OWSMRF III Scope of Work 5c

Feasibility study for improved understanding of non-breeding birds through deployment of novel monitoring technologies

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For further information please contact:
JNCC, Quay House, 2 East Station Road, Fletton Quays, Peterborough PE2 8YY.
https://jncc.gov.uk/
Communications@jncc.gov.uk

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This document is compliant with JNCC's Evidence Quality Assurance Policy.

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Contents

Definitions

Age class: A group of individuals from the same species that are of similar age.

Life stage: A life stage is characterised by specific development milestones and behaviours. Typically, in seabirds, key life stages are chicks, juveniles, sub-adults and adults.

Breeding status: A group of adult individuals from the same species that are either “breeding” or “not breeding” in a given year.

Breeder: An adult bird of breeding age that attempts to breed in a given year.

Non-breeder: A bird, either sexually mature or not, that does not breed in a given year. For the purpose of this work, non-breeders include immatures and sabbatical birds, as opposed to birds during the non-breeding season.

Immature (or pre-breeder): A bird that is not yet physiologically mature and has not reached breeding age. Immatures include juveniles and sub-adults.

Sabbatical bird: An adult bird of breeding age that does not attempt to breed in a particular year but may attempt to breed in subsequent years.

1 Background

1.1. The context

Offshore wind farms (OWF) are a key part of the transition to renewable energy generation as the UK seeks to achieve clean power by 2030 and Net Zero by 2050 (The Crown Estate 2024). These ambitious targets have fostered the rapid expansion of offshore wind developments in the UK, and the geographic spread is set to increase further offshore with the advent of floating wind. However, there is still considerable uncertainty around the environmental impacts of large-scale developments, particularly on marine birds. To inform the planning process of the potential impacts of proposed offshore wind farms, detailed Environmental Impact Assessments (EIAs) and Habitats Regulations Assessments / Appraisals (HRA) are required. EIAs assess potential impacts to the wider environment, whilst HRAs assess whether a plan or project has the potential to have an adverse effect on the integrity of a site (Special Protection Area, or 'SPA') protected under The Conservation of Habitats and Species Regulations (Amendment) (EU Exit) 2019 and The Conservation of Offshore Marine Habitats and Species Regulations 2017 (as amended).

Seabird impact assessments for offshore wind comprise several stages, including site characterisation surveys, predicting OWF impact mortalities from collision with turbines and from displacement and barrier effects (due to avoidance of the OWF area), apportioning predicted OWF mortality to different age classes and relevant protected sites (the latter within HRA only), and modelling population-level responses to predicted OWF impacts through Population Viability Analysis (PVA). Uncertainty in each step of the impact assessment can lead to increased levels of precaution applied to consenting decisions, therefore risking the rapid roll out of offshore renewable energy that is needed to combat climate change.

Seabird research, conservation and management often focus on the breeding component of populations. In a given year, not all individuals reproduce; some are too young and have not reached sexual maturity (referred to as "immatures" or "pre-breeders"), while others are old enough to breed but skip breeding that year due to poor condition, lack of mate or suitable nesting sites, or low prey availability (referred to as "sabbaticals" or "skipped breeders"). Non-breeding birds form a large component of populations for most seabird species particularly in those that mature late and show high rates of skipped breeding. They play an important role in maintaining seabird populations, by representing a potentially large pool of future reproductive individuals ready to move in and/or supplement lost breeders, thus helping buffer against sudden adult mortality. Ignoring non-breeding portions of seabird populations risks false predictions of population response to change, therefore limiting the validity of offshore wind impact assessments. For the purpose of this work, non-breeders include immatures and sabbatical birds, as opposed to "birds during the non-breeding season".

Due to their lack of reproductive constraints, non-breeders are expected to represent a relatively larger component of seabirds observed further offshore compared to more nearshore areas (Hall & Ruffino 2026). This is a growing concern as developments expand in offshore areas, potentially overlapping with non-breeder distributions. Non-breeders may behave differently at sea than breeding birds, which could alter their sensitivity to collision and displacement, and therefore their overall risk from OWF mortality. Furthermore, with predicted increased frequency of extreme weather events, and potentially diseases too such as HPAI, non-breeding rates, as well as non-breeder attendance at or near colonies, are likely to change. This is creating a challenge for undertaking robust assessments of seabird population status and trends.

The Offshore Wind Strategic Monitoring and Research Forum (OWSMRF) Phase III identified a fundamental lack of knowledge of the ecology, behaviour and population dynamics of non-breeding birds, which poses a challenge to OWF impact assessments. Detailed information on knowledge gaps, evidence required to fill those gaps and Research Opportunities (RO) for obtaining evidence is reviewed in the OWSMRF III Knowledge Gap 5 report (Hall & Ruffino 2026) and summarised in JNCC (2026). The report describes several ROs which will help improve understanding of non-breeders, their behaviour in relation to offshore wind farms, the proportion of the whole population that they make up, and their role in seabird populations.

The OWSMRF III Developer Group, after discussions with OWSMRF stakeholders, asked JNCC to produce detailed scopes of work for a selection of priority ROs. The present scope of work synthesises and elaborates on RO5.4c (Better understanding of the proportion of non-breeders within populations), as described in Hall and Ruffino (2026), by providing a more detailed set of aims and objectives, possible methods that might be employed and important aspects (e.g. risks, dependencies) that would need to be considered. It should provide the information that is required to draft an invitation to tender and to judge the quality of applications, should any interested funding party wish to proceed with this project.

1.2. The issue

1.2.1 Non-breeders in offshore wind impact assessments

In the UK, offshore wind impact assessments do not systematically consider all non-breeding components of seabird populations; this varies between stages of the assessment, countries and the legislative remit of the assessment (HRA versus EIA). Crucially, poor understanding of key aspects of the demography of different age classes and breeding status is limiting the extent to which non-breeders can be accounted for in assessments. For example, when modelling seabird population responses to predicted OWF impacts, sabbaticals are not explicitly parameterised within PVA (i.e. they are not included as a separate class of adult individuals due to lack of empirical evidence on their vital rates and population sizes).

Adult non-breeding rate (i.e. frequency of skipped breeding in adult birds) is a key metric in seabird population dynamics. Robust estimates of adult non-breeding rates and population sizes are crucial to enable a quantitative evaluation of the role that sabbaticals play in population resilience, and how this may change over time with the effect of extrinsic environmental or anthropogenic pressures. Sabbatical rates can be applied at two separate stages of an impact assessment:

i) at the apportioning stage, to assign predicted OWF impacts to relevant breeding status components of a population, in the absence of sabbatical at-sea distribution data; and

ii) at the PVA stage, to account for a proportion of adult birds that skip breeding within the population in a year. Not all seabird species present in the UK have estimates of sabbatical rates and there is substantial uncertainty in rates across species for those where empirical data is available.

Currently recommended adult non-breeding rates for use in impact assessments are based on old and sparse data collected on a handful of species and sites; these include auks (as a group of species), black-legged kittiwake, northern gannet, European shag and large gulls (as a group of species) in Scotland (see Hall & Ruffino 2026). In addition, these rates may

not be comparable due to the disparity of metrics, terminology and methods used to define and quantify adult non-breeding rates in the literature.

Similar questions apply to immatures. Knowledge of age class proportions within populations is used to apportion predicted OWF impacts to different age classes and inform population structures when modelling impacts at the PVA stage. However, these proportions are often based on theoretical assumptions of age class distributions within stable populations, which lack validation with observations at colonies or at sea.

1.2.2 Non-breeders in traditional colony monitoring

At present, seabird colony monitoring in the UK is focussed on breeding adults, and for most species actively excludes individuals that are not adults or apparently breeding. Information on non-breeders is sometimes noted, but current databases (such as the Seabird Monitoring Programme) do not allow for input of this data. Uncertainties in the presence of non-breeders at colonies also leads to potentially inaccurate correction factors (k-factor values) used to convert individuals observed into breeding pairs, particularly for species that do not have clearly defined nests such as common guillemot and razorbill. This is a concern, as in this context, counts of individual birds can greatly overestimate the numbers of breeding birds and provide false population estimates for use in impact assessments, leading to either under- or over-estimates of predicted impacts.

Developing approaches that allow distinguishing non-breeding from breeding individuals at colonies would vastly improve understanding of non-breeding rates and age class proportions and help generate more accurate breeding population counts. Being able to quantify proportions of different age classes and breeding status within populations with confidence, and how they may vary over time, across regions and species, would reduce uncertainty in both the apportioning and population modelling stages of the impact assessment process.

Novel colony monitoring technologies have the potential to deliver a step change in how we obtain information on certain aspects of seabird ecology and behaviour that are often considered as otherwise infeasible with traditional, observer-based monitoring. Before deploying such monitoring at scale, a feasibility assessment is essential, including a review of novel techniques, an evaluation of what they can achieve, their requirements and potential risks, alongside trials of new data collection methods in the field.

This piece of work will generate recommendations for improving existing colony monitoring to obtain robust, up-to-date non-breeding metrics for use in impact assessments. Non-breeding rates generated from colony monitoring will help ground-truth estimates derived by other means. For example, this work would assist with undertaking other OWSMRF III Research Opportunities such as RO5.4a–b, which explore the use of theoretical modelling and expert knowledge to improve estimates of adult non-breeding rates, and RO5.5 which requires robust estimates of non-breeding metrics to undertake sensitivity analyses and quantify the relative influence of non-breeders in seabird population persistence (see also related detailed Scope of Work SoW5a).

2 Aim and objectives

2.1 Aim

This scope of work aims to explore the use of novel monitoring techniques deployed at seabird colonies as a means of improving understanding of non-breeding birds (both immatures and sabbaticals), largely for the purposes of obtaining better empirical estimates of non-breeding rates and population sizes, but potentially also for collecting additional demographic and behavioural observations. Obtaining better empirical evidence of the ecology and behaviour of non-breeders at colonies is critical for industries as well as seabird conservation purposes more widely.

Four objectives are described below, and Bidders will be asked to submit a separate cost for Objective 4, which would depend on the outcomes of Objectives 1–3.

2.1.1 Objective 1 – Initial review

Initial review to refine scope of work. Agree key ecological questions, non-breeding metrics and species to focus on.

2.1.2 Objective 2 – Review of technology-based colony monitoring systems and tools for the study of non-breeders

What technology-based monitoring systems and tools are available for the study of non-breeders at or near seabird colonies? Review of novel monitoring techniques both in development and already deployed in other species, locations and contexts. Identification and description of available systems.

2.1.3 Objective 3 – Devise a field trial of best systems

Based on the review work from Objectives 1–2, devise a field trial of best systems for monitoring non-breeders at or near colonies.

2.1.4 Objective 4 – Undertake field trial, report on outcomes and provide recommendations for future work (PLEASE COST SEPARATELY)

Undertake trial of best systems, draw conclusions on feasibility of using novel technologies and produce recommendations for future work.

3 Detailed tasks

The Project involves a series of tasks to meet the objectives listed above.

3.1 Objective 1 – Initial review

This includes:

- Forming an Advisory Panel and refining scope of work;
- Reviewing current understanding of non-breeding bird attendance and numbers at colonies; highlighting potential intrinsic and extrinsic drivers;
- Assessing how immatures and sabbaticals are currently identified in traditional UK colony monitoring.

3.1.1 Form an Advisory Panel and refine scope of work

This first part of the work will aim to refine the scope of the feasibility study, in close consultation with a small group of experts in seabird colony monitoring. Members of the expert group will be selected by the Project Team at the kick-off meeting. They should include representatives of the Seabird Monitoring Programme (SMP) and may include seabird experts from outside the UK, with practical expertise in the use of advanced monitoring technology at colonies. Together with the Advisory Panel, the Project Team will agree the ecological questions to be addressed, a list of key 'non-breeding metrics' to be considered (see examples provided below) as well as the seabird species to focus the study on.

Importantly, the Panel will need to set out what key metrics are needed to be able to shift the dial for impact assessments; for example, among the long list of possible metrics of interest, which of these are essential for improving the assessment process? What are the quick wins and those that would help deliver change in the longer term? On the other hand, what metrics may be of academic interest but not directly relevant to offshore wind impact assessments? Therefore, the Project Team should consider including EIA/HRA practitioners in the Panel to help focus on key evidence needs.

Ecological questions include:

3.1.1.1 Non-breeding rates

- For any given species, what proportion of total birds in attendance at colonies during the breeding season are non-breeders (immatures, sabbaticals)?
- How does proximity to other colonies affect non-breeder attendance?
- Is non-breeder attendance frequency-dependent (breeder/non-breeder ratio)?

3.1.1.2 Variation in non-breeding rates, and drivers

- How do non-breeding numbers vary between years and sites?
- Is there variation in non-breeder attendance at colony between species?
- What are the main factors affecting variation in non-breeding rates? Is non-breeder attendance at colonies dependent on weather conditions? How do HPAI outbreaks affect non-breeding rates?

3.1.1.3 Phenology

- When do non-breeders tend to arrive at colonies, what is their peak of attendance, and when do they tend to leave?

3.1.1.4 Use of space

- When attending colonies, do non-breeders use the same areas as breeding individuals, or do they tend to group in other areas of the colony or at sea in the vicinity of the colony?
- Do non-breeders tend to stay at one colony, or visit multiple colonies?

3.1.1.5 Other demographic rates

- What are the survival rates of immatures? What are the survival rates of non-breeding adults?
- What age do new breeders recruit and does this vary according to environmental drivers?
- What is the likelihood of adults skipping breeding one year? What is their chance of breeding the following year, and being successful?

Several metrics of interest should be considered as part of this work, but only those with clear implications to impact assessments will be retained. This list will be refined through consultation with experts. Examples include:

- non-breeder presence at colony;
- numbers (how many are observed at colonies);
- where are non-breeders usually observed (centre of colony/edge/away from colony, on land/at sea, how far from the colony);
- phenology (when are they observed at/near colonies);
- behaviour (do they interact with breeding adults?);
- survival rate;
- age at recruitment;

- rates of non-breeding, and variation in rates between years, across species and colonies;

- likelihood of subsequent breeding and breeding success in sabbaticals.

3.1.2 Review current understanding of non-breeding bird attendance and numbers at colonies, and highlight potential intrinsic and extrinsic drivers

This should not repeat previous work but build on the information presented in the Seabird Monitoring Handbook (Walsh *et al.* 1995) and the initial review by Hall and Ruffino (2026), drawing on recent literature as required, as well as expert knowledge for those species where information is limited. The review should focus on UK breeding seabird species, and present for each species or species group, information on whether immatures (of different age classes) and sabbaticals are known to attend colonies, at what times of year, whether they are more likely to occupy nearby at-sea or on land areas, and what factors may be driving their presence or numbers at or near colonies. For each species routinely monitored in the UK, it should be determined whether age classes and breeding status can be identified with confidence, using information for example on plumage characteristics, behaviour, phenology or use of space.

3.1.3 Assess how immatures and sabbaticals are currently identified in traditional UK colony monitoring

This work will present the main limitations of current monitoring methods in terms of types of data collected, timing and frequency of data collection and observation effort, for detecting and counting non-breeders. This work will also identify those species for which traditional observation methods are impeding our understanding of breeding population sizes (e.g. production of reliable k-factor values). Ultimately, it will generate a list of species for which novel monitoring technology could be developed to advance our understanding of non-breeding birds (Objective 2).

3.2 Objective 2 – Review of technology-based colony monitoring systems and tools for the study of non-breeders

This work requires collating information from the literature, and potentially from experts too, to identify and review seabird monitoring technologies and tools that are currently, or have been, deployed at colonies (see also recent review of seabird monitoring technologies by Bennett *et al.* 2026). This work will also assess emerging systems that could be deployed soon for the study of seabird phenology, ecology and behaviour at colonies. This includes advances in autonomous, remote technology, as well as automated pipelines and tools, to support the collection, storage and processing of data. The review will focus on methods that could collect information on immatures and/or sabbaticals at colonies or in the areas of sea or land in the vicinity of colonies (e.g. club sites, or at-sea locations where non-breeders aggregate and rest). Technologies should be capable of addressing one or several of the ecological questions identified in Objective 1 above.

There will be several types of monitoring technologies that could potentially deliver useful data. For example:

- Fixed cameras (e.g. time lapse photography and video, motion-triggered photography and video.
- Uncrewed Autonomous Vehicles.
- Thermal imaging.
- Tracking (e.g. GPS, GLS, Argos).

The review should:

- document the different technologies identified and deliver an assessment of existing automated workflows and tools for the collection and analysis of large amounts of data, including Artificial Intelligence (AI) systems and citizen science.
- describe in detail what the requirements are for each system, their associated risks and challenges, their cost, and provide a detailed evaluation of how suitable each of them may be for obtaining data on the metrics of interests and key species identified.
- determine how different systems could be deployed concurrently to help validation and increase efficiencies.
- describe instances where these systems have been applied to the study of non-breeding seabirds, anywhere in the world. The Contractor(s) should document ecological questions that have been addressed using data collected by each system and provide an indication of the quality and quantity of data acquired, and the ability of the system to address these questions.

Examples of technical, resource, health & safety, and ethical and welfare considerations are provided below (this list may not be exhaustive):

3.2.1 Data quality, outputs and processing workflows

- Type of information gathered and accuracy.
- Processing workflows – data handling, checking, validation, processing, analysis, interpretation, integration.
- Storage of data, management and futureproofing of databases and tools.

3.2.2 Operational performance, durability and resource requirements

- Equipment longevity, replacement cycles, battery life.
- Personnel required, including equipment installation and maintenance, but also time required for collecting (e.g. frequency of visits) and processing the data.
- Expertise required (e.g. for using the equipment, developing new functionality if required and analysing and interpreting the data). For some species, expert knowledge on where is best to survey to find immatures or sabbaticals may be required.
- Cost of equipment.

- How mature is the technology or, for those systems in development, when will they be available at commercial scales and will they have undergone sufficient and relevant testing?

- Can technologies or systems be combined, including with observer-based traditional monitoring, to improve cost-effectiveness?

3.2.3 Coverage, feasibility and system limitations

- Spatial coverage and representativeness of data collected at the colony scale.

- Geographic coverage: are there any similar systems installed at UK colonies where additional deployment could build on?

- Any known risks or challenges; are there any examples of the system failing and if so, why? Are there inherent known biases in the system? (For example, detection ranges, battery life constraints, need for solar recharging which can affect detection at times of day/night, missing bird).

- Feasibility across different seasons and environments.

- Risks and their mitigation when accessing colonies (e.g. weather conditions, working near cliff edges, using boats), deploying equipment, handling birds, etc.

3.2.4 Applicability to species, licensing and deployment constraints

- Which species/groups of species are these methods most applicable to? Relates to plumage characteristics (whether age classes and breeding status can be identified), breeding phenology, nest type (burrow nesting), phenology, etc. A list of all species on which this system has been successfully deployed should be presented. This should include evidence of success for those species which the technology has previously been applied, or an indication of potential for success with species this has not been evidenced.

- Disturbance effects due to installing equipment, flying drones, etc.

- Tracking, fitting tags, tag effects.

- Permissions and license requirements for accessing colonies, potentially handling and marking birds, and using equipment (e.g. drones).

In addition to searching the literature, seeking advice from relevant experts with practical expertise in the use of advanced monitoring technology at seabird colonies should also be considered. This could provide additional information when details may not necessarily be readily available from published or grey literature. Seabird experts conducting regular monitoring at colonies may have useful perspectives on feasibility in different conditions/environments and be able to point out practical logistical or licence considerations that might otherwise be overlooked.

Work under this Objective will provide material to support a field trial of the best systems, technologies and tools (Objective 3). It should describe the pros and cons of each system identified, with sufficient information to allow a practitioner to plan, prepare and execute a

trial of each system or combination of systems. Ranking criteria should then be generated to help identify best systems for the key species and metrics of interest. The review should be structured and framed such that it can be easily updated as experience is gained, and further information becomes available.

3.3 Objective 3 – Devise a field trial of best systems

This work package builds on the outputs of Objectives 1–2 to design a trial of the systems that have been identified as most promising for obtaining data on key non-breeder metrics of interest.

3.3.1 Selection of candidate species

Candidate species will be selected by the Project Team and Advisory Panel based on:

- current levels of monitoring at colonies;
- challenges associated with traditional observer-based monitoring (due, e.g. to species phenology or breeding behaviour);
- the potential of innovative techniques to enhance collection of non-breeder data.

3.3.2 Selection of candidate sites

For short-listed species, the Contractor(s) will:

- undertake a detailed assessment of potential locations where deployment of technology-based monitoring may be feasible for the study of non-breeding birds;
- investigate any issues with accessing sites for deploying technology or obtaining data representative of large colony sections;
- determine how representative of other sites the data may be (e.g. site configuration, colony size, terrain, environmental conditions);
- whether colony monitoring (e.g. counts, demography, tracking) is already taking place or planned.

For each candidate species and metric of interest, this will result in a list of top-ranked sites around the UK where a trial could be considered.

3.3.3 Practical implementation

The Contractor(s) will provide all necessary information to run a pilot study, including practical requirements to implement a trial, from setting up the equipment to data collection. This should include:

- a breakdown of the core tasks associated with planning and deploying monitoring.
- an estimated pilot deployment timeframe.

- an indication of overall effort (number of sites to be monitored, number of visits per site per season) and cost (staff time, equipment).
- the types of data to be collected and how.
- the expertise and any permissions/licenses required (for example for deploying technology).

3.3.4 Maximising efficiencies

In addition, the work should consider whether:

- citizen science could be harnessed as an additional means of collecting information on the metrics of interest, if some of the selected sites are accessible to the public.
- information could be collected on different metrics or different species concurrently.
- combining innovative technology with traditional monitoring methods is appropriate, and if this is the case, the Contractor(s) should demonstrate value for money, explore whether calibration may be required and, if so, how it will be undertaken.

3.3.5 Data management

Novel remote monitoring technology can generate large amounts of data, so it is imperative that any feasibility study looks at data storage, handling, processing, analysis, interpretation and reporting requirements. The work should explore the common pitfalls around management of large volumes of data and identify suitable data systems (e.g. automated workflows, citizen science) and expertise for the different technology and metrics of interest.

3.4. Objective 4 – Undertake field trial, report on outcomes and provide recommendations for future work (PLEASE COST SEPARATELY)

This work will:

- deliver a pilot study at UK seabird colonies as planned in Objective 3;
- draw conclusions on the feasibility of using novel technologies for the monitoring of non-breeders at colonies based on the outcomes of the trial, and
- produce recommendations for future work, including further testing of novel systems when required, and how extensive deployment of appropriate methods could be progressed.

3.4.1 Collect and analyse field data to address key ecological questions

This work will involve collecting data using novel technology at several candidate sites for the key species identified, processing and analysing the data acquired, and interpreting results, to answer the key ecological questions of interest (as defined by Objectives 1–3). Running a field trial will address questions such as, for a given species:

- can the technology allow identifying immatures and sabbaticals visiting colonies?
- can novel systems installed at colonies allow estimating non-breeder population sizes, and variation through time?
- what levels of precision and accuracy can these novel techniques achieve?

3.4.2 Assess technologies and provide recommendations

The completion of the pilot study will be accompanied by a full assessment of the technologies deployed for a set of species and metrics, how well they performed in the field and how data collection or cost-effectiveness could be improved, their potential risks or limiting factors and how they could be mitigated. An assessment of data processing workflows and tools will also be undertaken.

This will then lead to a series of conclusions on the feasibility of using novel monitoring technologies, and data processing workflows, to improve understanding of non-breeding birds at colonies, addressing the question “is it achievable, scalable and if so, at what cost?”. Clear recommendations should cover the following aspects:

- is further testing required, and if yes what technology should be deployed, on what species and where?
- scalability of the novel monitoring systems to obtain robust estimates of non-breeding metrics: what are the practical implications of a large-scale coordinated monitoring?

The Seabird Monitoring Programme (SMP) does not currently collect specific data on non-breeders. Therefore, this work should also explore at a high-level what alterations to the SMP database would be required to enable data collected on non-breeders to be widely shared and made available.

4 Outputs

The Contractor(s) will produce a detailed report that documents the findings from of Objectives 1–3, and should include the following:

- Objective 1: a list of key ecological questions, metrics of interest and species to consider in this feasibility study, alongside clear rationale and justification for the inclusion/exclusion of types of data. An overview of the current knowledge around non-breeders at colonies, for species breeding in the UK, as well as limitations of current monitoring techniques for detecting and counting non-breeders at colonies.

- Objective 2: a detailed assessment of available technologies; for each system, what it can achieve, what are their requirements, known limitations and risks, how can cost-effectiveness be improved, how suitable it is for obtaining data on specific non-breeding metrics for a range of key species.

- Objective 3: material to support the trial of appropriate technologies; as much information as possible to allow a practitioner to plan, prepare and execute a trial of each system or combination of systems.

In addition, a separate document will be produced when reporting on the outcomes of the field trial:

- Objective 4: reporting of results, including information acquired, analysis and interpretation of data, followed by lessons learnt, conclusions on feasibility of using novel technologies and recommendations for further testing (if required) and wider implementation.

Additional presentations and updates will be given throughout the course of the project, typically following completion of major milestones to allow for any emerging issues to be addressed promptly.

5 Timescale

An indicative timeline of work is provided below, and the Contractor(s) should provide a detailed Gantt chart, showing how long each objective will take to deliver and when delivery will take place. The key objectives, milestones and deliverables of this contract are:

- Week 1: start-up meeting
- Week 6: final scope of work agreed
- Week 14: draft report (Objective 1)
- Week 26: draft report (Objective 2)
- Week 38: draft report (Objective 3)
- Week 45: final report
- Unconfirmed: draft report (Objective 4)

6 Contractor requirements

The Contractor(s) would need to demonstrate the following expertise and experience:

- Excellent knowledge of seabird ecology and population dynamics
- Strong experience in collecting seabird colony data in the field (experience from the UK desirable)
- Experience in deploying technology-based monitoring systems
- Understanding of best practice and issues around undertaking seabird colony monitoring
- Demonstrated network of contacts/expertise, ability to identify and contact relevant experts for further information
- Ability to access relevant literature, including scientific journals and grey literature (e.g. industry, NGO or government reports)
- Good understanding of offshore wind impact assessments
- Good understanding of the interactions between offshore windfarms and seabird populations
- Previous experience with delivering similar work

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