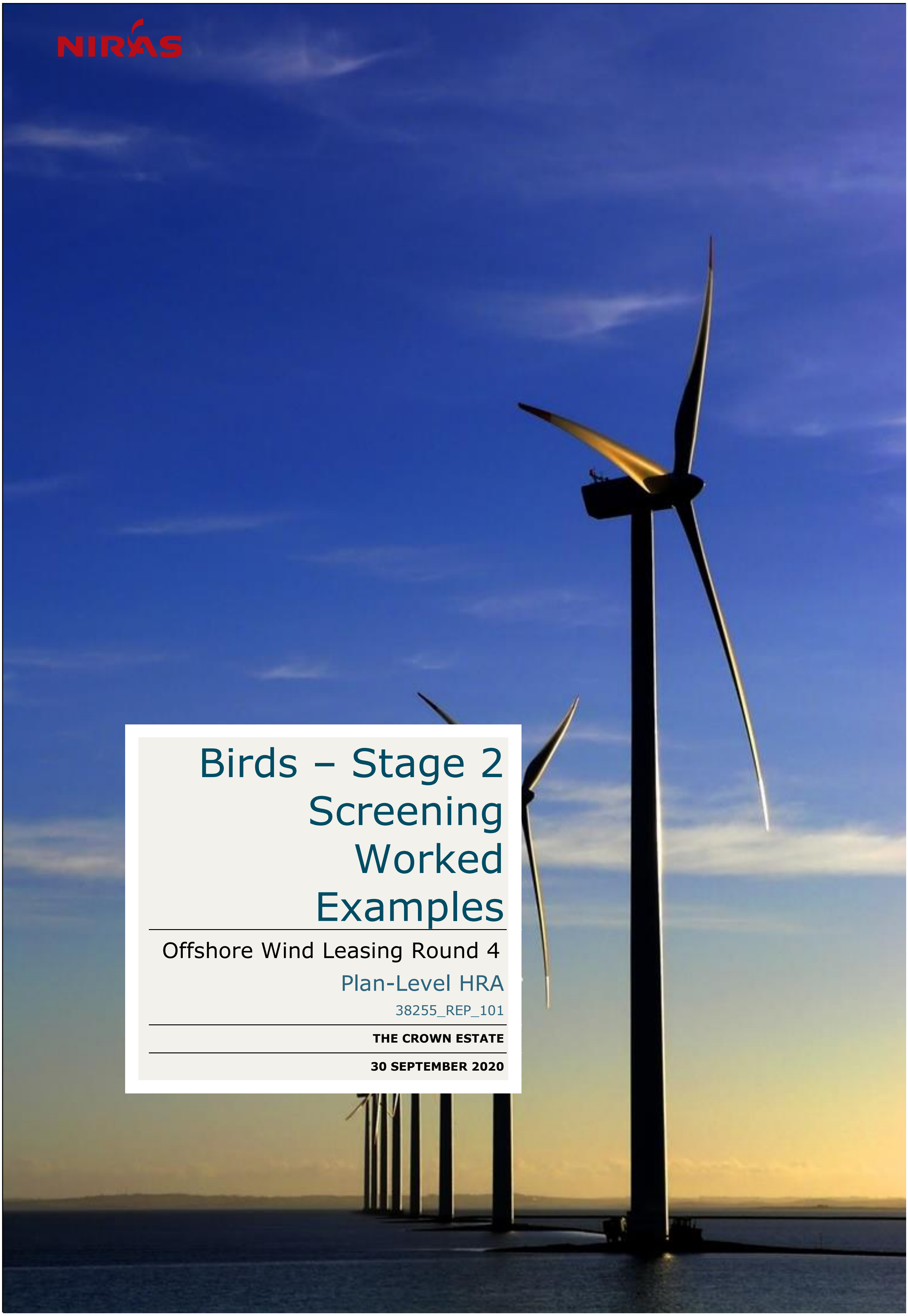

Birds – Stage 2 Screening Worked Examples

Offshore Wind Leasing Round 4

Plan-Level HRA

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THE CROWN ESTATE

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1. Introduction

1.1.1 The Round 4 HRA Principles report (2020) defines five categories of birds for the purposes of screening:

- Breeding birds in the breeding season;
- Breeding birds in the non-breeding season;
- Wintering seabirds;
- Migratory waterbirds; and
- Migratory seabirds.

1.1.2 For breeding birds in the breeding season and wintering seabirds it will be assumed that connectivity, established through application of the spatial criteria set out in the Round 4 HRA Principles report (2020), will lead to a Likely Significant Effect (LSE).

1.1.3 For breeding birds in the non-breeding season and migratory waterbirds and seabirds a second stage will be applied to quantify the likely magnitude of any impact, before forming a judgement about LSE.

1.1.4 This document provides worked examples of the calculations that will be undertaken in this second stage of the screening approach to determine LSE, and is provided for illustrative purposes. The results do not in any way form part of the plan-level HRA for Offshore Wind Leasing Round 4.

2. Worked examples

2.1 Breeding birds in the non-breeding season

2.1.1 For breeding birds in the non-breeding season (e.g. kittiwake from Flamborough and Filey Coast SPA) connectivity will be identified by applying the spatial criteria set out in the Round 4 HRA Principles report (2020) to the Biologically Defined Minimum Population Scale (BDMPS) regions presented in Furness (2015). This will be completed on a species by species basis. It is assumed for the purposes of this exercise that the BDMPS population is composed of the non-breeding populations of the breeding interest features of a range of SPAs and that these are evenly distributed within the BDMPS region. An assessment made of the likely impact at the BDMPS population level will, therefore, be assumed to translate into an impact of similar relative magnitude on each of those component populations. Consequently, the calculations proposed will be undertaken once, for each species for which a BDMPS region is defined and LSE concluded (or not) for all component SPAs together.

2.1.2 The second stage of screening calculates the magnitude of the likely impact and generates the output presented in Figure 2.1. In this theoretical worked example, connectivity has been identified between a hypothetical project and fulmar in the post-breeding season, herring gull in the non-breeding season and guillemot in the non-breeding season.

2.1.3 Effect estimates for relevant species will be calculated using strategic level abundance estimates and following guidance relevant for either collision risk modelling (e.g. Band, 2012; MacGregor *et al.,* 2018) or displacement (JNCC *et al.,* 2017). In this example, for fulmar, collision risk modelling has predicted a total of two collisions in the post-breeding season. For herring gull, collision risk modelling has predicted a total of 500 collisions in the non-breeding season. For guillemot, displacement analysis has predicted a total displacement mortality of 1000 guillemots in the non-breeding season.

2.1.4 Having calculated the Plan level effect, the proportion of the baseline mortality of the BDMPS population that this equates to then needs to be calculated. A conclusion of LSE or the requirement for further consideration is then identified through application of the approach set out in the Round 4 HRA Principles report (2020). In the example below, when the predicted effect for guillemot is compared to the relevant BDMPS population the predicted effect exceeds 1% of the baseline mortality of the BDMPS population and this is taken to indicate an LSE. An LSE is also, therefore, assumed for all relevant SPAs that contribute to the BDMPS population. In this example, the impact on herring gull is between 0.5% - 1% and so further consideration of likely in-combination effects will be undertaken before a conclusion is reached. For fulmar the effect is equivalent to less than 0.5% of baseline mortality and so no LSE is concluded for this species.

Species				Calculation of effect	Population at risk					LSE test - Project alone	
Species	Impact	Season	Connectivity?	Effect estimate	Population	Adult survival rate	Baseline mortality rate	1% of baseline mortality rate	1% of baseline mortality	1% baseline mortality test	LSE
					Indiv.				Indiv.		
Guillemot	Displacement	Non-breeding	Y	**1000**	1617306	0.939	0.061	**0.00061**	**986.55666**	**1.0136**	**Yes**
Herring gull	Collision	Non-breeding	Y	**500**	466511	0.834	0.166	**0.00166**	**774.40826**	**0.6457**	**Maybe**
Fulmar	Collision	Post-breeding	Y	**2**	957502	0.936	0.064	**0.00064**	**612.80128**	**0.0033**	**No**

Figure 2.1: Worked example for breeding birds in the non-breeding season for a hypothetical wind farm

2.2 Migratory waterbirds

2.2.1 For migratory waterbirds (e.g. pink-footed goose from North Norfolk Coast SPA), connectivity will be identified, using the screening tool (i.e. Stage 1 of screening), based on the migratory polygons presented in Wright *et al.* (2012).

2.2.2 Stage 2 of the overall screening process will calculate the magnitude of the likely impact and generates the output presented in Figure 2.2. For this category only collision risk is considered in this stage of screening.

2.2.3 The results from Stage 1 of screening (i.e. identification of connectivity undertaken by the GIS screening tool) will be added into the first section of the Stage 2 output presented in Figure 2.2, specifically the second column ('Connectivity?'). This column can then be filtered to show only those features relevant to the Plan.

2.2.4 The second section of Stage 2, presented in Figure 2.2 ('Bird collision risk') specifies relevant collision risk parameters including:

- avoidance rate (default 98% unless a species-specific value is available);
- the proportion of birds assumed to fly at potential collision height (PCH) (taken from Wright *et al.,* 2012); and,
- pColl, which is the key risk term calculated by the Band collision risk model. Species specific pColl values will be calculated using the Band model and a worst case turbine design scenario (at this point it is assumed this will be for a generic 8 MW turbine, unless the proposed projects received as part of the Round 4 process lead to the identification of an alternative worst case scenario) and with relevant species parameters taken from Robinson (2005) and Alerstam *et al.* (2007).

2.2.5 Collision risk can be calculated using these parameters, provided that the proportion of the migratory corridor, for each species, that is occupied by turbines ('swept area ratio') is also known.

2.2.6 The third section of Stage 2, presented in Figure 2.2 ('Calculation of collision risk') calculates, therefore, the swept area ratio. To do this, information on the width of the migratory corridor, the turbine diameter (at this point it is assumed this will be for a generic 8 MW turbine, unless the proposed projects received as part of the Round 4 process lead to the identification of an alternative worst case scenario) and the number of turbines. These parameters are used to calculate the area of the migration window (width of migratory corridor multiplied by rotor diameter) and the total rotor swept area (area of rotor swept area of one turbine multiplied by the number of turbines). The area of the migratory window and the total rotor swept area are then used to calculate the swept area ratio. Note this calculation does not require information on how turbines are placed within the corridor (and nor does the Band model itself).

2.2.7 The final part of the third section of Stage 2 uses the parameters from section two ('Bird collision risk') and calculated values from section 3 ('Wind farm and turbine characteristics') to calculate collision risk using the following formula:

*pColl * (1-avoidance rate) * PCH * swept area ratio * 2*

2.2.8 This calculation involves a multiplication factor of two to account for both spring and autumn passages through the wind farm.

2.2.9 In the fourth section of Stage 2, presented in Figure 2.2 ('Calculation of collision estimate') information on the population at risk is used to calculate a collision risk estimate for each species. This requires the total flyway population of each species (e.g. from Wright *et al.,* 2012) and the proportion of that population considered to be at risk of interacting with the wind farm. This population is then multiplied by the collision risk calculated in the third section to provide a collision risk estimate.

2.2.10 The final section of Stage 2, presented in Figure 2.2, identifies whether an LSE will occur. To do this the baseline mortality for each species is required and the calculated collision estimate from the fourth section is compared to this value. In line with the approach outlining in the Round 4 HRA Principles report (2020), an LSE will be assumed if the collision estimate exceeds 1% of the baseline mortality. Further consideration of the collision estimate will be undertaken if the collision estimate represents between 0.5-1% of the baseline mortality. If the collision estimate represents less than 0.5% of the baseline mortality it will be assumed that an LSE will not occur.

Species		Bird collision risk			Calculation of collision risk						
Parameter	Connectivity?	Pcoll	AR	PCH	Width of migration corridor	Turbine diameter	Area of migration window	No. of turbines in Region	Total rotor swept area in Region	Swept area ratio	Collision risk
Un					km	m	m2		m2		
Curlew	Y	5.3%	0.98	0.25	10	200	2000000	200	6283185	3.142	**0.001665**
Pink-footed Goose	Y	7.8%	0.98	0.3	10	200	2000000	200	6283185	3.142	**0.0029405**
Wigeon	Y	9.0%	0.98	0.15	10	200	2000000	200	6283185	3.142	**0.0016965**

Calculation of collision estimate				LSE test - Project alone					
Population	Population predicted to interact with wind farm	Migratory population at risk - project alone	Collision estimate	Adult survival rate	Baseline mortality rate	1% of baseline mortality rate	1% of baseline mortality	1% baseline mortality test	LSE
Indiv.							Indiv.		
140000	0.6	84000	139.8637	0.75	0.25	0.0025	350	0.3996	No
360000	0.5	180000	529.2955	0.88	0.12	0.0012	432	1.2252	Yes
440000	0.4	176000	298.5770	0.9	0.1	0.001	440	0.6786	Maybe

Figure 2.2: Worked example for migratory waterbirds for a hypothetical wind farm

2.3 Migratory seabirds

2.3.1 For migratory seabirds (e.g. great skua from Hoy SPA), the screening approach will be identical to that to be applied for migratory waterbirds, although the identification of connectivity using migratory corridors for each species will be based on the approach presented in WWT Consulting and MacArthur Green (2014).

3. References

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