



ARCUS

WINTER ORNITHOLOGY REPORT 2018-19

**HAVERIGG III WIND FARM LIFE EXTENSION
NORTH LANE, HAVERIGG, CUMBRIA**

WINDCLUSTER LTD.

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ABBREVIATIONS

BoCC:	Birds of Conservation Concern
BOU:	British Ornithologists Union
DAS:	Discretionary Advice Service
HMP:	Her Majesty's Prison
Km:	Kilometres
LNR:	Local Nature Reserve
NE:	Natural England
NERC:	Natural Environment and Rural Communities
NNR:	National Nature Reserve
SSSI:	Site of Special Scientific Interest
SPA:	Special Protection Area
VP:	Vantage Point

EXECUTIVE SUMMARY

Arcus Consultancy Services Ltd (Arcus) was commissioned by Windcluster Ltd to carry out ornithology surveys at Haverigg III Wind Farm (the Development) in Cumbria, between September 2018 and August 2019. The scope of surveys was agreed with Natural England.

This report details the results of the winter bird collision monitoring completed between September 2018 and February 2019 (inclusive). The wintering bird surveys included:

- Carcass searches;
- Searcher efficiency trials; and
- Carcass persistence trials.

The results of the breeding season ornithology surveys (March to August 2019) will be detailed in a separate report.

Based on the results of the carcass persistence and searcher efficiency trials undertaken in parallel with the carcass searches to date, it is considered likely that the vast majority (at least 70%) of bird carcasses in situ (i.e. not removed by scavengers) at the time monitoring was carried out were detected. Initial results indicate that levels of collision mortality are relatively low. However, initial results also indicate high levels of scavenger removal at the Development, which may mean that many bird carcasses are removed before they can be detected. Further trials are being completed during the breeding season, the results of which will determine whether initial results represent typical levels of scavenger removal at the Development.

1 INTRODUCTION

1.1 Background

Arcus Consultancy Services Ltd (Arcus) was commissioned by Windcluster Ltd to carry out ornithology surveys at Haverigg III Wind Farm (the Development) in Cumbria, during 2018-19. The results of the ornithology surveys will be used to inform an application for the life extension of the Development. Surveys commenced in September 2018 and will be completed in August 2019.

This report details the results of the winter bird collision monitoring completed between September 2018 and February 2019 (inclusive). The results of the breeding season ornithology surveys (March to August 2019) will be detailed in a separate report.

Note that the winter bird collision monitoring at the Development took place concurrently with monitoring at the adjacent Haverigg II Wind Farm. Although this report will focus on monitoring at the Development, due to its close proximity to Haverigg II, relevant results of winter bird collision monitoring at the latter development are also included for reference.

Species names used in this report follow the British List¹, which is maintained by the British Ornithologists' Union (BOU), with all species referred to by their British (English) vernacular name. A list of scientific names, as well as details of relevant legislation and conservation status, of all bird species referred to in this report is provided in Table A1.1, Appendix 1.

1.2 Site Description

The Development is located approximately 2 kilometres (km) west of Haverigg, Cumbria. It comprises four operational onshore wind turbines. It is sited east of Her Majesty's Prison (HMP) Haverigg, immediately to the west of the four-turbine Haverigg II Wind farm. Both wind farm developments are located within a single landownership area (the Site). The Site Boundary and turbine locations of both wind farm developments are shown in Figure 1, Appendix 2.

The southern part of the Site is largely comprised of intensively grazed grassland, while the northern part of the Site is a motocross track.

1.3 Nearby Statutory Sites Designated for Ornithological Features

A search for the following statutory sites designated for ornithological interests was completed:

- Sites of international importance within 20 km of the Site:
 - Special Protection Areas (SPAs); and
 - Ramsar sites.
- Sites of national and local importance within 10 km of the Site:
 - Sites of Special Scientific Interest (SSSIs);
 - National Nature Reserves (NNRs); and
 - Local Nature Reserves (LNRs).

1.3.1 Statutory Sites of International Importance

The Site is adjacent to the Morecambe Bay & Duddon Estuary SPA, which is designated for a range of waterfowl and seabird species, and the Duddon Estuary Ramsar site, which is partly designated for wintering waterfowl, as well as for natterjack toad (*Epidalea calamita*). In addition, Morecambe Bay Ramsar site, which is designated for a range of waterfowl and seabird species, is located approximately 11.4 km to the southwest of the Site. Details of

¹ British Ornithologists' Union. (2017). The British List: A Checklist of Birds of Britain (9th edition). *Ibis* 160: 190-240.

these statutory sites are summarised in Table 1 below and locations are shown in Figures 2 and 3, Appendix 2.

Table 1: Summary of statutory sites of international ornithological importance within 20 km of the Site

Site name	Designation	Qualifying ornithological interests/ features*	Approximate location in relation to the Site**
Morecambe Bay & Duddon Estuary	SPA	<ul style="list-style-type: none"> • Non-breeding populations of the following species: <ul style="list-style-type: none"> - Pink-footed goose ; - Whooper swan; - Shelduck; - Pintail; - Little egret; - Oystercatcher; - Golden plover; - Grey plover; - Ringed plover; - Curlew; - Bar-tailed godwit; - Black-tailed godwit; - Turnstone; - Knot; - Ruff; - Sanderling; - Dunlin***; - Redshank; - Mediterranean gull; - Lesser black-backed gull; • Breeding populations of the following species: <ul style="list-style-type: none"> - Herring gull; - Lesser black-backed gull; - Sandwich tern; - Little tern; - Common tern; • Waterfowl assemblage; and • Seabird assemblage. 	Adjacent to the south-western boundary of the Site
Duddon Estuary	Ramsar site	<ul style="list-style-type: none"> • Internationally important wintering populations of the following species: <ul style="list-style-type: none"> - Pintail; - Knot***; - Redshank***; • Wintering waterfowl assemblage of international importance; and • Waterfowl assemblage of national importance during spring and autumn passage. 	Adjacent to the south-western boundary of the Site
Morecambe Bay	Ramsar site	<ul style="list-style-type: none"> • Internationally important wintering populations of the following species: <ul style="list-style-type: none"> - Pink-footed goose; - Wigeon; - Goldeneye; 	11.4 km to the south-southwest

Site name	Designation	Qualifying ornithological interests/ features*	Approximate location in relation to the Site**
		<ul style="list-style-type: none"> - Red-breasted merganser - Great crested grebe; - Lapwing; - Golden plover***; - Bar-tailed godwit; - Knot***; - Dunlin***; • Internationally important spring/autumn passage populations of the following species: <ul style="list-style-type: none"> - Shelduck; - Pintail; - Eider; - Cormorant***; - Oystercatcher; - Grey plover; - Ringed plover; - Curlew; - Turnstone***; - Sanderling; - Redshank***; - Lesser black-backed gull; • Internationally important breeding populations of the following species: <ul style="list-style-type: none"> - Herring gull; - Lesser black-backed gull; - Sandwich tern; and • Wintering waterfowl assemblage of international importance; and • Staging area for migratory waterfowl including internationally important numbers of passage ringed plover. 	

*Information on qualifying ornithological features was taken from the following sources (last accessed 04/06/2019):

- Morecambe Bay & Duddon Estuary SPA: *Site Citation*. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/641980/morecambe-duddon-citation.pdf
- Duddon Estuary Ramsar site: *Information Sheet on Ramsar Wetlands*. Available online at: <http://jncc.defra.gov.uk/pdf/RIS/UK11022.pdf>
- Morecambe Bay Ramsar site: *Information Sheet on Ramsar Wetlands*. Available online at: <http://jncc.defra.gov.uk/pdf/RIS/UK11045.pdf>

**At the closest point

***A specific race (subspecies) is specified in the citation. With the exception of knot, for which the *islandica* race is specified, this is the nominate race (i.e. the first-named race of a species, which has the same scientific name the same as that for the species e.g. *Calidris alpina alpina* and *Tringa totanus totanus*); scientific names (genus and species) of all birds mentioned in this report are presented in Table A1-1, Appendix 1)

1.3.2 Statutory Sites of National and Local Importance

A number of statutory sites of national and local importance which support ornithological features were identified within 10 km of the Site. A summary is provided in Table 2.

Table 2: Summary of statutory sites of national and local importance within 10 km of the Site citing ornithological interests as a feature

Site name	Designation	Description of ornithological interests/features*	Approximate location in relation to the Site**
Duddon Estuary	SSSI	The SSSI is a component of the Duddon Estuary & Morecambe Bay SPA, and is partly designated for ornithological interests. It regularly supports large numbers of wintering waders and wildfowl, with internationally important numbers of pintail, knot and redshank, as well as nationally important numbers of shelduck, red-breasted merganser, oystercatcher, ringed plover, curlew, dunlin and sanderling on passage.	Adjacent to the south-western boundary of the Site
Millom Ironworks	LNR	The LNR supports a range of plant and animal species, including 20 bird species such as skylark and meadow pipit.	3.5 km to the east-northeast
Sandscale Haws	NNR	It is noted that the dune habitat within the NNR supports a high diversity of plants and animals, including large numbers of wintering wildfowl and waders.	5.3 km to the south-east of the Site
Duddon Mosses	SSSI	Although the SSSI is primarily designated for habitats/vegetation, the citation notes that the breeding bird community it supports includes grey heron, buzzard, curlew, woodcock, cuckoo, barn owl, tawny owl and nightjar.	6.5 km to the north-east of the Site
North Walney	NNR	Year-round ornithological interest is a key feature of the North Walney NNR, which supports breeding wildfowl, wintering waders, raptors and passage migrants.	6.9 km to the south-east of the Site
Duddon Mosses	NNR	Although the raised peatland habitat and specialist bog flora it supports are the key ecological features of this NNR, it is noted that raptors such as buzzard and barn owl hunt across the NNR, and waders and waterfowl such as pink-footed and geese also make use of the NNR in winter.	8.8 km to the north-east of the Site
Kirkby Moor	SSSI	Although the SSSI is primarily designated for habitats/vegetation, the citation notes that the SSSI supports breeding red grouse, curlew, and snipe, and provides feeding habitat for peregrine and raven.	8.9 km to the east of the Site
<p>*Information on qualifying ornithological features was taken from the following sources (last accessed 11/06/2019):</p> <ul style="list-style-type: none"> • Duddon Estuary SSSI Citation. Available online at: https://designatedsites.naturalengland.org.uk/PDFsForWeb/Citation/1000104.pdf • Duddon Mosses SSSI Citation. Available online at: https://designatedsites.naturalengland.org.uk/PDFsForWeb/Citation/1000199.pdf • Kirkby Moor SSSI Citation. Available online at: https://designatedsites.naturalengland.org.uk/PDFsForWeb/Citation/1006121.pdf • Duddon Mosses and North Walney NNR: https://www.gov.uk/government/publications/cumbrias-national-nature-reserves/cumbrias-national-nature-reserves • Sandscale Haws NNR: https://www.nationaltrust.org.uk/sandscale-haws-national-nature-reserve • Millom Ironworks LNR: http://friendsofmillomironworkslnr.btck.co.uk/ <p>**At the closest point</p>			

1.4 Summary of Initial Ornithological Consultation

A Discretionary Advice Service (DAS) request was made to Natural England (NE) in July 2018 relating to the scope of supporting information to be used in the assessment of ornithological and ecological impacts of a proposed life extension to the Development. A DAS consultation meeting with NE took place on 09/08/2018. Discussions during the meeting focussed on obtaining sufficient information to enable the competent authority to undertake an Appropriate Assessment of the proposals in the context of the Habitat Regulations. Existing reports containing relevant ecological and ornithological information were identified, and the proposed ornithological survey scope for the life extension to the Development was discussed. Following the meeting, Arcus issued a letter to NE (dated 10/09/2018) listing the available information and confirming the proposed survey scope. In their response (via email dated 18/09/2018) NE confirmed that the proposed survey scope was required.

In addition, NE advised is that a breeding bird survey should be undertaken in 2019 to update existing data, as well as vantage point (VP) surveys (between 01/05/2019 and 15/07/2019) to assess potential impacts on breeding gulls from the nearby SPA. It was further advised that methods of providing biodiversity net gain should be considered as part of the planning application (e.g. via a Habitat Management Plan, or through supporting local nature reserves). Reference was also made to NE guidance on bat survey requirements.

The Arcus letter and email response from NE are provided in Appendix 3. Subsequent consultation relating to the scope of ornithology surveys during the breeding season and bat surveys will be detailed in subsequent reports.

2 METHODS

Winter bird collision monitoring was completed each month between September 2018 and February 2019 (inclusive), with the aim of determining the level of bird collision mortality due to the Development, particularly for species that are designated features of the nearby statutory sites. This involved monthly searches for bird carcasses, together with trials to validate the search results. Deployment of items for the searcher efficiency trials was undertaken by Jim Harding; all other monitoring was completed by Matt Harding. The methods are described below.

2.1 Carcass Searches

Searches of all four turbines were undertaken once per month to record bird mortality due to turbine collisions. Carcass search dates were as follows²:

- September 2018: 27/09/2018;
- October 2018: 25 & 26/10/2018;
- November 2018: 22/11/2018;
- December 2018: 13 & 14/12/2018;
- January 2019: 23 & 24/01/2019; and
- February 2019: 13/02/2019.

Further details of each survey visit (including survey times, weather conditions and notable bird/mammal sightings) are provided in Table A4.1, Appendix 4.

During each carcass search, the ground within a 110 m grid centred on the base of each turbine was intensively visually searched to identify any evidence of bird collisions (i.e. bird carcasses or injured birds). Each of the turbine search areas, which are shown in Figure 4, Appendix 2, was divided into eleven transects, running north-south and parallel to each

² Some of survey visits were completed within a single day, while others were split over two consecutive days. However, the survey effort was the same for all visits, with each turbine searched once per survey visit.

other, 10 m apart. Each was slowly walked by the surveyor, scanning the ground ahead and to 5 m either side of the transect line for bird carcasses or other remains (e.g. feathers).

For all carcasses identified within the search area the following information was recorded:

- Species (and age/sex where this could be determined);
- Turbine number;
- Grid reference (to ten figures);
- Date and time of detection;
- Distance from the turbine base in metres, measured by GPS or tape measure;
- Notes on condition, including evidence of scavenging post-mortem, any apparent injuries, apparent/likely cause of death, apparent freshness and persistence.

2.2 Searcher Efficiency Trials

Monthly searcher efficiency trials were undertaken, during the course of each carcass search visit, to determine the efficiency of surveyors at detecting bird carcasses.

For practical reasons, and due to landowner permission issues related to the deployment of carcasses (see Section 2.4), food items (biscuits and bread rolls) were deployed in place of bird carcasses. The type of item was varied between survey visits.

This involved deployment of a variable number of items (between 3 and 21) at random locations within the turbine search area of two turbines per carcass search visit, and a second surveyor searching for them. The two turbines searched changed from visit to visit so that each turbine was searched a total of three times within the winter period.

2.3 Carcass Persistence Trials

Monthly carcass persistence trials were carried out to determine how long bird carcasses remained in situ until removed by scavengers. The aim of these trials was to determine how long bird carcasses are likely to be detectable following collision with turbines.

Each carcass persistence trial involved the deployment of a single, feathered and intact woodpigeon carcass within the carcass search area of turbine 1 (at British National Grid Reference SD 13450 79640) which was left undisturbed by surveyors. The carcass was monitored using a Bushnell Trophy camera trap affixed to fence posts. The trap was triggered by movement, with photographs taken every five seconds during periods of continuous triggering. The camera trap location is shown in Figure 4, Appendix 2.

The carcass trials commenced in January 2019 and were subsequently completed once per month, during the course of the monthly carcass searches. The camera trap was checked during each carcass search visit and memory cards/batteries replaced as required.

2.4 Survey Limitations

2.4.1 Carcass Searches

As landowner permission was limited to the area within the Site Boundary, some parts of the search area around all turbines was inaccessible. As far as possible, these areas were checked from within the adjacent Site Boundary using binoculars.

2.4.2 Searcher Efficiency Trials

The access restrictions noted above limited the areas within which search items could be deployed. In addition, as noted above, food items (biscuits and bread rolls) were deployed in place of bird carcasses. However, the type of item was varied between survey visits to minimise the potential for bias in levels of detectability.

2.4.3 Carcass Persistence Trials

Initially, landowner permission to deploy bird carcasses for the carcass persistence trials was not granted due to concerns relating to livestock welfare. Eventually it was agreed that bird carcasses could be deployed in a restricted area in the west of the Site, which is fenced off from livestock. Consequently, the carcass persistence trials did not commence until January 2019, and were limited to the search area around turbine 1.

Due to the limited area suitable for carcass deployment, the location of the camera trap could not be varied between survey visits to reduce the potential for resident scavengers becoming habituated to carcass provisioning.

Note, however, that the persistence of incidental observations of bird carcasses across the Site was monitored each month to give an indication of scavenger removal rates.

3 RESULTS

3.1 Carcass Searches

3.1.1 Bird Carcasses/Remains Found During Carcass Searches

The remains of a single herring gull were found just outside the search area of turbine 4 during the carcass searches at the Development. Full details are presented in Table 3. Although herring gull is also a qualifying interest of both the Morecambe Bay & Duddon Estuary SPA and the Morecambe Bay Ramsar site, this relates to the breeding population. No bird remains were observed within the carcass search area for the Development during the winter carcass searches.

Table 3: Summary of bird remains identified during the 2018-19 winter carcass searches

Carcass reference number	Date first recorded	Turbine no.	Distance (m) from turbine	Species (and age/ sex if determined)	Carcass condition	Apparent/ likely cause of death	Apparent freshness	Persistence
20181025T403	25/10/18	4	77	Herring gull (adult)	Right wing and skull	Potential collision	Did not appear to be freshly killed; potentially several weeks old	Remains persisted for seven weeks until wing removed on survey visit of 13/12/2018

3.1.2 Other Records of Bird Carcasses/Remains

In addition to the carcasses/remains found during the formal carcass searches, there were two incidental records of bird remains observed outside the formal carcass searches, as the surveyor was arriving on/leaving the Site. An additional nine carcasses or other remains were found during concurrent surveys at the adjacent Haverigg II Wind Farm. A summary of these records is presented in Table 4.

Table 4: Summary of incidental records of bird remains identified during the 2018-19 winter survey period

Carcass reference number	Date first recorded	Grid reference(s)	Species (and age/sex if determined)	Carcass condition (including any evidence of scavenging)	Apparent /likely cause of death	Apparent freshness	Persistence	Other notes
20180928NA02	28/09/18	SD 14232 79498	Herring gull (adult)	Wings and spine/breastbone only; feathers apparently plucked by raptor	Probable raptor (peregrine) kill	Did not appear to be freshly killed; potentially several weeks old	Some remains persisted for almost eight weeks – final observation during survey visit on 23/11/2018	Observed in east of Site, outside turbine area
20190214NA12	14/02/19	SD 14271 79525	Wader species probably redshank or spotted redshank	Upper mandible and feathers (plucked) only	Probable raptor kill	Appeared to be relatively freshly killed; likely only days old	N/A; collected for attempted species identification	Probably same individual recorded during formal carcass searches earlier on same date (carcass 20190214T310, detailed below)
20180928T301	28/09/18	SD 13671 79505	Wader species, possibly golden plover	Only right wing present	Unknown	Did not appear to be freshly killed; potentially several months old	N/A; remains collected for attempted species identification	Recorded during carcass searches at adjacent Haverigg II
20181026T104*	26/10/18	SD 13751 79316	Rook (juvenile)	Whole carcass; right thigh damaged, broken neck, external damage on neck	Collision	Appeared to be freshly killed; likely only days old	Remains gradually disappeared, but some persisted for almost 16 weeks – final observation	Recorded during carcass searches at adjacent Haverigg II

Carcass reference number	Date first recorded	Grid reference(s)	Species (and age/sex if determined)	Carcass condition (including any evidence of scavenging)	Apparent /likely cause of death	Apparent freshness	Persistence	Other notes
							(feather clumps) during survey visit on 14/12/2018	
20181214T305	14/12/18	SD 13709 79454	Raptor species, possibly short-eared owl	Only upper mandible and body feathers present	Potential collision	Appeared to be freshly killed; some congealed (but not fully dried) blood observed	N/A: remains collected for attempted species identification	Recorded during carcass searches at adjacent Haverigg II
20181214T306	14/12/18	SD 13711 79506	Falcon species (female), kestrel or merlin	Dismembered – two wings, tail feathers, legs and breastbone present; feathers possibly plucked	Potential collision	Appeared to be freshly killed; some congealed (but not fully dried) blood observed	Remains collected for attempted species identification, but some remaining feathers were present during subsequent survey visit on 23/01/2019	Recorded during carcass searches at adjacent Haverigg II

Carcass reference number	Date first recorded	Grid reference(s)	Species (and age/sex if determined)	Carcass condition (including any evidence of scavenging)	Apparent /likely cause of death	Apparent freshness	Persistence	Other notes
20190124T207	24/01/19	SD 13876 79058; SD 138757 9062; SD 138217 9094; and SD 13877 79051	Herring gull (adult)	Scavenged – feathers and part of one wing only,	Collision	Did not appear to be freshly killed; potentially several weeks old	Some remains persisted for three weeks – final observation during survey visit on 14/02/2019	Recorded during carcass searches at adjacent Haverigg II Remains spread around four locations: a group of feathers close to turbine, and sections of wing and flight feathers at three locations along fence line (possibly indicating scavenging)
20190124T108	24/01/19	SD 13799 79243; and SD 13806 79257	Woodpigeon	Feathers only	Probable raptor kill	Did not appear to be freshly killed; potentially several weeks old	Some remains persisted for three months – final observation during survey visit on 23/04/2019**	Recorded during carcass searches at adjacent Haverigg II Remains in two locations: a group of plucked feathers by fence line, and a small number of flight feathers at second location line (possibly indicating scavenging)
20190214T409	14/02/18	SD 13793 79665	Wader species	Scavenged – only wing sections (apparently bitten off by mammal) and feathers present	Unknown	Did not appear to be freshly killed; potentially several weeks old	N/A: remains collected for attempted species identification	Recorded during carcass searches at adjacent Haverigg II
20190214T310	14/02/18	SD 13668 79438	Wader species probably redshank or spotted redshank	Feathers only; apparently plucked by raptor	Probable raptor kill	Appeared to be relatively freshly killed; likely only days old	N/A: remains collected for attempted species identification	Recorded during carcass searches at adjacent Haverigg II Other remains (feathers and a partial bill) of a wader, probably the same individual, were recovered from outside turbine

Carcass reference number	Date first recorded	Grid reference(s)	Species (and age/sex if determined)	Carcass condition (including any evidence of scavenging)	Apparent /likely cause of death	Apparent freshness	Persistence	Other notes
								search area (carcass 20190214NA12, detailed above)
20190214T111*	14/02/18	SD 13698 79220	Herring gull (adult)	Whole carcass; breast opened by scavenger, and legs/tail missing, otherwise undamaged	Collision	Did not appear to be freshly killed; potentially several weeks old	Carcass persisted until at least 17/05/2019***	Recorded during carcass searches at adjacent Haverigg II
<p>**Recorded during formal carcass searches at Haverigg II, but located outside the turbine search area for this Development</p> <p>**Results of breeding season surveys will be included in a subsequent report</p> <p>*** Results of breeding season surveys will be included in a subsequent report; date of most recent search at the time of writing</p>								

3.2 Searcher Efficiency Trials

The total detection rate during the winter searcher efficiency trials at the Development ranged from 70.0% to 100% per visit, with an overall detection rate of 91.8% across the survey period. All items deployed at turbine 2 were found during all three searches of these turbines, while the total detection rates across all three searches of turbines 1, 3 and 4 ranged from 83.3% to 94.4%. A summary of the results during each search is provided in Table 5, while the detection rates per turbine and per item type are presented in Tables 6 and 7 respectively.

Detection rates during concurrent winter searcher efficiency trials at the adjacent Haverigg II Wind Farm were very similar, with an overall detection rate of 90.0% across the survey period.

Table 5: Summary of detection rates during each of the 2018-19 searcher efficiency trials

Month & year	Type of item deployed	Turbine no.	Detection rate per turbine	Detection rate per visit	Percentage of detections per visit
September 2018	Biscuit	3	4/5	7/10	70.0
		4	3/5		
October 2018	Bread roll	1	3/4	9/10	90.0
		2	6/6		
November 2018	Bread roll wrapped in cling film ³	3	6/6	12/12	100.0
		4	6/6		
December 2018	Bread roll wrapped in cling film ³	1	5/7	13/15	86.7
		2	8/8		
January 2019	Bread roll	3	7/7	13/13	100.0
		4	6/6		
February 2019	Biscuit	1	7/7	13/13	100.0
		2	6/6		
Total detections across survey period				67/73	91.8

Table 6: Summary of total detection rate per turbine during the 2018-19 searcher efficiency trials

Turbine no.	Total detection rate	Total percentage of detections
1	15/18	83.3
2	20/20	100.0
3	17/18	94.4

³ This was to give the item a paler appearance

Turbine no.	Total detection rate	Total percentage of detections
4	15/17	88.2

Table 7: Summary of total detection rate per item type during the 2018-19 searcher efficiency trials

Item type	Total detection rate	Total percentage of detections
Biscuit	20/23	87.0
Bread roll	22/23	95.7
Bread roll wrapped in cling film ³	25/27	92.6

3.3 Carcass Persistence Trials

The carcass deployed during the January trial was taken by a fox (*Vulpes vulpes*) seven days after deployment⁴, while the carcass deployed during the February trial was taken by a stoat (*Mustela erminea*) six days after deployment. Further details are presented in Table 8.

Rates of carcass persistence during concurrent trials at the adjacent Haverigg II Wind Farm were markedly higher, with carcasses persisting for a minimum⁵ of 36-56 days.

Table 8: Summary of the winter 2019 carcass persistence trial results

Trial number	Deployment date	Persistence period of carcass/ remains	Notes
1	24/01/2019	7 days ⁴	<ul style="list-style-type: none"> A cow inspected carcass on 25/01/2019 but did not disturb it. The only scavenger recorded was a fox, which visited/inspected carcass on multiple occasions on 30 & 31/01/2019, before removing it (on 31/01/2019). Trap checked during February visit on 13/02/2019 – carcass had been removed, although a small number of body feathers still present⁴.
2	13/02/2019	6 days	<ul style="list-style-type: none"> Carcass slightly disturbed (i.e. moved) by a cow on 14/02/2019, but remained in clear view). A stoat was recorded investigating carcass on a single occasion on 16/02/2019 but did not appear to disturb it. Carcass removed by a stoat on 19/02/2019 (6 days after deployment). Following carcass removal, deployment area was again inspected/visited by a stoat, as well as several other potential

⁴A small number of body feathers were still present at the start of the subsequent trial in February (20 days after carcass deployment). While these feathers were detectable, without prior knowledge that a carcass had been present they may not have been attributed to a mortality event because there were so few and small numbers of feathers are regularly blown across the Site.

⁵ The exact number of days that remains persisted could not be detected because some remains (feathers) were not visible on the camera trap photographs, and the surveyor only visited the Site on a monthly (rather than daily) basis, so remains may have persisted for several additional days in between survey visits.

Trial number	Deployment date	Persistence period of carcass/remains	Notes
			scavenger species: fox, badger (<i>Meles meles</i>) and brown rat (<i>Rattus norvegicus</i>). • Trap checked during March visit on 21/03/2019 – no remains evident.

4 SUMMARY OF KEY FINDINGS

4.1 Carcass Searches

- During the winter carcass searches, remains of a single herring gull were found within the turbine 4 search area. Herring gull is a qualifying interest of Morecambe Bay & Duddon Estuary SPA and the Morecambe Bay Ramsar site (although this relates to the breeding population). No other bird carcasses or other remains were observed within the turbine search area for the Development.
- Remains from up to 11 additional birds⁶ were found outside the formal carcass searches (nine during surveys at the adjacent Haverigg II Wind Farm, and two in other parts of the Site outside the search areas).
- Of the maximum total of 12 individual birds recorded⁶, herring gull was the species encountered most frequently (four individuals). There were also 3-4 waders⁶ (likely two different species), two raptors (likely two different species) and single woodpigeon and rook.
- Note that it is not certain that all the carcasses/remains were attributable to collision events, with evidence that up to four of the maximum total of 12 individual birds recorded⁶ (one herring gull, one woodpigeon and 1-2 waders) may have been the remains of raptor kills, and a further two for which likely cause of death could not be assessed (due to the condition of the remains).
- Of the maximum total of 12 individual birds recorded⁶, carcasses/remains from six persisted on the Site for several weeks or months, including some feathers from a bird that was collected to attempt species identification. The remaining six carcasses/remains were collected to attempt species identification.

4.2 Searcher Efficiency Trials

- Searcher efficiency trials indicated that the detection rate was high, with an overall detection rate of 91.8% across the survey period (and a comparable detection rate of 90.0% during concurrent trials at the adjacent Haverigg II Wind Farm).
- Across all searcher efficiency trials, detection rates varied from 83.32% at turbine 1 to 100% at turbine 2. Although both of these turbines are located within the motocross track, the area around turbine 1 includes large patches of tall, dense vegetation, rough/uneven ground and some ditches, while the area around turbine 2 is flatter and more open, with large areas of open sand.
- There was also some variation in detectability of deployed items, ranging from 87.0% for biscuits to 95.7% for bread rolls, suggesting that bird carcasses may be more easily detected at certain turbines, and detection rates could vary according to the type of remains (e.g. size, colour and shape).
- These results indicate that detectability is high ($\geq 70\%$), regardless of the location or size/type of remains.

⁶ One set of remains (20190214NA12) may have been from an individual (carcass 20190214T310) recorded during the formal carcass search completed on the same date (i.e. remains from a single bird present in two different locations, potentially due to scavenger activity)

- The majority of birds colliding with turbines and still in situ (i.e. not removed by scavengers) are therefore likely to be detected by surveyors during the carcass searches.

4.3 Carcass Persistence Trials

- Remains (feathers) from the carcasses persisted for seven and six days during the January and February trials respectively, indicating that carcasses/remains of birds colliding with turbines at the Development may only to persist for a few days.
- However, it is notable that carcass persistence rates during concurrent trials at the adjacent Haverigg II Wind Farm were markedly higher (a minimum⁵ of 36-56 days). Similarly, bird remains found during the carcass searches and other incidental records that were left in situ also persisted for a period of several weeks
- Given that only two carcass persistence trials were completed during the winter bird collision monitoring, it is possible that the variation in carcass persistence rates between the Development and the adjacent Haverigg II Wind Farm is a result of chance. Alternatively, it is possible that it may be at least partially associated with differences in use of the two areas by scavengers, e.g. due to differences in habitat (with higher levels of cover from dense vegetation and sand dunes present around the camera trap deployment location at the Development compared with that at the adjacent Haverigg II Wind Farm). Further carcass persistence trials during the breeding season may help to determine whether the initial results are spurious or represent typical levels of scavenger removal.
- Results of the carcass trials completed to date suggest that the number of birds present during the carcass searches may be an under-representation of the actual number of carcasses (i.e. additional bird carcasses are eaten/removed by scavengers before they are detected during monthly visits). Further carcass persistence trials during the breeding season may help to elucidate this.
- However, it is acknowledged that levels of removal by scavengers may vary at different times of year (e.g. rates may be higher when scavengers are breeding and have young to feed, and/or when other food resources are scarce), and may also vary across the Site (e.g. there may be more scavengers in areas with dense vegetation to provide cover), or possibly according to bird species (e.g. some bird species may be more palatable to scavengers than others).

5 CONCLUSION

Based on the results of the carcass persistence and searcher efficiency trials undertaken in parallel with the carcass searches to date, it is considered likely that the vast majority (at least 70%) of bird carcasses in situ (i.e. not removed by scavengers) at the time monitoring was carried out were detected. Initial results indicate that levels of collision mortality are relatively low. However, initial results also indicate high levels of scavenger removal at the Development, which may mean that many bird carcasses are removed before they can be detected. Further trials are being completed during the breeding season, the results of which will determine whether initial results represent typical levels of scavenger removal at the Development.

APPENDIX 1: BIRD SPECIES NAMES AND CONSERVATION DESIGNATIONS

Table A1-1 list provides English vernacular and scientific names for all bird species recorded during the survey. Taxonomic order and nomenclature is based on the BOU 'British List'¹.

Table A1-1: List of English vernacular and scientific names of bird species mentioned in this report

Species*		Schedule 1/ Annex I listings	Birds of Conservation Concern (BoCC) ⁷ listing**	Listed on Schedule 41 of the NERC (2006) Act ⁸
English (British) vernacular name	Scientific name			
Pink-footed goose	<i>Anser brachyrhynchus</i>	-	Amber	-
Unidentified goose species	<i>Anser sp.</i>	Unknown	Unknown	Unknown
Whooper swan	<i>Cygnus cygnus</i>	Annex I; Schedule 1	Amber	-
Shelduck	<i>Tadorna tadorna</i>	-	Amber	-
Wigeon	<i>Mareca penelope</i>	-	Amber	-
Pintail	<i>Anas acuta</i>	-	Amber	
Eider	<i>Somateria mollissima</i>	-	Amber	-
Goldeneye	<i>Bucephala clangula</i>	-	Amber	-
Red-breasted merganser	<i>Mergus serrator</i>	-	-	-
Red grouse	<i>Lagopus lagopus</i>	-	Amber	✓
Great crested grebe	<i>Podiceps cristatus</i>	-	-	-
Grey heron	<i>Ardea cinerea</i>	-	-	-
Little egret	<i>Egretta garzetta</i>	Annex I	-	-
Cormorant	<i>Phalacrocorax carbo</i>	-	-	-
Buzzard	<i>Buteo buteo</i>	-	-	-
Oystercatcher	<i>Haematopus ostralegus</i>	-	Amber	-
Lapwing	<i>Vanellus vanellus</i>	-	Red	✓
Golden plover	<i>Pluvialis apricaria</i>	Annex I	-	-
Grey plover	<i>Pluvialis squatarola</i>	-	Amber	-
Ringed plover	<i>Charadrius hiaticula</i>	-	Red	-
Curlew	<i>Numenius arquata</i>	-	Red	✓
Bar-tailed godwit	<i>Limosa lapponica</i>	Annex I	Amber	

⁷ Eaton, M.A., Aebischer, N.J., Brown, A., Hearn, R.D., Lock, L., Musgrove, A.J., Noble, D.G., Stroud, D.A., and Gregory, R.D. 2015. Birds of Conservation Concern 4: the population status of birds in the UK, Channel Islands and Isle of Man. *British Birds* 108, 708-746.

⁸ Natural Environment and Rural Communities (NERC) Act 2006: <http://www.legislation.gov.uk/ukpga/2006/16/contents>

Species*		Schedule 1/ Annex I listings	Birds of Conservation Concern (BoCC) ⁷ listing**	Listed on Schedule 41 of the NERC (2006) Act ⁸
English (British) vernacular name	Scientific name			
Black-tailed godwit	<i>Limosa limosa</i>	Schedule 1	Red	✓
Turnstone	<i>Arenaria interpres</i>	-	Amber	-
Knot	<i>Calidris canutus</i>	-	Amber	-
Ruff	<i>Calidris pugnax</i>	Annex I; Schedule 1	Red	-
Sanderling	<i>Calidris alba</i>	-	Amber	-
Dunlin	<i>Calidris alpina</i>	Annex I	Amber	-
Woodcock	<i>Scolopax rusticola</i>	-	Red	-
Snipe	<i>Gallinago gallinago</i>	-	Amber	-
Redshank	<i>Tringa totanus</i>	-	Amber	-
Spotted redshank	<i>Tringa erythropus</i>	-	Amber	-
Black-headed gull	<i>Chroicocephalus ridibundus</i>	-	Amber	-
Mediterranean gull	<i>Ichthyaetus melanocephalus</i>	-	Amber	-
Common gull	<i>Larus canus</i>	-	Amber	-
Great black-backed gull	<i>Larus marinus</i>	-	Amber	-
Herring gull	<i>Larus argentatus</i>	-	Red	✓
Lesser black-backed gull	<i>Larus fuscus</i>	-	Amber	-
Sandwich tern	<i>Thalasseus sandvicensis</i>	Annex I	Amber	-
Little tern	<i>Sternula albifrons</i>	Annex I; Schedule 1	Amber	-
Common tern	<i>Sterna hirundo</i>	Annex I	Amber	-
Woodpigeon	<i>Columba palumbus</i>	-	-	-
Cuckoo	<i>Cuculus canorus</i>	-	Red	✓
Barn owl	<i>Tyto alba</i>	Schedule 1	-	-
Tawny owl	<i>Strix aluco</i>	-	Amber	-
Short-eared owl	<i>Asio flammeus</i>	Annex I	Amber	-
Nightjar	<i>Caprimulgus europaeus</i>	Annex I	Amber	✓
Kestrel	<i>Falco tinnunculus</i>	-	Amber	-
Merlin	<i>Falco columbarius</i>	Annex I; Schedule 1	Red	-
Peregrine	<i>Falco peregrinus</i>	Annex I; Schedule 1	-	-

Species*		Schedule 1/ Annex I listings	Birds of Conservation Concern (BoCC) ⁷ listing**	Listed on Schedule 41 of the NERC (2006) Act ⁸
English (British) vernacular name	Scientific name			
Rook	<i>Corvus frugilegus</i>	-	-	-
Raven	<i>Corvus corax</i>	-	-	-
Skylark	<i>Alauda arvensis</i>	-	Red	✓
Starling	<i>Sturnus vulgaris</i>	-	Red	✓
Meadow pipit	<i>Anthus pratensis</i>	-	Amber	-
<p>* Species names and order follow the British List maintained by the BOU¹ **Where no BoCC status is shown, birds are Green-listed (i.e. of lowest conservation concern)</p>				

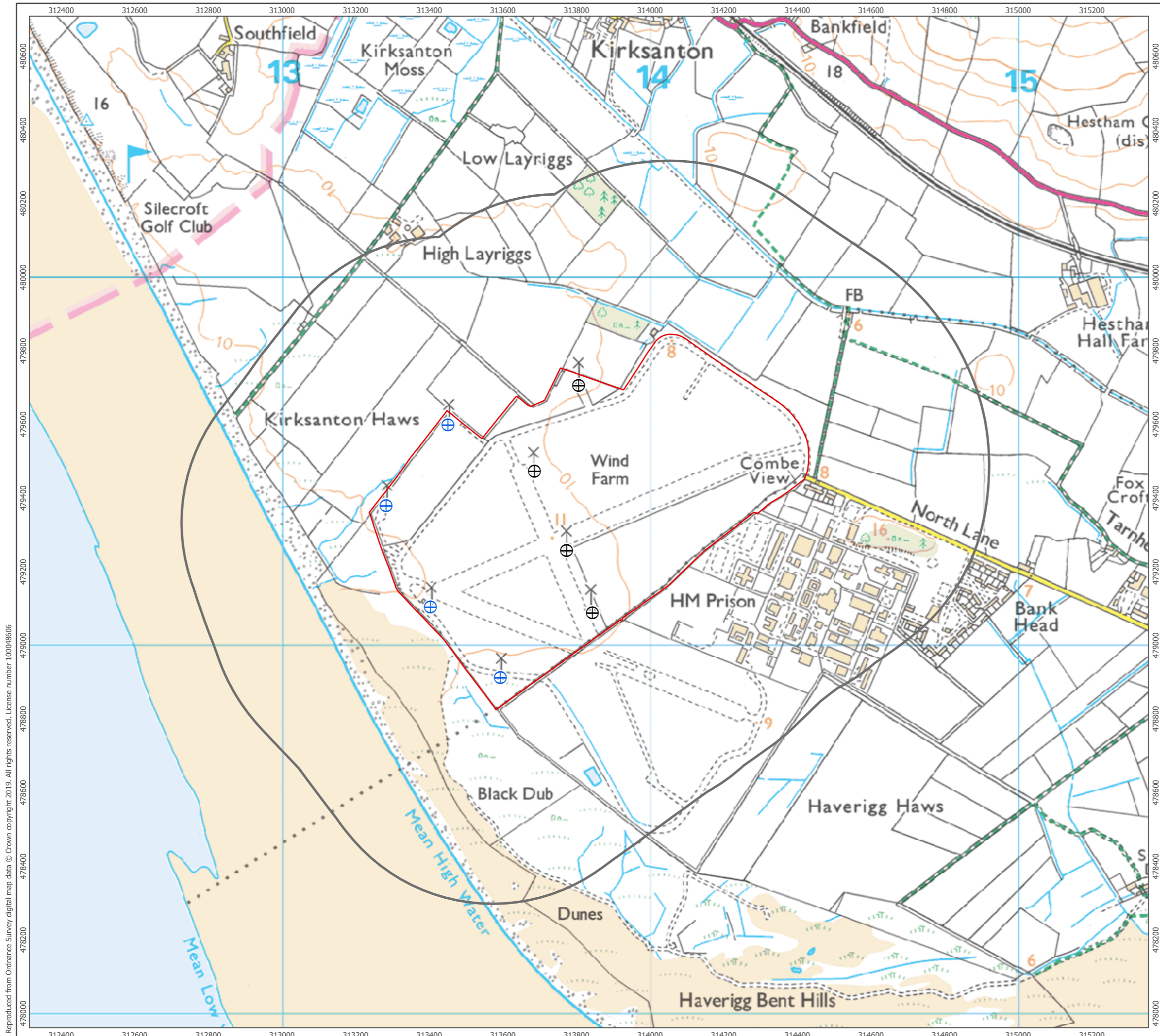
APPENDIX 2: FIGURES





Figure 1: Development Location

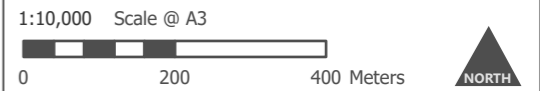
Figure 2: Statutory Sites of European Importance within 20 km

Figure 3: Statutory Sites of National Importance within 20 km

Figure 4: Collision Monitoring Survey Areas



-  Haverigg III Turbines (the Development)
-  Haverigg II Turbines
-  Site Boundary
-  Ornithology Study Area

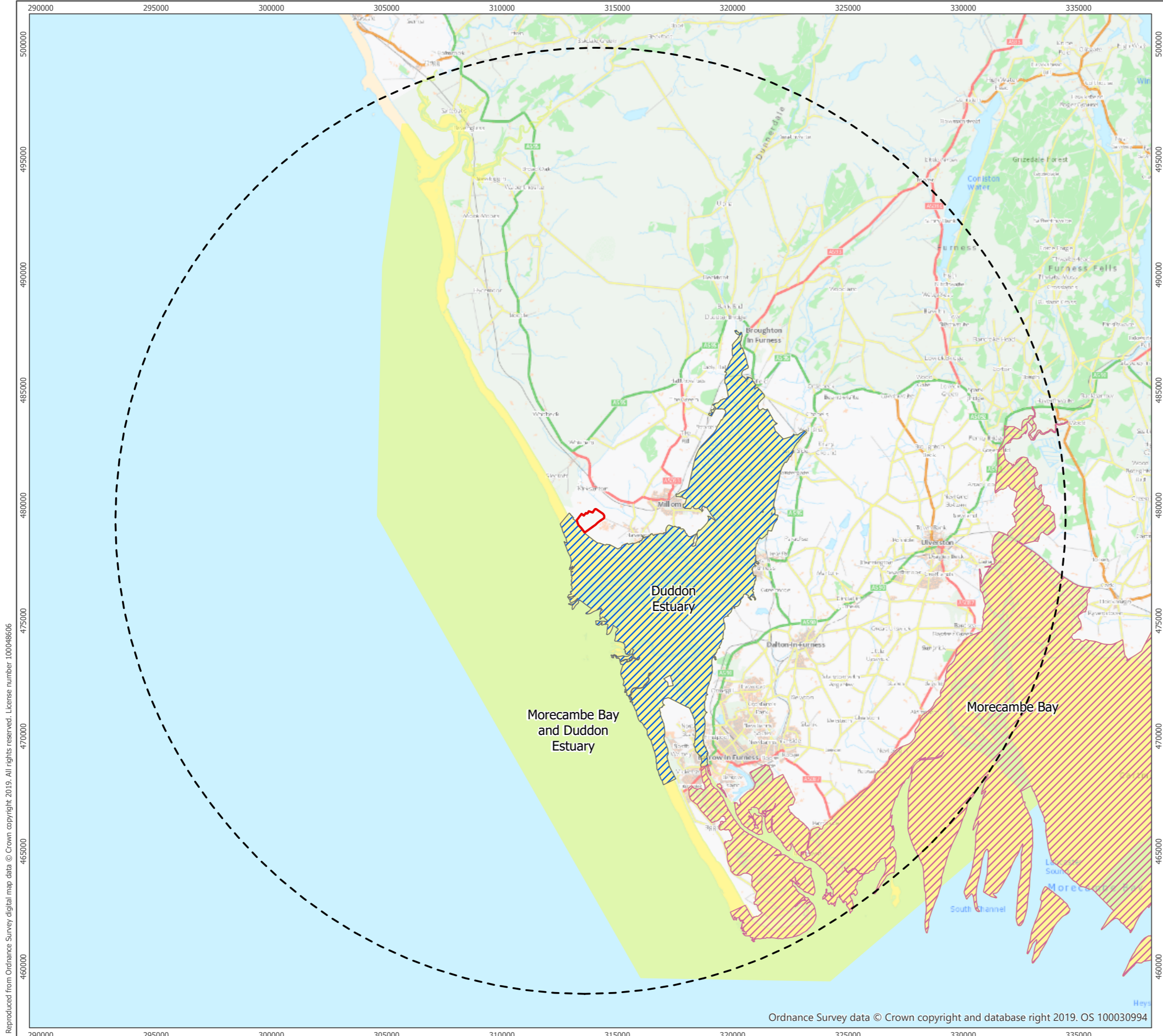


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Checked By: SC	Date: 16/07/2019

Development Location
Figure 01

**Haverigg III Wind Farm Life Extension
Winter Ornithology Report 2018-19**

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Windcluster



- Site Boundary
- 20 km Buffer of Site Boundary
- Duddon Estuary Ramsar
- Morecambe Bay Ramsar
- Morecambe Bay & Duddon Estuary SPA

1:160,000 Scale @ A3



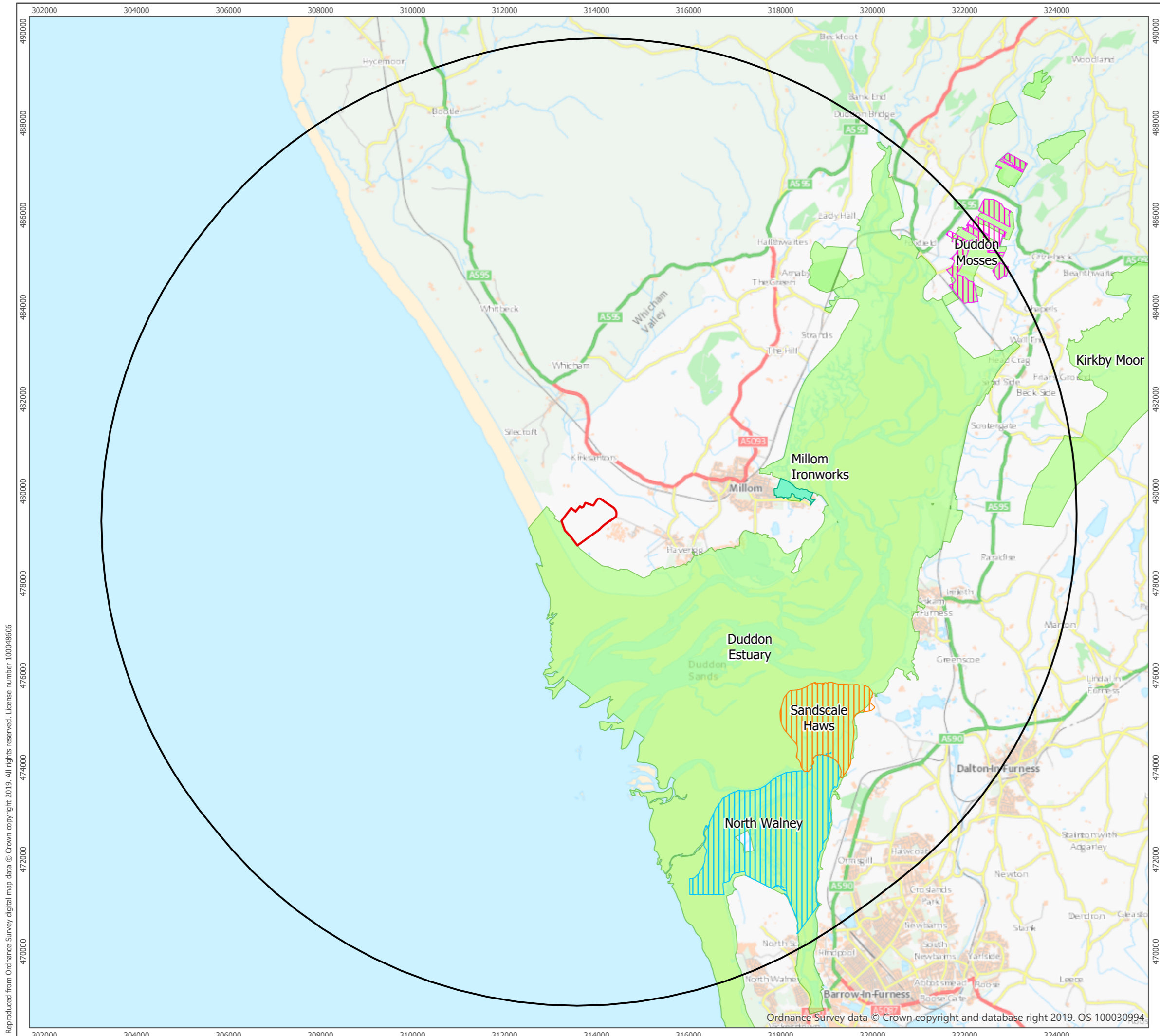
Produced By: LC	Ref: 3344-REP-007
Checked By: SC	Date: 16/07/2019

Statutory Sites of Ornithological Importance within 20 km
Figure 02

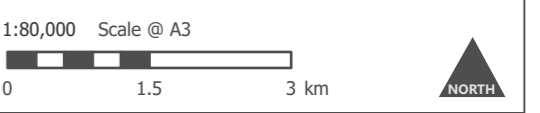
Haverigg III Wind Farm Life Extension Winter Ornithology Report 2018-19

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- Site Boundary
- 10 km Buffer of Site Boundary
- Millom Ironworks LNR
- Duddon Mosses NNR
- North Walney NNR
- Sandscale Haws NNR
- Sites of Special Scientific Interest (SSSI)



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Statutory Sites of National Importance within 10 km
Figure 3

Haverigg III Wind Farm Life Extension Winter Ornithology Report 2018-19

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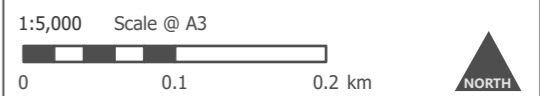
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Windcluster



- Site Boundary
- Haverigg III Turbines
- Ornithology Study Area
- ★ Camera Trap Location



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Collision Monitoring Survey Areas
Figure 4

Haverigg III Wind Farm Life Extension
Winter Ornithology Report 2018-19

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APPENDIX 3: DETAILS OF CONSULTATION WITH NATURAL ENGLAND RELATING TO WINTER BIRD COLLISION MONITORING

- Letter from Arcus summarising existing information and confirming proposed survey scope
- Email response from Natural England



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3 Swinegate
York
YO1 8AJ

Kate Berry
Advisor – Cumbria Team
Natural England
Lake District National Park Building
Murley Moss Business Park
Oxenholme Road
Kendal
Cumbria
LA9 7RL

10 September 2018

Our Reference: 2022/NE_DAS
Natural England Reference: 252221
Copeland BC Reference: 4/02/0505/0

Dear Kate,

Haverigg III Wind Farm – Life Extension Application – Scope of Ornithological and Ecological Surveys

At the meeting between Natural England and Windcluster (supported by Arcus) in Kendal on 9 August 2018 we discussed the scope of supporting information to be used in the assessment of ornithological and ecological impacts of a proposed life extension to Haverigg III Wind Farm (the Development). The focus of discussion was on obtaining sufficient information to enable the competent authority to undertake an appropriate assessment of the proposals in the context of the Habitat Regulations.

During our meeting, we discussed the availability of other survey information from adjacent wind farms, and the likely suitability of that information for use in support of a life extension application for the Development.

Available Information

The following additional information is available for use in support of the application for the Development either through being publicly available (e.g., online) or through agreement with the owners of the reports.

A summary of the surveys completed in relation to these reports is presented in Table 1.

Table 1: Summary of ornithology and ecology surveys completed at the operational HMP Haverigg and Haverigg II Wind Farms for which results are available for use in support of the application for the Development*

Site	Relevant Document	Survey period	Surveys completed
Ornithology Surveys			
Haverigg II Wind Farm (Operational Monitoring)	Wintering Birds Report 2014-15	August 2014 to March 2015	<ul style="list-style-type: none"> • Vantage Point Surveys • Winter field count surveys (fortnightly) Nocturnal Surveys (8 visits at approximately monthly intervals)
HMP Haverigg Wind Farm (Baseline Surveys)	Ornithology Chapter of Environmental Statement Written Statement (2013)	March 2009 to March 2010	<ul style="list-style-type: none"> • Vantage Point Surveys • Breeding bird survey • Winter walkover survey
Non-avian Ecology Surveys			
Haverigg II Wind Farm (Operational Monitoring)	Natterjack Toad Survey 2015	June and July 2014; and April to June 2015	<ul style="list-style-type: none"> • Natterjack Toad Survey
HMP Haverigg Wind Farm (Baseline Surveys)	Ecology Chapter of Environmental Statement Written Statement (2013)	Various areas surveyed between August 2009 and August 2011; most surveys completed in 2010	<ul style="list-style-type: none"> • Phase 1 Habitat Survey • Invertebrate Survey • Reptile Survey • Great Crested Newt Surveys • Natterjack Toad Surveys • Bat Activity Surveys
*The most recent surveys are listed first			

It is understood that Natural England may have access to some of the above information and potentially further detail and other reporting from the area in their internal archives. If there is other information Natural England would like to be used in the assessment please let us know.

Scope of Surveys

During the 9 August meeting, we agreed that due to the nature of the application as a life extension rather than new Development, subject to the availability of the above information for use in support of the application, it was likely that further ornithological site survey could be limited to carcass searches in the immediate vicinity of the Haverigg III Wind Farm turbines.

Arcus therefore proposes that the following surveys are undertaken in support of the Development in order to provide an appropriate baseline for assessment in the planning application (whether EIA or non-EIA) and to provide the necessary information to inform an appropriate assessment:

- Extended Phase 1 Habitat Survey of the Development site (to confirm that the habitats are consistent with those present during other surveys).
- Carcass Searches – Monthly search of each turbine within a radius of 50 m of the turbine base. Regular carcass persistence and observer efficiency trials would also be completed to validate the results of the carcass searches.

All other information relating to protected species and habitats (*e.g.*, the range of surveys suggested in the DAS Report¹) will be sourced from the existing written information referred to in this letter, and updated desk-studies.

It would be much appreciated if you could confirm that the survey approach set out is considered to form an appropriate baseline for the Development and is acceptable to Natural England.

Timescales

Windcluster currently expects to undertake the above carcass search surveys from September 2018 to August 2019 and to submit an application for the Development in Quarter 4 2019. We expect to consult with Natural England again to present the survey results and a draft assessment prior to the application submission.

It would be appreciated if Natural England could respond to this letter by Wednesday 19 September 2018 to enable the appropriate surveys to commence in September 2018.

If you have any queries in respect of this letter please do not hesitate to contact the undersigned.

Yours sincerely,



Mike Bird

Associate Director

cc. Planning Department, Copeland Borough Council

Encs. Haverigg II Repowering Natterjack Toad survey 2015, Haverigg II Repowering Wintering Birds Report 2014-15 compressed, HMP Haverigg ES_ Written Statement – PFR [all available to download [HERE](#)]

¹ Arcus Consultancy Services Ltd (July 2018). DAS Request – Supporting Information

From: Berry, Kate (NE) <Kate.Berry@naturalengland.org.uk>
Sent: Tuesday, September 18, 2018 2:24 PM
To: Mike Bird <mikeb@arcusconsulting.co.uk>
Subject: NE response: Scope of Ecology and Ornithology Surveys

Hi Mike

Thank you for sending through a scoping request for the ornithology surveys required to support the time extension application for Haverigg III wind farm.

A Phase 1 Habitat Survey and Carcass Search survey are required as outlined.

In addition, and to supplement the existing field data that has been collected in support of the neighbouring sites, our advice is that a further standard breeding bird survey should be undertaken for 2019. The existing breeding bird survey data available to support this application is from 2009 and therefore needs updating. In addition to this, and to supplement the breeding bird survey data and carcass searches, we advise that vantage point surveys are undertaken 1st May – 15th July 2019 to assess the impacts of the turbines on breeding SPA gulls.

The existing data and these additional surveys should provide enough information with regards ecological concerns and specifically have the right information to allow an HRA to be completed in due course.

Due to the lack of baseline data to be used for comparison for the Haverigg III turbines we also advise you consider ways of providing any biodiversity net gain in this application. All new development should leave the natural environment in a measurably better state than it was beforehand as outlined in the recently revised [National Planning Policy Framework](#).

The HMP Haverigg application was accompanied by a Habitat Management Plan. Is this something you would be able to offer? Or alternatively maybe contributions to the RSPB to increase gull numbers at Hodbarrow (e.g. contribute to rafts); support management at Hodbarrow/ other reserve sites in the area; support Natterjack management etc.?

With regards to bat survey requirements please see our [standard guidance note](#).

In terms of ongoing advice, as you have outlined that you are not likely to need further advice from us until Autumn 2019, it may be best if we close the current contract we have and set up a new one in the next financial year for any further advice as needed. From the current contract we have currently charged £330 for the meeting on the 9th August and before closing it down will invoice £220 for the 2 hours we have spent reviewing and responding to this request.

I hope the above is helpful

Kind Regards

Kate

Kate Berry
Adviser
Cumbria Team

Tel: 0208 026 2178
Mob: 07795 590192

Please note I do not work Wednesdays

APPENDIX 4: CARCASS SEARCH DETAILS

Full details of the 2018-19 winter carcass searches are presented in Table A4.1 below.

Table A4.1: Details of the 2018-19 winter carcass searches

Survey date	Turbine number	Search start time	Search end time	Weather conditions at start and end of search					Notable observations of birds and mammals
				Wind speed	Wind direction	Rain	Cloud cover	Notes	
27/09/18	4	12:57	13:35	5	SW	0	2/8		
	3	14:32	15:15						
	2	16:00	16:30						
	1	17:00	17:20						
25/10/18	4	15:27	16:01	5-6	W	0-1	8	Dull light	
	3	16:10	17:00						
26/10/18	2	09:00	09:42	4	N/NW	0	5-3	Heavy rain during the previous night	
	1	10:04	10:40						
22/11/18	4	12:34	13:01	3	E	2-0	8	Heavy rain shortly before search	<ul style="list-style-type: none"> Flocks of curlew, starlings, corvids and gulls feeding in east of site (outside turbine envelope); Kestrel observed near turbine 1; Badger and otter (<i>Lutra lutra</i>) tracks also noted near turbine 1
	3	14:00	14:30						
	2	14:42	15:02						
	1	15:12	15:38						
13/12/18	2	13:45	14:16	6	SE	0	4-3	Low light angle towards end of carcass search	<ul style="list-style-type: none"> 200+ curlew, 100+ lapwing, 100+ golden plover, single redshank, plus skylarks, starlings, corvids, herring gulls and black-headed gulls foraging/roosting in east of the Site; Skins of pink-footed and unidentified geese also observed flying over Site
	1	14:36	15:05						
	3	15:15	15:45						

Survey date	Turbine number	Search start time	Search end time	Weather conditions at start and end of search					Notable observations of birds and mammals
				Wind speed	Wind direction	Rain	Cloud cover	Notes	
14/12/18	4	09:55	10:27	3	SE	0	1	Low light angle	<ul style="list-style-type: none"> • 120+ curlew flew through turbine envelope; • Three golden plover also present within turbine envelope
23/01/19	2	12:54	13:20	2	SE	0	1-7	Strong sunlight; frost overnight	<ul style="list-style-type: none"> • Approximately 15 snipe in flooded field north of turbine 1 and single grey heron on nearby pool • 30+ golden plover, 170+ lapwing, starling flock, 100+ black-headed/common gulls, 20+ herring gulls, two great black-backed gulls and corvid flock foraging/roosting in east of Site; • Approximately 1,000 pink-footed geese to east of Site. • Fox tracks noted around turbines 1 and 2, and lagomorph tracks also noted around turbine 1
	1	13:23	13:43						
24/01/19	4	10:39	11:09	2	E	0	8-6	Heavy rain overnight; dull light in morning brightening in afternoon	
	3	13:19	13:45						
13/02/19	1	13:25	14:00	4	SSW	0	8		<ul style="list-style-type: none"> • 30 lapwing, flock of 100+ gulls (predominantly herring gull with smaller numbers of lesser black-backed, great black-backed and black-headed gulls) and corvid flock in east of Site; • 200+ pink-footed geese also foraging in east of Site; • Kestrel observed near turbine 1; • 50 starlings feeding near turbine 3
	2	14:17	14:51						
	3	15:06	15:35						
	4	15:39	16:06						
Key: <ul style="list-style-type: none"> • Wind speed: according to Beaufort Scale • Wind direction: according to 16-point compass • Rain: 0 = None; 1 = Drizzle/Mist; 2 = Light showers; 3 = Heavy showers; 4 = Light rain; 5 = Heavy rain • Cloud cover: in eighths of sky (oktas) 									