate
1 st April – 30 th June	0.1
1st July – 30 th Septmber	0.4
1 st October – 31 st March	0.25

Stocking levels will be kept low between April and June in order to prevent trampling of ground nesting birds and their nests.

In addition to the proposed stocking levels the habitats in Areas 1-3 will further be managed for hen harrier with the non-application of fertiliser or lime on the land and prevention of any new drainage of the fields as detailed in Drawing 6 for the lifetime of the scheme.

Given the number of variables that can affect the outcomes of a grazing management scheme, site monitoring will be essential and will be incorporated into the applied mitigation. The scheme will be monitored each year for the first 5 years of the scheme and again after 10 and 15 years to study the progress of the sward structure and make any modifications to the plan as outlined. The results will be discussed withNatureScot to ensure compliance with the requirements in order to provide optimal habitats for hen harrier.

Post-Construction Monitoring

In addition to the Mitigation and Enhancement Plan (please refer to Section 7.9 of the EIA Report Chapter 7: Ecology and Nature Conservation) and in terms of habitats outlined above, the Applicant will provide financial assistance to the Orkney Raptor Study Group to continue monitoring the hen harrier and shorteared owl populations of the SPA. The surveys will be conducted as above, for the first 5 years of the scheme being commissioned and again in years 10 and 15 of operation.

Short-eared owl

Introduction

Between September 2020 and August 2022, a total of 20 flights of individual short-eared owl were recorded throughout the VP surveys, with all flight activity recorded during the breeding seasons with 13 flights between May and June 2021 and seven flights between May and July 2022. The total flight time recorded was 2,887 seconds of which 2,778 seconds was recorded within the site, the majority of which was below 20 m above the ground with only a total of 381 seconds recorded between 25-180 m. A total of three breeding attempts were recorded in 2021 and one in 2022 for short-eared owl, all the breeding attempts were located outside the site boundary but within the wider 2 km study area (see **Technical Appendix 8.1** of the SEI Report for full details).

Methods

Short-eared owl require extensive areas of open land with an adequate small mammal population generally preferring open moorland and rough grassland (Hardey *et al.*,2013). As with hen harrier, much of the area within the Site and wider area provide optimal breeding and foraging habitat for short-eared owl which is why they are relatively common, with around 25 % of the Scottish population (283 of 1,088) found in Orkney (Wilson *et al.*, 2015).

As discussed above Amar and Redpath (2005) and Amar *et al.* (2008) outlined the importance of rough and unmanaged grassland and a mixture of rough grassland and heather type habitats as a source of

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prey for hen harrier. These habitats are identified as key for the presence of Orkney vole, the key constituent of the diet of short-eared owl in Orkney. As such, it is considered this habitat type is key for short-eared owl also.

Hardey *et al.* (2013) outlines in Scotland and Wales that short-eared owl have home ranges of between 18 and 875 ha and generally hunt within 2 km of their nest locations during the breeding season. Although this may be extended up to 6 km depending on prey availability. Research undertaken by the BTO (BTO, 2023) suggests that in Scotland a typical home range for short-eared owl is approximately 200 ha and outlines a variety of grassland types and heights within range is beneficial. However, they state that territory sizes vary considerably, ranging from 40 to 875 ha.

A similar methodology as used for hen harrier above will be used to establish the types of habitat important to short-eared owl for both breeding and foraging and then to calculate the amount of the habitats within this home range that will be lost due to the Proposed Development.

For short-eared owl, a key foraging range of 200 ha and a wider range of 865 ha will be used to establish the impacts of habitat loss on the SPA population of short-eared owl. A key foraging range of 200 ha would equate to a circular area with radius of 800 m and a wider range of 865 ha would equate to a circle with a radius of 1.65 km. Given in reality it is unlikely a home range would be circular with short-eared owl avoiding unsuitable habitats for hunting such as hard standing and open water, a slightly wider area will used meaning a core foraging range of 1 km and a wider home range of 2 km will be used for this study.

Although there is no evidence to show that short-eared owl are displaced by working wind turbines but as a species they forage in a similar manner to hen harrier close to the ground and for the case of this study we will establish a similar worse case scenario that short-eared owl will be displaced by turbines out to 500 m, i.e. the indirect loss.

Results and Discussion

The areas for the four key habitat types within the core foraging range for short-eared owl from Nests 1 -3 are shown in **Table 8 - 10** respectively and displayed in **Drawings 3 - 5**. The amount of each of the four habitat types lost due to the Proposed Development in terms of the percentage available within the core 1 km foraging range of each nest is shown in **Tables 8 -10**.

Classification	Nest 1 - Lost due to Proposed Development in 1 km buffer (ha)		ClassificationNest 1 - Lost due to ProposedHabitat availDevelopment in 1 km buffer (ha)Nest 1 - 1buffer (ba)buffer (ba)	Habitat available: Nest 1 – 1 km	Nest 1: % Proposed D	lost due to Development
	Direct loss	Indirect loss	buller (na)	Direct loss	Indirect loss	
Habitat 1	0.00	0.00	0.00	0.00%	0.00%	
Habitat 2	0.52	17.94	78.50	0.66%	22.85%	
Habitat 3	0.94	31.8	218.50	0.43%	14.55%	
Habitat 4	0.08	0.27	17.10	0.49%	1.58%	
Total	1.54	50.01	314.00			

Table 8. - Habitat lost within 1 km - Short-eared owl: Nest 1



Classification	Nest 2 - Lost due to Proposed Development in 1 km buffer (ha)		Habitat available: Nest 2 – 1 km	Nest 2: % Proposed [lost due to Development
	Direct loss	Indirect loss	buffer (ha)	Direct loss	Indirect loss
Habitat 1	1.05	33.63	160.80	0.65%	20.91%
Habitat 2	0.37	46.61	81.50	0.45%	57.19%
Habitat 3	0.56	11.31	31.00	1.80%	36.48%
Habitat 4	0.12	20.13	40.80	0.30%	49.34%
Total	2.10	111.68	314.00		

Table 9. - Habitat lost within 1 km - Short-eared owl: Nest 2

Table 10. - Habitats loss within 1 km for Short-eared owl: Nest 3

Classification	Nest 3 - Lost due to Proposed Development in 1 km buffer (ha)		osed Habitat available: er (ha) Nest 3 – 1 km	Nest 3: % lost due to Proposed Development	
	Direct loss	Indirect loss	buffer (ha)	Direct loss	Indirect loss
Habitat 1	0.02	20.90	212.00	0.01%	9.86%
Habitat 2	0.00	1.82	59.95	0.00%	3.04%
Habitat 3	0.00	0.00	15.20	0.00%	0.00%
Habitat 4	0.00	0.000	26.80	0.00%	37.3%
Total	0.02	22.72	314.00		

Loss of Short-eared Owl Breeding and Foraging Habitat – Core Area: 1 km Range

The results of the analysis of habitat loss with the core foraging range for short-eared owl as a result of the Proposed Development shows an average loss across all three territories of:

Habitat 1 - key nesting habitat calculated as; ((0+0.65+0.01)/3) = 0.22 %.

Indirect losses account for on average ((0.00+20.91+9.86)/3) = **10.26**%.

Habitat 2 - key foraging habitat average loss was calculated as; ((0.66+0.45+0)/3) = 0.37 %.

Indirect losses account for on average ((22.85+57.19+3.04)/3) = **27.7**%.

Much of the wider (2 km) foraging range, i.e. the area between 1 km and 2 km from the three territories, is made up of improved grassland fields or open water (both fresh water and sea water). In order to further calculate the impact of habitat loss including the wider foraging zone, the areas of Habitat 1 (key breeding habitat) and Habitat 2 (key foraging habitat) were digitised between 1-2 km and the amount of breeding and foraging habitat lost to the Proposed Development calculated to include the fact that the foraging birds may utilise the wider areas as part of their territories.

Given the fact that short-eared owl are not restricted by the requirement to return to the nest to feed young and / or breeding partner it is considered their foraging range in the winter months would include as a minimum the full 2 km foraging range.

The remaining habitats were not classified as either key foraging or breeding habitat and consisted of habitats such as improved grassland which can provide good foraging at certain times of year but much of the year can be either poached due to over grazing or long dense grass used for sileage, fresh water

or sea water bodies, small built-up areas or clearly defined cereal crops. These habitats are classified out to 2 km and shown in **Drawings 3 - 5**.

Classification	Habitat Lost due to Proposed Development in 2 km buffer (ha)		Habitat available: Nest 1 – 2 km	Nest 1: % lost due to Proposed Development	
	Direct loss	Indirect loss	bullet (lia)	Direct loss	Indirect loss
Habitat 1	0.16	11.2	11.20	1.42%	100%
Habitat 2	2.90	77.5	198.10	1.46%	39.12%

Table 12. - Habitat loss within 2 km for Short-eared owl: Nest 2

Classification	Habitat Lost due to Proposed Development in 2 km buffer (ha)		Habitat available: Nest 2 – 2 km	Nest 1: % lost due to Proposed Development	
	Direct loss	Indirect loss	buffer (ha)	Direct loss	Indirect loss
Habitat 1	1.28	33.1	369.40	0.35%	8.96%
Habitat 2	2.38	89.1	265.60	0.90%	33.55%

Table 13. - Habitat loss within 2 km for Short-eared owl: Nest 3

Classification	Habitat Lost due to Proposed Development in 2 km buffer (ha)		Habitat available: Nest 3 – 2 km	Nest 1: % lost due to Proposed Development	
	Direct loss	Indirect loss	buffer (ha)	Direct loss	Indirect loss
Habitat 1	1.17	33.1	514.90	0.22%	6.43%
Habitat 2	2.05	64.6	343.80	0.60%	18.79

Loss of Short-eared Owl Breeding and Foraging Habitat – Wider Area: 2 km Range

The results of the analysis of habitat loss inclusive of the wider foraging area for short-eared owl as a result of the Proposed Development shows an average loss across all three territories of:

Habitat 1 – key breeding habitat calculated as;

- direct loss ((1.42+0.35+0.22)/3) = **0.67** %,
- indirect loss (100+8.96+6.43)/3 = **38.46** %.

Habitat 2 – key foraging habitat calculated as;

- direct loss ((1.46+0.9+0.6)/3) = **0.98** %,
- indirect loss (39.12+33.55+18.79/3)=**30.49** %.

Within 1 km of the three short-eared owl territories, a total of 0.22 % direct loss and 10.26 % indirect loss of key breeding habitat and 0.37 % direct loss and 27.7 % indirect loss of key foraging habitat was predicted to be lost as a result of the Proposed Development. If the territory size is increased to the 2 km wider area these figures increase slightly with a predicted 0.67 % direct loss and 38.46 % indirect loss of breeding habitat and 0.98 % direct loss and 30.49 % indirect loss of foraging habitat lost, as the 2 km wider area covers more of the Proposed Development than the smaller 1 km area.



Summary

It is calculated that an average of 0.22 % and 0.67 % of breeding habitat (habitat 1) will be lost due to direct habitat loss for hen harrier across the 1 km and 2 km ranges, respectively. These figures rise to 10.26 % and 38.46 % if the indirect losses are included due to 500 m displacement from operational turbines.

During the two breeding seasons none of the short-eared owl breeding locations was recorded within 500 m of the proposed turbines then it is considered these indirect impacts are unlikely to impact on the breeding locations of short-eared owl at the Site. It is therefore considered that the direct and indirect impacts on short-eared owl due to breeding habitat loss during both construction and operation of the wind farm (both breeding and non-breeding season) are negligible and not significant is therefore concluded that the assessment in terms of breeding habitat at the site as discussed in the Shadow HRA and Chapter 8 of the submitted EIA Report remains unchanged.

It is calculated that an average of 0.37 % and 0.98 % of key foraging habitat (Habitat 2) will be lost due to direct habitat loss for short-eared owl across the 1 km core foraging range and wider 2 km range, respectively. These figures rise to 27.7 % and 30.49 % for indirect losses when considering the worst case 500 m displacement from operational turbines.

Short-eared owl and their behaviours are less studied in Orkney than hen harrier and can be a secretive and difficult species to monitor closely. Without any detailed studies to use the same methodology for the impacts of habitat loss was used as for hen harrier.

As mentioned above, short-eared owl were occasionally recorded (20 flights across 2 years) foraging in this 500 m turbine buffer and therefore if the operating turbines lead to displacement from the Site then this foraging resource will be lost to the SPA population. The figures of 0.37 % and 0.67 % direct loss are considered to be negligible and not significant. When the impacts of indirect habitat loss are considered the potential loss of 27.7 % of habitat within the 1 km core foraging range (30.49 % across the wider 2 km range) this is considered to be a significant loss and is a change from the outcome concluded within the assessment in terms of breeding habitat at the site as discussed in the HRA and Chapter 8 of the submitted EIA Report.

As outlined for hen harrier above to mitigate for any habitat loss, the mitigation plan proposed will be implemented to mitigate for any loss of foraging habitat, as outlined above, to being a significant impact on the SPA qualifying short-eared owl. The calculations outline that an average of 60 ha of Habitat 2 the key foraging habitat will result in a 50% reduction in flight activity to hen harrier due to displacement from the operating turbines and this loss will be mitigated for by creating new foraging habitat which will also benefit and mitigate potential habitat loss impacts presented to short-eared owl.



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