UNITED STATES DEPARTMENT OF THE INTERIOR
Bureau of Ocean Energy Management
Office of Renewable Energy Programs

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Guidelines for Providing Avian Survey Information for Renewable Energy Development on the Atlantic Outer Continental Shelf Pursuant to 30 CFR Part 585

I. Introduction to Guidelines

Before the U.S. Department of the Interior, Bureau of Ocean Energy Management (BOEM), will approve the siting of a facility, structure, or cable proposed for a renewable energy project on the Atlantic Outer Continental Shelf (OCS), an applicant must submit with its Site Assessment Plan (SAP), Construction and Operations Plan (COP) or General Activities Plan (GAP), as applicable, the results of its site characterization surveys, with supporting data, to BOEM.

BOEM requires the results of site characterization studies to evaluate the impact of proposed activities on physical, biological, and socioeconomic resources as well as the seafloor and sub-seafloor conditions which could be affected by the construction, installation, and operation of meteorological towers, buoys, cables, wind turbines, and supporting structures. The information will be used by BOEM, other Federal agencies, and potentially affected states in the preparation of National Environmental Policy Act (NEPA) documents, for consultations and to meet other regulatory requirements. Early communication with BOEM as well as adhering to these guidelines should ensure BOEM's information needs are met, and BOEM is confident survey results obtained through procedures consistent with these guidelines will be sufficient for BOEM's decision-making process. BOEM recommends this early communication takes the form of an avian survey plan and a pre-survey meeting. Please note BOEM may stipulate through lease or grant terms that lessees and grantees submit a SAP, COP, or GAP Survey Plan, and schedule a pre-survey meeting with BOEM to discuss the plan prior to conducting survey activities in the leased or granted area.

These guidelines provide recommendations for complying with information requirements of BOEM's renewable energy regulations outlined within 30 CFR Part 585 Subpart F. Site characterization activities in this document refer only to avian surveys. BOEM provides recommendations for conducting and reporting the results of other baseline collection studies in separate guidelines: (http://www.boem.gov/Renewable-Energy-Program/Regulatory-Information/Index.aspx#Notices_to_Lessees,_Operators_and_Applicants). These guidelines may be updated periodically, as new information or methodologies become available, and this version supersedes previous versions.

The overall purpose of the required information is to describe the key species and habitat within the survey area possibly affected by the proposed operations. The avian survey plan should aim to:

- Identify and confirm which avian species are using the project site where development is proposed;
- Establish a pre-construction baseline which may be used to assess whether detectable changes associated with proposed operations occurred in post construction abundance and distribution of avian species;
- Collect additional information aimed at reducing uncertainty associated with baseline estimates and/or to inform the interpretation of survey results; and
- Develop an approach to quantify any substantial changes in the distribution and abundance of avian species associated with proposed operations.

The avian survey plan should describe a program to collect sufficient information on the biology of the survey area that will allow BOEM and other agencies with jurisdiction to make well-founded decisions in context with the regional biology. The applicant should employ the appropriate equipment and analytical techniques for all surveys. BOEM encourages the applicant to review the "Developing Environmental Protocols and Modeling Tools to Support Renewable Energy and Stewardship" (McCann, 2012) to assist in determining the most appropriate protocols for the proposed project: (http://www.data.boem.gov/PI/PDFImages/ESPIS/5/5208.pdf).

II. Authority and Regulations

BOEM has statutory obligations under the Outer Continental Shelf Lands Act (43 USC 1337(p)) as amended by the Energy Policy Act of 2005 to protect the environment and conserve natural resources of the OCS. Additionally, BOEM has statutory obligations under NEPA, the Endangered Species Act (ESA), and the Migratory Bird Treaty Act (MBTA). Under BOEM's regulations, a plan (SAP, COP, or GAP) must describe biological, social, and economic resource information potentially affected by activities proposed in the SAP, COP, or GAP (see SAP- 30 CFR 585.610(b)(5), 585.611(a),(b)(3), (5) and (7); COP – 30 CFR 585.626(a)(3), 585.627(a)(3), (5), and (7); and GAP – 30 CFR 585.645(a)(5), 585.646(c), (e) and (g)). BOEM also has a memorandum of understanding (MOU) with the U.S. Fish and Wildlife Service (USFWS) describing how both agencies will work together in the implementation of Executive Order 13186: "Responsibilities of Federal Agencies to Protect Migratory Birds". The MOU identifies specific areas in which cooperation between BOEM and USFWS will substantially contribute to conservation and management of migratory birds and their habitats, many of which are supported by these guidelines: (http://www.boem.gov/Renewable-Energy-Program/Regulatory-Information/Index.aspx#Notices_to_Lessees,_Operators_and_Applicants).

For BOEM to evaluate impacts to biological, social, and economic resources, BOEM and its Federal consulting partners under the aforementioned statutes (USFWS and National Marine Fisheries Service (NMFS)) require sufficient baseline information on the potentially affected area. These guidelines are meant to clarify and provide a general understanding of information which BOEM, in consultation with USFWS and NMFS, requires to adequately address impacts of offshore renewable energy projects on biological, social, and economic resources. BOEM will review the submitted SAP, COP, or GAP and additional information to determine if it contains necessary information to conduct BOEM's technical and environmental reviews. Upon

completion of BOEM's technical and environmental reviews required by Federal laws, BOEM may approve, disapprove, or approve with modifications the plan.

Elements of these guidelines may be required under the terms and conditions of a specific lease or grant. A lease or grant may also have different requirements than those discussed in these guidelines. Lessees or grantees should note that while these guidelines and conditions in their lease or grant may be similar, they must comply with the terms of their lease or grant.

III. Pre-Survey Coordination with BOEM

BOEM has found developing a pre-survey strategy allows for the discussion of common goals and expectations with the applicant prior to mobilization of a biological survey. BOEM firmly believes maintaining an early and open dialogue with the applicant is critical to timely, comprehensive execution of a biological survey. BOEM recommends the applicant works closely with BOEM staff to arrive at a strategy meeting overall requirements and tailors the avian survey to site-specific needs of the area. Engaging in discussions with other agencies (e.g., USFWS, NMFS, National Park Service [NPS]) and concerned parties will also help resolve any issues which may arise as early as possible. The applicant is obligated to resolve any items and issues which may be in dispute. BOEM may determine it is necessary for a developer to resurvey some or all of the lease area in the event survey results are insufficient.

An avian survey plan meeting all of the reasonable parties needs is an important first step toward a successful biological survey. In developing an avian survey plan, a review of previous investigations, such as other biological survey efforts of the area, can be helpful in selecting equipment and in choosing the sampling and analytic approaches.

BOEM strongly recommends a pre-survey meeting. This meeting may include, but is not limited to, discussions regarding:

- survey logistics (proposed survey area, dates, times, survey period length, weather limitations, etc.);
- field techniques and equipment to be utilized/specifications of data acquisition systems;
- data to be acquired;
- data processing and analysis; and
- data and information to be submitted.

IV. Survey Results and Supporting Data

In addition, BOEM strongly recommends the lessee provide the following reports to assist BOEM in tracking progress and implementation of surveys and, to evaluate the quality of environmental information collected. By providing the following reports, BOEM can ensure survey data and information is sufficient to meet the requirements of a SAP, COP, or GAP. The data gathered may also be used to develop appropriate avoidance, minimization, and mitigation measures to avian species. BOEM may share these reports with other agencies (e.g., USFWS, NMFS, and NPS).

Quarterly Progress Reports
These progress reports should highlight survey findings and include (at a minimum):

- number of surveys conducted, dates, start and end times, weather conditions;
- number of birds by species/taxonomic group;
- maps and spatial data showing the locations of birds (see Spatial Data Submission Guidelines at http://www.boem.gov/Renewable-Energy-Program/Regulatory-Information/Index.aspx);
- the status of data processing, error checking, and analysis; and
- plans for upcoming avian surveys and related study efforts.

Comprehensive Annual Report
The purpose of the annual report is to present results (trends and patterns) of survey efforts from the current year's and any previous years' efforts. The report should provide an evaluation of the effectiveness of survey techniques and include any refinements for the coming year. The report should also include a schedule of reports and efforts for the upcoming years. In addition, the report should discuss results of other efforts (previous and current) and how they relate and inform the findings.

Data Management
BOEM requires all data to be processed, validated, and made available as needed. BOEM also encourages uploading survey data into an online archive such as the Compendium of Avian Occurrence Information for the Continental Shelf Waters (O'Connell et al., 2009) or the Ocean Biogeographic Information System (OBIS) Spatial Ecological Analysis of Megavertebrate Populations (OBIS-SEAMAP; http://seamap.env.duke.edu/), Avian Knowledge Network (http://www.avianknowledge.net/content), the National Oceanographic Data Center (NODC; http://www.nodc.noaa.gov/) or other archive for future study.

V. Survey Methodology

Given that the distribution and abundance of many avian marine species are known to change under ambient conditions, multiple survey visits are often needed to establish a baseline characterizing the species' distribution in space and time. On the Atlantic OCS, analyses of temporal variability suggests that most inter-annual variance in relevant environmental conditions for seabird occurrence and abundance (sea surface temperature and surface chlorophyll concentration from satellite remote sensing) and in relative abundance of birds observed in BOEM lease blocks will be captured by surveys spread over 2 to 3 years (Kinlan et al., 2012).

In some cases, the area affected could have sufficient information to establish a baseline from previous study efforts, therefore needing fewer (if any) additional surveys to establish a baseline. In some cases, it may be necessary to expand the survey area beyond the project area to aid in the interpretation of survey results and to improve confidence estimates (Ib Peterson, pers. comm.) or the use of control sites to assess post-construction effects. This can be discussed on a case-by-case basis during the pre-survey planning and coordinating phase.

According to 30 CFR 585.610(a) (8) (SAP) and 30 CFR 585.626(b) (15) (COP) applicants must submit with SAPs and COPs "proposed measures for avoiding, minimizing, reducing,

eliminating, and monitoring environmental impacts." Lessees and grantees should consider these future monitoring and mitigation measures when developing a survey plan for avian resources. Remember post-construction surveys may be required to assess significant impacts of post-construction operations to a species. In such cases, the baseline information and post-construction survey effort must have the statistical power to detect a significant impact. (See Peterson et al. (2011) for an example of an analytic approach that was used to assess displacement using pre- and post-construction survey data.)

There are a number of methods used to characterize the spatial distribution and abundance of avian species on the OCS. Boat-based surveys and aerial surveys are examples of commonly used methods. Boat-based surveys allow for a fine level of detail, but can be expensive, slow, and require more time to cover a large geographical area. Aerial surveys allow for more coverage of a larger geographic area in a shorter period of time. However, aerial surveys do not always allow for identification to the species level and can cause disturbance at low altitudes. Thus, avian abundance may be underestimated. Tables 1 and 2 provide general guidance for conducting and presenting results from pre and post-construction boat and aerial surveys.

Digital aerial survey methods are replacing visual aerial survey methods for assessing the impact of wind energy on seabirds in United Kingdom waters (Thaxter and Burton, 2009). There are advantages in using digital aerial survey methods over other methods. For example, digital aerial survey methods are much safer to conduct than traditional aerial surveys and less prone to disturb birds because the planes fly at a higher altitude (500 meters [m]) as opposed to (70-180 m). Abundance estimates from methods using digital stills and video were closely comparable; while estimates from visual aerial surveys were lower (Buckland et al., 2012). Therefore, one should use the same methodology in pre and post-construction surveys to assess impacts. See Thaxter and Burton (2009), Buckland et al. (2012), and McCann et al. (2012) for more information on digital aerial survey methods and protocols. In addition, BOEM published results from a two-year study which developed and tested high-resolution digital aerial imaging methodologies to survey for marine birds, mammals, and sea turtles (Normandeau, 2012). Table 3 provides general guidance for conducting and presenting results from pre- and post-construction digital surveys.

Table 1. Boat-based surveys for avian species on the OCS.

Focus	Determine spatial temporal distribution and abundance and behavior of avian species.	
Timing	Two annual cycles of surveys to capture inter-annual variation in counts.	Additional surveys may be needed to fill in temporal or spatial gaps from preliminary investigations (e.g., to complete an annual cycle, to increase spatial certainty, to capture a specific migration period). Additional surveys may be needed if initial surveys were poorly executed or if conditions have changed since initial surveys were conducted (e.g., El Nino).
Scope	• Surveys should be collected in a manner to be presented in a geo-spatial database. • Surveys should be conducted in all seasons in which the species of interest are present. • Surveys should be conducted monthly in an effort to capture the peak annual abundance. However, surveys may be conducted more frequently if expected use times are known. • For commercial wind projects, all blocks where developments is proposed would have to be surveyed plus a buffer that is at least 1 nmi to control for edge effects.	
Technical Suggestions	• Use line-transect sampling method (i.e., Camphuysen et al., 2004) using parallel lines or sawtooth pattern and covering at least 10% of proposed development area. (It is assumed that 300 meters (m) from both sides of the transect line can be surveyed). • Surveys should start after sunrise when there is enough light to identify birds to species. • To count as independent, surveys of the same location should take place three or more days apart (Kinlan et al., 2012). • Record weather conditions at the start of each transect line (wind speed & direction, visibility, % cloud cover, precipitation, temperature at start and finish, time of day, name of observers). No surveys should be conducted if conditions on the Beaufort scale are greater than or equal to four or when visibility is poor. • Use at least two qualified biologists with binoculars specializing in seabirds, to identify birds (not to detect them). • Identify each bird to species; if this cannot be done, then identify taxonomic group. • Estimate actual distance and bearing for all detections so distance sampling techniques can be used to correct for birds missed at greater distances from the ship (see Buckland et al., 2001). Before each survey, surveyors should calibrate distance estimation using a laser rangefinder on objects (e.g., buoys) at a variety of distances. • Account for detectability. To estimate the density and abundance for each species viewed on the water, use distance data collected from line transect sampling to model a distance function (see Buckland et al., 2001). Analyses should use recent versions of Distance software which allows covariates (observer, sea state, etc.) to be incorporated into the estimation of detection functions, and the Akaike Information Criterion values should be used to determine whether it is advantageous to use these covariates (Maclean et al., 2009). Report density estimates, standard errors, and 95% confidence intervals. • Record each bird observation time, use GPS to record the location of each observation along transect line, record the number of birds in each flock, record the behavior of birds on water (resting, foraging, flying, etc.). • For flying birds, estimate vertical flight elevation and flight direction. • During the survey, the ship's speed should be a constant speed of 10 knots. • Record birds following the ship for possible separate analysis. • Note any events that may attract or deter birds-such as a fish kill, passing ships, or passing planes during the survey.	
Presentation of Results	• Provide spatially-explicit density estimates and associated variance (95% confidence intervals) by species/taxonomic groups in map and tabular formats.	

Table 2. Aerial surveys for visual avian species on the OCS.

Focus	Determine spatial temporal distribution and abundance of avian species.	
Timing	Two annual cycles of surveys to capture inter-annual variation in counts.	Additional surveys may be needed to fill in temporal or spatial gaps from preliminary investigation (e.g., to complete an annual cycle, to increase spatial certainty, to capture a specific migration period). Additional surveys may be needed if initial surveys were poorly executed or if conditions have changed since initial surveys were conducted (e.g., El Nino).
Scope	• Surveys should be collected in a manner to be presented in a geo-spatial database. • Surveys should be conducted in all seasons in which the species of interest are present. • Surveys should be conducted monthly in an effort to capture the peak annual abundance. However, surveys may be conducted more frequently if expected use times are known. • Survey area should include the entire proposed survey area and a buffer that is at least 1 nmi to control for edge effects.	
Technical Suggestions	• Twin engine aircraft or other suitable aircraft to ensure safety and endurance(e.g., single engine Kodiaks). • High winged aircraft with excellent all around visibility. • Use line-transect sampling method. • Transects should be orientated perpendicular to the coast and spaced 3 kilometer (km) apart. • Weather conditions before take-off and at start of survey should be: sea state < Beaufort 3, absence of rain or fog, visibility >10 km. • Ideally, the plane may fly between 150-200 km/hr at an altitude ranging from 75-100 m. However, to satisfy safety concerns, flights at altitudes of 140-180 m may be conducted without impacting the detection of birds > 40 cm in body length (Certain and Bretagnolle, 2008). These ranges in altitude and speed may minimize disturbance to birds (Perkins et al., 2004; Certain and Bretagnolle, 2008) while clearing wind turbine blades. • Conduct multiple surveys at different times of day to capture potential peak numbers of birds and note behavior (e.g. feeding or resting) during sightings. • To count as independent, surveys of the same location should take place three or more days apart (Kinlan et al., 2012). • Collect the appropriate data so distance sampling techniques can be used to correct for birds missed at greater distances from the plane (see Buckland et al., 2001). • Record altitude, cloud cover, sea state, and glare (i.e., percent area obscured by glare on the surface of water) every 10 minutes during survey. • Two qualified biologists specializing in seabirds will scan a fixed width 150 m transect on either side of the plane (Certain and Bretagnolle, 2008; Paton et al., 2010). • At each new sighting along transect, record GPS position, time, number of birds, and species composition. Identify each bird to species, but if this cannot be done, then identify taxonomic group. • Account for detectability. To estimate the density and abundance for each species viewed on water, use distance data collected from line transect sampling to model a distance function (see Buckland et al. 2001). Analyses should use recent versions of distance software which allows covariates (observer, sea state, etc.) to be incorporated into the estimation of detection functions, and the Akaike Information Criterion values should be used to determine whether it is advantageous to use these covariates (Maclean et al., 2009). Report density estimates, standard errors, and 95% confidence intervals.	
Presentation of Results	• Provide spatially-explicit density estimates and associated variance (95% confidence Intervals) by species/taxonomic groups in map and tabular formats.	

Table 3. High-resolution digital aerial surveys for avian species on the OCS.

Focus	Determine spatial temporal distribution and abundance of avian species.	
Timing	Two annual cycles of surveys to capture inter-annual variation in counts.	Additional surveys may be needed to fill in temporal or spatial gaps from preliminary investigation (e.g., to complete an annual cycle, to increase spatial certainty, to capture a specific migration period). Additional surveys may be needed if initial surveys were poorly executed or if conditions have changed since initial surveys were conducted (e.g., El Nino).
Scope	• Surveys should be collected in a manner to be presented in a geo-spatial database. • Surveys should be conducted in all seasons in which the species of interest are present. • Surveys should be conducted monthly in an effort to capture the peak annual abundance. However, surveys may be conducted more frequently if expected use times are known. • Survey area should include the entire proposed survey area and a buffer that is at least 1 nmi to control for edge effects.	
Technical Suggestions	• Twin engine aircraft or other suitable aircraft to ensure safety and endurance (e.g., single engine Kodiaks). • Use strip-transect sampling method and plan to cover the entire survey area in a single day. Transects should be orientated east-west to minimize sun glare effects (see Normandeau, 2012 for details about minimizing glare) • Imaging should cover at least 10% to 20% of the survey area (Thaxter and Burton, 2009; Normandeau, 2012). • Conduct surveys when the sea state is less than Beaufort 4 and in absence of rain, low elevation clouds, and fog to ensure birds are not missed and can be identified (Thaxter and Burton, 2009). • The plane may fly between 220-350 km/hr and at minimum flight height of 450 m (Thaxter and Burton, 2009; Normandeau, 2012). • Conduct multiple surveys at different times of day to capture potential peak numbers of birds and note behavior (e.g. feeding or resting) during sightings. • To count as independent, surveys of the same location should take place three or more days apart (Kinlan et al., 2012). • Color images should be used in all surveys with an image resolution of 2 cm^2 or finer (Normandeau, 2012). • Record altitude, cloud cover, sea state, and glare for each image (see Normandeau, 2012). • Identify each bird to species if this cannot be done then identify taxonomic group. Two qualified biologists specializing in seabirds should assess images independently and images must be audited by an expert (see Buckland et al., 2012). • At each new sighting along transect, determine position of birds relative to GPS location, time, number of birds, species composition, and behavior.	
Presentation of Results	• Provide spatially-explicit density estimates and associated variance (95% confidence Intervals) by species/taxonomic groups in map and tabular formats.	

Guidance Document Statement
BOEM issues guidance documents to clarify, supplement, and provide more detail about certain BOEM regulatory requirements of and to outline information required of the applicant to support their various submittals. This guidance document sets forth a policy and an interpretation of a regulatory requirement to provide a clear and consistent approach to complying with that requirement. An applicant may use an alternate approach for compliance; however, early and frequent coordination with BOEM will be especially critical in this case to ensure the work conducted meets BOEM's regulatory requirements.

Paperwork Reduction Act Statement
The information collection provisions of this document are intended to provide clarification, description, or interpretation of requirements contained in 30 CFR 585 Subpart F. The Office of Management and Budget (OMB) has approved the information collection requirements for these regulations and assigned OMB Control Number 1010-0176.

Contact Information
For further information or inquiries regarding these guidelines please contact the Office of Renewable Energy Programs at (703) 787-1340 or renewable_reporting@boem.gov.

References
Buckland, S.T., D.R. Anderson, K.P. Burnham, J.L. Laake, D.L. Borchers, and L. Thomas. 2001. Introduction to distance sampling: estimating abundance of biological populations. Oxford University Press, London.

Buckland, S.T., M. L. Burt, E. A. Rexstad, M. Mellor, A.E. Williams and R. Woodward. 2012. Aerial surveys of seabirds: the advent of digital methods. Journal of Applied Ecology 49(4):960 967.

Bundesamt für Seeschifffahrt und Hydrographie (BSH). 2007. Standard. StUK 3 –Investigation of the Impacts of Offshore Wind Turbines on the Marine Environment. 57pp.

Camphuysen, C.J., Fox, A.D., Leopold M.F., and I.K. Petersen. 2004. Towards standardized seabirds at sea census techniques in connection with environmental impact assessments for offshore wind farms in the U.K.: A comparison of ship and aerial sampling methods for marine birds, and their applicability to offshore wind farm assessments. Koninklijk Nederlands Instituut Voor Onderzoek Der Zee Report commissioned by COWRIE.

Certain, G. and V. Bretagnolle. 2008. Monitoring seabirds population in marine ecosystem: The use of strip-transect aerial surveys. Remote Sensing of Environment 112:3314–3322.

Kinlan, B.P., E.F. Zipkin, A.F. O'Connell, and C. Caldow. 2012. Statistical analyses to support guidelines for marine avian sampling: final report. U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs, Herndon, VA. OCS Study BOEM 2012-101. NOAA Technical Memorandum NOS NCCOS 158. xiv+77 pp.

Langston, R.H.W. 2010. Offshore wind farms and birds: Round 3 zones, extensions to Round 1& Round 2 sites & Scottish Territorial Waters. RSPB Research Report No. 39 commissioned by COWRIE.

Maclean, I. M. D., L. J. Wright, D. A. Showler, and M. M. Rehfisch. 2009. A Review of Assessment Methodologies for Offshore Windfarms. Report commissioned by COWRIE Ltd., COWRIE-METH-08-08, London.

McCann, J. 2012. Developing Environmental Protocols and Modeling Tools to Support Ocean Renewable Energy and Stewardship. U.S. Deptartment of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy, Herndon, VA., OCS Study BOEM 2012-082.

Normandeau Associates, Inc. 2012. High-resolution Aerial Imaging Surveys of Marine Birds, Mammals, and Turtles on the US Atlantic Outer Continental Shelf—Utility Assessment, Methodology Recommendations, and Implementation Tools for the US Dept. of the Interior, Bureau of Ocean Energy Management. Contract # M10PC00099. 378 pp.

O'Connell, A. F., B. Gardner, A. T. Gilbert, and K. Laurent. 2009. Compendium of Avian Occurrence Information for the Continental Shelf Waters along the Atlantic Coast of the United States, Final Report (Database Section - Seabirds). Prepared by the USGS Patuxent Wildlife Research Center, Beltsville, MD. U.S. Department of the Interior, Geological Survey, and Bureau of Ocean Energy Management Headquarters, OCS Study BOEM 2012-076.

Paton, P., K. Winiarski, C. Trocki, and S. McWilliams. 2010. Spatial Distribution, Abundance, and Flight Ecology of Birds in Nearshore and Offshore Waters of Rhode Island: Interim Technical Report for the Rhode Island Ocean Special Area Management Plan 2010, 304 pp.

Perkins, S., G. Sadoti, T. Allison, and A. Jones. 2004. Relative waterfowl abundance within Nantucket Sound, Massachusetts during the 2003-2004 winter season. Massachusetts Audubon Society, Lincoln, Massachusetts.

Petersen, I.K., M. Mackenzie, E. Rexstad, M. Wisz, and A. Fox. 2011. Comparing Pre- and Post-Construction Distributions of Long-Tailed Ducks *Clangula hyemalis* at a Danish Offshore Wind Farm. Tech Report 2011–1, Centre for Research into Ecological and Environmental Modelling, St Andrews.

Thaxter, C.B. and N.H.K. Burton. 2009. High Definition Imagery for Surveying Seabirds and Marine Mammals: A Review of Recent Trials and Development of Protocols. British Trust for Ornithology Report Commissioned by Cowrie Ltd.