



ARCUS

ECOLOGICAL APPRAISAL

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

WINDCLUSTER LTD

SEPTEMBER 2019



Prepared By:

Arcus Consultancy Services

Suite 1C
Swinegate Court East
York
North Yorkshire
YO1 8AJ

T +44 (0)1904 715 470 | **E** info@arcusconsulting.co.uk
w www.arcusconsulting.co.uk

Registered in England & Wales No. 5644976

TABLE OF CONTENTS

EXECUTIVE SUMMARY	II
1 INTRODUCTION	1
1.1 Site Description	1
2 METHODS	1
2.1 Desk Study.....	1
2.2 Ecological Walkover	2
2.2.1 Preliminary Bat Appraisal.....	2
2.3 Carcass Searches.....	2
2.4 Searcher Efficiency Trials	3
2.5 Carcass Persistence Trials	3
2.6 Survey Limitations.....	3
3 RESULTS	4
3.1 Desk Study Results.....	4
3.1.1 Designated Sites.....	4
3.1.2 Protected Species	4
3.1.3 Aerial Imagery.....	5
3.1.4 Cumulative Effects	5
3.2 Ecological Walkover Survey Results	5
3.2.1 Site Overview	5
3.3 Preliminary Bat Appraisal.....	6
3.3.1 Roost Potential	6
3.3.2 Foraging Potential.....	7
3.3.3 Commuting Potential and Connectivity.....	7
3.3.4 Non-native Invasive Species	8
3.4 Carcass Searches.....	8
3.5 Searcher Efficiency Trials	8
3.6 Carcass Persistence Trials	9
4 DISCUSSION	9
5 CONCLUSION.....	11
APPENDIX A: FIGURES.....	12
APPENDIX B: PHOTO LOG	14

EXECUTIVE SUMMARY

Arcus Consultancy Services Ltd ('Arcus') was commissioned by Windcluster Ltd (the 'Applicant') to undertake an Ecological Appraisal of a parcel of land ('the Site') at Haverigg III Wind Farm, (the 'Development') in Cumbria.

No potential effects of extending the operational phase of the Development are anticipated on any form of non-avian ecology, except for bats; this report therefore focuses on bats. However, in accordance with CIEEM guidance, the Site was assessed for all protected species at the time of the survey.

An initial desk-based assessment to search for records of bats within 10 km of the Site was undertaken. A survey of the site was undertaken in April 2019 which assessed habitats for their potential to support commuting, foraging, and roosting bats. The survey covered the Site and a buffer extending up to 200 m from the Land Ownership Area (referred to throughout as 'Survey Area'). During the survey, a ground-level assessment of the suitability of trees, buildings and other structures to support bat roosts and/or provide commuting or foraging habitat was undertaken. Carcass searches of all four turbines were undertaken once per month from April to August, and monthly searcher efficiency trials were also undertaken. Carcass persistence trials were undertaken once a month from April to September.

The desk-based assessment identified no statutory sites designated for bats within 10 km of the Survey Area. 128 bat species records were returned within 10 km of the Survey Area.

The majority of the Survey Area is sheep-grazed and comprised grassland and hardstanding, providing limited foraging potential for bats. The Survey Area is largely devoid of linear features that could be used by commuting bats. No trees are present within the Site. The only onsite building is a substation which, due to its condition, was considered to provide negligible potential for roosting bats. The Study Area has therefore been classed as having 'negligible' suitability for bats.

Carcass persistence trials show that a 'carcass' would potentially remain for at least 12 hours, and the frequency of survey visits suggest that had turbine-bat collisions been a regular occurrence, carcasses would have been detected. The carcass searches at the Site had a detection rate of 67% on average. No bat carcasses were recorded during the searches.

Collision risk has been assessed as low, due to the limited foraging potential, limited connectivity to good-quality habitat, and no evidence of mortality. The Survey Area is coastal, with no existing links to wider areas of suitable habitat. Low-lying woodland in the northeast corner of the Survey Area is below turbine height and located over 150 m from the nearest turbine tip. It is therefore unlikely that commuting bats would be at such a height to come into contact with the blades.

It is possible that the wind farm displaces individual bats, due to bats avoiding the area; however, the weather conditions (largely high wind speeds due to placement on the coast) make it unlikely that bats would be preferentially using the area.

The life extension of the Development is considered to have a negligible effect on bats.

1 INTRODUCTION

Arcus Consultancy Services Ltd ('Arcus') was commissioned by Windcluster Ltd (the 'Applicant') to undertake an Ecological Appraisal of a parcel of land ('the Site') at Haverigg III Wind Farm (the 'Development') in Cumbria. The results of the ecological appraisal will be used to inform an application to vary the planning permission for the existing Development to extend the operational period from 2025 to 2040.

Haverigg III Wind Farm comprises four Vestas V52 wind turbines with a height to blade tip of 76 m and supporting infrastructure (access tracks, switchgear). The total generating capacity of the Haverigg III Wind Farm is 3.4 MW. Planning permission was granted for the Haverigg III Wind Farm in 2002 (planning ref: 4/02/0505/0) and was constructed in 2005 (hereafter referred to as the 'Development').

This report details the ecological baseline conditions and likely potential ecological constraints to the extension of the wind farm in this location, taking into account relevant planning policy and legislation. No potential effects of extending the operational phase of the Development are anticipated on any form of non-avian ecology except bats. Therefore, the remainder of this report focuses on bats.

Further mitigation, where applicable, has been described in order to provide additional information for assessing effects and to inform recommendations to avoid or reduce potential adverse ecological impacts.

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

For the purposes of this report, 'Site' refers only to Haverigg III Wind Farm, whereas Survey Area refers to both wind farms plus a buffer of 200 m from the boundary of each wind farm, as shown in Figure 1 of Appendix A.

1.1 Site Description

The Development is located approximately 2 km west of Haverigg, Cumbria. It comprises four operational onshore wind turbines. It is sited west of HMP Haverigg (a prison), 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 Land Ownership Area, Survey Area (encompassing both wind farms) and turbine locations of both wind farm developments are shown in Figure 1, in Appendix A.

The southern part of the Site largely comprises intensively grazed grassland, while the northern part of the Site is a section of the motocross track which spans Haverigg II and Haverigg III Wind Farms.

2 METHODS

2.1 Desk Study

Bat records within 10 km of the Site were requested from Cumbria Biodiversity Data Centre (CBDC). A search for national and internationally designated sites for bats within 10 km of the Site was undertaken using publicly available data. A search of online geographical data sources was undertaken to identify known bat roosts in order to further determine local distribution of bat species. This information was assessed in relation to the species' known range.

Aerial imagery, maps and habitat survey maps (where available) were reviewed to identify features of potential value for bats. Cumulative effects were taken into consideration through a review of Local Planning Authority websites to check for the presence of single turbines, major infrastructure developments or any other developments that may have an effect on local bat populations within the area.

2.2 Ecological Walkover

A survey of the Site was undertaken on 17th April 2019 by Senior Ecologist Caroline Airson MCIEEM¹ (Natural England Bat Licence: 2015-16953-CLS-CLS). The aim of this survey was to assess habitats for their potential to support commuting, foraging, and roosting bats. The survey covered the Site and the Survey Area, as shown on Figure 1 in Appendix A.

2.2.1 Preliminary Bat Appraisal

A ground-level preliminary appraisal of the suitability of trees, buildings and other structures to support bat roosts and/or provide suitable commuting or foraging habitat was undertaken with reference to Bat Conservation Trust (BCT)² survey guidelines. This initial bat appraisal would inform whether or not further surveys would be required to assess the potential effects of the Development on bats. Habitats and any features, e.g. trees, within Survey Area were classified according to their 'Roost Suitability'. Should evidence of bats be recorded, or the features assessed to provide suitability to support bats, further surveys may be required. Further surveys inform the requirement to apply for a European Protected Species Mitigation (EPSM) licence from Natural England to ensure that works are legally compliant.

2.3 Carcass Searches

Searches of all four turbines were undertaken once per month during the 2019 bat survey season (April to August) to record bat mortality due to turbine collisions. Carcass search dates were as follows:

- April 2019 – 23 & 24/04/2019;
- May 2019 – 16 & 17/05/2019;
- June 2019 – 20 & 21/06/2019;
- July 2019 – 16 & 17/07/2019; and
- August 2019 – 22 & 23/08/2019.

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 bat collisions (i.e. bat carcasses or injured bats). The search area was divided into eleven transects, running north-south and parallel to each 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 bat carcasses or other remains (e.g. wings).

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; and

¹ Associate member of the Chartered Institute of Ecology and Environmental Management

² Collins, J. (ed.) (2016) *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (3rd ed.). The Bat Conservation Trust, London.

- Notes on condition, including evidence of scavenging post-mortem, any apparent injuries, apparent/likely cause of death, apparent freshness and persistence.

2.4 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 bat carcasses.

For practical reasons, and due to landowner permission issues related to the deployment of carcasses (see Section 2.6), food items (mini Mars bars) were deployed in place of mouse carcasses, which are normally used as substitute bat carcasses. The location of items was varied between survey visits to minimise the potential for bias in levels of detectability.

This involved deployment of a variable number of items (between 2 and 6) 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 season.

2.5 Carcass Persistence Trials

Monthly carcass persistence trials were carried out between April and September 2019 to determine how long carcasses remained *in situ* until removed by scavengers. The aim of these trials was to determine how long bat carcasses are likely to be detectable following collision with turbines.

Each carcass persistence trial involved the deployment of pieces of spam within the carcass search area of turbine 3 (at British National Grid Reference SD 13747 79727) 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. Bird carcasses were also placed in conjunction with the spam assessments for ongoing ornithology works, with species likely to scavenge bird carcasses also likely to scavenge bat carcasses.

The camera trap was checked during each carcass search visit and memory cards/batteries replaced as required.

2.6 Survey Limitations

The Ecological Walkover Survey was undertaken in April, and therefore at an optimal period for habitat surveys (April – September, inclusive). Access to all sections of Haverigg III Wind Farm was possible, therefore there are considered to be no restrictions to that survey.

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 and spam 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 3 on Haverigg III.

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.

It is important to 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.

Carcass searches were only completed between April and August; however, bat activity season extends from April to October, meaning there are potentially two months of missing data. May to August provides the peak monitoring period according to the Bat Conservation Trust² and the guidelines state that for April, September and October, these months are weather- or location-dependent and may not be suitable due to spring and autumn weather conditions. It was considered that the high exposure of the Haverigg site with known cold, windy and wet weather conditions³ would make bat surveys sub-optimal in Autumn months. Therefore, only surveying from April to August is not considered a limitation.

A camera trap was stolen from the Site, meaning no data is available for the April to May period. Although not specifically focussed on bats, ornithology focussed carcass persistence trials have been ongoing between September 2018 and September 2019, which show that there is not a high rate of scavenging. Despite the missing April-May data, data is available for June, July, August and September which record a similar level of scavenging; therefore, it is concluded that April-May would have likely yielded the same results.

3 RESULTS

3.1 Desk Study Results

3.1.1 Designated Sites

There are no statutory designated sites within 10 km of the Survey Area that are designated for bats. However, although not designated for bats, the Survey Area is adjacent to 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*). Both of these sites provide foraging habitats for bats, albeit the exposed nature of the sites may limit this.

3.1.2 Protected Species

A total of 128 bat species^{4,5} records were returned within 10 km of the Study Area. Those relevant to habitats recorded within the Study Area are detailed in Table 3.1, excluding three records with non-specific grid references.

Table 3.1: Records of Bat Species

Bat Species	Number of records	Record type	Distance, direction and date of most recent record from Survey Area	Distance, direction and date of closest roost record from Survey Area
Common pipistrelle	36	Roost (4), Field (23), Auditory (8), Other (1)	9.4 km east-north-east, 2017	3.3 km east-north-east, 2002
Soprano pipistrelle	22	Roost (4), Field (11), Auditory (5), Other (2)	7.1 km north-north-east, 2016	6.6 km north-east, 2003
Unknown Pipistrelle sp.	18	Roost (6), Field (4), Auditory (4), Droppings (1), Other (3)	7.9 km east-south-east, 2017	4.3 km north-east, 2000

³ Historic weather conditions were reviewed for the months of April, September and October at Haverigg <https://www.timeanddate.com/weather/@2647309/historic>

⁴ Wildlife and Countryside Act 1981 (as amended), Schedule 5

⁵ Conservation of Habitats and Species Regulations 2017

Bat Species	Number of records	Record type	Distance, direction and date of most recent record from Survey Area	Distance, direction and date of closest roost record from Survey Area
Brown long-eared bat	8	Roost (2), Field (2), Droppings (1), Other (3)	9.2 km east-north-east, 2017	7.3 km north-north-east
Noctule	12	Field (8), Auditory (2), Other (2)	7.6 km south-east, 2015	None
Daubenton's bat	1	Other	7.4 km north-north-east, 2010	None
Brandt's bat	1	Roost	6.3 km north-north-east, 1999	6.3 km north-north-east, 1999
Whiskered bat	1	Field	4.8 km north-east, 2013	None
Natterer's bat	2	Field	4.5 km north, 2007	None
Unidentified Nyctalus bat species	1	Auditory	9.4 km east, 2008	None
Unidentified bat sp.	26	Roost (5), Field (9), Auditory (4), Droppings (4), Other (4)	4.7 km north-east, 2013	3.1 km east-north-east

3.1.3 Aerial Imagery

Aerial imagery⁶ dated from 2003 to 2018 shows the majority of the Survey Area as being open and exposed grassland, with limited habitat suitable for roosting or commuting bats. The grassland, albeit low in potential, may provide some foraging habitat for bats. Offsite habitat including estuary habitat to the south and a copse at the northwestern corner of the Survey Area, both of which are Priority Habitat deciduous woodland, may provide more suitable habitat. A review of habitat in the wider landscape showed the Site as having limited connectivity to more suitable habitat.

3.1.4 Cumulative Effects

A review of Cumbria County Council's planning portal⁷ showed no developments that could affect bats in cumulation with the Development. A review of a map of British Wind Farms showed that the closest windfarms, other than the adjacent Haverigg II, is Askam and Ireleth Wind Farm located over 9 km to the east of the Site.

3.2 Ecological Walkover Survey Results

3.2.1 Site Overview

The southern part of the Site largely comprises intensively grazed grassland, while the northern part of the Site is a section of motocross track which has been recently regraded and is therefore bare earth. The majority of the Survey Area is exposed grassland. Within the Site itself, the grassland is short, sheep-grazed, improved grassland.

⁶ Aerial imagery available here: <https://earth.google.com/web/>, [Accessed April 2019]

⁷ Cumbria County Council's Planning portal available here: <https://maps.cumbria.gov.uk/eggp/eggp.aspx?dept=Planning&scriptname=Applications%20-%20County%20Matters> [Accessed March 2020]

3.3 Preliminary Bat Appraisal

3.3.1 Roost Potential

3.3.1.1 Trees

No trees are present within the Site or Survey Area for Haverigg III. A copse of trees was shown on aerial imagery adjacent to the southern boundary of the Site, within land associated with HM Haverigg. However, during the walkover this was no longer present; in its place was low-lying scrub. (Photograph 1 in Appendix B). Furthermore, there were no standards within any of the hedgerows identified within the Survey Area.

Further from the Site, 11 *Lleylandii* trees were within a residential garden near the access gate to Haverigg II (Photograph 2 in Appendix B). The trees had slim trunks, with no evident gaps or lifted bark, and they were therefore classed as having low bat roost potential.

Broadleaved woodland was located in the northeast corner of the Survey Area, although no access was granted due to being within the curtilage of farm buildings and fenced off. The woodland appeared to be a mix of oak, ash and maple (Photograph 3 in Appendix B). The trees were typical of such planted woodland – small in stature due to over-plantation and slim-trunked. However, the viewpoint from the Site did not allow all of the woodland to be viewed. Therefore, it is possible that larger trees with more cracks and crevices, and therefore with more roost potential, were available. Such habitat in the area is limited and therefore may offer an important local resource for bats in terms of roosting and foraging.

3.3.1.2 Buildings

Only a single building was located within the Site: a substation building which was in excellent condition, with no evident gaps in the render, plastic fascias, lead flashing or roof tiles (Photograph 4 in Appendix B). Due to its condition, the building was considered to provide negligible potential for roosting bats.

Numerous buildings were present within the Survey Area that encompassed Haverigg III, namely a small-holding with multiple buildings, a pillbox, a substation and an agricultural barn.

A two-storey agricultural barn was present on the northeastern boundary of the Survey Area (Photograph 5 in Appendix B). Due to construction type, the building offered low roosting potential for bats. The barn was of steel-frame construction, with a low dado breezeblock wall and Yorkshire-boarding to the elevations. Skylights within the roof, as well as gaps in the Yorkshire-boarding will result in high light levels internally. This building is considered unlikely to support bats.

A second substation building was present near the access track to Haverigg II, which was single-storey and of masonry construction, with a pitched and tiled roof (Photograph 6 in Appendix B). The lead flashing and wooden fascias were in good condition, as were the well-aligned tiles, with no evident gaps recorded. Although this building offers low potential for roosting bats, this potential is lowered by the exposed nature of the Site and vicinity of residential properties, which provide better opportunities for roosting bats.

A small-holding was adjacent to the northeastern corner of Haverigg II, and provided moderate roosting potential for bats (Photograph 7 in Appendix B). The small-holding comprised four buildings, the largest of which was built within the external masonry walls of a dilapidated (roofless) building that previously stood on the footprint. This latter building was of breeze-block construction, with a single-pitched corrugated metal roof and timber fascias. Either side of the derelict wall is a further single-storey building, both of which are

flat-roofed and of masonry construction, although one was concrete-rendered and one was timber-clad. The final building was also of masonry construction, with the majority of the concrete render missing, and a pitched roof of corrugated sheeting. All of the buildings and standalone masonry walls provide moderate roosting potential for bats, especially with the vicinity of the adjacent woodland copse.

A pillbox formed from concrete, stones and brickwork lay within the motocross track (Photograph 9 in Appendix A). Although gaps were present within the structure, the level of light within the pillbox was very high due to numerous windows and open roof sections. Therefore, it was considered that the potential for roosting bats was low.

3.3.1.3 Other Structures

A half-built structure was present on the northernmost boundary of the motocross track at the north of the Survey Area (Photograph 8 in Appendix B). Three masonry walls were present, along with a series of roofing materials. This structure was considered to provide negligible opportunities for roosting bats due to exposure to weather and lack of cracks and crevices.

The turbines due to their construction type and location were considered to provide negligible roosting potential for bats. No other structures were recorded within the Survey Area.

3.3.2 Foraging Potential

The majority of the Survey Area is short, sheep-grazed, improved grassland, which, coupled with the exposed nature of the Survey Area, provides limited foraging potential. The section of the motocross track to the northeast of the Survey Area, with a higher sward of vegetation and the adjacent woodland area, provides more suitable foraging habitat. However, the section of motocross track directly to the north has been regraded and is therefore devoid of vegetation. Restricted areas of water bodies were recorded within the motocross track adjacent to Haverigg II, and adjacent to the northeast corner of the Survey Area (Photographs 10-12 in Appendix B). The water bodies provide an alternative habitat type and therefore add diversity in terms of invertebrate food resource and foraging habitat. However, the ponds within the motocross track have limited macrophytes and high silt levels, and appeared lacking in invertebrates.

Offsite in the west of the Survey Area, the dense scrub and estuary habitat have the potential to support bat foraging activity due to diversity of habitats; however, it is likely that the exposed nature from the Irish Sea limits this potential. The floodplain and grazing marsh adjacent to the north of the Survey Area is more likely to provide a diverse invertebrate population, and therefore food resource for bats.

Overall, the foraging potential within the Survey Area and the surrounding area is limited.

3.3.3 Commuting Potential and Connectivity

Other than the hardstanding tracks associated with access to the turbines, the Survey Area is largely devoid of linear features that could be used by commuting bats. Two linear features identified were an agricultural ditch adjacent in the northeast corner of the Survey Area, and two parallel species-poor defunct hedgerows running from the access track to Haverigg II. The ditch connects to a wider watercourse network to the north and an area of floodplain and grazing marsh. Millom Park woodland, located 3 km north of the Survey Area, is likely to provide good foraging and roosting potential; however, connectivity to this habitat feature is indistinct.

3.3.4 Non-native Invasive Species

No non-native invasive floral or fauna species were recorded within the Study Area at the time of survey.

3.4 Carcass Searches

No bat carcasses were found; however, carcasses or other remains from birds were found during the carcass searches at the Development. Note that it is not certain that these carcasses/remains were attributable to collision events with the Development – there was some evidence that four may have been the remains of raptor. Further details are given in the Breeding Bird Report that accompanies the application.

3.5 Searcher Efficiency Trials

The total detection rate during the breeding season searcher efficiency trials at the Development ranged from 17% to 80% per visit, with an overall detection rate of 67% across the survey period. The total detection rates across all of the searches of turbines 1 to 4 were 56%, 56%, 88% and 70% respectively. A summary of the results during each search is provided in Table 3.2, while the detection rates per turbine are presented in Table 3.3.

Detection rates during concurrent winter searcher efficiency trials at the adjacent Haverigg II Wind Farm were lower, with an overall detection rate of 51% across the survey period. It is unclear whether there should be a reason why detection was lower in this area; turbines were in similar habitats and the searcher was the same each time. The difference may be statistical fluctuation, given the low numbers involved.

Table 3.2: Summary of detection rates during each of the 2019 searcher efficiency trials

Month & year	Type of item deployed	Turbine no.	Detection rate per turbine	Detection rate per visit	Percentage of detections per visit
April 2019	Miniature mars bars	1	3/4	5/7	71%
		2	2/3		
May 2019	Miniature mars bars	3	3/4	7/9	78%
		4	4/5		
June 2019	Miniature mars bars	1	1/3	1/6	17%
		2	0/3		
July 2019	Miniature mars bars	3	4/4	7/9	78%
		4	3/5		
August 2019	Miniature mars bars	1	1/2	4/5	80%
		2	3/3		
Total detections across survey period				24/36	67%

Table 3.3: Summary of total detection rate per turbine during the 2019 searcher efficiency trials

Turbine no.	Total detection rate	Total percentage of detections
1	5/9	56%
2	5/9	56%
3	7/8	88%
4	7/10	70%

3.6 Carcass Persistence Trials

The spam deployed was eaten/removed by scavengers between surveys (i.e. the carcasses did not persist until the subsequent survey visit). Animals recorded visiting the spam included brown hare, magpie (further information is provided in Table 3.4). No spam was visible after one day during the May baiting. No spam lasted longer than 6 days during the persistence trials.

Table 3.4: Summary of the breeding season 2019 carcass persistence trial results

Deployment date	Minimum persistence period of carcass/remains ⁸	Notes
17/05/2019	1 day	<ul style="list-style-type: none"> Spam last seen being foraged by carrion crow on 18/05/2019. Spam inspected by brown hare, magpie, unknown animal, starling, sheep and carrion crow.
21/06/2019	2 hours	<ul style="list-style-type: none"> Carrion crow feeding on spam on 21/06/2019; Remains inspected on various dates by magpie, carrion crow and brown hare.
16/07/2019	6 days	<ul style="list-style-type: none"> Family of magpies feeding on spam on 17/07/2019 and 18/07/2019. Magpie investigating spam (small amount visible) on 23/07/2019. No spam visible after 23/07/2019.
23/08/2019	2 hours	<ul style="list-style-type: none"> Carrion crow feeding on spam 23/08/19

4 DISCUSSION

The Study Area has been classed as 'negligible' suitability for bats. The majority of the Survey Area is short, sheep-grazed improved grassland, which, coupled with the exposed nature of the Survey Area, provides limited foraging potential. Furthermore, other than the hardstanding tracks associated with access to the turbines, the Survey Area is largely devoid of linear features that could be used by commuting bats. Suitable habitats in the surrounding area are also limited to an area of broadleaved woodland in the northeastern corner of the Survey Area, and restricted lengths of hedgerows forming field boundaries for the surrounding arable land. The results of the desk study support this conclusion, as

⁸ The exact number of days that remains persisted could not be detected because the spam was not always 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.

the most recent records of bats have been recorded over 4.5 km from the Survey Area and the nearest recorded roost is 3.3 km away.

Roosting opportunities within the Study Area are limited, with no trees present within the Site. The onsite buildings provide very limited roosting potential, further downgraded by the exposed nature of the Site. The offsite small-holding in the northeastern corner provides moderate roosting opportunities; however, due to being located adjacent to woodland, it is considered that bats would be more likely to forage in the woodland rather than the exposed Site, so this should not be considered a restriction to the Development.

During the August persistence trial, the spam only remained for two hours; this is likely due to carrion crows' learning behaviour, as location couldn't be varied due to landowner constraints. From the first of the carcass persistence trials (i.e. where there can be no learned behaviour yet), this showed that a 'carcass' would potentially remain for at least 12 hours, and the frequency of survey visits between both wind farm sites suggests that had turbine-bat collisions been a regular occurrence, carcasses would have been detected despite average observer efficiency data. Breeding bird surveys and searches were being undertaken in tandem which had an observer efficiency of 91% on Haverigg II and 94% on Haverigg III. Surveyors were asked to record any carcass finding, with no bat carcasses recorded. No bat carcasses were recorded during any of the bird or bat focussed searches for either of the wind farms.

According to the interim guidance produced by SNH *et al.* for bats and onshore wind turbines⁹, wind farms can affect bats in the following ways:

- *Collision mortality, barotrauma and other injuries;*
- *Loss or damage to commuting and foraging habitat, (wind farms may form barriers to commuting or seasonal movements, and can result in severance of foraging habitat);*
- *Loss of, or damage to, roosts;*
- *Displacement of individuals or populations (due to wind farm construction or because bats avoid the wind farm area).*

The collision risk has been assessed as low due to the limited foraging potential within the Survey Area, limited connectivity to good quality habitat in the surrounding area, and no evidence of mortality. The Survey Area is coastal, with no existing links to wider areas of suitable habitat, therefore the turbines do not form a barrier to commuting or seasonal movements, and there is to be no loss of habitat by life extension. Vegetation in the area surrounding the Site and Survey Area was low-lying, with the woodland in the northeast corner of the Survey Area being below turbine height and located over 150 m from the nearest turbine tip. Therefore, it is unlikely that commuting bats would be at such a height to come into contact with the blades.

No clearance or demolition works are required, and therefore no potential roosts will be impacted. The closest known roost is 3.3 km from the Survey Area and therefore outside a reasonable zone of impact.

It is possible that the wind farm displaces individual bats due to avoiding of the area; however, the weather conditions (largely high wind speeds due to placement on the north-west coast) make it unlikely that bats would be using the area anyway.

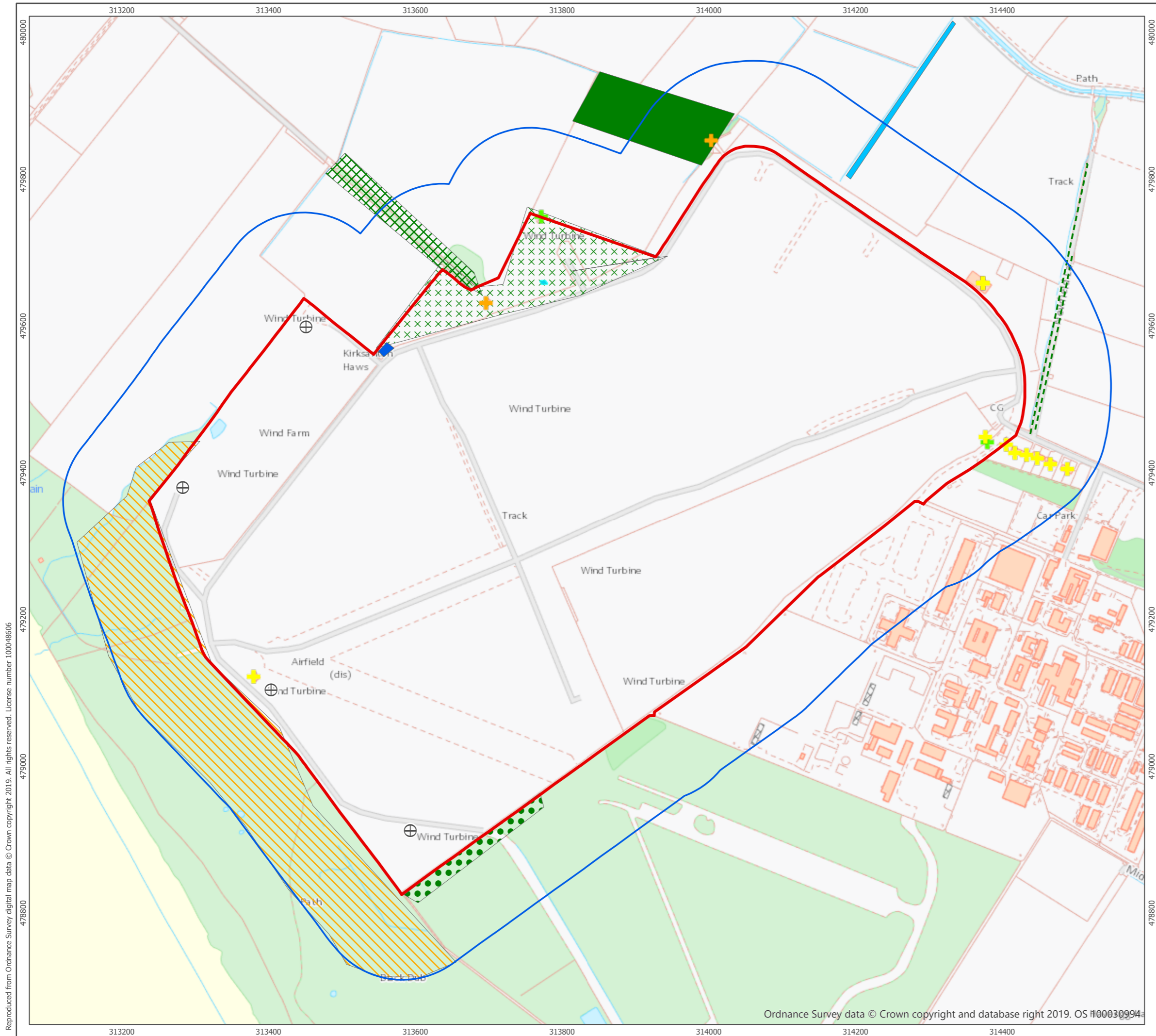
⁹ SNH *et al.* (January 2019), *Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation*.

5 CONCLUSION

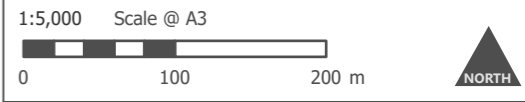
The Survey Area provided limited potential for foraging, roosting and commuting bats, with no casualties or mortalities recorded during the surveys. The effects of the life extension plans for Haverigg III wind farm on bats, individually and cumulatively with other developments will be negligible.

No significant effects of extending the operational phase of the Development are anticipated on any form of non-avian ecology.

APPENDIX A: FIGURES



- ⊕ Haverigg III Wind Turbines
- ▭ Land Ownership Area
- ▭ Survey Area
- Phase 1 Habitat Survey
- - - Defunct hedge - species-poor
- Broadleaved woodland - semi-natural
- ▨ Scrub - dense/continuous
- ▩ Broadleaved Parkland/scattered trees
- ▧ Scrub - scattered
- Running water
- Standing water
- ▨ Dune grassland
- Bat Roost Assessment
- ⊕ Negligible
- ⊕ Low
- ⊕ Moderate
- ⊕ High
- ⊕ Confirmed Roost



Produced By: SC	Ref: 3344-REP-010
Checked By: PP	Date: 01/10/2019

Ecology
Figure 1

**Haverigg III Wind Farm
Ecological Appraisal**

Reproduced from Ordnance Survey digital map data © Crown copyright 2019. All rights reserved. License number 100048606

Ordnance Survey data © Crown copyright and database right 2019. OS 100030994

APPENDIX B: PHOTO LOG

	
<p>Photograph 1: Low lying scrub through fence.</p>	<p>Photograph 2: Low roost potential trees adjacent to access gate of Haverigg II.</p>
	
<p>Photograph 3: Offsite copse behind small-holding.</p>	<p>Photograph 4: Substation building onsite.</p>
	
<p>Photograph 5: Agricultural barn.</p>	<p>Photograph 6: Substation near access track.</p>



Photograph 7: Small-holding at the north east corner of the Survey Area.



Photograph 8: Half built structure in motocross area.



Photograph 9: Pillbox.



Photograph 10: Waterbody in motocross area.



Photograph 11: Waterbody in motocross area.



Photograph 12: Ditch running from north eastern site boundary.